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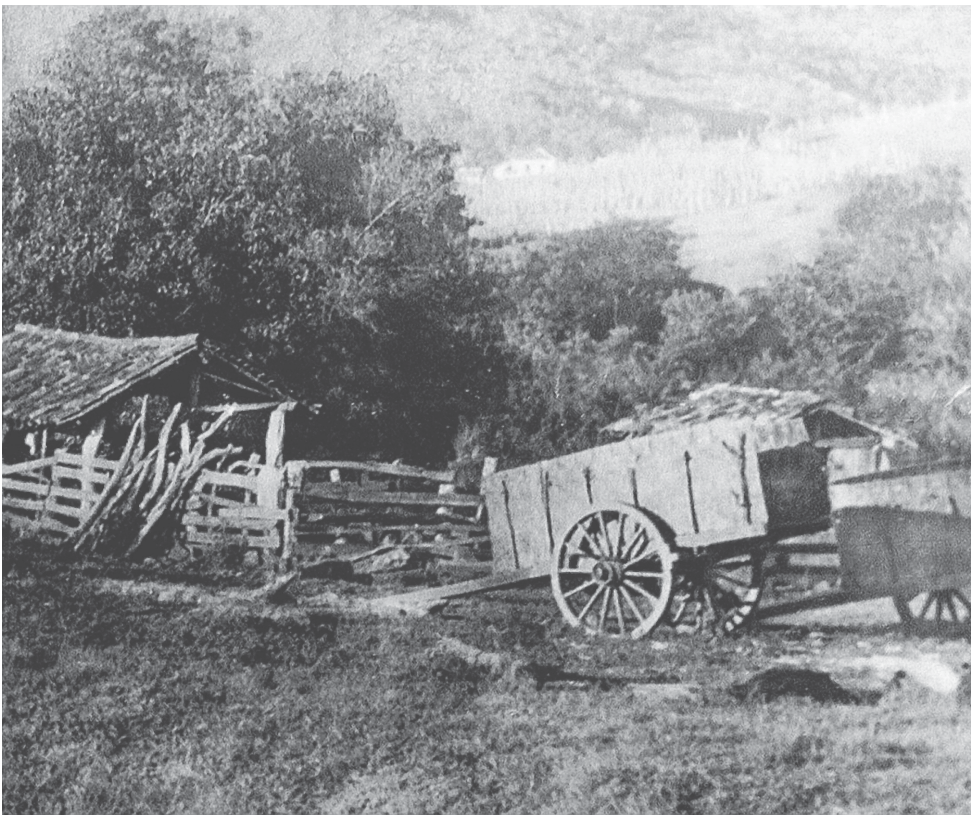
SLAVERY AND THE ECONOMICS OF LABOR IN BRAZILIAN COFFEE PLANTATIONS, 1850-1888

Pedro Carvalho de Mello



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To the memory of my parents, Paulo José and Nina.
And to the memory of my grandparents, Antônia
Andréia and José Manoel, Ignez and Antônio.

I would like to give a special thank to Sergio Tadeu Ribeiro,
extending to all friends and colleagues of ESAGS, to make
possible the publication of this book.

TABLE OF CONTENTS

PRESENTATION

This book is a summary and interpretation of findings of several years of my research on Brazilian economic history and in the economic aspects of slavery in coffee plantations. It started with my dissertation, "The Economics of Labor in Brazilian Coffee Plantations". It was followed by research and books and articles published since that time.

The purpose of the present book is to update the findings and to discuss the economic aspects of slavery in coffee plantations in the second half of the nineteenth century, and contribute to current debates within both Brazilian slave studies and economic history.

Herbert Klein and Francisco Luna published in 2010 a book, with the title "Slavery in Brazil", that reviews practically all the literature written about this subject in Brazil. More than 600 books, articles and dissertations have been reviewed by the authors. They comment that, while the literature about slavery in the United States is not advancing like in the past, in Brazil the situation is the opposite, with a growing literature and interest. I hope my book can contribute for the economic approach in the analysis of slavery.

I would like to thank several persons and institutions who helped me during my career. In its beginning, for writing my Ph.D. dissertation (Economics Department, University of Chicago), my Advisor was Robert W. Fogel, and the other two members of the Advisory Committee were Deirdre McCloskey and H. Gregg Lewis. For them, I give my sincere thanks and my deep appreciation for their guidance during the writing. I would like to extend my thanks for the Ford Foundation, who gave a full scholarship for the whole period of my graduate education in the United States.

When I was writing my Dissertation, I found out that, in Stanford, Robert W. Slenes was also writing a dissertation on the demographics and economics of slavery in Brazil, covering the

same period. We met in Chicago, exchanged ideas, and became good friends since then. Bob Slenes also helped me a lot, in order to guarantee the final edition of my dissertation in accordance with the University of Chicago rules.

I would like to thank Joseph Sweigart and John Shulz, for the friendship and support. Marina de Almeida Rego, who was always encouraging me to pursue my academic careeer, and who once travelled in Europe carrying the three hard cover volumes weighting 15 pounds of Fernand Braudel's *Civilisation Matérielle, Economie et Capitalisme, XVe.-XVIIIe Siécle* to bring them to Brazil for me. Iraci del Nero da Costa, Francisco Luna and Nelson Nozoe, of FEA/USP, who also helped and encouraged me to pursue activities in the field of economic history. Also, my colleages at the Department of Economics, Administration and Sociology of ESALQ (University of Sao Paulo), where I was an Associate Professor till my retirement. In particular, Pedro Valentim Marques, Geraldo SantÁnna de Barros and Bento Munhoz. Finally, my new School, ESAGS, after my retirement from ESALQ. I extend my thanks to my colleagues at IDE/FGV of Fundação Getulio Vargas, who always gave me support for carrying my academic activities. In particular, Clovis de Faro, Ricardo Spinelli and Marcos Villela.

Finally, my family was essential to allow me to pursue my academic life. During the writing of my dissertation, my mother Nina, during several months, helped me to collect and organize the information about slave prices and rental rates. My wife Dorothy, which at the time was also doing her Doctorate at the University of Chicago, and my two sons, Andre and Guilherme, born in Hyde Park during this time, gave me the practical and emotional support. In the years since, they continued to contribute to my career, giving me constant encouragement. Andre helped me, recently, to organize this book. I have to thank, in memoriam, my aunt (that was like my grandmother) Herminia de Mello Nogueira Borges, one of the first female art photographers in Brazil, and author of the picture used in the cover of this book. Now, after the arrival of my two daughters in law, Denise and Lakshmi, I dedicate this book to my five grandchildren: Andréa, Fernando, Avi, Luiza and Maya. My love for all of them.

FOREWORD

Slavery and Abolition in Brazil

The core of this book is to examine two issues: First, was slavery profitable for coffee planters, and was it viable to resort on slaves to expand coffee production? Second, if slavery was so important in economic terms, how to explain its final demise in 1888?

As we argue and evaluate in the book, and taking an empirical approach based mostly on primary sources, we came to the conclusion that slavery viewed as an investment by coffee planters was profitable, and the reasons for its demise in the coffee region should be looked in moral and political grounds, and not in overwhelming economic forces.

The interaction with the relevant literature about the economic reasons presented to explain the institution of slavery in Brazil led me to choose these questions. I consider them relevant to current and past economic theory, and this motivated me to examine in great detail the several particular issues connected with the questions raised by me, as shown in the following chapters of this book.

The purpose of choosing the topic of slavery and labor in coffee plantations is due to two main reasons. First, because it is one of the major historical areas of study, and the economic analysis we have used can bring an additional angle to examine some of the topics – especially the profitability of slavery – involved in the debate about the reasons for the end of slavery in Brazil. Second, by the importance it had for the social and economic development of Brazil in the 20th century. The fact that we had a peaceful process of abolition of slavery and a massive arrival of European laborers at the end of the 19th century has had an important impact in the formation of Brazilian society.

It is important to justify the time and the place we selected for the analysis [1]. I decided to select the time period 1850-1888 for my study because it was both illustrative of how slave labor was performed in Brazil, and how, in spite of its importance, was abolished in a peaceful way and without disrupting the coffee economy. With respect to the choice of place, it was based in the fact that the principal activity of the country, and employing slave labor in the plantations, was the coffee culture. The coffee economy was located, at the time, in Southeast Brazil. Those were the reasons for me to examine the last years of slavery and to choose the mature coffee economy in the Southeast and not some other area or time period[2] .

I am aware of the moral implications of my research, which are the ultimate issues when studying slavery. Even considering that the moral problem of slavery must be viewed in historical context, I hope that, even being concerned with the purely economic aspects of slavery in coffee plantations during the second half of the nineteenth century, the present book can contribute to the debate about the ideological and political struggle to end slavery.

As will be presented in this work, and based on research and collection of bodies of qualitative and quantitative evidence, we reached the opinion that ideological and political forces, not economic ones, were the overriding factors in the destruction of Brazilian slavery.

1 During almost four centuries, even during the last years of slavery, slaves were employed in several activities throughout Brazil. They were the dominant labor force, they constituted most of the agricultural workers, and were very important also within the local societies.

2 This book is basically a specialized monograph, and not a general survey book. It does not intend to summarize the history of Brazilian slavery. For a recent and inclusive history of slavery in Brazil, see Hebert S. Klein and Francisco Vidal Luna, Slavery in Brazil (Cambridge: Cambridge University Press, 2010).

PART I

Slavery and Coffee Plantation Economy

In order to provide the basic elements for the analysis about the profitability and abolition of slavery, the first part of the book examines the general background of the discussion about the slave question in the period 1850-1888, mainly from the perspective of the coffee economy.

CHAPTER 1

The Slave Question In The Period 1850-1888

When we examine the economic, social and political history of Brazil, slavery has to be ranked one of the main issues of analysis and discussion. Perhaps in no other country of the Western Hemisphere, black slavery was so pervasive, and lasted so long. Thus, the end of slavery in Brazil, the subject of this book, is a fascinating topic of analysis, and also an important issue, since for more than one century after Abolition Brazil still has to face the consequences of this process.

Commodities and slave labor

Brazil, during the colonial period (1500-1822) was a colony of a country – Portugal – that after the 16th century had to rely for protection and commercial links on other stronger countries. Thus, Portugal acted more as a "middleman" than as a country developing its own market. Most of the time, Holland, and after Great Britain, played the role of receiving the commodities from Brazil and "adding value" to them[3] .

3 See Alencastro, Luis Felipe de. O Trato dos Viventes: Formação do Brasil no Atlântico Sul, séculos XVI e XVII (São Paulo: Companhia das Letras, 2000).

In the nineteenth century, however, Brazil, already as an independent country, was able to look for its own interests. As this century progressed, coffee became one of the most important commodities traded in the world. The only way for Brazil to meet the challenge of becoming a competitive producer was to become efficient in the initial production stage, or, as we say today, "behind the farm gates". It had to ship its commodity at a price competitive enough even to displace what was produced in the own colonies of the major European countries. Even distance to markets, at a time of high transportation costs, posed further obstacles to the Southern country.

The economic history of the country, in most of its spam, reflects the importance for its economy of the production of commodities. The basic economic fact was that there were strong comparative advantages in Brazil for producing mineral and tropical agricultural commodities[4] .

There was intense competition among other regions of the world to produce the major commodities – like sugar or coffee, for example – for the international market. The most important European countries – Great Britain, France, Spain, Portugal, Holland – fought fiercely to have and run their own primary producing colonies. The top part of the "chain value" was in Europe, and, in the late nineteenth century for coffee, in the United States. The processing, insurance, trade, distribution, commerce were near their domestic markets.

The real challenge, however, was to create competitive advantages. And here comes the "crux of the matter": labor was a scarce factor of production. Nowadays, because we take for granted the importance of technology and of the total productivity effect, we do not evaluate properly how important were labor costs in the commodities market.

Efficient labor usage was therefore a key factor to achieve competitiveness. By this, we do not mean only to have "cheap labor". Perhaps more important was the labor organization, on top of cheap labor, necessary to run efficiently a large plantation.

4 The principal commodities were: sugar, coffee, cotton, rice, gold, iron ore, diamonds, cattle, indigo, Brazilian wood, rubber and others. In the economic history of Colonial Brazil, and after of Independent Brazil (Empire and Republic), Brazil had a peculiarity: it always was a multi-commodities producer. Because of that, it has had a more complex society, and, in economic terms, a less risky economy, because diversification of commodities protected it against the "price lottery" common to countries that strongly rely in only one commodity. See Boxer, Charles R. The Golden Age of Brazil (Berkeley and Los Angeles: University of California Press, 1964); Roberto c. Simonsen, História Econômica do Brasil. 4th Ed. (São Paulo: Companhia Editora Nacional, 1969).

Coffee plantations and Slave Labor

Coffee cultivation was the most important economic activity of Brazil in the second half of the 19th century[5] . The coffee economy in Southeast Brazil, 1850-1888, could be described as an organized plantation society. The basic economic elements of production and costs were present, there are ample evidence in the relevant literature that an efficient allocation of resources was a main concern by coffee planters, and we intend to show in this book that the profit motif was the main factor behind their effort for organizing the production and delivery of coffee to the ports.

It should be mentioned that the planters in Brazil – sugar planters, coffee planters, and others – worked and lived in their plantations. They were active managers, lived in the plantations with their families, and developed plantation societies, like the Southern United States. They were not absentee plantation owners, like most of the British, French or Dutch. This is very important in the context of Abolition, because they saw in it a threat of their social organization of life and the way the plantation economy was organized, and not only a mere economic change in the customary labor regimen.

Abolition of Slavery

The whole abolition process took part during the upward phase of the Brazilian coffee boom. In the second half of the nineteenth century coffee cultivation was the most important economic activity in the country.

Coffee exports were booming: the Brazilian share in the world coffee production increased from 18 percent in the 1820s to 56 percent in the 1880s, and coffee exports increased steadily from 2,485, 000 bags of 60 *kilogrammes* in 1850 to 4,515,000 bags in 1888, at a rate of increase of 2.09 percent per annum[6].

The demand for coffee was growing steadily, mainly in the United States, and prices increasing (average value in gold pound sterlings per bag of sixty *kilogrammes*) in the period at the rate of 1.10 percent per annum, and the coffee producing area was continuously expanding[7].

Coffee production, however, and again contrasting with almost all the experiences of slavery abolition in other countries, [8] continued to increase

5 See Coes, Donald. "Brazil,", in William A. Lewis (editor), Tropical Development, 1880-1913 (Evanston, Illinois: Northwestern University Press, 1970), pp. 100-127.

6 Coffee production, exports and prices are examined in Chapter 2.

7 Ibid.

8 For most societies abolishing slavery, the economic results – particularly in the immediate years following the end of slavery – were disastrous. See, as an example, Emanuel W. Riviere, "Labour Shortage in the British West Indies after Emancipation," Journal of Caribbean History, IV (May 1972), 1-30.

even in the years immediately following the final abolition in 1888, and at a rate higher than before.

During the slavery period, coffee plantations were virtually staffed by slaves, but, with abolition, rather than a change of legal status of workers – from Black slaves to Black free workers – it was instead a change from Black slaves to European free workers.

Most of the immigrants, partially subsidized by the Central and Provincial governments, came from the North of Italy[9]. Between the years 1887 and 1897, around 837,500 immigrants, of which 71.6 percent were Italians[10], arrived in the Province of São Paulo, which was the most important coffee producing area in Brazil after 1890. During the whole period 1827-1886, however, the total European immigration in the Province was only 52,890[11].

This experience with European workers as the majority of workers in coffee plantations is also unique in the context of the aftermath of abolition of slavery in other countries.

Brazil was the last country in the Western World to abolish slavery. The abolition was gradual and pacific. It was made within a legal framework, which followed four major legal steps. The law passed on 4 September 1850, ending the African slave trade[12], eliminated the external supply of slaves to the country. The Law 2040, passed on 28 September 1871, known as the Free Womb Law[13], liberated the children of slave mothers born after that date[14] . This law eliminated the other possible source of supply, internal, determined by demographic factors. The law passed on 28 September 1885, known as the Sexagenarian Law, gave freedom, without any indemnification to the slave owners, of slaves sixty years old or more[15]. Finally, the law passed on 13 May 1888, known as

9 European immigration and the labor question in coffee plantations is discussed in Chapter 11. For European immigration in São Paulo, see Holloway, Thomas. Immigrants on the Land: Coffee and Society in São Paulo, 1886-1934 (Ithaca, NY: Cornell University Press, 1980).

10 Antonio Franceschini, LÉmigrazione Italiana nellÁmerica del Sud: Studi sulla Espansione Coloniale Transatlantica (Rome, 1908), pp. 512-15.

11 Ibid.

12 The law was effectively enforced, and Brazil had only two more years with sporadic and insignificant cases of illegal importation.

13 The Lei do Ventre Livre, also known as the Rio Branco Law.

14 This Law gave two options to the masters: either to care for the newborn children of slave women until the age of eight, and receive from the government an indemnification of 600 milreis (in six-percent thirty-year bonds) or to make a free use of their labor until they reached the age of twenty-one, and receive no indemnification. The slave owners's choice was overwhelmingly for the second alternative, and those minors, called ingenuos, were priced like assets.

15 After three more years of labor (not paid for) for those between sixty and sixty-five years of age. Although not very important in the sense of decreasing the effective labor force, it had a highly symbolic effect, of not allowing old people, past 65 years of age, to die as a slave.

the Lei *Aurea*. This law gave freedom to all slaves in Brazil, without any indemnification or any other condition.

The abolition process, with exception of some minor labor incidents, was entirely pacific. This pacific transition, without indemnification to slave owners, acquires more importance when it is compared with other countries in the New World – Brazil, which had 1,510,806 slaves in 1872[16], was, after the United States, the largest slave society in the nineteenth century.

In those countries where slavery was also of economic importance, the abolition was made either in the context of a Civil War, such as the tragic experience of the United States, or in colonies that had allegiance to their European metropolises – such as the British or Dutch West Indies, or finally, in the context of Independence Wars, as in some Spanish colonies[17].

In Brazil, abolition was made by domestic initiative, through Parliamentary means[18]. Although the slavery institution was very important for the coffee planters, and they are alleged to be the group gradually holding more political power in the country, nonetheless the laws gradually abolishing slavery were passed and enforced without violent resistance.

Importance of Slavery

It is noteworthy that the institution of Negro slavery was the dominant form of labor organization in Colonial Brazil (1500-1822). Almost to the end of the Colonial period the number of slaves surpassed the free population – in the mid eighteenth century slaves represented more than sixty percent of the total population; in 1800 they still represented half of the total population[19].

With the coming of the Portuguese Court to Brazil in 1808, and Independence in 1822, although European immigration began in a small

16 Brasil, Recenseamento da População do Império do Brazil a que se procedeu no dia 1 de Agosto de 1872: Quadros Estatísticos, 23 volumes, (Rio de Janeiro, 1872-1876).

17 The fact that the abolition process took part during several years, and that Brazil – since it was the last country - had a "learning curve" provided by the societies abolishing slavery, no doubt contributed to enlarge the time spam of adaptation to a world without slaves in the coffee plantations. See Anstey, Roger T. The Atlantic Slave Trade and British Abolition, 1760-1810 (London: Macmillan, 1975); and Craton, Michael and Walvin, James. A Jamaican Plantation: The History of Worthy Park, 1670-1870 (Toronto: University of Toronto Press, 1970).

18 With exception of the 1850 Law, that although voted in Parliament, was partially motivated and enacted after years of growing British pressure. See Bethell, Leslie. The Abolition of the Brazilian Slave Trade (Cambridge: Cambridge at the University Press, 1970). Peabody, Sue and Keyla Grimberg. Slavery, Freedom, and the Law in the Atlantic World: a Brief history with Documents (Boston; Bedford/St. Martin's Press, 2007).

19 Caio Prado Júnior, História Econômica do Brasil, 8th Ed. (São Paulo: Editora Brasiliense, 1962), p.351.

scale, slavery continued by far the most important source of labor for plantations, and represented a sizable part of the total population. In 1850 this proportion was thirty percent, and fifteen percent in 1872[20].

Brazil was also the principal importer of African slaves, and the number of them coming between 1500 and 1852, when effective trade ended, is estimated as 4.8 million[21].

Klein and Francisco Vidal Luna, in a recent and major work about Slavery in Brazil, devote the first part of the book to discuss the political economy of slavery[22]. According to them:

> "It was the establishment of the Portuguese colony of Brazil after 1500 that was to mark the beginnings of the modern slave plantation economy of the Americas, which so influenced hemispheric developments for the next four centuries"[23].

They also add that "the study of African slavery in Brazil is fundamental to the study of the Afro-Brazilian experience of the 4.8 million Africans who arrived on its shores"[24]. Although in the first centuries of the Brazilian colony native Indians were also used as slaves, gradually slavery in Brazil became synonymous with Black slavery.

According to Klein and Luna:

> "without question, then, Brazil in 1800 had the largest population of Africans and Afro-Americans among the European colonies and was the largest slave system in the Americas"[25].

This pattern continued almost to the last two decades of the 19th century in Brazil. In the second half of the nineteenth century, more than 1.7 million slaves around 1870 were of Black African origin.

Thus, in the second half of the nineteenth century, the slavery economy was highly entrenched in Brazil, having developed along the past centuries supportive institutions for the slave plantation model. Even at that late stage of the economic history of Brazil,

20 Ibid., p.351.
21 Philip D.Curtin, in earlier estimatives, reached a lower number. According to him, 3,647,000 Africans, about 38% of the total slave imports to the New World. Curtin, The Atlantic Slave Trade, A Census, p. 89. More recent works have revised the estimates, and we are using the studies of Herbert Klein.
22 Herbert S. Klein and Francisco Vidal Luna, *Slavery in Brazil* (Cambridge: Cambridge University Press, 2010).
23 Ibid, p. 13.
24 Ibid, p. 14.
25 Ibid, p. 73.

> "It was thus the successful Brazilian system that would influence the pattern of all future commercial agricultural slave regimes. What distinguished this American slave society from most previous slave societies was in fact the domination of slaves as agricultural workers, their vital importance in the production of goods for the international market, and their importance within the local societies"[26].

During the three last decades of the Imperial period (1822-1889), although it had diminished its importance in other regions of Brazil, slavery was the dominant form of labor organization in the coffee producing provinces[27], and coffee plantations were virtually staffed by slaves until the 1888 final abolition[28].

The Debate about the Demise of Slavery in Brazil

The interpretation of the demise of slavery in Brazil has been the subject of important studies[29]. Most studies present explanations for the abolition which rely with a varied degree either in cultural, institutional, political, ideological, demographic or economic causes[30].

Given this close association between slavery and commodity production in Brazil, it is not a surprise to find that the economic rationality – translated in profitability – of the use of Black slaves in coffee plantations was never an issue. There was general agreement among planters about this point. Only during the campaign for Abolition, in the last decade of slavery in Brazil, this issue was raised by foreign and Brazilian abolitionists.

During the three decades after the II World War, several studies were published in Brazil, arguing that slavery was not profitable, and

26 Ibid, p. 13.

27 Provinces of Rio de Janeiro, São Paulo, Minas Gerais and Espírito Santo, and the Municipio Neutro, the district where the city of Rio de Janeiro was located.

28 The concentration of slaves in the coffee plantations is discussed in Chapter 4.

29 For an earlier review of those studies, see Richard Graham, "Brazilian Slavery Re-Examined: A Review Article," *Journal of Social History*, III, No. 4 (Summer 1970), 431-53. See also Robert W. Slenes, "The Demography and Economics of Brazilian Slavery, 1850-1888 (Ph.D. diss., Department of History, Stanford University, 1966). For a more recent and complete review, see Herbert S. Klein and Francisco Vidal Luna, *Slavery in Brazil* (Cambridge: Cambridge University Press, 2010).

30 In addition to the book by Klein and Luna, mentioned above, the two most important works, both containing a good bibliography, are Emilia V. da Costa, *Da Senzala à Colonia* (São Paulo: Difusão Européia do Livro, 1966) and Robert Conrad, *The Destruction of Brazilian Slavery: 1850-1888* (Berkeley: The University of California Press, 1972).

that coffee planterswere missing the advantages of free labor[31] . The conclusions reached in these studies were, and are still widely quoted in the economic literature in Brazil. These studies, in a sense, were attributing a pre-capitalist mentality to coffee planters, with the exception of *Paulista* coffee planters, implying lack of profitability rationality in the investment in slaves. The abolition of slavery was interpreted as based on economic forces, and due to the growing importance of *Paulista* coffee planters and their willingness to hire free (European) labor to replace slaves. In the last four decades, however, several books and articles have reviewed these arguments, bringing more empirical studies and research in historical primary sources to enrich the debate[32] .

31 Other works dealing with slavery in coffee plantations and/or abolition are: Pedro Calmon, "A Abolição," *Revista do Arquivo Municipal de São Paulo*, IV (May 1968), 127-46; Percy A. Martin, "Slavery and Abolition in Brazil", *Hispanic American Historical Review*, XIII, No.2 (May 1933), 151-96; Maurilio de Gouveia, *História da Escravidão* (Rio de Janeiro: Gráfica Tupy, 1955); Robert B. Toplin, *The Abolition of Slavery in Brazil* (New York: Atheneum, 1975); Stanley Stein, *Vassouras: A Brazilian Coffee County, 1850-1900, 2nd ed.* (New York: Atheneum, 1970); Paula Beiguelman, *A Formação do Povo no Complexo Cafeeiro: Aspectos Políticos* (São Paulo: Livraria Pioneira Editora, 1966); Celso Furtado, *Formação Econômica do Brasil*, 5th ed. (Rio de Janeiro: Editora Fundo de Cultura, 1963); Otavio Ianni, "O Progresso Econômico e o Trabalhador Livre," *in História Geral da Civilização Brasileira*, Tomo II, III (São Paulo: Difusão Européia do Livro, 1969) , 297- 319; Richard Graham, "Causes for the Abolition of Negro Slavery in Brazil: An Interpretative Essay," *Hispanic American Historical Review*, XLVI, No.2 (1966), 123-37; Eugene D. Genovese, *The World the Slaveholders Made* (New York: Vintage Books Edition, 1971); Emília V. da Costa, "O Escravo na Grande Lavoura,"*in História Geral da Civilização Brasileira*, Ed. Sergio B. de Hollanda, Tomo II, III (São Paulo: Difusão Européia do Livro, 1969), 135-88.

32 See Cardoso, Ciro Flamarion et. al. *Escravidão e Abolição no Brasil: Novas Perspectivas* (Rio de Janeiro: Zahar, 1988); Castro, Antônio Barros de. "Escravos e senhores nos engenhos do Brasil. Um estudo sobre os trabalhos do açúcar e a política econômica dos senhores" (São Paulo: tese de doutorado, UNICAMP, 1976); Chalhoub, Sidney. *Visões da Liberdade: Uma história das últimas décadas da escravidão na Corte* (São Paulo: Companhia das Letras, 1990); Dean, Warren. Rio Claro: A Brazilian Plantation System, 1820-1920 (Stanford: Stanford University Press, 1976); Eltis, David. "Slavery and freedom in the Early Modern world," in Stanley L. Engerman, ed., *Terms of Labor, Slavery, Serfdom, and Free Labor* (Stanford: Stanford University Press, 1999), pp. 25-49; Fogel, Robert W. *Without Consent or Contract. The Rise and Fall of American Slavery* (New York and London: W.W.Norton, 1989); Gomes, Flávio dos Santos. *Experiências Atlânticas: Ensaios e Pesquisas sobre a Escravidão e o Pós-Emancipação no Brasil* (Passo Fundo, Rio Grande do Sul: Editora UPF, 2003); Gorender, Jacob. *O Escravismo Colonial. 4th ed. rev.* (São Paulo: Editora Ática, 1985); Leff, Nathaniel H. *Subdesenvolvimento e Desenvolvimento no Brasil, 2 volumes,*(Volume I: Estrutura e Mudança Econômica, 1822-1947). (Rio de Janeiro: Editora expressão e cultura, 1991); Luna, Francisco Vidal and Herbert S. Klein, *Slavery and the Economy of São Paulo, 1750-1850* (Stanford: Stanford University Press, 2003); Marcondes, Renato Leite *A Arte de Acumular na Economia Cafeeira* (Lorena, São Paulo: Editora Stiliano, 1998); Martins, Roberto Borges. "Growing in Silence: The Slave Economy of Nineteenth Century Minas Gerais, Brazil," *Ph.D. Dissertation, Economics,* Vanderbilt University, 1980; Mello, Pedro Carvalho de. " Aspectos econômicos da Organização do Trabalho da Economia Cafeeira do Rio de Janeiro, 1850-1888," *Revista Brasileira de Economia,* 32, no. 1 (Jan./Mar.1978), pp. 19-68; Mello, Pedro Carvalho de. "The Economics of Labor in Brazilian Coffee Plantations, 1850-1888," (Ph.D. Dissertation, Department of Economics, University of Chicago, 1973); Mello, Pedro Carvalho de. " Rates of Return on Slave Capital in Brazilian Coffee Plantations, 1871-1881," Fogel, Robert W. and Stanley L. Engerman (editors), *Without Consent or Contract, Markets and Production, Technical Papers, Volume I* (New York and London: W.W. Norton & Company, 1992), pp. 63-79; Mello, Pedro Carvalho de. " Expectation of Abolition and Sanguinity of Coffee Planters in Brazil, 1871-1888," Fogel, Robert W. and Stanley L. Engerman (editors), *Without Consent or Contract, Conditions of Slave Life and the Transition to Freedom, Technical Papers, Volume II*

Organization of the Book

We intend in this book to show and detail particular economic aspects that we deem important to be investigated in order to increase our knowledge about the economics of slavery in Brazil, such as slave prices, hire rates, slave longevity, rates of return in investment, and other topics that relate to debates in economic theory and current economic theory. We believe that, together, they can support and improve our understanding about the economic forces that are the determinants of profitability, and to provide a justification of using prices to determine expected future activity and profitability.

In the following chapters of this book, we will examine the economics of slavery in coffee plantations during the period 1850-1888, with special attention to the years following the 1871 Free Womb Law. Most of the research on primary sources was concentrated in the Province of Rio de Janeiro. Since this province was the most important coffee producing area of the country during the period covered by this book, nothing essential will be lost for the analytical interpretation of the problems posed. In addition, this province has received relatively less attention in the literature than the São Paulo coffee producing area, and our empirical investigation can contribute to the knowledge about this area.

We will start the discussion with the coffee economy and production. Based on data on coffee production, exports and prices, and also based on an analysis of the changes in the coffee region slave population, it intends to assess the course of demand for slaves in coffee plantations in the period 1871-1888 (Chapters 2, 3 and 6).

Following this background on the aspects of coffee production and demand for labor, we examine the purchase market and the rental market for slaves. In order to gather information about prices and rental rates, we did an extensive research on several primary sources, and were able to

(New York and London: W.W. Norton & Company, 1992), pp. 629-646; Monasterio, Leonardo M. "FHC errou? A Economia da Escravidão no Brasil Meridional," . *História e Economia, Revista Interdisciplinar*. São Paulo: BBS, I, no. I (2do. Semestre 2005), pp. 13-28; Motta, José Flávio e Nelson Hideiki Nozoe. "Cafeicultura e Acumulação". *Estudos Econômicos*, 24, no.2 (maio/Ago. 1994), pp. 253-320; Queiroz, Sueli Robles Reis de. *Escravidão Negra em São Paulo* (Rio de Janeiro: Livraria José Olympio editora, 1977); Rangel, Armenio de Souza. "Escravismo e Riqueza – Formação da Economia Cafeeira no Município de Taubaté, 1765/1835," (São Paulo: tese de Doutorado, REA-USP, 1990); Schwartz, Stuart B. *Slaves, Peasants, and Rebels: Reconsidering Brazilian Slavery* (Urbana: University of Illinois Press, 1992); Slenes, Robert W. "The Demography and Economics of Brazilian Slavery, 1850-1888,". (Ph.D. Dissertation, Department of History, Stanford University, 1976); Soares, Luiz Carlos. "A Escravidão Industrial no Rio de Janeiro do Século XIX,". *Anais do V. Congresso Brasileiro de História Econômica*, ABPHE, 2003; Versiani, Flávio Rabelo. "Brazilian Slavery: Toward an Economic Analysis". Revista Brasileira de Economia, 48, no. 4 (Dezembro 1994), pp. 463-478.

provide the basic data on the course of slave prices and hire rates in the period 1835 through 1888 (chapters 4 and 5).

In order to study the profitability and the viability of slavery, we had to estimate slave longevity in the second half of the nineteenth century in Brazil. We opted for constructing slave life tables, based in the results of the 1872 Census. The Life Tables were constructed for the male and female slave population (Chapter 7 and appendix A).

Next, we estimated the alternative rates of return on other capital assets than slaves, for the 1870s and 1880s. In order to assess an indicator for the gains the coffee planter could get if they invested in financial assets rather than purchasing slaves, we studied both the banking sector and the stock market of Brazil during the second half of the nineteenth century (Chapter 8).

Chapters 1 to 8, therefore, constitute the background for the core of this book. The core of this book is to examine two issues: First, was slavery profitable for coffee planters, and was it viable to resort on slaves to expand coffee production? Second, if slavery was so important in economic terms, how to explain its final demise in 1888?

To advance the conclusions reached in this study, we argue that slavery was profitable and an efficient way to organize labor in coffee plantations, and that the collapse of slavery in 1888 can be attributed to political and ideological forces, and not to economic fundamentals.

The calculation of profitability uses information about slave prices, hire rates, value of marginal product, interest rates and slave longevity. The intention is to examine the issue of profitability of slavery, using estimates of slave age price profiles and slave age earning profiles, and calculate the rates of return earned by slave capital in coffee plantations in the 1870s, especially in 1873. (Chapter 9).

In order to explain the collapse of slavery in the mid 1880s, we examine the impact of the expectation of abolition by coffee planters in their demand for slaves in the 1880s. In order to make this assessment, we rely in four different metrics: sanguinity of coffee planters, behavior of the slave real hire rates, changes in the shape of the slave age-price profiles during different years, and the expected economic life of slavery – through slave price information (Chapter 10).

Finally, we examine the labor market in coffee plantations during the transition from slave Black labor to European free labor in the years 1985-1895, and discuss the issue of forced labor in countries with vast supply of land (Chapter 11).Based on that, we make concluding remarks about the consequences of the way Abolition was done in Brazil (Chapter 12).

PART II

CHAPTER 2
Coffee Production, Exports, Prices, And Revenues

A distinguished feature of slavery in coffee plantations was the performance of the coffee economy in the nineteenth century. We will examine in detail in the next chapters of this book the several aspects related to the economic nature of slavery in the plantations, but this discussion would not take place if the coffee economy was not booming during this century. As we will see in this chapter, a virtuous cycle happened: rising prices, expanding production and a growing demand in the export market.

Coffee production

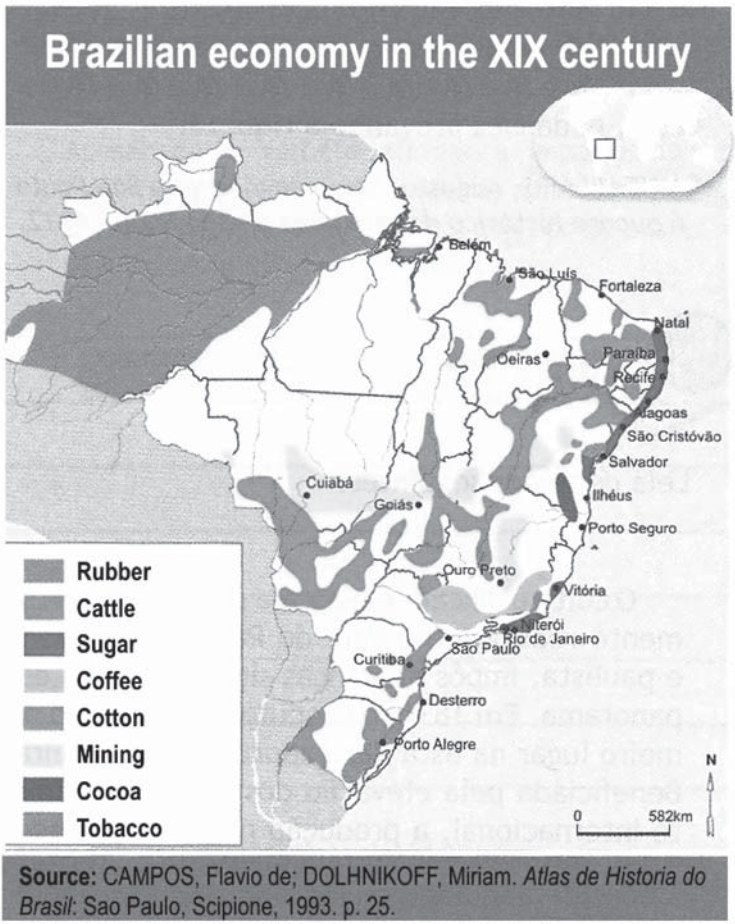
Although by the climate and soil conditions coffee could flourish in many parts of Brazil, virtually all the marketable coffee crops were produced in the provinces located in the Southeast of the country[33] .

Thus we will refer as coffee region the coffee producing provinces of Rio de Janeiro, São Paulo, Minas Gerais and Espírito Santo. Also included is the *Município Neutro*, a county or district where the city and port of Rio de Janeiro was located, and that from an economic and geographical viewpoint was the regional metropolis, the financial and the commercial

33 The major work in the many aspects of coffee cultivation during this period is Affonso d'Escragnolle Taunay, *História do Café no Brasil*, 15 vols. (Rio de Janeiro: Departamento Nacional do Café, 1939-1943). See also Bacha, Edmar Lisboa. " Política Brasileira do café: uma Avaliação Centenária, " in Marcellino Martins and E. Johnston, *150 Anos do Café* (Rio de Janeiro: Marcellino Martins & E. Johnston Exportadores Ltda., 1992); Delfim Netto, Antônio. *O Problema do Café no Brasil* (São Paulo: Instituto de Pesquisas Econômicas-USP, 1981); Simonsen, Roberto C. "Aspectos da História Econômica do Café,". Instituto Histórico e Geográfico Brasileiro (editor). In *Anais do Terceiro Congresso de História Nacional*, vol. IV. (Rio de Janeiro: Imprensa Nacional, 1941), pp. 211-304; Milliet, Sergio. "Roteiro do Café," Sérgio Milliet(ed.) In *Roteiro do Café e Outros Ensaios*. (São Paulo: Coleção Departamento de Cultura, 1939), pp. 7-70.

center of the region[34]. This role, however, would be gradually split and then being shifted to the complex of the city of São Paulo and the city and Port of Santos, but this increasingly so after the continuous expansion of the Western São Paulo in the 1890s.

Map 2.1 – Map of the Brazilian economy in the XIX century



The total area of the coffee region was 980,946 square kilometers (km²), about 11.8 percent of the total surface of the country. However, only a small part of this area had coffee cultures.

34 The *Municipio Neutro* was the capital of the Empire of Brazil. The Empire was organized in a central government, provinces and counties (*municípios*). Given the size of Brazil, almost as large as the United States, the political organization of the Empire had some similarities with the North American country. The *Município Neutro* performed functions that resembled the political and administrative role played by the District of Columbia (DC) in the United States.

We will adopt the characterization of Laerne, a Dutch coffee expert, who made an extensive and excellent field research on many aspects of coffee cultivation in Brazil between September of 1883 and April of 1884[35] .

According to him, during this period the coffee producing area within the coffee region, totaling 380,000 km^2 (38.7 percent), could be divided into two zones or areas of influence of the ports of Rio de Janeiro (the "Rio Zone") and Santos (the "Santos Zone").

In the Rio Zone the maritime climate prevailed, and the coffee zone lied from 200 to 550 meters above the level of the sea. The area was 155,000 km^2 in extent, and it comprised all the *municípios* (counties) which belonged geographically to the Valley of the Paraíba River[36].

It included the whole Rio de Janeiro province and a small part of Espírito Santo (70,000 km^2), the Northeastern counties of São Paulo (30,000 km^2) and the Eastern counties of Minas Gerais, bounded by the Paraíba River in the east and the Mantiqueira Mountains on the west (55,000 km^2).

In the Santos Zone the continental climate was predominant, and the zone was consequently further inland. It was also higher in altitude, between 600 and 1,000 meters above the sea level. The area was 225,000 km^2 in extent, comprising the Central, Northwestern and Western of São Paulo (200,000 km^2) and the Southeastern counties of Minas Gerais (25,000 km^2)[37] .

Thus the total coffee producing area within the coffee region was 380,000 km^2 in extent. The area which was planted with coffee was, of course, a fraction of this. Laerne estimated it as 832,000 *hectares*[38] , what is equivalent to 2.2 percent of the coffee producing area. It is important to notice that the expansion of the coffee producing area could be made in virgin lands within the region, and had not to compete with other agricultural uses of the land. Thus, the limiting factors of production were labor and capital, and not land.

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35 C.F.Van Delden Laerne, *Brazil and Java: Report on Coffee Culture in America, Asia and Africa* (London: W. M. Alden & Co., 1885). Laerne was attached to the Department of Interior at Batavia (Java), charged by the Dutch Government with a special mission (fact finding and evaluation of Brazilian potential for coffee production) to Brazil on behalf of the coffee culture and coffee commerce in the Dutch possessions in Asia(competitors of Brazil in the export market).

36 See Lamego, Alberto R. *O Homem e a Serra*. (Rio de Janeiro: Edição da Divisão Cultural do IBGE, 1963).

37 Ibid, pp. 261-263.

38 One hectare is equivalent to 2.47acres. One km2 has the equivalent of 100.4 *hectares*.

Of the total extent of the area planted with coffee, the Rio Zone had 700,000 *hectares* (80.5 percent) and the Santos Zone 132,000 (19.5 percent). The next sections presents a discussion about the central points about coffee production, exports and prices, which are relevant for this study.

Extent of Land Planted

The extent of land planted changed through time, but in the coffee producing area it was increasing during the whole period 1871-1888. In 1874, it was estimated that nearly 1,500,000 acres (or 607,300 *hectares*) were under coffee cultivation[39] . It can be estimated, then, from the 1884 Laerne figure of 832,000 hectares, that in this decade the increase in the area planted with coffee was about 37 percent.

The number of trees, since it had a close relationship with the area planted – the space left in planting was, on average, 12 by 14 *palmos*[40] in the Rio Zone, giving rather more than 1,200 trees to a *hectare*, and in the Santos Zone 14 by 14, or rather more than 1,000 trees to a *hectare* – was also increasing in the period[41].

In 1874 it was estimated that the coffee trees in Brazil numbered about 530 million[42]. In 1884 Laerne made the following estimation, shown in Table 2.1, which indicates that the number of coffee trees had increased from 530 million to 992 million (or 87 percent) in over one decade.

TABLE 2.1
Number of Coffee Trees in the Coffee Region, 1884 (in thousands)

ZONE	Fruit-bearing	Young Trees	Total
Rio	756,757	93,509	850,265
Santos	100,845	40,434	141,279
Total	857,602	133,943	991,545

Source: Laerne, Brazil and Java, p.367.

39 C. G. Warnford Lock, Coffee: Its Culture and Commerce in all Countries. (London: E. F. N. Spon, 1888), p. 172.
40 A palmo had 0.22 meters or 8.66 inches.
41 Laerne, Brazil and Java, p. 367.
42 Lock, Coffee: Its Culture and Commerce in all Countries, p.172.

Asset Values of Coffee Trees

The coffee trees (or, more appropriately, shrubs) have a characteristic of capital goods, since, once planted, they could produce coffee for many years. This is a very important aspect of coffee cultivation, since once ready to bear fruits the plant had a capital value equal to the years of cultivation lying on it – and a value equal to the capitalized value of the expected net returns – and it could not well be thrown out of cultivation like cotton or sugar cane, without great loss of capital. Even with low prices, planters would continue to cultivate their coffee fields with expectations of a rise in prices of coffee.

To propagate the coffee plant, the seeds were sown in nurseries, and after reaching a height of from eighteen to twenty-four inches, they were transferred to the plantations and planted from six to ten feet apart, according to the county, zone and conditions.

As a general rule the crop was not expected until four years after setting out the young plants, unless when the plants were from eighteen months to two years before transplanting, in which case a partial crop was obtained at the end of the third year[43] .

Hence, on average, full production of the young trees was reached at the age of six and sometimes between six and eight years.

The average economic life of the trees – as opposed to their biological life – or, according to Laerne[44] , the period during which the planter thought it was to his advantage to maintain the plantation (consequently the period of paying production) was on average of 25 to 30 years, or a period from fifteen to twenty years in which the trees were bearing fruits[45] .

The production per coffee tree also had a life cycle pattern, attaining full productivity at mid ages. This was reflected in the evaluation of the coffee trees according to age. Thus, the life cycle pattern of productivity of the trees, together with the capitalization of the expected net revenues, resulted in an age-price profile for the coffee trees.

Based on data shown in a mortgage loan made by Banco do Brazil, Figure 2.1 show an age price profile for coffee trees of the *Fazenda Oriente*, in 1882.

43 Joseph M. Walsh, Coffee: Its History, Classification and Description (Philadelphia: J. M. Walsh, 1894), p. 71.
44 Laerne, Brazil and Java, p. 296.
45 Walsh, Coffee: Its History, Classification and Description, p. 174.

FIGURE 2.1
Age Price Profile of Coffee Trees of *Fazenda Oriente*, 1882 (in *réis* for each 100 trees)

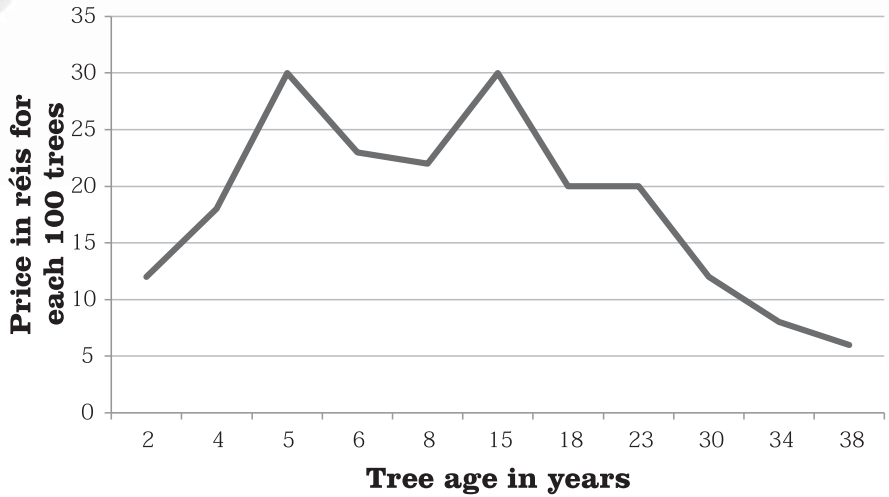


TABLE 2.2
Average Value of Coffee Trees According to Age (Real Values in milréis)*

Age of the Coffee Trees (in years)	1868-69[a]	1877[b]	1886[c]
1	84	59	
2–3	125	98	96
3–5	146	157	240
5–8	211	196	290
8–16	211	274	290
16–20	136	176	240
20-25	104	117	192
Over 25 years	104	59	101

Note: * Buescu Price Index, 1870: 100 (This index was estimated by Mircea Buescu. It appears in Mircea Buescu, 300 Anos de Inflação. (Rio de Janeiro: APEC, 1973), p. 223. Hereafter I will call it the Buescu Price Index.

Sources: [a] Mortgages of Coffee Plantations, in Atas da Gerencia do Banco do Brasil, No.68 (21 January 1868) and No. 177 (9 September 1869), Banco do Brasil, Brasilia.

[b] Plantations values around 1877, quoted in Laerne, Brazil and Java, p. 297.

[c] Bella Vista Plantation, Vassouras, Rio de Janeiro. Inventorie 13 December 1886, CPOV, Listed in Appendix B.

Table 2.2 presents the *milréis* value of coffee trees according to age for three different periods of time[46] . A comparison of the age-price profiles of coffee trees between 1868-69, 1877 and 1886 shows that the real prices of the young coffee trees in 1886 was higher than in the other two periods. Since those are long-lived assets, reflecting in their price the view their owners have of the future, in the mid 1880s coffee planters predicted a continuation, for the 1890s, of the "booming" conditions of the preceding decades (as opposed to their expectations about the future of slavery, as shown in Chapter 10).

Land Size of Coffee Plantations

Table 2.3 is based on the data obtained in a research on the *Atas da Gerencia do Banco do Brasil*, in the period 1867-1870, in which there are summary transcripts of the coffee planters mortgage applications and their evaluation by the Bank's experts[47].

Plantations are classified according to the size of the land plot, measured in *alqueires*[48]. The estates producing coffee were denoted according to their extent and importance.

They were called *fazendas* (average size: 300 to 400 *alqueires*); *fazendolas* (150 *alqueires*); *sítio* (100 *alqueires*) and *situação* (not exceeding 50 *alqueires*)[49] . Thus, the *fazendas* and *fazendolas* were the plantations and small plantations, respectively[50].

It was not uncommon, as shown in the mortgage applications, for the same coffee planter to own one *fazenda* and one or two *sitios* or *situações*, in general in the same county and in many cases in contiguous estates. Another pattern we found was the same coffee planter to own two or three *fazendas*, one or two in the Paraíba Valley and the other in the coffee frontier lands in Minas Gerais or Espírito Santo[51].

Table 2.3 shows, for one average plantation, the average number of *alqueires* of land, slaves, coffee trees (thousands) and value (in *milréis*). It also shows the average number of coffee trees per slave and per *alqueire.*

46 The monetary unit in Brazil during this period was the *milréis.* The notation for one *milréis* was 1$000. For one thousand *milréis* –called one *conto de réis* – was 1:000$000. The figures after the dollar sign were called réis (e.g., one hundred *réis* would be $100). For this book, to facilitate the notation, we will use a comma instead of the colon (:) to denote thousand of units of *milréis* (e.g., 1,000$000 instead of 1:000$000). In addition, we will ignore sometimes the zeros after the dollar sign, or use a point to indicate it (e.g., 1,000$000 would be denoted as 1,000.0 or 1,000).

47 We located those *Atas,* in manuscript form, in the Banco do Brasil in Brasília, D.F.

48 One *alqueire* is equivalent to 4.8 *hectares* or 11.86 acres.

49 Laerne, *Brazil and Java*, pp. 273-276.

50 Brazilian Historians call the big plantations as the *"grande lavoura"*. See Canabrava, Alice P. "A Grande Lavoura," in Sérgio Buarque de Holanda (org.), *História Geral da Civilização Brasileira*, vol. 6 (Rio de Janeiro: Bertrand Brasil, 1997).

51 Our sample consisted of coffee planters from the Province of Rio de Janeiro.

TABLE 2.3
Rio de Janeiro Coffee Plantations, 1867-1870
Classified According to Land Size by Diverse Characteristics

Plantation Size (Classified by the Number of *Alqueires*)	Number of Plantations	Average Number of Alqueires per Plantation	Average Number of Slaves per Plantation	Average Number (in thousands) of Coffee Trees per Plantation	Average Value of Plantations (in *milréis*)	Average Nmber of Coffee Trees per Slave	Average Number of Coffee Trees per *Alqueire*
0–74	11	47.0	20	99.0	63,398$	4,995	2,106
75-149	11	106.8	37	156.4	100,135$	4,216	1,464
150-299	6	182.0	52	214.5	147,422$	4,138	1,179
300-599	6	432.2	95	362.0	252,790$	3,824	838
600-1,199	5	825.0	132	426.8	351,533$	3,243	517
Over 1,200	2	1,835.0	310	921.0	754,300$	2,976	505
ALL	41	320.8	68	249.9	182,107$	3,728	779

Source: Atas da Gerencia do Banco do Brazil, 1867-1870.

TABLE 2.4
Coffee Region Coffee Plantations, 1883
Classified by the Provinces According to Diverse Characteristics

Provinces of the Coffee Region (1)	Number of Plantations (2)	Average Number of *Hectare*s per Plantation (3)	Average Number of Slaves per Plantation (4)	Average Number of Coffee Trees per Plantation (5)	Average Value of Plantation (in *milréis*) (6)	Average Number of Coffee Trees per Slave (7)	Average Number of Coffee Trees per *Hectare* (8)	Percent of Value of Slaves in Total Value of Plantation (9)
RIO ZONE	574	693	44	154	113,250$	3,539	222.1	45.2
Rio de Janeiro*	191	628	56	197	139$535	3,514	313.8	47.0
Espírito Santo	165	698	37	130	98,054$	3,491	185.9	44.6
São Paulo (Northeast)	218	746	37	134	101,723$	3,607	180.1	43.6
SANTOS ZONE	146	633	36	88	82,063$	2,450	139.6	38.2
São Paulo (Central and Western)	146	633	36	88	82,063$	2,450	139.6	38.2
TOTAL	720	681	42	141	99,788$	3,349	219.7	43.6

Note: * It includes only the *municípios* (counties) listed by Laerne as exclusively coffee-planting.
SOURCE: Laerne, Brazil and Java, pp. 218-23 (coffee plantations mortgaged to *Banco do Brazil* on 30 June 1883).

Table 2.4 is based on a larger sample of mortgages of the *Banco do Brazil*, and in a different period, the mid of 1883. It shows information on the same characteristics as Table 2.3, but classified according to the coffee producing provinces. In addition, it shows in column (9) the proportion of the value of slaves in the total value of the plantations, that was 43.6 percent in the coffee region.

TABLE 2.5
Coffee Region Coffee Plantations, 1883-1884
Classified by the Number of Slaves and According to Diverse Characteristics

Coffee Plantation Size, Defined by the Number of Slaves in the Plantation	Number of Plantations in the Sample	Number of Slaves per Plantation	Percentage of Field hand Slaves in the Total Slave Labor Force	Average Number (in Thousands) of Coffee Trees per Plantation	Average Number of *Hectares* per Plantation	Percentage of Plantation Land Planted with Coffee	Average Number of Coffee Bags (60 Kg.) Produced Annually per Field Hand Slave	Average Number of Coffee Trees per Field Hand Slave (thousandth)	Annual Yield in Bags (60 Kg.) per 1,000 Coffee Trees
Less than 49	1	32	71.4	61.0	120.0	50.8	31.8	2.4	13.0
50 -99	9	74	63.9	302.1	1,022.8	49.3	38.5	6.4	6.0
100-149	8	123	56.7	439.6	1,186.6	29.7	36.5	6.3	5.8
150-199	8	165	59.2	539.6	1,299.4	34.4	29.7	5.5	5.4
200-249	6	225	57.1	785.8	2,097.2	31.5	34.1	6.1	5.6
250 and over	6	320	53.4	1,036.7	2,320.7	35.4	32.6	6.1	5.4
Average for All	38	165	57.1	567.1	1,466.3	35.7	33.6	6.0	5.6

Note: The sample of plantations comprises 29 coffee plantations in the Rio Zone and 9 coffee plantations in the Santos Zone.
Source: This Table was adapted from Laerne, Brazil and Java, pp. 328-329, and 334-335.

Table 2.5 is based on a sample of coffee plantations surveyed by Laerne in late 1883 and early 1884. We present information on diverse characteristics of coffee plantations, classified by the size of their labor force. Thus plantation size here is defined according to the number of slaves each plantation owned.

In Table 2.5 it is shown the average proportion of field workers in the slave labor force, about 57.1 percent; the average proportion of *hectares* planted with coffee in the plantations, about 35.7 percent; the average number of coffee bags (of 60 kilogrammes each) produced annually per a field-worker slave, about 33.6 bags; the average number of coffee trees

per field-worker slave, about 6,000 trees; and the average annual yield in bags per one thousand trees, about 5.6 bags.

We show in Table 2.6 the list of assets owned by a coffee plantation in Vassouras, an important coffee producing county of the Province of Rio de Janeiro, listed in an 1882 inventory[52].

TABLE 2.6
List of Asset Values of the *FAZENDA ORIENTE*, 1882

(1)	**LAND**		
	59 *alqueires*, planted with coffee and for pasture		8,260$000
(2)	**COFFEE TREES**		
	13,000 with 18 years of age	2,600$000	
	30,000 with 8 years of age	6,600$000	
	17,000 with 6 years of age	3,910$000	
	12,000 with 4 years of age	2,160$000	
	18,000 with 5 years of age	5,400$000	
	16,000 with 2 years of age	1,920$000	
	55,000 with 15 years of age	16,500$000	
	34,000 with 23 years of age	6,800$000	
	10,000 with 30 years of age	1,200$000	
	12,000 with 38 years of age	720$000	
	15,000 with 34 years of age	1,200$000	
	Sub-Total		49,010$000
(3)	**BUILDINGS**		
	House, with wooden floor and tiles	10,000$000	
	Sickward	1,800$000	
	30 slave dormitories (*lances de 5 senzalas*)	2,400$000	
	7 maid dormitories and corn warehouses	1,050$000	
	9 coffee warehouses	2,400$000	
	Annex house with two rooms	400$000	
	Garage for Troley Cars	400$000	
	Wooden pig shed	100$000	
	Slave kitchen house	80$000	
	Sub-Total		18,630$000
(4)	**SLAVES**		
	42 female and 60 male slaves	123,000$000	
	51ingenuos	4.501$000	
	Sub-Total		128,011$000
(5)	**ANIMALS**		
	80 pigs in the field	400$000	
	30 pigs fattening	900$000	
	27 oxen	1,620$000	
	12 milk cows	600$000	
	10 calves, 11 bulls (10 young)	435$000	
	5 donkeys, 6 mules and 1 horse	1,490$000	
	Sub-Total		5,545$000
(6)	**OTHERS**		
	Stock of provisions and coffee	29,620$000	
	Machines, house for coffee preparation	7,000$000	
	Furniture and silver objects	8,065$000	
	Sub-Total		44,685$000
	GRAND-TOTAL		254,041$000

Source: "Documentos da Família Werneck".

52 We found the manuscript of this Inventory among the papers of the "Documentos da Família Werneck", Codice 112, Arquivo Nacional, Rio de Janeiro.

The value of slaves, coffee trees and land varied in each plantation, and also through time, geographical location and plantation size. In Table 2.7, based on a research on inventories of coffee plantations in Vassouras, the relative values of the assets for different plantations and in different years are presented[53] .

TABLE 2.7
Coffee Plantations in Vassouras, Various Years
Relative Value of Slave, Land and Coffee Tree Assets in Total assets (in percentages)

ASSETS	1839	1846	1851	1853	1874	1875	1882
Slaves	37.4	56.8	46.8	76.4	68.6	40.4	50.4
Land	Rented	23.1	rented	8.2	11.3	23.9	3.3
Coffee Trees	39.0	5.2	33.0	4.9	0.2	26.8	19.3
Others	23.6	14.9	20.2	9.5	19.9	8.9	27.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sources: Coffee Plantations' Inventories, manuscripts, Cartório do Primeiro Ofício de Vassouras, listed in Appendix B.

Coffee Exports

Since the internal consumption of coffee in the domestic market was supplied with the *escolha* quality (an inferior grade of quality, of difficult marketing in the export market), the aggregate coffee exports are a very good proxy for the marketable coffee production.

Figure 2.2 shows the evolution of Brazilian coffee exports in the years 1821 to 1899. During this whole period the coffee production increased continuously in trend in Brazil. Between 1821 and 1850 the trend rate of growth of coffee exports was 8.47 percent per annum[54]. Between 1850 and 1888 coffee exports increased at the rate of growth of 2.09 percent per annum[55]. From 1871 until 1888 this rate of increase was 2.7 percent per annum[56]. In the decade immediately following the abolition of slavery, 1889 to 1899, the rate of increase in coffee exports was 6.4 percent per annum[57].

53 The Table 2.7 was intended as an illustration of the relative evaluation of the assets in different dates and for different assets in terms of risk. Thus, some of the plantations had total or only part of the lands they were using as rented, and therefore a nil or small share of land. Others were only in the beginning of coffee cultivation, and had only very young coffee trees, and therefore a small share for coffee trees, and so forth.

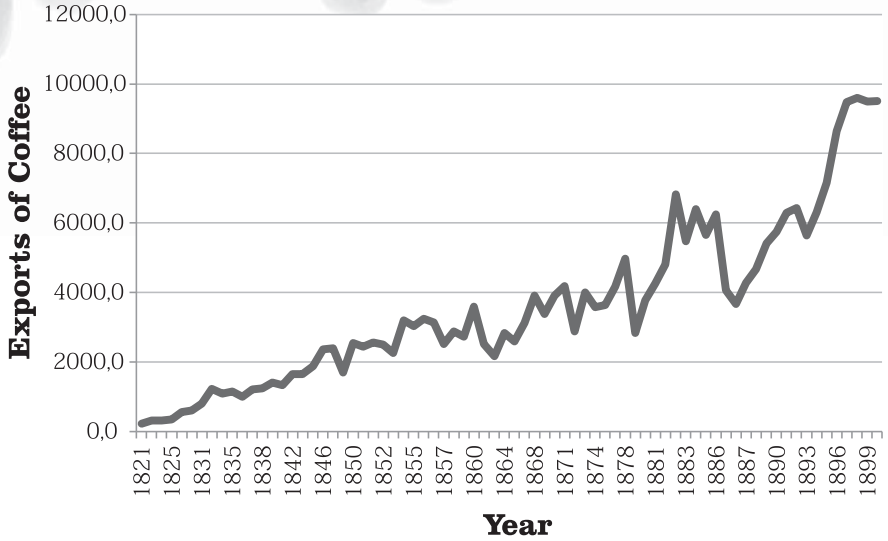
54 Log Ec = 5.42257 + 0.08472 t r2 : .913 Ec = exports

55 Log Ec = 7.69487 + 0.02094 t r2 : .585 Ec = exports

56 Log Ec = 8.08222 + 0.02700 t r2 : .285 Ec = exports

57 Log Ec = 8.45747 + 0.06395 t r2 : .847 Ec = exports

Figure 2.2 – Brazil: Coffee exports 1821-1899 (1,000 bags of 60 kg)



Source: Brazil, Instituto Brasileiro de Geografia e Estatistica, Anuario Estatistico do Brasil, Ano V, 1939-1940

When analyzing the year to year changes in the quantity exported, it should be noticed that many coffee planters kept stocks of coffee in the plantations, from one commercial year to another, in order to speculate in prices.

Those stocks, however, as a percentage of the total crop, were very small, since planters did not have the storage facilities, availability of credit and resources to finance keeping those stocks, business connections and the expertise to speculate in coffee prices.

TABLE 2.8
Brazilian Coffee Exports (in 1,000 kg.), according to the Zones and Provinces Coffee Region, 1870-1890

Calendar Year	Rio de Janeiro (1)	Minas Gerais (2)	Espírito Santo (3)	São Paulo (4)	Total Rio Zone* (1+2+3+4)	Santos Zone**	COFFEE REGION
1870	109,968	31,704	5,759	17,518	164,949	28,207	193,156
1871	113,437	35,152	7,916	19,153	175,658	25,266	200,924
1872	102,586	26,199	6,101	13,057	147,943	25,434	173,377
1873	92,584	28,308	6,966	17,964	145,822	33,305	179,127
1874	105,175	37,116	5,137	18,221	165,649	44,801	210,450
1875	119,269	41,637	8,033	17,635	186,574	47,443	234,017
1876	111,562	36,403	5,787	17,381	171,133	41,517	212,650
1877	107,252	38,346	8,569	17,118	171,285	48,835	220,120
1878	109,608	47,926	6,222	24,018	187,774	66,273	254,047
1879	120,419	51,233	7,856	21,570	201,078	67,569	268,647
1880	133,765	54,782	9,086	21,807	219,440	67,394	286,834
1881	148,008	73,773	11,096	26,508	259,385	81,864	341,249
1882	156,124	66,974	10,103	25,473	258,674	100,870	359,544
1883	113,085	67,346	11,471	26,375	218,277	113,006	331,283
1884	130,429	62,994	8,495	20,719	222,637	122,824	352,461
1885	110,214	85,457	12,425	17,767	225,863	114,669	340,532
1886	122, 569	64,741	11,516	16,749	215,575	124,070	339,645
1887	61,937	46,364	8,805	14,426	131,532	113,653	245,185
1888	109,478	66,507	9,140	14,970	200,095	115,669	315,764
1889	80,090	69,465	9,191	18,646	177,392	137,616	315,008
1890	78,643	59,770	7,965	13,944	160,322	152,749	313,071

Notes and Sources:
* Coffee exported by the Port of Rio de Janeiro. The results for the Province of Minas Gerais do not include the production from the part of that Province belonging to the Santos Zone. The figures are from: Estado do Rio de Janeiro, *Relatório Apresentado ao Sr. Vice-Presidente do Estado... pelo Secretario de Finanças....31 de Julho de 1893*, in 31 July 1893, Mappa demonstrativo da Exportação de Café, no. 11.
** Based on Wileman, *Brazilian Year Book*, 1908, p. 629. The data was transformed from a commercial to a calendar year basis.

The holding of stocks from one commercial year to another was done at the level of the coffee exporters, in the city-ports of Rio de Janeiro and Santos. Those stocks averaged 347,000 bags (of 60 kg.) per year in the 1880s, or about 7 percent of the average yearly exports during this decade[58].

58 J. P. Wileman, *Brazilian Year Book, I and II* (Rio de Janeiro: The Offices of the Brazilian Year Book, 1908 and 1909), I, p. 630.

Thus the quantities exported do not represent exactly the exportable surplus of the crop, but the surplus of the quantities transported annually to the ports plus the variation in stocks in the commercial city-port. This difference, however, was small, not exceeding 5 percent of the annual exports[59].

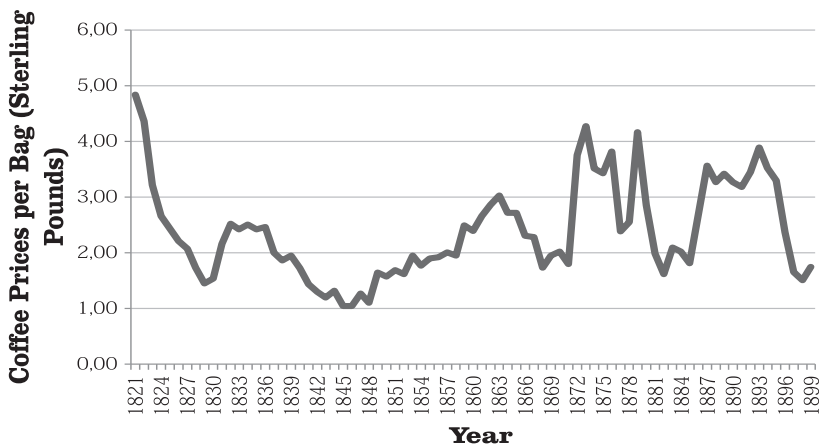
Table 2.8 shows the origin, by province and zone, of the coffee exports of the coffee region. It is clear, by inspecting the Table, that the main responsible for the increase in coffee production during the period 1871-1888, principally in the 1880s, was the Santos Zone. It is also noteworthy to observe the increasing share of Minas Gerais (not considering the counties of that Province belonging to the Santos Zone) in the Rio Zone total, since it increases from 19.2 percent in 1870 to 37.3 percent in 1890.

Coffee Prices

Figure 2.3 presents the evolution of coffee prices (average value in gold sterling pounds per bag of 60 kg.) in the period 1821 to 1899. We can see that in the period 1850-1888 the trend of prices was positive, showing a rate of growth of 1.1 percent per annum[60] .

Table 2.9 presents the average prices, in nominal and real terms, and in *milréis* and gold sterling pounds, of coffee exports (in bags of 60 kg.) during the commercial years 1870/71 to 1889/90. It also presents the exchange rate of *milréis* per sterling pounds.

Figure 2.3 – Brazil: Coffee prices, 1821-1899 (average value in gold pound sterlings, per bag of 60 kg)



Source: Brazil, Instituto Brasileiro de Geografia e Estatistica, Anuario Estatistico do Brasil, Ano V, 1939-1940

59 The annual variation of stocks, on absolute values, averaged 35 percent in this period, in relation to the annual stocks. Thus .35 (.07) = 2.5 percent (approximation). If we assume for the planters the same figure of 2.5 percent (what is an overestimation, since, by the reasons presented above, they did not have the same facilities and information as coffee exporters), then we obtain the 5.0 percent figure.

60 Log Pc = 0.65163 + 0.01096 t r2 = .19 Pc = price of coffee

TABLE 2.9

Real and Nominal Average Prices of Coffee Exports (in milréis and sterling pounds) and the exchange rate, Commercial years 1870/71 to 1889/90 (Prices per bags of 60 kg.)

Commercial Years	*Milréis* prices*** nominal values[a]	Price Index[b] *Milréis*	*Milréis* prices*** real values	Sterling Prices*** nominal values[a]	Price Index[c] Sterling Pounds	Sterling Prices*** real values	Exchange Rate *Milréis*/Sterling Pounds
1870/71	20$081	100.0	20$081	2.03	100.0	2.03	10$878
71/72	17$647	99.9	17$665	1.76	97.8	1.80	9$987
72/73	32$967	99.8	33$033	3.43	107.5	3.19	9$600
73/74	39$716	99.8	39$796	4.31	110.6	3.90	9$198
74/75	32$653	99.7	32$751	3.50	105.0	3.33	9$309
75/76	34$718	99.6	34$857	3.39	99.1	3.42	8$817
76/77	31$440	100.9	31$160	3.90	92.5	4.22	9$470
77/78	28$740	102.2	28$121	2.34	90.7	2.58	9$771
78/79	27$331	103.5	26$407	2.61	86.2	3.03	10$463
79/1880	48$230	104.9	45$977	4.29	81.5	5.26	11$228
1880/81	34$463	106.3	32$421	3.17	84.8	3.74	10$862
81/82	25$669	107.9	23$790	2.34	81.7	2.86	10$956
82/83	18$341	109.5	16$750	1.61	82.9	1.94	11$344
83/84	24$436	111.1	22$025	2.19	80.4	2.72	11$130
84/85	24$436	108.9	22$439	2.10	77.1	2.72	11$601
85/86	22$957	106.7	21$515	1.77	73.7	2.40	12$908
86/87	30$770	104.4	29$473	2.39	70.0	3.41	12$843
87/88	43$926	102.3	42$938	4.10	69.8	5.87	10$696
88/89	29$967	104.4*	28$704	3.15	69.9	4.51	9$505
89/1890	30$888	103.7**	29$786	3.39	71.3	4.75	9$078

NOTES: * average of three last years

** average annual exchange rate, Rio de Janeiro calendar year

*** Average prices

SOURCES: a – *Anuário Estatístico do Brasil*, 1939-1940, p.p. 1353 and 1375-80.

b – Mircea Buescu, *300 Anos de Inflação*, p. 223.

c- We have used the "Exports of goods and services Price Index", of the price índices for main categories of goods and services, 1870-1965. In C. H. Feinstein, "Studies in the National Income and Expenditures of the United Kingdom", *National Income, Expenditures and Output of the United Kingdom, 1865-1965*, vol. 6.

In the whole period between the commercial years of 1871-72 and 1887-88 there seems to be no significant secular trend in coffee prices[61]. In real *milréis* the trend is slightly negative, and in real sterling pounds slightly positive, but both cases do not present a significant goodness of

61 For an analysis of coffee prices in the period 1857 to 1906, see Antonio Delfim Netto, *O Problema do Café no Brasil,* (São Paulo: Faculdade de Ciências Econômicas e Administrativas, 1959).

fit[62]. For the critical period between the years of 1881-82 and 1887-88, however, real milréis prices increase at 10.3 percent per annum[63] .

When analyzing the fluctuations in coffee prices during this period, we should notice that it was always pointed out by contemporaries[64], and also by modern writers, that international coffee price movements were not necessarily those felt by the planters[65] .

The steadly depreciation of the exchange rate *milréis*/sterling pounds would cushion the effect of falling prices and permit the planters to shift part of the burden to others in the economy, particularly in the import-consuming urban populations of Rio de Janeiro and São Paulo (see Table 2.9).

Coffee Commerce

In addition, there was a difference between those prices and the coffee prices received by the planter at the plantation. The coffee produced in the plantations, after the beans were processed – dyed, milled and sorted – was transported from the plantation to the warehouses of the *Comissário do Café* (the coffee factor, important figure of middleman in the chain production and commerce of coffee) in the Rio de Janeiro or Santos ports[66] .

The *Comissário* always represented many plantations, and he would sell the various crops to the *Ensacadores* (coffee brokers), who would make the blending and sell the bags to the exporter.

The net price received by the coffee planter depended on the quality of coffee he produced, and the share of transport, various fees (from factors and brokers) and the provincial and central government taxes.

There was, at the plantation, a trade off between the quantity and the quality of the coffee produced, since the last would require more dressings and weeding, and more care in the harvest, and therefore more labor costs, to be diverted from the coffee expansion activities.

Coffees were classified and priced, during this period, according to seven different classes (*lavado; superior fino; primeira boa; primeira regular; primeira ordinária; segunda boa* and *segunda ordinária*).

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62 Log P'c = 3.41263 - 0.0076 t r2 = .017 P'c = price of coffee in *milréis*
Log P''c = 1.08327 + 0.00776 t r2 = .016 P''c = price of coffee in sterling pounds

63 Log P'c = 2.78919 + 0.10279 t r2 = .559 P'c = price of coffee in *milréis*

64 Rio de Janeiro (State), *Relatorio da Directoria de Fazenda da Provincia do Rio de Janeiro,* 1882, p. 8.

65 Ronald Coes, "Brazil", in *Tropical Development,* 1880-1913, ed. W.A. Lewis (Evanston, Illinois: Northwestern University Press, 1970), pp. 100-27.

66 See the important work of Joseph E. Sweigart, *Coffee Factorage and the Emergence of a Brazilian Capital Market, 1850-1888*, chapter 2, pp. 12 – 65.

In 1880, to exemplify the range of prices according to quality classes, the extreme prices (prices per 10 kg. of coffee) during the year, in Rio de Janeiro, for the *lavado* coffee were 4$750 to 7$800, while the *segunda ordinária* fetched 3$000 to 4$700. This suggests a difference of 62 percent between the average prices of the higher and lower qualities of coffee produced[67] .

In general, a large plantation would produce more than one quality of coffee. In addition of the six types of coffee, an inferior quality, called *escolha*, was also produced. Since it carried almost no value to be exported, only a small part of this coffee would be exported, since the bulk of it was consumed in the country[68].

The price received by the coffee planter was on average 30 percent to 40 percent lower than the price F.O.B. received by the exporter[69]. Of the difference in prices, transportation costs from the plantation to the port accounted for 25 percent, provincial duties and government taxes for another 25 percent, and the remaining 50 percent were the fees, commissions, insurance, and losses in transit.

Coffee Revenues and Share of Total Exports

Table 2.10 shows the quality exported, revenues, and the share of coffee exports in total exports of Brazil, in five-year averages between 1821 and 1869, and at an annual basis between 1870 and 1890. During the period 1871 to 1888 (commercial years)[70] revenues (in gold sterling pounds) increased steadily, at 1.17 percent per annum[71]. The share of coffee exports in total exports of Brazil increased from 16.3 percent in 1821 to 67.7 percent in 1890. This shows the increasing importance of this economic activity in Brazil.

67 *Jornal do Comercio, Retrospecto Comercial do Jornal do Comercio*, Rio de Janeiro, 1880, p. 41.
68 *Relatorio da Directoria de Fazenda da Provincia do Rio de Janeiro*, 1879, p. 42.
69 The 40 percent figure was based on the detailed accounts presented by Laerne, *Brazil and Java*, pp. 248-250; the 30 percent figure was based in Castro, including, however, an extra 6 percent for the government taxes. Helio O. P. de Castro, "Viabilidade Econômica da Escravidão no Brasil, 1880-1888", *Revista Brasileira de Economia*, XXVII, No. 1 (January/March 1973), p. 50.
70 The commercial years are from July 1 this year to June 30 of next year.
71 Log Rc = 9.25656 + 0.01167 t r2 : .121 Rc = revenues

TABLE 2.10

Coffee Exports (1,000 bags of 60 kg. each), Revenues from Coffee Exports (in thousands of *milréis* and sterling pounds), and Share of Coffee Exports in Total Exports of Brazil

Commercial Years of 1821-1869 (in annual averages of five-year periods) and 1870-1890 (annual)

Commercial Years	Quantity Exported (1,000 bags)	Revenues from Coffee Exports in *Milréis*	Revenues from Coffee Exports inSterling Pounds (1,000)	Share of Coffee Exports in Total Exports
(A) Annual average for 5 - year period:				
1821-1829*	300	4,150	725	18.5%
1830-1834	772	12,582	1,769	37.5%
35-39	1,165	17,787	2,428	46.0%
40-44	1,417	17,866	2,279	42.3%
45-49	2,002	22,558	2,471	40.9%
50-54	2,514	36,678	4,313	48.6%
55-59	2,736	51,200	5,635	48.7%
60-64	2,555	62,650	6,863	49.3%
65-69	3,240	76,420	6,737	42.4%
(B) Years				
1870	3,827	84,504	7,766	50.3%
71	4,060	71,646	7,172	37.6%
72	3,497	115,285	12,013	53.6%
73	2,774	110,173	11,976	58.1%
74	3,853	125,812	13,512	60.3%
75	3,407	118,286	13,414	64.4 %
76	3,553	111,707	11,752	57.1 %
77	3,843	110,447	11,299	59.3 %
78	4,909	134,629	12,613	65.7 %
79	2,618	126,260	11,237	56.8 %
1880	3,660	126,134	11,604	54.6 %
81	4,081	104,753	9,553	49.9 %
82	6,687	122,643	10,187	62.2 %
83	5,316	130,033	11,681	59.9 %
84	6,238	152,434	13,140	67.4 %
85	5,436	124,792	9,671	64.0 %
86	6,075	186,925	14,543	70.9 %
87**	1,964	74,411	6,958	59.4 %
88***	3,444	103,205	10,857	50.0 %
89***	5,586	172,258	18,983	66.5 %
1890***	5,109	189,894	17,850	67.7 %

NOTES: * average for the 9-year period; ** second half-year of 1888; *** calendar years

SOURCE: *Anuário Estatístico do Brasil*, 1839-1940, pp. 1, 375-80.

Brazilian Coffee Exports in the World Market

In Table 2.11 we show the Brazilian participation in the world coffee market. Part (A) of the Table shows the share of Brazil, in percent, in the total world production. We can see that Brazil became during the period 1852-1890 the dominant producer in the world market. The Brazilian share in world coffee production increased from 18 percent in the 1820s to 56 percent (average) in the 1880s.

Part (B) of Table 2.11 shows the destination markets of the coffee exported by Brazil, during the period 1872-1889. We can see by inspecting the Table that the demand for coffee was steadily increasing during this period, mainly in the United States and Europe.

TABLE 2 .11
Brazilian Participation in the World Coffee Market

(A) Brazil, other producing countries and World's production of coffee crops (in bags of 60 kg.), and share of Brazil, total for three years periods (commercial years). Total in Thousands of Bags.

Commercial Years	Brazil	Other Countries	Total World Production	Share of Brazil (Percent)
1852-1854	7,750	7,133	14,883	52.1
55-57	8,422	7,334	15,756	53.5
58 – 1860	8,830	7,697	16,527	53.4
1861-1863	6,560	8,252	14,812	44.3
64 – 66	8,238	9,325	17,563	46.9
67- 69	10,478	10,284	20,762	50.5
1870 - 1872	11,384	11,511	22,895	49.7
73 – 75	10,034	10,799	20,833	48.2
76 – 78	12,300	12,809	25,109	49.0
79 – 1881	10,359	12,395	22,754	45.5
1882 – 1884	18,241	13,072	31,313	58.3
85 - 87	14,923	11,831	26,754	55.8
88 – 1890	17,089	12,824	29,913	57.1

SOURCE: Wileman, *Brazilian Yearbook,* 1908, p.269.

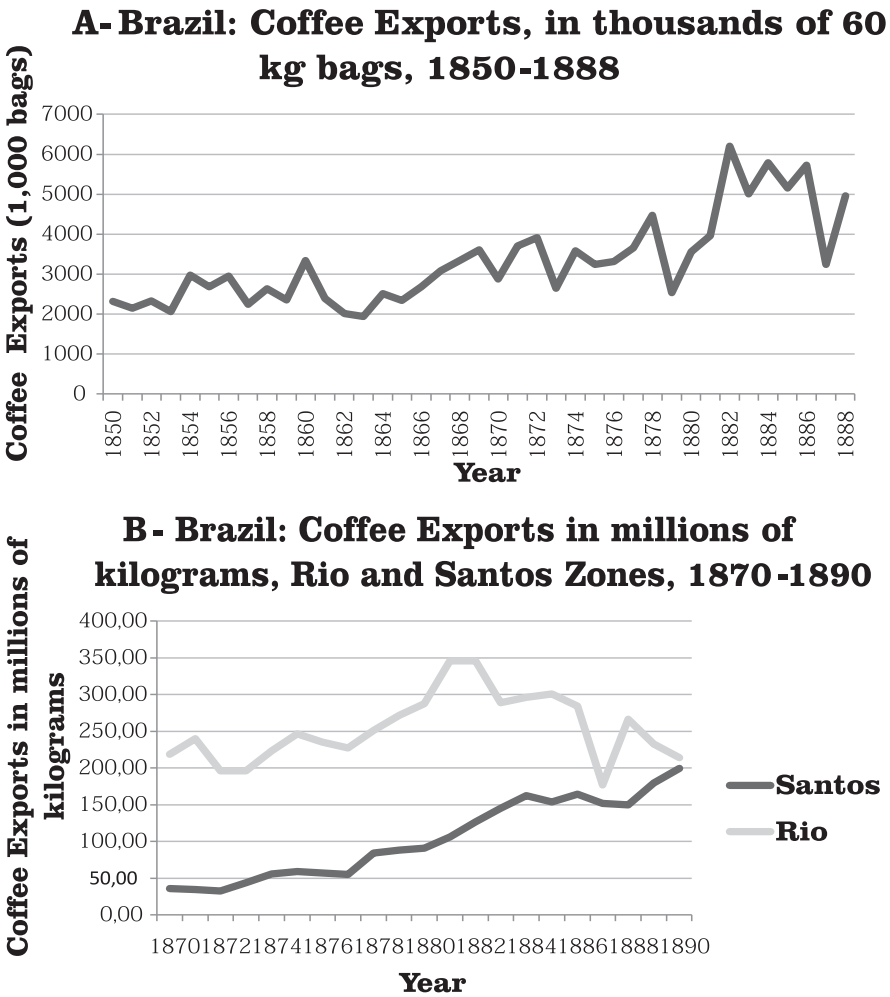
(B) Destination of the Rio and Santos Port coffee shipments, in bags of 60 kg., total for three-year periods (commercial years). Total in Thousands of Bags.

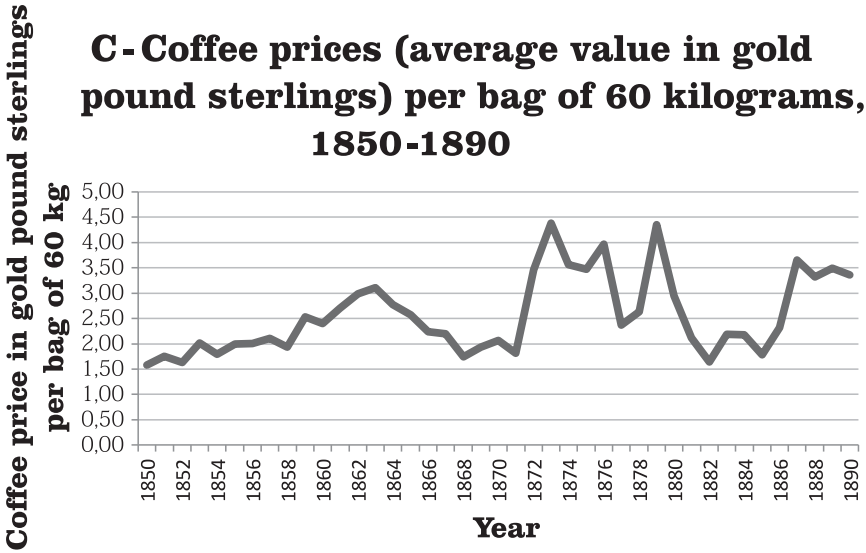
Commercial Years	Europe	Mediterranean	United States	Other Countries	Total
1872-1874	4,548	4	4,981	717	10,250
75-77	4,647	110	5,168	762	10,687
78-1880	6,843	118	6,853	1,090	14,904
1881-83	7,271	450	8,002	1,262	16,985
84-86	7,419	587	8,754	945	17,705
87-1889	6,583	193	6,821	760	14,357

SOURCE: Wileman, *Brazilian Yearbook*, 1908, p. 630.

We show in Figure 2.4 a summary view of coffee prices and exports.

Figure 2.4 – Brazil: Coffee exports 1850-1888, Rio and Santos zones coffee exports, and coffee prices 1850-1888.





In addition to coffee, Brazil's main exports were sugar, cotton, hides, rubber, tobacco and other extractive products (see Table 2.12, Part A). The coffee provinces, in the period 1881-1885, contributed with 64.2 percent of the total agricultural production of the country, according with the Report of the Ministry of Agriculture (see Table 2.12, Part B).

TABLE 2.12
Brazilian Exports and the Agricultural Production of the Coffee Region

(A) Value of the principal Exports of Brazil, commercial years of 1876 and 1886, in thousands of *milréis*

EXPORTS	1876/77 VALUE	1876/77 Percent	1886/87 VALUE	1886/87 Percent
Coffee	112,111.6	57.3	152,433.5	67.4
Sugar	29,992.3	15.3	22,699.5	10.0
Cotton	12,084.7	6.2	10,994.1	4.8
Rubber	11,033.9	5.6	10,623.0	4.7
Hides	8,137.3	4.2	5,132.8	2.3
Tobacco	6,875.6	3.5	6,759.3	3.0
Others*	15,327.9	7.9	17,678.3	7.8
TOTAL	195,563.3	100.0	226,269.7	100.0

NOTES: * cocoa, *erva-mate*, gold, diamonds, wood, Brazilian nuts, and other products.
SOURCES : Brazil, *Relatório do Ministério da Fazenda*, 1880, Quadro 45 and 1887, Quadro 34.

(B) Official value of the Agricultural Production of the Empire of Brazil. Total for the five-year period, commercial years, 1881-1885, in thousand of *milréis*.

REGIONS	VALUE	PERCENTAGE
COFFEE REGION	704,657.3	64.2
Rio de Janeiro*	321,891.2	29.3
São Paulo	242,436.8	22.1
Minas Gerais	118,466.7	10.8
Espírito Santo	21,862.6	2.0
OTHER PROVINCES	393,616.0	35.8
EMPIRE OF BRAZIL	1,098,273.3	100.0

NOTES: * It includes the *Municipio Neutro*.
SOURCE: Brazil, *Relatorio do Ministério da Agricultura*, 1887, p. 6.

To conclude this chapter, the data indicates that in the second half of the nineteenth century coffee cultivation was the more important economic activity of the country. Coffee exports were booming, prices increasing and the supply was responding with the utilization of new (virgin) lands, moving principally towards to the Western direction of the Santos Zone.

Chapter 3
Management of slave labor in coffee plantations

The Brazilian coffee planters, inside the *fazendas de café* they managed, had to organize the labor force with the objective of optimizing production, minimizing costs and planning for viable investment projects. The principal factor of production was labor, and a peculiar sort of labor – slave labor, but free laborers were also used.

The *Fazenda de Café*

The *fazendas de café*, or, what was called by the contemporaries, the *grande lavoura*, produced most of the marketable coffee crops. In addition, the coffee plantations had the nature of an agricultural and industrial unit, in which coffee was the commercial crop, but also produced other goods for self-consumption.

According to Laerne,

> "The appearance of a Brazilian *fazenda* factory is seldom cheerful. Huge buildings of two stories, surrounded by rows of smaller buildings arranged in a quadrangle which constitute the dwellings of the slaves and free laboreurs, the apothecary's house, sick wards and warehouses, besides the extensive *terreiros* or drying fields of cemented or paved floors···.the surrounding hills of the *fazenda* are all denuded of wood, and sown with grass so as to supply pasture for horses, mules, sheep, cattle and pigs. The pigs on a *fazenda* yield the staple food of the master as well as the slaves···A slave, besides maintaining the roads and bridges, has to attend the planting of maize, beans, mandioc, potatoes, in short, all that is needed on a *fazenda* for the consumption of the work people···"[72] .

Labor discipline

Slavery gave many advantages to coffee planters: they had a guaranteed labor supply; the labor force participation was high, since

72 Laerne, Brazil and Java, pp. 277-290.

in coffee plantations it could be allocated in such a way as to occupy children, women and elders; labor troubles could be minimized or avoided; and planters could use a system combining incentives and force in order to extract obedience. Therefore, it provided planters with a disciplined, specialized and coordinated labor force[73]. As Laerne describes it,

> "The slaves are awakened by a bell at four o'clock in the morning, to get ready to go to work. At half past four or five they must march to their labors in troops or *turmas* from twenty-five to thirty souls – in order to start work at half past five or six. They toil on – dinnertime excepted – till at least seven o'clock; then the troop marches homeward. This is in the less busy season; in harvest they have generally to work by artificial light, whether in the drying fields, the *terreiros* or in the factories (*engenhos*)"[74].

As we mentioned, slaves in coffee plantations were allocated only partially in the production of coffee. Coffee was the market crop, but, in addition, a number of the slaves or of their hours of work were employed for the production of corn, black beans, rice, manioc, cattle, hog, poultry and other food production activities.

A French observer, Louis Couty, making a survey of coffee plantations in 1883 gave a description of several aspects of labor organization in coffee plantations[75] . He asked two planters to organize for him statistics about the allocation of working days of the slaves of their plantations. So, in one plantation with 200 slaves, 2,400 days per annum on average were allocate to corn production, and 4,500 days to beans production. They estimated one fifth of the total labor force was utilized only for the planting and processing of food to be consumed in the plantation.

Therefore, a substantial part of the labor force was employed for the production of goods consumed in the plantation. Although this characteristic of plantation self-sufficiency, so typical of Brazilian colonial history, was mitigated during the second half of the nineteenth century, we see that up to the end of slavery those plantations kept an immense variety of occupations for the slaves.

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73 For a description of slave labor in coffee plantations, see Stein, *Vassouras*, pp. 161-169, and Warren Dean, "The Planter as an Entrepreneur : The Case of São Paulo" i*n Hispanic American Historical Review*, XLVI, No. 2 (May 1966), pp. 138-52. See also, from the same author, Rio Claro: *A Brazilian Plantation System, 1820-1920* (Stanford: Stanford University Press, 1976).

74 Laerne, *Brazil and Java*, pp. 91-92.

75 Louis Couty, *Étude de Biologie Industrielle sur le Café. Rapport Adressé à M. le Directeur de l''Ecole Polytechnique",* (Rio de Janeiro, 1883)

All but the too young and sick slaves could be put to perform a job in the plantations. The labor could be coordinated and crops produced in such a way to derive the best mix of output, market and non-market crops, and to occupy evenly the labor force throughout the year. The annual schedule of a field slave (*escravo da roça*) was made such as to let him to keep and dress 4,500 coffee trees on average, besides maintaining the roads and bridges, to attend the planting of corn, beans, manioc, potatoes, and other tasks. As commented by Laerne in 1885, the plantation was capable of producing "in short, all that is needed on a *fazenda* (plantation) for the consumption of the work people"[76]. Although coffee picking could be done before May and after September, it was seldom done "because provisions must be harvested in the beginning of the year and planted afresh against October"[77].

The "gang" labor

A distinctive feature of slavery in coffee plantations was gang labor. As Laerne remarked about the slave gangs' labor in the weeding task in coffee cultivation,

> "It is a curious thing to see those *turmas* or gangs of slaves working in the field. A *turma* consists usually of from 20 to 25 slaves, male and female, under charge of a *feitor* or overseer, who is generally himself a slave. Every turma has a male or female cook, who prepares their food on the spot. If several *turmas* have to work together (I have seen gangs from 100 to 125 souls) there is a Portuguese overseer, often termed *administrador* to superintend the work"[78] .

According to Couty, a (large) plantation, with 250 slaves on average, needed a manager, apothecary, book-keeper, two or at least one overseer, machinist and 5 or 6 drivers. About half of the slaves worked in gangs (*escravos do eito*). The gangs of slaves were formed by 25 or 30 slaves having a driver as a leader, another driver to supervise the gathering of coffee and other for the mill. All drivers were slaves. Ten per cent of the slaves worked in the mill (*engenho*) and in the coffee drying terrace (*terreiro*), another ten per cent as gatherers of coffee, other ten per cent in skilled jobs, and the remaining in house tasks or other conditions.

76 Laerne, op. cit., p. 290.
77 Ibid, p. 300.
78 Laerne, Brazil and Java, pp. 91-92.

Couty presents the distribution of slaves by occupation in a typical plantation (*fazenda*) in Campinas, São Paulo, 1883.

Table 3.1
Distribution of Slave Occupations in a Campinas Coffee Plantation, 1883

SLAVE OCCUPATIONS	NUMBER OF SLAVES
Masons	4
Carpenters	2
Blacksmith	2
Cartmen (*Carroceiros*)	3
Carters (*Carreiros*)	2
Cattle Feeders (*Tratadores de Bois*)	2
Horse Breeders (*Tratadores de Cavalos*)	2
Mechanics	3
Ant-Killers (*Matadores de Formigas*)	2
Gardeners	3
Field Cooks (*Cozinheiros da Roça*)	2
Planter House Cooks (*Cozinheiros da Casa Grande*)	1
Cook Helpers (*Ajudantes da Cozinha*)	2
Hog or Pig Feeders (*Porqueiros*)	2
Poultry Feeders (*Tratadores de Aves*)	1
Food Porters (*Carregadores de Comida*)	2
Coffee Washers (*Lavadores de Café*)	13
Tailors (*Consertadores de Roupas*)	2
Soap Makers (*Fabricantes de Sabão*)	1
Flour Makers (*Farinheiros*)	1
Nursers, Drivers, etc.	14
Field Gang Workers (*Trabalhadores do Eito*)	118
Sick Persons and Invalids	22
Domestic Servants, Coachmen, etc.	12

SOURCE: Louis Couty, *Étude de Biologie Industrielle sur le Café*

In another coffee county, this time in the Rio de Janeiro Province, Couty visited an important coffee planter, who owned 9 coffee plantations in the county of Cantagalo[79] . Based on his observations , Couty organized the following Table:

79 The plantations of the Count of Nova Friburgo, ranked among the three most important coffee planters of Brazil.

Table 3.2
Distribution of Slave Occupations in Nine Cantagalo Coffee Plantations, 1883

PLANTATIONS	Total Population[1]	Elders and Sick	Children *Ingenuos*[2]	Skilled Slaves	Women Coffee Gatherers	Field Gang Slaves	Total Number of Slaves[3]
First Plantation	150	24	20	8	12 to 30	60	110
Second Plantation	370	25	45	35	30	130	260
Third plantation	140	15	20	4	15	60	110
Fourth Plantation	92	10	15	3	14	40	65
Fifth Plantation	330	30	45	12	25	130	265
Sixth Plantation	105	10	15	4	12	50	85
Seventh plantation	353	40	70	25	30	140	250
Eighth Plantation	290	30	70	15	15 to 25	120	240
Ninth Plantation	250	28	35	8	20	105	160

NOTES:

1. Accounting all slaves, *ingenuos* and free labor
2. Ingenuos were the children born of slaves after the 1871 Law, legally free``
3. Total includes only the slaves capable of working, with good health (*escravos válidos*)

SOURCE: Louis Couty, *Étude de Biologie Industrielle sur le Café*

Free Laborers

In addition of slaves, free laborers were also present in coffee plantations during this period[80]. Most of the top managerial and discipline control jobs, and some skilled positions, were held by free laborers. In nine coffee plantations in Rio de Janeiro, surveyed in 1884 with more detail by Laerne, and having a total of 1,596 slaves, there were 57 free people employed in management, and 23 skilled laborers, as carpenters, smiths, masons, machinists, and railway construction manpower[81].

Besides these occupations, however, there were also free workers in jobs traditionally held by slaves, the *camaradas*. In general, although there were regional differences of nomenclature or definition, *camaradas* were the hired hands and sharecroppers, living with their families on planter's land, practicing subsistence agriculture and working as hired hands during labor peak-demand times, and being social and politically dependent on the planters[82].

80 See Lamounier, Maria Lúcia. "Agricultura e Mercado de Trabalho: Trabalhadores Brasileiros Livres nas Fazendas de Café e na Construção de Ferrovias em São Paulo, 1850-1890," *Estudos Econômicos*, 37, no. 2 (Abril-Junho 2007), pp. 353-372.
81 Laerne, Brazil and Java, p. 333.
82 Furtado, *Formação Econômica do Brasil*, pp. 143-46.

The number of *camaradas* in coffee plantations was never large, though. In 1854, a survey made in the entire province of São Paulo, about the total labor force consisting of slaves, "colonists" (the way European immigrants were called), and *camaradas* or *agregados*, of agricultural establishments (consisting of coffee and sugar plantations, and cattle ranches), revealed that of the 62,216 people working in coffee plantations, less than 7 percent were not slaves; this proportion was 4.2 percent in the sugar plantations (employing 15,641 slaves) and 29 percent in cattle ranches (employing 4,347 slaves)[83].

Simonsen estimated that between 1870 and 1880 five-sixths of coffee production and two-thirds of sugar production were produced by slaves[84] . In 1884 Laerne remarked that:

> "There is not a trace of actual free labor just now in Central Brazil… as yet everything there depends on slave labor"[85].

This seems to be exaggerated, since in other parts of his Report he described the many stages of coffee planting in which free laborers were utilized, but it seems reasonable to conclude that in the whole period of our study free laborers represented only a small proportion of the coffee plantations' labor force.

Supervising and Managing Free Labor

In the second half of the nineteenth century coffee plantations were becoming gradually more specialized in coffee production, and loosing some of its previous self-sufficiency. Many jobs in the 1880s were out-sourced, mainly in transportation, clothes and food production, and some specific tasks were being shifted to free laborers.

As Laerne noticed in 1884, about the clearing of forest land:

> "For this hard and often dangerous work slaves are never employed… it is usually the *caboclos* and *mineiros*, that is to say, the Brazilians of the interior [free laborers]…who make a trade – and a favorite one – of felling the forests"[86].

83 Taunay, *História do Café no Brasil, III,* p.135.
84 Roberto C. Simonsen, "Aspectos da História Econômica do Café", in *Anais do Terceiro Congresso de História Nacional,* Ed. Instituto Histórico e Geográfico Brasileiro (Rio de Janeiro: Imprensa Nacional, 1941), IV, pp. 211-304.
85 Laerne, *Brazil and Java,* p. 89.
86 Laerne, ibid, p. 279.

Another specific task, also given sometimes to free laborers, was the laying out and keeping of new coffee gardens. This process was described by Laerne in 1884:

> "The laying out of new gardens can here and there be agreed for by the job with *mineiros* (free laborers native of the Province of *Minas Gerais*)…who now and then establish themselves temporarily in a place; the owner [of the plantation] hands over to those people a *cafezal* planted by slaves, on condition that they keep and dress the young trees carefully during four successive years…"[87].

Laerne, in another passage of his report, adds that:

> "The *caboclos* …were persuaded to lend their assistance to lay out the first gardens…for pulling, transporting and planting *mudas* [sprouts]…"[88] .

Another specific task for free laborers was to help during the harvest, as commented by Laerne in 1884:

> "When the crops are heavy…the planters try to hire pickers···from the *sitiantes* (small landowners) and *quitandeiros* (small vendors) in the neighborhood or free laborers – *camaradas*…[89]"
> " *camaradas* will seldom pick coffee at their own risk, but when they do they receive…"[90].

The Costs of Brazilian Free Labor

Since coffee planters hired free laborers, and given the large population of free laborers in Brazil, then why the free labor system was not wide spread used in the coffee plantations?

The bottom line is that free labor was relatively expensive in the coffee region during all the period we are interested in. This was well documented by contemporary sources.

In 1836 the President of the Province of São Paulo complained in the annual report that:

87 Ibid, p. 292.
88 Laerne, *Brazil and Java*, p. 282.
89 Ibid, p. 302.
90 Ibid, p. 301.

> "The lack of workers was noticeable…it was difficult to find them even at a daily payment of 1$000…the solution was then to import 100 unskilled laborers from Europe at a five year contract…"[91].

Thirty four years later, in 1870, a report by another President of the same Province remarked that:

> " …although the wage rate in the Province of São Paulo is too high…"[92].

In 1884 Laerne observed this same phenomenon in the coffee region, an we can find two passages in his report with comments:

> "the fact that laborers are now so scarce and wages so high…"[93] or "the wages in Brazil are too high to allow of free labor being employed on the coffee plantations.."[94] .

Data on wages in coffee plantations are difficult to obtain, but the pieces of evidence we collected are consistent with the hypothesis that real wages were high and that real wages remained constant and possibly even increased during this period.

In 1856 the President of the Province of Rio de Janeiro made a survey in the principal coffee counties (*municípios*), and among other questions it was asked the wage rate of skilled (*official de ofício*) and unskilled workers (*trabalhador de enxada*), and also the cost of food, housing and clothing. The question made was: what amount is needed daily to feed a worker, and how much is needed to allow him to pay rent monthly and clothes annually? . In answering the first question some counties made a distinction between wages including (*salário e sustento*) and not including room and board (*salário a sêco*), but some others did not. I was able to sort out the answers, and reconstruct the information, presented in Table 3.3[95]:

Although if we compare wages and cost of food it seems to indicate some differences of real wages among counties, they are consistent with what we know about the *municipios* during the mid 1850s. For instance, *São Fidélis*, that reports the highest wage, and a low cost of food, was beginning at this time to open its lands to coffee cultivation, and had to pay higher wages to attract workers to its frontier territory (that had at this time hostile Indian tribes and also had to clear forests). The low cost

91 *Relatorio do Presidente da Provincia de São Paulo*, 1836. See Taunay, *História do Café no Brasil*. Vol. 3, p. 81.
92 *Relatorio da Província de São Paulo*, 1870.
93 Laerne, *Brazil and Java*, p. 227.
94 Laerne, ibid, p. 147.
95 For a discussion of this report, see Taunay, *História do Café no Brasil*, vol. 3, p. 36-45.

of food can be explained by the planting of corn, beans, manioc, and other crops, that was usually done in new lands (just cleared from the forest) during the preparation for the planting of coffee trees, what was typical of the process of turning virgin lands to coffee cultivation. So we consider the results of Table 3.3 as reliable, and by inspection we can conclude that real wages were high in this period, by contrasting the reported money wages with the cost of living.

In 1876, Taunay reports that the unskilled workers (*camaradas*) were receiving , in a monthly basis, from 10$000, including room and board, to 20$000, without it. Skilled laborers were paid from 2$000 to 10$000 daily. To dig ditches and build fences, wages varied from 1$000 to 1$500 a day, with room and board, or 2$000 without it[96] .

In 1884 Couty reported that *camaradas* were receiving 20$000 per month[97]. In the same year Laerne reported that *camaradas* were receiving, for clearing land in coffee plantations, an average of 2$000 per day with room and board. For felling the forest land, they were paid from 2$000 to 2$500 daily, with room and board[98]. Laerne also remarked that the wages in coffee planting were somewhat higher than in other activities, like sugar production[99].

TABLE 3.3

Wages and Cost of Living in some Coffee Counties of the Province of Rio de Janeiro, 1856, (in *milréis*)

COFFEE COUNTIES (1)	**Unskilled Daily Wages (2)**	**Unskilled Daily Wages (3)**	**Skilled Daily Wages (4)**	**Skilled Daily Wages (5)**	**Cost of Living (6)**	**Cost of Living (7)**	**Cost of Living (8)**
	Without Room & Board	**With Room & Board**	**Without Room & Board**	**With Room & Board**	**Food**	**Rent***	**Clothing****
Angra dos Reis	-	$560	1$580	-	$400	4$000	48$960
São João do Príncipe	1$000	-	2$000	1$280	-	-	-
São Fidélis	1$600	-	2$000	-	$500	6$000	30$000
São João da Barra	-	$600	-	1$800	$400	12$000 (including clothing allowance)	See column 7
Mangaratiba	-	$800	-	1$400	$400	5$000	40$000
Magé	16$800*	12$000*	2$000	1$200	$580	2$000	Not reported
Parahyba do Sul	-	$540	2$000	-	$600	6$000	36$000
Rezende	-	$800	-	-	$400	-	-

96 Taunay, *História do Café*, vol. 3, p. 44.
97 Couty, *L'Esclavage*, quoted in Taunay, ibid, vol. 8, p. 179.
98 Laerne, *Brazil and Java*, p. 278, 279 and 304.
99 Ibid, p. 147-148.

Rio Claro	-	$600	-	2$000	$800	7$000	25$000
Valença	-	$800	-	1$500	$400	9$600 (monthly, together with clothing)	See Column (7)
Vassouras		200$000**	2$000	-	Total of 250$000 (unskilled) to 280$000 (skilled), annual, including rent and clothing		

NOTES: * monthly; ** yearly

SOURCE: Relatório da Província do Rio de Janeiro, 1856

The cost of living between 1850 and 1884, according to O. Onody, increased less than 40%[100]. If we use the Buescu Price Index, the value would be less than 50%[101]. If we pick the highest unskilled wage per day with room and board in 1856, $800, and compare it with the lowest similar figure reported for 1884, 1$200 (an increase of 50 percent), than any other combination will show an increase greater than 50%, what favors our hypothesis that real wages increased or at least remained constant in the period 1850-1888.

In addition, we also have evidence pointing to the fact that these real wages were high in comparison with similar wages paid in Europe. The Belgian Minister made an official report to his country in 1888, about Brazil as a field for emigration to be used by Belgians. He concluded, among other observations, that "wages offered in towns are high compared with those in European or American countries, including the Argentine Republic···"[102].

If we average the monthly wages (including room and board) presented in the Consul's list, it can be seen that the average wage varied from 3£10s to 5£6s. The equivalent monthly wage with room and board in Great Britain, according to Wood, was 2£6s (6£4s - 3£8s)[103] . If we compare both results it is clear that even by international standards wages in the coffee region were high.

100 Onódy, *A Inflação Brasileira*.
101 Buescu, *300 Anos de Inflação*.
102 Quoted in SAJ, August 18, 1888, p. 524.
103 Wood, "Real Wages", 1909. For the period 1885-1889 Wood calculates that the weekly wage of an "average operative"- that he defines as an average of skilled and unskilled wages of urban and rural workers in the United Kingdom – was 30.2 s, increasing to 32.4s in the period 1890-1894. By linear interpolation we choose 31s as the wage per week in 1888 or 6£4s as the monthly wage of this "average operative". Wood estimated the cost of commodities and housing at 19.5s in both periods, what converted to a monthly figure gives 3£8s, or almost 4£0.

Clearing of Forest and farm land use

The new coffee plantations, in general, would have most of their lands as forest land (*mata virgem*). As we commented above, coffee expansion was usually made using new and virgin lands, instead of changing land use already existing. This was considered a very difficult and demanding job.

The area under cultivation would progressively increase through time. The old coffee gardens, when not economically productive, would be fallen and the land lay fallow.

The technology of land use was to prepare the land – that is, to clear the *mata virgem* - by the lash and burn method, and then to plant the coffee trees. The soil, once depleted, would be abandoned to coffee cultivation. According to Laerne, as a general rule plantations from twelve to fifteen years old were applying manure[104]. The problem of soil erosion, given the heavy rains and the hilly terrain, was more severe in the Rio Zone than in the Santos Zone[105].

Technical Improvements

Technical improvements advanced more in the coffee processing activities. The drying *terreiros* (coffee drying terraces), in earlier times made of mud, were during the 1870s and 1880s made of stone, macadam or cement.

The milling and sorting of the coffee beans were also the subject of many technological advances, since this would improve the quality of coffee, and therefore the price fetched in the market.

Thus during this period many new machines were introduced and widely used in coffee plantations, like winnowing machines, de-pulping machines, equipment for de-hulling, and other technical improvements[106].

Planting Season, Harvest and Crops

The planting season was in September, October and November. The *carpa* (or thorough dressing of the trees) was made in April or early May, before the beginning of the harvest.

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104 Laerne, *Brazil and Java*, p. 297.

105 See Stanley Stein *Vassouras'*, for a vivid discussion of this problem in the county of Vassouras (located in the Rio Zone).

106 M. R. Lezé, "Cultura e Indústria do Café no Brazil", *Revista Agrícola do Instituto Fluminense de Agricultura*, XXII, No. 3 (September 1891), PP. 13-26. This Review, when under the name of "Revista Agrícola do Imperial Instituto Fluminense de Agricultura", devoted a substantial portion of its pages to inform the province's (Rio de Janeiro) coffee planters of the technical developments in coffee cultivation and processing.

As a rule the harvest began immediately after the *carpa*, in the month of May, and would be finished, when the crop was larger, in September, otherwise in August.

The following crops were usually planted between (in strips of land) the coffee trees: maize or corn, in the months of September, October and November; beans and mandioc, in February and March.

Transportation before the Railroads

The use of railroad transportation began in Britain in the 1830s, and arrived in Brazil in the 1850s. Due to the adverse geographical conditions between the coffee planting zones and the embarkation ports (mountains from 2,000 to 3,000 feet high), only in the 1870s they began to be used more effectively.

Before the railroads, the coffee production, after being processed in the plantation to obtain the coffee beans, was transported by land to the many small ports in the coast (and inside the Guanabara Bay), and from there transported by boats again to the Port of Rio de Janeiro (the transportation hub for exports).

Coffee plantations were located in mountainous terrain, and there was a steep descent to the port locations. Thus, before the advent of railroads, transportation was very expensive and labor intensive. It was effected by mules, each mule carrying about two bags of 60 kilogrammes each[107].

The mountain paths were always in bad condition, due to the rains and by the successive passage of the carriers. A journey of 100 to 300 kilometers to the port of Rio de Janeiro, typical of any plantation in the Rio Zone, on an average of 12.6 km./day, would take from one week to over three weeks[108] .

The transportation of coffee from the *fazendas* to the port was subjected to accidents and losses. It was also very costly. According to the 1857 report on the project design of the D. Pedro II Railroad, the average length between the coffee producing area and the Port of Rio de Janeiro was between 25 to 30 *leguas* (or 164 km. to 196.8 km), with the minimum distance of 15 *leguas* (98.4 km.) and the maximum distance of 45 *leguas* (295.2 km.)[109].

107 Laerne, *Brazil and Java*, p. 190.
108 Laerne states that it took upwards of a month in former times to go from Barbacena to Rio de Janeiro (379 km.), what gives an average of 12.6 km./day. Ibid, p. 101.
109 Estrada de Ferro Dom Pedro II. Terceiro Relatório Apresentado pela Directoria aos Acionistas da Estrada de Ferro D. Pedro II, em 31 de Janeiro de 1857 (Rio de Janeiro, 1857), p. 51.

According to the estimates of the British engineer in charge of the report, the cost of mule transportation alone, not including the cost of sea transportation within the Rio de Janeiro Bay (*Baia de Guanabara*), was over 1$000 per arroba (of 14.4 kg.), or 4$000 per bag (of 60 kg.)[110]. With the railroad planned, the cost would be half as much.

Transportation after the Railroads

In fact, railroad transportation had a rapid development in Brazil, particularly in the coffee region, mainly after 1876[111]. In Table 3.3 we present the progressive mileage of Brazilian railroads in various years. As a result, in 1883, a 379 km. trip from Barbacena (Minas Gerais) to the city of Rio de Janeiro was made in twelve hours (versus upwards of one month in former times)[112].

With developments in transportation and communication, land in the hinterland became more accessible, and coffee plantations were developed, principally in the terras roxas - one of the best soils for coffee culture – of the Western São Paulo.

These improvements in transportation also freed slaves – according to Stein fully 20 percent of the plantation's effective male working force, "always chosen from among the best"- from the job of slave muleteers to field workers[113] .

Coffee planters were important for the financing of railroad construction, and also for the entrepreneurial drive to carry on the construction of new railroads. In the Province of Rio de Janeiro, the *Estrada de Ferro D. Pedro II,* which became later on the most important rail network of the country, was planned by coffee planters from the Vassouras county. They even hired two engineers from Great Britain to design the project, but they lost the bid for the concession[114]. Another railroad company, the *Companhia de Estrada de Ferro de Cantagallo*, was organized in 1857 like a public company by the important coffee planter *Barão de Nova Friburgo*[115]. In the Province of São Paulo, two important railway companies – *Paulista Railway Co. and the Mogyana Railway Co.* – were launched in 1862 and 1872, respectively, as public companies with minority capital from coffee planters from the Province (complementing the British investment)[116].

110 Estrada de Ferro D. Pedro II, Terceiro Relatório Apresentado, p. 51.
111 See Odilon N. de Matos, *Café e Ferrovias*, (São Paulo: Editora Alfa-Ômega, 1974).
112 Laerne, *Brazil and Java*, p. 101.
113 Stein, *Vassouras,* p.91
114 Taunay, *História do Café no Brasil,* Vol. 4, p. 398.
115 Taunay, ibid, p. 410.
116 Lock, Coffee: its Culture and Commerce, p. 176.

TABLE 3.4
Progressive Mileage of Brazilian Railroads, Various Years (1854 to 1892)

YEAR	MILEAGE	YEAR	MILEAGE
1854[a]	9.5	**1873[c]**	700.0
1860[b]	138.0	**1880[b]**	2,112.0
1863[a]	265.0	**1882[a]**	2,768.0
1870[b]	462.0	**1890[b]**	6,198.0
1872[a]	578.0	**1892[a]**	7,027.0

SOURCES:

a – Frank St. Angel, "British Investment in Brazilian Railroads, 1880-1913" (M.A. Dissertation, University of Chicago, 1948);

b – Brazil, Ministry of Finance. Economical Data about Brazil. (Rio de Janeiro: Imprensa Nacional, 1924);

c – Orva Lee Ice, Jr. , "British Direct Investments in Brazil up to 1901"(M.A. Dissertation, University of Chicago, 1948).

Managerial economics of the coffee plantations

The Brazilian coffee planters, inside the *fazendas de café*, could exercise their management skills, with the objective of optimizing production, minimizing costs and planning for viable investment projects. The principal factor of production was labor, and a peculiar sort of labor – slave labor[117] .

Thus, the managerial skills had to be exercised with the help of slave labor. However, regarding the rental market and the purchase market for slaves, coffee planters – individually – were "price takers". Prices and hire rates were determined in the broad "macro" market. In the next two chapters we will examine the course of slave prices and hire rates.

117 See Fenoaltea, Stefano. "Slavery and Supervision in Comparative Perspective: A Model," *The Journal of Economic History*, 44, no. 3 (September, 1984), pp. 635-668.

PART III

The Slave Market for Coffee Plantations

The three chapters of this part will examine the price and rental markets of slaves, as well the supply (demography) of slave labor to coffee plantations. During the second half of the 19th century the slave market, for both purchase/sale and rental, was very well organized in several regions of the Empire of Brazil. It was an activity accepted by Society during that time, at least until the 1870s, and slaves were advertised in newspapers, used for collateral in bank loans, listed in inventories, owned by government entities, by the Church, manufacturing companies, and even by British companies.

Another subject of considerable importance was the effective number of slaves that could be available for coffee plantations. It is interesting to note, as will be seen in the next three chapters, that abolitionist measures tried, in different times of the second half of the nineteenth century, to curb the number of slaves and to increase (through diverse taxes) the cost (price) of slaves used in coffee plantations.

CHAPTER 4
The Purchase Market and the Course of Slave Prices

Actual market prices of slaves are very difficult to be obtained, but there are very good proxies, like newspaper advertisements, plantation' inventories evaluations, and other sources[118] .

118 See Marcondes, Renato Leite and José Flávio Motta, "Duas Fontes Documentais para o Estudo dos Preços dos Escravos no Vale do Paraíba Paulista," *Revista Brasileira de História*, 21, no. 42 (2001), pp. 495-514; Sena, Marina de Avellar. *Compra e Venda de Escravos* [em Minas Gerais] (Belo Horizonte: Editora Littera Maciel Ltda, 1977)..

With respect of prices, there is another difficulty, related to the nature of assets[119]. The theoretical difficulty is that an asset price reflects not only the services provided this year, but also the "expectation" about the monetary value of the services provided during the remaining years of life of the asset, discounted for the present by an appropriate rate of discount[120]. And, as we are going to see in Chapter 10, the "Abolitionist pressure" in the late 1880s played an important role in establishing slave prices.

Research on Slave Prices

Based on a research on the sources listed in Table 4.1, we were able to obtain 11,121 individual prices of slaves by gender and activity. Most of them also provide information on age, skill, health, family, and other attributes. We also obtained price information on the total value and number of slaves in coffee plantations for 6,866 slaves[121] .

TABLE 4.1
LIST OF SOURCES OF SLAVE PRICES*

SOURCES	NUMBER OF SLAVES
Jornal do Commercio advertisements (Rio de Janeiro)	4,291
Coffee Plantation Inventories, **Arquivo Nacional (A.N.)**	4,150
Coffee Plantation Inventories, in **Documentos da Família Werneck (A.N.)**	875
Coffee Plantation Inventories, **Cartório do Primeiro Ofício de Vassouras** (Vassouras, Province of Rio de Janeiro) (CPOV)	1,307
Carta de Libertação dos Escravos, Arquivo Histórico do Estado da Guanabara (A.H.E.G.), city of Rio de Janeiro	498
Mortgage applications of coffee plantations, **Banco do Brazil**	6,866
TOTAL	17,987

NOTES: * A more detailed description of those sources, with the listing of the plantations, is presented in Appendix B.

119 See Engerman, Stanley L. "Some Considerations Relating to Property Rights in Man," *Journal of Economic History*, 33, no. 1 (March 1973), pp. 43-65.
120 Net cash flows were the difference between revenues and costs, and we are considering these flows in an annual basis. Being more specific about the revenue received by the slave owner, it is the value of marginal product earned by each slave.
121 See Lima, Carlos A.M. " Escravos Artesãos: Preço e Família (Rio de Janeiro, 1789-1839)," *Estudos Econômicos*, 30, no. 3 (Julho-Setembro 2000), pp. 447-484.

The **Jornal do Commercio** slave advertisements for sale (hereafter J.C.) were published daily in the city of Rio de Janeiro, located in the *Município Neutro*. The city was the principal port, commercial and services center for the coffee plantation economy of the Paraíba Valley of the Rio de Janeiro province.

Most of the advertisements published the price asked, gender, profession, skill and age (exact age or an indication of it, using words like young, adult, old, and other expressions). We obtained prices for all years between 1850 and 1888, and also for most of the years between 1835 and 1849. The sampling procedure was to read and extract price information from the daily issues of J.C., based on the first week of each month. In the 1880s, however, when advertisements for sale (but not for hire) were gradually disappearing, for the reasons discussed in Chapter 9, we had to go through all the daily issues.

Plantation inventories are a very rich source of information for many aspects of the coffee plantation economy, including prices of slaves. In the research in the **Arquivo Nacional** of Rio de Janeiro we obtained, for different years, and for different counties of the Province of Rio de Janeiro, information on evaluation of slaves in 34 plantations and small holdings, with a total of 4,150 slaves. The classification of plantations and small holdings according to the size of the slave labor work force is shown in Table 4.2.

TABLE 4.2
Classification of plantations According to the Size of the Slave Labor Force

Size of the Smallholding and Plantation		**Number of Smallholdings and Plantations**
slaves	With less than 20	5
slaves	With 20 to 50	6
slaves	With 51 to 100	5
slaves	With 101 to 150	6
slaves	With 151 to 200	7
slaves	With 201to 300	2
300 slaves	With more than	3
	TOTAL	34

Source: Plantation Inventories, Arquivo Nacional

We obtained individual prices by gender for all of them, by age for 87.7 percent of them, and for many plantations there is also information on skill, health, family composition, color[122], and origin (African, or according to African ethnic groups, or provenience from other provinces of Brazil).

The **Documentos da Familia Werneck (DFW)** are a handwritten ten volumes collection of manuscripts deposited in the *Arquivo Nacional* of Rio de Janeiro, with documents and memoires of the Werneck family. This family was an important kinship of coffee planters centered in Vassouras, one of the important coffee counties in the Province of Rio de Janeiro.

Among the documents, we found copies of nine inventories of coffee plantations and smallholdings, totaling 875 slaves. The individual slave prices contained information on gender (all), age (41.6 percent), color, origin, skill, profession, and health conditions.

In the Cartorio do Primeiro Ofício de Vassouras (CPOV), located in the city of Vassouras, we found 37 inventories with information on slave prices, of plantations and smallholdings of the parishes of Conceição, Mendes, Paty dos Alferes, Ferreiros and Sacra Família do Tinguá[123] .

The individual prices obtained in this research totaled 1,307. There was information about gender (all), age (82.2 percent), skill, profession, color, origin, and health conditions. Since this sample had a large proportion of small size holdings, it can complement the sample obtained from the *Documentos da Família Werneck* (DFW), and represent better the spectrum of plantations by size of the slave work force.

If we add the samples DFW and CPOV we obtain the following distribution of ownership for the 2,182 slaves in the Vassouras County:

Table 4.3

Distribution of Slave Ownership by Size of the Slave Labor Force

Distribution of Ownership	Number of Slaves
With less than 20 slaves	24
With 20 to 50 slaves	9
With51 to 100 slaves	8
With 101 to 200 slaves	1
With 201 to 300 slaves	2
With more than 300 slaves	2
TOTAL	46

Source: Samples DFW and CPOV

122 Although all non –indian slaves were African descendents, some of them were mixed with whites. Brazilians, even at that time, recognized and made distinctions according with shades of color and appearance, and the principal division was among mulattoes or blacks. See Degler, *Neither Black nor White*, for a discussion about race and skin color in Brazil.

123 See Motta, José Flávio e Renato Leite Marcondes. "O Comércio de Escravos no Vale do Paraíba Paulista: Guaratinguetá e Silveiras na Década de 1870,". *Estudos Econômicos*, 30, no.2 (Abril-Junho 2000), pp. 267-299.

Information on individual prices of slaves for the last four years of slavery were exceedingly difficult to be obtained in the other sources, since we were not able to find inventories with price by age information, and the J.C., as a result of the Abolitionist pressure, was publishing fewer and fewer advertisements[124] .

So we were very lucky to find in the *Arquivo Histórico do Estado da Guanabara* (former *Município Neutro*) the *Carta de Libertação dos Escravos* (CLE), an archive with data on actual prices paid for slaves, and with information about age, skill, gender and other characteristics, for 86 slaves in 1885, 51 in 1886, and 361 in 1887. The CLE listed the slaves who were freed by their masters in exchange for an indemnification paid by the government, after a mutual agreement was reached about the value of the slave.

Since the years 1885 to 1887 were crucial for the exam of the behavior of slave prices, and since these prices showed a remarkable drop, it is important to discuss a bit more the actual working of market prices of assets. We can make an analogy with the stock market. In a typical day of trading, only a very small proportion of the shares of each stock listed are traded. Nevertheless, we take for granted that the prices set by the Exchange reflect a fair market value of the assets traded. Of course, what we see is the shares that were in fact exchanged, and the price received by the seller and the price paid by the buyer. During that same day, several more holders or prospect buyers of shares would be following with attention the market, but opted to postpone a transaction. Suppose that the market prices are falling. One investor can decide to sell the share – and take the loss (or realizing the loss) or can postpone the decision for the next day. This is how the market works.

Returning to the psychology of the slave market in the final three years of slavery, and examining the situation in retrospect, we can assume that some slave owners decided to sell, and take the loss (using for comparison bench mark the slave prices of the years before the "abolitionist pressure") or to postpone the decision, either because they could believe in a favorable political reversal, or, what makes more sense, they were expecting the government to pay "full pre-abolitionist pressure" prices. Since the number of transactions was increasing dramatically in the period 1885-1887, mainly in the last year, it means that more and more slave owners lost these hopes and saw these prices as reflecting

124 See Motta, José Flávio. "Derradeiras Transações: O Comércio de escravos nos Anos de 1880 (Areias, Piracicaba e Casa Branca, Província de São Paulo)," in Anais do XII Encontro Nacional de Economia Política. (São Paulo: 2007).

the value of slaves in the period. Thus, it is reasonable to assume that the prices we collected represented a fair market price of slaves during the final years of slavery (or at least a lower bound of prices).

Finally, we were able to locate in Brasilia the *Atas da Gerência do Banco do Brazil*, handwritten, and in which there are – for the years 1867 to 1870 – the abstracts of mortgages of 113 coffee plantations located in the Province of Rio de Janeiro, with evaluations (checked by the Bank's experts) of their assets and earnings. In 41 of them there are information on the number of slaves and their global values, totaling 6,866 slaves[125].

According to the 1872 Census there were 48,939 slaves in the *Município Neutro*, and 292,637 slaves in the Province of Rio de Janeiro. Thus our 17,987 sample of slave prices, which refer to both units, represents 5.27 percent of their total population. If we consider the coffee producing region and add the slave populations of São Paulo (156,612), Minas Gerais (370,479) and Espírito Santo (22,207), the same sample would represent 2.0 percent of the total population.

Series of Slave Prices

With the information contained in the sample we can construct series of slave prices for the period, according to varying characteristics. Our purpose is to examine their trends during this period, and to discuss the validity of making inferences about the evolution of slave prices in coffee plantations when 23.86 percent of the sample was taken from advertisements in a newspaper of the city of Rio de Janeiro.

From the 4,291 slaves of the JC sample, we excluded 11.3 percent slaves who were either explicitly listed as *velho* (old), *meia-idade* (of middle age) and 50 years or older, and those listed as 16 years or younger, or those whose indication suggested they belonged to this age cohort, like the *moleques, molecotes, pardinho (a)* and *negrinho(a)*. The rationale for that exclusion was to make the price series comparable with the hire rate series, since in terms of absolute prices, if we compare the series of prices with and without the groups excluded, for any given year their difference never exceeded in absolute values 10 percent of the series excluding those slaves.

125 We used regression analysis to test if the average price of slaves (P) increased with the size (S), measured in number of slaves of the plantation. The results are:

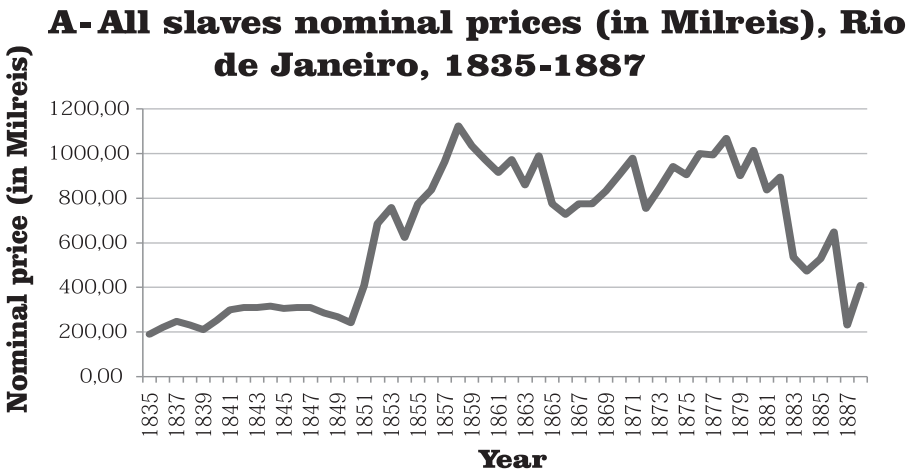
$$P = 1{,}003.34 - 0.281587\ S \qquad r2 = 0.0233$$
$$(35.491) \quad (.295595)$$

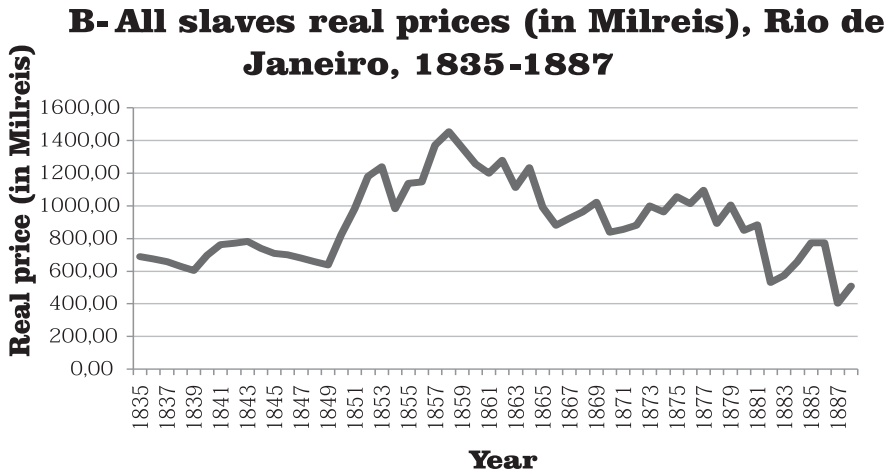
There were 40 coffee plantations in the sample, with sizes from 11 slaves to 322 slaves. The results of the regression, with a small slope and a very small r2 , suggests that the average price of slaves did not vary much between small and large plantations, and thus the bias of our sample towards big plantations will likely not bias the results.

Thus, the effect of this exclusion did not alter much the average price of slaves, since the lower average price of olds and very young was partly compensated by a higher average price of middle age and young slaves near sixteen years of age[126].

Figure 4.1 shows a graphical representation of the price series, in nominal values (Figure 4.1 a) and real values (Figure 4.1 b), in *milréis*, of the 17-49 old group of male and female slaves, hereafter called all slaves. In Table 4.4 we present the average (mean) price, standard deviation, number of observations, coefficient of variation and the real prices.

Figure 4.1 – All slaves real and nominal prices, 1835-1887





126 Unfortunately, only those explicitly listed as belonging to these age groups are excluded, so it is quite possible that some slaves not explicitly listed as such also belong to that group. However, this sort of bias is also likely to occur with the hire rate series, and therefore does not constitute a serious problem.

Looking at the evolution of real prices of all slaves in the period 1835-1887, we can divide it into five sub-periods:

1. 1835-1850: real prices are almost constant, rising at the rate of growth of 0.11 percent per annum[127];
2. 1851-1858: the years immediately following the cessation of the African slave trade, and when slave prices in real terms show the highest rate of growth, of 5.80 percent per annum[128];
3. 1859-1867: slave real prices decline during these years, at a negative rate of (- 5.68 percent) per annum[129];
4. 1868-1877: slave real prices are rising at the rate of growth of 1.57 percent per annum[130] ;
5. 1878-1887: during this decade slave real prices show a substantial and steadily decline, at the negative rate of growth of (-10.07) per annum[131]

The "all" slave price series can be broken down in female and male price series, which are represented in Figure 4.2. Of the 3,807 slaves in the sample, 2,573 (67.6 percent) were males and 1,234 (32.4 percent) were females. Given the mix of skills of urban slaves, and the relatively high representation in this sample of urban occupations among female slaves vis a vis the male slaves, female slave prices tend to be higher than male slave prices[132].

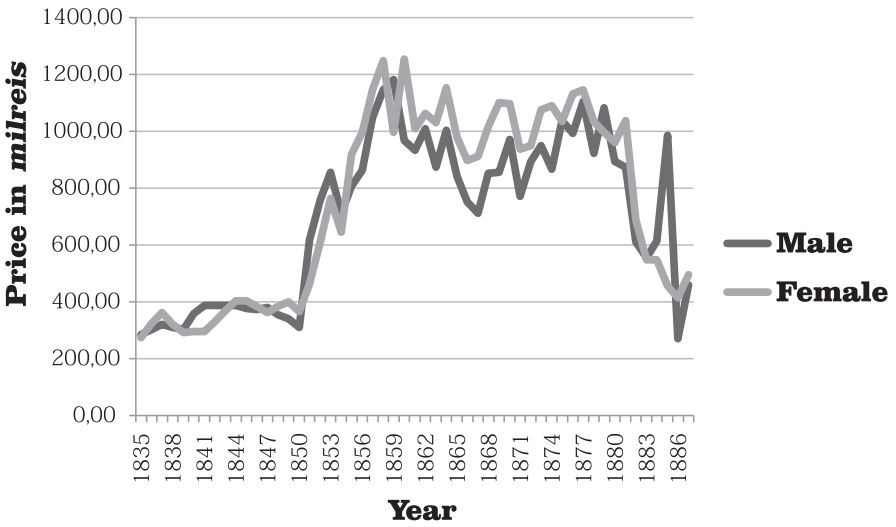
Another way of breaking down the "all" slave price series is by using the information about the skill and the profession, which was presented in all the advertisements. The first thing to notice is that the city of Rio de Janeiro also functioned as an important distribution center of slaves for the surrounding rural areas of coffee production. The advertisements themselves suggest that hypothesis.

We classified as rural slaves those in which it was explicitly specified they had agricultural skills, like "*escravos da roça*", "*lavoura*", "*chácara*", "*todo serviço inclusive roça*", and other qualities. We did not include some slaves who were offered as "*do ganho*", "*serviço braçal*" or other

127 Log Pst = 6.4449 + 0.0011 t r2 = .0056 Pst = slave prices
128 Log Pst = 6.7644 + 0.0580 t r2 = .5510 Pst = slave prices
129 Log Pst = 7.3068 - 0.0568 t r2 = .8320 Pst = slave prices
130 Log Pst = 6.7782 + 0.0157 t r2 = .3200 Pst = slave prices
131 Log Pst = 6.9969 - 0.1007 t r2 = .6700 Pst = slave prices
132 See Algranti, Leila Mazan. "Os ofícios urbanos e os escravos de ganho no Rio de Janeiro Colonial (1802-1822)," in Tamás Szmrecsányi, ed., *História Econômica do Período Colonial* (São Paulo; Ed. HUCITEC/FAPESP, 1996), pp. 195-214.

designation, although they were non-skilled slaves which could be presumably employed in the fields. We classified them as urban slaves, together with all the other slaves with skills ranging from domestic service (valets, butlers, cooks, head cooks, and other jobs) to porters, carpenters, tailors, masons, fishermen, gardeners, sailors, and other skills.

Figure 4.2 – Male and female slave prices, Rio de Janeiro, 1835-1897



The range of skills that we grouped as urban was representative of the structure of slave occupations in the city of Rio de Janeiro. Thus, the 1872 Census listed (slaves) for the *Município Neutro* : 498 artists, 527 sailors, 174 fishermen, 1,384 seamstresses, 65 miners and quarrymen, 276 metalworkers, 690 carpenters, 596 construction workers, 54 leather workers, 232 clothiers, 34 hat makers, 188 shoemakers, 5,785 servants and day laborers, and 22,842 domestic service slaves (where 94.7 percent of all the urban female slaves were listed).

The 1872 Census listed, among slaves, 3,207 male and 2,488 females as agricultural workers, or 16.5 percent of the total slave labor force. Those rural slaves worked in the small farms supplying vegetables, fruits, milk, poultry, and other goods, to the city and also in the 40 coffee plantations, and 17 sugar (also producing molasses) plantations of the rural districts of the *Município Neutro* [133].

133 Bárbara Levy, "Participação da População Livre e Escrava numa Codificação Sócio-Profissional do Rio de Janeiro (1850-1870): Alguns Aspectos", in *Trabalho Livre e Trabalho Escravo, vol.I*, (São Paulo: Anais do VI Simpósio Nacional dos Professores Universitários de História, 1973), p. 655.

TABLE 4.4

Rio de Janeiro All Slave Prices, 1835-1887:

Mean Price (Nominal and Real), Standard Deviation, Sample Size and Coefficient of Variation (Prices in *Milréis*)

YEAR	Mean Price (Nominal)	Standard Deviation	Sample Size**	Coefficient of Variation	Real Prices*
1835	272$100	59.9	57	.22	627$000
37	310$700	57.5	55	.19	616$500
39	294$500	73.6	51	.25	551$500
1841	359$800	84.5	40	.23	700$000
44	378$500	95.9	40	.25	716$900
45	369$700	95.2	35	.26	683$400
47	366$400	98.6	55	.27	646$200
49	338$800	93.2	60	.28	614$900
1850	320$000	150.2	16	.47	589$300
51	448$600	202.7	80	.45	780$200
52	694$000	269.7	72	.39	1,139$600
53	806$500	349.6	69	.43	1,250$400
54	668$800	368.5	43	.55	973$500
1855	811$100	379.4	62	.47	1,111$100
56	874$400	399.9	80	.46	1,126$800
57	1,006$400	553.0	66	.55	1,290$300
58	1,151$500	390.6	73	.34	1,470$600
59	1,090$300	485.6	78	.45	1,387$200
1860	1,016$500	379.6	111	.37	1,288$300
61	938$500	394.0	92	.42	1,185$000
62	1,007$200	405.4	81	.40	1,266$900
63	900$000	343.1	116	.38	1,100$200
64	1,031$900	353.7	126	.34	1,227$000
1865	896$600	408.3	97	.45	1,035$300
66	797$100	309.3	82	.39	894$600
67	768$500	337.4	66	.44	838$100
68	859$500	326.3	113	.38	910$500
69	931$600	420.9	103	.45	958$400
1870	1,007$900	326.8	177	.32	1,007$900
71	815$800	292.9	99	.36	816$600
72	859$200	347.0	254	.40	860$900
73	975$700	305.0	297	.31	977$700
74	958$500	354.3	105	.37	961$400
1875	1,028$300	304.3	184	.30	1,032$400
76	1,025$700	325.9	111	.32	1,016$600
77	1,093$500	339.0	124	.31	1,070$000
78	932$400	368.3	83	.40	900$900
79	1,035$100	371.9	154	.36	986$700
1880	893$200	342.0	73	.38	840$300
81	917$800	325.0	45	.35	850$600
82	607$900	252.6	42	.42	555$200
83	550$000	178.0	10	.32	495$000
84	584$400	268.8	16	.49	536$600
1885	796$700	279.8	6	.35	746$700
86	325$000	106.1	2	.33	311$300
1887	450$000	44.7	6	.10	439$900

Notes: * Deflated by Buescu Price Index, 1870=100.

** Sample size is the number of individual slaves advertized.

There was, therefore, a rural sector in the *Município Neutro* (county of Rio de Janeiro) that could both supply and demand slaves, using the J.C. as the vehicle of information. But, in addition, the city also served as a slave distributor to the coffee producing counties in the Province of Rio de Janeiro. There are many indications for that. First, 52.6 percent of the slaves advertised in an individual basis, with information about price, were rural slaves. Second, by the information on the advertisements in the rental market, which, due to transportation and other causes which make physical proximity a necessity, tend to represent best the market location orientation of slave services, we find that only 22 percent of the advertisements are for rural slaves.

Finally, this can be seen by the frequency in which advertisements of blocs of slaves (we are not including families here) offered as having agricultural skills appear. In 1872, for instance, there are 98 advertisements in the J.C. offering blocs of slaves for sale. We found many cases in which the slaves were offered in blocs of the same age and gender, or then from the same origin or same province, reflecting the internal trade of slaves, or, then, explicitly mentioning that the bloc of slaves had training in plantation work and were good to work in coffee plantations, and other rural jobs.

From those 98 advertisements, 78 percent specify the size of the bloc, the number of slaves offered totaling 662. The following distribution existed, shown in Table 4.5:

TABLE 4.5
Size of Blocs of Slaves advertised in the County of Rio de Janeiro by Blocs

Size of the Bloc of Slaves	Percent of Advertisements	Percent of Slaves
3 - 5 slaves	59.2	26.3
6 - 10 slaves	19.7	17.8
11 - 15 slaves	14.5	21.3
21 - 50 slaves	4.0	8.9
TOTAL	2.6	25.7
	100.0	100.0

SOURCE: Prepared by the author based on J.C. advertisements

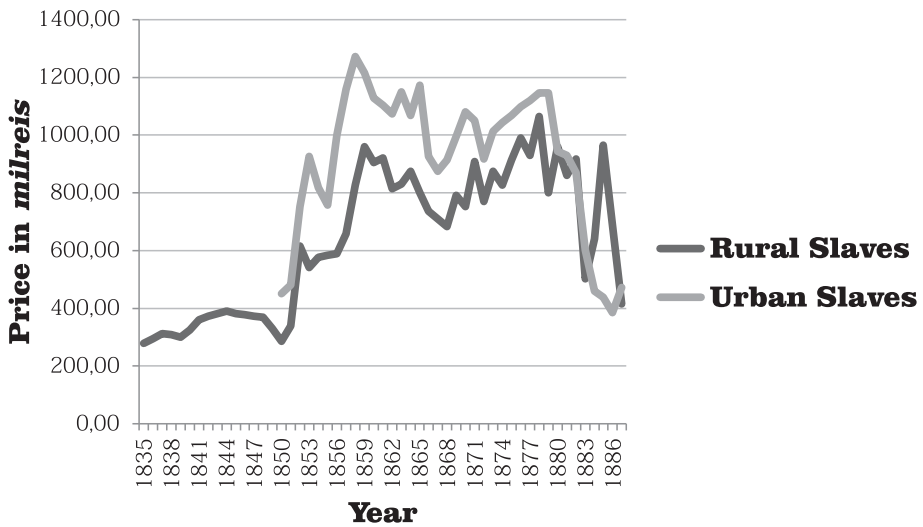
From the available historical sources, still other examples can be shown to stress the point that the city of Rio de Janeiro played an important role in the marketing of slaves to the coffee producing counties of the Province of Rio de Janeiro. There were specialized firms for buying

and selling slaves, as can be seen by the city's licenses granted[134]. This can also be seen by the frequency in which some addresses appear in the *Jornal do Comercio* (J.C.) advertisements.

Another example is given by one of the roles played by the *Comissário de Café* in Rio de Janeiro, e.g., to supply slaves to their clients in the coffee plantations of the Paraíba Valley[135].

Figure 4.3 shows a graphical representation of the rural and urban slave prices. Of the 3,807 slaves advertised, 2,003 slaves (52.6 percent) were rural and 1,804 slaves (47.4 percent) were urban slaves. As can be observed, both series present the same pattern through the period as the other series, i.e., a rapid increase in the 1850s following the ending of the African slave trade, cyclical variations at the higher prices in the 1860s and 1870s, and a steady decline in the 1880s.

Figure 4.3 – Urban and rural slave prices, Rio de Janeiro, 1835-1897.



Prices of Male Slaves 20-29 year-old

A more precise and homogeneous series than the ones presented above can be obtained by using the 20-29 year old male slaves, based on the information obtained from the coffee plantations, *Carta de Libertação dos Escravos* and the *Jornal do Commercio* advertisements.

134 Arquivo Histórico do Estado da Guanabara, Códices 6-1-9, 6-1-23, 2-1-32, and 6-2-11. *Divisão do Patrimônio Histórico e Artístico da Guanabara*, Rio de Janeiro.

135 This role of the City of Rio de Janeiro as a slave distributor was increased during the 1860s and 1870s, with the inauguration of the railroad linking the city to the coffee producing counties. See Stein, *Vassouras*, pp. 110-114.

Using the information on the price of slaves according to age and gender, provided by the 6,332 individual prices from inventories of coffee plantations (Table 4.1, rows 2, 3, and 4, hereafter referred as the C.P. sample), we obtained individual prices for 414 male slaves between the ages of 20 to 29, during the period 1826-1886, or 6.5 percent of the C.P. sample.

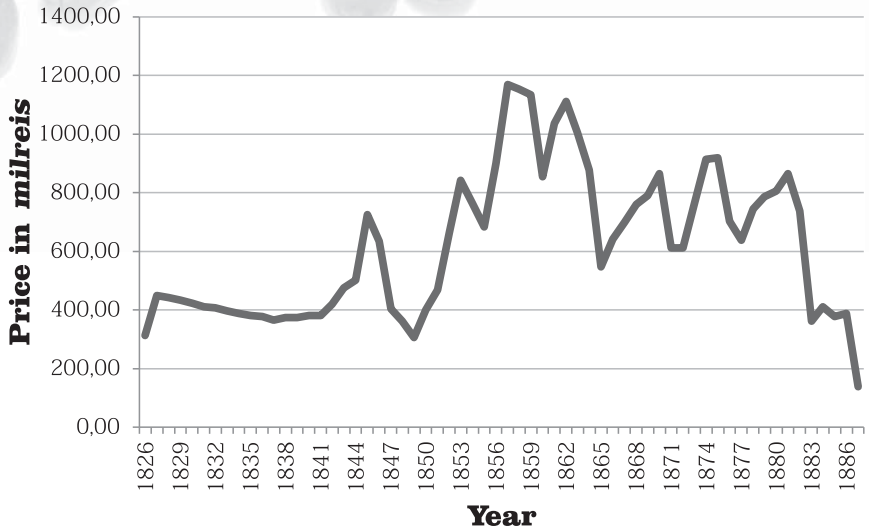
The C.P. sample is based on evaluations of slaves, shown in inventories, rather than the asking prices as in the J.C. advertisements, or the market values as in the C.L.E. sample, or the appraisal values as in the *Banco do Brazil* mortgage applications. Unfortunately, for some of the years of the period we do not have price information in the C.P. sample, or then the information on male slaves 20-29 years exists, but only with a very small number of observations. In addition, we also do not have enough information for the three last years of slavery, which were the most crucial years.

Thus, in order to improve the size of the number of observations, but keeping a coherence with the C.P. sample, we used the information on individual prices of 20-29 male slaves provided by the J.C. advertisements, in a total of 166 prices, for the period 1837-1883. Finally, for the crucial period 1885-1887 we have used the information contained in the C.L.E. sample, on 35 individual prices for male slaves in the 20-29 age cohort. Hereafter, this aggregate information is called the Total Sample (T.S.), containing 615 prices of male slaves aged 20-29..

The aggregate price series for the 20-29 male slaves, during the period 1826-1887, is presented in Figure 4.4. The price series is presented in real terms, using the Buescu Price Index (1850 = 100). Given the weight (67.3 percent) of the C.P sample in the total sample (T.S.), and also considering that we tried to extract compatible prices from the J.C. or C.L.E. samples, we are confident this series of the T.S. can be interpreted as showing the price movements in real terms of the male prime field hands in coffee plantations during this period.

By a visual comparison with this series and the all slave price series in real terms (Figure 4.1, part b), we can observe a similar pattern through time of the behavior of these two series. This can be better seen by comparing the rates of changes in prices.

Figure 4.4 – Real prices of male slaves, 20-29 years old, 1826-1897 (Buescu Price Index, 1850:100)



We can distinguish 9 sub-periods in the period 1826-1887 for the 20-29 male slave price series:

1. 1826-1845 : during these two decades prices were increasing at the rate of 2.3 percent per annum[136];
2. 1845-1849 : in the five-year period just preceding the effective closing of the African slave trade, slave prices decline at (-22.6 percent) per annum[137], partly due to the huge importation of 247,500 African slaves, landed in Brazil between 1846 and 1852, most of them before 1850 (see Table A1, Appendix A);
3. 1849-1857 : during this period slave prices rise rapidly, at 14.6 percent per annum[138];
4. 1857-1866 : during this decade slave prices decline at (-7.2 percent) per annum[139];
5. 1866-1871 : slave prices increase at 8.9 percent per annum[140];

For the years of the period we are most interested, the 1870s and 1880s, we present in Table 4.6 the annual mean prices (for the total of 440 individual prices of male slaves from 20 to 29 years), the sample size

136 Log Pst = 5.7616 + 0.0225 t r2 = .37 Pst = slave prices
137 Log Pst = 6.7739 - 0.2258 t r2 = .97 Pst = slave prices
138 Log Pst = 5.7147 + 0.1462 t r2 = .84 Pst = slave prices
139 Log Pst = 7.1926 - 0.0723 t r2 = .69 Pst = slave prices
140 Log Pst = 6.2195 + 0.0890 t r2 = .97 Pst = slave prices

or number of slaves for each year, the standard deviation and the real prices (using the Buescu Price Index, 1870=100).

We can discern two basic sub-periods, 1871-1881 and 1881-1887. In the overall sub-period 1871-1881, slave real prices are increasing at 0.74 percent per annum[141], but it is useful to further sub-divide these years into three sub-periods. Together with the period 1881-1887, they complete the 9 sub-periods we mentioned before:

1. 1871—1875 : slave prices are rising, at 6.0 percent per annum, reaching a peak in 1875, then declining[142];
2. 1875-1877 : slave prices decline at the rate of (-19.2 percent) per annum[143];
3. 1877-1881 : slave prices rise continuously again, at the rate of 6.6 percent per annum[144];
4. 1881 – 1887 : after 1881, slave prices fall continuously and rapidly, at an annual rate of (-23.7 percent) per annum[145].

Resuming the conclusions about the research on slave real prices, there is a pattern of rapid increase in the 1850s, following the ending of the African slave trade, cyclical variations at the higher prices in the 1860s and 1870s, and a steady decline in the 1880s. This can be confirmed by the only other source available on the prices of coffee plantation slaves, Stein's research in Vassouras[146] .

141 Log Pst = 7.2082 + 0.0074 t r2 = .023 Pst = slave prices
142 Log Pst = 6.4976 + 0.0597 t r2 = .29 Pst = slave prices
143 Log Pst = 6.9858 - 0.1918 t r2 = .87 Pst = slave prices
144 Log Pst = 6.4239 + 0.0660 t r2 = .91 Pst = slave prices
145 Log Pst = 6.9261 - 0.2367 t r2 = .77 Pst = slave prices

146 Stein's research on prices was based on notarial records. He presents a graph showing the average price of male and female 20-25 years old in Vassouras, the same county in the Paraíba Valley of Rio de Janeiro where we draw part of our sample. We estimated visually the values in *milréis* and deflated by the Buescu Price Index. We observe again the same pattern of rapid increase in the 1850s, a trend of smooth and slightly increasing prices up to a peak in 1879, and then a steady decline in the 1880s. We are indebted to Stein's work to provide us with an inspiring and excellent analysis of the coffee plantation economy in Brazil, which was very useful for our own work. Stein, *Vassouras*, p. 229.

TABLE 4.6
Average Price of Male Slaves Aged Twenty to Twenty-Nine Years, 1870-1887
(Nominal and Real milréis Prices)

YEARS	Nominal Prices	Number of Slaves	Standard Deviation	Real Prices*
1870	1,412$900	57	190.1	1,428$900
71	1,550$000	1	--	1,551$600
72	1,104$300	23	298.8	1,106$500
73	1,371$600	146	165.5	1,375$100
74	1,662$500	8	244.6	1,667$500
1875	1,643$300	30	344.8	1,649$900
76	1,257$100	7	269.9	1,245$900
77	1,193$800	8	182.1	1,168$100
78	1,406$300	9	312.2	1,358$700
79	1,473$000	11	380.4	1,404$000
1880	1,533$300	3	152.8	1,442$400
81	1,700$000	3	173.2	1,575$500
82	1,341$100	28	342.7	1,224$700
83	723$500	17	164.0	651$200
84	800$000	1	--	734$600
1885	715$900	22	203.2	670$900
86	647$800	23	271.1	620$500
1887	255$700	44	82.3	250$000

NOTES: *Buescu Price Index, 1870=100
SOURCES: Coffee Plantation's Inventories, Jornal do Comercio advertisements, Cartas de Libertação dos Escravos.

Value of the Ingenuos

Finally, the *ingenuos*, as were called the children born from slave mothers, and freed, under some conditions, by the 1871 Free Womb Law, were also priced. Since they were no longer, technically speaking, assets to be traded in the market, planters found a way to reconcile the law with the reality of the market[147] .

In the coffee planter's inventories the distinction was often made between the evaluation of slaves, called "prices", and the evaluation of the *ingenuos*, called "value of the services of *ingenuos*". Both slaves and *ingenuos*, however, were listed together in the evaluation list.

We present in Table 4.7 a sample of male and female "*ingenuo*" average prices (meaning "value of the services") according to age, from three coffee plantation inventories made in 1882 (more than 10 years after the Free Womb Law) in Vassouras.

147 See Robert W. Slenes, Na Senzala, uma Flor: Esperanças e Recordações na Formação da Família Escrava: Brasil Sudeste, Século XIX. (Rio de Janeiro: Editora Nova Fronteira, 1999).

TABLE 4.7
Prices of Male and Female Ingenuos, Vassouras, 1882 (in *milréis*)

AGES	Male *Ingenuos*	Male *Ingenuos*	Female *Ingenuos*	Female *Ingenuos*
	Price	Number	Price	Number
2 months	5$000	1	-	-
4 months	-	-	10$000	1
1 year	5$000	5	6$000	10
2 years	8$300	6	10$000	4
3 years	25$000	4	37$100	7
4 years	46$700	6	35$000	4
5 years	65$000	2	56$700	6
6 years	98$700	4	90$000	2
7 years	150$000	1	-	-
8 years	162$500	4	-	-
9 years	-	-	-	-
10 years	160$000	3	136$000	5
11 years	-	-	150$000	1

SOURCE: Inventories in C.P.O.V., plantations Conceição, Oriente and B.F.Cruz. See Appendix B.

As can be observed, *ingenuo* prices increase with age, reflecting the capitalization of the expected positive net earnings. We will see in Chapter 9 that this behavior reflects the age price profiles of male and female slaves , which increase between the ages 6 (female) and 7 (male) to 21 years.

Chapter 5
The Rental Market and Hire Rates for Slaves

Systematic direct information on hire rates of slaves in coffee plantations are very difficult to be obtained. Although we found in the coffee plantation inventories indications that slaves were borrowed and loaned to other plantations nearby on occasion, these transactions hardly assumed explicitly the implicit exchange of hire rates in the operation. Furthermore, even if they were made explicit, it is very difficult to find these registers[148].

Research on Hire Rates of Slaves

The only plantation in which we found systematic registers on hire rates was the *Fazenda Imperial de Santa Cruz*, a government owned experimental farm in the *Município Neutro*[149]. We found 305 individual hire rates for the period 1857-1868[150] .

The sex composition in the sample showed 51.1 percent female slaves and 48.9 percent male slaves. There were many skilled slaves rented in the period: 11 masons, 25 pottery-makers and brick-makers, 22 carpenters, 1 plumber, 3 coopers, 2 barbers, 1 basket-maker and 1 dressmaker. Most of the slaves, however, were gang workers. Hire rates for skilled slaves were on average from 100 percent to 150 percent higher than for the gang slaves. The mean monthly hire rates (*milréis*) in the period, for all slaves, were:

1857	16$50
1860	24$00
1861	16$50
1862	12$90
1863	11$00
1864	9$00

148 See the discussion in Chapter 9. See also Laerne, *Brazil and Java*, pp. 278, 302, 344-45, 350, 351, 358.

149 The *Fazenda Imperial de Santa Cruz* was one of the major farms in the history of Brazil. During Colonial times, the Fazenda, located in the Rio de Janeiro state, had thousands of slaves, had cattle and produced several agricultural commodities. It was managed by the Jesuits, till the expulsion from Brazil in mid 1700s, when it became property of the crown.

150 "*Fazenda Imperial de Santa Cruz*", Códice 1122, Arquivo Nacional, Rio de Janeiro.

1865	11$20
1866	12$50
1867	8$60
1868	10$00

The other indication we found was in an inventory in the C.P.O.V., in which two plantation slaves (*escravos da lavoura*) were listed, and where there are both the price and the hire rates for the same slaves. Camillo and Maria were rented from April 5 of 1886 to May 13 of 1888 for the total values, respectively, of 453$000 and 337$000. Their evaluation in March 10 of 1887 was 809$000 for the 40 years old Camillo and 600$000 for the 39 years old Maria.

To have a better picture of the rental market, however, we need more systematic evidence. Fortunately, the *Jornal do Commercio* also published monthly hire rates. Using the same sample procedure as in the research on prices, we got 4,829 individual advertisements, all by gender, skill, and profession, and some by age. We excluded 7.6 percent of them, of those listed as old, of middle age, 50 or over 50 years old, or 16 years old or under 16, and those referred as *moleques, molecotes, negrinho(a)* and *pardinho(a)*[151] .

Seldom in the advertisements it is explicated the word slave (*escravo*). This is true also for the price advertisements, but there can be no doubt that they were slaves. However, although in the case of hire rates there is some degree of arbitrariness in assessing and selecting the slaves from the free-workers, there are some patterns, like the sentence construction, the use of the same words, the frequency in which the same address appears, or, more important, the indication of color or shade of color – *preto(a), negro(a), pardo(a)*, or another indication – which leaves no doubt that the advertisement refers to a slave.

Series of Slave Hire Rates

We present in Figure 5.1 and Table 5.1 the monthly hire rate for all slaves between 1835 and 1888. We can observe that slave hire rates were increasing during all the period. We deflated this series by the Buescu price index, and we present the real hire rates in the same figure.

151 The Portuguese words describe youngsters and boys/girls under 16 years old.

Figure 5.1 – Nominal and real monthly hire rates of slaves, Rio de Janeiro, 1835-1888

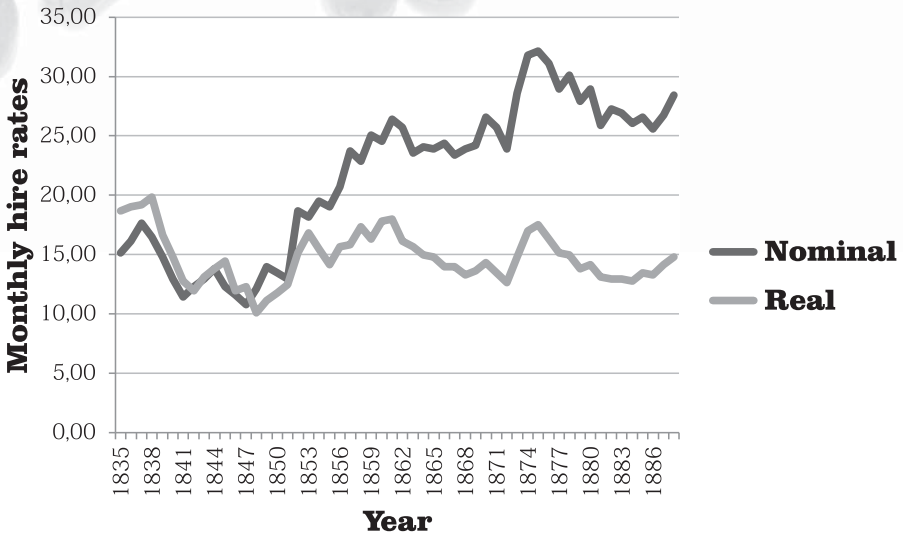


TABLE 5.1

Rio de Janeiro All Slaves Monthly Hire Rates, 1835-1888:
Mean Monthly Hire Rates (Nominal and Real), Standard Deviation, Number of Slaves (Sample Size) and Coefficient of Variation (in *milréis*)

YEAR	Mean Hire Rate (Nominal)	Standard Deviation	Sample Size	Coefficient of Variation	Real Hire Rates*
1835	15$000	1.41	2	.09	18$800
37	18$000	6.93	3	.39	19$400
1841	11$000	1.16	4	.11	11$600
44	13$700	1.53	3	.11	14$100
45	12$300	3.74	9	.30	12$400
47	10$500	0.90	12	.09	10$100
49	13$700	3.25	18	.24	13$500
1851	13$000	3.90	108	.30	12$300
52	18$600	5.20	122	.28	16$600
53	18$400	6.66	110	.36	15$500
54	19$600	5.82	137	.30	15$500
1855	19$100	5.18	117	.27	14$200
56	20$800	5.93	109	.29	14$600
57	23$700	6.23	109	.26	16$500
58	23$400	6.22	117	.27	16$300
59	25$100	7.24	96	.29	17$400
1860	25$000	6.75	70	.27	16$700
61	26$100	8.37	97	.32	17$900
62	26$400	5.17	77	.20	18$000
63	24$000	6.34	85	.26	15$900
64	24$200	7.01	63	.29	15$600
1865	24$300	5.05	86	.21	15$200
66	24$500	6.51	80	.27	14$900
67	23$900	5.46	88	.23	14$200
68	24$000	5.72	65	.24	13$800

69	24$500	6.33	52	.26	13$700
1870	26$900	5.28	130	.20	14$600
71	25$900	6.18	42	.24	14$100
72	24$200	4.34	46	.18	13$200
73	31$100	8.87	102	.29	16$900
74	32$700	7.35	117	.22	17$800
1875	32$000	8.03	102	.25	17$500
76	30$500	8.00	99	.26	16$400
77	29$500	6.89	85	.23	15$700
78	29$700	7.83	89	.26	15$600
79	28$400	8.22	89	.29	14$700
1880	29$000	8.12	82	.28	14$800
81	26$600	8.70	172	.33	13$400
82	27$200	8.22	189	.30	13$500
83	27$200	8.89	235	.33	13$300
84	26$600	8.71	242	.33	13$300
1885	26$900	11.50	237	.43	13$700
86	26$700	10.10	235	.38	13$900
87	27$900	10.80	229	.39	14$800
1888	28$700	10.30	99	.36	15$200

NOTES: * Buescu Price Index, 1850 = 100
SOURCE: Advertisements in Jornal do Commercio, Rio de Janeiro, 1835-1888

We can distinguish six sub-periods in this All Slaves hire rate series, in real terms, with different lengths:

1. Between 1835 and 1862 decline at (-8.7 percent) per annum[152];
2. Between 1841 and 1862 the hire rates are increasing at 2.2 percent per annum[153];
3. In the decade 1862 to 1872 real hire rates decline at the rate of (-2.3 percent) per annum[154];
4. In the three-year period from 1872 to 1874 hire rates increase rapidly, at the rate of 14.9 percent per annum[155];
5. In the following decade, from 1874 to 1883, hire rates decline at the rate of (-3.4 percent) per annum[156];
6. But, in the critical years between 1883 and 1888 real hire rates are increasing at the rate of 2.9 percent per annum[157].

We present in Figure 5.2 the monthly hire rates series for slaves according to gender, male and female, for the period 1835-1888, and in Figure 5.3 the monthly hire rates according to urban and rural location,

152 Log H st = 3.10363 - 0.08734 t r2 = 0.86 Hst = slave hire rate
153 Log H st = 2.40337 + 0.02164 t r2 = 0.68 Hst = slave hire rate
154 Log H st = 2.83073 - 0.02286 t r2 = 0.76 Hst = slave hire rate
155 Log H st = 2.46325 + 0.14949 t r2 = 0.86 Hst = slave hire rate
156 Log H st = 2.91031 - 0.03446 t r2 = 0.96 Hst = slave hire rate
157 Log H st = 2.53984 + 0.02864 t r2 = 0.92 Hst = slave hire rate

for this same period. We observe in those series the same basic trends described for all slave series.

Thus the main finding about the rental market of slaves is that real hire rates show a clear upward trend in the late 1880s. The importance of this finding will become clearer when we compare with the behavior of slave prices during this period and discuss in Chapter 10 the sanguinity of coffee planters. If we consider the period 1847-1888, there is also an upward trend during this overall period, although for this overall period the statistical testing shows weak results[158] .

This pattern of increasing – or not declining – hire rates for slaves is also observed in the two other works on Rio de Janeiro we are familiar with.

Soares presents data on slave hires rates from the *Arquivo da Santa Casa da Misericórdia* from 1748 to 1871, showing un upward trend in nominal values[159]. He also presents the following data on monthly hire rates and number of female nurse slaves (*amas escravas*) from the *Casa dos Espostos*:

Period	Monthly Hire Rates(in *milréis*)
1847-1848	15$000
1849-1853	16$000
1854-1857	28$000
1858-1874	35$000
1875-1888	40$000

Period	Number of Slaves
1849-1857	159
1858-1867	105
1868-1877	155
1878-1888	27

Lobo reports that in the *Cia. Stearica* candle factory of Rio de Janeiro the monthly hire rate of slaves increases from 12$000 in 1840-1841 to 25$000 in 1871, down to 20$000 in 1874 and remained stable at this level until December of 1884[160] .

Adjustments of Hire Rates to Represent Net income

The series on monthly rates we have presented are very useful to illustrate movements in magnitudes over time. However, they present

158 Log H st = 14.9704 + 0.020 4 t r2 = 0.005 Hst = slave hire rate
159 Ubaldo Soares, A Escravatura na Misericórdia: Subsídios, (Rio de Janeiro, 1958), p. 61.
160 Eulalia L.Lobo, "Evolução dos Preços e do Padrão de Vida no Rio de Janeiro, 1820-1930: Resultados Preliminares", *Revista Brasileira de Economia*, XXV, No.4 (October/December 1971), p. 252-53.

important limitations if they are to be interpreted as estimates of the net income received by slave owners, unless some adjustments are made.

Those adjustments are based on the knowledge of the contractual conditions and other characteristics of hired slave employment, like rate of turnover, risk of runaways, brokerage fees, advertisement costs, taxes, medical insurance (implicit), time lost while lessors were waiting to find lessees, and other conditions.

In Chapter 9 we attempt to estimate those magnitudes for the rental market of Rio de Janeiro (city and coffee plantation slaves), in order to make the adjustments required for an estimate of the yearly net rent received by owners of slaves when they rented their slaves out.

Figure 5.2 – Monthly hire rates of male and female slaves, Rio de Janeiro, 1835-1888

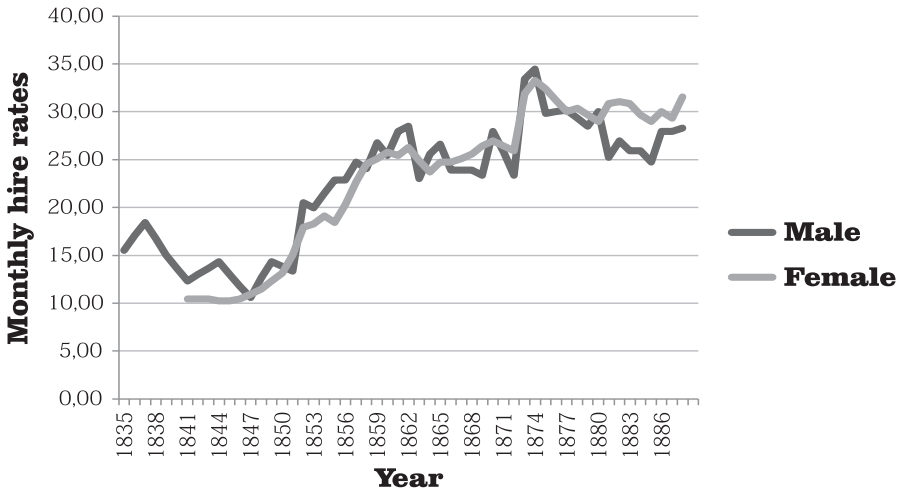
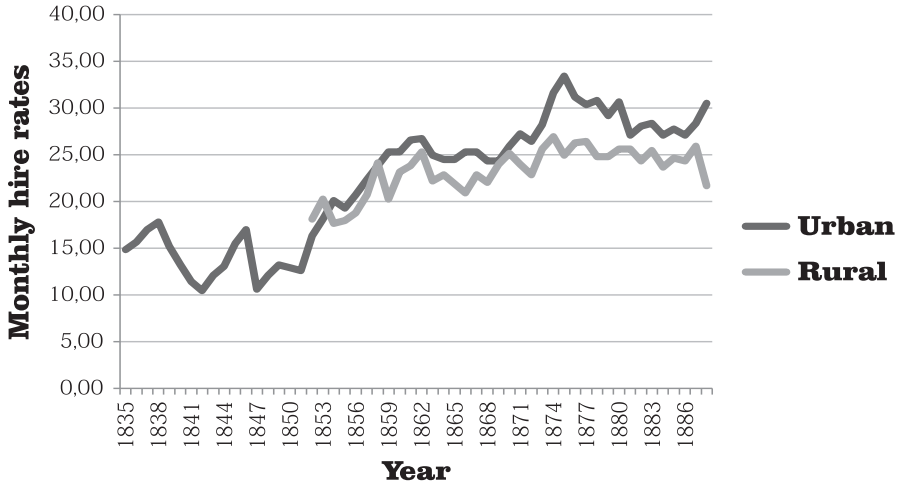


Figure 5.3 – Monthly hire rates of urban and rural slaves, Rio de Janeiro, 1835-1888



Chapter 6
Changes in the Coffee Region Slave Population

The 1871 Free Womb Law cut off the possibility of self- growth of the slave population, and after that date slave population became a stock of slaves, subject to change in their numbers only by the mortality and manumissions (and successful flights) conditions.

The mortality conditions will be discussed in the next chapter, and in Appendix A, where we present estimates of slave longevity
In this Chapter our objective is to examine the course of slave population in the coffee region.

Measuring the Stock of Slaves

Although the stock of slaves was given, and would progressively decrease by virtue of the age specific mortality conditions peculiar to this population (and for manumission and flight reasons), this does not imply that the slave population in a given occupation or region could not increase. That is, a decline in the overall slave population does not imply a fall in the number of slaves used in a particular region or occupation[161] .

Indeed, we want to show that this process of concentration of the slave population was occurring in the coffee region, especially in the coffee producing counties during most of the period 1871-1888. The number of slaves in the coffee producing counties was increasing in the period 1871 to 1881-1883, but declining afterwards.

161 See the following works that discuss the issues of economic viability of slavery: Castro, Antônio Barros de. "Escravos e senhores nos engenhos do Brasil. Um estudo sobre os trabalhos do açúcar e a política econômica dos senhores" (São Paulo: tese de doutorado, UNICAMP, 1976); Castro, Helio O.P. de. "Viabilidade Econômica da Escravidão no Brasil, 1880-1888," Revista Brasileira de Economia, 27, No. 1 (Jan./Mar. 1973), pp. 43-67; Domar, Evsey D. "The Causes of Slavery or Serfdom: a Hypothesis," Journal of Economic History, 30, no. I (March 1970), pp. 18-32; Eltis, David. "Slavery and freedom in the Early Modern world," in Stanley L. Engerman, ed., Terms of Labor, Slavery, Serfdom, and Free Labor (Stanford: Stanford University Press, 1999), pp. 25-49; Goldin, Claudia D. "The Economics of Emancipation," in Journal of Economic History, 33, no. 1 (March 1973), pp. 66-85; Versiani, Flávio Rabelo. "Brazilian Slavery: Toward an Economic Analysis". Revista Brasileira de Economia, 48, no. 4 (Dezembro 1994), pp. 463-478; Yasuba, Yasukichi. "The Profitability and Viability of Plantation Slavery in the United States,". Economic Studies Quarterly, XII (September 1961), pp. 60-67.

In addition, it was a selective concentration process, focusing in male and young slaves, and with agricultural training.

We present in Table 6.1 the data on the Brazilian slave population for the years 1823, 1872, 1872-1873 and 1886-1887. The data is presented for the provinces of the coffee region (Espírito Santo, Rio de Janeiro, Minas Gerais, São Paulo and Municipio Neutro) and the other provinces of the Brazilian Empire.

The data comes from the four slaves population censuses taken during the nineteenth century.

The 1823 Census is the best slave counting done in the period before the ending of the African slave trade.

The 1872 Census was the only general population census made during the period of slavery, and it contains the free and the slave population. It is very reliable, and it was taken in August 1872, although for some provinces (e.g., São Paulo) it was completed only two years later.

The Free Womb Law of 28 September 1871 contained one provision, requiring a slave registration or counting (*Matrícula dos Escravos*). This census is also very reliable, since the register would provide the slave owner with a proof of legal property of the slave and therefore give him incentives for an honest and thorough registry. The registration was made between the first of April of 1872 and the thirtieth of September of 1873. It was intended as a legal registry of slave property, producing a document to be used for slave sales, transfers, inventories, wills and other transactions. The *Matrícula* Census was made independently of the 1872 Population Census, by a different government agency and different personnel. Thus it can be cross checked with the 1872 Census for accuracy and consistency.

The *Matrícula* was updated many times in the subsequent years, the results being published in the reports of the Ministry of Agriculture (*Ministério da Agricultura*)[162]. The second Slave *Matrícula* was done between 30 March 1886 and 30 March 1887, and it was ordered by one of the provisions of the Sexagenarian Law. Like the first *Matrícula*, and for the same reasons, it is also very reliable.

Thus those four censuses are the best sources of information on the slave population in Brazil during the nineteenth century.

162 Robert Slenes did a meticulous work in analyzing and criticizing the statistical data provided by the Matriculas, and his conclusions are supporting the reliability of the slave population statistics coming from this source. See Robert W. Slenes, "The Demography and Economics of Brazilian Slavery, 1850-1888,". (Ph.D. Dissertation, Department of History, Stanford University, 1976).

Slave Population in Brazil and the Coffee Region

We can observe in Table 6.1 that the number of slaves in Brazil increases from 1823 to 1872, at the geometric average rate of 0.54 percent per annum, but then declines from 1872/73 to 1886/87 at the rate of (-5.54 percent) per annum.

The coffee region shows the same behavior as the total slave population of Brazil, but with an important difference. It shows a higher rate of growth in the upward trend (1.44 percent) per annum.

If we look to the aggregate of other regions, however, a different picture emerges. The slave population declines in both periods. From 1823 to 1872 it declines at the negative rate of (-0.29 percent) per annum, and from 1872/73 to 1886/87 at (-7.28 percent) per annum.

Thus the slave population, in relative terms, was concentrating in the coffee region, from 38.4 percent of total Brazilian slave population in 1823, up to a share of 59.0 percent in 1872, and in 1886/87, on the eve of final Abolition, it had 66.7 percent of the total number of slaves in Brazil.

TABLE 6.1
Brazilian Slave Population by Provinces and Regions, 1823, 1872, 1872/73 and 1886/87

PROVINCES	1823	1872	1872/73	1886/87
Coffee Region	446,549	891,306	881,417	482,571
Espírito Santo	60,000	22,659	22,738	13,381
Rio de Janeiro	150,549[a]	292,637	304,744	162,421
Minas Gerais	215,000	370,459	336,711	191,952
São Paulo	21,000	156,612	169,964	107,329
Município Neutro	-	48,939	47,620	7,488
Other Provinces	717,197	623,500	667,215	240,848
Amazonas	6,040[b]	979	1,183	-
Pará	40,000	27,458	30,989	10,535
Maranhão	97,132	74,939[c]	74,939	33,446
Piauí	10,000	27,795	25,533	8,970
Ceará	20,000	31,913	33,960	108
Rio Grande do Norte	14,376	13,020	13,484	3,167
Paraíba	20,000	21,526	27,245	9,448
Pernambuco	150,000	89,028	93,496	41,122
Alagoas	40,000	35,741	33,242	15,269
Sergipe	32,000	22,623	32,974	16,875
Bahia	237,458	167,824	173,639	76,838

Paraná	10,191[b]	10,560	10,715	3,513
Santa Catharina	2,500	14,984	14,730	4,927
Rio Grande do Sul	7,500	67,791	83,370	8,422
Mato Grosso	6,000	6,667	7,064	3,233
Goyaz	24,000	10,652	10,652[c]	4,955
BRAZIL	**1,163,746**	**1,510,806**	**1,548,632**	**723,419**

NOTES: a- Rio de Janeiro and Município Neutro

b – Since the figures are missing, we are using the correspondent ones from the 1819 Census

c – Using the correspondent one from the 1872 Census

SOURCES: *Census of 1823 (and 1819)*, F.J.Oliveira Vianna, "Resumo Histórico dos Inquéritos Censitários Realizados no Brazil", *in Recenseamento do Brazil*, 1920,I (Rio de Janeiro, 1922), 404-5, 414.

Census of 1872: Recenseamento da População do Império a que se Procedeu no dia 1 de Agosto de 1872.

Matrícula 1872/73: Brazil, Ministério dos Negócios do Império, Directoria Geral de Estatística, *Relatório e Trabalhos Estatísticos*, 1875, 1877 and 1878.

Matricula 1886/87: Brazil, Ministério da Agricultura, *Relatório do Ministério da Agricultura*, 1888, p.24.

Although the aggregate data can pick the effects of the migrations from the rest of Brazil to the coffee region, it does not capture the important internal migrations inside the coffee region[163] .

A good indicator, however, can be obtained by looking the data at the county (*município*) level. Tables 6.2 to 6.5 present the evolution of the slave population in the provinces of Rio de Janeiro and São Paulo, by grouping them according to the coffee producing counties.

TABLE 6.2

Slave Population of the Principal Coffee Counties of the Paraíba Valley and Central and Western (Mogiana and Paulista) Regions. Province of São Paulo, selected years

COUNTIES	1836	1854	1874	1883	1886
Paraíba Valley	15,434	28,572*	32,630	28,380	20,432
Bananal	1,679	7,621	8,281	7,168	4,182
Guaratinguetá	1,158	--	4,352	5,312	3,165
Jacareí	2,315	2,586	2,541	1,478	1,124
Lorena	3,824	2,508	4,176	2,464	3,089
Mogí das Cruzes	1,872	1,802	1,657	1,048	539
Pindamonhangaba	524	5,628	4,419	4,177	2,914
São José dos Campos	458	928	1,390	1,618	976
Taubaté	3,604	--	5,814	5,115	4,443

163 See Herbert Klein, "The Internal Slave Trade in Nineteenth Century Brazil: A Study of Slave Importations into Rio de Janeiro in 1852," *Hispanic American Historical Review*, LI, No. 4 (November 1971); Douglas H. Graham and Sergio Buarque de Holanda Filho, *Migration, Regional and Urban Growth and Development in Brazil: A Selective Analysis of the Historical Record 1872-1970*, vol. 1 (São Paulo: Instituto de Pesquisas Econômicas da Universidade de São Paulo, 1974); Laerne, Brazil and Java, pp. 118-119.

Central	11,289	15,268	26,301	26,748	19,357
Campinas	3,917	8,190	13,685	15,665	9,986
Capivarí	1,674	3,707	3,189	3,612	2,003
Jundiaí	2,051	1,945	3,800	1,631	3,548
Piracicaba	3,647	1,426	5,627	5,840	3,820
West (Mogiana)	1,122	9,920	10,886*	13,963	10,527
Amparo	--	986	2,130	4,630	3,524
Mogí Mirim	1,122	5,073	5,006	3,429	2,300
Mogi Guacú	--	1,052	--	795	559
Casa Branca	--	1,782	2,093	3,915	3,004
Sao Simão	--	1,027	777	1,194	1,140
West (Paulista)	--	3,947	11,272	14,801	12,591
Rio Claro	--	1,955	3,935	4,852	3,304
Descalvado	--	409	2,715	2,860	3,931
Limeira	--	1,583	3,054	3,624	2,374
São Carlos	--	--	1,568	3,465	2,982
TOTAL	27,845	57,887	81,089	83,892	62,907

NOTES: * Linear interpolations for Guaratinguetá (2,750) and Taubaté (4,709), between 1836 and 1874, are included in the total.

** Linear interpolation, between 1854 and 1883, for Mogi Guaçú (880) is included in total.
SOURCES: For the years of 1836, 1854, 1874 and 1886 the slave population data was obtained from José Francisco de Camargo, *Crescimento da População no Estado de São Paulo e seus Aspectos Econômicos, vol. II* (Sao Paulo, 1952); for 1883, Laerne, *Brazil and Java*, p. 118-119.

Table 6.2 includes 21 out of the 30 more important coffee producing counties in São Paulo in the early 1880s[164]. It can be observed that the aggregated slave population of the coffee producing counties increased rapidly between 1836 and 1854, at an average geometric rate of growth of 4.3 percent per annum, and continued to grow, at a declining but positive rate, from 1854 to 1874 (1.8 percent per annum) and from 1874 to 1883 (0.4 percent per annum).

In the overall period 1836 to 1883 the aggregated slave population increased at 2.4 percent per annum. From 1883 to 1886, however, this population declined very rapidly, at the rate of (-14.4 percent) per annum.

The course of the slave population in the major coffee producing counties, when the counties are grouped according to the Rio Zone (Paraíba Valley of North of São Paulo) and the Santos Zone (Central and Western regions of São Paulo), shows a differential growth during this period.

Notwithstanding the alleged capitalistic and modern character of the Western *Paulista* planter, and the alleged implication of this attitude to the demand for slaves, the slave population in the Western (Mogiana and Paulista) region was growing at the highest rate during the upward trend, and declining at the smallest rate in the downward trend, as shown in Table 6.3, vis a vis the other regions of the Province[165] .

164 Laerne, ibid, p. 118-119.
165 See Dean, Warren. "The Planter as an Entrepreneur: The Case of São Paulo" in *Hispanic American Historical Review*, XLVI, No. 2 (May 1966), pp. 138-52; Dean, Warren Rio Claro: *A Brazilian Plantation System, 1820-1920* (Stanford: Stanford University Press, 1976).American Historical Review, XLVI, No. 2 (May 1966), pp. 138-52; Dean, Warren Rio Claro: A Brazilian Plantation System, 1820-1920 (Stanford: Stanford University Press, 1976).

TABLE 6.3
Rates of Growth of the Slave Population in the Coffee Producing Counties of São Paulo (percentage rates)

Province of São Paulo	1836/1874	1836/1883	1874/1883	1883/1886
Rio Zone, Paraíba North	+ 2.02 %	+ 1.32 %	-1.74 %	-16.43 %
Santos Zone, Central	+ 2.29 %	+ 1.88 %	+ 0.21 %	-16.17 %
Santos Zone, Western	+ 8.06 %	+ 7.05 %	+3.26 %	-10.93 %

SOURCE: Table 6.2

As a result, the share of slaves in the Western region on the aggregated slave population of the coffee producing counties in São Paulo increased from 4.0 percent in 1836 to 27.3 percent in 1874 and 36.7 percent in 1886. In relation to the total number of slaves in the Province of São Paulo, the share of the Western São Paulo increases from 14.1 percent in 1874 to 21.5 percent in 1886[166].

Thus the shifts of the slave population in this province coincide with the regional shifts of coffee production during this same period, and can be seen as a derived demand for slave labor[167].

Table 6.4 classifies the coffee counties of the Province of Rio de Janeiro into two groups. The Western (upper) Paraíba Valley section was the region where coffee plantation started in the 1820s and 1830s, and during the 1870s and 1880s it can be called the "old" coffee region of the province[168].

166 The slave population in São Paulo was 107,329 in 1886. See Camargo, *Crescimento da População no Estado de São Paulo e seus Aspectos Econômicos, I*, p. 56.
167 See Camargo, ibid, 3 vols.; and Sérgio Milliet, "Roteiro do Café," in *Roteiro do Café e Outros Ensaios*, Ed. Sérgio Milliet (São Paulo: Coleção Departamento de Cultura, 1939), PP. 7-70.
168 Stanley Stein wrote an excellent monograph about one of the most important counties of this region, the *Município de Vassouras*. See Stein, *Vassouras*.

TABLE 6.4

Slave Population of the Province of Rio de Janeiro, According to the Major Coffee Producing Counties (Eastern and western Paraiba Valley) and the Aggregate of Other Counties, Selected Years

COUNTIES	1872 [a]	1872/73 [b]	Dec. 1878 [c]	June 1881 [d]	July 1882 [e]	June 1884 [f]	June 1885 [g]	March 1886 [h]
Major Coffee Counties	***139,933***	***148,795***	***157,679***	***158,351***	***155,739***	***150,296***	***145,463***	***101,480***
Eastern Paraíba	**45,306**	**47,834**	**61,771**	**65,946**	**65,820**	**62,497**	**60,775**	**44,434**
Cantagallo*	16,305	17,562	19,864	21,502	21,621	19,140	18,274	12,232
Nova Friburgo	6,684	4,576	4,964	4,957	4,937	5,289	5,500	6,094
Sta. Maria Magdalena	7,502	10,003	12,307	13,010	12,891	12,499	11,939	8,623
Sao Fidélis	14,815	15,693	17,528	19,078	18,994	18,427	18,041	12,424
Sapucaia	--	--	7,108	7,399	7,377	7,142	7,021	5,061
Western Paraíba	**94,627**	**100,961**	**95,908**	**92,405**	**89,919**	**87,799**	**84,688**	**57,046**
Barra Mansa	10,944	11,397	11,226	11,441	11,246	11,036	10,784	7,926
Paraíba do Sul	17,107	18,801	15,945	15,816	15,369	14,386	13,990	10,095
Pirahy	13,475	13,386	11,686	11,629	11,360	11,054	10,780	6,038
Rezende	9,437	9,185	9,124	8,489	8,240	8,209	7,880	4,899
Valença	23,496	27,099	26,279	25,965	25,344	24,223	23,731	17,607
Vassouras	20,168	21,093	21,648	19,065	18,630	18,891	17,523	10,481
Other Counties	***152,704***	***152,735***	***131,560***	***117,496***	***113,092***	***107,942***	***105,443***	***60,941***
TOTAL (Rio de Janeiro)	***292,637***	***301,170***	***289,239***	***275,847***	***268,831***	***258,238***	***250,906***	***162,421***

NOTES: *It includes the Município de Santo Antonio de Pádua after 1884;
** It includes the Município of Carmo after 1883

SOURCE: a) *Recenseamento* 1872; b) Matrícula of 1872/73 in *Relatório da Província do Rio de Janeiro*, 13 December 1881; c, d, e, f, and g) updated results of the 1872/73 Matrícula; c)was published in the *Relatório do Ministério da Agricultura*, 1881, vol. I; d, f and g) were published in the *Relatórios da Província do Rio de Janeiro*, respectively, in 13 December 1881, 8 August 1885, and 8 August 1886; e) was published in Laerne, *Brazil and Java*, p. 120-121; h) is the new *Matrícula* of 1886/87, published in the *Relatório da Província do Rio de Janeiro*, 12 September 1887.

The Eastern (lower) Paraíba Valley section was at its height during the 1860s to the 1880s. It was expanding North towards the Province of Espírito Santo, and West toward Minas Gerais[169]. It can be called the "new" coffee region of the province.

Using the data presented in Table 6.4, Table 6.5 presents the rates of change in the slave population of the coffee producing areas of Rio de Janeiro between 1872/73 and 1881 and 1886.

169 For a description of the coffee counties of the Province of Rio de Janeiro, see Alberto B. Lamego, *O Homem e a Serra* (Rio de Janeiro: Edição da Divisão Cultural do IBGE, 1963).

TABLE 6.5

Rates of Growth of the Slave Population in the Coffee Producing Counties of Rio de Janeiro (percentage rates)

Province of Rio de Janeiro	1872,73/1881	1881/1886
Total of Coffee Producing Counties	+ 0.76 %	-11.12 %
Eastern Paraíba	+ 3.78 %	-9.87 %
Western Paraíba	-1.04 %	-12.06 %
Other Counties(non coffee producers)	-3.01 %	-16.51 %
TOTAL OF PROVINCE	-1.03 %	-13.24 %

SOURCE: Table 6.3

We observe that the slave population of the non-coffee counties was declining throughout the whole period, but the slave population in the Western Paraíba increases until 1878, declining afterwards, while in the Eastern Paraíba it increases up to the mid of 1881, but also declines afterwards. In relative terms, the share of the slave population of the major coffee producing counties in the total slave population of the Province increases continuously, from 49.4 percent in 1872/73 to 62.5 percent in 1886.

So far, then, we have observed that the slave population, in relative terms (as a proportion of the total), was concentrating in both the coffee region and the coffee producing counties, during the whole period 1871 to 1888.

In absolute terms (in total numbers), however, we observe that the number of slaves in the coffee producing counties, which is a less aggregated and hence a more representative unit for slavery in coffee plantations, was increasing until the years of 1881 to 1883, but declining afterwards.

This can be seen indirectly by the evolution of coffee exports during the period 1882 to 1885, in which there was a relative stagnation, in an otherwise upward trend for the whole century (as shown in Figure 2.2)[170].

170 Coffee exports are a good proxy for coffee production. Looking at the exports between 1882 to 1895, the rate of growth was small, 0.68 percent per annum (log Ec : 8, 57672 + 0.0680 t, r square: 0.025), when compared with the other sub-periods (see Chapter 2). Since there was a lag of four to five years between coffee planting and the full blossoming of their fruits, the relative stagnation between 1882 and 1895 can be traced back to a relative stagnation in new coffee plantings in the planting seasons of the 1880s.

Obstacles to the Internal Trade of Slaves[171]

One of the causes for the decline of slave population in the coffee counties in the 1880s can be attributed to the provincial laws of 1881 and 1882. The laws enacted an import duty for slaves sold to the coffee producing provinces, fixed at 1,500$000 (Rio de Janeiro), 2,000$000 (São Paulo) and 2,000$000 (Minas Gerais).

The import duties charged on the import of slaves coming from the other provinces rendered practically impossible the traffic of slaves between the Northern and Southern provinces. The amount of taxes charged was equivalent, and even higher at this time, to the price of a male prime field hand slave. Over and above this, the slave trade within the provinces was restricted by new taxes on the sale and transport of slaves.

Ironically, the very success of the concentration of slaves in the coffee region, which became more evident in the 1870s (after the Free Womb Law), made coffee planters afraid that the draining (and a selective one, as we will see below) of slaves from the other provinces would make those provinces - since they would have progressively less to loose - more receptive to abolitionist proposals.

Modern labor markets have a problem with the mobility of laborers. Economic mobility, in general, tend to be tied to place. One of the advantages of slave labor is that they provided planters with more mobility of slave labor. We would expect, therefore, planters to pose a fierce resistance to government measures to curtail that mobility.

Thus the fear of a loss of political support from the other provinces, once they would lost all their valuable slaves, can help to explain the small resistance of coffee planters to the import duties enacted by their provinces.

According to the South American Journal,

> "the taxation···had been so raised as to become prohibitive···due to the desire to arrest that tendency of late years to localize slavery exclusively in the Southern provinces, which might drawn on them a tremendous economic and social catastrophe"[172] .

171 See Graham, Douglas H. and Sergio B. de Holanda Filho. *Migration, Regional and Urban Growth and Development in Brazil: A Selective Analysis of the Historical Record, 1872-1970. Vol. I.* (São Paulo: Instituto de Pesquisas Econômicas da Universidade de São Paulo, 1971); Herbert S. Klein, "The Internal Slave Trade in Nineteenth Century Brazil: A Study of Slave Importations into Rio de Janeiro in 1852," *Hispanic American Historical Review*, LI, no. 4 (November 1971), pp. 567-85.

172 The South American Journal and River Plate Mail, 6 January 1888, p.2.

Although the set of taxes aiming to stop or decrease the trade of slaves was important to explain the leveling off and then the decline in the absolute number of slaves in the coffee countries, we should not exaggerate the importance of supply factors, since demand considerations also played an important role in the 1880s.

Given a rising demand for slave labor services during the 1880s, those taxes could be circumvented in a number of ways, and also the existing rental market could receive adaptations and become large and more developed, since there were no additional taxes for slaves for hire[173].

In addition, there was one important exception recognized by the provincial law on the import duty on interprovincial slave trade, which potential for tax evasion could not escape the attention of coffee planters.

In the case of slaves already owned at the date of the law, and brought from a plantation outside the province, to another agricultural unit owned by the same planter, he would be tax exempted. This provision, however, only contributed to stress one aspect that was in the essence of coffee cultivation during this period, i.e., the continuous expansion and transfer to new land belonging to the coffee planters and/or their offspring (and with them their slaves).

In any case, with an effective policy of freezing the slave labor force at the county level, and since, as suggested by Tables 6.3 and 6.5, there was different rates of growth for the demand of slaves (e.g., in the coffee counties of the Western São Paulo in comparison with the North São Paulo), after a while this would inevitably produce a disparity of the rate of change in prices, and, after an interval of time, in the absolute value of slave prices. Thus, this disparity, in that scenario, would be increasing through time, becoming more evident in mid 1880s.

This study, however, did not uncover one single mention of the trends commented above in the contemporary literature. All the indications we found show that there was a high degree of arbitrage in the slave prices of the different regions of the provinces of Sao Paulo and Rio de Janeiro during the 1880s.

Intra-regional Slave Trade

The set of taxes, and in particular the import duties, were more successful in stopping the trade of slaves from the non-coffee region to the coffee region, but did not totally curtail the intra- regional slave trade.

173 The Law, perhaps, had this hidden objective. The property would remain in the non coffee producing provinces, but the service of the slaves – what really mattered for the planters – would be used in Southern Brazil.

Table 6.6 is based on the number of slaves transacted, according to the tax records, in the major coffee producing counties of the Province of Rio de Janeiro[174].

The number of slaves transacted each year was obtained by dividing for each county and each year, the total revenue obtained by the head tax or taxes (numerator) and the nominal value of the specific tax or taxes (denominator). The head tax (*meia siza*) was charged for the transfer of property of the slave (purchase and sale, with *averbação*).

It is interesting to examine this table in the two decades of the period. From 1870 to 1880, before the import duties on interprovincial transfer of slaves, and before the "abolitionist pressure", those results confirm the evidence shown in Tables 6.2 and 6.3, that slaves were concentrating in the Eastern Paraíba section.

From 1870 to 1880, the number of slaves transacted in the Eastern Paraíba section increased at the rate of growth of 15.6 percent per annum[175], in the Western Paraíba at 7.7 per annum[176], in the aggregate of coffee counties at 11.3 percent per annum[177], in the other counties at 3.7 percent per annum[178], and in the total province at 8.5 percent per annum[179] .

After 1880, the number of transactions declined substantially, but did not disappear. Even in 1888, there were 466 slaves transacted in the Rio de Janeiro province.

174 The provincial import duty is not included here, since, according to the official records, there was not a single case of payment of the tax. Thus, officially, there was a complete stop in the interprovincial trade of slaves, although the *Relatorios* complained, many times, that slaves from the *Municípo Neutro* were being transferred in large numbers to the Province of Rio de Janeiro It was mentioned that the planters used a device of having a legal domicile in the city of Rio de Janeiro, buying slaves there, and transferring them to the adjacent province. See the *Relatorios da Directoria de Fazenda da Província do Rio de Janeiro*, yearly issues, 1871 to 1889.

175 Log St = 7.12646 + 0.15595 t Rsquare: .85 St : Number of Slaves Transacted

176 Log St = 7.98878 + 0.07728 t Rsquare: .68 St : Number of Slaves Transacted

177 Log St = 8.19569 + 0.11271 t Rsquare: .82 St : Number of Slaves Transacted

178 Log St = 8.03595 + 0.03684 t Rsquare: .37 St : Number of Slaves Transacted

179 Log St = 8.80989 + 0.08473 t Rsquare: .86 St : Number of Slaves Transacted

TABLE 6.6

Number of Slaves Transacted, According to the Tax Records, in the Major Coffee Producing Counties of the Province of Rio de Janeiro, 1870-1888

YEARS	*Coffee*	*Producing*	*Counties*		
	Eastern Paraíba*	Western Paraíba**	Total	Aggregate of other Counties	Total of the Province of Rio de Janeiro
1870[a]	1,324	2,564	3,888	3,613	7,501
71[a]	1,583	2,212	3,798	3,035	6,833
72[b]	1,796	2,636	4,432	3,601	8,033
73[b]	2,320	3,752	6,072	3,806	9,878
74[b]	3,302	4,783	8,085	3,618	11,703
1875[b,c]	2,493	4,380	6,873	4,103	10,976
76[b,d]	6,123	5,408	11,531	3,509	15,040
77[b,d]	4,983	4,005	8,988	3,665	12,653
78[b,d]	5,533	5,008	10,541	3,880	14,421
79[b,d]	4,963	4,549	9,512	3,708	13,220
1880[b,d]	5,437	5,106	10,543	6,762	17,305
81[b,e]	2,348	2,075	4,423	3,563	7,986
82[f]	1,185	1,374	2,559	2,291	4,850
83[f]	846	1,606	2,452	2,216	4,668
84[f]	846	1,330	2,176	1,502	3,678
1885[f]	1,022	900	1,922	1,265	3,187
86[g]	959	1,437	2,396	2,002	4,938
87[g]	865	1,572	2,437	2,005	4,432
1888[g]	78	179	257	209	466

NOTES: * Eastern (Lower) Paraíba Valley Counties: Cantagallo, Nova Friburgo, Santa Maria Magdalena , São Fidélis, Sapucaia (created in 1875);

** Western (Upper) Paraíba Valley Counties: Barra Mansa, Paraíba do Sul, Pirahy, Rezende, Valença, Vassouras.

a: *imposto de 25$000 na compra e venda de escravos*

b: *imposto de 20$000 na compra e venda de escravos*

c: *imposto de 100$000 sobre a averbação de escravos*

d: *imposto de 20$000 sobre a averbação de escravos*

e: *imposto de 30$000 sobre a averbação de cada escravo vendido de um para outro município da Província*

f: *imposto de 50$000 de compra e venda de escravos incidindo sobre os escravos existentes na Província*

g: i*mposto de 20$000 na compra e venda de escravos existentes na Província*

SOURCES: Adapted from Tables entitled " *Receita da Província do Rio de Janeiro arrecadada pela Directoria de Fazenda e mais Repartições que lhe são Subordinadas*", in *Relatorio da Directoria de Fazenda da Província do Rio de Janeiro*, yearly issues, 1871-1889.

Between the years 1880 and 1888, the number of slaves transacted in the Eastern Paraíba section declined rapidly, at the rate of (-33.7 percent) per annum[180], in the Western Paraíba at (-24.5 percent) per annum[181], in the aggregate of coffee counties at (-28.4 percent) per annum[182], in the other counties at (-27.4 percent) per annum[183], and in the total province at (-28.0 percent) per annum[184].

180 Log St = 8.55454 - 0.33678 t Rsquare: .67 St : Number of Slaves Transacted
181 Log St = 8.40447 - 0.24542 t Rsquare: .58 St : Number of Slaves Transacted
182 Log St = 9.16113 - 0.28366 t Rsquare: .63 St : Number of Slaves Transacted
183 Log St = 8.86546 - 0.27436 t Rsquare: .63 St : Number of Slaves Transacted
184 Log St = 9.72053 - 0.27992 t Rsquare: .64 St : Number of Slaves Transacted

Slave Occupation Classified by Regions and Provinces and the Internal Slave Trade

Table 6.7 shows the slave occupations in each of the coffee producing provinces and in the aggregate of the other provinces in Brazil in 1872. Although most slaves were listed as farm workers, reflecting the preponderance of agriculture in the economic activities in Brazil, they were also present in a variety of occupations.

TABLE 6.7

Slave Occupations in the Coffee Producing Provinces, the Aggregate for the other Provinces of Brazil, and Brazil, 1872

	Coffee	Prod	ucing	Pro	vin	Ces		
Occupations	**São Paulo**	**Município Neutro**	**Rio de Janeiro**	**Minas Gerais**	**Espírito Santo**	**Total**	**Other Provinces**	**Brazil**
Artists(mechanics)	37	498	275	...	1	811	1,047	1,858
Sailors	270	527	108	...	34	939	849	1,788
Fishermen	92	174	104	...	12	382	880	1,262
Seamstresses	3,337	1,384	6,878	8,160	219	19,978	20,788	40,76
Miners & quarrymen	66	65	73	12	...	216	553	769
Metal workers	459	276	43	7	100	885	190	1,075
Carpenters	1,140	690	235	88	180	2,333	3,266	5,599
Textile workers	1,286	......	143	8,031	224	9,684	3,512	13,196
Construction workers	751	596	49	27	51	1,474	2,539	4,013
Leather workers	256	54	...	8	4	322	241	563
Dyers	21	...	...	...	...	21	23	44
Clothiers	193	232	29	5	24	483	896	1,379
Hat makers	60	34	1	...	...	95	171	266
Shoemakers	302	188	76	32	22	620	1,543	2,163
Farm workers	84,620	5,695	141,575	278,767	12,917	523,574	284,827	808,401
Servants & day labo*rers	8,720	5,785	25,670	14,744	241	55,160	39,328	94,488
Domestic service	21,169	22,842	23,136	14,356	3,252	88,755	86,622	175,377
Without profession**	33,013	9,899	90,242	44,317	4,709	182,180	175,619	357,799
TOTAL	**156,792**	**48,939**	**292,637**	**370,459**	**22,659**	**887,912**	**622,894**	**1,510,806**

NOTES: * It includes the slaves who were hideout; ** Since the particular tables from the Census, from where Table 6.6 was adapted, included all the slave population, children are presumably listed under the heading of "without profession". The only exception seems to be Minas Gerais, were part of the children are presumably listed as " farm workers".

SOURCE: *Recenseamento* 1872

To assess the change through time of the slave labor force in coffee plantations, it is very important to examine the aspects related to some economic characteristics of the labor force.

One interesting aspect is to compare the "non-farm workers" with the "farm workers" in the Coffee producing regions and the other, non-coffee producing region.

Selective Concentration of Slaves in the Coffee Region

Table 6.8 shows evidence of the selective concentration process in the coffee producing provinces, the aggregate for the rest of Brazil, and Brazil, according to the results of the 1872 Census, the 1872/73 *Matrícula* and the 1886/87 *Matrícula*. It examines the concentration of slaves with the following characteristics: male, farm worker and prime age (defined in this Table as from 14-15 to 40 years old).

By comparing Table 6.8 with Table 6.1, we observe that:

(1) 1872

Proportion to total (Brazil) slaves in coffee region	59.0%
Proportion of male (Brazil) slaves in coffee region	60.5%
Proportion of farm workers (Brazil) slaves in coffee region	64.8%
Proportion of prime age (Brazil) slaves in coffee region	60.0%

(2) 1872/1873

Proportion of total (Brazil) slaves in coffee region	56.9%
Proportion of male (Brazil) slaves in coffee region	56.4%
Proportion of farm workers (Brazil) slaves in coffee region	59.5%
Proportion of prime age (Brazil) slaves in coffee region	54.0%

(3) 1886/1887

Proportion of total (Brazil) slaves in coffee region	66.7%
Proportion of male (Brazil) slaves in coffee region	69.2%
Proportion of farm workers (Brazil) slaves in coffee region	67.7%
Proportion of prime age (Brazil) slaves in coffee region	65.4%

TABLE 6.8
Number of Farm-worker Slaves, Male Slaves and Prime Age Slaves in the the Provinces of the Coffee Region, the Aggregate of Other Provinces and Brazil, According to the 1872 Census and the Slave *Matrículas* of 1872/1873 and 1886/1887

PROVINCES	1872 Census	1872 Census	1872 Census	1872/73 Matrícula	1872/73 Matrícula*	1872/73 Matrícula*	1886/87 Matrícula	1886/87 Matrícula	1886/87 Matrícula
	Farm Workers	Male	Prime Age[a]	Farm Workers	Male	Prime Age[b]	Farm Workers[d]	Male	Prime Age[c]
Coffee Region	**523,574**	**486,613**	**413,790**	**354,623**	**419,885**	**246,866**	**413,517**	**265,968**	**347,678**
Espírito Santo	12,917	11,859	10,130	15,895	12,226	9,956	11,957	7,112	10,233
Rio de Janeiro	141,575	162,394	123,731	204,009	168,054	132,167	149,815	87,767	113,053
Município Neutro	5,695	24,886	24,633	6,914	24,402	23,524	2,220	3,653	5,514
São Paulo	84,620	88,040	74,184	127,805	95,916	81,219	96,782	62,688	78,648
Minas Gerais	278,767	199,434	181,112	...	...	...	153,743	104,748	140,230
Other Provinces	**284,827**	**317,721**	**276,204**	**241,229**	**323,942**	**209,956**	**197,678**	**118,647**	**184,222**
BRAZIL	**808,401**	**804,334**	**689,994**	**595,852**	**743,827**	**456,822**	**611,195**	**384,615**	**531,900**

NOTES: The report from the *Directoria Geral de Estatística,* from where these figures were obtained, did not publish the complete results of the *Matrícula* for those aspects. a: slaves aged 16 to 40; b: slaves aged 14 to 40; c: slaves aged from approximately 15 to 40; d: farm workers over 15 years

SOURCES: 1872 Census: *Recenseamento 1872*; 1872/1873 *Matrícula* : Brazil, Relatório do Ministério dos Negócios do Império, 1875, *Anexo G, "Quadro Estatístico dos Escravos Matriculados no Império"*; 1886/1887 *Matrícula: Brazil, Relatório do Ministério da Agricultura*, 14 May 1888, p. 24.

Thus, we can conclude that, since slaves which were males, prime age and farm workers were the more valuable workers in coffee plantations, that the "quality" of the slave labor force in the coffee provinces was slightly higher than in the rest of the country, and this edge was maintained, if not increased, from 1872 to 1886/1887.

This selective concentration process of the slave labor force can be better observed with data at the county level. Table 6.9 presents data at the county (*município*) level in the Province of Rio de Janeiro in 1881 (using the updated results for this year of the 1872/1873 *Matrícula*), according to the major coffee producing counties and the aggregate for the other counties.

Table 6.9 can be better seen by transforming it in percentage ratios. This is done in Table 6.10, where, looking at the columns, each entry is the ratio (in percentages) of the population with the characteristic (e.g., male) named at the head of the column, over the total population in the regional unit (e.g., Eastern *Paraíba*).

TABLE 6.9

Number of Male Slaves, Farm worker Slaves* and Slaves aged 21 to 60 Years in the Major Coffee Producing Counties, the Aggregate of other Counties and the Province of Rio de Janeiro (total), in 1881**

COUNTIES	FARM WORKERS	MALES	Aged 21 to 60	Male Farm workers 21 to 60	Total Slave Population
Major Coffee Counties	**83,273**	**87,414**	**87,571**	**45,662**	**158,351**
Eastern Paraíba	36,213	35,283	38,378	19,710	65,846
Cantagallo	8,673	10,928	11,393	4,860	21,502
Nova Friburgo	1,914	2,765	2,449	1,229	4,957
Santa Maria Magdalena	6,758	7,527	6,614	4,086	13,010
São Fidelis	14,967	9,984	14,111	7,327	19,078
Sapucaia	3,901	4,079	3,811	2,208	7,399
Western Paraíba	47,060	52,131	49,193	25,952	92,405
Barra Mansa	4,321	6,308	5,016	2,365	11,441
Paraíba do Sul	8,540	9,119	8,573	5,069	15,816
Pirahy	6,910	6,580	6,870	3,962	11,629
Rezende	5,796	4,780	5,916	3,199	8,489
Valença	13,291	14,804	12,220	6,298	25,965
Vassouras	8,202	10,540	10,598	5,059	19,065
Other Counties	**55,766**	**62,529**	**62,557**	**29,807**	**117,496**
RIO DE JANEIRO	**139,039**	**149,943**	**150,128**	**75,469**	**275,847**

NOTES: * Farm workers over 21 years old

** Updated results for 1881of the 1872/73 *Matrícula*

SOURCE: Adapted from tables entitled "*Quadro Demonstrativo do Movimento da População Escrava da Província do Rio de Janeiro, de 30 de Setembro de 1875, até 30 de Junho de 1881"*, in *Relatório da Província do Rio de Janeiro,* 13 December 1881

Comparing the "new" coffee region of the Province (Eastern *Paraíba* Valley) with the aggregate of the non-coffee counties, we can see that the former had a higher proportion of their slaves as farm workers over 21 years old, males and between the ages of 21 to 60. As a result, the proportion of slaves having simultaneously those three characteristics (i.e., the male farm worker slaves between the ages 21 and 60) were 29.9 percent in the Eastern *Paraíba*, while this same proportion was 25.4 percent for the aggregate of the non-coffee counties.

The "old" coffee region, the Western *Paraíba*, with the exception of the proportion of males, had smaller ratios for farm workers and 21-60 years old slaves than the " new" coffee region, but higher than the aggregate of the other counties of the Province.

TABLE 6.10

Percentage Ratios of the Male Slaves, Farm Worker Slaves and Slaves Aged 21 to 60 Years in the Slave Population of the Major Coffee Producing Counties and the Aggregate of other Counties of the Province of Rio de Janeiro, 1881

Regions of the Province	Farm Workers*	Male	Aged 21 to 60	Male, Farm Worker, and Aged 21 to 60
Major Coffee Producing Counties	**52.6**	**55.2**	**55.3**	**28.8**
Eastern Paraiba Valley	54.9	53.5	58.2	29.9
Western Paraiba valley	50.9	56.4	53.2	28.1
Aggregate of Other Counties	**47.5**	**53.2**	**53.2**	**25.4**
Total of the Province of Rio de Janeiro	***50.4***	***54.4***	***54.4***	***27.4***

NOTES: * Farm workers over 21 years old

SOURCE: Table 6.9

Decline of the Absolute Number of Slaves

Summing up the evidence presented about the course of slave population, we see that in the 1870s the process of concentration –and a selective concentration – was well under way in the coffee region. In the 1880s, however, although it continued in relative terms, in absolute terms the number of slaves began to decline.

This was not caused by any inadequacy of the stock of slaves of the country during this period. The number of slaves in coffee plantations in 1884 was only one-fifth of the total number of slaves in the country[185].

Since the number of slaves in coffee plantations was dependent on the total stock of slaves in the country and in the excess demand function for slaves in coffee plantations, it is clear that demand considerations played a very important role. Thus the "abolitionist pressure", as we will see in Chapter 10, was fundamental for determining the course of slave population in coffee plantations.

By acting both in the demand for slaves – as suggested by the behavior of slave prices – and in the supply of slaves – like the enactment of the coffee provinces' "import" duty laws -, the "abolitionist pressure" was successful in curtailing and then stopping (and reversing) the growth of the number of slaves in the coffee counties.

Although we do not have the data on the evolution of the aggregate number of slaves directly employed in coffee plantations, the data on slave population at the coffee producing counties level indicates that it was probably stable or declining in the 1880s.

185 Laerne, *Brazil and Java*, p. 368.

Coffee production, however, was able to continue to increase in the 1880s – although the period was one of relative stagnation, as we saw in Chapter 2- with a dwindling stock of slaves. This is possible due to the increase in productivity caused by the technological advances in the coffee processing activities inside the coffee plantations, the regional shift in production to the better (more fertile) and new soils (principally in the *Santos* region), an increase in specialization of labor in coffee cultivation (by a decrease in coffee plantations' reliance on self- sufficiency, and the improvements in transportation, which freed part of the plantations' labor force from transport to field work), and, regarding the coffee cultivation itself, by a relative abandonment of the planting of new trees (which Laerne attributes to the expectation of abolition of slavery by coffee planters[186] , and therefore another consequence of the "abolitionist pressure"), and a concentration on the care of the coffee trees already planted (that we saw in Chapter 3 to be almost one million trees, of which almost 50 percent had been planted in the 1870s).

Demographic Projections of the Slave Population: A Counterfactual Exercise

The final demographic issue we want to cover in this Chapter are the projections of the total slave population.

A topic of considerable importance during the final two decades before Abolition was the prediction of how long the stock of slaves could last, given that the Free Womb Law and the Sexagenarian Law were enacted and enforced[187] , and in the assumption that the rate of manumission would be constant at the levels prevailing before the "abolitionist pressure" of the 1880s[188] .

Thus we can state it as the following counterfactual hypothesis: assuming the existence of the 1871 and 1885 Laws, but not of course the 1888 Final Abolition Law, and given the historical trends of manumission (i.e., before the extraordinary change in those rates brought about by the "abolitionist pressure" of the 1880s), what would be the slave population in the future (i.e., in 1892 and 1902)? How adequate would be this

186 There are numerous passages in his Report about this (e.g., pp. 272-73, 286, 339-40, 345) , from which the following remark is typical:" Four or five years ago, even, the plantations were constantly being extended, so that there were no hands to spare; now there is very little more planting done than is necessary to keep up the existing *cafesaes*". Laerne, *Brazil and Java*, p. 286.

187 See our discussion of the *Abolicionista* and *Emancipacionista* positions, in Chapters 10 and 11.

188 See Mendonça, Josefi Maria Nunes. Entre a Mão e *os Anéis: a Lei dos Sexagenários e os Caminhos da Abolição no Brasil* (Campinas; UNICAMP, 1999).

projected stock of slaves to supply coffee plantations (assuming that the coffee region import duty laws on the interprovincial trade of slaves were not passed or enforced) ?

TABLE 6.11

Projections of the Male, Female and Total Slave population, by Ten Year Cohorts, 1892 and 1902

A) MALE Slave Population

Age Groups	1872*	1882	1892	1902
0-10	195,906			
11-20	174,960			
21-30	223,606	150,164	142,835	
31-40	104,348	177,404	118,988	113,676
41-50	33,989	76,246	129,972	87,024
51-60	26,793	21,669	48,694	82,978
61-70	21,004			
71+	22,476			
Total	803,032	425,483	440,489	283,678

B) FEMALE Slave Population

Age Groups	1872*	1882	1892	1902
0-10	170,033			
11-20	145,350			
21-30	196,137	123,131	150,556	
31-40	97,540	157,962	99,075	97,342
41-50	31,287	75,338	121,993	76,450
51-60	24,371	22,046	53,354	83,360
61-70	19,304			
71+	20,206			
Total	704,228	378,477	394,978	260,152

C) TOTAL Slave Population, 21 to 60

Age Groups	1872*	1882	1892	1902
21-30	419,743	273,295	263,391	
31-40	201,888	335,366	218,063	211,018
41-50	65,276	151,584	251,965	163,474
51-60	51,164	43,715	102,048	169,338
Total	738,071	803,960	835,467	543,830

NOTES: * Not projections, but using figures from the 1872 Census

To perform the counterfactual exercise, we will use our estimates of slave longevity, presented in Chapter 7, the data on manumissions during the 1870s and 1880s[189], and the slave population by age cohorts according with the 1872 Census. Another outcome of the exercise will

189 There are no systematic records of the number of runaway slaves. However, before the mass flights of the 1880s, caused by the Abolitionist Movement, slave flights from coffee plantations were relatively unimportant.

be to test the usefulness of our slave longevity estimates, by using the data on the actual manumissions taken place between the Census and the 1886/87 *Matrícula*, and the results of this *Matrícula*, and then to compare it with the projection of the slave population to 1886/87.

Table 6.11 presents the projections of the slave population, according to male (Part A), female (Part B) and total slave population aged 21 to 60, for 1892 and 1902. Part C of the Table presents the projections of the total (male and female) slave population, between the ages of 21 and 60 years, for 1882, 1892 and 1902. We used as the basis for the projections the number of slaves and the age distribution presented in the 1872 Census.

The disaggregated results for one-year and five-year age cohorts, showed in the Census, were used whenever possible. The projections were made separately for the male and female slaves. For all age groups we begun by using, when necessary, linear interpolation to obtain the number of slaves in each age cohort. We centered it at the mid of the year, and then applied the coefficients of the probability of survival ten years after. Those coefficients are the average between the upper and lower bound estimates of the probability of slave survival in a ten year period, based on Tables A.9 and A.10 of Appendix A. Finally, the projected slave population in 1882, 1892, and 1902 were aggregated in ten-year cohorts.

Estimation of the Number of Manumissions

The slave population projections presented in Table 6.11 do not take into account the number of manumissions in the period. This, as we will see below, will be more than offset by the inclusion of i*ngenuos*.

The 1870s, with respect to the manumission trends being followed, were not typical of the historical trends preceding it, by the relatively high number of such occurrences. However, it was a far cry more representative of the history of Brazilian slavery than the manumission trends observed in the 1880s[190].

In addition to the traditional factors responsible for manumissions in Brazil[191], several other factors contributed to that. Beginning just after the passage of the Free Womb Law, some Catholic Orders who were

190 See Bertin, Enmidelce. *Alforrias na São Paulo do século XIX: Liberdade e Dominação* (São Paulo: Humanitas FFFCH/USP, 2004); Eisenberg, Peter L. "Ficando livre: as alforrias em Campinas no século XIX," *Estudos Econômicos*, 17, no.2 (1987), pp. 175-216; Lacerda, Antônio Henrique Duarte, *Os padrões das Alforrias em um município mineiro em expansão: Juiz de Fora, Zona da Mata de Minas Gerais, 1844-88* (São Paulo: Annablume, 2006).

191 Carl N. Degler, Neither Black nor White: *Slavery and Race Relations in Brazil and the United States*. (New York: The MacMillan Company, 1971), pp. 39-47.

important owners of slaves, began to liberate them. The Benedictine Order (over 1,700 slaves) and Carmelite Monks were among the first important institutions to liberate their slaves[192]. The Government of the Empire – another important slave owner – followed the same policy with respect to their (almost 3,000 slaves) agricultural slaves[193]. In the late 1860s and early 1870s many slaves – about 20,000, including the members of their families - , which served in the Army during the Paraguayan War as surrogates for drafted slave owners or their relatives, were also freed[194] .

The 1871 Free Womb Law had a provision (Art. III) which created an Emancipation Fund (Fundo de Emancipação). The sources of money for the Fund were based in taxes on slaves, lotteries, fines and other resources. The Fund aimed to purchase slaves from their owners, paying market prices, and then freed them[195].

From the date of the Free Womb law (28 September 1871) until 31 December 1878, official statistics show that 21,342 slaves had been freed. Out of this total, 24.5 percent were manumitted through the Emancipation Fund, and 75.5 percent gratuitously by their masters[196]. From this last date until 30 June 1882 an additional 66,363 slaves were freed (40 percent paid by the Fund and other sources and 60 percent gratuitously)[197].

After the years of 1882 and 1883, the number of manumission rise substantially. Between the first of July 1882 and 30 June 1885, 69,951 slaves were manumitted[198], and with the Sexagenarian Law of 28 September 1885 an additional 40,858 slaves were manumitted[199].

When the results of the 1886/87 *Matrícula* were revealed, the difference between the slave population in 30 September 1886 (mid period of the *Matrícula*, done between 30 March 1886 and 30 March 1887) and the last update of the 1872/73 *Matrícula* (done in 30 June 1887), was 409,809 slaves[200].

192 The Catholic Church, as a whole, was an important slave owner. This role was widespread, from small churches to monasteries. See Gouveia, *História da Escravidão*, p. 299; Conrad, *The Destruction of Brazilian Slavery*, p. 112; Henrique de Beaurepaire Rohan, "*O Futuro da Grande Lavoura e da Grande Propriedade no Brazil*", in *Congresso Agrícola: Colecção de Documentos*. (Rio de Janeiro: Typographia Nacional, 1878), p. 248.

193 Conrad, *The Destruction of Brazilian Slavery*, pp. 72-73; Rohan, "O Futuro da Grande Lavoura e da Grande Propriedade no Brazil", p. 248.

194 Conrad, *The Destruction of Brazilian Slavery*, p.76.

195 See Dauwe, Fabiano. "Os múltiplos sentidos da liberdade: A viabilidade e as expectativas da libertação pelo fundo de emancipação de escravos," *II Encontro Escravidão e Liberdade no Brasil Meridional (2003)*; Motta, José Flávio. "Derradeiras Transações: O Comércio de escravos nos Anos de 1880 (Areias, Piracicaba e Casa Branca, Província de São Paulo)," in *Anais do XII Encontro Nacional de Economia Política*. (São Paulo: 2007).

196 *Relatório do Ministério da Agricultura, 1880*, p. 44.

197 *Relatório do Ministério da Agricultura, 1883*, p. 12.

198 *Relatório do Ministério da Agricultura, 1886*, p.34.

199 Ibid, p. 31.

200 *Relatório do Ministério da Agricultura, 1888*, p.25.

A substantial fraction of this figure, however, were not manumissions, but an undercount of the slave deaths, accumulated in the successive updating of the 1872/73 *Matrícula*, only discovered by the second *Matrícula*, done in 1886/87.

Since the actual manumission figures between 30 June 1885 and 30 September 1886 (with the exception of the slaves older than 60 year freed by the Sexagenarian Law) were not published, we estimate that for this 1.25 year period the number of manumissions, in an annual basis, was the similar to the one observed between 30 June 1882 and 30 June 1885 (23,317 yearly), what gave us 29,146 manumissions for this period. We add to his figure an additional 59,045 manumissions of *sexagenários*[201].

Summing up these figures, the number of manumissions, from 28 September 1871 to 30 September 1886, was 286,695. From this date to 13 May 1888 (Final Abolition Law, the *Lei Áurea*), an additional 123,419 slaves were manumitted[202]. When Final abolition was decreed in that day, there remained around 600,000 slaves in the Empire of Brazil[203].

Looking at the period 28 September 1871 to 30 June 1882, the total number of manumissions was 87,695. This indicates for the 1870s an annual average of 7,972 slaves manumitted per annum.

Unfortunately, we do not have systematic evidence on the gender, age, skill, health and domicile of manumitted slaves. According to the literature available, there is a pattern for age and domicile, and perhaps for health and skill, rather than for sex. Hence, older and urban slaves, and perhaps the sick and the skilled (by self-purchase) were more likely of being manumitted[204].

Since we are interested in the rate of manumissions representative of the historical trends prevailing in the almost 400 hundred years of slavery in Brazil, we will use the average of the 1870s as this representative rate (79,720 per decade), although this is probably an overestimation, by the reasons presented before, of the traditional trends. In addition, in order to estimate the impact of manumissions on the age-cohorts 21-60, and since older slaves were more likely of being manumitted, we assume that the estimated cumulative impact of manumissions, at the end of the decade, on these particular age cohorts, would be reduced from 79,720 to 50,000 per decade[205] .

201 *Relatório do Ministério da Agricultura, 1887*, p.39.
202 *South American Journal*, 21 July 1888, p. 436.
203 Ibid, p. 436.
204 Degler, *Neither Black nor White*, p. 43-44; Viotti da Costa, *Da Senzala à Colonia*, pp. 263-264; Conrad, *The Destruction of Brazilian Slavery*, pp. 111-13.
205 The age cohort of importance here is the 11-50 one decade earlier, since this would become the 21-60 slaves at the end of the decade. The only examples of age breakdowns

We assume, then, only as an approximation of the order of magnitudes involved here, that the total of slaves between 21 and 60 years in 1892 would be smaller by 100,000 (or 12 percent) slaves, or equal to 735,467 slaves, rather than the 835,467 slaves shown in Table 6.11, Part C, because of manumissions. In 1902, since we are assuming a cumulative rate of 50,000 manumissions per decade, the number of projected slaves between 21 and 60 would be 150,000 smaller (or 28 percent), or equal to 393,830 rather than the 543,830 slaves projected.

The Potential Employment of *Ingenuos*

The draining in the projected stock of slaves in 1892 and 1902, caused by manumissions, could be more than offset by the employment of the *ingenuos* in the labor force.

As we said earlier, the Free Womb Law had a provision that the children of slave mothers would remain under the care and control of their mother's master. The Master was obliged to care and support those children until their eighth birthday, and then he had an option. He might choose between delivering them to the Government, and receive an indemnity of 600 *milréis* in government bonds (due thirty years after that date, paying an interest rate of 6 percent annually), or availing himself of the services of these children, without paying them, until they attained the age of twenty-one. Virtually all the masters chose to retain their *ingenuos* at their service.

The number of *ingenuos* in 30 June 1885 was 439,831 of which 219,354 were males and 220,760 females. Of this total, 269,354 were in the coffee region[206]. This suggests that, assuming an uniform distribution of age, that 167,000 were between the ages of 10 to 15[207]. Given the evolution of the *ingenuo* population, we could roughly estimate 334,000 *ingenuos*, between 10-20 years, for both 1892 and 1902.

Our estimates for the annual net earnings of slaves, by age and sex (Figure 9.4 of Chapter 9), suggest that children between 10 and 17 were earning between 20 percent to 50 percent of the peak age earnings of

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of manumissions we found are about the effects of the Emancipation Fund in the *Município Neutro*, quoted in Conrad, *The Destruction of Brazilian Slavery*, p. 112. He presents data on the age distribution of 1,567 persons freed, from which it can be estimated that 54.5 percent were under twenty-one, and 29.4 percent over forty. If we assume that half of the slaves under 21 were between 11-21, and half of the persons over forty were 41-50, the proportion of persons from 11 to 50 years manumitted, with respect to the total number of manumissions, would be 58.1 percent, which is the approximate figure (62.7 percent) we used, the differences arising because of the rounding up to 50,000.

206 *Relatório do Ministério da Agricultura, 1886*, p. 36.

207 In June of 1885 the *ingenuos* could at most have been 15 years old.

slaves, and from 50 percent to 75 percent for the *ingenuos* from 17 to under 21 years of age. Our estimates suggest that the *ingenuos* from 10 to under 21 years were earning at least 60 percent of the average earnings of slaves from 21 to 60 years.

This indicates that the 334,000 *ingenuos* would be, in terms of efficiency, equivalent to at least the 200,000 manumitted slaves that would have drained the 1892 and 1902 slave projections, which lead us to the conclusion that the *ingenuo* labor force could more than make up for those lost by the impact of manumissions.

Thus this very crude exercise suggests that, given the historical trends of manumission prevailing in the 1870s, and the utilization of *ingenuos* between ages 10-20 in the labor force, the slave population projections of Table 6.11 can give an order of approximation to answer the question of what would be the slave population in 1892 and 1902.

Adequacy of the Projected Stock of Slaves for Labor in Coffee Plantations in the 1890s

Since we have to estimate the total stock of slaves that would be available in Brazil, under the assumptions of the counter factual hypothesis, the next question arises, of how adequate would be this projected stock of slaves to supply coffee plantations, assuming not legal restrictions or prohibitive taxation on the interprovincial slave trade.

According to Laerne, the number of slaves directly engaged in coffee planting in the beginning of 1884 was[208]:

In the Rio Zone:	233,333
In the Santos Zone:	50,674

According with this estimative, the total number of slaves directly engaged in coffee planting was 284,007. Based on his method to obtain these estimates, a plantation slave represents an export production of 18 bags of coffee in the Rio Zone[209] , and of 26.7 bags in the Santos Zone[210].

The shipments of coffee from the Port of Santos in the commercial years of 1892/93 and 1902/03 were, respectively, 3,412,882 bags and 8,542,881 bags of 60 kilogrammes each[211]. From the Port of Rio de Janeiro, coffee exports in 1892/93 were 3,013,357 bags and in 1902/03 4,147,343 bags of 60 kg[212].

208 Laerne, *Brazil and Java*, p.368.
209 Laerne, *Brazil and Java*, p. 338.
210 Ibid, p. 354.
211 Wileman, *Brazilian Year Book*, 1908, p. 629.
212 Ibid, p. 629.

Hence, using Laerne's estimates of the average product of slaves, and assuming no change in the average product during the two decades[213] , these exports would require, in 1892, the following labor force:

Rio Zone	167,409 slaves
Santos Zone	127,823 slaves
Total	295,232 slaves

The volume of exports in 1902 would require the folowing number of slaves in the two Zones:

Rio Zone	230,408 slaves
Santos Zone	319,958 slaves
Total	550,366 slaves

Conclusions about the Slave Population Projections

By comparing those estimates with the projections of the slave population in Brazil in 1892 and 1902 (Table 6.11, part C), the following conclusions can be reached upon.

First, with the 1892 projected slave population 21-60 of 835,467 slaves for Brazil, it would be easily possible, by a relatively small volume of internal migrations, to concentrate 35 percent of this total in the coffee plantations, and produce the actual crop. As Laerne himself commented in 1884:

> "So long as the Emancipation Act of 1871 continues in force, there is not reason to expect – for the first 6 or 7 years at least – any important diminution in the Brazilian coffee crop. As to how long the slave system will continue to furnish sufficient hands for coffee planting – that is a question, which it is difficult at present to answer with any degree of certainty "[214].

Second, the projection of a total population of 543,830 slaves in 1902 shows that, while virtually still possible to match the requirements of 550,366 slaves for coffee plantations, it would be extremely difficult, by a host of social and political reasons, to mobilize and concentrate the entire slave labor force of the country in the coffee plantations[215] .

213 Which is reasonable, since no major progresses were made in technology of building of infra structure in the coffee region in the two decades being examined.

214 "Laerne, *Brazil and Java*, pp. 378-79.

215 This in the assumption, dismissed by the historical experience in a number of examples (e.g., Ybicaba coffee plantation) that slaves in coffee plantations could only be used in an all-or-nothing basis, that is, that mixed labor forces of slaves and immigrants or free laborers could not be used.

This exercise suggests, therefore, that given the spectacular expansion of coffee exports that actually took place in the 1890s, the stock of slaves that could be available (without the 1888 Final Abolition) would barely meet the demand for labor at the turn of the century. So in this sense the demographic arguments have an overwhelming force.

But, as we have shown in this Chapter, for the 1880s and early 1890s the stock of slaves was appropriate to meet the labor requirements of coffee plantations. To understand the decline of slavery in the coffee economy, that began after 1881 (see Chapter 10), demand factors and not supply factors of slaves played the major role.

Finally, we can test the usefulness of the slave longevity estimates by making a forecast of the slave population from August 1872 to September 1886. By using the same method employed in Table 6.11, we estimate the total number of slaves, aged 15 to 60, as being 993,525.

According with the Slave *Matrícula* of 1886/87 the slave population was 723,419. The number of manumissions from the Free Womb Law to the *Matrícula* we saw earlier to have been 286,695 persons. If we add up the two figures, the result obtained, 1,010,114, is only 1.6 percent higher than the projected slave population (993,525)[216]. This shows the usefulness of the estimates of slave longevity, since we used the average of the upper and lower bounds to make the point estimates presented here, and the test shows a value very close to the mid of the interval.

216 A les crude method could make a different calculation. Instead of using the manumission figures as we used above, it would in the first place to deduct the 99,903 persons over 60 of the 286,695 figure. In the second place, it would not add the balance, 186,392 manumitted, to the 1886/87 *Matrícula* figure, because this would implicitly assume that all slaves were manumitted at the date of the *Matrícula*. Instead, it would assume a median age of 40 years for the manumitted slaves, and that the average date of manumissions could be centered five years before (September 1881) the *Matrícula*. Applying the coefficients of slave longevity of 40 year old slaves for five years, the equivalent number of manumissions in September 1886 would be 220,000. Adding this to the 723,419, the result obtained, 943,419, would be only 5 percent smaller than the projected population. Other tests of the slave longevity estimates can be done, but the testing of the mid point of the interval suggests that they give satisfactory results, principally if we consider that we present interval estimates, and not point estimates, in Chapter 7.

PART IV

Slave longevity and cost of capital

In order to calculate the rate of return on the investment in slaves, presented in Chapter 9, and the viability of slavery, presented in Chapter 10, we need to estimate Life Tables for slaves, and the rate of return obtained by coffee planters in alternative investments in the financial market. Although these two chapters have this specific objective, most of the research presented was based in primary sources and used novel methods in the context of existing studies about slavery in Brazil, thus they have their own historical interest.

CHAPTER 7

Estimating Slave Longevity in Nineteenth Century Brazil

This Chapter presents estimates of slave longevity in the second half of nineteenth century Brazil. In addition to contributing to an important topic in slave demography, they can serve three purposes in this book. First, they were used for the slave population projections presented in Chapter 6. Second, they are used to estimate the rate of return on the investment in slaves (Chapter 9). Finally, they are used for the estimation of slave age earnings profile and the Sanguinity Index (Chapter 10).

Slave Mortality Conditions

To estimate slave longevity in the second half of the nineteenth century in Brazil, upper bound and lower bound estimates of Slave Population Life Tables will be calculated. The upper bound estimates of

the slave population are also the Life Table (lower bound) estimates of the black and mulatto population (referred here as colored). For these estimations we will use adjusted figures from the ones presented in the 1872 Census.

Our present knowledge of the prevailing slave mortality conditions during this period, from which longevity can be inferred, is limited almost exclusively to the crude estimates offered by the testimony of contemporary observers.

Those estimates present various shortcomings, stemming from the uncritical use of the sparse and incomplete population figures available, and for neglecting to adequately consider the distortions caused by the variations in the mix of gender and age composition of the population, due to the African slave trade and the manumissions (and flights) of slaves. Besides varying over a large range, most of those measures are estimates of the crude death rates[217] .

Slave age specific death rates by gender[218] , based on Life Tables, in addition of being a better demographic statement of mortality conditions in a given population, are the most appropriate for some studies about the economics of slavery, like profitability and economic viability, in which it is essential the knowledge of slave longevity by age groups.

Furthermore, the 1871 Free Womb Law, taking place only two decades after the closing of the African slave trade, makes still more relevant the knowledge of slave longevity. This Law marked a predictable end to slavery in the future, dependent upon the mortality conditions of the slave population at the time of its enactment.

It was then agreed by all contemporaries that, assuming that the Law would be enforced, those conditions would determine the approximate period when slavery would disappear. The crucial question, therefore, centered on what were the mortality conditions specific to the slave population, and this question was one of the central issues of the controversy about abolition of slavery in the 1870s and 1880s[219]. In

217 If D is the total number of deaths among slaves in a country during a particular year, and P is the average number of slaves living in that country during the year, then the crude death rate is m = (D/P).k, where k is a constant, that we assume takes the value of 1,000. This is a modified definition of the one taken from Mortimer Spiegelman, *Introduction to Demography* (Chicago: The Society of Actuaries, 1955), pp. 54-55.

218 If, for any sex, nDx is the number of deaths between ages x and x+n among slaves in a country during a year, and nPx is the average number of slaves between ages x and x+n living in the country during the year, then the age specific death rate is ${}_nm_x = {}_nD_x/{}_nP_x 1{,}000$. Ibid, pp.55-56.

219 After the passing of the 1871 Law, it was a prevalent attitude among many slave owners and the advocates of the continuation of slavery to support the position that the mortality conditions alone would bring a fast end to slavery, and no further measures were necessary. By using their estimates of mortality, those *Emancipacionistas* tried to dismiss the *Abolicionistas,* who, also based on their own estimates, predicted a much longer period for the existing slave population, and then pressed for an immediate end to slavery.

particular, forecasts about slave longevity according to age groups were the most important topics of the debate, since the most sensitive issue was the prediction of the future slave labor force in the most valuable age groups (15 to 45 years).

Our present knowledge

Unfortunately, however, for both the contemporaries and the modern historical studies of slave demography, the reliable record of death of slaves was seldom made in Brazil. Even when made, they were related to some cities or provinces, and their correct use does not provide a meaningful or consistent interpretation for the country as a whole.

The existence of only one population census in the period (the 1872 *Recenseamento*) also precludes the use of cohort survival techniques for Life Table construction. Fortunately, however, the method devised by Arriaga, based on stable population theory, permits the estimation of a Life Table from the age distribution of the free and slave population by color and gender as presented in this Census[220].

This method is appropriate when vital statistics cannot be utilized, and it is very useful for historical demographic studies in cases where practically no statistics exist and where no highly accurate method can be used. The basic data used are the proportional five-year age group distribution between ages 10 and 59 provided by a single census, and it only requires that the completeness of enumeration in the census should be relatively the same in all the ten age (five-year) groups 10-59.

The 1872 *Recenseamento* was the first Brazilian Census of population, and the only one taken during the whole life span of the slavery institution in Brazil. It is considered by modern demographers as a very satisfactory one, thus it can be utilized by this method.

Many adjustments are necessary to correct the Census data before using the method. The degree of arbitrariness involved is smaller when we consider the total free and slave black and mulatto population, and increases until we reach the slave population. Thus we will present the Life Table estimation for the two populations. Before explaining those adjustments, however, we will present a survey of the mortality estimates of the nineteenth century contemporaries, as well as the ones presented in the modern literature, although among the latter several authors are

220 Method B, in Eduardo E.Arriaga, *New Life Tables for Latin American Populations in the Nineteenth and Twentieth Centuries,* Population Monograph Series, No. 3 (Berkeley: University of California Press, 1968).

also based on the former's estimates. Recently, however, several studies and monographs are attempting to prepare better estimates of slave mortality[221].

Survey of Mortality Figures

The main problem with those efforts was the lack of availability of a systematic collection of vital statistics for any segment of the population during that period[222] .

The most known attempt to directly measure vital statistics of the free and slave populations according to color was made by Von Eschwege in Minas Gerais, a province in the Southeast of Brazil, in 1814[223]. They are shown in Table 7.1.

TABLE 7.1

Crude Death Estimates for Free and Slave population in Minas Gerais, 1814 (made by Von Eschwege)

POPULATION	FREE POPULATION (crude death rates per thousand)	SLAVE POPULATION (crude death rates per thousand)
WHITE	28.3	.....
MULATTO	27.5	60.0
BLACK	53.8	68.6
INDIAN	37.0	.....

SOURCE: F.J. Oliveira Vianna, "O Povo Brasileiro e sua Evolução", in Recenseamento do Brasil, 1920, I (Rio de Janeiro, 1922), p. 339.

Based on the 1847 and 1848 Census results for Rio Grande do Sul, a province in the South of Brazil, and which he considered as offering the best living and labor conditions to slaves in the country, Ferreira Soares estimated the crude death rates as 20.8 for slaves and 8.5 per thousand for the free population[224] .

221 See the work of Read, Ian William Olivo. "Unequally bound: the Conditions of Slave Life and Treatment in Santos County, Brazil, 1822-1888" (Ph.D. Dissertation, History, Stanford university, 2006). See also Amantino, Márcia. "As condições físicas e de saúde dos escravos fugitivos anunciados no Jornal do Commercio (RJ) em 1850," *História, Ciências, Saúde – Manguinhos,* 14, no.4 (out.-dez. 2007), pp. 1377-1399.

222 We have standardized the notation about the vital statistics presented by the authors reviewed in this section, in accordance with the definition of mortality proposed by Spiegelman.

223 Eschwege, W.L. von. *Pluto Brasiliensis* ([1833]; 2 vols.; São Paulo: Ed. Nacional, 1944). These statistics were reproduced in F. J. Oliveira Vianna, "O Povo Brasileiro e sua Evolução", in *Recenseamento do Brasil,* 1920, I (Rio de Janeiro, 1922), p. 339.

224 Sebastião F. Soares, *Elementos de Estatística Comprhendendo a Theoria da Sciencia e a sua Applicação a Estatística Commercial do Brazil, Tomo II* (Rio de Janeiro: Typographia Nacional, 1865), pp. 46-47.

For the country as a whole, given the more unfavorable mortality conditions as compared with Rio Grande do Sul, he assumed a crude death rate for slaves of 23.8 per thousand[225] .

In 1867, during the debate about the *Lei do Ventre Livre* (what would become the Free Womb Law of 1871), the official opinion of the Full Council of the Empire regarding the proposal of the Law presented some estimates made by the members of the Council[226] . The Visconde de Abaeté, based on British West Indies vital statistics, estimated that the Brazilian slave population had a crude death rate of 27.8 per thousand[227]. The Visconde de Jequitinhonha estimated the slave crude death rate as slightly below 50.0 per thousand[228]. The Barão do Rio Branco estimated the slave crude death rate as not greater than 30.0 per thousand[229].

Three years later, in the justification for the project of the *Lei do Ventre Livre,* the *Câmara dos Deputados* (Congress) estimated, based on the statistics of the Rio de Janeiro City in 1870, that the slave crude death rate was 41.0 per thousand[230]. Souza e Silva, invited by the Congress as a demographic expert, although he did not provide any statistics, estimated the slave expectation of life as one-third of the free man[231].

Ottoni, an opponent of the *Ventre Livre* Law, adopted the slave crude death rate of 50.0 per thousand in his *Parecer*[232]. In 1878 Correia, presenting the report of the *Directoria Geral de Estatistica* about the slave registration (*Matrícula*) of 1872-1873, presented slave crude death rates for four provinces in 1876, in the North (Amazonas 9.2) and Northeast (Piauhy 10.3, Rio Grande do Norte 5.4 and Bahia 11.8 per thousand)[233].

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225 Ibid, p. 49.

226 Report of the Conselho de Estado Pleno, enacted on 2 April 1867, published in Brazil, *Trabalho sobre a Extincção da Escravatura no Brasil* (Rio de Janeiro: Typographia Nacional, 1867).

227 Ibid, pp.25-26.

228 Ibid, p. 32.

229 Ibid, p. 53.

230 Brazil. *Congresso, Câmara dos Deputados, Elemento Servil. Parecer e Projecto de Lei Apresentados a Camara dos Srs. Deputados na Sessão de 16 de Agosto de 1870, pela Comissão Especial Nomeada pela mesma Câmara em 24 de Maio de 1870* (Rio de Janeiro: Typographia Nacional, 1870).

231 *Elemento Servil,* Anexo 0, p. 158. Souza e Silva is not clear if he is referring to the expectation of life at birth or of an adult slave.

232 Christiano B. Ottoni, *A Emancipação dos Escravos. Parecer*. (Rio de Janeiro: Typographia Perseverança, 1871), pp. 30, 35, and 41. Actually, by mistake, he mentioned the Death Crude Rate of 25.0 per thousand. Some years later, he corrected this mistake by adopting a Death Crude Rate of 50.0. See Ciro T. de Padua, "Um Capítulo na História Econômica do Brasil", *Revista do Arquivo Municipal de São Paulo, XI* (January/February 1945), p. 140.

233 Brazil, *Ministério dos Negócios do Império, Directoria Geral de Estatística, Relatório e Trabalhos Estatísticos, 1878*, p. 122.

In 1878, during the *Congresso Agrícola* (Agricultural Congress), the Barão do Rio Bonito estimated mortality among slaves (although he used the expression black race) as showing a crude death rate of 50.0 per thousand[234].

In 1883 Mariani estimated crude death rates for the aggregation of slaves and *ingenuos* (those born from slave mothers but freed because they were born after the 1871 *Ventre Livre* Law). He tried to overcome, by this aggregation, the fact that by using death rates of slaves alone, this would cause an underestimated and false picture of the slave mortality conditions. As a matter of fact, since during 1877 and 1881 the younger slaves would be aged at least from 5 years and 5 months to 9 years and 5 months, and therefore the crude death rate of this population would actually be an age specific death rate. He found the following results, presented in Table 7.2.

TABLE 7.2
Crude death rates per thousand of slaves and ingenuos

YEAR	MALE (Crude Death Rates per thousand of slaves and Ingenuos)	FEMALE (Crude Death Rates per thousand of slaves and Ingenuos)	TOTAL (Crude Death Rates per thousand of slaves and Ingenuos)
1877	20.0	17.1	18.9
1878	20.6	18.4	19.6
1879	19.6	17.6	18.7
1880	19.2	17.3	18.3
1881	17.1	15.3	16.3

SOURCE: Brazil. Ministerio dos Negocios do Império. Relatório Apresentado à Assembléia Geral Legislativa na Terceira Sessão da Décima Oitava Legislatura pelo Ministro e Secretário de Estado dos Negócios do Império, Pedro João Velloso, Anexo J., Estatística (Rio de Janeiro: Typographia Nacional, 1883), PP. 11-12.

The Mariani estimates were based on the updated results of the Slave *Matrícula*, and were part of a report presented to the *Assembléia Legislativa* (Congress). Ottoni, by that time a member of the Senate, criticized those figures as too low. He estimated, instead and only for the slave component of the population, a crude death rate of 35.0 per thousand[235]. Vieira Souto, in 1884, in his estimates of slave mortality, also

234 *Congresso Agrícola. Colecção de Documentos*. (Rio de Janeiro: Typographia Nacional, 1878), p. 237.
235 Quoted in Padua, "Um Capítulo na História", p. 141.

considered that the published figures of the Slave *Matrícula* death rates were too low, and adopted a rate of 20.0 per thousand for the crude death rate[236].

All the estimates presented above differ a great deal, and are scattered over a large range. If they are transformed into estimates of longevity of newborn slaves (or expectation of life at birth)[237] , we can roughly estimate them as varying between 16 years to 44 years for the pre 1871 crude death rate estimates. For the post 1871 estimates we have the problem that a growing number of *ingenuos* were not part of the slave population. If we then use the Mariani estimates, expectation of life at birth would vary between 51 to 63 years.

To put those results into perspective, we should keep in mind that life expectancy for the total population of Brazil was estimated at 27.4 years in 1872, as 32.0 years in 1920 and 55.5 years as late as in 1960[238].

Mortality Estimates for Slave's Age Groups

The attempts to estimate directly the slave longevity according to certain age groups were far more erroneous than the crude death rate estimates. For Brazil we have many sparse comments about that. Simonsen gives the estimates of 7 years as the slave life expectancy in mining and 20 years in sugar plantations for a twenty-year old slave[239] .Boxer writes that "an Italian Capuchin Missionary who visited Bahia in 1862 was told that their labor is so hard and their sustenance so small, that they are reckoned to live long if they hold out seven years". Commenting upon the mining region (the comment above was about sugar plantations) he quotes a traveler who made an exhaustive inquiry in Minas Gerais in 1734 that "the owner did not normally expect to get more than twelve years work out of the slaves they bought as young men"[240] .

For the coffee cultivating region in the nineteenth century the picture is no different. Stein, writing about the coffee producing province of Rio de Janeiro in the Southeast of Brazil in the middle of the nineteenth century, wrote that

236 Quoted in Ruy Barbosa. *Emancipação dos Escravos. Parecer Formulado pelo Deputado Ruy Barbosa como Relator das Comissões Reunidas de Orçamento e Justiça Civil. Camara dos Deputados. Sessão de 4 de Agosto de 1884, Projecto No. 48* (Rio de Janeiro: Typographia Nacional, 1884), p. 40.
237 For this rough transformation, we interpret the inverse of the crude death rate as approximately equivalent to the expectation of life at birth.
238 Arriaga, *New Life Tables*, p. 42.
239 Roberto C. Simonsen, *História Econômica do Brasil, 4th.* Ed. (São Paulo: Companhia Editora Nacional, 1969), p. 134.
240 Charles Ralph Boxer, *The Golden Age of Brazil* (Berkeley and Los Angeles: University of California Press, 1964), p. 174.

> "slaves were worked hard and they were not expected to last indefinitely. Proof of this was visible in all sides. At the height of Vassouras prosperity a planter sized up the situation when he wrote (in 1852) that it is widely demonstrated that the average working life of a slave used in coffee cultivation is fifteen years"[241] .

Fernandes quotes an even lower estimate for this period, "one slave could give, on average, only ten years of work"[242] . Simonsen gives a still lower estimate, an average life of seven years for slaves in coffee plantations, between 1800 and 1850[243]. Perhaps a better estimate was made by the correspondent of Ceylon's Observer in 1882, obviously interested, as a representative of a country (British Colony) competing with Brazil in the world coffee market, in a fair appraisal of all questions concerning coffee production and its labor force[244] . According to him,

> "Looking at a gang of slaves working in a coffee plantation, one is struck with the large proportion of young and strong looking people among them. Were I asked to say what could be got out of the gangs I have seen working on the coffee estates – very few being about forty and most of them between the ages of 15 to 30 years – I would be safe in calculating thirty years as the average workable time"[245].

Estimates of the slave age-specific mortality rates and probability of survival according to age cohorts also show too much discrepancy. Earlier, in 1882, in Campos, an important producing county in the Province of Rio de Janeiro, the traveler Graham was told by the owner of a 200 slaves sugar plantation that "not half the negroes born in her estate live to be ten years old"[246]. Stein, quoting the French traveller Couty, writes that "in 1883 an observer claimed that infant mortality was high···the number of infants one month to two tears old he considered large, with far fewer six-

241 "Stein, *Vassouras*, p. 183.
242 Florestan Fernandes, "Do Escravo ao Cidadão", in *Brancos e Negros em São Paul*o, Ed. Roger Bastide and Florestan Fernandes, 2nd. Ed., (São Paulo: Companhia Editora Nacional, 1959), p. 35.
243 Simonsen, "Aspectos da História Econômica do Café", p. 263.
244 It is interesting to notice that many observers from competing coffee producing countries (or colonies), like Laerne, came to Brazil during 1881 to 1884. This was partly due to the world depression in world markets for tropical products, but, in addition, they were obviously interested in assessing the prospects of future Brazilian production in face of the expectation of abolition and its effects on the labor force.
245 A. Scott-Blacklaw, "Slavery in Brazil", in *South American Journal and River Plate Mail,* 20 July 1882, p. 10.
246 Mary Graham, *Journal of a Voyage to Brazil and Residence There During Part of the Years 1821, 1822, and 1823* (London: Longman, Hurst, Rees, Orme, Brown and Green, 1823).

to-ten years old surviving···". He estimated that of 1,000 slave births only 120 survived the early years[247]. Stein also quotes an English observer that commented (1872) "among the slave class it is stated to be an admitted fact that 50 percent of the newborn slaves would die before attaining the age of eight"[248] . Valete, in 1871, presented different estimates. According to him, 53.6 percent of the newborn slaves would die until they were 19 years old (from 1,000 slaves born alive, he estimated 353 would die between 0 and 5 years, 77 between 5 and 9 years, 45 between 10 and 14 years, and 61 between 15 and 19 years)[249].

Construction of Life Tables

The rather extensive presentation of those estimates about crude death rates, life expectancy and age specific mortality rates were intended to stress the point that they show so different estimates, that because of that modern historical studies cannot depend on them.

Their main problem was that they were based mostly on conjectures, given the lack of any systematic collection of death statistics. But that was not the only problem. For those few attempts of using reasonable vital statistics, we are left with the problem of representativeness, since they refer either to one occupation, province or rural versus urban setting.

More important, enough attention was not paid to the effects of the African slave trade, gender imbalances, manumissions and internal migrations on the age distribution of slaves, and therefore on mortality estimates.

Thus, in what follows, we will attempt to construct estimates of slave longevity which take account of those problems. Table 7.3 presents the Brazilian population in 1872 by gender, color, and legal status (free or slave). Two considerations emerge from the table.

First, when the colored (black and mulatto) population is considered as a whole, is the small proportion of slaves in relative terms. They represented only 26.2 percent of total colored population, what is small when compared with this same percentage in the American South or even Cuba during their respective experiences with slavery[250] .

247 Stein, *Vassouras*, p. 186. He is quoting Couty, Biologie Industriel sur le Café, p. 111.
248 Stein, Ibid., p. 186.
249 Paulino J. Soares de Sousa (Valete). *Carta aos Fazendeiros e Comerciantes Fluminenses sobre o Elemento Servil, ou Refutação do Parecer do Sr.Conselheiro Christiano Benedicto Ottoni acerca do Mesmo Assumpto por um Conservador*. (Rio de Janeiro: Typographia Nacional, 1871), p. 37.
250 In the American South less than 6 percent of the Negro population was free in 1860. Robert W. Fogel and Stanley L. Engerman, *Time on the Cross, vol. I, The Economics of American Negro Slavery* (Boston: Little, Brown, and Company, 1974), p. 37. In Cuba the percentage of slaves in total Black population was 74.1 percent in 1841 and 62.9 percent in 1861. Cuba, *Census of the Republic of Cuba*, 1919 and Curtin, The Atlantic Slave Trade, p. 34.

The second consideration is that slaves were not only blacks, but also mulattoes. There was a difference, however, since the ratio of black slaves to free blacks was 1.12, but the ratio of mulatto slaves to free mulattoes was only 0.14. About 52.9 percent of all blacks were slaves, or the majority of them. It is true that free mulattoes represented about 78 percent of the free colored population, much more than the population of slave mulattoes in the total slave colored population, but this last figure, about 32 percent, shows that slave mulattoes represented almost one third of all slaves.

TABLE 7.3
Brazil 1872: Free and Slave Population by Gender and Color (in thousands)*

LEGAL STATUS	MALE	FEMALE	TOTAL
FREE	4,328.7	4,100.9	8,429.6
White	1,971.8	1,815.5	3,787.3
Mulatto	1,684.0	1,650.3	3,334.3
Black	472.0	449.1	921.1
Caboclo **	200.9	186.0	386.9
SLAVE	805.1	705.7	1,510.8
Mulatto	252.8	224.7	477.5
Black	552.3	481.0	1,033.3
TOTAL	**5,133.8**	**4,806.6**	**9,940.4**

Notes:
* The results presented in this Table are the aggregate results of the age distribution of the "Quadros Gerais".
** The *caboclos* are the population with Indian descent alone, or descendent from mixing of white and Indian families.
SOURCE: *Recenseamento de 1872*.

Impact of Manumissions

Those considerations show that for a meaningful analysis of the slave population we should account for both blacks and mulattoes. They also bring to light the extent of manumissions that took place in Brazil[251] . That about three-quarters of the Brazilian colored population were free in 1872 shows how significant it had been for the present colored population and also for the ancestors of the great number of descendents of manumitted slaves[252].

251 Grinberg, Keila. "A Poupança: Alternativas para a Compra da Alforria no Brasil (2ª. Metade do século XIX)," in *Revista de Indias* LXXI (251), 2011 pp.137-158.
252 For recent studies about manumission, see Bertin, Enidelce. *Alforrias na São Paulo do século XIX: Liberdade e Dominação* (São Paulo: Humanitas FFFCH/USP, 2004); Eisenberg, Peter L. "Ficando livre: as alforrias em Campinas no século XIX," *Estudos Econômicos,* 17, no.2 (1987), pp. 175-216; Florentino, Manolo. "Sobre Minas, Crioulos e a Liberdade Costumeira no Rio de Janeiro, 1789-1871," in Manolo Florentino, ed., *Tráfico, Cativeiro e Liberdade no Rio de Janeiro, Séculos XVII-XIX* (Rio de Janeiro: *Civilização Brasileira*, 2005), pp. 331-366; Grimberg, Keila.

Since this Chapter attempts to measure slave longevity in the biological sense, slave "deaths" by manumissions (and flights) will only indirectly enter in our calculations.

The Arriaga method should be used when two conditions hold: (i) in relative terms, insignificant international migration, or an approximately closed population with insignificant in or out external migration; (ii) almost constant fertility in past years.

Much of the work in this Chapter and Appendix A will be to discuss in what extent the figures of the 1872 slave population violate those assumptions, and how they can be corrected.

Manumissions can be thought as an out migration of the colored slave population toward the colored free population[253]. Due to the significant extent of manumission we can not assume that the slave population was closed. We do not know the number, by gender and age, of the Brazilian population in 1872 that was born slave but manumitted before that date. Given the extent and degree of manumission[254], and the importance of both the mulatto and black elements in the slave population, this analysis will consider separately the total colored population, free and slave, rather than only the slave colored population.

Thus, by using the total colored population, we do not have to worry with the problem of manumissions (and flights). In addition, since the other adjustments that will be made are of a smaller relative magnitude in comparison with the slave colored population, the longevity estimates of the total colored population can be used with some confidence as the approximation of the upper bound of slave longevity. Moreover, given that mortality conditions among the free colored did not differ much of those among slaves, as will be discussed below, they can be interpreted as a close upper bound.

Emigration of the colored population in Brazil was practically non-existent. But there was immigration of Africans. In order to obtain the closed colored and slave populations, we have to adjust them for the existence of immigrants in the population[255].

Liberata, a *Lei da Ambigüidade: As Ações de Liberdade da Corte de Apelação do Rio de janeiro no Século XIX* (Rio de Janeiro: Relume Dumará, 1994); Lacerda, Antônio Henrique Duarte, *Os padrões das Alforrias em um município mineiro em expansão: Juiz de Fora, Zona da Mata de Minas Gerais, 1844-88* (São Paulo: Annablume, 2006).

253 We are excluding the *caboclo* population from the colored population, since in general they have Indian descendent alone or are white and Indian half-breed.

254 The extent and degree of manumission in the period 1871 to 1888 was seen in Chapter 6, in the analysis on the changes of the slave population.

255 See Gemery, Henry A. and Hogendorn, Jan S. (editors). *The Uncommon Market. Essays in the Economic History of the Atlantic Slave Trade* (New York: Academic Press, 1979).

Immigration of Black Slaves from Africa

Those immigrants were Blacks from Africa. Two adjustments are needed: (i) The first will be to estimate and then deduct the number of Africans from each age-sex cohort. (ii) The second will be to estimate and then deduct the first generational impact in each age-sex cohort of the African immigration to Brazil in the nineteenth century.

These adjustments are discussed at great length in Appendix A, sections (1) and (2). Briefly resuming, they consisted of the following steps.

The adjustments of (i) consisted of: (a) The 1872 Census presented the number and gender, but not the age, of Africans in Brazil in 1872; (b) Using the figures of the number of Africans entering Brazil between 1801 and 1852, and the indications we have about the presumed age distribution of the imported slaves, their gender ratio, the mortality conditions in the "Middle Passage" – the crossing of the Atlantic Ocean from Africa to America – and the mortality conditions during the "seasoning period" in Brazil, we reconstituted the age distribution of the African population in Brazil in 1872; (c) we deducted then the Africans from each sex and age cohort of the total colored population, as part of the process for obtaining the colored native population.

The adjustments in (ii) consisted of: (a) the first generational was the more important indirect impact in the 1872 colored population caused by the African immigration; (b) we estimated the number of the prolific female African immigrants after the "seasoning period" in Brazil, between 1801 -1852, and estimated the part of their prolific activity performed in Brazil (i.e, the number of their children born in Brazil); (c) we then estimated, from the number of children born in Brazil, the number who would be still alive in 1872, and their gender and age distribution; (d) we then deducted this result from the 1872 colored population, and, together with the deduction of the Africans, we obtained the "native" colored population by gender and age cohorts in 1872; and (e) we then estimated the free and slave components of this population, by using the information on manumission patterns.

Slave Fertility

The second condition necessary for the Arriaga Method is the existence of an almost constant fertility in the past years. With respect to the free colored population, we have no reasons to expect any large change in fertility. There were no large changes in their health, economic

or social conditions taking place during the time period covered in this study that could induce those changes in fertility. With respect to the slave component of the colored population, representing 26.2 percent of this total, we need to make some additional considerations.

Following the cessation of the African slave trade in 1852 and the subsequent rise in slave prices, it is often argued that Brazilian slave owners adopted the policy of giving a better treatment to their slaves. One of the aspects of this amelioration policy is said to be a better care for expectant slave mothers and their infants, as well as incentives to slave marriage and offspring[256]. Although there was never any argument similar to the ones about slave breeding in the antebellum South, a case exists for arguing for an improvement in some of the conditions affecting fertility[257].

It is conceivable therefore, that the suppression of the African slave trade in 1852 would have some positive effect in the fertility rate of the slave population. The extent of it, however, was probably minimal. The response of demographic behavior to changes in the economic conditions is a long run process, and it takes some time to begin and more for the effects to be significantly observed. Since the lapse of time was only 20 years between the suppression of trade and the 1872 Census, those conditions could not be operating yet or its effects felt in the slave population.

In addition, the debate about the "Free Womb Law" started in 1867, and thus could have affected slave owners expectations about the profitability of the amelioration policy. Besides, the considerations about the long run supply of labor and the economic incentives for the amelioration policy were not evenly spread among the geographical regions of Brazil, and thus the internal slave trade offered an alternative

256 See Amantino, Márcia. "As condições físicas e de saúde dos escravos fugitivos anunciados no Jornal do Commercio (RJ) em 1850," *História, Ciências, Saúde – Manguinhos, 14*, no.4 (out.-dez. 2007), pp. 1377-1399; Andrade, Rômulo. "Casamento entre escravos na região cafeeira de Minas Gerais," *Revista universidade Rural, Série Ciências Humanas, 22*, no.2 (Jul./Dez. 2000), pp. 177-288; Andrade, Rômulo "Havia um mercado de famílias escravas? (A propósito de uma hipótese recente na historiografia da escravidão), *Revista de História* (Juiz de Fora), 4, no.I (1998), pp. 39-104; Botelho, Tarcísio Rodrigues. "Família e escravidão em uma perspectiva demográfica: Minas Gerais (Brasil), século XVIII," in Douglas Cole Libby and Júnia Ferreira Furtado, eds., *Trabalho livre, trabalho escravo, Brasil e Europa, séculos XVIII e XIX* (São Paulo: Annablume, 2006), pp. 195-222; Florentino, Manolo and José Roberto Góes. *A Paz das Senzalas: Famílias escravas e Tráfico Atlântico, Rio de Janeiro, c.1790-c.1850* (Rio de Janeiro: Civilização Brasileira, 1997); Gomes, Flávio dos Santos. *Experiências Atlânticas: Ensaios e Pesquisas sobre a Escravidão e o Pós-Emancipação no Brasil* (Passo Fundo, Rio Grande do Sul: Editora UPF, 2003); Lima, Carlos A.M. " Escravos Artesãos: Preço e Família (Rio de Janeiro, 1789-1839)," *Estudos Econômicos*, 30, no. 3 (Julho-Setembro 2000), pp. 447-484; Read, Ian William Olivo. "Unequally bound: the Conditions of Slave Life and Treatment in Santos County, Brazil, 1822-1888" (Ph.D. Dissertation, History, Stanford university, 2006).

257 Castro, "Viabilidade Econômica da Escravidão no Brasil, 1880-1888", p.p. 45 and 54.

for the amelioration policy. Finally, in a slave disease and morbidity environment as in 1852-1872 Brazil the epidemiology conditions were significant, and could easily overcome any deliberate efforts to increase the rate of fertility[258]. Therefore, it is extremely doubtful if any measurable changes in the fertility conditions of the slave or colored population were effected between 1852-1872.

Arriaga Method

Before applying the Arriaga Method B, however, we need to make some corrections, because of under-numeration and age heaping, in the age distribution of the "native" colored and slave population, which are presented in section (3) of Appendix A.

The Arriaga Method B uses the smoothed values of the proportional distribution of this "native" populations thus obtained, by gender and five-year age groups, from ages 10 to 59 ($C_{x'x-5}$). The Method and its application are presented in section (4) of the Appendix A.

Briefly resuming the steps used, the method is based on the Stable Population Theory. It uses the transformation of one of its fundamental equations, in which the logarithm of the ratio of the smoothed proportional distribution of the population (i.e., "native" slave or colored by gender) in five-years age cohorts ($C_{x'x-5}$) over the Life Table values of the proportion of persons in this age group who were alive out of each person born (i.e., in age zero) ($_5L_x$), or ln [($C_{x'x-5}$). $_5L_x$], is a linear function of the logarithms

258 In a five year observation period in five coffee plantations in Rio de Janeiro, a thesis presented to the Medical School of Rio de Janeiro shows quantitative evidence of the importance of epidemics in the disease and morbidity slave environment. The Santa Rita, Boa Sorte, Boa Vista, Areias and Itaóca coffee plantations, located in the Paraíba Valley, had a total of 925 slaves. The observation period was 1848-1852, when the amelioration policy was beginning. The slaves lived in well built houses, in a healthy location, had cotton and wool clothes, and had "so abundant food, that each one can eat as much as he wants"(lunch and dinner, with corn meal, beans with bacon, and jerk beef each other day). The Santa Rita and Areias plantations had regular hospitals, that also served the other three in more serious cases. In the Santa Rita plantation (160 males, 106 females and 64 children under 10-12 year slaves) were born yearly on average 15 to 20 infants, and in Areias with Itaoca plantations (159 males, 101 females and 55 children slaves) were born 9 to 12 yearly only in Areias. Boa Sorte plantation had 66 males, 37 females and 32 children and Boa Vista 76 males, 49 females and 20 children slaves. Mortality among children was:

PLANTATION	1848	1849	1850	1851	1852
Santa Rita and Boa Sorte	5	10	9	19*	16*
Areias and Boa Vista	...	...	9	10	23*

During the years (*) of 1851 and 1852 there were epidemics of pertussis, measles and dysentery in the plantations. They extracted a heavy toll from the children. As the medical observer himself noticed, "mortality among children depends much less of treatment···". See Reinhold Teuscher, *Algumas Observações sobre a Estatística Sanitária dos escravos em Fazendas de Café* (Rio de Janeiro, Faculdade de Medicina do Rio de Janeiro, Dissertação, 22 July 1853).

of the intrinsic birth rate of the population (b), where ln b is the intercept, and the regression estimates of the intrinsic growth rate of the population (r'), where r'(x – 2,5) is the slope.

The values of ${}_5L_x$ were obtained from the "West Family" Model Life Tables of Cole and Demeny[259], and selected on the basis of the least square regressions which indicated the "West" Life Tables which can best represent the mortality conditions of the colored and slave "native" slave populations in 1872.

After that, by using the established procedures for Life Table construction, we obtained the estimated abridged Life Tables for the male and female colored (slave upper bound) and slave (lower bound) populations, presented in section (5) of Appendix A.

Life Tables for Brazilian Slaves

Based on those tables, we present in Table 7.4 the upper and lower bounds of the expectation of life (i.e., the average length of life) for the male and female slave population at certain ages.

In order to obtain those final estimates, we had to make several assumptions and adjustments. The number of assumptions and their relative importance were much greater to the slave component of the colored population than to the total colored population. Thus the results obtained for the colored population as a whole should be seen as more precise than the ones for the slave population.

The free colored population, however, occupied the lower status in the free Brazilian social stratification[260], and its conditions of food, health and living were not much different from the slave population[261]. We have to consider, though, that not only the share in the labor force of the slave population was greater than the free colored, but slaves worked in a more intense way, and therefore the slave population could have faced harsher mortality conditions[262]. But we should not exaggerate these differences,

259 Ansley Coale and Paul Demeny, *Regional Model Life Tables and Stable Population* (Princeton: Princeton University Press, 1966).

260 Herbert S. Klein, "The Colored Freedman in Brazilian Slave Society", *Journal of Social History, III,* No. 1 (Fall 1969), pp. 30-52.

261 Gilberto Freyre even argues that food and nutrition conditions were better among slaves than for the free colored population. Gilberto Freyre, *Casa Grande e Senzala, 16th ed.* (Rio de Janeiro: José olympio editor, 1973), pp. 33-34, 44, 46, and 75.

262 In 1884 Laerne remarked that "it would surprise me greatly if the conditions of the slaves be not considerably worse already than it was ten years ago, that is to say., if they have not to do more work than formerly when the same amount of money could purchase twice as much working power. They are better treated, better fed and cared for, but they must work harder". Laerne, *Brazil and Java*, p. 91.

since the epidemiological environment of 19th century Brazil tended to reduce them[263] .

TABLE 7.4
Brazil 1872: Male and Female Expectation of Life at Certain Ages

AGE	Slave Lower Bound	Slave Lower Bound	Slave Upper Bound	Slave Upper Bound
	Male Slave E_x	Female Slave E_x	Male Slave E_x	Female Slave E_x
0	18.26	20.35	23.38	25.53
1	29.81	30.31	33.56	34.17
0	18.26	20.35	23.38	25.53
5	35.65	36.42	38.44	39.29
10	33.07	34.11	35.59	36.66
15	29.85	31.26	32.30	33.70
20	26.76	28.51	29.18	30.84
25	24.11	26.08	26.02	28.25
30	21.63	23.79	23.28	25.78
35	19.26	21.55	21.10	23.35
40	16.93	19.27	18.50	20.88
45	14.75	16.84	16.09	18.27
50	12.63	14.28	13.88	15.57
55	10.60	11.79	11.67	12.93
60	8.68	9.50	9.59	10.51
65	6.94	7.53	7.71	8.39
70	5.45	5.87	6.08	6.60
75	4.23	4.56	4.75	5.17
80	3.59	3.85	3.89	4.25
85+	2.3o	2.58	2.30	2.58

SOURCE: Appendix A, Tables A.9 and A.10

Therefore, the results presented in Table 7.4 for the colored population, since they are biased in the direction of overstating mortality conditions, can be interpreted also as the upper bound boundary for the estimate of slave longevity. With respect to the slave population (lower bound) results, since our procedure was to utilize the "West Family" Model Life Tables representing the most severe mortality conditions of all the "West" Model Life Tables, it can be considered as the lower boundary for the estimate of slave longevity.

263 Viotti da Costa, *Da Senzala a Colonia,* p.p.. 253-67.

In Chapter 6 we used the mid-point (or the average) of the interval bounds of our estimated slave probability of survival coefficients for the purpose of slave population projections, between the 1872 Census and the 1886/1887 *Matrícula*, and obtained close results, what enhance our confidence in those interval estimates.

Comparative Comments about Mortality

A life expectancy between 18 and 23 years for a male slave supports the interpretation that slavery mortality conditions in Brazil were closer to the Cuban, West Indies and Dutch Guyana than to the American South experience[264].

Life expectancy for a male slave was exemplified as in the order of 18 years in Jamaica and 35.54 years in the 1850 American South[265]. It should be noticed, however, that mortality conditions among the free population were also higher when compared with the North American or Western European populations, and this is consistent with the important role played by the epidemiological environment in 19th century Brazil[266].

Finally, from the slave owner point of view, more than the mortality conditions alone determined their perception of the life span of the slave. Economically, slave capital could be depreciated by diseases, and eliminated by manumissions, flights, or diseases and accidents that could totally impair the use of a slave to produce income (in the last case even imposing a negative value to this unit of capital)[267].

Nevertheless, the slave length of life as measured by the Life Tables were by far the most important factor to determine slave longevity, and we believe that the estimates presented in this Chapter are reasonable and useful for the understanding of this important aspect of the demography and economics of Brazilian slavery.

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264 Fogel and Engerman, *Time on the Cross*, I, pp. 24-27.

265 Robert Evans Jr., "The Economics of American Negro Slavery", in Aspects of Labor Economics, ed. Universities-National Bureau Committee for Economic Research (Princeton: Princeton University Press, 1962), p. 212; Fogel and Engerman, *Time on the Cross: Evidence and Methods, A Supplement, II,* p. 120.

266 Compare the life expectancy of 27.4 years in 1872 for the total population of Brazil with Norway (44.9), Holland (36.4), United States (white 40.4), England and Wales (39.9) and France (39.1) around 1850, as presented by Evans, *The Economics of American Negro Slavery*, p. 213.

267 Klein, Herbert S. and Ben Vinson III. *African Slavery in Latin America and the Caribbean.* 2nd rev. ed. (New York: Oxford University Press, 2007); Bergad, Laird. *Slavery and the Demographic and Economic History of Minas Gerais, Brazil, 1720-1888* (Cambridge: Cambridge University Press, 1999); Gomes, Flávio dos Santos. *Experiências Atlânticas: Ensaios e Pesquisas sobre a Escravidão e o Pós-Emancipação no Brasil* (Passo Fundo, Rio Grande do Sul: Editora UPF, 2003); Miller, Joseph C. *Way of Death: Merchant Capitalism and the Angolan Slave Trade, 1703-1830* (Madison: University of Wisconsin Press, 1988); Wood, Peter H. "More Like a Negro Country: Demographic Patterns in Colonial South Carolina, 1700-1740," Engerman,Stanley L. and Eugene D. Genovese (editors). In *Race and Slavery in the Western Hemisphere: Quantitative Studies.* (Princeton: Princeton University Press, 1974), pp. 131-72.

Chapter 8

Coffee Planters and the Financial and Capital Markets in Brazil: The Alternative Rate of Return

In order to examine the asset value and profitability of slavery, we need to use a suitable rate of discount for the purpose to calculate the present value of the net cash flows generated by the investment in the purchase of slaves. We intend in this Chapter to estimate the rate of return coffee planters could obtain if they decided to invest in other capital assets than slaves, during the period 1871-1888. This indicator will be used as the rate of discount[268].

It is not our intention either to estimate the rate of return in these capital assets from a social point of view, or to estimate the rate of return on capital on the assumption that the total capital invested in slaves would be diverted to be invested in other capital goods.

Rather, we are concerned with marginal decisions by coffee planters, in the sense that if a coffee planter decided to invest more in other capital goods and less in slaves, he would obtain the rates of return in the former given by the market.

Thus those market rates, that we are calling the alternative rate of return, are the ones a coffee planter would receive if he chose to invest in something other than slaves, with suitable account taken of the differences in risk and non-pecuniary factors between other investment goods and slaves.

It is very difficult to obtain a precise estimate of this alternative rate of return. First, we do not know with exactitude the differences between the particular structure of risk characteristic of the investment

268 As background literature for this chapter, see the following works by this author: Pedro C. de Mello, "Uma visão comparativa do conceito de desenvolvimento econômico de Furtado com as teorias recentes," *História e Economia. Revista Interdisciplinar*. São Paulo: BBS, v. 2, no. 1, (2007), pp. 107-134; *Economia e Finanças Internacionais (Text Book)*. FGV/IDE/FGV on line. (Rio de Janeiro: FGV on Line, 2003); *Economia para Empresas e Organizações (Text Book)* FGV/IDE/FGV on line. (Rio de Janeiro: FGV on Line, 2004); *O B de BRICS: Potencial de Consumo, Recursos Naturais e Economia Brasileira*. (São Paulo: Saint Paul Editora, 2012); "Corporate Governance in Listed Brazilian Companies, 1882-1890: a Theoretical Framework" *História e Economia. Revista Interdisciplinar*. São Paulo: BBS, Vol. 10, no.1 (1º. Semestre 2012), pp. 133-148.

in the slave market and the average risk involved in the other investment goods. Second, we do not know the differences on the non-pecuniary factors between other investment goods and slaves. Finally, the statistical information existent for this period does not allow precise inferences.

Financial and Capital Markets in Brazil, 1871-1888

During the second half of the 19th century the production and exportation of coffee was the principal economic activity of Brazil. Brazilian activities were the beginning part of a value added chain aiming European and North American consumption markets. Thus, Brazil was integrated with the financial developments occurring in those societies[269]. In particular, foreign direct investment in infrastructure and the development of corporations issuing bonds and shares to be traded in the stock market. During the years 1871-1888, Brazil had several important commercial banks, the presence of important investment banks, and an active Stock Exchange in Rio de Janeiro. Most financial instruments of the world financial market were issued and traded in Brazil[270].

The years 1871-1888 experienced one of the most important periods of our financial history. It was marked by the diversification and strengthening of financial intermediation – mainly by the newborn banking industry – and by the creation of new instruments of credit, as well by the institutional development of the financial system. In parallel, the capital market instruments and institutions, specially the stock exchange, were very important to allow investments in projects requiring long term for maturity, like the infrastructure projects undertaken in Brazil during this period.

There are few studies published with series on interest rates for Brazil in the 19th century[271]. We can, however, with the information obtained in a research on government reports, Brazilian newspapers, the London Stock Exchange Year Book and other sources, estimate several rate of return series for various investment opportunities other than slaves, with different degrees of risk involved. This can give an approximation or suggest the order of magnitude of the alternative rate of return.

269 See Araújo, Eurilton, e Alexandre Cunha, *Brazilian Inflation and GDP from 1850 to 2000: Na Empirical Investigation*. (Rio de Janeiro: IBMEC, 2002).

270 Lutz, Friedrich and Lutz, Vera. *The Theory of Investment of the Firm*. (Princeton: Princeton University Press, 1951).

271 The more complete work about the financial history of Brazil was written by Raymond W. Goldsmith, *Desenvolvimento Financeiro sob um Século de Inflação*. (Rio de Janeiro: Editora Harper & Row do Brasil Ltda., 1986). In page 51, where he examines the behavior of interest rates during the years 1850-1889, he quotes my own estimates, presented in this Chapter and based on Pedro C.de Mello, "Os Fazendeiros de Café e o Mercado Financeiro e de Capitais, 1871/88," Estudos Econômicos, 14, no. 1 (Jan./abril 1984), pp. 145-161.

Returns on the Investment in Financial Instruments

We present in Table 8.1 the yields earned on various economic activities during the period 1870-1888, which can be suggestive of the rate of return obtainable in the relatively less risky investment opportunities available[272].

Column (1) presents the average annual real interest rate on short term (up to one year) prime commercial paper and other debt instruments traded in the Rio de Janeiro financial market, years 1876-1888. Rio de Janeiro was the major Brazilian city at the time, and the principal export port for coffee[273]. It functioned also as the more important capital and money market of the nation. We can see that the average annual rates did not fluctuate much, and the central tendency is clearly within the 7 percent to 8 percent range[274].

In column (2) we present the annual average of the real lending rate of commercial banks in the principal financial centers of the country, years 1870-1882. The period of the 1870s and 1880s was one of mild inflation for some years (between 1875 and 1883) and mild deflation for the others[275]. It was also one of rapid development in transportation and communication, banking, and other activities, but serious imperfections persisted in the incipient financial markets. There were regional differences in the real lending rate, the Northern provinces charging consistently more one or two percentage points than the Southern provinces. The average for the country, however, shows very little variation during the period, and the central tendency is close to 9 percent[276].

272 Marcondes, Renato Leite *A Arte de Acumular na Economia Cafeeira* (Lorena, São Paulo: Editora Stiliano, 1998).

273 See Peláez, Carlos and Wilson Suzigan, *História Monetária do Brasil: Análise da Política, Comportamento e Instituições Monetárias* (Brasília: editora Universidade de Brasília, 1981).

274 The distribution is only slightly skewed to the right, the mean is 7.61, median 7.40 and the mode between 7.26 and 7.40.

275 Using the Buescu Price Index, with 1870=100, we have: 1870=100; 1871=99.89; 1872=99.82; 1873=99.75; 1874=99.67; 1875=99.60; 1876=100.9; 1877=102.2; 1878=103.5; 1879=104.9; 1880=106.3; 1881=107.9; 1882=109.5; 1883=111.1; 1884=108.9; 1885=106.7; 1886=104.4; 1887=102.3. In Buescu, *300 Anos de Inflação*, p. 223.

276 The distribution is only slightly skewed to the left. The mean is 8.91, median 9.00 and mode 9.02.

TABLE 8.1

Yields on Various Economic Activities, 1870-1888 (in percentage rates)

YEARS	Commercial Papers (1)	Lending Rate (2)	Demand Deposits (3)	Government Bonds Dividend Only (4)	Government Bonds All (5)	Railroad Debenture Dividend Only (6)	Railroad Debenture All (7)
1870	...	9.02	4.68	...	...	...	...
71	...	9.87	5.12	...	...	...	...
72	...	9.28	4.30	...	...	...	...
73	...	8.57	5.26	...	...	...	...
74	...	9.00	5.35	5.83	5.83	...	...
1875	...	9.02	4.83	5.82	5.40	...	...
76	7.26	9.40	5.19	5.80	5.28	...	...
77	8.01	...	...	5.84	4.13	...	...
78	6.23	8.51	2.96	5.71	8.69	...	...
79	6.41	8.64	4.36	5.70	4.76	...	...
1880	7.40	...	...	5.77	4.71	...	...
81	5.92	8.37	...	5.56	9.10	...	...
82	7.39	8.38	...	5.54	5.76	7.28	7.28
83	8.28	...	...	5.49	7.66	7.55	7.26
84	8.32	...	...	5.63	6.17	7.88	5.44
1885	7.30	...	...	5.64	7.64	8.02	9.21
86	7.66	...	...	5.99	0.90	...	...
87	9.90	...	...	5.31	0.97	...	...
1888	8.79	...	...	5.25	4.65	...	....

SOURCE and EXPLANATION: (1) *average annual real interest rate on prime commercial paper in Rio de Janeiro*: Basically circulation capital available for the short term (up to one year) commercial financing. The yearly rates are the arithmetic average of the simple average of the high and low monthly figures, presented in the *Retrospecto Commercial do Jornal do Commercio*, yearly issues, 1876-1888. To deflate this and the other values needed to arrive at this Table, I used the Buescu Price Index, in Buescu, *300 Anos de Inflação*, p.223;

(2) *real lending rate of commercial banks in Brazil*, and

(3) *real rate on demand deposits in commercial banks in Brazil*: both columns were adapted from information on the balance sheets of commercial banks, presented in the *Relatórios do Ministério da Fazenda*, yearly issues, 1869-1881. The banks, located in several provinces of Brazil, were: Banco do Brazil; English Bank do Rio de Janeiro; Banco Rural e Hypothecario; Banco Commercial do Rio de Janeiro; Banco de Campos; Banco da Bahia; Caixa Reserva e Mercantil da Bahia; Caixa Economica da Bahia; Caixa Commercial de Alagoas; Banco do Maranhão; Banco do Rio Grande do Sul; Sociedade Commercio da Bahia; Banco Commercial do Maranhão; Banco Commercial do Pará; Companhia União dos Lavradores; Sociedade Industrial e Mercantil; Banco Hypothecario e Commercial do Maranhão;

(4) *Government Bonds, real dividend only*, and

(5) *Government Bonds, sum of real dividend and real capital gain rates*: Based on the annual arithmetic average of the high and low monthly rates of the *Apólices de 6 percento e valor nominal de 1:000$* (1874-1886) and the *Apólices de 5 percento e valor nominal de 1:000$* (1886-1888), published in *Retrospecto Commercial do Jornal do Commercio*;

(6) *Average real rates of return on railroad debentures, real dividend only*, and

(7) *Average real rates of return on railroad debentures, sum of real dividend rate and real capital gain rate:* both were based on nominal prices and other information on railroad debentures presented in the *Retrospecto Commercial do Jornal do Commercio*, 1881-1885. The companies were: Macahé-Campos; Sorocabana; Leopoldina; Mogyana; Santo Antonio de Padua; Santa Izabel do Rio Preto; Oeste de Minas; Carris Urbanos; Príncipe do Grão Pará; Carris de Nictheroy.

Brazilian Commercial Banks paid interest rates on demand deposits (actually, more in the nature of time deposits), and this was perhaps the lowest return one could obtain by investing (or depositing) his money. On average, the real interest rate on demand deposits was in the range of 4.5 percent to 5.0 percent (see Column 3)[277].

Government bonds were also considered among the relatively small risk investment opportunities available. To estimate the yearly rate of return on government bonds, as well as in other bonds, debentures and stocks, the following method is used. Suppose a coffee planter makes an investment this year, by buying a bond or a stock. Thus, one year from now, he will have earned a real dividend rate plus a capital gain (or loss) in real terms. For the actual estimation, the monthly price of a given bond or stock was taken as the average of the monthly high and low prices. The yearly prices are simple averages of the monthly figures.

The nominal dividend rate at the end of the period, times the par value of the bond or stock, and deflated by one plus the variation of the price index, gives the year total dividend per bond or stock in real terms.

This figure, divided by the average yearly price, gives the real dividend rate for the year. The capital gain rate of return for any given year was estimated by dividing the difference of the next year's or end of the period stock or bond price in real terms and this year's stock or bond price.

Thus the yearly rate of return is the sum of the real dividend rate and the capital gains rate[278].

The estimates of the real rate of return on government bonds are made, respectively, for the real dividend rate only (Column 4) and for the sum of the real dividend rate and the capital gains rate (Column 5)[279].

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277 See Guimarães, Carlos G. "Bancos, Economia e Poder no Segundo Reinado: o Caso da Sociedade Bancária Mauá, MacGregor & Companhia (1854-1866)" (tese de Doutorado,Universidade de São Paulo, 1997). Guimarães, Carlos G. "O Império e o Crédito Hipotecário na segunda Metade do Século XIX: os Casos do Banco Rural e Hipotecário do Rio de Janeiro e do Banco Comercial e Agrícola na Década de 1850," in Campos em Disputa: História Agrária e Companhia. (Juiz de Fora: Annablume, 2007); Villela, André. "The Political Economy of Money and Banking in Imperial Brazil: 1850-1870" (Ph.D. Dissertation, London School of Economics and Political Science, 1999).

278 In symbols,

$$R_t = [(D_{t+1} \; V / 1 + \Delta \; BPI) \div (P_t)] + [(P_{t+1} - P_t) / 1 + \Delta \; BPI) \div (P_t)] ,$$

Where:

R_t = rate of return on year t
D_{t+1} = nominal dividend rate at the end of the year period
V = par value of bond or stock
P_t = average price of bond or stock in year t (centered at mid-year)
P_t+_1 = average price of bond or stock at the end of the one year period
Δ BPI = annual variation of the price index (Buescu Price Index) in the year t to t+1

279 For the period 1874-1886 the data is based on monthly high and low prices of the *Apólices de 6 percento e valor nominal de 1:000$*. For 1886-1888 the monthly high and low prices of the *Apólices de 5 percento e valor nominal de 1:000$* are used. Both figures were published in the *Retrospecto Commercial do Jornal do Commercio*, 1874-1888.

When only the real dividend rate on government bonds is estimated, small fluctuations occur, and the central value is clearly between 5 percent and 6 percent. When the sum of the real dividend rate and the capital gains rate is used, some wide fluctuations appear, the distribution being skewed to the right. The central tendency is between 4.5 percent and 6.0 percent[280].

Railroad debentures, some containing articles guaranteeing first preference in the distribution of dividends, were also transacted in the Rio de Janeiro capital market. We have information for a small period only (1882 to 1885), but for both the real dividends only rate (Column 6) and the sum of the real dividends rate and capital gains rate (Column 7), we notice that the central tendency is in the range of 7 percent to 8 percent.

A more appropriate standard of comparison with investments in slaves is perhaps the rate of return which prevailed on capital invested in transportation, manufacturing, insurance, banking, and other industries, characterized by longer terms and relatively higher risks than the ones depicted in Table 8.1. This possibility arises, of course, if we assume that those opportunities were actually open to investment decisions by coffee planters.

Joint Stock Companies in Brazil

Although economic activities in Brazil during the 19th century were primarily agricultural, by the 1870s and 1880s an important host of industrial and service activities had already emerged. A government survey in 1886 found 43,585 commercial and industrial businesses in Brazil[281].

An additional survey in the same year, based on 20,930 industrial and commercial establishments, found that 17,503 of them were owned by single individuals, and 3,427 (or 16.4 percent) were organized as joint stock companies[282].

In the following year (1867) another government survey was made about the number of companies (Brazilian and Foreign) organized as joint stock, and capable of being listed in Stock Exchanges in order to trade shares and bonds[283]. The survey found a total of 69 companies. They belonged

280 The mean is 5.44 percent, the median 4.76 percent, and the mode between 4.5 percent and 5.5 percent.

281 In 1854-1855 this figure was 39,597. So, there was an increase of 3,988 firms during the decade. The survey was made by the *Comissão de Estatística do Ministério da Agricultura, Comercio e Obras Públicas, and published in Relatório do Ministério da Agricultura*, 1866.

282 In Portuguese language, *sociedades por ações*, meaning public companies.

283 Published as the *Relação das Companhias Nacionais e Estrangeiras que funcionam no Império, in Relatório do Ministério da Agricultura,* 1867, Anexo 1, Volume 1.

to diverse sectors of economic activity: railroads, insurance, navigation, gas lighting, mining, water supply, toll roads, market plazas and others. The total nominal capital reached 108 million *milréis*, equivalent to 10 million sterling pounds[284]. There were 20 foreign owned companies, with an average capital of 303,459 sterling pounds, and 49 Brazilian owned companies, with an average capital of 83,165 sterling pounds.

In 1887 the government published another survey of the joint stock companies[285]. By that time, or during the two decades after the 1867 survey, their number had increased to 135 companies, with a total capital of 270 million *milréis*, or 25 million sterling pounds[286]. They had also diversified, as can be seen in Table 8.2.

The historical evidence available shows that one segment of the coffee planters invested in bonds and stocks. Among the items listed in the 1873 Inventory of the Barão de Nova Friburgo, one of the leading coffee planters of Brazil during the time, we found he owned 8,371 sterling pounds equivalent worth of government bonds, bank and insurance stocks[287]. According to one participant of the 1878 Agricultural Congress, the large planters (*Grande Lavoura*) were divided in three classes, one of them consisting of coffee planters that also had investments in bonds and stocks[288].

Coffee planters not only invested in stocks and bonds, but, more important, they also founded and promoted railroads and other commercial and industrial joint stock enterprises. Coffee planters during this period showed a high degree of entrepreneurship. They engaged in many activities other than coffee plantations, like the brokerage side of coffee trade, banking activities, manufacturing, development of the institutional process necessary to bring the Italian immigrants to Brazil, and other businesses linkages connected to coffee producing[289].

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284 The total capital was 108,003:217$. This figure was converted in sterling pounds (£10,097,533) with the exchange rate of 10$696 per sterling pound, published in *Anuário Estatístico do Brasil*, 1939-1940, p. 1.353.

285 Published as the "*Relação das Sociedades Anonymas, organizadas depois da Lei no. 3,150 de 4 de Novembro de 1882, que achavam-se funcionando legalmente até 31 de Dezembro do ano passado", in Relatório do Ministério da Agricultura*, 1887.

286 The total capital was 269,929:200$, or £25,236,462, using the exchange rate for 1887 of 10$696 per sterling pound, published in the *Anuário Estatístico do Brasil*, 1939-1940, p.1.353.

287 The Barão owned 250 Provincial bonds of 200$000, 100 shares of the Banco do Brazil and 10 shares of the insurance company Argo Fluminense, totaling 77:000$000. In "*Inventário (June 14, 1873) Barão e Baroneza de Nova Friburgo (Antonio Clemente Pinto)*" deposited in the Arquivo Nacional". Listed in Appendix B.

288 *Congresso Agrícola*, 1878, p. 134.

289 For a description of entrepreneurship of São Paulo coffee planters, see Warren Dean, "The Planter as an Entrepreneur: The Case of São Paulo", in *Hispanic American Historical Review*, XLVI, No. 2 (May 1966), p. 138-152.

The principal undertaking, however, was in the construction and promotion of a railway network. In both the Rio de Janeiro and São Paulo provinces coffee planters founded, organized as joint stock companies, issued shares in the market, became also shareholders, and participated in the company boards[290].

TABLE 8.2

Joint Stock Companies: Total Number and Capital According to Economic Activities, 1887 (in one thousand *milréis*)

ECONOMIC ACTIVITIES	Number of Companies	Capital (in 1,000 milréis)
Railroads	14	51,356
Banks and savings institutions	13	87,400
Insurance (maritime and others)	13	32,500
Street cars	13	25,600
Navigation	5	11,300
Mining	6	6,900
Central sugar factories	9	6,300
Docks	2	6,000
Immigration and colonization	5	5,000
Water supply	2	3,700
Electricity and telephones	4	3,350
Industrial manufacturing	6	2,878
Building construction	6	2,675
Carriages and coaches (rental)	1	800
Amusement parks	4	254
Metal and ceramic artifacts	4	338
Dynamite	1	180
Mutual assistance	2	105
Laundry	1	100
Knife manufacturing (cutlery)	1	45
Agricultural and husbandry	1	8,000
Brokerage	1	1,000
Commerce and agriculture	1	800
Market plaza	1	500
Zoological garden	1	263
Commerce of lotteries	1	200
Educational establishments	1	50
Real state	1	25
Textiles	15	12,310
TOTAL	**135**	**269,929**

SOURCE: *"Resumo da Relação de Sociedades Anonymas, organizadas depois da Lei no. 3,150 de 4 de Novembro de 1882, que achavam-se funccionando até 31 de Dezembro do anno passado", in Relatório do Ministério da Agricultura, 1887.*

290 In the Rio de Janeiro Province, the Dom Pedro II Railway, that would become later the greatest trunk line in the country, was promoted (they, however, lost their bid for the concession) by coffee planters of Vassouras, that even hired two engineers from England to design and plan the line (Taunay, *História do Café, IV*, p. 398). Another railroad, the *Companhia Estrada de Ferro do Cantagallo*, was organized as a joint stock company by the coffee planter Barão de Nova Friburgo in 1857 (Taunay, *História do Café, IV*, p. 410). In the São Paulo Province, the *Paulista Railway Co.* and the *Mogyana Railway Co.* were organized as joint stock companies in 1862 and 1872, respectively, with a leading participation of coffee planters.

Investments and Returns in Joint Stock Companies in Brazil

In this section, however, we are interested only in having a picture of the rates of return coffee planters would obtain by simply using their capital, rather than their capital and entrepreneurship, in other activities than coffee plantations[291].

By choosing the joint stock companies operating in Brazil in a variety of activities (banks, railroads, streetcars, navigation, insurance, private roads, market plazas, gas lighting and others) and whose stocks were not closely held but actively transacted in the stock exchange market, we can estimate their yearly rates of return, and then to suggest the realization obtained on capital goods with the characteristics of long-term and relatively higher risk when compared with fixed income investment in the financial market[292].

There was an active market for the bonds, stocks and shares of a number of joint stock companies in the stock exchange market of Rio de Janeiro. The *Retrospecto Commercial do Jornal do Commercio* published for some years the capital stock, the number, par, and value market of shares and bonds, and the nominal dividend rate.

In Table 8.3 we make use of this information, for a sample of 65 companies, with a total capital of 176 million *milréis* or 17 million sterling pounds, to derive the average yearly rates of return on investment on various economic activities with stocks transacted in the Rio de Janeiro Stock Exchange Market in 1877, 1878, and 1882[293].

The rates of return for each of the 9 economic activities are a weighted average, the weights being the capital stock of each joint stock company. Both the simple and the weighted average for the total of joint stock companies show fluctuations, with the central values in the range of 11 percent to 12 percent during the period.

Although the information presented in Table 8.3 covers only three years, they indicate that the rates of return on those activities fluctuated widely during the period. This was due partly to the still incipient and not well established capital markets. More important, however,

291 See Pedro c. de Mello, "Mercado de Capitais e Desenvolvimento Econômico", Helio O. Portocarrero de Castro (editor), *Introdução ao Mercado de Capitais* (Rio de janeiro: IBMEC, 1979).

292 According to the report on the Brazilian coffee trade by the British Consul-General in 1882, "those railroads pay dividends at the rate of ten to fourteen per centum per annum. All but one are native enterprises, in many instances many planters being large shareholders, who grumble at low coffee prices, but not at their railroad dividends". Quoted in Lock, *Coffee: Its Culture and Commerce in All Countries*, p. 176.

293 The total capital of those companies in 1878 was 175,921:000$ or £16,813,628 using the exchange rate of 10$463 per £ of 1878.

those fluctuations suggest that some of those economic activities, like manufacturing and railroads, were perhaps riskier than the investments in the long established slave, real estate and coffee markets, and therefore in coffee plantations[294].

TABLE 8.3

Average Yearly Rates of Return * on the Stocks of Various Economic Activities, transacted in the Rio de Janeiro Stock Exchange market, in 1877, 1878, and 1882 (rates in percentages)

ECONOMIC ACTIVITIES	Realized Capital in 1878 (Thousand *Milréis)*	Yearly Rate of Return on Investment 1877, in %	Yearly Rate of Return on Investment 1878, in %	Yearly Rate of Return on Investment 1882, in %
Banks [a]	72,132	16.98	15.46	6.47
Railroads [b]	24,676	-3.46	10.32	- 4.25
Street cars [c]	11,200	8.43	11.78	10.19
Navigation [d]	7,432	35.84	30.25	12.48
Insurance [e]	25,800	16.18	25.36	29.94
Private toll roads [f]	1,980	10.65	13.34	2.95
Market plazas [g]	1,000	2.64	- 1.30	0.26
Gas lighting [h]	8,100	20.02	- 20.12	- 5.20
Others [i]	23,601	-3.61	27.56	- 1.72
TOTAL	**175,921**			
Simple average of the rates		**11.52**	**12.52**	**5.12**
Weighted average (by capital) of the rates		**11.47**	**16.45**	**6.45**

NOTES: * Sum of real dividend rate and the real capital gains rate. Within each economic activities the rates are weighted by the capital stock of each company.

SOURCE: For the nominal dividend rate, capital, par and market value of stocks, *Retrospecto Commercial do Jornal do Commercio*; for Price Index, Buescu, *300 Anos de Inflação*, p. 223.

a *Banks:* do Brazil; Rural e Hypothecario; Commercial do Rio de Janeiro; English of Rio de Janeiro; Industrial e Mercantil; Mercantil de Santos; Predial; and do Commercio.

b *Railroads*: Petropolis; Macahé a Campos; Paulista; Sorocabana; Leopoldina; Nitheroyense; Campos a São Sebastião; São Paulo à Rio de Janeiro; and União Valenciana.

c *Street Cars*: São Christovão; Jardim Botânico; São Paulo; Pernambuco; Pelotas; São Luiz do Maranhão; Porto Alegre; Villa Izabel; Locomotora; and Carris Urbanos.

d *Navigation*: Navegação Brasileira; Espírito Santo e Campos; União Nitheroyense; Ferry; Paulista; and Fluvial do Espírito Santo.

e *Insurance*: Fidelidade; Argos Fluminense; Garantia; Nova Permanente; Nova Regeneração; Confiança; Integridade; and Popular Fluminense.

f *Private Roads*: União e Indústria; and Magé a Sapucaia.

g *Market Plazas*: da Gloria; da Harmonia; and do Mercado Nitheroyense.

h *Gas Lighting*: do Rio de Janeiro; de Nitheroy; and de Campos.

i *Others*: Transportes Marítimos de Salvamento; Bonds Marítimos; Docas de D.Pedro II; Brazil Industrial; União Industrial; Florestal Paranaense; Melhoramentos de Santos; Carruagens Fluminense; Commercio e Lavoura; Architectonica; Petropolitana; Economia Auxiliar; Pastoril Agrícola e Industrial; Material para Construção; and Industrial Fluminense.

294 The sample showed in Table 8.3 is biased in favor of the most lasting and therefore most successful companies. I did not include some companies which had their stocks floated in the Rio de Janeiro Stock Exchange market, but never progressed beyond the planning stage or initial construction stage, or those failing after a few years.

The rates of return on investment of shares in joint stock companies presented in Table 8.3 cover only the years of 1877, 1878, and 1882. A complete coverage for the period 1870-1888 can be obtained by using the information contained in the *London Stock Exchange Year Book* [295].

This, however, is not a small sample. The second half of the 19th century dates the onset of Brazilian modernization in a set of economic activities, and in many senses the British were prominent during this period, particularly as a source of foreign investment in Brazil[296].

We selected only the joint stock companies with sole operation in Brazil, even though some of them had their legal domicile in England. In the context of this Chapter, however, it is not important the location of the legal domicile of the joint stock company, since those financial instruments (shares, debentures, and bonds) issued in London could and were transacted in Brazil, and in some cases simultaneously issued (with public offering) in the Rio de Janeiro Stock Exchange and London Stock Exchange markets[297].

Table 8.4 presents the number and capital of British organized joint stock companies operating in Brazil up to 1888, most of them having their legal domicile in London (railroads; shipping and ports; gas, water drainage and tramways; telegraph; banks; mining; sugar factories; cotton mills; flour mills; and miscellaneous). Information on the expended capital up to 1888 is not available for all companies. The figures on capital in current sterling pounds were deflated by the Sauerbeck-Statist Price Index, in order to obtain the results in 1888 sterling pound values[298].

This total capital stock of British investments in Brazil up to 1888, approximately 47 million sterling pounds, shows the importance of British investments in Brazil during this period[299]. We have calculated from

295 *London Stock Exchange Year Book*, 1890 and 1891.

296 Great Britain was the overwhelming source of foreign investment in Brazil during this period. For an account of the importance of the British presence in Brazil, see Allan K. Manchester, *British Preeminence in Brazil, Its rise and Decline* (Chapel Hill: University of North Carolina Press, 1933); Richard Graham, *Britain and the Onset of Modernization in Brazil, 1850-1914* (Cambridge: Cambridge at the University Press, 1968). About British investments in Brazil, see Ice, "British Direct Investments in Brazil up to 1901", and St. Angel, "British Investment in Brazilian Railroads, 1880-1913".

297 The *Retrospecto Commercial do Jornal do Commercio* regularly presented dividend and stock price information for various joint stock companies with legal domicile in London and sole operation in Brazil. The values were shown in Sterling Pounds, an indication that there were shareholders owning and trading the securities. These securities were also transacted in the Rio de Janeiro Stock Exchange market, and in general they were listed both in British and Brazilian currency.

298 The Sauerbeck –Statist Price Index is reprinted in B.R. Mitchell and P. Deane, *Abstract of British Historical Statistics* (Cambridge: Cambridge at the University Press, 1962), pp.474-475.

299 The bulk of British investments in Brazil, however, was not in direct investments, but in government stocks and bonds. According to Ice, in 1900 the total British investments in Brazil approximated 160 million sterling pounds, and of this amount 98 million were in government stocks and bonds, 30 million in railway companies and 32 million in miscellaneous companies. See Ice, "British Direct Investments in Brazil up to 1901".

Wileman's Year Book of 1908 the total capital of all joint stock Brazilian owned companies (excluding railroads), which had their legal domicile and operation in Brazil, and which were created before 1888, but still existent in 1908[300]. The total of the authorized initial capital in *milréis* of the 54 companies, that we have converted in sterling pounds and deflated by the Sauerbeck-Statist Price Index, is approximately 13 million sterling pounds[301] . We have added to this figure the total capital of the 37 Brazilian owned railroad companies operating and having their legal domicile in Brazil, obtained from the South American Journal and Pessoas' report on railways of Brazil[302] . The expended capital in *milréis*, converted in sterling pounds and deflated by the Sauerbeck-Statist Price Index, shows a total of almost 26 million sterling pounds[303].

TABLE 8.4

British Investments in Joint Stock Companies in Brazil up to 1888*
(Number and Capital according to Economic Activities)

Economic Activities	Number of Companies	Capital in Sterling Pounds (Thousands of Sterling Pounds of 1888**)
Railroads	21	30,047
Shipping and port	17	3,398***
Gas, Water drainage and tramways	20	4,804
Telegraph	3	2,805
Banks	3	3,446
Mining	7	988
Miscellaneous	9	1,103***
Total	**80**	**46,951**

SOURCE: * This list was adapted from the London Stock Exchange Year Books of 1881, 1887, and 1890; "Railways of South America, I – Empire of Brazil", in South American Journal, 11 July 1885, p. 341; Cyro D. R. Pessoa Jr., *Estudo Descriptivo das Estradas de Ferro do Brazil* (Rio de Janeiro: Imprensa Nacional, 1886), Appendice; Wileman, *Brazilian Year Book*, 1909; and Michael G. Mulhall, *The English in South America* (Buenos Ayres: Standard Office, 1878), p. 531.

** Sauerbeck-Statist Price Index, in Mitchell and Deane, *Abstract of British Historical Statistics*, pp. 474-475.

*** The figure of the capital stock for some of the companies of this economic activity is missing, so this total presented underestimates the total amount of capital of this category.

The grand total of the capital invested in the Brazilian joint stock companies (as defined above) is £ 39,059,939, in sterling pounds of

300 Wileman, *Brazilian Year Book,* 1908.
301 £13,001,331 in 1888 sterling pounds.
302 "Railways of South America, I – Empire of Brazil", in *South American Journal*, 11 July 1885, p. 341; Pessoa, *Estudo Descriptivo das Estradas de Ferro do Brazil*, Appendice.
303 £25,968,608 sterling pounds of 1888.

1888. Although this figure is a small underestimation of the capital stock, nevertheless the estimate of 39 million sterling pounds of Brazilian owned capital stock in joint stock companies, by comparison with the equivalent British owned capital of 47 million sterling pounds, shows the importance of British investments in Brazil.

With the information contained in the *London Stock Exchange Year Book* it is possible to construct series of yearly rates of return (sum of dividend and capital gain rates) for railroads, transportation and others, banks and gas companies. We were able to obtain figures of the average market price of stocks for only three periods in time[304].

Since there was a period of price deflation in Great Britain between 1870 and 1888, the rates are presented in their real values[305]. The rates of return are presented in Table 8.5. As in Table 8.4, the sampling procedure used selected the more lasting companies, and therefore the most successful ones. Thus there was a bias in the direction of overestimation of those rates of return[306].

There were wide fluctuations in the weighted average rates[307] for each of the four economic activities during the period, but the central tendency did not vary much among them, being between 9 percent and 10 percent for railroads, 8 percent and 9 percent for transportation and others, 11 percent and 12 percent for banks and between 10 percent and 11 percent for gas companies. We also present, as a standard of comparison, the yearly rates of return (average of 12 percent in the period) of the São Paulo Railway Company. According to Graham, "the most profitable British railway enterprise anywhere in Latin America."[308]

For the total British investments presented in the Table a weighted average rate of return was obtained, by using the total capital stock of each economic activity as the weight[309] . The central tendency of this aggregate rate in the period is between 9 percent and 10 percent, although the distribution is skewed to the left[310].

304 For the companies created before 1880, the market value, when floated, in 1880 and 1889; for those created after 1880, only the floating value when issued and the value in 1890. Thus the yearly market prices were obtained by linear interpolation.
305 The nominal figures on stock prices and dividends were converted in real values by the Sauerbeck-Statist Price Index.
306 Of the 80 companies included in Table 8.4, I selected 20 joint stock companies with a total capital of £14,766,300.
307 Weighted by the capital stock of each firm within the economic activities.
308 "*Graham, Britain and the Onset of Modernization in Brazil, 1850-1914*, p. 66. See also pp. 60-65. This series of returns was estimated based on Appendix B of Graham's book, which contains the financial record of the company.
309 Railroads (£10,790,000); Transportation and others (£1,705,500); Banks (£1,000,000); and Gas Companies (£1,270,800).
310 The arithmetic mean is 9.38 percent, median 9.79 percent, and the mode between 9 percent and 11 percent.

TABLE 8.5

Average Yearly Rates of Return* on the Stocks of Various British Investments in Brazil, Transacted in the London Stock Exchange Market, 1870-1888

YEAR	São Paulo Railway	Railroads (All Companies Listed)	Transportation and Others	Banks	Gas Companies	WEIGHTED AVERAGE RATE OF RETURN**
1870	9.96	7.10	...	...	6.72	**7.06**
71	4.52	3.04	...	...	5.87	**3.34**
72	4.11	4.55	...	5.36	8.79	**5.03**
73	23.96	18.61	...	12.35	13.00	**17.58**
74	18.98	14.63	12.91	13.93	14.10	**14.33**
1875	11.16	11.14	9.28	11.04	11.96	**10.99**
76	15.31	12.02	9.33	11.29	12.47	**11.69**
77	16.97	13.12	10.43	11.84	13.61	**12.76**
78	14.60	10.76	5.66	8.76	10.20	**9.98**
79	12.27	8.86	3.71	7.43	9.10	**8.18**
1880	12.58	6.99	4.71	10.88	8.26	**7.10**
81	13.27	9.05	9.15	14.63	12.86	**9.77**
82	6.29	8.06	10.43	15.93	13.26	**9.31**
83	14.38	11.10	12.45	16.93	12.78	**11.80**
84	10.42	10.77	12.44	17.40	12.71	**11.58**
1885	14.24	10.09	7.51	14.96	10.06	**10.12**
86	10.66	7.31	4.86	12.18	7.08	**7.33**
87	4.90	4.01	5.74	9.02	5.89	**4.71**
1888	10.43	5.24	5.93	7.73	6.20	**5.56**

NOTES: * Sum of real dividend rate and the real capital gains rate (weighted average by capital in each class of British investments).

** It does not include the São Paulo Railway Co. separately, since these rates of return are already included in the average of all railroads

SOURCES: For the nominal dividend rate, capital, par value, and market value of stocks, the *London Stock Exchange Year Books, 1881 and 1890*; for the price index, Sauerbeck-Statist, reprinted in Mitchell and Deane, *Abstract of British Historical Statistics*, pp. 474-475; the rates of return of the São Paulo Railway were calculated from the par value of the stock, nominal dividend rate and share prices of the *Financial Record of the São Paulo Railway Company LTD*, as presented by Graham, *Britain and the Onset of Modernization in Brazil, 1870-1914*, pp. 326-329.

NAME OF THE COMPANIES INCLUDED IN THE TABLE: **Railroads**: Bahia and São Francisco; Brazilian Imperial Central Bahia; Conde D' Eu; Great Western of Brazil; Imperial Brazilian Natal and Nova Cruz; Minas and Rio; Porto Alegre and New Hamburg; Recife and São Francisco; San Paulo; São Paulo and Rio de Janeiro. **Transportation and Others**: Rio de Janeiro City Improvement; Brazilian Street Railway; Amazon Steam Navigation. **Banks**: English of Rio de Janeiro; London & Brazilian. **Gas Companies**: Bahia; Nictheroy; Pará; Rio de Janeiro; São Paulo.

TOTAL CAPITAL IN STOCKS (Sterling Pounds): Railways (£10,790,000); Transportation and Others (£1,705,000); Banks (£1,000,000); and Gas Companies (£1,270,000).

Resuming the results of Tables 8.3, 8.4 and 8.5, we can assess the likely values for rates of return under different conditions of risk. We estimate that the rates of return for short term and relatively riskless investment opportunities, like demand deposits and government bonds, were between 4 percent and 6 percent. The realization on guaranteed private bonds and the prime commercial papers was between 7 percent

and 9 percent. For the relatively high risk[311] and long term investments in joint stock companies (and in a sample procedure which favored the most successful ones) the rates of return were between 9 percent and 11 percent, perhaps 12 percent.

As we commented earlier, we have no a *priori* reasons to consider investment in slaves on coffee plantations (excluding for a while the problem of expectation of abolition) with a higher risk than in joint stock companies, or at least in some of them, like railroads. The slave market in Brazil had been functioning for more than three hundred years, and investors in slaves had a large body of accumulated experience to draw upon when assessing the expected values of the relevant variables in a slave investment decision. Thus the element of uncertainty was probably lower in the slave investment decisions than in transportation or manufacturing [312]. Even the risk element, present in any investment decision, had been reduced during this time for some of the variables involved in the slave investment decision making. There was, for instance, insurance companies offering policies to insure on slave diseases, flight, and death[313]. Finally, coffee planters had properties manned by large number of slaves, and had to invest in bulk to purchase slaves, and thus, by diversification, could dilute the risk of the investment (represented mainly by the probability of unexpected death or serious health impairment of a single slave).

Cost of Capital and the Alternative Rate of Return: Final Comments

Before concluding this Chapter, it is useful to estimate what was the cost of capital faced by coffee planters when borrowing in the money and capital markets. In the contemporary chronicles coffee planters complained at the time of the high interest rates they had to pay when borrowing funds[314]. Part of the outcry – sometimes planters reported

311 One of the most used measures for risk in financial investments is the coefficient of variation (the ratio of the standard variation over the mean). We can observe in Tables 8.4 and 8.5 that the real rate of return fluctuates a lot in the annual series, an indication of high standard deviation.

312 The demand for slaves was based on the value of the marginal product of labor. The planters could manage the labor productivity, but depended – and this was the main element for risk – on the behavior of coffee prices. As we saw in Chapter 2, the coffee market – both prices and quantities – was booming during this period. The other element of the slave price – the supply conditions – was seen in Chapters 6 and 7, and there we discussed the associated risk conditions. Overall, save the political scenario discussed in Chapter 10, we can assess the risk associated with investment of slaves as being at least compatible with other means of investment available to the planters.

313 There existed even an insurance company with the name of "Slave Life Insurance Union" (*União Seguros de Vida dos Escravos*). Quoted in Stein, *Vassouras*, p. 310. Ferreira Soares mentions that there existed slave insurance during the cholera epidemics in Brazil (1855-1856). Soares, *Elementos de Estatística, Tomo II*, p. 48.

314 See Ryan, Joseph J. "Credit where Credit is Due: Lending and Borrowing in Rio de Janeiro, 1820-1900" (Ph.D. Dissertation, University of California Los Angeles, 2007); Saes, Flávio. *Crédito e Bancos no Desenvolvimento da Economia Paulista (1850-1930)*. (São Paulo: IPE/USP, 1986).

they were asked rates as high as 18 percent for long term loans – can be explained by the fact that planters meant not the interest rate alone, but the sum of the interest rate and the amortization rate (repayment of the principal)[315].

Part of it, however, had more substantial causes. For the period 1850-1870, given the more imperfect capital and money markets, poor transportation and communication, inflation and financial panics (like the ones in 1858 and 1864 in Rio de Janeiro), and the incipient banking system (with lack, for instance, of mortgage institutions), there were wide fluctuations of the lending rate for coffee planters[316]. According to Laerne, in those earlier times the majority of the planters even had to carry on coffee planting with their own money[317].

There were even some untypical months in which, for an accumulation of circumstances, this rate was in fact above 12 percent. On the average, however, according to Ferreira Soares, perhaps the best qualified Brazilian expert in economic and statistical matters at this time, the interest rate charged by the market (in the 1860s) was around 10 percent, with sometimes an extra 2 percent added as risk and transactions cost factors[318]. The same proposition had been made earlier by Lacerda Werneck. He said the interest rate for the loans to coffee planters was composed of two parts, one the rent of capital, and the other the risk component[319] . For him the average interest rate in that definition was 12 percent[320], and that the rates of 15 percent and 18 percent argued by some observers were not representative of the market average[321] .

In the 1870s and 1880s the average lending rate to coffee planters had dropped to a value around 8 percent to 10 percent. Many causes concurred for this improvement of the money and capital markets during this period[322]. First, there was a general progress in the economic

315 "*Proposta do Banco do Brazil", in Relatório do Ministério da Fazenda*, 1872, pp. 22-23. This double meaning of the Word causes great confusion among modern scholars trying to interpret coffee planters' complaints about high interest rates.
316 For claims of high interest rates being charged, see *Relatório do Ministério da Agricultura,* 1876, pp. 17-18; Augusto de Carvalho, O Brazil: Colonização e Imigração, 2nd. Ed. (Porto: Imprensa Portugueza, 1876), p. 234.
317 Laerne, *Brazil and Java*, p. 212.
318 Soares, *Elementos de Estatística, Tomo II*, p. 41.
319 L.P. de Lacerda Werneck, *Estudos sobre o Crédito Rural e Hypothecário, seguidos de Leis, Estatutos e outros Documentos* (Rio de Janeiro: B. L. Garnier, 1857), p. 6.
320 Ibid, p. 56.
321 Ibid, p. 56.
322 The debate among coffee planters in the *Congresso Agrícola* (Agricultural Congress) of 1878 is a very good and illustrative example of how coffee planters approached the problem of the cost of capital they faced, and how they perceived the changing situation in the capital and money markets. In particular, the degree in which it was subtly improving in relation to the 1860s, how the emerging role of the government in long term agricultural loans could be used in their favor, and also how the relative differences among them in terms of political power, economic situation and geographical location could affect their position as borrowers. *Congresso Agrícola, Collecção de Documentos*, pp. 52, 134, 149, 155, 169, 170, 172, 175, 180, 189.

conditions, and particularly in transportation and communication. Second, there was the increasing role of the government owned *Banco do Brazil* in providing long term agricultural loans at very favorable conditions. The great impulse in this respect was caused by the enactment of Law 2.400 of 17 September 1873, which gave more resources and improved the Bank's mortgage loan practices[323]. Interest rate was fixed at 6 percent and amortization at the maximum of 5 percent yearly[324]. By 30 June 1888 the Bank had given mortgage loans to 1,350 plantations, all in the coffee producing provinces, totaling 76,263:213$000[325] .

In addition, there was the creation of mortgage and long term credit private banks[326] , and the progressive elimination of the Comissarios do Café (coffee factors) as money lenders and middlemen between planters and money and credit institutions, due to the development of the latter[327].

Thus, to conclude this Chapter, we estimate that the alternative rate of return for the period 1871-1888 was in the range of 8 percent to 12 percent, with the central value around 10 percent.

323 *Relatório do Ministério da Agricultura,* 1876, p. 18.
324 Ibid, p. 18.
325 *Relatório do Ministério da Fazenda*, 1889, p. 7.
326 Stein, *Vassouras,* pp. 19-20, 52, 239-240.
327 For complaints of coffee planters about coffee factors money lending practices, see *Congresso Agrícola, Colecção de Documentos*, pp. 151, 155. Stein traces the role of the coffee factors as source of credit in the 1850s and 1860s and the progressive elimination of the planter-factor-bank triangle of debt in the 1870s and 1880s, and the emergence of a new financial era. Stein, *Vassouras,* pp. 19, 20, 47, 52, 238.

PART V

Profitability and Viability of Slavery in Brazil

The next two chapters are the core of this book. We will examine in Chapter 9 the issue of profitability of slavery, and in Chapter 10 the issue of economic viability of slavery. They are the core of the book because there is an intense debate around those two issues, which we outlined in Chapter 1. Our intention, in the next two chapters, is to use empirical evidence collected for chapters 9 and 10, as well as economic tests specially designed, plus the elements shown in chapters 2 to 8, in order to address the following questions: First, was slavery profitable for coffee planters, and was it viable to resort on slaves to expand coffee production? Second, if slavery was so important in economic terms, how to explain its final demise in 1888?

CHAPTER 9

Rates of Return on Slave Capital in Coffee Plantations, 1871-1881

The test we are going to use to examine the profitability of slavery in coffee plantations consists of estimating the rate of return on slave capital and of comparing it with the alternative rates of return on capital assets other than slaves.

This is not a test of the economic viability of the system of slavery, but merely an estimation of the internal rate of return (IRR) on the purchase price of slaves engaged in coffee production.

Based on the IRR obtained, we can make a comparison with the alternative rate of return on financial investments obtained in chapter 8, and then to assess the profitability of the investment in slaves.

Purpose of the Test

This book is concerned with a particular industry (coffee plantations) in a particular region (the Southeast) of which only a fraction of the total population is involved in the analysis. The subpopulation under study represents approximately one-fifth of the total number of slaves in the country at its peak in 1883[328].

It is valid, therefore, to calculate economic profitability using not the rearing costs but the market price of slaves as a cost of investment, against which the internal rate of return must be determined. Such a test of profitability is important in helping to explain some historical questions raised by the debate over slavery in coffee plantations, and can show whether or not the demand for slaves was increasing between 1871 and 1881 due to economic reasons.

A finding that a planter who purchased a slave at market price could have made a rate of return equal to or better than that of alternative investments with a similar risk, would mean, first, that regardless of how inefficient slave labor was in relation to free labor, coffee planters who employed it were making profits from its use.

Second, that if there were planters demanding slaves for reasons of conspicuous consumption (for reasons of "status" and "social prestige"), in addition to reasons of production, the aggregate demand of this category of slave owners was too limited to raise the market price of slaves above the level dictated by normal business considerations. If for most coffee planters (and the Paraíba Valley planters constituted the majority of the planters during this period) the desire for prestige was part of their demand for slaves, slave prices would have been above the level dictated by business considerations alone, and the rate of return would have been lower when compared with assets of equivalent risk, the difference being the premium paid by conspicuous consumption.

Finally, that if planters had a pre-capitalist mentality and were bound by traditional attitudes and paternalistic behavior, this did not prevent them from responding to economic incentives and from allocating resources as would any other market-oriented business entrepreneur having a capitalistic mentality.

328 Laerne estimated as 284,007 the number of slaves engaged in coffee planting, about 21.1 percent of the 1,346,648 slaves who (according to his reading of the registers) ought to have been alive in June 1883. See Laerne (1885), 368.

Calculation of the Test

For the test of profitability, this book will make use of the Fogel and Engerman approach (F-E) for the year of 1873[329] (Fogel and Engerman 1974a, 2:80-81) and of an adaptation of the Evans approach for all the other years (in three-year periods) in the period from 1871 to 1881 (Evans 1962).

The F-E approach uses the following equations.

$$P_s = R_f \sum_{t=1}^{N} \frac{\theta_t \lambda_t}{(1+i)} t \qquad (1$$

$$\theta_t = \frac{R_t}{R_f} = \frac{\frac{(1+i)^{0.5}}{\lambda_{t-0.5}/\lambda_{t-1}} P_{st} - \frac{\lambda_t/\lambda_{t-0.5}}{(1+i)^{0.5}} P_{s(t+1)}}{R_f} \qquad (2$$

Where Ps = price of slaves, Rf = annual net revenue derived from a slave, Φ = ratio of the net earnings of a slave of a given age to the average peak-age net earnings of a slave, λ t = probability that a slave will live through year t, i = rate of return or rate of discount, f = subscript denoting prime field hands, and t = time in years.

These equations yield simultaneous estimates of the rate of return (i) and the age-specific hire rates (Φt Rf) from data on the distribution of slave prices by age and gender, on the estimate of slave longevity, and data on the annual net revenue derived from a slave. The estimates of slave longevity by gender and age groups have been presented in Chapter 7[330]. Table 9.1 presents the upper bound, lower bound , and average values of λ t for male and female slaves in five-year groups[331].

329 Fogel and Engerman *Time on the Cross*, volume 2, p. 81.
330 The values of λ t are a transformation of the values of lx presented in the Appendix A, Tables A.9 and A.10.
331 The values of λ t used in the computation, in a half-year basis, were obtained by linear interpolation.

TABLE 9.1
Values of λt for Male and Female Slaves

Age	Male Upper Bound	Male Lower Bound	Male Average	Female Upper Bound	Female Lower Bound	Female Average
1	0.67	0.59	0,63	0.72	0.65	0.68
5	0.53	0.44	0.48	0.57	0.48	0.52
10	0.50	0.41	0.45	0.53	0.44	0.48
15	0.47	0.39	0.43	0.50	0.43	0.46
20	0.44	0.36	0.40	0.47	0.39	0.43
25	0.42	0.33	0.37	0.43	0.35	0.39
30	0.38	0.29	0.34	0.39	0.31	0.35
35	0.33	0.26	0.30	0.35	0.28	0.32
40	0.30	0.22	0.26	0.32	0.24	0.28
45	0.25	0.19	0.22	0.28	0.21	0.25
50	0.21	0.15	0.18	0.24	0.18	0.21
55	0.17	0.12	0.14	0.21	0.15	0.18
60	0.13	0.08	0.11	0.17	0.12	0.14
65	0.09	0.06	0.07	0.12	0.08	0.10
70	0.05	0.03	0.04	0.08	0.05	0.06

Source: Tables A.9 and A.10, Appendix A

Prices of slaves of a given age varied according to gender, skill, profession, health, and physical complexion. Figure 9.1 presents the distribution of the average relative price for each age of male and female slaves.

Each average price (for each year of age) is expressed as a proportion of the average peak-age price of slaves aged twenty to twenty-nine. We used a sample of fifteen coffee plantations from the province of Rio de Janeiro functioning in 1873[332]. The total number of slaves was 2,169, comprising 1,153 male and 1,016 female slaves. A seventh-order polynomial on age was fitted to those values[333]. These fitted curves with the smoothed values of Pt are presented in Figure 9.2.

332 For the list of 1873 coffee plantations, see Appendice B.

333 The equation was in the form of

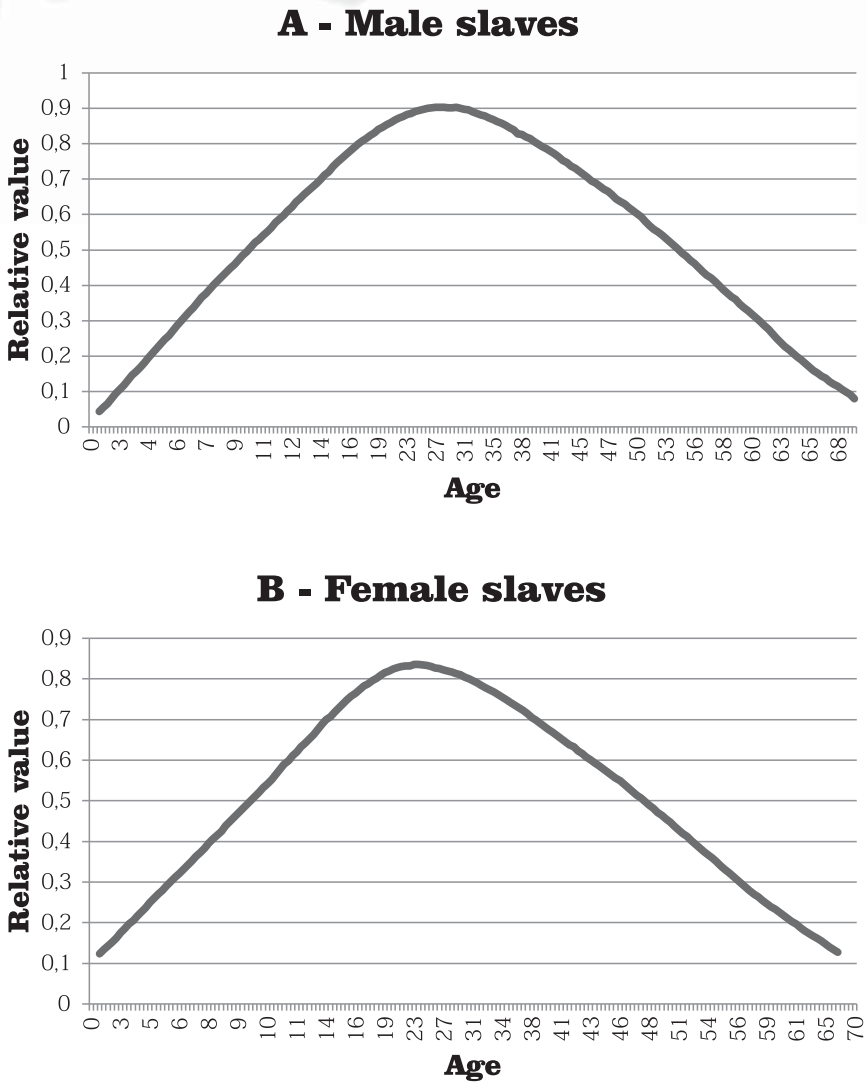
$$P_t = \alpha_0 + \sum_{j=1}^{7} \alpha_j t^j$$

The values o j from j=3 to j=7 were tried, and the best fit given by the seventh-order polynomial. The results for the relative prices according to age are

Male slaves R-square= 0.9672 F-statistic (7,69) = 290.298
Female slaves R-square= 0.9664 F-statistic (7,63) = 258.552

Figure 9.1. Relative age prices profiles of slaves, Rio de Janeiro coffee plantations, 1873. A: Male slaves; B: Female slaves.

Figure 9.2: Averages of prices relative to age (fitted relative prices), male and female slaves. Province of Rio de Janeiro, 1873. A: Male Slaves; B: Female slaves



The yearly net rent received by slave owners renting out slaves is a good estimate of the annual income earned by the slave capital good. The series on monthly hire rates have been presented in Chapter 5. In order for these hire rates to be interpreted as estimates of annual net income received by the slave owners, adjustments have to be made.

Estimates of Net Revenue of Slave Prime Field Hands

Given the sensitivity of the results of the analysis to the value of R_f, four estimates of the net income based on different methods of adjustment have been computed. Three of these use information on hire rates, while the fourth is an estimate of the value of marginal product of slave labor based on a production function. The objective is to obtain the best possible estimate of the net value of the marginal product of slave field hands in coffee plantations for 1873, and then to use it to generate an annual series for the period 1871-1881, based on monthly hire figures presented in Table 9.2[334].

TABLE 9.2
Hire Rates of Male Slaves Agricultural Laborers Rio de Janeiro, 1871-1888 *(milréis)*

YEAR	Nominal Monthly Hire Rates	Standard Deviation	Number of Slaves	Real Monthly Hire Rates	Real Annual Hire Rate
1871	24.1	4.3	13	24.1	181.0
1872	22.5	3.6	19	22.4	168.2
1873	24.3	3.5	24	24.3	182.5
1874	26.7	2.9	3	26.7	200.5
1875	23.3	5.1	15	23.3	175.0
1876	27.7	3.4	11	27.4	205.8
1877	25.7	5.0	9	25.0	187.8
1878	24.8	3.8	12	23.9	179.5
1879	23.6	2.8	12	22.5	160.0
1880	26.8	4.5	24	25.1	188.5
1881	24.2	6.2	47	22.4	168.2
1882	25.1	5.4	41	22.8	171.2
1883	22.7	4.2	65	20.3	152.5
1884	24.8	6.0	64	23.2	174.2
1885	23.8	5.6	33	22.2	166.7
1886	22.5	5.0	29	21.5	161.5
1887	25.0	7.6	28	24.4	183.3
1888	21.1	5.8	20	21.0	157.7

NOTES: Buescu Price Index, 1873=100
SOURCE: Monthly Hire Rates, advertisements of the *Jornal do Commercio*

334 A word of caution is needed. Net income is calculated as a residual. Some of the items for the calculation can be found in the primary sources, but others have to be assumed, in the best way possible. Nevertheless, there are inevitable degrees of arbitrary decision. In every arbitrary decision, we tried to bias in favor of decreasing the net annual value. We hope in the future better calculations will be possible.

The first method uses the information on the daily rate of the *escravos de ganho* in the city of Rio de Janeiro. The *escravos* or *negros do ganho* were slaves who worked for wages or sold goods in the streets and returned a specified sum of money to their masters on a daily or weekly bases. Although they could keep for themselves whatever they earned above the amount due to their masters, they were punished if they failed to meet the requirements stipulated by their masters[335].

Using the *Jornal do Commercio* advertisements for sale of *escravos do ganho* for 1870, 1871, and 1873, in which the owners stated for the benefit of prospective buyers how much those slaves could earn daily, as well as the fact that they were performing agricultural labor, we obtain the average daily rate of 1$200[336]. To convert it into annual figures some adjustments are needed.

If slaves worked on Sundays, their masters permitted them to work and keep whatever they earned.

Because of illness and disease, there was an average loss in coffee plantations of 5.5 percent of the working days per year. This estimation is based on a report by Teuscher, a doctor working between 1847 and 1852 on five plantations, two of which had hospitals and which totaled 925 slaves[337]. According to this source the slaves were well cared for and well nourished and lodged. Teuscher collected information during this period on the number of sick slaves per month and the average length, in days, of the disease[338].

Table 9.3 presents information for three-month periods, based on his figures. For each month, and then grouped in three-month periods, the total number of calendar days times de number of slaves in the plantation was the denominator, and the number of sick slaves times the average

335 Algranti, Leila Mazan. "Os ofícios urbanos e os escravos de ganho no Rio de Janeiro Colonial (1802-1822)," in Tamás Szmrecsányi, ed., *História Econômica do Período Colonial* (São Paulo; Ed. HUCITEC/FAPESP, 1996), pp. 195-214; Lima, Carlos A.M. " Escravos Artesãos: Preço e Família (Rio de Janeiro, 1789-1839)," *Estudos Econômicos*, 30, no. 3 (Julho-Setembro 2000), pp. 447-484; Karasch, Mary. "From Porterage to Proprietorship," in Stanley L. Engerman and Eugene D. Genovese (editors) *Race and Slavery in the Western Hemisphere: Quantitative Studies* (Princeton: Princeton University Press, 1974), pp. 369-93.

336 The *"real"* was the unit of account in Brazil until 1942. One *"milréis"* (1$000) was equivalent to one thousand *"reis"* (plural for *"real"*), or one thousand *"milréis"* (1:000$000), called the *"conto"*. It was the largest monetary unit. After 1942, Brazil had the *"cruzeiro"* and several other units of account (because of the hyper-inflation decades) but in 1994 returned to the *"Real"* as the Brazilian currency.

337 Teuscher, Reinhold. "Algumas Observações sobre a Estatística Sanitária dos Escravos em Fazendas de Café". *Dissertation, Faculdade de Medicina do Rio de Janeiro, 22 July 1853.* (Rio de Janeiro: Typographia e Impressora de J. Villeneuve, 1853).

338 Amantino, Márcia. "As condições físicas e de saúde dos escravos fugitivos anunciados no Jornal do Commercio (RJ) em 1850," *História, Ciências, Saúde – Manguinhos,* 14, no.4 (out.-dez. 2007), pp. 1377-1399.

length of days they remained sick was the numerator. The percentages represented in Table 9.3 were calculated from this ratio. In addition, to account for the time lost by information costs related to the search for a suitable place to work, an amount of time equal to 5 percent of the work year is assumed. Adding up the Sundays, the days lost due to illness and the days lost due to information costs, we arrive at 279 work days.

TABLE 9.3
Percentage of Days Lost Due to Illness on Coffee Plantations

Quarter of the Year	Percentage of Total Days Lost Due to Disease
First Quarter (January-March)	6.3
Second Quarter (April-June)	5.9
Third Quarter (July-September)	5.2
Fourth Quarter (October-December)	4.6
Average for the Year	5.5

Assuming these slaves would earn the stipulated 1$200 per day during 279 workdays, the master's gross revenue would be 334$800. Since these slaves were rented on a daily basis, presumably the cost of the slave's clothes and part of the cost of food and lodging was borne by the master.

Next one must consider the various expenses of slave maintenance. According to Lobo, during 1873 and 1874 the daily cost of food for each slave in a Rio de Janeiro candle factory was $400 *réis* on average[339]. This would amount to 111$600 for the work year, and we can assume that half of this cost was born by the owner (55$800). During this period, a single room in a *cortiço* (sort of slum) house cost between 9$842 and 12$654 a month[340]. Assuming that 30 percent of this (average) value would be representative of the slave's lodging expenses, 41$000 a year (rounding up) would be the implicit cost of housing in 1873, borne by the owners[341]. According to Laerne, in 1883 the typical annual cost of slave clothes was 11$500 for a male and 13$333 for a female on coffee plantations[342]. Based on Lobo's work, medical expenses, consisting of treatment by barber-surgeons and medical prescriptions, could be estimated at 12$500

339 Lobo, Eulália L. "Evolução dos Preços e Padrão de Vida no Rio de Janeiro, 1820-1930: Resultados Preliminares," *Revista Brasileira de Economia*, XXV, no. 4 (Oct/Dec. 1971), pp. 235-65, in p. 256.
340 Ibid, p. 256.
341 We saw in Chapter 3 that in São Paulo, in 1876, on average room and board represented half of the gross wage of an unskilled free worker in coffee plantations, and that the monthly gross wage was 20$000 a month (and 10$000 without room and board). Thus, in an annual basis, the room and board could be 120$000, what suggests that the values shown by Lobo are in the higher side. This bias, however, is in the (right) direction of overestimating the costs (and giving a bias for low net returns).
342 Laerne, *Brazil and Java*, p. 350.

per annum in 1873[343]. Slaves over twelve years old in Rio de Janeiro paid a head tax of 10$000 per annum[344]. Finally, there were the expenses of commission house fees and newspaper advertisements, on average amounting to 7.5 percent of the gross earnings.

Summing up all those expenses and bringing all the monetary values to 1873 values according to the Buescu Price Index, we arrive at the value of 179$200 as the estimate of the net hire rate per annum. That is, the gross earnings for the 279 workdays are 334$800. Deducting 55$800 for food, 41$000 for lodging, 11$190 for clothes, 12$500 for medical expenses, 10$000 for tax and 25$110 for commission and advertisement fees, the net estimate is 179$200.

The second method uses information on monthly hire rates of male slaves performing agricultural labor in the city of Rio de Janeiro and its environs, based on advertisements for rental in the *Jornal do Commercio.* Table 9.2 presents the nominal monthly hire rates, the standard deviation, the number of slaves and the real monthly hire rates for the period 1871-1888.

Unfortunately, only very scant evidence is available of the typical contractual arrangements for hired slaves performing agricultural labor in Rio de Janeiro. Based upon what prevailed in the hiring contracts typical of coffee plantations, however, one suspects that 50 percent of minor medical expenses and most of the costs of food and lodging (on average for six out of seven days) were borne by the lessee, and that clothes, taxes, major medical expenses, and days of work lost because of disease were borne by the lessors.

In addition, the prevalence of rental rates on a monthly rather than a yearly basis indicates some degree of turnover during the year. Thus the expenses of workdays lost while awaiting suitable opportunities, as well as the costs of advertisement and the broker's fee must be discounted.

Based on real figures, the monthly hire rate in 1873 was 24$300, which is representative of the period, since in the decade 1870-1879 the average real monthly hire rate was 24$400. This would be equivalent to a 291$600 gross annual hire rate. From the last figure one must deduct 16$040 for days lost due to disease (5.5 percent of the work year), 14$580

343 According to Lobo, the yearly cost of clothes, utensils, and medical expenses in 1863, in a Rio de Janeiro candle factory, was 28$219 for the *colonos*. Apparently, there was no material difference in treatment between the *colonos* (who worked as indentured servants) and the slaves in the same factory. Assuming 15$000 as the cost of clothes, and 3$219 as the yearly cost of utensils (blankets, beds, forks and spoons, candles, and other items), then medical expenses would be 10$000 (Lobo, p. 254).

344 *Brazil, Relatorio do Ministério da Fazenda* (1873), p.45.

for searching costs (5 percent of the work year), 21$870 for advertisement costs and broker's fee (7.5 percent of the work year),10$000 for slave taxes, 21$570 for food and board (one-seventh of typical annual slave expenses), 6$250 for medical expenses (50 percent of typical annual slave expenses), and 11$190 for clothes.

Adding up the lessor's expenses 101$500, and deducting them from the gross annual hire rate of 291$600, the annual net hire rate is estimated as 190$100. Based on the cyclical pattern of the monthly hire rates in real terms (Table 9.2, column 4), the annual net hire rates were extrapolated and are presented in column 5 of Table 9.2[345].

The third estimate of the annual net value of the marginal product of male slave field hands is based on Laerne's survey on coffee plantations in 1883 and 1884. Collecting from the many passages in which Laerne's report mentioned instances of hired slaves and contractual conditions in coffee plantations, a picture can be formed of the working of the rental market in coffee plantations.

Laerne's report suggests that during peaks in the demand for labor, mainly during mid harvest season, planters would hire slave field hands from vicinities of the coffee plantation[346]. Hire rates, in this case, were higher than the average hire for more extended periods or for those prevailing during short periods but at another time of the year. With board, the typical hire rate during those peak periods was 2$000 per day or from 15$000 to 25$000 monthly.

Slaves were also hired on coffee plantations for longer periods of time and on a more regular basis. Thus Laerne mentions that "of the 390 on *SantÁnna* [coffee plantation] 40 are hired"[347]; "of the 240 slaves working on this *[Itybira]* plantation, 70 are hired on the same terms as the three last mentioned *fazendas*"[348]; in the *Monte Alverne* plantation, "besides [the planter's] own slaves, he has 5 hired slaves"[349].

In those cases, a typical hire contract would be as follows: "The price paid for them one with another is 20$000 per month, which sum is reduced in proportion to loss of time, if the slave should be ill more than 8 days successively. The keep of the slave falls on the employer. This includes clothes as well as food"[350].

345 Although the basis for the extrapolation was not 190$100, but the average value of the four estimates presented in this chapter, as will be seen below.
346 Laerne, *Brazil and Java,* pp. 278, 302, 344, 345.
347 Ibid, p. 350.
348 Ibid, p. 351.
349 Ibid, p. 358.
350 Ibid, p. 350.

The typical hire rates were, "The male slaves are generally hired for 20 and the females for 15 *milréis* a month with board…he has five hired slaves, paying 25$000 per man and 20$000 per woman with board. Owing to the isolated situation of this state…they were not to be had cheaper"[351].

Thus a monthly hire rate of 20$000 for male field hands was typical in coffee plantations at the end of 1883 and the beginning of 1884, or 215$400 in a year based on 1873 *milréis*. From this gross hire rate, it is necessary to deduct 11$850 for days lost to illness (5.5 percent of the work year), 10$770 for searching costs (5 percent of the work year)[352], 6$250 for medical expenses (50 percent of typical annual slave expenses), and 10$740 for miscellaneous food and board expenses (on the assumption that hired slaves would spend every other Sunday , or one-fourteenth of the year, at the owner's place and expense). No taxes are deducted, since the owners of rural slaves did not have to pay the slave head tax[353]. All these expenses add up to 39$610. Deducting this sum from the gross hire rate of 215$400 gives an estimate of 175$790 for the net hire rate of male field hands in 1873.

The final estimate is based on the production function of the slave-using sector. A Cobb –Douglas production function with constant returns to scale is assumed for the coffee plantation sector. We can estimate the net earnings of prime field hands by using the following equation, based on Fogel and Engerman[354].

$$R_f = \alpha P_c Q/L_f - M_f \qquad (3)$$

Where R_f = net earnings of prime field hands, α = share of labor cost of slaves in total costs, P_c = price of coffee received by the planters, M_f = average annual maintenance cost of a prime slave field hand, Q = Output, and L_f = input of labor (prime field slaves).

For the field hand the gross proceeds depended on the price of coffee and the quantity of his/her annual output. The relevant price of coffee (P_c) is the net price realized at the farm. Coffee prices at the farm, as seen in Chapter 2, were on average 30 to 40 percent lower than the FOB

351 Ibid, pp. 302 and 358.
352 Since the slaves hired in coffee plantations were likely to come from the vicinity and from owners known to each other, no costs of advertisements and broker's fees are assumed.
353 Only slaves in the urban sector (cities, towns, and villages) paid the *taxa de escravos* or slave head tax. Brazil (1873), 45.
354 Fogel, Robert W. and Stanley L. Engerman *Time on the Cross. Vol. I: The Economics of American Negro Slavery. Vol. II: Evidence and Methods: A Supplement* (Boston: Little, Brown and Company, 1974), in vol. II, p. 73..

prices. We can also see in Table 2.9 that FOB prices were very high in the commercial years of 1872-1873 and 1873-1874.

Thus, using the decade average of the FOB prices between 1868-1869 and 1877-1878, 6$923 per *arroba*, the price at the farm can be estimated at 4$150 to 4$850 per *arroba*. This price is close to the lower bound of the average price interval reported by 29 coffee plantations asking mortgages in the *Banco do Brazil* between 1867 and 1869 (4$200 to 5$000 per *arroba* at the farm)[355]. Weinschenck, presenting his typical budget of costs and revenues on a coffee processing unit for 1871 presents the weighted average price at the farm of 4$996 per arroba[356]. Since we want, on purpose, a bias in favor of underestimation of profits, we will use a point estimate of 4$500 per arroba as typical in 1873 for the coffee price at the farm (Pc).

To estimate the annual output of a slave field hand, a sample of twenty-nine coffee plantations in Rio de Janeiro, with 1,849 slaves, was used. These plantations asked for mortgage loans from the *Banco do Brazil* between 1867 and 1869, and they reported (and the Bank had one or more experts for an independent checking of this information) their average or typical production in coffee *arrobas*[357].

The weighted average product per slave – that is, including all slaves of the plantation – in this period was 85.6 arrobas of coffee. Coffee was the market crop, but corn, beans, rice, sugar, and *mandioca* (cassava) were also produced, as well as meat and dairy products[358]. Since these products usually were consumed inside the plantation, we will not include them in the average product of slaves, although they will be accounted for when estimating maintenance costs.

Before the "Free Womb Law" (1871), the proportion of slave field hands in the total slave labor force of the coffee plantations was on average 50 percent. This is confirmed by Teuscher (1853), according to whom only half of the total number of slaves in the five coffee plantations (with 925 slaves) in which he worked as a doctor were field hands. After the passing of the Free Womb Law this proportion increased, because the aging of the stock of slaves would concentrate in relative terms those slaves in the age cohorts characteristic of field hands. In 1883 the average proportion of field hands in the slave labor force was 57.1 percent, as

355 *Atas da Gerência do Banco do Brazil, 1867-1869.*
356 Weinschenck, Guilherme B. "Cultura do Café e sua Preparação,". *Revista Agrícola do Imperial Instituto Fluminense de Agricultura*, XIV (December 1872), pp. 34-36.
357 Ibid, 1867-1869.
358 Correia, Antonio P., Jr. *Da Côrte à Fazenda de Santa Fé, Impressões de Viagem*. (Rio de Janeiro: Typographia Universal de E.H. Laemmert, 1870), p. 93.

shown in Table 2.5, Chapter 2. Twelve years had gone by since the law had been passed, and therefore the total slave population consisted of slaves over twelve years of age. The use of this figure for 1873 would be an overestimation.

Adopting the figure of 50 percent as typical of most large coffee plantations in 1873, and an average product for all slaves of 85.6 *arrobas* of coffee, we obtain an estimate of 171.2 arrobas per field slave. This seems an upper boundary, since according to a different sample for 1883, the average product per slave field hand was 140 *arrobas* of coffee[359], as shown in Table 2.5, Chapter 2. Therefore a value a bit smaller than the average of the two estimates, 155 arrobas of coffee per slave field hand, will be used as the estimate of (Q/Lf).

We consider this estimate typical of the Rio Zone. For the Santos Zone, with better soils (*terra roxa*), Laerne reported an average product per slave of 48.9 percent higher[360]. Since the estimates for the other elements in equation 3 are also typical of the Rio Zone, this will not affect the analysis. Besides, since the historical issue we are examining is the profitability of slavery in the Paraíba Valley coffee plantations', the use of typical values of the Rio Zone is consistent with the rest of the work.

To estimate the share of slave labor costs in total costs (α), we used a sample of thirty-six plantations, employing 3,033 slaves, which asked for mortgage loans from the *Banco do Brazil* between 1867 and 1869. The weighted average value of α for all slaves (called α' to distinguish it from α, which refers only to the slave field hands) was 40.8 percent[361].

Using information presented by Simonsen[362] , we can calculate that in the first decades of the nineteenth century before the closing of the African slave trade, the value of α' was between 35 and 40 percent. In 1873, using Simonsen's data, we can calculate that this value had risen to between 40 and 50 percent. In 1882, using for calculation the numbers provided by the German General Consul's report on the working of 8 coffee plantations, located in Minas Gerais (5), São Paulo (1) and Rio de Janeiro (2), the value of α' was 44.2 percent[363].

359 The value of 140 *arrobas* of coffee annually produced, on average, by a field slave was obtained from Table 2.5, Chapter 2 (see column entitled "Average Number of Coffee Bags (60 Kg.) Produced Annually per Field Hand Slave"). Dividing the total shown, 33.6 bags per field slave, and the conversion (bags had 60 kgs, and an arroba weighted 14.688 kg), we arrive at the value of 140 *arrobas* (actually, 137,3, rounded up to 140).

360 Laerne, *Brazil and Java*, p. 368.

361 Ibid, 1867-1869.

362 Simonsen, Roberto C. "Aspectos da História Econômica do Café,". Instituto Histórico e Geográfico Brasileiro (editor). In *Anais do Terceiro Congresso de História Nacional*, vol. IV. (Rio de Janeiro: Imprensa Nacional, 1941), pp. 211-304, in p.287.

363 The report was reprinted in its significant parts in the *South American Journal and Brazil and River Plate Mail* (July 20, 1882) :7-8.

Based on a sample of 941plantations mortgaged to the *Banco do Brazil* up to June 1883, Laerne reported figures from which the values of α' can be estimated for the Rio de Janeiro coffee producing (47.07 percent) and sugar and coffee producing counties (47.8 percent); Minas Gerais and Espírito Santo (44.57 percent) and São Paulo (56,4 percent), which give the aggregated weighted result of 49.4 percent for the entire Rio Zone. For the Santos Zone this value was 38.4 percent[364]. Thus the average value of α' for all slaves in 1873 was in the range of 40 to 50 percent, or a central value of 45 percent.

For equation 3, however, the relevant α' refers not to all slaves but to the slave field hands. Using the age group of fifteen to fifty as the basis for the field hands, the average price for male and female slaves was 1,196$000, approximately 124 percent higher than the average price (534$000) of slaves between the ages of one and fourteen, and fifty-one and sixty-five.

Since among the age cohort fifteen to fifty there were some slave artisans and other skilled slaves worth more in value than the field hands, the figure of 100 percent will be used instead of 124 percent.

In addition, since the proportion of field hands in the total number of slaves was 50 percent, this suggests that α for field hands should be α = 0.75 α' = 0.75 (45 percent) = 33.8 percent.

So far, collecting the values of P_c = 4$500 per *arroba*; Q/L_f = 155 *arrobas*; and α = 33.8 percent, the gross R_f can be estimated as 235$755. The maintenance costs (Mf) must be deducted from this figure. Out-of-pocket expenses included food and clothing, medical care and supervision. Although most of the food consumed by slaves was produced in the plantations, some items (like salt, and candles) had to be purchased. These items, however, represented no more than 5 percent of total food expenses. According to a letter written in 1856 by the President of the Province of Rio de Janeiro,

> "the food allowance for sustenance of slaves [working in road construction in a rural district] for lunch, dinner and supper, including Sundays and Holy Days, with coffee and sugar brandy [*cachaça*] on the work days, was $200 réis a day"[365] .

Converting this figure into an annual basis at 1873 values, and calculating 5 percent of it, the estimate of 4$700 is obtained. Laerne

364 Laerne, *Brazil and Java*, pp.218-233.
365 Ministério dos Negócios do Império, 1856.

estimated in 1883 that clothes for slaves cost 11$500 for male and 13$300 for female slaves per year, which in 1873 values represented an average expense of 11$100[366]. We also have to take into account medical expenses, which were estimated at 12$500 yearly for the slave field hands. It is difficult to obtain direct information on the supervision costs of slave field hands, but a good approximation is given by the management costs of the plantation. According to the figures on the annual expenses of nine coffee plantations in Rio de Janeiro in 1883 collected by Laerne we can estimate the supervision costs per field hand as 32$000 in 1873 values[367].

This figure overstates the maintenance and supervision costs in two ways: In the first place, it assigns all supervision costs to field hands who, in actuality, accounted for only 50 percent of the labor force, and in the second place, the total management costs including other costs in addition to supervision. The final effect will be to bias downward the estimate of the net value of the marginal product of slave field hands, and that is the direction that we want the bias to have.

Summing up the maintenance costs, we obtain the value of M_f as 60$300, and deducting it from the estimate of the gross value of the marginal product, 235$775, we obtain the net R_f of 175$475 for field slaves.

This value represents the average for male and female slave field hands. According to the prices in 1873 of slaves aged twenty to twenty nine, presented in Table 4.6 of Chapter 4, male slaves were valued on average about 10 percent more than were females. This 10 percent difference also existed in the rental market, as shown in Chapter 5. Thus we can estimate the value of R_f for males as 183$800 and 167$100 for females[368].

Results for Rf obtained by the four methods of calculation

The four estimates of R_f obtained for 1873 by the four different procedures are as follows:

1. Rio de Janeiro *negros do ganho* in agricultural work, male slaves.....179$200
2. Rio de Janeiro monthly hire rates for male agricultural work.....190$100
3. Laerne's report on coffee plantations' hiring of male Field hands.....175$790
4. Using production function, male slave field hands.....183$800

366 Laerne, *Brazil and Java*, p.350.
367 Ibid, pp. 329 and 333. In 1883, the value quoted by him was 35$700.
368 The difference in prices refer to prime field hands working in gang labor. In urban occupations, women slaves, depending on her skills, were valued, on average, even higher than male slaves.

The four estimates, obtained from different methods and sources, show remarkably similar results. The R_f for male slaves in 1873 varied between 175$790 and 190$100, which gives a central value of 183$500, rounded down to the nearer $500 *réis*. Female slaves' R_f can be estimated, assuming them to be 10 percent lower than the R_f for male slaves, as varying between 149$000 and 173$000, which gives a central value of 166$000.

Calculation of the Internal Rate of Return (IRR)

On the basis of the data on slave longevity, prices according to age and annual revenue derived from a slave, we used equations 1 and 2 to derive the internal rate of return for the investment of slaves in 1873[369]. The values obtained for the internal rate of return were 13.0 percent for both male and female slaves. These results, when compared with the alternative rate of return of 10 percent (the average interest rate or return earned by coffee planters in other investments), show that slave capital was at least as remunerative as alternative employments of this capital (as discussed in Chapter 8).

Sensitivity Tests for the IRR

To test the sensitivity of these results to the method of analysis employed, alternative estimates can be obtained by allowing small changes in the magnitudes of the variables used to estimate the rate of return.

For this sensitivity test only male slaves aged twenty to fifty and equation 1 are used. An estimate of the effect of a change in the price of slaves can be obtained by constructing an interval for the prices of 1873 of the twenty - to twenty-nine –year old male slaves, presented in Table 4.6, by using the standard deviation.

The sample of the 1873 coffee plantations' male slaves aged twenty to twenty-nine consisted of 141 slaves (of the 146 slaves mentioned for this year in Table 4.6, 4 were not coffee plantations' male slaves and were therefore were left out of the following calculation). Thus, for the 141 slaves, the average price (real value) was 1,375$890, the standard deviation 198.8, and the standard error of the mean 16.74[370]. The one-

369 For capital budgeting evaluation, or investment projects appraisal, usually the best tool available is the Net Present Value (NPV) method. However, since in the case we are examining there are no alternative projects, or change in the signs of cash flows from positive to negative, the Internal Rate of Return (IRT) method is simpler and acceptable.

370 If four crippled and sick slaves (with prices of 950$000, 800$000, 700$000, and 0) are not included in the sample, the average price becomes 1,398$180, the standard deviation 138.32 and the standard error of the mean 11.82.

standard- deviation interval of prices for the male twenty-to-twenty-nine-year-old slaves would therefore range from 1,777$090 to 1,574$690.

Given the hire rate of 182$500 and the average values of λ t, the rates of return would range from 15.5 to 11.5 percent. These results indicate that probable errors in the estimation of slave prices would not result in more than a 13 to 20 percent change in the rate of return.

To estimate the effects of change in the hire rates, the lower estimate, 175$500, and the upper estimate, 190$100, can be used. In this case, given the average price of 1,375$890 and the average values of λ t, the rates of return would be 12.5 and 14.0 percent. Looking at Table 9.2, the coefficient of variation in slave hire rates in 1873 was 14.4 percent[371].

Applying it to the lower estimate of the hire rate, we obtain 150$200. Even at this reduced lower bound, the rate of return would be 10.5 percent. Finally, if instead of using the average of the upper and lower estimates of slave longevity, only the lower ones are used, the rate of return would be 12.5 percent.

It appears, therefore, that neither probable errors of any single variable nor use of the lower bounds of the estimates would lower the rate of return on slaves below the estimated 10 percent alternative rate of return. An accumulation of all the probable errors and lower estimates[372], in the direction of biasing downward, which is not likely to occur, would lower the estimated 13.0 percent rate of return to 8.5 percent, which is still inside the limits of 8.0 percent and 12.0 percent suggested as the range of the alternative rate of return during this period.

Results Obtained

In other words, the method of analysis and the estimates of the magnitudes of the variables, together with the test for the sensitivity of errors and use of the lower bounds of the estimates, suggest that the rate of return on slave capital for 1873 was at least equal to the rates of return being received by alternatives forms of physical or financial capital.

This situation not only prevailed in 1873, but was typical of the entire 1870-1881 period. Table 9.4 presents, for three-year periods, the average real price of male slaves aged twenty to twenty-nine, the average real annual hire rates[373], and the rate of return obtained, based on equation 1.

371 The average coefficient of variation is defined as the ratio of the standard deviation over the mean. For 1873, the value was 14.4. During the period 1871-1881, was 16.6 percent.
372 Using the price of 1,574$690, the annual hire rate of 150$200 and the lower estimate of slave longevity.
373 These figures were obtained by using the estimate of the average annual hire rate in 1873, 182$500, and using the yearly movements in the real monthly hire rates (presented in Table of Chapter 4) of male slave field hands to generate the value for the period 1870-1881 (column 5). The three-year period figures are the averages of the real annual hire rates (1873 values) for each period.

TABLE 9.4
Rates of Return on the Investment in Male Prime Field Hands, 1870-1881 (*milréis*)

YEARS	Real Average Annual Prices	Real Average Annual Hire Rates	Rate of Return (percent)
1870-1872	1,362$300	178$000	13.0
1873-1875	1,585$000	186$000	12.0
1876-1878	1,275$600	191$000	15.0
1879-1881	1,473$900	175$200	11.5

Rates of return varied between 11.5 percent and 15.0 percent. These results become more significant due to the behavior of slave prices, presented in Chapter 4. Although these prices showed variations during this period, the real prices between 1871 and 1881 show a positive geometric average annual rate of growth of 0.74 percent. Thus for a calculation on a yearly basis of the rate of return actually earned by coffee planters during the 1870s, the positive growth rate of real prices would mean a positive rate of capital gains in the investment of slaves. This would reinforce the estimated rate of return.

The average rates of return estimated for 1871-1881 are not the ones coffee planters actually earned, since final abolition in 1888 came before the expiration of the thirty-year period assumed by the use of equation 1 in the calculation. This estimation was intended to provide an answer to the question of what rate of return coffee planters could earn if they expected that coffee prices, slave maintenance costs and the average labor product would be similar in the 1880s and 1890s to those prevailing in the 1870s. The results obtained showed that a coffee planter who purchased a male prime field hand in the 1870s at the prevailing market price, expected to earn at least what he could have earned through alternative investment opportunities.

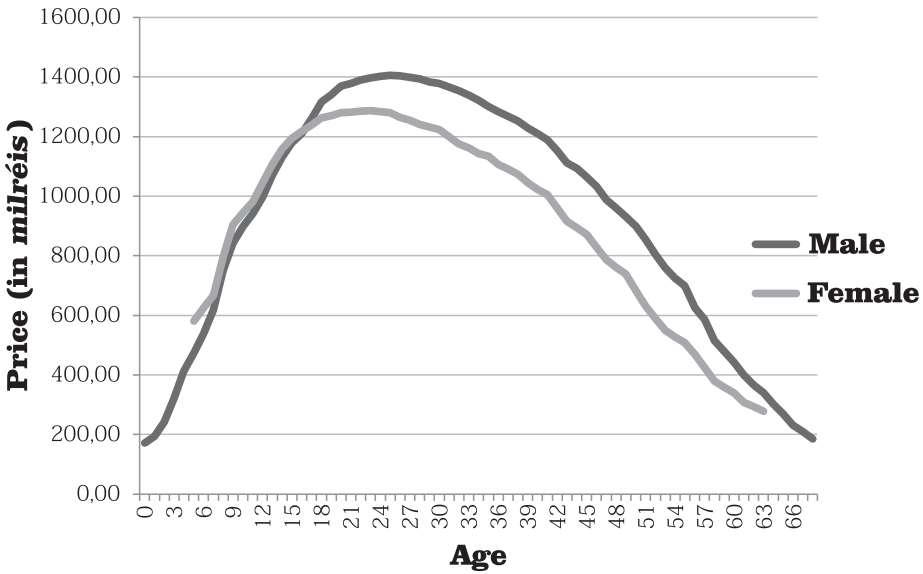
Since practically all the information used to estimate the rates of return was typical of the Province of Rio de Janeiro, these calculations suggested that investment in slave capital was profitable for the coffee planters of the Paraíba Valley, and that this can explain much of their behavior regarding the ownership of slaves. High rates of return together with positive capital gains in the investment of slaves during 1871-1881 are very good reasons for explaining the increase of demand for slaves during this period[374].

374 The increase in the absolute number of slaves, and the increase of the relative percentage share of slaves in the Santos Zone, as shown in Chapter 5, are a strong indication that the positive rates of return were also prevailing in that region.

Further evidence about Profitability

Further evidence about the behavior of demand for slaves can be seen in Figures 9.3, 9.4, and 9.5[375]. Figure 9.3 compares the prices of male and female slaves of Rio de Janeiro in 1873 according to age. This pattern of pricing according to age and gender undermines the validity of the hypothesis of conspicuous demand for slaves, which cannot explain why "status" and "social prestige" reasons would vary so much with age of slaves, or by gender within the same age group.

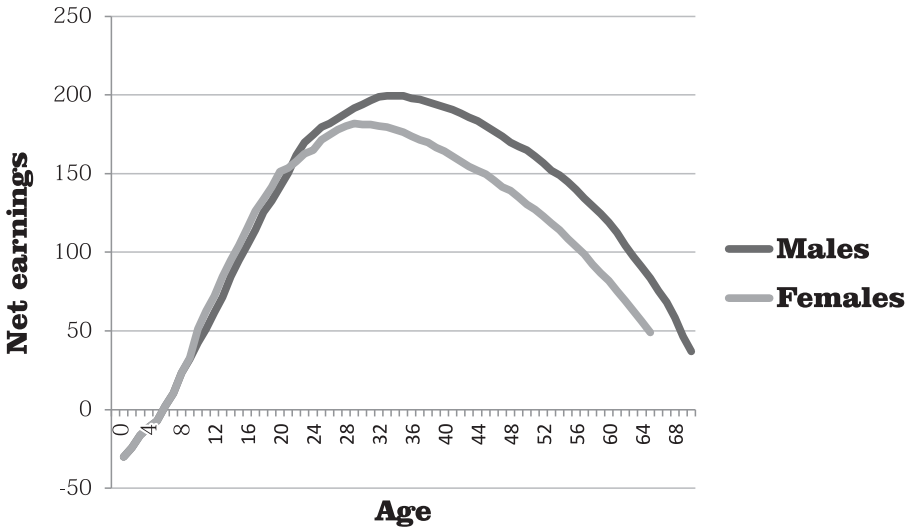
Figure 9.3 – Prices (in milréis) of slaves by age and sex, Rio de Janeiro, 1873.



A better explanation for this pattern is given in Figure 9.4, where the annual net earnings according to age are compared among male and female slaves. It can be seen that although at earlier ages annual net earnings were negative, they then increase and after ages six to seven are already positive. Female slave prices reached a peak at age twenty-two, while male prices reached their peak at ages twenty-six to twenty-seven. In addition, female slave prices were higher than those of male slaves until age sixteen. This is not due to any breeding potential of female slaves, since at this time the Free Womb Law had been enacted more than sixteen months previously.

375 This discussion of the age-price and age-earnings profiles is based on and follows the methodology set forth in Fogel and Engerman (1974a), 2:83.

Figure 9.4 – Annual net earnings of slaves by age and sex, Rio de Janeiro, 1873.



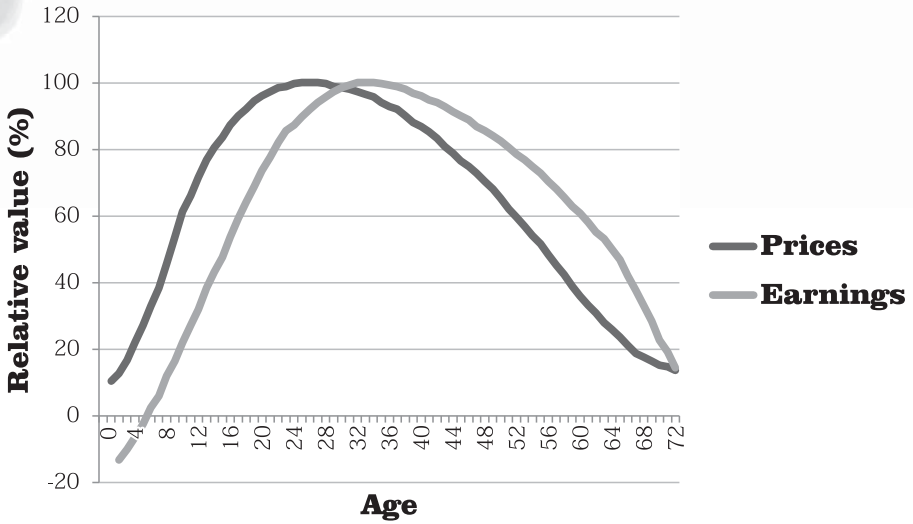
The relationship between the age-price and age-earnings profile, for male slaves, is better seen in Figure 9.5. Earnings were negative until ages six to seven, after which time the net annual earnings become positive, while prices are positive and increasing since age one[376], indicating the expectation that at later ages the earnings would become positive.

Although both prices and earnings rose, prices reached a peak at ages twenty-six to twenty-seven, that is, eight to nine year sooner than earnings, which reached a peak at age thirty-five. These differences reflect the fact that the price of slaves was dependent not only on the amount of net earnings but also on the length of the period over which he would produce those earnings. After the age of thirty-five, both earnings and prices declined.

An interesting feature of Figure 9.5 is the pattern of earnings of male slaves aged sixty to sixty-five. A sixty- year-old male slave produced an annual net earning of 62.2 percent of peak net earnings. Although declining faster in the immediately following years, this proportion is still 46.1 percent of peak earnings for sixty-five-old slaves. This was not insignificant, since in 1873 a sixty-year-old slave could earn 13$700 a month, and those earnings, although falling steadily with age, would still be 74.3 percent of this magnitude for a sixty-year old.

376 In 1873, children under one year old were free (called *ingenuos*).

Figure 9.5 – A comparison of the relative price and earnings of male slaves by age, Rio de Janeiro, 1873



No wonder then that during the discussion of the "Sexagenarian Law" of September 28, 1885, giving freedom – without any indemnification to slave owners – to slaves sixty years old and older, slave owners (and coffee planters in particular) opposed the law, and fought for (and eventually obtained) a clause to the law that those slaves "who are over 60 and under 65 years of age, as a form of compensation to their masters, had to grant them unpaid labor for another three years – or until they reached the age of sixty-five" (Conrad 1972, 210-229, 310-316). Thus coffee planters' support for that provision of the law, instead of being based on planters' traditionalism, or even on an unnecessary cruelty, as their support is sometimes interpreted, seems to have been based on economic considerations[377].

377 An irony of this Law is that the old slaves, receiving freedom, would be outside the social net of protection for old and infirm slaves provided by the planters. There was a potential material loss (and a correspondent gain to the former owner, no more responsible for supporting the old slaves), to be weighted against the psychological gains of becoming a free person at that age and at the new social environment available for the former slave.

Chapter 10

Expectations of abolition and sanguinity of coffee planters

It was seen in chapters 4 to 6 that several indicators suggested that the demand for slaves was continuously falling during the period 1882-1888. We argue in this chapter that, given existing characteristics and legal constraints, the declining demand for slaves in Brazil during this period indicates that Brazilian slavery was moribund in the 1880s.

It will also be argued that the reason for the declining demand for slaves in the 1880s was not the inherent unprofitability of slavery in coffee plantations, but the effect of the increasing " abolitionist pressure" – or the cumulative impact of an antislavery ideology – on the optimism of coffee planters regarding the political viability of slavery.

A Moribund Institution?

First one must define what one means by a "moribund institution". As economists use the term "moribund institution", slavery would be moribund if the market price of a prime field hand slave was tending to be, or actually was, below the costs of rearing this slave[378]. Was Brazilian slavery moribund in this sense?

Since the "Free Womb Law" of 1871, which gave freedom to children born of slave mothers after that date, slavery could not be perpetuated by the self-growth of its population. To be sure, slavery was doomed to disappear. Since the stock of slaves could not be replenished, death would put an end to it after a span of time.

But abolition occurred well before slavery's natural death. Had the final Abolition Law of 1888 not been passed (and totally enforced), the twenty-one-to sixty-year-old slave population could have been estimated at 835,000 in 1892 and 544,000 in 1902[379].

A population of this size could have provided an adequate supply of slaves to meet the actual coffee production of the 1880s and 1890s by an internal shift of the slave population toward the coffee plantations.

378 See Yasukichi Yasuba, "The Profitability and Viability of Plantation Slavery in the United States", **Economic Studies Quarterly**, XII (September 1961), p.60-67.
379 As discussed in Chapter 6 of this Book.

Thus, to assess if the Brazilian slavery institution was moribund, we need a more specific frame of reference. The question is whether slavery would have remained economically viable, in the absence of political pressure during the span of time from the 1871 Free Womb Law until the hypothetical date in which the country's shrinking stock of slaves would be inadequate to meet the slave labor requirements of coffee plantations. More specifically, this chapter is concerned with devising an operational test that would indicate whether slavery was moribund in the economic sense by 1888.

A good indicator of a moribund institution in a particular region or economic activity, such as coffee plantations, is the steady decline of vested interest in the institution of slavery measured by the wealth in slaves (their number times their average price) belonged by slave owners[380].

To be made formal, all cases of domestically promoted peaceful abolition required legal sanction or parliamentary measures, and most historical evidence will show that laws sanctioning abolition were passed after the importance of a country's vested economic interest in slavery was dwindled. Thus for an institution to be moribund, it is not necessary that the extreme case of zero wealth in slaves be reached, only that a strong trend in that direction be present.

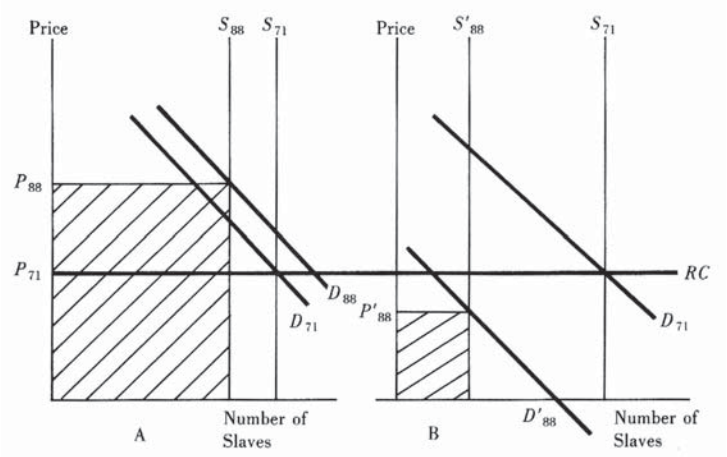
Although the relationship between economic interest and political sentiment is very complex, it seems safe to suppose that the reactions of slave owners (those being principally coffee planters, who constituted the most influential group in the political decision-making process during this period) to abolition would be less severe within a context of falling slave values, than in a case of a sudden abolition at a time when both prices and quantities of slaves were rising.

Since the short-run supply curve of slaves in the purchase market was completely inelastic, slave prices were determined by short-run changes in the demand schedule. Thus, when treating an institution (or industry) like slavery in coffee plantations after 1871, the characteristic that would suggest its becoming non-viable (or moribund) is a continuous decline in the demand for the specialized capital (slaves) used in the production of the industry's product (slave labor services).

Figure 10.1, sub-divided in Figures 10.1.a and 10.1.b, help to explain this for the entire slave population. Suppose that in 1871 the price of a prime field hand was just equal to the present value of his rearing costs (RC).

380 For a similar view, see Goldin, "The Economics of Emancipation", **Without Consent or Contract, Volume 2**, pp. 614-628 and Gunderson, "The Origin of the American Civil War", in **Journal of Economic History, 34**, pp. 915-950.

Figure 10.1 – Hypothetical effects of changes in the demand schedules on slave prices



Let's look first at Figure 10.1.a. Suppose that the demand was increasing from D_{71} to D_{88}. Now, let's look at Figure 10.1.b, and suppose that the demand was declining from D71 to D'_{88} .

The same forces compensating for a rising or falling demand also affected the number of manumissions. Suppose then that supply decreased only for reasons of mortality, as in Figure 10.1 A, from S_{71} to S_{88} . In Figure 10.1 B the number of slaves, in addition to the mortality reasons, also decreased because of manumissions, the joint effect being a shift from S_{71} to S'_{88}.

Behavior of the Demand

One can see that not only would the aggregate value of slaves be different in both cases (area marked), but that in Figure 10.1.a dynamic forces were working to increase the value and give incentive to increase the supply of slaves (P_{88} > RC).

This was caused either by lobbying for non-enforcement of the Free Womb Law, or by any scheme to have the *ingenuos* (free children born of slave mothers) as de *facto* slaves after they completed their twenty-first birthday, or finally by making the alternative cost of manumissions very high and putting the economic stakes involved in the passing of the Sexagenarian Law and the Final Abolition Law in a different situation.

In Figure 10.1 b, however, since the demand for slaves would be continuously falling, no such economic incentives would be present.

Thus the continuously declining demand for slaves (observed after 1881) indicates that the institution of slavery was moribund in Brazil

during the 1880s. For us, Figure 10.1.b is representative of the last years of slavery.

What caused this falling demand? What are the competitive hypotheses to explain it? How do we test them?

The "abolitionist pressure" as a hypothesis

In order to explain the decline in the demand for slaves on coffee plantations I put stress on exogenous factors, which will be termed the "abolitionist pressure". The relatively sudden growth of a powerful antislavery movement both inside and outside Brazil has been amply documented.

Although both the idea and the institution of slavery existed in virtually the entire Western world for 3,000 years, its ethical legitimacy seldom disputed, in less than 100 years, beginning in the last decades of the eighteenth century, slavery disappeared from the scene in the Western Hemisphere, condemned by all but a few[381]. The anti-slavery movement was perhaps the first mobilization of public opinion at a world scale, phenomenon that it is prevalent in our days for a set of political, moral and social issues.

According to this study, the increasingly dynamic political and ideological abolitionist movement, involving both domestic and foreign influence on Brazilian public opinion – in sum, the constant erosion of society's support for the institution and the political acceleration of the movement after 1885 – was the central factor causing the decline in the demand for slaves on coffee plantations[382] .

Among the causes of the abolitionist pressure, it is important to stress the influence which other slave societies of the New World had on the Brazilian experience. It is generally agreed that the late 1860s and the mid- 1880s were characterized by abolitionist agitation (although of admittedly different natures). It is also no coincidence that the first period occurred just after the U.S. Civil War and the death of North American slavery, and that the second coincided with the 1884 abolition in Cuba, leaving Brazil as the last bastion of slavery in the Americas[383].

Although I think most interpretations would note the importance of the decline of society's support of the institution of slavery, the point I

381 See Davis, *The Problem of Slavery in Western Culture*, 1966.

382 Wehling, Arno (coordenador) . *A Abolição do Cativeiro* (Rio de Janeiro: Instituto Histórico e Geográfico Brasileiro, 1888).

383 See Laerne, *Brazil and Java*, pp. 79-80, for a comment on the Cuban abolition. The Emancipation Act of May 8, 1884 decreed that slavery in Cuba should be abolished by degrees, but in practice virtually abolished slavery.

want to make is that this erosion was happening in spite of the economic interests of coffee planters, those being based on the profitability considerations discussed in Chapter 9.

The Competitive Hypothesis of non-profitability

The competitive hypothesis that I want to investigate is based on arguments very similar in content to those raised by Phillips in his explanation for the non-profitability of slavery in the United States[384]. According to Phillips, slavery was condemned on technical grounds, since it lacked flexibility and efficiency and was a riskier application of capital than were other activities – that is, slavery was a non-profitable investment[385].

In the view of the competitive hypothesis common to various authors, with the onset of Brazilian modernization and the beginnings of the experiment with capitalism in the second half of the nineteenth century, slavery, a pre-capitalist institution, had to be given up due to the gradual decline in the demand for slave labor services, a decline caused by gradual modernization.

In addition, according to this view, there was a split in coffee planters' interest and attitudes regarding slavery. One group, the Paraíba Valley planters, was bound by traditional social values and attitudes. In this view, its demand for slaves was based more on reasons of tradition, social prestige, and paternalism than on profitability considerations[386]. This group can be contrasted with the coffee planters of central and west São Paulo, who were of a more dynamic capitalist mentality, open to new ideas, trying new forms of labor organization (such as European immigration), and increasingly dissatisfied with slaves as a solution to their labor problems[387].

As a corollary of this reasoning, the coffee-planted area was rapidly expanding to the west of São Paulo, both economic and political power were shifting to this region, where a new kind of planter was ready to innovate by substituting free labor for slave labor. Thus, in this competitive hypothesis, it can therefore be argued that the non-profitability of slavery, together with the regional shift in coffee production to the west of São

384 Phillips, "The Economic Cost of Slaveholding in the Cotton Belt", in *Political Science Quarterly, XX* (June 1905) and *American Negro Slavery: A Survey of the Supply Employment and Control of Negro Labor as Determined by the Plantation Regime*. New York: D. Appleton and Company, 1918.

385 See, as an example, Ianni , "O Progresso Econômico e o Trabalhador Livre", in *História Geral da Civilização Brasileira, Tomo II, vol. III*, pp. 298, 304, 316-317, 319.

386 Genovese, *The World the Slaveowners Made,* pp. 84-85, can be used as an example.

387 Ibid, pp. 85-88.

Paulo, would cause a gradual decline in the demand for slave labor services (a process which was happening at an increasing pace in the 1870s and 1880s). As a result, the demand for slaves would gradually fall during this period.

Testing the two hypotheses

I have shown in chapter 6, however, that the process of selective concentration of slaves was well under way in west São Paulo in the 1870s, more than in any other part of the coffee region. Furthermore, I have also shown, in Chapter 9, that between 1871 and 1881 the ownership of slavery by the Paraíba Valley coffee planters could be well explained by profitability considerations.

Nevertheless, since the demand for slaves was indeed falling during the 1880s, the above hypothesis does seem to offer a plausible interpretation of this fact. Let us therefore test the two hypotheses – mine and the one above – in order to discover which best describe the circumstances.

Let us consider slavery as industry in which firms owned or rented capital goods (slaves) and used them as factors of production to produce a marketable commodity (labor services). One must make a distinction between the rental market, where slave services were transacted, and the purchase market, where slaves themselves (capital goods) were transacted.

Assuming competition, all firms faced a single hire rate. In the short run, the revenue of the fixed factor (slaves) was a residually determined quasi-rent. Assuming long-run equilibrium for the industry and all slaves homogeneous in age, skill, and physical strength, the price of the capital good (slaves) was then the capitalized value of these quasi-rents during the life span of a slave.

This theoretical framework can be used to test the two hypotheses. It focuses implicitly on the interplay between the rental and purchase markets for slaves.

In the competitive hypothesis of non-profitability, the society's increasing knowledge of the inefficiency and non-profitability of slavery, translated into market behavior, would produce a falling demand for slave labor services and thus (with a short-run totally inelastic supply) a fall in the price of slave labor services (i.e., in the hire rate).

Assuming constant maintenance costs, the capitalization of this falling net hire rate would then produce a falling price for slaves. Thus, the conduit for the declining values would be originated in the rental market.

According to this interpretation, the falling price for slaves in the purchase market would be caused by the falling net hire rates in the rental market.

My interpretation, in contrast, focuses exclusively on the purchase market. The abolitionist pressure created uncertainty[388]. It put in doubt if the asset (slave) would be capable of providing services in the future years, even if it was fit to regular work. The abolitionist pressure created uncertainty, defined as the holding of anticipations which are not unanimous or universal but constitute a probability distribution under which the parameters of the distribution are themselves varied[389] .

This uncertainty acted in the purchase market through the capitalization of the net hire rate, and not in the rental market – assuming, quite plausibly, that the abolitionist movement did not produce non-pecuniary costs for the rental of slaves in coffee plantations.

Since we are not directly interested in the *ex ante* investment decision per se, the manner in which the uncertainty is formally introduced is irrelevant. By knowing the ex post price of slaves, we already know how the market performs this capitalization.

To facilitate the analysis, a simple formula is used to express the price of a prime field hand:

$$P_{sf} = (H_f / i). [\ 1 - 1 / (1+i)^n\ ] \qquad (1)$$

In which P_{sf} = price of prime slave field hand, H_f = annual net revenue derived from a slave, equal to the net hire rate, i = rate of discount, n = expected economic life of a slave, in which the upper bound would be the biological life of the slave, as given by the slave life tables calculated in Chapter 7.

We can call as x the equation $[\ 1 - 1 / (1+i)^n\ ]$, in order to facilitate the presentation. Thus,

$$P_{sf} = (H_f / i). x \qquad (2)$$

In order to choose between the two competing hypotheses, I propose to use four tests, using information about the rental and purchase markets for slaves: (i) the "sanguinity index"; (ii) an index of the real hire rate of slaves; (iii) the change in the shape of the slave age-price profiles; and

388 Mattos, Hebe. *Duas Cores do Silêncio: os Significados da Liberdade no Sudeste Escravista – Brasil Século XIX* (Rio de Janeiro: Nova Fronteira, 1998).

389 Based on the definition of Lutz and Lutz,*The Theory of Investment of the Firm*, 1951, p. 182.

(iv) an index of the "political death" of slavery[390]. Although obtaining the data required extensive research using primary sources, the indexes in themselves are simple. However, together they constitute a strong test which enables one to decide among the two hypotheses.

Sanguinity Index

The first test involves constructing Fogel and Engerman's "sanguinity index". Although used by these authors to answer a different question, this index can also be used in our case if we change its interpretation[391].

This index is a ratio of two series: (i) the annual price over hire rate for the period 1871 to 1887 and (ii) the average price over hire rate for a period in which there exists an "average" or "normal" state of expectations.

It is difficult to define series (ii). In the discussion of the behavior of slave prices during this period, we saw that during the 1850s slave prices were forced to adjust to changes occurring in the supply of slaves provided by the African slave trade and the internal sources. The 1880s were characterized by the growing importance of the abolitionist movement. Thus I will take the period 1860-1879 as representative of the "average" state of expectations.

Formally, the "sanguinity index" can be defined as:

$$I_s = \{ [(Pi/Hi) / (\sum_{j=1}^{n} (P_j / H_j)/n] - 1 \} 100 \qquad (3)$$

where Pi = price of slaves in year i, Hi = hire rates of slaves in year i, j = years of the period characterized as of "normal" or "average" expectations, and n = number of years of the "normal" expectation period.

Thus, the annual hire rate reflects the market appraisal of the productive value of slave labor services in a particular year. The purchase price reflects this market's appraisal in this year and the following years, during the life time of slaves.

The "sanguinity index", being the ratio of the two series, can therefore test the relative optimism or pessimism about the future prospects of the institution of slavery. By totally differentiating equation (2), we obtain:

$$P^*_{sf} = H^*_f - i^* + x^*$$

390 The profitability test, although not inappropriate if the yearly rate of capital losses are included in the calculation of the internal rate of return, does not yield adequate insight here.

391 For an explanation of the construction and interpretation of the index, see Fogel and Engerman, "The Economics of Slavery", in Fogel and Engerman, eds., *The Reinterpretation of American Economic History*, pp. 331-332.

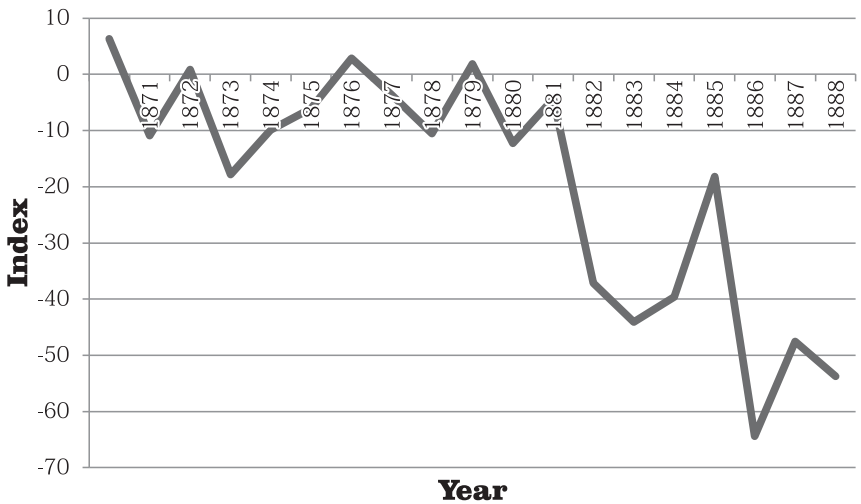
Where an asterisk (*) over any variable represents it in rate-of-change form. Suppose the interest rates do not change during this period (i* = 0). According to the competitive hypothesis, the n in equation (1) would be equal to the biological life of a prime field hand slave, since the uncertainty element in the economic life of slavery, if it existed, would not change during this period. Assuming that the slave mortality conditions do not change during this period, n* = 0.

Therefore, since i* and n* can be considered as equal to zero in this interpretation, x* would also be equal to zero (that is, the capitalization factor would not change during this period). One would expect that slave prices and hire rates would change at the same rate (P* = H*) and that I_s would either be a straight line or would present only a few fluctuations during this time[392].

In my interpretation, however, the n in equation is the expected economic life of slavery, which because of the increasing uncertainty caused by the "abolitionist pressure" was declining at an increasing rate. Since one would expect that the capitalization factor x would be declining, x* would be negative. Thus in my interpretation Is would fall continuously in the last years of slavery.

Using the information on the price and hire rates presented in Chapters 4 and 5, I present in Figure 10.2 the "sanguinity index" for the period 1871-1888.

Figure 10.2 – Sanguinity index, 1871-1888.



392 Presumably, H* < 0 , P* < 0, but H* = P*.

Although it can be observed that slave owners were pessimistic in the two years following the Free Womb Law, their optimism increased after a while and oscillated throughout this period up until 1881. In the years immediately following, optimism lessened significantly, rising again in 1885 in the hope that with the passage of the Sexagenarian Law, thought to be a concession to the abolitionist forces, abolitionist pressure would decrease. However, since the abolitionist movement reached full power in 1886, its pressure continued to be felt and hopes were drastically diminished until the very end[393].

It is clear that sanguinity declined rapidly in the 1880s, showing that the abolitionist pressure was acting in the purchase market through the capitalization of the net hire rate. This is even more apparent in Figure 10.3, which, while presenting the "sanguinity index" based on the prices and hire rates of male and female adult urban slaves and of male rural slaves aged twenty to twenty-nine, uses the 1860-1879 period as the "average" period of expectations.

Figure 10.3 – Sanguinity index of urban and rural slaves, 1870-1888

Two features of the urban and rural sanguinity indexes are noteworthy. The first is the fact that the "sanguinity index" falls rapidly in the 1880s for both urban and rural slave owners. Even if, presumably, the abolitionist pressure was more intense in the urban areas, both rural and urban slave

393 As Conrad remarked, the Sexagenarian Law "was a change in the status quo and so broke the forward momentum of the liberation movement, causing it to mark time in late 1885 and early 1886, before the final rush for triumph". Conrad, *The Destruction of Brazilian Slavery,* p. 211.

markets were connected, and slaves would be moved from one market to the other. Thus, we would not expect very different patterns of behavior of the indexes.

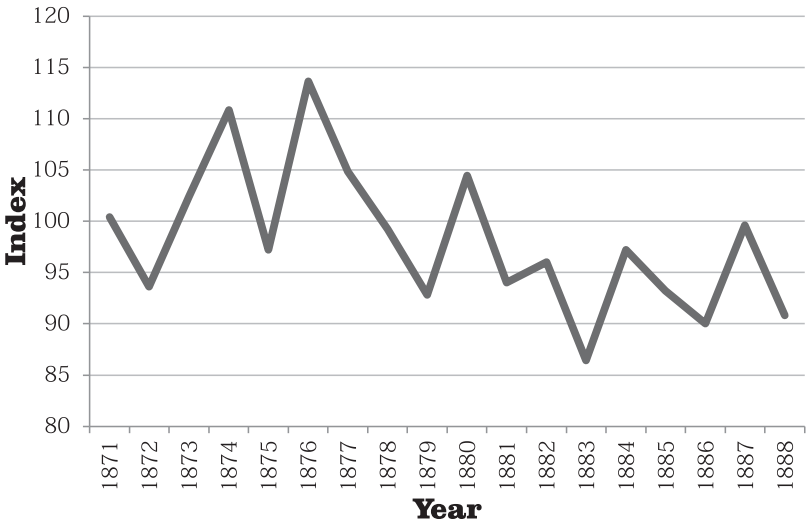
The second is is the fact that, by comparing the 1870s rural and urban "sanguinity indexes", the expectations of rural slave owners, although volatile, conform with the trend of "normal" or "average" expectations. Urban slave owners, however, were consistently more pessimistic during this period than were rural ones, which support the interpretation that the Brazilian abolitionist movement was mainly an urban phenomenon[394].

Real Hire Rate Index (RHR Index)

This index further supports the interpretation that it is the purchase market, and not the rental market, which is relevant to the decline of demand for slaves during this period.

For the construction of the RHR Index I used the evolution of the real annual hire rate for male rural slaves in the period 1871-1888, with 1871 as the base year (1871=100), based on date presented in Chapter 5. Figure 10.4 presents the RHR Index from 1871 to 1888.

Figure 10.4 – Index of real net hire rate for rural males slaves (1871 = 100).



According to the theory that the decline in the demand for slaves was caused by both the non-profitability of slaves and the increasing importance of modern planters in coffee plantations (opting for hiring

394 See Viotti da Costa, *Da Senzala à Colonia*; and Graham, "Causes for the Abolition of Negro Slavery in Brazil".

free labor and European immigrants) in coffee production, the real hire rate should have been gradually and steadily falling during this period, reflecting the declining demand for slave labor services[395].

However, we can observe a different picture based on the RHR Index. Figure 10.3 shows that real hire rates increased from 1871 to 1876 at the average geometric annual growth rate of 2.4 percent, fell in the period of 1876 to 1883 at the rate of 3.15 percent per annum, increased again between 1883 and 1887 at the growth rate of 2.9 percent per annum, and fell again only in the last year of slavery. Although growth rate was slightly negative in the overall period of 1871-1888 (- 0.76 percent per annum), in the critical 1882-1887 period the trend was positive[396]. The validity of these results would not be compromised if other series of slave real monthly hire rates by gender and occupation were included[397].

The cyclical movements in the real net annual hire rate for male rural slaves during 1871-1888, rather than supporting an interpretation of a continuous and steady falling in the demand for slave labor services, seem to reflect the fluctuations and trends in coffee exports and revenues during this period, as can be seen in Figure 10.5.

Changes in the Slave Age-Price Profile

My intention is to examine the purchase market of slaves, with the objective of exploring the competing hypothesis regarding this market – specifically, uncertainty regarding price or output of coffee as compared with uncertainty over the future of the institution of slavery.

Since expectations other than the "abolitionist pressure", like falling coffee prices, depressions in the world coffee market, and other events, could have been acting in the purchase market for slaves, the presentation of the age-price profiles for slaves in different time periods intends to examine these possibilities. As we will see below, the result reinforces the interpretation developed in the "sanguinity index".

But first of all it is useful to examine the situation of coffee prices and output during this period, since most economic studies agree that the formation of expectations about price and output is generally based on a weighted average of current and past experience of those magnitudes (e.g., the adaption expectation model), with lower weights placed on the more distant past than on recent experience.

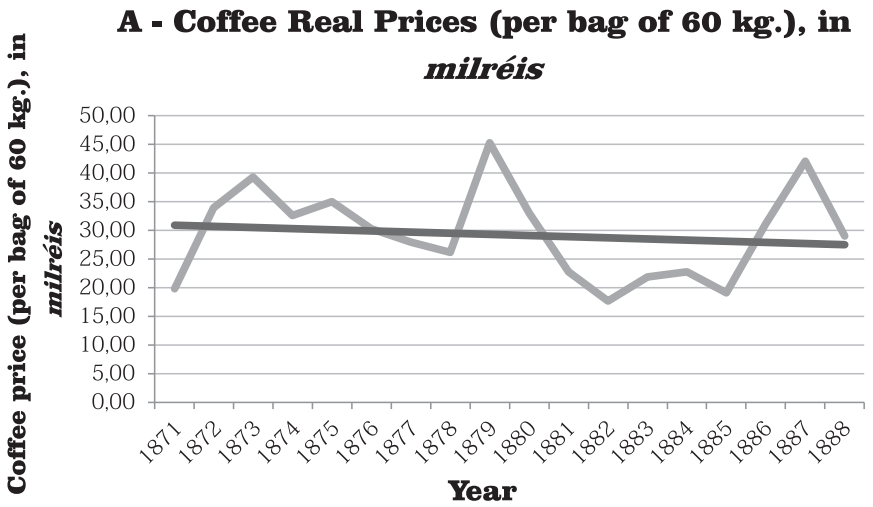
395 Even assuming a constant or falling supply of slave services during this period, reflecting the "demographic shrinking" of the stock of slaves.
396 Log Ht = 5.072 + 0.01371 t, R-square = 0.15.
397 See Chapter 5, Figures 5.1, 5.2 and 5.3.

Figure 10.5 presents the course of real coffee prices and revenues, and coffee exports during the 1871-1888 commercial years.

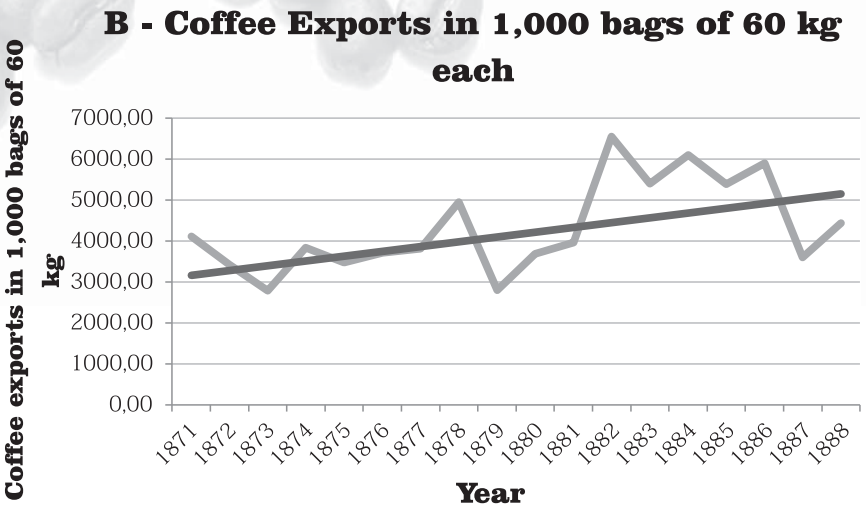
As can be observed, although the trend of real coffee prices was slightly negative in this period[398], there was a high positive trend in coffee exports[399] and an almost perfect matching of falling real prices and rising exports, so that the real coffee revenues also showed a positive trend during this period[400].

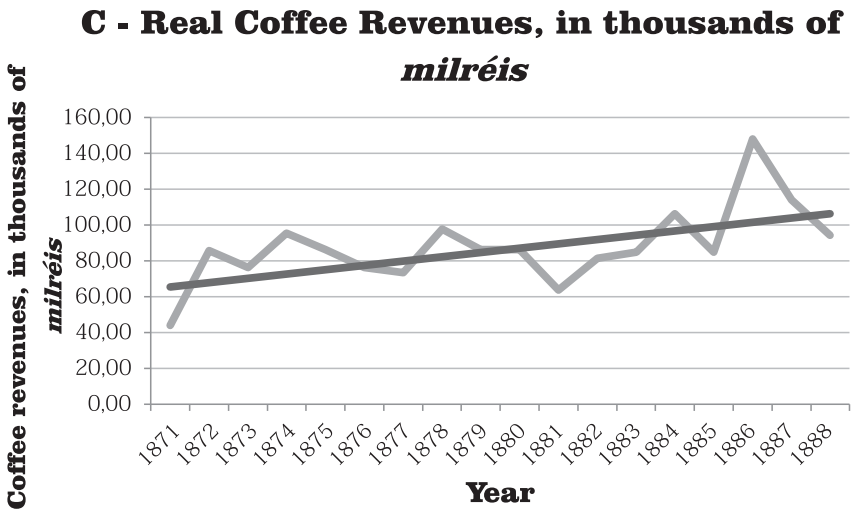
It should be noted that the period from 1871 to 1888 was a booming one for exports within the longer period 1821-1889 and was characterized by high coffee prices and revenues. In addition, if one focuses only in the sub-period of the commercial years of 1882 to 1888, then the trends of real coffee prices, coffee exports, and real coffee revenues are all positive[401].

Figure 10.5 – The Course of Coffee Real Prices, Exports and Real Revenues., Brazil, 1871-1888. A=Coffee Real Prices (per bag of 60 kg.), in *milréis*; B=Coffee Exports in 1,000 bags of 60 kg each; C= Real Coffee Revenues, in thousands of *milréis*.



398 The trend line for coffee prices in 1871-1888 is Pc = 31.2 – 0.183 t; R-square= 0.014.
399 For coffee exports, E_c = 3.178 + 121.2 t; R-square =0.29
400 For coffee revenues, Rc = 97,046 + 2,468 t ; R-square= 0.36
401 For the real coffee prices in 1882-1888 : Pc = 14.17 + 3.02 t ; R-square: 0.58. For coffee exports, E_c = 3,504.8 + 25.8 t; R-square: 0.019 and for Real coffee revenues, R_c = 112,988 + 5.369.4 t; R-square: 0.24.





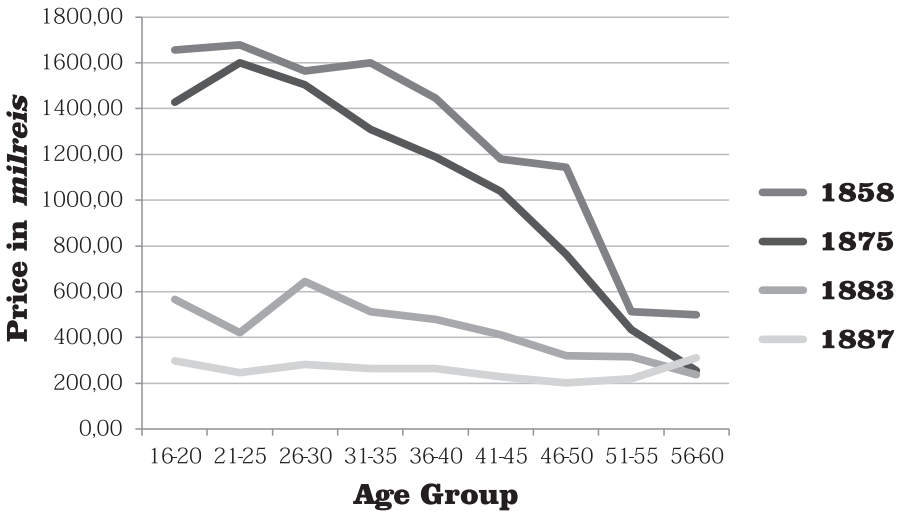
The evidence presented above suggests that there was no sustained basis for the pessimism of coffee planters about the long-range future of the coffee market which could explain such a huge decline in the demand for slaves in the period from 1882 to 1887.

Slave age-price profiles can be used to support the interpretation that the principal reason for this falling demand was fear of abolition and not expectations about the prospects of the coffee market.

In Figure 10.6 we present the age price profiles of male and female slaves between the ages of 16 and 60, for the years 1858, 1875, 1883

and 1887. It is expressed in absolute values, and as averages of slave prices for the age cohorts 16-20, 21-25,…., 56-60[402].

Figure 10.6 – Changes in the Shape of Age-Price Profiles of Male and Female Slaves, Sixteen to Sixty years old



The basic shape of the age price profiles was robust to differences in the trend of slave prices. That is, the shape would not change during the ups and downs of average slave prices, although the whole curve would shift up and down. This can be seen in Figure 9.6, by comparing the age-price profiles of coffee plantation slaves in 1858 and 1875[403].

Although economic factors affecting the expectations of coffee planters (such as the coffee market's business cycles) could have affected the average price of slaves by causing changes in the derived demand for slaves, they would probably have tended to have had little impact on the age cohorts.

In other words, they would not have significantly affected the distribution according to age. The "abolitionist pressure", however, by creating expectations about abolition with less than full indemnification (or even none, as it turned out) according to market values, would have had a greater impact on the shape of the age-price profile.

402 The total sample consisted of 1,004 male and female slaves from ages 16 to 60. For the year 1887, prices from 363 slaves in the Rio de Janeiro (city), *Cartas de Libertação dos Escravos*, were used; for the other years, Rio de Janeiro (province) *Coffee Plantation Inventories*: 226 slave prices (1858), 277 (1875), and 138 (1883). See Appendix B for the list of sources.
403 Real slave prices (three years moving average) for 1858, 1,382$700, were 37.8 percent higher than 1875 prices, 1,003$460, as can be seen in Table 4.2.

One would therefore expect a change in the shape of the age-price profile, probably with a flattening in the younger ages. Since the price of slaves was the capitalized value of the net stream of future labor services, prices of younger slaves (aged fifteen to thirty-five, for example) would have had a relatively higher decline when compared with middle-aged or old slaves (aged forty-five to sixty, for example).

Looking at Figure 10.6, and by comparing 1858 with 1875, we see that the age-price profile was resistant to differences in the trend of average prices. In addition, there was no "abolitionist pressure" during the period 1850-1880 similar to the one prevailing in the 1880s, according to which slavery was increasingly expected to be abolished with no indemnification[404].

The age-price profiles of 1858 and 1875 can be interpreted, therefore, as typical of the period before the "abolitionist pressure" of the 1880s. However, looking to the age-price profiles for 1883 and 1887, a different picture emerges: These profiles became increasingly flat in the 1880s and in 1887 the profile is virtually flat[405] . Thus, in 1887, the price of a slave was virtually identical to the net annual rate to be paid. For planters, it became a matter of indifference to own or rent new slaves.

The " Political Death" of Slavery

The term "abolitionist pressure" needs some clarification[406]. Although in a broad sense there was some sort of abolitionist sentiment throughout the entire period beginning in the years preceding the closing of the African slave trade and ending in 1888, one can distinguish three different phases, each with its specific effects on the expectations among coffee planters about the future of slavery.

The first phase stretches from 1831, when the African slave trade was declared illegal in Brazil[407] , to the early 1850s, when it was finally abolished

404 The issue of indemnification was very important at the time. There are three basic questions involved. First, assuming full indemnification would be paid, what would be the reference value for that, the market price at the time of Abolition, or the value by which the slave was purchased? A related issue was the legal property of the slave, since they could – and were – transferred to other buyers. The second issue was expectations about full or partial or no indemnification, and there was an increasing uncertainty about this question after 1885. The final issue was the financial arrangement for indemnification, if granted: paid in currency or by government securities.

405 And the average price approaching the annual rental value of a slave.

406 During the 1880s, to support the abolition of slavery was part of the *zeitgeist* of the intellectual changes taking place in the principal cities of Brazil. The three best sources for a description and analytical interpretation of the abolitionist movement in Brazil are Viotti da Costa, *Da Senzala à Colonia*; Conrad, *The Destruction of Brazilian Slavery*; and Beiguelman, *A Formação do Povo no Complexo Cafeeiro*.

407 Law of November 7, 1831, prohibiting the African slave trade, which was never enforced by the Brazilian government.

after considerable pressure from Great Britain[408]. It can be considered the first phase for our classification of coffee planters' expectations about the end of slavery in Brazil.

Given the 300-year-long planters' reliance on the importation of African slaves[409], the realization in the 1840s that the end of the trade was approaching, and the period of price adjustment in the slave purchase market following the trade's effective termination in 1851/1852 created a spurt of expectation that slave labor would become scarce and more expensive, and that a substitute for the cheap African slave was therefore needed.

Although the first attempts to bring European and Chinese workers to coffee plantations were made during this period[410], expecting the possibility of a labor shortage, there was neither expectation nor mention of an immediate end to the slavery institution among coffee planters.

This relative lack of concern can be seen in the sentiments of contemporary Brazilian society where little evidence can be found that the legitimacy of the institution was being challenged at this time. With the development of the internal slave trade and the completion in the purchase market of the adjustment period of slave prices to the new supply conditions, these expectations were dissipated.

The second phase centers starts with the discussion about the Free Womb Law, enacted in 1871. With the debate about this important legal measure, beginning in 1867 and lasting until the early 1870s, there was another spurt of expectations of coffee planters about slavery. This time, however, it became evident that the inevitable demographic shrinking of slavery would require a discussion of the alternatives for slave labor.

A consensus gradually emerged among coffee planters that the deaths and manumissions of slaves would produce a natural end to slavery, and that meanwhile a permanent (i.e., European immigration) or transitory (i.e., Chinese immigration) substitute for slave labor had to be found.

Although during the late 1860s and early 1870s coffee planters felt that slavery was doomed, neither they nor the Brazilian social body at large expected involuntary manumissions or an abrupt end to slavery without full indemnification according to market prices. Slavery was still legitimate in society's eyes.

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408 For Great Britain role in the abolition of slave trade in Brazil, see Leslie Bethell, *The Abolition of the Brazilian Slave Trade.*

409 See Klein and Luna, *Slavery in Brazil,* for an updated survey of the works about this important topic.

410 Eduardo da Silva Prado, "Immigration", in *Le Brésil* em 1880.

Coffee planters therefore viewed the gradual abolition of slavery by natural causes, together with the search for suitable substitutes, as a reasonable way to achieve the transition to free labor while sparing agricultural production. This position, called "*Emancipacionismo*", was sharply attacked by the "*Abolicionistas*", who pointed out that slave longevity and concentration of slaves in coffee plantations would unacceptably prolong the institution in Brazil. This criticism by the abolitionists, however, would be developed and become widespread only in the mid 1880s[411].

The third phase was in the 1880s. It was only in these years that the "abolitionist pressure" increased and that coffee planters' expectations acquired a new nature. This time they expected slavery to end for political, as opposed to natural reasons (as would happen as a consequence of demographic decline).

Moreover, after 1882, when the abolitionist movement gained momentum and became widespread, coffee planters became increasingly aware that there would probably be no indemnification whatsoever. Their main concern, therefore, was no longer their financial loss but the urgent solution to the labor crisis they felt would occur along with abrupt abolition, as will be discussed in Chapter 11.

As the London-based *South American Journal*, quoting government sources, noted in 1885, it is fair enough to admit "that advocates of slavery open and avowed there are none in Brazil" and that "those who are not abolitionists assume the title of emancipators"[412].

The coffee planters' attitude was to accept the political death of slavery while trying to prolong it as much as possible, pegging its end to the discovery of a temporary or permanent solution to the expected labor problem. Indemnification became only a secondary concern, the major issue being a smooth transition from slave labor to a suitable substitute for work in coffee plantations.

It is in this last sense that the term "abolitionist pressure" was used in this study, emphasizing the connections between the political and ideological movement to abolish slavery in the 1880s and the demand for slaves by coffee planters.

That by the mid-1880s coffee planters were pessimistic is well documented by observers. Laerne, in a survey of coffee plantations in late 1883 and early 1884, noticed that planters did not expect slavery to last

411 Laerne, *Brazil and Java,* p. 108.
412 *South American Journal and River Plate Mail*, 22 June 1885, p.305.

longer than 1890[413]. In 1885 the *South American Journal* commented that Premier Saraiva, assuming the government of the Empire and taking into account all those elements of acceleration of the abolitionist movement, ventured to express his conviction that by 1892 Brazilian slavery would finally be extinct[414].

Neither did the effect of "abolitionist pressure" on slave prices escape the attention of some observers. As a member of the cabinet of the Empire remarked in 1884, the institution of slavery created an economic anomaly, for its value is determined in direct proportion to the number of slaves : As slave labor becomes scarce, the value of the remaining slaves decreases as well[415]. Ruy Barboza, a great Brazilian statesman, argued along the same lines and maintained that the reason for this anomaly is the "spontaneous action" of the abolitionist movement[416] .

A Measurement of the "Political Death" of Slavery[417]

Indeed, one can obtain in a more formal way, via slave prices, the number of years coffee planters expected slavery to last for each year of the period 1881-1887 and then to translate this into the date they expected the political death of slavery.

With the information on the prices of the twenty – to twenty-nine-year-old male rural slaves, presented in Chapter 4, and the estimates of interest rate, presented in Chapter 8, it is possible to measure the unnatural "death" of slavery, by the use of equation (1).

In this case, however, n only represents the expected "economic life" of male slaves , and not the "life table demographic" expected average life of male slaves.

Using the information on slave prices and hire rates presented in columns (1) and (2) of Table 10.1, and using the 10 percent point estimate for the alternative rate of return[418] , we can solve for n in equation (1). The results are shown in column (3) of Table 10.1. This Table calculates the "political death" of slavery.

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413 Laerne, *Brazil and Java*, pp.86 and 95.
414 *South American Journal*, 27 June 1885, p.306.
415 Conselheiro Martim Francisco, *Acta da Conferência de Estado*, June 25,1884, quoted in Barboza, *Emancipação dos Escravos*, p.17.
416 Barboza, *Emancipação dos Escravos*, p.16-17.
417 I am truly indebted for Deirdree McCloskey, member of my Ph.D. Dissertation Advisory Committee, for developing and suggesting this indicator, when revising my manuscript. The indicator she suggested ended up to become one of the highlights of my work.
418 The use of the estimated 13 percent rate of return on the investment of slaves, shown in Chapter 8, would not alter the results.

TABLE 10.1
The "Political Death" of Slavery

YEARS	(1) Prices[a]	(2) Hire Rates[a]	(3) n[b]	(4) Expected Year of Abolition
1881	1,700$000	181$720	29	1910
1882	1,341$000	188$740	13	1895
1883	723$500	170$530	6	1889
1884	800$000	186$210	6	1890
1885	715$900	178$710	5	1890
1886	647$800	169$010	5	1891
1887	255$700	187$810	1	1888

NOTES:
a: nominal values in *milréis*
b: the value of n measures the expected "economic life" of slaves, in years, and was obtained by solving equation (1), $P_s = H/i\ [\ 1 - 1/(1+i)^n]$

The results shown in column (3) indicate, for each year of the period 1881-1887, for how many years coffee planters expected slavery to last. The year 1881, as argued before, was typical of the period in which "abolitionist pressure" was not yet present, so the n for this year (29 years) is very close to the estimated boundaries (26.76 and 29.18) of the life expectancy of a twenty-year-old male slave (Table 7.2, Chapter 7).

From this year until 1883 there was a dramatic fall in the value of n to a very low magnitude (6 years), a trend which continued at this level until 1887, when there is another intense decline (n becomes 1 year), showing that months before the final Abolition Law of May 13, 1888, slavery was already virtually extinct in Brazil.

The information presented in column (4) of Table 10.1 , representing the dates slavery was expected to end, also bears upon the above analysis. If 1881 can be considered typical of the expectations prevailing in the years before the "abolitionist pressure" of the 1880s, coffee planters in the 1870s expected slavery to be in existence after the turn of the nineteenth century.

With the acceleration of "abolitionist pressure", however, those expectations were rapidly reassessed. Slavery, which in 1881 was expected to last until at least 1910, was subjected to a remarkable change of expectations in less than two years. As early as 1883, coffee planters correctly perceived that slavery would end at a date close to 1890.

Although optimism increased in the years surrounding the passage of the Sexagenarian Law in 1885, the year 1887 marked the coffee growers' realization that the "political death" of slavery would occur the following year. Thus slave owners quite perceptively foresaw this occurrence five years before the 1888 final abolition.

This means that since the slave purchase market had translated those expectations into gradually falling prices, the capital losses of slave owners occurred more intensely in the years 1882 and 1883, and again in 1887, and *not* in 1888.

In conclusion, the evidence presented in the "sanguinity index", the evolution of the real hire rates, the change in slave age-price profiles, and the "political death" of slavery, all suggest the need to consider more than purely economic factors in order to understand the process of abolition in coffee plantations. As Engerman wrote, "more complicated models, drawing upon social, political, and moral, in addition to economic considerations are necessary before we can develop a more complete explanation of the ···fall of slavery"[419].

Although a full explanation for the abolition path in Brazilian coffee plantations would require more than a command of economics, I hope the economic analysis and quantitative evidence I have used in this Chapter can illuminate some of the issues involved in the debate.

419 Engerman, "Some Considerations Relating to Property Rights in Man", *Journal of Economic History*, XXXIII, No. 1 (March 1973), p.65.

CHAPTER 11
DIMENSIONS OF THE LABOR PROBLEM IN THE COFFEE REGION AND SIMILARITIES WITH OTHER SLAVE SOCIETIES

We intend, in this chapter, to describe the expectations of coffee planters with the inevitable end of slavery, and how they perceived and evaluated the different possible alternatives. It is important to stress that this depiction of the possible labor arrangements foreseen by coffee planters conveys the expectations based on the spirit of the nineteenth century prevailing ideas in Brazil[420].

It was shown that the number and demographic composition of the stock of slaves in the coffee region in the 1870's was adequate for the continuation of slavery in coffee plantations for a few decades, and that slavery was profitable, but that the ideological pressure against the institution, that gained strength in the 1880's, made planters aware that the institution would end soon.

We intend to show the proportions and dimensions of the labor problem faced by coffee planters, and also putting into perspective (in the eyes of Brazilian planters) the similarities with the labor problem faced by other slave societies when their abolition of slavery came.

We think a very important element to understand planter's reaction to the proposed abolitionist measures during this period was that Brazil was the longest -lasting country having slavery in the Western Hemisphere, so she could learn from the experience of other countries. If we could agree with Davis that "Negro bondage was a single phenomenon, or Gestalt, whose variations were less significant than underlying patterns of unity[421]" than we want to add that the same applies to the labor problems emerging after abolition and to the solutions tried to solve it.

The "crux of the matter": supply of laborers in the event of Abolition

It is important to keep in perspective that Brazil was a land intensive

420 What was the effective outcome after the 1888 Abolition in the labor market organization in different

421 David Brion Davis, *The Problem of Slavery in Western Culture,* (New York: Cornell University Press, 1966), p. 229

but labor scarce country, and had to compete with other tropical regions labor intensive and scarce in good agricultural land.

Coffee planters faced a complex labor problem, which was increasing in the last two decades of slavery. If we choose 1884 as a representative year, we saw that slaves still represented almost the totality of workers in coffee plantations, since they were the most economically convenient organization of labor. At the same time planters' sanguinity was shaken by the "abolitionist pressure"[422].

The pessimism of planters was not due to their traditional attitudes in production. When dealing with other factors of production, such as capital, they did not display alleged "pre-capitalistic" mentality. For instance, Brazilian planters were much more advanced than producers in other coffee producing countries in the employment of machineries for the processing of coffee berries.

Laerne noticed in his trip to Brazil in 1884 that:

> "During the last ten years the preparation by machinery has progressed enormously…to spare hand labor and improve the badly harvested crop by careful preparation, the Brazilians do not hesitate to spend fortunes in procuring the newest machinery…[423].

Planters organized congresses and clubs to discuss their common problems, and they were also attentive to the evolution of coffee planting in other countries (with an eye in the respective labor markets). Some planters invented new machines for processing coffee, others published manuals, technical books and reviews, other tried the introduction of different species of coffee trees, and other innovation measures. Planters also invested in railroad transportation, or in the creation of more advanced commercial structures for coffee marketing. In short, from an economic point of view they were entrepreneurs highly responsive to changes in input costs or output quality prices.

The essential reason for the existence of the *questão do elemento*

422 See Aitken, Hugh G.J. *Did Slavery Pay?* Hugh G.J. Aitken, ed.(New York: Houghton-Mifflin, 1971); Genovese, Eugene. *Roll, Jordan, Roll. The World the Slaves Made*. (New York; Vintage Books, 1976); Higman, B.W. *Slave Population and Economy in Jamaica*, 1807-1834 (Cambridge: Cambridge University Press, 1976); Hummel, Jeffrey Rogers. *Emancipating Slaves, Enslaving Free Men. A History of the American Civil War* (Peru,Illinois: Open Court, 1996); Mattoso, Kátia de Queiros. *Ser Escravo no Brasil* (São Paulo: Editora Brasiliense, 1981); Mintz, Sidney W. *Sweetness and Power. The Place of Sugar in Modern History* (New York: Penguin Books, 1985); Ransom, Roger L. and Sutch, Richard. *One Kind of Freedom. The Economic Consequences of Emancipation* (Cambridge: Cambridge University Press, 1977).
423 C.F.Van Delden Laerne, *Brazil and Java. Repport on Coffee Culture in America, Asia and Africa*. (London, 1885), p. 317.

servil (slavery debate) was that slaves provided an efficient, disciplined and organized labor force at the lowest cost, and without slaves the alternatives – freedmen and Brazilian laborers – were an expensive source of labor.

It is interesting to notice that Van Delden Laerne, that made so thorough investigation in coffee plantations in Brazil, was attached to the Department of Interior at Batavia (Java), and he was charged by the Dutch government with a special mission to Brazil on behalf of the coffee-culture and coffee-commerce of Dutch possessions in Asia.

Java was the second larger exporter of coffee after Brazil (Brazilian production in 1884 represented almost 50% of the world production), and so it was important for them to assess the prospects of Brazilian coffee culture, and, in particular, how those prospects would change in face of abolition. His conclusion was:

> "The prospects of Brazilian agriculture in general, and coffee planting in particular, are far from encouraging, owing to the labor difficulty… it is very difficult to replace them (slaves)…I fear that a heavy blow will be dealt to coffee planting in Brazil. A blow as severe as that which smote Jamaica in 1838 after the Emancipation of slaves…"[424].

Coffee planters' complaints about the scarcity of labor were made even before the closing of the African trade (1850), when British harassment provoked an increase in prices. Their concerns accentuated after the end of trading, when prices rose sharply, but until the 1870's those complaints can be interpreted as saying that there was an excess demand for slaves at the old prices. Only in the last two decades of slavery, principally in the 1880's, when the abolitionist pressure intensified and their sanguinity about the institution was shaken, did these complaints assume a different nature.

As Laerne remarked in 1884:

> "in that country coffee planting is passing through a crisis, which… is threatening its very existence. But it is not the system of coffee planting that has occasioned this crisis: it is exclusively the more and more urgent necessity for laborers[425]".

424 Laerne, *Brazil and Java*, p. 374-376
425 Ibid, p. 272.

He noticed that when talking with the *fazendeiros* (planters) about coffee planting he was listened to in general with obvious indifference, but that there was much more interested displayed in whatever referred to the labor difficulty[426].

He found planters very worried about the future of coffee planting. Even so successful and big planter as the Count of Nova Friburgo, who owned nine plantations with almost two thousand slaves in the Paraíba Valley, had 80 km of private railways and telegraph connecting the plantations, had this to say to him in 1884:

> "the gradual decay of the *grande lavoura* (big plantations) is no longer to be resisted…yours is the future (Java)…we are doomed…all hope of maintaining the industry has abandoned us now…[427].

Coffee planters expected the freedmen would work for them only a small fraction of what they did as slaves. Their expectations were based partly on the behavior of the Brazilian freedmen after gaining freedom, and also by observing the behavior of the free laborers in the country. Perhaps more important for the making of coffee planters expectations was what they learned from other slave societies that had experienced an abolitionist experience[428].

The crux of the matter of the slavery issue *(questão do elemento servil)* was thus, and increasingly so in the end of the 1870s and in the 1880s, how labor could be organized and how could coffee continue to be cost efficient and productive without slavery? What sources of alternative labor would be better if slaves had to be replaced?

Emancipation of slaves in other parts of the world as evaluated by Brazilian coffee planters

If the fact that Brazil was the last country in the Western World to continue maintaining the slavery institution explains much of the growing abolitionist feeling, principally in the 1880's when she was the sole surviving slave power, on the other hand it provided Brazilian coffee planters with the example of consequences of abolition in other countries. And these examples gave them reasons to be afraid of what could happen in Brazil.

426 Ibid, p. 273.
427 Ibid, p.339
428 See Bergad, Laird *The Comparative Histories of Slavery in Brazil, Cuba and the United States.* (New York: Cambridge University Press, 2007).

The American South and the West Indian colonies (particularly Jamaica) were the ones most commented in that respect. As remarked by Laerne:

> "when the slave emancipation and its consequences are discussed, it is usual to point…to the fate of the Southern states of the North American Union… [429]".

Three years later, in 1887, almost on the eve of the May 13th 1888 Abolition, an observer commented:

> "I have often heard in Brazil…that the final extinction of slavery will be the death blow to the profitable cultivation of coffee…this idea was, of course, derived from knowing the disastrous results that ensued in Jamaica after the sudden emancipation of slaves there…"[430].

Others even assumed Brazilian experience with abolition would be worse than those experienced by these societies. As a Britain connected with São Paulo coffee planters wrote in 1883:

> "The whole civilized world would rejoice to see this terrible question of Emancipation settled, and none more so than the Brazilians themselves…England and the United States, when they emancipated their slaves, were not entirely dependent on slave labor for their lives as nations…Brazil, though, is absolutely so dependent, hence she can not follow (their) example…Jamaica was financially ruined for the ensuing years after the Emancipation of 1834…the Southern United States for a period rolled back into jungle and forest…both those countries, during the years of darkening and ruin, received help from other parts of their respective empires – Brazil though is one, and one only, and has no one to help…[431].

Allusions of how the Southern United States had years of crisis after Abolition, but after were recovered, and could account with the labor of the ex-slaves were common in the newspapers and other vehicles of public opinion[432]. In 1880 a diplomatic incident, with great repercussion,

429 Ibid, p. 86
430 Wells, James A. "A Sketch of Brazil", published in the *South American Journal* (henceforth SAJ), April 30, 1887, p. 253.
431 "Letter from Walter J. Hammond, from Jundiahy, São Paulo, SAJ, April 26, 1883.
432 See, as examples, Laerne, op. cit.; SAJ, April 26, 1883; "Times", August 16, 1886.

was created in Brazil when the American Minister in Rio de Janeiro wrote a letter to the Brazilian Anti Slavery Society detailing the prosperity of the Southern states of North America since the Abolition of slavery there.[433]

Since in the North American experience was difficult to separate the consequences of Abolition from the consequences of the Civil War in the disorganization of labor, it was the Jamaican experience that caused more concern for the coffee planters. So it will be useful to deal briefly with it. It was an example of Emancipation with full indemnification to the slaveholders, but with serious repercussions for the economic organization of labor.

After the Emancipation in 1834, sugar production declined steadily from 68,962 tons in 1830 to 28,750 tons in 1850[434]. There was a shift from labor in plantations to subsistence agriculture by the ex-slaves. Between 1836 and 1846, 156 sugar plantations went bankrupt; by 1846 the rate of failures had declined, but 86 more plantations were abandoned from there until 1852[435].

It was assumed at the time of Emancipation that after a transition period, production would increase more than before, given the alleged superiority of free to slave labor. However, labor participation rate dropped substantially. According to Aufhauser:

> "On the 138 sugar states for which data is available, the resident labor force on the states decreased from 41,820 in 1832 to only 13,973 in 1846…those who remained on the states under the new conditions, only the men were working as before…two thirds of the women and all of the children withdrew from field labor…the number of hours worked by those who elected to stay on the states was reduced as well…"[436].

433 Blacklaw, A. J. "Slavery in Brazil", SAJ, July 20, 1888. For a complete account of the Hilliard incident, see Robert Conrad, *The Destruction of Brazilian Slavery,* 1850-1888, p. 141-43.

434 Data from Robert Keith Aufhauser, "Work and Slavery: Profitability, Discipline and Technology on Caribbean Plantations" (Unpublished Ph.D. Dissertation, Harvard University, August 1971). According to his analysis, if from the point of view of the planters the consequence of Abolition was a collapse of the plantation system and the common measures of economic progress which went out with it, from the freedmen viewpoint the decline of the number of working days represented a net gain of leisure, benefiting the mass of population, and a sudden rise in the standard of living, not only in the number of leisure hours at their disposal, but also in terms of the level of consumption. (p. 61).

435 Ibid, p. 60. According to another author, 14 sugar plantations and 465 coffee plantations had been abandoned in Jamaica between 1838 and 1848. During the same period, in other British colonies also emancipated, 40 states were abandoned in Trinidad; in Guiana 72 sugar plantations were abandoned between 1838 and 1850. See W. Emanuel Rivière, "Labor Shortage in the British west Indies after Emancipation", *Journal of Caribbean History*, vol. 4, May 1872, 1-30, p. 17.

436 Aufhauser, op. cit., p. 61-62.

It might be argued that coffee planters could choose the examples of Barbados and other West Indian colonies where the consequences of Abolition were not so disastrous. They had reasons, however, to think that the situation in the coffee region had more similarities with the Jamaican situation before abolition than any other.

As the correspondent of *The Times* wrote from a coffee county in São Paulo in 1883:

> "the places principally affected by the English emancipation were Barbadoes and other West Indian possessions. As to Jamaica, its history is well known, being one of gradual decline in prosperity from the date of the promulgation of emancipation for 15 or 20 years… The Barbado and the other islands did not suffer so seriously owing to being very much smaller, and having less unoccupied lands for negroes to squat upon; to which must be added the foresight of some of the masters, who had all the bananas and other fruit trees cut down, so that the emancipated slaves were from the very day of their freedom obliged to work to live, the masters possessing the money (from indemnification) and still retaining the land…" [437]

In the continuation of his report, the The Times' Correspondent made a comment that represented the major concern for Brazilian coffee planters:

> "if this destroying of the fruit trees and roots were impossible in the island of Jamaica, how much less possible would be in the Empire of Brazil, with its thousands upon thousands of unexplored miles abounding in game, rich in soil, full of edible roots and fruits, watered by magnificent rivers abounding in fish, a hiding ground where nations could hide and could thrive unseen…[438].

Although a somewhat exuberant description of the situation in Brazil, nevertheless this quotation intuitively captures the economic nature of the problem. The emphasis on the importance of the alternatives open to the ex-slaves to determine the success of plantations in keeping their labor force is the key element to understand planters' dilemma, and why they

437 SAJ, August 2, 1883. The Correspondent of *The Times* reported from Jundiahy, São Paulo (probably was Hammond, see foot note 27.
438 Ibid.

give more attention to real examples resembling the Brazilian scenario, like Jamaica and the United States.

Almost up to the end of slavery in 1888 slaves represented the overwhelming majority of workers in coffee plantations, as seen in Chapter 6. As said by the chief of the Liberal Party in 1880, a Senator, "slaves are the only agriculturists in Brazil, and that free labor counts for little in the coffee planting, nay is absolutely null…[439]". The reason, as seen in Chapter 9, was due to the profitability of slavery in coffee plantations. Although plantations and slavery are two separate issues, while slavery existed there was a close association between them.

Given Abolition, the plantation system would have to organize labor by another means than slavery[440]. The coffee planters feared they would lose, at least partially, the advantages they received with slave labor: guaranteed labor supply in all seasons, high labor participation rate for men, women, children and elderly, discipline, control of troubles, low requirement for cash flow expenses, and other advantages they perceived[441].

The description of labor organization in coffee plantations presented in Chapter 3, and the advantages they saw on it, can explain their reluctance in changing the system of slavery when based on economic considerations.

For them, slavery was crucial for taking advantage of this organization system at the lowest cost. It gave property rights over persons, with the power of deciding how much hours of work the slaves would perform each day – that is, planters decided the labor leisure choice of their slaves – and where to allocate those hours – that is, regardless of the preferences of slaves over the kinds of job or way to perform those work hours. But this potential power had to be used together with incentives, in order to produce an optimum mix of penalties and benefits towards the desired behavior[442]. As Laerne observed,

> "in harvest time it is customary to task the slave to a particular quantity: from 7 to 9 or from 3 to 5 *alqueires* per day, according to the abundance of the crop. If he picked less, he incurred punishment,

439 Opinion of the Senator Martinho Campos in the debate of August 30, 1880, in the Senate, quoted in Laerne, op. cit., p. 83.
440 For a discussion of the distinction between plantation and slavery, see Ulrich B. Phillips, "The Decadence of the Plantation System", *American Academy of Political and Social Sciences, Annals*, XXXV, Jan. 1910, p. 37-38.
441 For a discussion of this point, see Lewis Cecil Gray, *History of Agriculture in the Southern United States to 1860, 2 vols,* (Washington, DC and New York: 1933-1941, I, ps. 448, 462, 470-74.
442 See Fogel and Engerman *Time on the Cross*, chapter 6, Paradoxes of Forced Labor.

> corporal chastisement or temporary withdraw of small privileges···a money payment was made to encourage him if he had picked more··· Sunday work, not being compulsory, was also paid for…[443].

Coffee trees are relative delicate, and coffee cultivation needs labor on a year-round basis to keep the trees, plant new ones and replace old ones, dress the gardens, harvest, dry and process the beans, transport and other tasks. So it was essential to have a stable labor force that could be relied upon during labor peak- demand times. In particular, if the labor force could be organized in such a way to allow great efficiency, such as the gang labor system, that was the source of economies of scale in production.

The outlines of the "Slavery Question"

The most important question in Brazil during the period after the closing of the African slave trade in 1850 was the "slavery question" (*a questão do elemento servil*). No single group was more concerned than coffee planters with the consequences of immediate abolition. This abolition would mean not only a financial loss to planters but, perhaps more important, a change in the organization of labor on coffee plantations.

If with abolition the freedman would continue to work as much as before, at a reasonable cost for planters, than only a redistribution of income or wealth would be involved, from one group –slave owners – to another – ex slaves. The freedmen would receive the capitalized value of the difference between their wages (or the value of their marginal product) and their maintenance costs.

In this case the transition to free labor would have only a wealth redistribution effect[444]. Abolition could even have a positive effect, since the slaves after freedom would be willing to work more productively, as it was expected by many liberal reformers.

But it turned out that this was not the nature of the problem, since planters expected a different course of events following abolition[445]. They feared abolition would cause the ruin of coffee plantations, since the

443 "Laerne, op. cit., p. 301. He added that in the Paraiba Valley "in general a slave would get 200 réis per a*lqueire* during the first 4 or 5 weeks of harvest, which sum was increased during the rest of the picking-time to 240 réis per *alqueire*". At the same time and place, "*camaradas* (free laborers)", as he remarked, "would seldom pick coffee, but when they did they received 250-300 réis, in others from 300 to 400 réis per *alqueire*".

444 There is much more to say about this point, and also about the effects of the Free Birth Law on the value of male and female slaves, as it was shown in Chapter 9.

445 Espada, Henrique, "Sob o Domínio da Precariedade: Escravidão e os Significados da Liberdade de Trabalho no Século XIX," *Topoi-Revista de História 6 (11),* 2005, pp. 289-325.

freedmen would work only a fraction of what they used to before while slaves. Indeed, planters were worried, and their concern was growing through the end of the 1870's and beginning of the 1880's, with the repercussions of abolition of slavery in terms of affecting the allocation of resources. They were concerned that there would happen not only a income and wealth transfer effect but also a change in the allocation of resources[446].

Their preoccupation was not only the loss of wealth in the case of abolition without full indemnification, but, more important yet, the disorganization of labor that would be caused, whether abolition was made with or without full compensation.

The basic problem for coffee planters was that, if complete abolition was determined, how to secure a labor force providing the same effort and discipline as slaves, as well the same latitude for organizing the labor for the routine tasks? As observed in 1881 by Couty, "the question is not how to liberate the negroes, but how to find a substitute for them; and, if it is easy to suppress the slave, none knows how to organize free labor[447].

Planters did find an answer. How they could switch from a position in the beginnings of the 1880s in which the labor needs were met almost exclusively by slaves to one a few years later in which European workers were the main source of labor in coffee plantations is what we will examine in the next sections.

Alternatives to Slave Labor in the View of Coffee Planters

Coffee planters began to search for slave replacement some years in advance of the Abolition. Although they tried to postpone as much as possible that day, they began to inquire and discuss alternatives in the 1880s. Very representative of coffee planters's opinion was the "Agricultural Congress" *(Congresso Agrícola)* taken place in Rio de Janeiro during July of 1878[448].

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446 In a broad sense, if we account leisure and utility as a component of national income, and since with freedom of choice the freedmen preferred a composition with more leisure and less labor effort than before, there would be an increase in national income. From the point of view of planters, or from the conventional measurement of national income, the violent change expected of the labor leisure choice of slaves when freed would increase the cost of labor, and, if the demand for labor was not completely inelastic, would reduce production.

447 Louis Couty, *LÉclavage au Brésil* (Paris: 1881), p. 33. Couty added that "the abolitionists···. have not found the way how to indemnify the masters neither the way to substitute the extinct labor supply···"p. 33.

448 *Relatorio do Clube da Lavoura,* (Rio de Janeiro: May 17, 1880), reporting the "Congresso Agrícola de 8 a 13 de Julho de 1878". For a summary of the conclusions of the most important meeting of planters during slavery, see Affonso dÉscragnolle Taunay, *História do Café no Brasil* (15 volumes, Rio de Janeiro: 1939-1943), in volume 6, p. 83-87.

This Congress was sponsored by the Government of the Empire, and was attended by more than three hundred planters or their representatives from the coffee region. There, the labor question was the most important topic of discussion. The major issues discussed dealt upon domestic labor supply problems and external labor source alternatives. There were also several interventions and discussions which in a sense tried to evaluate the costs and benefits of each alternative arrangement to replace slave labor. When evaluating the various questions that were depressing agriculture, most participants of the Congress considered the labor problem the most important one[449].

Employment of the freed ex-slaves

This was the most obvious solution, since it was a trained labor already living in the plantation. It is reasonable to suppose that the ex-slaves would view routine and disciplined daily work, as well the gang-labor system, as an outward manifestation of slavery. The coffee planters, however, could compensate them with a wage capable of reaching a compromise. The problem was the coffee planters thought this wage would be so high as to end the economic viability of their commodity exports.

The coffee planters, therefore, never seriously contemplated that possibility. Their predictions were very pessimistic, as can be glimpsed by a reading of the comments and opinions of the planters or their representatives.

A São Paulo representative in Brazilian Congress called attention for the psychological motives of the slaves when freed and said to the House, in 1874:

> "After the last slave will be gone…what will happen to agriculture in the Province?...the slave, once he is free, does not work to anybody. The thought that once he was a slave is a strong motive of repugnance, making him reject any contract with the planter"[450].

In the beginning of 1883, a foreign observer of São Paulo coffee plantations was seeing the question from the viewpoint of costs, and wrote:

> "we well know that all wealth of Brazil today proceeds from the labor

449 And Chinese immigration the best solution, as will be seen in this Chapter.
450 *Anais da Assembléia Legislativa Provincial de São Paulo*, Sessão 2, Março de 1874.

> of a million of slaves, who, if freed tomorrow, would not work; or, if they did, it would be to a limited extent that the exequer of the nation would become empty…"[451].

During this same year, a correspondent of *The Times* was commenting about the alternatives available in the labor market, and wrote:

> "It is imperative that before abolishing slavery free labor shall be at hand to replace the slaves of Brazil, for of these latter not one-third will work after emancipation, and this third will not do more than two-thirds of what it does now…"[452].

The correspondent went on:

> "To find out how many emancipated slaves would consent to work…at present about 500,000 slaves are engaged in the coffee plantations, of whom more than probable only 150,000 would work after liberated, if freedom were granted unconditionally; and as the real working value of these would be two thirds of what it now is, the number can be only be valued at 100,000 out of the 500,000 now working…"[453].

If we turn to the more sound opinions of the two foreigners who made extensive surveys and trips to coffee plantations, and could consult planter's opinions on the subject, we find the same result. "

Couty remarked in 1884:

> "all the big planters are convinced that the majority of their slaves will leave them and that they will stop working, in a routine way, after their freedom"[454].

In that same year, Laerne found that among planters was spread the notion that ex-slaves would not work. He considered that it was caused by "a confusion of ideas that leads to the unfavorable opinion held of free Negroes"[455]. But in the same paragraph he observed that:

451 SAJ, April 26, 1883, p. 21.
452 SAJ, August 2, 1883, p. 16.
453 Ibid, p. 16.
454 Louis Couty, *Le Brésil en 1884* (Rio de Janeiro, 1884), p. 105.
455 Laerne, op. cit., p. 348.

> "the plantation slave works 14, 16, even 18 hours a day if required… the *fazendeiros* are now so much accostumed to have the slaves work at least 14 hours per day, that they call an ex-slave that works 6 or 7 hours a day for his own hand, lazy…all things considered, an ex-slave is certainly not likely to work harder than a Brazilian from the interior, who has quite a few wants…and to supply these modest demands, a couple of hours's work at utmost is sufficient in a country like Brazil…"[456].

To conclude this section about the expectations of coffee planters regarding the ex-slaves labor effort, in the event of emancipation, we argue that partly based on the examples of other slave societies after abolition, and partly based on their experience with the freedmen at the time, they expected, and this feeling was growing in the mid 1880s, that Abolition would cause the ruin of most coffee plantations.

Since at the same time they did not expect that the institution of slavery would last long, their sanguinity regarding the future of coffee culture in Brazil was increasingly diminishing during this period. They expected that in order to have the freedmen work with the same discipline, routine and organization in coffee plantations as they did before when slaves, the wage plus other necessary labor costs would have to be too high to allow a profitable operation for most coffee plantations.

Indeed, it has been argued by Celso Furtado that, given the traumatic experience of slavery, coupled with the possibility of subsistence agriculture, the supply of labor by the freedmen in the labor market showed the characteristics of a "backward supply labor curve"[457]. If this hypothesis is valid, the "backward bending supply of labor curve" implies that a shortage of labor created by Abolition could not be adequately solved just by raising wages.

Trying to Implant Mechanisms for Coerced Labor

Given the feasibility of economic activities being developed - in particular, tropical commodities that could use more efficiently economies of

456 Ibid, p. 348. The modest demand were "to get daily his cigarette and his *feijoada*, a dish of black beans with *mandioca* –meal and a bit of meat and fish⋯".
457 Celso Furtado, *Formação Econômica do Brasil, 6ª. Edição,* (Rio de Janeiro: Editora Fundo de Cultura, 1963). He does not claim explicitly, but we have inferred that He makes the assumption of a backward supply of labor, since He writes: "the freedmen had relatively high wages in coffee plantations⋯but this improvement in real wages seems to have had negative rather than positive effects in the allocation of factors⋯to understand this is necessary to account some general social aspects of slavery⋯a man in this system⋯is not prepared to respond to economic stimuli⋯the rising of his wage above his needs⋯immediately provokes a strong preference for leisure" (p. 165-66).

scale in their production-, slavery as a rule existed in situations of abundant supply of land together with a lack of adequate offer of voluntary labor.

Plantations needed a source of labor that could conform at the lowest cost to the routine and discipline needed, given the alternatives available. In general, slavery had been the system of labor organization adopted by plantations in the West Indies and Cuba. All those slave societies lost their slaves by Emancipation in a span of time of less than 50 years, beginning in the 1830s.

Emancipation came about mostly by outside interference, by an ideological anti-slavery movement formed and developed outside, and imposed on them, what was aided by the fact that those societies were colonies of European countries.

From an economic point of view, however, this Emancipation was premature, since the causes that in the first place are in the economic nature of the slavery institution had not been solved – that is, the adequate offer of voluntary labor was not at hand for some of those emancipated plantation societies.

But it is not clear why only slavery should exist in situations like that, when there is not sufficient voluntary labor at low wages. As argued by Kloosterboer, as labor systems, serfdom, debt slavery, indenture labor and even contract labor under penal sanction can fulfill almost exactly the same function[458].

Slavery is one of the forms of coerced labor, perhaps the extreme form, and may be the more adequate economically, principally when one ethnic group enslaves the other, like in the Americas, but it is not the only form[459]. The form compulsory labor takes "will in the first depend on the spirit of the times", as she remarks[460].

Given the ideological condemnation of slavery throughout the Western world in the late 19th century, other forms of compulsory labor were resorted to[461].

In general two solutions were tried in the plantation societies in the Americas to overcome the labor shortage after abolition. One was to enact

458 W.Kloosterboer, *Involuntary Labour since the Abolition of Slavery.*

459 Kloosterboer defines as compulsory labor when the laborer cannot withdraw when he/she wishes without being liable to punishment, and/or for which he/she has been accepted without his/her willing consent to it. It is distinct from modern wage labor, that is compulsory in a certain extent, because in this form everyone may at least decide for himself/herself whether he/she would rather work or not work – no direct external compulsion other than wages are exerted. Kloosterboer, ibid, p.2.

460 Ibid, p. 1.

461 Kloosterboer gives a description of each case of coerced labor adopted in British West Indies, Mauritius, South Africa, Dutch West and East Indies, United States, Latin America, Madagascar, Belgian Congo, Portuguese West Africa, and other places, in the 19th century and even in the 20th century.

laws and legal measures to force the ex-slaves to work. The other was to find an external source. Both exhibited overtones of coerced labor.

Since Emancipation came at different times to them, the late society giving freedom to the slaves would have learned from the experiences of the former, and therefore the relative efficacy of both measures was gradually being known. Brazil came last in this "learning curve process", and thus, observing the others, put an increasingly weight in the second solution, as we will examine in the next section. But, before, we will discuss the attempts made in Brazil for the first solution, to coerce labor.

In the British Indies, although Abolition came in 1834, complete freedom was not immediately granted. For slaves aged six or more the apprenticeship system was introduced, compelling the ex-slaves to work for their former masters for a number of years without payment. As this system came to an end in 1838, sooner than predicted by the Law – because of British reaction against excesses of its use – a shortage of labor appeared.

The former apprentices tried alternative forms of employment, and in the colonies with low population density and relative abundance of lands (not cultivated) there was a substantive increase in subsistence agriculture.

Thus legal measures were tried to compel them to work in the plantations, and they were called "vagrant laws". As Riviere points out,

> "One of the foremost questions facing British West Indian planters was: what strategy could best secure a labor force equal both in quantity and quality to the demands of plantation sugar produced in a profitable basis?"[462].

As he shows, planters' strategy, first, when the labor shortage was greater, was a combination of rising rents (to discourage the practices of small farm) and payment of wages (aimed at making them laborers dependent upon money wages), and to oblige them to remain in an active labor supply pool (via the "Vagrant Laws").

This policy worked better in the colonies where alternative opportunities to the freedmen were scarce (Tobago, Barbados, Grenada, and others). It performed poorly in the colonies where there was a relative abundance of potential agricultural lands together with a low population density (Jamaica, Trinidad, Guiana, and others). So in the latter group planters tried, in addition, to provide positive incentives, offering economic advantages (cottages, schools, use of land, and other benefits) in order to

462 Riviere, Emanuel W. "Labour Shortage in the British West Indies after Emancipation".

stabilize a work force in the plantations. Brazil looked, as "bench marks", the experiences developed in the latter group of plantation societies (land abundant). Even the "coerced labor" measures were discussed and tried[463]. This policy also had mixed results, and led the planters to look for the second solution, the external sources.

As the Abolitionist pressure was continuing to increase, the planters began to look for special measures compelling the freedmen to work for them at what they considered to be the "normal wage". Those proposed measures tried to cut the mobility of freedmen, in order to prevent them to exploit alternative occupations or places; others tried to tax the property of small plots of land, in order to discourage subsistence agriculture, and " idleness and vagabondage" laws were proposed, to prevent them having their desired amount of leisure time[464].

The Brazilian Free Labor

Since planters feared that slaves, if emancipated, were expected to work only a fraction of what they were doing, why planters did not resort to Brazilian laborers? Why coffee planters would complain about the scarcity of labor in the second half of the nineteenth century, when a considerable portion of the population were neither slaves nor planters?

The answer, as shown in Chapter 3, and contrary to the opinion of most observers of the time and even today writers, is that they were an expensive source of labor given the expected productivity they would show if they were to work in plantations.

The external outlook of life conditions of the population engaged in subsistence agriculture or extractive activities, like fishing and hunting, in a country where most occupations were in the agricultural sector, always impressed most foreign visitors and contemporary observers as a display of poverty.

This led them to diagnose a situation of unemployment or disguised employment, and puzzled them why they could not be a cheap source of labor to the coffee plantations. Very often, they would blame the planters. The answer was in terms of the low regard, disbelief and traditional attitudes of planters towards the free Brazilian labor. Sometimes, they would blame the laborers themselves: laziness that pervaded the workers' attitudes in the labor market.

As remarked by an article in SAJ written in 1884,

463 In particular, the "vagrant Law", still being enforced today in Brazil.
464 Princesa Isabel, acting in place of the Emperor her father, promised in the yearly and important speech at the beginning of the year 1884, the *Fala do Trôno*, that vagrant laws were been studied and would soon be proposed. An Abolitionist newspaper commented in 1884 that "the proposal of the planters to have special laws enacted compelling the freedmen to work is both illogical and injust". SAJ, August 14, 1884, p. 2, quoting *The Rio News*.

> "She (Brazil) possesses available laboring material enough for many times her present production…the country already has some millions of people who have neither lands, money nor occupation…to ignore all these…is the greatest of economic blunders…. The planters have the choice in their own hands…"[465].

In the same year the following estimation of their number was made:

> "At the present moment Brazil has an available population of laborers sufficient for many times her present production. Assuming her population to be eleven millions, less than half a million will comprise the landholders, capitalists, and professional men. Out of the rest, and after making allowance for sex, age, and special occupations, there ought to be from 8,500,000 to 9,000,000 of available laborers, or four times the number of slaves (sic) on whose enforced labor the agricultural industries are now said to depend…"[466].

This population, notwithstanding their large number, was not expected to work. As a Frenchman who studied coffee and the labor problem observed in 1881,

> "The situation….can be resumed in one sentence: in Brazil there is no people…of her twelve million population, one million is composed of useless Indians, and one and a half million are slaves. There are left close to nine million, from what five hundred thousand are the families of slave owners: the planters, lawyers, doctors, clerks, civil servants, merchants, managers, etc. But between the management class and their slaves…six million people are born, vegetate, and die without serving their country…[467].

Coffee planters also contributed to the image of the Brazilian free labor as lazy, since they rationalized in this way their willingness of working with the discipline and routine at the wage rate planters wanted to pay them.

During the debates that took place in the Agricultural Congress, taken place in Rio de Janeiro in July of 1878, several coffee planters expressed the opinion that the potential contribution of the Brazilian free laborer as a substitute of slaves would be small. The participants did not expect the free laborers to work according to the planters' needs, since they regarded them as indolent and recalcitrant to routine labor[468].

465 "The Two Republics", 1884, quoted in *South American Journal,* August 14, 1884.
466 Article published in the *Rio News*, August 1884, quoted in *South American Journal,* August 14, 1884.
467 "Couty, *L'Esclavage*, p. 87.
468 *Relatorio do Clube da Lavoura,* May 17, 1880. Reference to the *Congresso Agrícola*, Rio de Janeiro, July 8 to 13. For a resumen of the conclusions, see Affonso Taunay, *História do Café no Brasil.*

Many reasons, less superficial than the mentality of planters or the indolence of free laborers, can explain why the proportion of Brazilian free laborers working in coffee plantations was small, or why coffee planters did not expect they could substitute slaves in the eventuality of a total abolition of slavery.

The "indolence" or "laziness" of the free workers could be the reflection of a distortion in work ethics caused by slavery, in which manual labor was downgraded and the work in coffee plantations associated with forced labor. Since many free laborers were freedmen or descended from slaves, this could add to these feelings. Also coffee planters repetitive remarks about the demerits of Brazilian free labor could reflect the frustration and be only a rationalization of the reluctance of those workers in being submitted to the routine work of coffee plantations at the wages offered.

The important issue, as discussed with regard to the freedmen, is how these idiosyncrasies would be translated by a market mechanism of supply and demand for labor, and be combined with other elements shifting the respective curves. In other words, how those non-pecuniary disadvantages of routine work would be compensated by pecuniary advantages and how the merits or demerits of free workers would be weighted in the setting of the wage rate. The answer, as we saw in Chapter 3, is that free labor was relatively expensive.

High costs of free labor help to explain why the number of free workers in coffee plantations was small during this period, and also help to explain why coffee planters were so pessimistic about the consequences of Abolition.

They would have, in order to hire free workers and the freedmen, to pay wages, and since those wages were high, and the labor not as productive as slave labor, this would hurt the competitive position of Brazilian coffee production in the international market.

Brazil, although the largest, was not the only country producing coffee, since other countries in the Americas, Africa and Asia were competing for this market. Although land and climate in Southeast Brazil were very suitable to coffee production, transportation and port infrastructure was being developed, and the technology of coffee planting was being improved, the disadvantages of large labor costs differential with competing producers could wipe out any advantages she might have in other input costs, and curtail Brazilian participation in the coffee market.

The External Source

Faced with the prospects of an increase in the labor shortage and high wages after Abolition, and because of their low expectations about the freedmen and national free laborers, planter's attention turned again to find an external source to provide their labor. As a matter of fact, like they had done during three hundred years of African trade and 30 years of inter and intra regional slave trade.

The solution of finding an external source was nothing new in the context of other plantation societies faced with the prospects or the aftermath of Emancipation. There are remarkable similarities between coffee planters' behavior and the behavior of their counterparts in the West Indies and Cuba.

This happened partly because Brazil was the last slave society to exist in the Americas, and therefore could learn from others' experience, but partly because they faced similar economic problems. Therefore, the various solutions coffee planters tried, and the process of arriving at them, are very similar to those experienced in the Caribbean region.

British Guiana and Trinidad, where the labor shortage remained acute even after planter strategy with positive economic incentives, turned to seek a solution in another direction, what again would be repeated later in many slave societies facing the prospects or consequences of Abolition.

They looked for an external source. They first tried free Africans and Portuguese (from Madeira Islands) indenture servants. In 1851, besides the freedmen (comprising 43 percent of the workers) there were 8,000 Native Indians , 6,000 Africans and 5,000 Portuguese in Guiana[469]. But they turned, after, to a source that would eventually solve their labor problem – the "importation" of Indian and Chinese workers from Asia (called "coolies"). In all, -the great number arrived between 1853 and 1874 – 200,000 Indians and 16,000 Chinese migrated to British Guiana, and 150,000 Indians to Trinidad[470].

Dutch West Indies, Surinam and Cuba also followed the same example. Cuba was, after Brazil, the country were slavery lasted longer. Wages rates were high, and since 1853 Cuban planters already had turned to China to look for an external source of labor. Between 1853 and 1873 about 140,000 Chinese "coolies" came to Cuba under 8 year labor contracts.

In these plantation societies, the immigrants would come as contracted laborers, following a pattern of indentured labor system. In general the immigrants would sign a contract committing themselves to

469 Riviere, ibid, p.11
470 Kloosterboer, *Unvoluntary Labor,* p. 8.

work from 5 to 8 years, at a specified wage, and in return they would receive advancement (or sometimes free) travel arrangements and promise of housing and medical attention. Contrary to a voluntary labor system, penal sanction was a common denominator in those contracts.

In the 1880s, therefore, Brazilian coffee planters could look to the example of all plantation societies after Abolition and know what labor problems to expect, and also how those societies tried to solve them.

The External Source: Attempts in Brazil to " Import" labor from China, India and Africa

Beginning in the 1840s, Brazilian coffee planters began to assess the prospects of the ending of the African source of slave labor. During the second half of the 19th century, having to face all the measures to emancipate slaves, culminating with the "abolitionist pressure" of the 1880s, planters tried to solve their "expected" labor shortage problem in the same way as their West Indian and Cuban counterparts.

There are striking similarities in their behavior, with the tentative for bringing Chinese "coolies" and other "indenture labor" solutions. History registers attempts to replace slaves with native Indians, but slavery of native Indians in Brazil had been prohibited since 1831(by the terms of the Law signed in October 27, 1831). Proposals to import "black colonists" from Africa were also discussed, but both public opinion and British pressure acted against the idea. Other external source that was discussed was to bring laborers from India, but this also faced British opposition.

Attempts for bringing Chinese "coolies" were carried with more strength. Suggestions were made since the beginning of the century[471], but they intensified only after 1850, when a few Chinese were brought to the country[472], gaining momentum in the 1870s when debates were held about the merits and demerits of Chinese labor. In 1869 and 1870 the Reports of the *Ministério da Agricultura* considered the Chinese immigration to be the ideal solution for the labor problem. By Decree of 9th July 1870 (supplemented by other decrees in 1872 and 1874) certain privileges were granted to a company for the purpose of importing Chinese "coolies". The examples of the United States, Peru, Cuba and West Indies were often recalled[473].

Although several attempts were made in the late 1870s and the 1880s, Chinese immigration never became feasible. Either due to effective

471 See Menezes e Souza, *Theses sobre a Colonização,* p. 475.
472 Ibid, p. 422.
473 It should be mentioned that the debate about Chinese immigration in Brazil was openly held and loaded with what today we interpret as strong racial and religious prejudice.

British pressure and even intervention, or by opposing domestic opinion – favoring immigration of Europeans - ,or, finally, because the effective costs were high in comparison with other alternatives, Chinese immigration was not implemented in a viable scale in the country.

European Immigration

The Brazilian experience was *"sui generis"* not so much in using foreign workers to substitute the ex-slaves, but in the sense of using European immigrants to that end. It was a process that began in the 1850s with the pioneer experiments of some coffee planters, to bring Swiss and German workers, with mixed results[474]. Later, several institutional arrangements were made in order to solve questions related to the immigration investment (how to share costs and benefits among planters and European families). The government became involved in the stage of searching potential immigrants in Europe, selecting and transporting them to Brazil, and for the initial settling costs in the country (which had the character of a "public good" after the arrival of the immigrants).

More than two million Italians, Spaniards, and Portuguese, came to Brazil, initially, to work in coffee plantations[475]. Brazilian society was able to attract and retain them[476]. There was a factor of luck involved: during the crucial years between 1885 and 1895, Italian emigration was at its maximum, and the United States (preferred destination) was following a "closed border" policy, and Argentina (second best destination) was facing a political turmoil and threats of Civil War.

Coffee production, different from sugar production, was more delicate to manage and more amenable to divide tasks that would provide opportunities for all members of the family – even children – to work. In addition, the average temperature prevailing in the lands used for coffee was lower than in the lands used for sugar cane production. Thus, these factors helped the settlement of European families in the coffee production region.

Thus, to conclude this chapter, the labor problem was eventually solved by coffee planters and the Brazilian government, after developing a long process of trial and error for "importing" human capital. It was a successful institutional innovation, but in which a social problem started, as we will comment in the next Chapter.

474 The Brazilian Empire pursued a policy of bringing European families from Germany, Switzerland, Açores and other regions in order to create small farms and settlement, like the United States. The coffee planters, however, planned to bring families in order to become workers in coffee plantations.

475 Later, in the XX century, Japanese workers also came to work in coffee plantations.

476 Martins, José de Souza *A Imigração e a Crise do Brasil Agrário* (São Paulo: Livraria Pioneira Editora, 1973).

PART VI

Final Considerations

We conclude this book raising some considerations that relate the manner in which the abolition of slavery was made in Brazil, to the subsequent social evolution of the country.

CHAPTER 12

The Aftermath of Abolition of Slavery in Coffee Plantations

In the second decade of the 21th century, coffee continues to be an important production segment of the Brazilian economy. A third of all coffee produced in the world comes from Brazil, and the country – like in the last 160 years -- keeps being by far the world's largest producer. In its domestic economy, other commodities today, like iron ore, soybeans, cattle and sugar, are more important than coffee.

Indeed, coffee remained important – in fact, as the most important economic activity in Brazil – in the 40 years following Abolition. The period 1889-1930 is known as the "Old Republic" (*Republica Velha*) and it was politically dominated by the coffee interests. Then, industrialization and other developments contributed to a diversification (economic and regional) of the country, and coffee lost its relative importance. Coffee production spread to the states of Parana and Bahia, and also became more important in Minas Gerais. Rio de Janeiro and São Paulo no longer are the major state coffee producers. Labor supply for coffee plantations is no longer an issue.

Looking at this process, is somewhat puzzling. After all, the reason for slavery to last so long was its economic nature. It was an important institution, and the process of Abolition was an important example of how

new ideas, moral stances and political movements can produce changes and bring social progress[477].

For Evsey Domar, the key variable to explain the existence of slavery (or serfdom) is a land/labor ratio, in which there is a situation of excess of land and shortage of labor. Relative land abundance, in the face of good market opportunities for agricultural crops, would give economic incentives for instituting a slave system[478].

Robert W. Fogel agrees, in a broad sense, that scarcity of alternative sources of labor brought by the high land/labor ratio, together with the prevalence of more expensive European labor, and the difficulties for Europeans to endure the rigors of the Tropics were factors to explain why slavery became dominant in the economy and society of so many New World settlements[479].

However, he considers that to be a very broad reason, which fails to explain why slavery was more prevalent for some agricultural crops, like sugar, cotton or coffee, but not to others, like wheat or other cereals. For him, the explanation is more related to the labor organization and the use of the gang system:

> " For the gang system to succeed there had to be a set of crops that allowed the division of the production process into a series of simple and easily monitored tasks. There also had to be a rapidly growing demand for such crops. Even so, the gang system flourished only where political and legal conditions kept the cost of operating gang-system plantations low. To operate effectively the system required an adequate supply of slaves, wide latitude in the use of the force needed to achieve an industrial discipline, and freedom to reallocate its labor force as economic conditions might dictate"[480].

With slavery, planters "had the license to establish whatever institutions and to use whatever force they deemed necessary to achieve that goal[481] . In the nineteenth century, the issue of discipline – to achieve efficient economies of scale in production – was very important, since a modern labor force was still in its infancy. In a sense, the great slave plantations were some of the largest privately owned enterprises of the

477 Gorender, Jacob. *A Escravidão Reabilitada.* (São Paulo: Editora Atica/Secretaria de Estado da Cultura, 1990).
478 Evsey D. Domar, "The Causes of Slavery or Serfdom: a Hypothesis", *Journal of Economic History,* 30, no. I (March 1970).
479 Fogel, *Without Consent or Contract*, p.34.
480 Fogel, Ibid, p. 39.
481 Ibid, p. 37.

age, and used some of the most advanced technology. And also, according to Fogel,

> "···planters led the way in still another major technological innovation – the development of a new industrial labor discipline. This was at once their greatest technological achievement, the foundation of their economic success, and the ugliest aspect of their system"[482].

As discussed in Chapter 3, the plantation system was capable of providing several advantages for the coffee planters: they had a guaranteed labor supply; the labor force participation rate was high since in coffee plantations it could be allocated in such a way to occupy children, women and elders; labor troubles could be avoided; it provided a disciplined, specialized and coordinated labor force, and so on. Thus, the challenge faced by coffee planters was how to keep efficient labor management in a different type of system, and European immigration, although never became prevalent in sugar cultivation, turned out to be feasible in coffee plantations.

We considered in this book the general economic issues about slave labor in coffee plantations and the process of Abolition of slavery. We want to conclude the book with a few remarks about the effects of Abolition for the coffee economy and for the ex-slaves. Plantation slavery showed differences in the several regions of the Western Hemisphere where it played an important role in commodity production.

The same differences appeared during the process of abolition, and the aftermath of it. In the coffee region of Brazil as a whole, the economic impact of Abolition on coffee production was minor. European immigration in large scale was capable of replacing slaves in the labor organization of the plantations with a reasonable success.

No compensation was paid to slave owners in Brazil with the end of slavery. Although slave owners were aware of the dramatic falling of the market value of their slaves assets after the mid 1880s (Chapter 10), they kept an expectation that they could reduce partially their capital losses from freeing the slaves, if the government would pay any compensation. This never happened, however.

Looking at the two major sub-regions of the coffee region, we have a different tale. The Rio Zone, on the Parahyba River Valley, became decadent. Due to soil erosion and loss of fertility and quality of land,

482 Ibid, p.25.

this region was unable to compete with the Santos Zone for attracting European immigrants.

The Santos Zone, on the other hand, boomed after Abolition. With a better factor endowment and resources than the Rio Zone, and with the benefits brought by the railroad system implanted in the 1880s, the region -- in its march to the West of the State of São Paulo --became the most important coffee production region in the world.

What can we say about the slaves themselves? With the success of the European immigration process, the labor problem faced by coffee planters, in a sense, was solved. The demand for labor of the ex-slaves, as a result, became weak, *vis a vis* what would happen in a scenario without the European laborers. There was no incentive, by the planters, to take care of the education and employment of the former slaves[483] .

With regard to the effects of Abolition on ex slave welfare and material income, it is likely they had some gains, in the work-leisure trade off. They benefited from some combination of increased leisure time, a lessened intensity of labor, and lowered labor force participation rates. This, however, was usually at the expense of loosing income opportunities given from a regular job, and this affected their consumption potential.

The consequences of Abolition were different in São Paulo, where there was a continuous and great afflux of European immigrants to coffee plantations, than in Rio de Janeiro and Minas Gerais, which had to account with the freedmen as their main source of labor supply.

The freedmen in these two provinces seemed to confirm the pessimistic forecasts of the coffee planters. Although a proportion of them continued to work there, others moved to urban centers, or to subsistence agriculture. A few years after Abolition, labor contracts in Rio de Janeiro were most for share cropping rather than wages, and gang routine fell in disuse[484]. In Minas Gerais, however, as remarked by the French observer Pierre Denis, who made an extensive survey on coffee plantations[485]:

> "almost all the Negroes are daily laborers···to obtain a constant effort from the Negroes it is needed a constant watch···the workers have to be jointed in gangs under the surveillance of an overseer"[486].

483 See Villa, Carlos Valencia, "A Economia dos Negros Livres no Rio de Janeiro e Richmond, 1840-1860" (Tese de Doutorado, Programa de Pós-Graduação em História Social, Instituto de Ciências Humanas e Filosofia, Universidade Federal Fluminense, Março de 2012).
484 Stanley Stein, op. cit., chapter 10, "Abolition and Aftermath".
485 Pierre Denis, *Le Brésil au XX Siécle.*
486 Ibid, p.218.

Denis compared the labor situation in São Paulo, with immigrants (colonists), and Minas Gerais, with the ex-slaves, and made the following comments:

> "the daily movement (of laborers) in the plantations is in opposite directions when considering Minas Gerais and São Paulo. In the latter, the white colonists live together in the plantation, under the supervision of planters, and go every morning to the coffee gardens. The planter watches his arrival, and also his departure. In Minas Gerais, on the other hand, the Negro workers live apart, far from the sight of the planter, and come when they please to the plantation, where the planter waits them, often in vain, to begin the work. In the afternoon, they disperse again···this is sufficient to show all the differences between the discipline in the Paulista plantation and the disorder in the Minas plantation···(in Minas) the wage of a two-days work is superior for their needs. Therefore, they do not supply a regular work. A good laborer works three days a week. One planter estimates that three hundred Negroes in working age live in his plantation, and however he is not capable to account with one hundred each morning…[487]"

The Empire Government was replaced by a Republican regimen in November 15 of 1889, less than two years after – and many say because of it – the Abolition of Slavery in May 13 of 1888. With the political and economic transformations on the country, the slavery issue became a thing of the past. There was no reparation or financial compensation for the former slaves.

Looking back at its 20th century economic performance, Brazil was one of the fastest growing countries of the world. However, it also became one of the most unequal countries in income distribution. No doubt that the way slavery was abolished, without any re-training, basic education, land and capital grants for small farms, and other forms of support, contributed for this sore social record[488].

487 Ibid, p. 258.

488 It became common in Brazil to refer to this unequal income distribution as creating a "social debt" to the poor. Not all poor Brazilians were of slave descendent, but most descendents of African slaves belonged to the poor population. The Constitution of 1988 provided extensive rights and social welfare benefits for all Brazilians, but lack of resources prevented the full enforcement of the rights. In the second decade of the 21th century, however, the Brazilian economy is showing a "virtue cycle", with rising income per capita and significant betterment of the income distribution. It appears that the "social debt" to the former slaves will be finally paid, in the form of economic and social progress to all Brazilians.

The Abolition movement represented the first large political movement in Brazil. For the first time, common citizens in several urban centers participated in political gatherings and rallies, and the press became pro-active in the discussion of themes that affected society as a whole.

The strength of the Abolition movement was in fighting the institution of slavery. After this goal was reached, the country did not mobilized to improve the lot of the former slaves[489]. There were a few isolated voices, like Joaquim Nabuco, that proposed large educational programs and material means for the ex-slaves to be incorporated as full citizens, but without political and societal support these proposals went still.

According to Engerman and Sokoloff, based on their work on factor endowments and slavery, the economic trajectory of former New World colonies over the past 300 years was largely determined by various facets of their natural environments[490] . They argue that in areas such as Brazil which possessed land (quality soil and climate) suitable for coffee (and sugar), it was feasible to obtain economies of scale in production with the use of slave labor.

One of the consequences of this "development path" was the concentration of wealth and income, and low regard to access for public education. Following this line of reasoning, and given that the successful replacement of slaves by European immigrants did not cause any large social pressure for progress in that direction, public education and economic support for the former slaves was condemned to never become a real issue.

What happened in Brazil was in stark contrast what happened in the United States, the other large slave society of the Western Hemisphere. The United States was much more generous in giving rights to the ex-slaves in the aftermath of freedom, and in making possible the increase in subsequent levels of income. The American economy was capable of improving its rates of income growth and in obtaining marked political changes in the initial decades after emancipation.

As a final comment, and based again in the insights of Engerman and Sokoloff, it is important to ask if independent institutional development could provoke significant change in the course of the "path dependence"[491].

489 See Badaró, Marcelo. *Escravizados e Livres: Experiências Comuns na Formação da Classe Trabalhadora Carioca* (Rio de Janeiro: Bom Texto, 2008).
490 Engerman, Stanley L. and Sokoloff, Kenneth, "Factor Endowments, Inequality, and Paths of Development in New World Societies", Economia, 3 (Fall 2002.), 41-109.
491 Engerman, Stanley L. and Sokoloff, Kenneth L. "Factor Endowments, Institutions, and Differential Paths of Growth among New World Economies: A view from Economic Historians of the United States". *Historical Paper no. 66. National Bureau of Economic Research.* (Cambridge, MA: December 1994).

First, they define institutional as a broad concept, that encompasses not only formal political and legal structures, but culture as well[492].

Second, they think there is an underestimation of the role of favorable resource endowment in the explanation of the "development path" of countries like Brazil. The existence of an extraordinarily favorable endowment (abundance of land with good climate and soil quality) created conditions, with the use of slave labor, to obtain economies of scale and to efficiently produce commodities with high value on the export market.

Third, they think there is an exaggeration in attributing excessive independence of institutional factors and institutional development from the factor endowments.

Fourth, they position themselves against an excessive determinism of "path dependence", but argue that the long-run effects of factor endowment are important, and these patterns of growth may be path influenced[493]. In their view, factor endowments predisposes towards certain paths[494] .

We support their vision, about the difficulties of policies going against the logic of the pattern of growth. On the other hand, we see political forces for change that can alter, even if not very deep, this predisposed course. In our opinion, there was room in the political scenario in the last decade of the 19th century to undertake measures benefiting the ex-slaves. This, however, never happened. It was a missing opportunity.

492 Ibid, p. 3.
493 Ibid, p. 3 and 4.
494 In their words, "factor endowments may influence the directions in which institutions evolve, but these institutions in turn ultimately affect the evolution of factor endowments. It is our contention, however, that the initial conditions had long run lingering effects, both because government policies and other institutions tended generally to reproduce the sorts of factor endowments that gave rise to them, and because certain fundamental characteristics of the New World economies and their factor endowments were difficult to change" p.18.

APPENDICES

Appendix A – Estimation Of Slave Longevity

This Appendix is connected to Chapter 7, and provides statistical and analytical support to the estimation of slave longevity in nineteenth century Brazil. However, in order to write the chapter, we did an extensive research on demographic data, which can be useful for historical studies about the Atlantic slave trade and impact on the Brazilian population.

Estimation of the number of Africans in Brazil by Gender and Age Cohorts in 1872

The 1872 Census presents the number of male and female freed and slave Africans in Brazil. Their number was 183,140 comprising about 3 percent of total colored population, or about 9 percent of the black population. The number of slaves among those Africans was 138,560 or about 75.7 percent of the total. The proportion of African slaves in the black slave population was 13.4 percent and in the total slave population was 9.2 percent.

We have to adjust the black component of the colored and slave populations for the African immigrants. The 1872 Census, unfortunately, does not break the African population by age groups, so we have to estimate it.

We need estimates about the number of Africans imported in Brazil between 1800 and 1852. After this year until 1872 no African entered in Brazil.

With the indications we have about presumed age distribution of slaves imported, the gender ratio, the mortality conditions in the "Middle Passage" (the crossing of the Atlantic Ocean from Africa to America) and the mortality conditions during the "seasoning period" in Brazil, we can reconstitute the age distribution of the African population in Brazil in 1872.

According to Fogel,

> "It is customary to date the beginning of the New World traffic in Africans to the year 1502, when the first references to blacks appear in the documents of Spanish colonial administrators. The end of this trade did not come until the 1860s. Over the three and a half centuries between these dates about 9,900,000 Africans were forcibly transported across the Atlantic. Brazil was by far the largest single participant in the traffic, accounting for 41 percent of the total"[495] .

The studies about the Atlantic slave trade are still being reviewed and updated, and new estimates being made. Klein and Luna report that 5.5 million persons were shipped from Africa across the Atlantic Ocean to Brazil. According to them,

> "of the estimated 10.7 million Africans who safely crossed the Atlantic from the late fifteenth century until the late nineteenth century, an estimated 4.8 million survived the crossing and landed in Brazil"[496].

Due to the importance of Brazil as a destination for African slaves, and given the huge numbers brought to this country by the traffic during the XIX century, this field of demographic research became very important[497]. We have now more complete statistics about embarkation and arrival of African slaves in Brazil. The leading research center is this field is Emory University and its "Emory Data Set"[498].

Klein and Luna comment that:

> "it should be noted that although all of the volume estimates of the slave trade, the relative importance of different time periods, and the rates of national participation have changed over the last quarter-century [1985-2010] the overall numbers of the slave trade are still well within the total limits established by Philip Curtin"[499].

495 Fogel, *Without Consent or Contract*, p. 18.
496 Klein and Luna, *Slavery in Brazil,* p.15.
497 See Herbert S. Klein, *The Atlantic Slave Trade. 2nd ed.* (Cambridge: Cambridge University Press, 2002).
498 Ibid, see the description of the "Emory data set" in p. 72.
499 Ibid, p. 152.

Table A.1, based on Curtin and Bethell, presents the slaves embarked in Africa between 1801 and 1830, and the slaves landed in Brazil between 1831 and 1852[500].

We begin our adjustments by assuming a 10 percent mortality rate for the slaves embarked in Africa until they landed in Brazil. African slaves going to Brazil embarked from different places in Africa and arrived at different ports in Brazil. So the mortality rate varied, mainly according to season and with the distance of the African port of origin, and with the number of days needed for the "Middle Passage".

TABLE A.1
Slaves imported in Brazil, 1801-1852

YEAR	TOTAL
1801-1810	206,200 a
1811-1820	266,800 a
1821-1830	325,000 a
1831-1835	2,981 b
1836-1840	143,409 b
1841-1845	92,636 b
1846-1852	247,500 b

SOURCES: a – Slaves embarked from Africa, Curtin, **The Atlantic Slave Trade**, Tables 62 and 67.
b – Slaves landed in Brazil, in Bethell, **The Abolition of the Brazilian Slave Trade**, p. 390.

This figure of 10 percent is then an average figure, and was applied only to slaves imported between the years from 1801 to 1830[501]. As a result, we obtain the number of slaves landed in Brazil during 1801-1830. Since the figures for 1831-1852 refer to slaves landed in Brazil, the mortality during the trip was already accounted, and no adjustment is needed.

500 Ibid, on slave arrivals in Brazil and African regional origin of slaves, see pp. 153-158.
501 Herbert Klein reports that from a total of 170,651 African slaves shipped to Rio de Janeiro between 1795-1811 it can be estimated a mortality rate in the ship of 95 per thousand. H. Klein, "The Trade in African Slaves to Rio de Janeiro, 1795-1811: Estimates of Mortality and Patterns of Voyages", *Journal of African History, X*, No. 4 (1969), p. 558. Between 1825-1830 Klein reports that from 169,502 slaves embarked in Africa, 11,869 perished at sea, giving a mortality rate of 70 per thousand. H.Klein, "O Tráfico de Escravos Africanos para o Porto do Rio de Janeiro, 1825-1830", in Separata dos Anais de História, No. 5, (São Paulo: Ed. Faculdade de Filosofia, Ciências e Letras de Assis, 1973), p. 99. Goulart estimates as 10 percent the mortality rate of slaves in the "Middle Passage" to Brazil in the 18th and 19th centuries. Mauricio Goulart, *Escravidão Africana no Brasil*, (São Paulo: Livraria Martins, 1949) , p. 278. Bandeira de Mello also estimates in 10 percent the mortality at sea and port of disembarkation, attributing it to poor hygiene, the mistreatment of slaves and the very bad food provisioning on board. Affonso B. de Mello, *O Trabalho Servil no Brasil*, (Rio de Janeiro: Departamento de Estatística e Publicidade do Ministério do Trabalho, Indústria e Comércio, 1939), p. 55. According to Manchester, "it is estimated that 15 percent of the slaves died during passage before British attempts to abolish the trade and 25 percent died afterwards". Manchester, *British Preeminence in Brazil*, p. 159.

African slaves newly arriving at Brazil faced a high mortality during their "seasoning period". First, many arrived already ill from Africa, due to the "Middle Passage"[502]. Second, they faced in Brazil a new disease environment. Third, they had to adapt themselves to new clothes and diet, a new discipline of work and a different climate. Fourth, the slaves going to plantations or urban centers out of the disembarkation port had to travel again[503].

We do not have accurate estimates for the mortality rate in Brazil during the "seasoning period", but assuming that 30 percent of the slaves died during their first three years in Brazil, and after that were "seasoned", in the sense of experiencing the same mortality pattern as other native slaves, will probably be an underestimation of the actual experience[504]. This percentage was then applied to all slaves landed in Brazil between 1801-1852, and after that the "seasoned" African population in Brazil between 1804-1855 was obtained[505].

The 1872 Census discriminated the African population according to gender, showing 115,329 males and 67,811 females. The male/female ratio is therefore slightly over 1.7/1. This conforms with the findings of

502 On mortality during the travel to Brazil, see Klein and Luna, *Slavery in Brazil*, p.p. 158-160.
503 On the trade and characteristics of African trade and the slaves transported to Brazil, see Klein and Luna, *Slavery in Brazil,* pp. 162-164.
504 There are sparse indications of mortality during the "seasoning period". Taunay reports about an "Account Book" of a Brazilian middleman in the first half of the 19th century, that bought slaves landed in Brazil from the market, and sold them to planters in the hinterland coffee plantations. So, he bought slaves already disembarked in Brazil. The average number of slaves dying while in his possession was 15 percent. After he sold slaves to planters, the percentage (of the original number) dying during the trip from coast to the hinterland was 11 percent. So, even not accounting the percentage of landed slaves dying in the central distributing center (*Valongo* market in Rio de Janeiro), and also not accounting the slaves perishing in the plantations during the remaining of the "seasoning period", we have 26 percent as the average rate of mortality. Afonso de E. Taunay, "Subsidios para a História do Tráfico Africano no Brazil", in *Anais do Museu Paulista, Tomo X* (São Paulo, 1941), p.p.. 277-285.
505 Stein quotes Ferreira Soares as arguing that plantation conditions were such that it was common for a planter to have twenty Five acclimated and trained slaves left three years after beginning a lot of one hundred. Stein, *Vassouras*, p. 70. It is useful here to reproduce the original: *" É preciso, porem, observar que pelo menos uma terça parte [dos escravos importados da Costa da Africa e indo para a lavoura] destes era ceifada por moléstias e pelas fugas, pelo que, no fim de três annos [tempo necessário para industriá-los] , sendo muito felizes os lavradores, podiam contar com 14,774 escravos para a lavoura [dos 22,160 Africanos que iam anualmente para a lavoura]. Não exagero este cálculo, porque sou informado que o fazendeiro que comprava 100 captivos, calculava tirar no fim de três annos 25 escravos para seu serviço". Sebastião Ferreira Soares, Notas Estatísticas sobre a Produção Agrícola e Carestia dos Generos Alimentícios no Império do Brazil,* (Rio de Janeiro, 1860), p.p. 134-135. In a subsequent work Ferreira Soares reduced this estimate of one quarter to one third of slaves left after the three years seasoning period: *"de cada 100 escravos que compravam [vindo da África] no fim de tres annos os mais felizes não podiam contar com mais de 33, porque os outros dous terços eram desaparecidos do trabalho pela mortalidade, pela fuga e pela inutilização do seu organismo", Soares, Elementos de Estatística, Tomo II,* p. 224. In view of those testimonies, our assumption of 30 percent mortality during the "seasoning period" seems an underestimation. A more rigorous study by Craton and Walvin obtained a mortality rate of 30 percent during the seasoning period in Jamaica. Michael Craton and James Walvin, *A Jamaican Plantation: The History of Worthy Park, 1670-1870*, (Toronto: University of Toronto Press, 1970).

surveys about the African slave trade for other countries, that invariably show an imbalance of sexes, favoring the import of male over female slaves. The sex ratio shown in those studies is in general even greater than this one found in the 1872 Brazilian Census[506]. Since almost twenty years had elapsed since the last group of Africans had arrived, and assuming that the life expectancy was smaller to men than to women, we assume the male/female ratio of 1.75/1.

We do not have direct indications of the age distribution of slaves imported in Brazil. We know, however, that slaves between 15 and 29 were preferred above all, slaves aged 35 years or more were avoided whenever possible, and also children below 10 years were not so desirable[507].

We will therefore assume the following age distribution of the slaves embarked in Africa, shown in Table A.2. Based on this Table, we can calculate that the mean age of 22.65 years.

TABLE A.2
Calculation of the Mean age of Slaves Embarked in Africa

AGE GROUPS	PERCENTAGE OF SLAVES
0-9	5
10-14	10
15-19	20
20-24	25
25-29	20
30-34	10
35+	10

The more difficult and troublesome part was to translate the age distribution by gender of "seasoned" Africans, immediately after the three years "seasoning period" given by the arbitrarily assumed age distribution

506 According to Degler, the records of captured slave ships in the 1830s and 1840s show ratios of one to four and one to five, in favor of males. Degler, *Neither Black nor White*, pp. 66-67.

507 According to Herbert Klein, most African slaves imported in Brazil were young adults, between 18 to 40 years. Klein, "O Tráfico de Escravos", p. 100. In another article Klein presents some estimates of age breakdowns for African slaves. He noticed there probably was an undercount of children, so the estimates he gives of 3.1 percent of children in the exports from Benguela (1738-1781) and 6.0 percent of *crias de peito* and *crias de pé* from Luanda are probably an underestimation. According to him, the more reliable Dutch trade statistics show that between 8 to 13 percent of the total number of slaves were children under 15 years old. Herbert Klein, "The Portuguese Slave Trade from Angola in the Eighteenth Century", *Journal of Economic History, XXXII,* No. 4 (December 1972), p. 905. In his 1867 *Parecer* Souza Franco states that the imports of African slaves were almost exclusively of adults. In Brazil, Conselho de Estado Pleno, *Trabalho sobre a Extincção da Escravatura no Brazil,* p. 58. One systematic attempt to examine demographic characteristics of slave imports in South Carolina shows that Africans arriving during 1735-1740 were mainly from Angola – the chief supplier of Brazil – and that slaves under ten average 13.5 percent of all slaves. Peter H. Wood, "More like a Negro Country: Demographic Patterns in Colonial South Carolina, 1700-1740", in *Race and Slavery in the Western Hemisphere: Quantitative Studies,* eds. Stanley L. Engerman and Eugene D. Genovese (Princeton: Princeton University Press, 1974), pp. 131-172.

of slaves imported from Africa, into the estimated age distribution by gender of Africans in Brazil in 1872, since there was a gap of 68 to 17 years.

For this translation we need a life table – representative of this period - for the black population in Brazil. But since we are assuming that the Africans after the "seasoning period" would experience identical mortality conditions as the native black population, we would run into a circularity problem, since the life table we need is the same one this Appendix tries to estimate.

We can overcome this difficulty by using the Life Tables for the 1872 Brazilian male and female total native population as estimated by Arriaga[508] This will understate the mortality conditions of the African population, since the Arriaga Tables included whites, who were the dominant socio economic class in Brazil, and had better mortality conditions than the colored population.

The final effect, however, will be to produce an overstatement of the mortality conditions of the native colored and slave populations. The reason is due to the greater proportional representation in the older age groups for the African population as a result of using the Tables, since when discounting this foreign population in each age group of the total colored and slave population, the net effect will be an underrepresentation in the older age groups.

This would overstate the mortality conditions of the native colored and slave populations, but since this is the direction of the bias that we want, we employ the Arriaga Tables.

We constructed one matrix of the "seasoned" African population in Brazil, for each gender, as if all of them had survived in 1872, by 5-year age groups as columns and 5-year groups of date of arrival (plus 3 years for "seasoning") as lines. We then built a second matrix, by gender, with the weights given by a transformation of the 1x column (expected number of survivals at certain ages) of Arriaga Tables. We applied them to the first matrix, and obtained the third matrix, formed by the Africans surviving in 1872. The relative distribution of the aggregation of each column of this third matrix and transformation in 10-year age groups is presented as columns (2) and (3) in Table A.3. It begins with the age cohort 20-29, since a newborn African entering Brazil in the last year of trade, 1852, would be at least 20 years old in 1872[509].

508 Arriaga, *New Life Tables*, Table III-3, Male and Female, pp. 29-30.

509 The absolute results we obtained, 175,402 males and 104,817 females with a total number of 280,219 Africans, were 53 percent greater than the actual number registered by the Census. It can be considered a good result, since we began from independent figures and assumptions. The difference can be explained by two reasons. First, the use of Arriaga Life Tables may have overstated the number of survivors in 1872. Second, and more important,

TABLE A.3
Estimates of the 1872 Survivals by Gender and Age Distribution of the African Slaves that Arrived in Brazil during 1801-1852

AGE GROUPS	Percentage	Percentage	Free Africans	Free Africans	Slave Africans	Slave Africans	Total Africans	Total Africans
	Male	Female	Male	Female	Male	Female	Male	Female
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
20-29	1.38	1.38	411	204	1,181	732	1,592	936
30-39	14.42	13.86	4,296	2,050	12,334	7,349	16,630	9,399
40-49	32.55	31.22	9,695	4,618	27, 845	16,552	37,540	21,170
50-59	27.48	27.14	8,186	4,014	23,506	14,390	31,692	18,804
60-69	16.35	17.17	4,871	2,540	13,985	9,103	18,856	11,643
70-79	6.73	7.70	2,005	1,139	5,757	4,082	7,762	5,221
80+	1.09	1.53	325	226	932	812	1,257	1,038
	100.00	**100.00**	**29,789**	**14,791**	**85,540**	**53,020**	**115,329**	**67,811**

We then used the Census totals for the free and slave Africans by sex, applied as weights the age proportional distributions of columns (2) and (3), and obtained the columns (4) to (9). Those columns are our final estimate of the male and female free, slave and total African population in Brazil in 1872 according to age groups[510] .

Estimation of the First Generation Impact of the African Immigration in the Colored and Slave Population Age Distribution in 1872

Before subtracting those results from the total colored and slave populations to obtain the native colored and slave populations, we also need the estimation of the indirect impact of this African immigration in the colored population. To put it simply, if we deduct the Africans but not their descendents, there would appear in the 1872 native colored population "children without parents" and this would, of course, distort the mortality inference that we could obtain by using the age distribution of this population.

The estimation of the indirect impact of this African immigration in the colored population is an exceedingly difficult task. The first order or first generation impact is the more important, and we will limit the estimation to the first generational impact of the African female immigration.

We have three steps to go:

(1) Of the total number of African female immigrants that landed in Brazil between 1801-1852, only 303,254 were alive immediately

our results give credence to the general allegations of contemporaries that masters, for fear of being accused of law violation for bringing Africans after the 1831 Law, were underreporting the African origin of their slaves.

510 We are assuming the same rate of manumission for each age group.

after the "seasoning period". We assume that only those had children, and that they did not reproduce during the "seasoning period", neither did those who died during it;

(2) We are interested only in estimating the number of children born in Brazil from the African female immigrants. We know, however, given their age distribution when they landed in Brazil that: (2.1) Part of their prolific activity had already been performed in Africa before they embarked. Thus, some of the children that would otherwise been born in Brazil (if, say, those immigrants were all under 15 years old when they landed) were born in Africa. They either stayed there or were brought with their mothers, and then would appear as Africans, and already included in Table A.1; (2.2) Some immigrants never completed or even started their reproductive experience, because they perished before it. Thus, some of the children that would be born in Brazil never did, because of the age specific mortality conditions among the African women after the "seasoning period" in Brazil; (2.3) Finally, some of them had children in Brazil, and we present below a method for the actual computation of their total number;

(3) With the same method we also estimate the number of children according to the calendar year they were born (by centering in five year periods between 1805-1871), and then use the Arriaga male and female life expectancy weights for the 1872 Brazilian population to estimate their total number and age distribution in 1872.

In Table A.4 we present the steps taken to calculate, for the African females arriving in a given year, the total number of children born alive (for each one hundred) in their whole fertility period. We assume their fertility period began in Brazil for the survivors immediately after the "seasoning period". Of the total number of African females that arrived in Brazil between 1801-1852, only 303,254 were alive immediately after the "seasoning period", and we assume that only those had children, and that they did not reproduce during the "seasoning period", neither did those who died during it.

TABLE A.4

Estimates of the Number of Children Born in Brazil from African Female Slaves Arriving in Brazil between 1801-1852

Age Groups (1)	Mi/M (2)	Pi/Mi (3)	Fi/Pi (4)	Fi/Mi (5)	Fi/M (6)	[400 (Fi/Mi)] (7)	(7)– (2) (8)	Survivals of Mi (9)	(8)–(9) (10)
0-9	.5	-	-	-	-	400	20.0	.56	11.2
10-14	.10	-	-	-	-	400	40.0	.77	30.8
15-19	.20	.08	100	8	1.6	392	78.3	.80	62.7
20-24	.25	.42	250	105	26.3	295	73.8	.84	62.0
25-29	.20	.66	300	198	39.6	202	40.4	.87	35.1
30-34	.10	.75	375	281	28.1	119	11.9	.92	10.9
35+	.10	.80	500	400	40.0	-	-	.96	-
Totals	1.0				135.6		264.4		212.7

Columns (1) and (2) are our assumed age distribution of slaves landed in Brazil. Column (3) is the share or quota in each age group of the number of prolific African immigrants (Pi), or the number that ever had an alive child during their whole fertility period. It was based on a study of fertility among black females based on the 1940 Brazilian Population Census[511].

If we examine the open age group 35+, that is, the more important one if we are interested in the complete biological fertility experience of those women (that for convenience we assume is fully realized after 35 or more years), we can observe that only 80 of each 100 female Africans ever had an alive child. Thus the quota of prolific women was 80 percent, and the number of prolific African female immigrants entering Brazil between 1801-1852 was .80(303,254)= 242,603. It should be noticed that for the black women over 60 years reporting in the 1940 Census – and at least half of them were born either slave or from slave mothers – the quota of prolific was 80.7 percent.

Column (4) represents, for each age cohort, the number of children born alive for each 100 prolific women, or the fertility rate. It was arbitrarily assumed for us as being approximately 30 percent smaller than the (relatively high) black fertility rates estimated from the 1940 black female Census results[512], as an allowance for the greater labor share and more intense hours of work of slave black women in comparison with free black women.

511 Instituto Brasileiro de Geografia e Estatística (IBGE), "A Fecundidade da Mulher, segundo a Cor, nas Diversas Unidades da Federação", in *Estudos de Estatística Teórica e Aplicada, Estatística Demográfica,* No. 14, Ed. By IBGE (Rio de Janeiro: IBGE, 1952), p. 83.

512 IBGE, ibid, pp. 71-72.

Column (5) is the product of Columns (3) and (4), and can be interpreted as the cumulative fertility for each one hundred women. If we observe the open age group 35 and over, we see that each one hundred women (prolific and non-prolific) that survived to that age had 400 children in their entire fertility period.

Column (6) is obtained as the product of Columns (5) and (2), that is, (6) = (5).(2), and shows that, given the age distribution of those women when they embarked in Africa, that they had already performed part of their prolific activity in Africa. So, out of those 400 children per 100 African females, 136 already were born in Africa, and they either stayed there or were brought with their mothers, and were accounted as African immigrants in Table A.7.

Column (7) is equal to 400 (the cumulative fertility rate of the open age group 35 and over) minus Column (5). Multiplying this Column (7) by Column (2) we obtain the number of children born in Brazil, when no allowance is made for mortality among the mothers. This is Column (8).

Since there was mortality among the mothers, Column (9) is based on the probability of an African female arriving in Brazil, and including three more years for the "seasoning period", to survive from the age she arrived until being 38-years old. The weights were based on the Arriaga 1872 Brazilian Female Life Table (for the age cohort 0-9 the weight was .5(0-4) + .5(5-9) of ${}_nP_x$) Column ${}_nP_x$ [513].

Finally, in Column (10), defined as (10) = (8). (9), we present the estimate of the number of children actually born in Brazil from those mothers.

Thus, resuming Table A.4, we observe that out of the possible 400 children to be born alive for each 100 female Africans, 136 were born in Africa, 213 in Brazil and 51 were never born because their mothers would perish before completing their fertility period.

Table A.5 presents the estimates of the first generational impact of the African female slaves that arrived in Brazil during 1801-1852. Several steps are needed for the construction of the Table.

We constructed a matrix with the columns centering in the five-year sub-periods in which the 1804-1855 period was divided. For the lines we centered in four consecutive columns, the first one beginning in the sub-period where the immigration occurred, one fourth of the product of the number of African females immediately after the "seasoning period" multiplied by the factor of 213/100. Adding up the results for each column

513 Arriaga, New Life Tables, p. 30.

gives us the estimate of the number of children born in Brazil in each of the sub-periods. Using again the Arriaga survival weights for the number of children centered in each of the sub-periods, we obtained the number of survivors in 1872 (after correcting by the factor of 1.53 obtained in the estimation of the age distribution of the African immigrants in 1872). In this way we obtained the 1872 age distribution of the first generation impact of the African female immigration. We assumed balanced (1 to 1) sex ratios.

To obtain the estimation of the colors of the African offspring among mulattoes and blacks, that we calculated to be 10 percent for mulattoes and 90 percent for blacks, we used a sample of inventories in coffee plantations[514]. We found 76 cases in which it was explicitly mentioned the color and African origin of the slave, with the following distribution: African husband and African wife, 48 cases; African husband and Black wife, 8 cases; African husband and undeclared color female, 11 cases; Black husband and African wife, 1 case; Undeclared color husband and African wife, 8 cases.

Of the 19 couples where the color of one of the mates was undeclared, 9 couples had children, of which 7 with black offspring and 2 with mulatto offspring. However, since the sample of African females included only slaves, and making an allowance for the fact that some of the freed women had children with white and mulattoes partners, we use the black/mulatto ratio of 9:1[515].

In Table A.5 we present the estimates of the 1872 survivals of the first generation impact of the African Female slaves that arrived in Brazil during 1801-1852.

Subtracting the estimates of Columns (8) and (9) of Table A.3 and Columns (6) and (7) of Table A.5 from the colored population, we obtain the native colored population by age groups. To obtain the native slave population, we first subtracted from the Census Slave population the slave African population by age groups [Columns (6) and (7) of Table A.3][516].

514 *Cartorio do Primeiro Ofício de Vassouras*, Inventories of Candida Maria de Souza (1855); C. M. J. Correa (1851); Caetano de S. Barboza (1846); *Documentos da Família Werneck* (Arquivo Nacional do Rio de Janeiro, Códice 112): Inventories 1841, Fazenda das Pindobas, Fazenda da Conceição (1858), Fazenda da Prata (1858). See Appendix B.

515 Based in the 1890 Census of the city of Rio de Janeiro, T. Lynn Smith compared interracial marriage patterns and showed that 70 percent of the marriages were black husband and black wife, and the other 30 percent had one mate black and the other white, *caboclo or mestiço*. T. Lynn Smith, Brazil, People and Institutions (Baton Rouge: Louisiana State University Press, 1947), p. 240.

516 For the age distribution of the slave population we are using the aggregate results we obtained by adding the province results for each age group. It is not known the reason, but they differ from the age group distribution showed in the *Quadros Gerais* of the Census. For the colored population, however, we are using the age distribution of the *Quadros Gerais* since they do not differ much from the other, and the bias involved is in the direction of overstating the colored mortality conditions.

TABLE A.5

Estimates of the 1872 Survivals of the First Generational Impact of the African Female Slaves that Arrived in Brazil during 1801-1852

AGE GROUPS	Black Male	Black Female	Mulatto Male	Mulatto Female	Colored Male	Colored Female
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0- 9	11,481	11,482	1,276	1,276	12,757	12,758
10-19	19,940	19,940	2,215	2,216	22,155	22,156
20-29	16,161	16,160	1,795	1,796	17,956	17,956
30-39	13,923	13,923	1,547	1,547	15,470	15,470
40-49	12,470	12,471	1,386	1,385	13,856	13,856
50-59	5,559	5,560	618	617	6,177	6,177
60-69	819	820	91	91	910	911
	80,353	80,355	8,928	8,928	89,281	89,284

We assumed that only part of the 1872 colored survivals showed in Table A.5 were born as slaves. To obtain their number, we just supposed that the manumission rates of the African male and female populations (25.8 percent and 21.83 percent) would also hold for them, and be the same for all age groups. Thus we also deducted those results from the slave population, and obtained the native slave population.

Another adjustment was necessary for the native slave population: to add those born into slavery but manumitted before 1872. We calculated that this proportion was 7.5 percent of the Census slave population. This rate was based in the 1856 Census of the Province of Rio de Janeiro, where this proportion was 7.33 percent[517]. Three steps are needed to estimate the manumission. We have first to make allowance for the atypical manumission rate of the Africans[518]. Second, we have to estimate the number of freedmen according to sex[519] . Finally, we have to estimate

517 This was the only document where we found this information. The Census results were published in the *Relatório da Província do Rio de Janeiro, 1858*. The rate of 7.5 percent for 1872 is probably an underestimate. Since in the five preceding years the slaves belonging to the Emperor (190), to the Court (3,000 of Santa Cruz Imperial Farm), to the Monks of Carmelite and Benedictine Orders (4,000) had been freed, as well as the slave soldiers (and their slave relatives) who fought the Paraguayan War, totaling 20,000, the actual proportion must have been much higher. The manumission figures are from Conrad, *The Destruction of Brazilian Slavery*, pp. 73-76, 112-113.

518 We add to the 1,510,806 slaves registered by the 1872 Census the 44,580 free Africans. Calculating 7.5 percent of this total gives us 116,654; subtracting again the free Africans, we obtain the final estimate of 72,074 native freedmen.

519 The male/female ratio was calculated to be 1.18:1. This figure was obtained by correcting (dividing) the male/female ratio of 2.014:1 of the free African population by the imbalanced male/female ratio of 1.7:1 of the total African population in 1872.

the age distribution of the freedmen[520]. The final estimate according to age groups of the *libertos* (freedmen) in 1872 is shown in Table A.6. Those results were then added to the native slave population to obtain the male and female native slave population corrected for manumissions.

TABLE A.6
Estimation of the Number of Libertos by Age Groups, 1872

AGE GROUPS	MALE FREEDMEN	FEMALE FREEDMEN
0-10	1,170	992
11-20	2,731	2,314
21-30	3,121	2,645
31-40	4,682	3,967
41-50	7,803	6,611
51-60	7,802	6,611
61-70	7,803	6,614
71+	3,901	3,307
Total	39,013	33,061

Corrections in the Age Distribution of the Native Colored and Slave Population

Before applying the Arriaga Method B, however, we need to make some corrections in the age distribution of the native colored and slave populations. The Method B requires that the completeness of enumeration in the Census should be relatively the same in all the ten-year age groups between ages 10 and 59. It is not important whether or not there is under-enumeration in these ages, as long as the under-enumeration is evenly distributed in these ten-year groups.

The trouble with the 1872 Census is that there were irregularities pertaining exclusively to certain age groups. We checked to see if the poor enumeration was observed only in the native colored or slave population, in which case it could mean no poor enumeration at all, but only the peculiarities, deserving attention, of this population. But the under-

520 Instead of assuming a constant manumission rate for all age groups, we made the assumption that the older the slave the higher the probability of being manumitted. Weighting by the age distribution of the population, this gives us the following distribution in percentage terms of the freedmen:

AGE GROUP	PERCENTAGE
0-10	3
11-20	7
21-30	8
31-40	12
41-50	20
51-60	20
61-70	20
71+	10
TOTAL	100.0

enumeration is observed for the total native Brazilian population, either looked by sex or color, if slave or free, and if the *Quadros Gerais* or the aggregation of the province results are used.

This poor enumeration was observed by Arriaga, using a graphical cohort analysis[521]. This was also observed by Giorgio Mortara in his analysis of the degree of correctness of the age distribution presented in the 1872 Census[522]. He attempted to correct the enumeration by using the cohort survival technique, based in the 1890 Census. Mortara calculated the corrected age distribution for the total native Brazilian population in 1872, but he did not discriminate his results according to gender or color, or to free or slave.

Based on the Mortara results, we estimated the corrected age distribution for the male and female native colored and slave population[523]. The first step was to obtain the native white population, by estimating the number of white foreigners in 1872 by age groups and subtracting them from the white population according to the 1872 Census[524]. Then we added the *caboclo* and native colored population to those results, obtained the native Brazilian population and calculated the shares of the male and female colored and slave population. The final step was to correct the native Brazilian population by the Mortara weights, and to multiply by the shares to obtain the male and female colored and slave population. Table A.7 presents those results for the ten-year-age groups between ages 0-69.

TABLE A.7

Male and Female Colored and Slave Population, Ten-Year-Age Groups 0-9 to 60-69

AGE GROUPS	Slave Male	Slave Female	Colored Male	Colored Female
0-9	161,344	140,297	797,871	756,981
10-19	166,755	143,035	679,808	648,636
20-29	145,339	129,800	540,326	510,161
30-39	99,240	91,585	389,098	376,858
40-49	58,984	57,620	205,540	211,590
50-59	39,321	36,428	125,104	129,151
60-69	29,241	25,749	81,652	81,960

521 Arriaga, *New Life Tables*, p. 26.

522 Giorgio Mortara, "*Estudos sôbre a Utilização do Censo Demográfico para a Reconstrução das Estatísticas do Movimento da População do Brasil, III – Análise dos Erros existentes nas Distribuições por Idade da População do Brasil", in Revista Brasileira de Estatística, Ano I, No. 3* (Rio de Janeiro: IBGE, July/September 1940).

523 After transforming the age groups 0-10, 11-20, ⋯, in age groups 0-9,10-19,⋯. ; and correcting for "age heaping"; and distributing the "undeclared" according to the Mortara technique employed in his article about this subject. Giorgio Mortara, *"Retificação da Distribuição por Idade da População Natural do Brasil", in Revista Brasileira de Estatística, Ano II, No. 5, Vol. III* (Rio de Janeiro: IBGE, January/March 1941).

524 The age distribution of the 1872 white foreign population was based in the 1920 Census.

Application of the Arriaga Method B.

Table A.8 presents the smoothing in 5-year age groups of the 10-59 male and female colored and slave populations presented in Table A.7[525] .

TABLE A.8
Brazil 1872: Smoothed Proportional Distribution of the Brazilian Native Slave and Colored Population, by Sex and Five-Year Age Groups, Ages 10-59

AGE GROUPS	Slave Male	Slave Female	Colored Male	Colored Female
Total	1.0000000	1.0000000	1.000000	1.000000
10-59	.7031520	.7103431	.681829	.684865
10-14	.1138646	.1105266	.123084	.121724
15-19	.1086455	.1064904	.111715	.110380
20-24	.1024073	.1014490	.100066	.098840
25-29	.0910739	.0913959	.087016	.086325
30-34	.0764663	.0784537	.072933	.073043
35-39	.0635354	.0661514	.059711	.060501
40-44	.0492962	.0523586	.045249	.046956
45-49	.0398646	.0425584	.035280	.037144
50-54	.0320749	.0340691	.026841	.028605
55-59	.0259230	.0268895	.019930	.021342

Arriaga Method B employs the transformation of one of the fundamental equations of the stable population theory[526] :

(1) $\text{Ln}[\, C(x, x+5)/{}_5L_x \,] = \ln b - r'\,(x + 2{,}5)$

Where :

Ln = Naperian logarithms

x = age

C(x, x+5) = proportion of the total population in ages x to less than x+5

${}_5L_x$ = total number of persons aged x to less than x+5 in a Life Table where $l_o = 1$

b = intrinsic birth rate of the population

r'= regression estimative of the intrinsic growth rate of the population

Another way or writing equation (1) is:

(2) $y = a - r'(x + 2{,}5)$

where:

$y = \ln [\, C(x, x+5)/ {}_5L_x \,]$

$a = \ln b$

The values of C(x, x+5) were presented in table A.8. The values of ${}_5L_x$ are not available. They can be obtained, however, from the "West"

525 Arriaga, *New Life Tables*, p. 295 for the smoothing technique employed.
526 Arriaga, *New Life Tables*, pp. 8-15 and Appendix II for description of Method B.

Life Tables of Cole and Demeny's model life tables[527]. Our intention is to obtain the values of ${}_5L_x$ from life tables that can best represent the mortality conditions of the colored and slave populations in 1872. So we used Tables 1, 2, 3, 4, and 5 of the "West" family, for males and females.

Those values of ${}_5L_x$ were used in equation (1) and ten least square regressions (for the five tables for each sex) were run for each of the colored and slave populations. The selection of the set of values of ${}_5L_x$ to be used was made on the condition that the slope of the adjusted straight line (r') should be the closest value to the observed intrinsic growth rate (r) for the population in 1872.

For the native colored population the value of r can be obtained by considering inter-census geometrical growth rates. A thorough study of the growth of the Brazilian population according to colors from 1872 to 1940 estimated values of r for the colored population (rc) between 16 and 17 per thousand[528].

The following regressions for the male (y_{cm}) and female (y_{cf}) colored population, based on the "West" Table 3:

(3) $y_{cm} = 1.383824 - 0.016100\ (x + 2.5)$ $r^2 : .98$

(4) $y_{cf} = 1.314371 - 0.017389\ (x + 2.5)$ $r_2 : .96$

are those where r'c = 16.744 (the average of the values of $r'_{cm} = 16.1$ and $r'_{cf} = 17.389$) is the closest value of r_c obtained with any set of ${}_5L_x$.

For the slave population it is very difficult to obtain an estimate of the intrinsic rate of growth (r_s). Most of the testimony by contemporaries point to the hypothesis of a declining slave population, but none tries to make the adjustments necessary for a correct appreciation, and were based in conjectures because of the lack of systematic vital statistics[529]. Our procedure was to select the regressions based on the ${}_5L_x$ of "West" Table 1, representing the most severe mortality conditions of the "West"family,

(5) $Y_{sm} = 1.702140 - 0.004922\ (x + 2.5)$ $r_2 : .70$

(6) $Y_{sf} = 1.616747 - 0.006840\ (x + 2.5)$ $r_2 : .77$

And also showing the smallest values of r'_s (5.88 per thousand).

527 Coale and Demeny, *Regional Model Life Tables and Stable Population*. The authors themselves (p. 29) suggest utilizing the "West" family in the usual circumstances of underdeveloped countries where there is no reliable guide to the age pattern of mortality that prevails.

528 Instituto Brasileiro de Geografia e Estatística, *"A Composição da população segundo a Côr, no conjunto do Brasil, nas Regiões Fisiográficas e nas Unidades da Federação", in Estudos de Estatística Teórica e Aplicada, Estatística Demográfica, No. 11*, ed. By IBGE (Rio de Janeiro: IBGE, 1950), pp. 37-38.

529 The 1878 report of the *Directoria Geral de Estatística* stated that if the *ingenuo* population would be added to the slave population (both figures appearing in the December 31, 1877 updated *Matrícula* results) it would be recognized that slavery would be considerably increased in Brazil, had not the Free Womb Law interfered. Directoria Geral de Estatística, *Relatório e Trabalhos Estatísticos*, 22 November 1878, p. 121.

Life Tables of the Colored and Slave Populations

Table A.9 presents the Abridged Life Table of the Colored Population (Slave Upper Bound) of Brazil, 1872, for male and female colored. Table A.10 presents the Abridged Life Table of the Slave Population (lower bound) for male and female slaves.

TABLE A.9

Abridged Life Table: Colored Population (slave upper bound), Brazil, 1872

(A) Male Colored

AGE x	n	l_x	$_nd_x$	$_np_x$	$_nq_x$	$_nL_x$	T_x	e_x
0	1	100,000	32,708	0.67292	0.32708	79,319	2,337,791	23.28
1	4	67,292	14,544	0.78387	0.21613	230,956	2,258,472	33.56
0	5	100,000	47,252	0.52748	0.47252	310,275	2,337,791	23.38
5	5	52,748	2,965	0.94379	0.05621	255,967	2,027,516	38.44
10	5	49,783	2,445	0.95089	0.04911	242,681	1,771,549	35.59
15	5	47,338	2,840	0.94001	0.05999	230,371	1,528,868	32.30
20	5	44,498	2,842	0.93613	0.06387	214,473	1,298,497	29.18
25	5	41,656	3,734	0.91036	0.08964	201,102	1,084,024	26.02
30	5	37,922	4,481	0.88184	0.11816	177,327	882,922	23.28
35	5	33,441	3,828	0.8853	0.11447	157,628	705,595	21.10
40	5	29,613	4,147	0.85996	0.14004	138,217	547,967	18.50
45	5	25,466	4,323	0.83024	0.16976	116,251	409,750	16.09
50	5	21,143	4,158	0.80334	0.19666	95,331	293,499	13.88
55	5	16,985	4,098	0.75873	0.24127	74,617	198,168	11.67
60	5	12,887	3,925	0.69543	0.30457	54,495	123,551	9.59
65	5	8,962	3,476	0.61214	0.38786	35,693	69,056	7.71
70	5	5,486	2,701	0,50766	0.49234	20,127	33,363	6.08
75	5	2,785	1,692	0.39246	0.60754	8,986	13,236	4.75
80	5	1,093	777	0.28868	0.71089	3,522	4,250	3.89
85+		316	316	0.00000	1.00000	728	728	2.30

(B) Female Colored

AGE x	n	l_x	$_nd_x$	$_np_x$	$_nq_x$	$_nL_x$	T_x	e_x
0	1	100,000	27,713	0.72287	0.27713	83,400	2,553,160	25.53
1	4	72,287	15,735	0.78233	0.21767	248,032	2,469,760	34.17
0	5	100,000	43,448	0.56552	0.43448	331,432	2,553,160	25.53
5	5	56,552	3,424	0.93945	0.06055	273,885	2,221,728	39.29
10	5	53,128	2,988	0.94376	0.05624	258,058	1,947,843	36.66
15	5	50,140	3,224	0.93570	0.06430	243,118	1,689,785	33.70
20	5	46,916	3,690	0.92135	0.07865	225,530	1,446,667	30.84
25	5	43,226	3,869	0.91049	0.08951	206,492	1,221,137	28.25
30	5	39,357	3,907	0.90073	0.09927	187,028	1,014,645	25.78
35	5	35,450	3,837	0.89176	0.10824	167,556	827,617	23.35
40	5	31,613	3,634	0.88505	0.11495	148,792	660,061	20.88
45	5	27,979	3,554	0.87298	0.12702	131,079	511,269	18.27
50	5	24,425	3,755	0.84626	0.15376	112,937	380,190	15.57
55	5	20,670	4,116	0.80087	0.19913	93,347	267,253	12.93
60	5	16,554	4,398	0.73432	026568	71,889	173,906	10.51
65	5	12,156	4,252	0.65021	0.34979	49,868	102,217	8.39
70	5	7,904	3,614	0.54276	0.45724	29,975	52,149	6.60
75	5	4,290	2,457	0.42727	0.57273	14,384	22,174	5.17
80	5	1,833	1,210	0.34012	0.66012	6,182	7,790	4.25
85+		623	623	0.00000	1.00000	1,608	1,608	2.58

TABLE A.10

Abridged Life Table: Slave Population (slave lower bound), Brazil, 1872

(A) Male Slaves

AGE x n	$_1x$	$_nd_x$	$_np_x$	$_nq_x$	$_nL_x$	T_x	e_x
0 1	100,000	41,191	0.58809	0.41191	72,809	1,825,819	18.26
1 4	58,809	15,102	0.74320	0.25680	194,792	1,753,010	29.81
0 5	100,000	56,293	0.43707	0.56293	267,601	1,825,819	18.26
5 5	43,707	2,950	0.93251	0.06749	210,330	1,558,218	33.65
10 5	40,757	2,234	0.94519	0.05481	198,066	1,347,888	33.07
15 5	38,523	2,541	0.93404	0.06596	186,866	1,149,822	29.85
20 5	35,982	3,180	0.91162	0.08838	172,251	962,956	26.76
25 5	32,802	3,431	0.89540	0.10460	155,433	790,705	24.11
30 5	29,371	3,566	0.87859	0.12141	138,160	635,272	21.63
35 5	25,805	3,533	0.86231	0.13769	120,370	497,112	19.26
40 5	22,252	3,632	0.83678	0.16322	102,132	367,742	16.93
45 5	18,620	3,546	0.80956	0.19044	84,172	274,610	14.75
50 5	15,074	3,409	0.77385	0.22615	66,738	190,438	12.63
55 5	11,665	3,197	0.72593	0.27407	50,177	123,700	10.60
60 5	8,468	2,901	0.65742	0.34258	34,886	73,523	8.68
65 5	5,567	2,403	0.56835	0.43165	21,405	38,637	6.94
70 5	3,164	1,710	0.45954	0.54046	11,082	17,232	5.45
75 5	1,454	963	0.33769	0.66231	4,389	6,150	4.23
80 5	491	385	0.21538	0.78411	1,487	1,761	3.59
85+	106	106	0.00000	1.00000	274	274	2.58

(B) Female Slaves

AGE x n	$_1x$	$_nd_x$	$_np_x$	$_nq_x$	$_nL_x$	T_x	e_x
0 1	100,000	35,418	0.64582	0.35418	77,584	2,035,179	20.35
1 4	64,582	16,704	0.74135	0.25865	213,760	1,957,595	30.31
0 5	100,000	52,122	0.47878	0.52122	291,344	2,035,179	20.35
5 5	47,878	3,500	0.92690	0.07310	229,756	1,743,835	36.42
10 5	44,378	2,817	0.93652	0.06348	214,721	1,514,079	34.11
15 5	41,561	3,029	0.92712	0.07288	200,701	1,299,358	31.26
20 5	38,532	3,470	0.90994	0.09006	184,139	1,098,657	28.51
25 5	35,062	3,610	0.89704	0.10296	166,296	914,518	26.08
30 5	31,452	3,605	0.88538	0.11462	148,227	748,222	23.79
35 5	27,847	3,482	0.87496	0.12504	130,395	599,995	21.55
40 5	24,365	3,225	0.86764	0.13236	113,543	469,600	19.27
45 5	21,140	3,076	0.85449	0.14551	98,026	356,057	16.84
50 5	18,064	3,173	0.82435	0.17565	82,513	258,031	14.28
55 5	14,891	3,382	0.77288	0.22712	66,170	175,518	11.79
60 5	11,509	3,474	0.69815	0.30185	48,846	109,348	9.50
65 5	8,035	3,164	0.60622	0.39378	31,893	60,502	7.53
70 5	4,871	2,470	0.49292	0.50708	17,666	28,609	5.87
75 5	2,401	1,517	0.36818	0.63182	7,536	10,943	4.56
80 5	884	658	0.25603	0.74434	2,824	3,407	3.85
85+	226	226	0.00000	1.00000	583	583	2.58

Appendix B –
List of sources of slave prices and hire rates

1) Newspapers'Advertisements
Jornal do Commercio, sample of the daily issues, 1835-1888

2) Archives:

a) *Arquivo Histórico do Estado da Guanabara, Divisão do Patrimônio Histórico e Artístico as Guanabara*

Códice 6-1-13 Cartas de Libertação dos Escravos, 1885.
Códice 6-1-14 Cartas de Libertação dos Escravos, 1886.
Códice 6-1-15 Cartas de Libertação dos Escravos, 1886.
Códice 6-1-16 Cartas de Libertação dos Escravos, 1886-1887.
Códice 6-1-17 Cartas de Libertação dos Escravos, 1887.
Códice 6-1-41 Documentos sobre Escravos, 1881-1887.
Códice 6-2-6 Libertação dos Escravos, 1885.
Códice 6-2-8 Libertação dos Escravos, 1887.
Códice 6-2-9 Libertação dos Escravos, 1887.

b) *Arquivo Nacional*, Rio de Janeiro.

b.1) Códice 112 Documentos da Família Werneck (Inventories: name of the coffee plantations, date of evaluation).

Fazenda do Oriente, 1882.
Fazenda dos Campos Elysios, 1882.
Fazenda da Conceição, 1882.
Fazenda de Pindobas, ? (1840-1850).
Fazenda owned by Antonio Gomes Ribeiro, ? (1830-1840).
Fazenda de Mont'Alegre, ? (1840-1850).
Fazenda owned by João Pinheiro de Souza, 1860.
Fazenda ?, 1849.

b.2 Códice 1122 Fazenda Imperial de Santa Cruz.

b.3) Seção de Inventários (inventories' deceased name, evaluation date, and coffee plantation name).

Pascoal Rodrigues dos Reis, 1875.
Joaquim Gonçalves de Moraes, 1866.
Inacio Barbosa, 1824.
Major João Vieira Machado da Cunha, 1864.

Fazenda da Saudade
João Quirino da Rocha Werneck, 2nd Barão de Palmeiras, 1858.
Fazenda da Conceição
Fazenda da Prata
Idelfonso de Sousa Ramos, Visconde de Jaguari, 1883.
Fazenda Três Barras
Marquês do Paraná, 1856.
Fazenda de Lordello
Domingos Custódio Guimarães, Visconde do Rio Preto, 1873.
Fazenda de Santa Tereza
Fazenda da União
Fazenda da Aliança
Manuel Pereira de Souza Barros, Barão de Vista Alegre, 1872.
Fazenda de Campo Alegre
Fazenda da Chacrinha
Barão da Guanabara, 1873.
Fazenda ? (in Mendes)
Barão do Rio Claro, 1869.
Fazenda Santa Roza
Sítio do Pedro Eugenio
Fazenda Boa Vista
Fazenda do Monjolinho
Antonio Clemente Pinto, Barão de Nova Friburgo, 1873.
Fazenda de Santa Rita
Fazenda das Areias
Fazenda da Boa Vista
Fazenda da Boa Sorte
Fazenda da Jacotinga
Fazenda da Itaóca
Fazenda das Laranjeiras
Fazenda do Gavião
Fazenda da Aldeia
Fazenda dos Cafés
Fazenda da Aguaquente
Fazenda do Macapá
Fazenda de São Lourenço
Fazenda do Cônego
Chácara do Chalet

3) Cartório do Primeiro Ofício de Vassouras, Rio de Janeiro (Inventories: deceased's name, date of evaluation)
Benjamin Benatar, 1856.
Bento Francisco da Cruz, 1882.
Boaventura da Rocha Brum, 1865.
Barão do Ribeirão, 1874.
Cândido José Figueira, 1870.
Custódio José de Carvalho, 1870.
Cláudia Maria Cardozo, 1886.
Cândida Fonseca de Lacerda, 1882.
Carolina d'Oliveira Werneck, 1876.
Caetano José Pereira, 1886.
Caetano Gonçalves da Costa.
Carolina Maria Marques, 1884.
Carlos Lopes Domingues da Costa, 1855.
Candida Rosa de Silles, 1855.
Candida Maria de Souza, 1855.
Carlota Maria de Miranda, 1872.
Carolina Maria de Jesus Correa, 1851.
Barão de Vassouras, 1884.
Baroneza do Amparo, 1876.
Barão do Paty dos Alferes, 1862.
Boaventura José Dutra, 1853.
Cândida Werneck de Alencar, 1875.
Caetano de Souza Vieira, 1861.
Bernardo Francisco Justiniano, 1881.
Barão do Guaribu, 1885.
Fazenda do Guaribu
Fazenda das Antas
Fazenda dos Encontros
Clemencia Maria da Silva, 1845.
Coronel Carlos Teixeira Leite, 1873.
Caetano de Souza Barboza, 1846.
Constancia Maria de Jesus, 1839.
Custódia Maria de Santa Thereza, 1827.
Visconde de Queluz, 1853.
Carolina Umbelina de Aguiar, 1872.
Carolina Gomes d'Andrade, 1866.
Carolina Isabel de Sá, 1853.

Deolinda de Jesus da Conceição Ferreira, 1884,
Deolinda Francisca de Jesus, 1885.
Delfina Francisca, 1825.

4) Atas da Gerencia do Banco do Brazil, Banco do Brasil, Brasília (Mortgage Applications: Ata's date)[530].

1867: August 9, 13; September 10, 17, 24; October 1, 8, 10, 22, 29; November 5, 12, 19, 26; December 17, 24.

1868: January 2, 7, 14, 21, 28; February 11, 14, 18, 25; March 3, 10, 17, 24; April 7, 11; May 5, 27; June 9, 16, 26, 30; July 14, 21, 28; August 4, 18, 28; September 12, 22; October 20; November 10; December 12, 15, 29.

1870: January 12, 24; April 27.

530 138 coffee plantation mortgage applications with 6,938 slaves.

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impressão e acabamento
Gráfica Objetiva

The book "The Economics of Slavery and Labor in Brazilian Coffee Plantations, 1850-1888" provides an empirical and analytical evaluation of the economic questions about the role of slavery in Brazil. Brazil was the last country in the Western World to abolish slavery in 1888. During almost 400 years of its history, the country used more than five million Africans as slaves in a varied range of activities, and plantations were the main employers of slave labor. Thus, the discussion about the institution of slavery in Brazil is one of the main topics of our economic history.

The purpose of the book, based on ample use of primary sources of data about the coffee economy of the second half of the nineteenth century, is to investigate four vital questions: was slavery profitable for coffee planters? was it a viable economic system? if it was profitable, how to explain the peaceful end of slavery in Brazil? what were, in the view of planters, the economic alternatives existing in the labor market for slavery?

In order to address these questions, the author made a deep analysis of several subjects related to the economics of slavery and labor in coffee plantations. Among them, the coffee economy, slavery, prices and rental hire fees in the slave labor market, discipline of labor in plantation slavery, mortality and life expectancy of slaves, rates of return in the financial market, profitability of slavery, abolition and the "political death "of slavery, and immigration and the labor question in the context of final abolition.

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