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The 'Labour Question' in Nineteenth Century Brazil: railways, export agriculture and labour scarcity

Lucia Lamounier

Department of Economic History
London School of Economics
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Introduction

This paper examines changing patterns of labour relations in nineteenth-century Brazil associated with the building of railways and expansion of export agriculture. It addresses the 1850s-1880s period, decades when the `labour question' became a pressing issue for contemporaries. The extinction of the trans-Atlantic slave trade in 1850 posed the problem of finding alternative supplies of labour at a time of increasing agro-export production. In 1852 effective action to start the building of railways was taken. As part of efforts to improve conditions in the sugar and coffee sectors, several concessions were approved. From the middle of the century through to the 1870s, the expansion of coffee cultivation and railway construction were closely inter-related phenomena in the southern provinces of Brazil and shaped the debate about labour. The 1870s was a key decade. First, these years witnessed a `railway mania' - a great fever of building new lines and branches in various regions of the country, especially in the new coffee districts. Second, concern about the labour question intensified with the approval in 1871 of the Rio Branco Law which provided for the gradual emancipation of slaves. From then until 1888, when slavery was finally abolished, several policies were implemented trying to solve the problem of labour supply and to set new patterns of labour relations. This involved the arrival of thousands of immigrants in the 1880s, imported with government aid, to support the near-continuous expansion of coffee cultivation.

For much of the period there were complaints about the `scarcity of labour' (*falta de braços*). Many sugar and coffee planters saw the building of railways as a means of counteracting the negative affects of the end of the overseas slave trade and the anticipated abolition of slavery. In addition to bringing `progress' and `free labour', and more practically lowering the cost of transport, railway construction was expected to free-up hundreds of workers engaged in the existing backward system of transport based on mules and bullocks. Between 1850 and 1890 several

thousands of kilometres of railways were built, most in the coffee region of the province of São Paulo. Railway construction required a great number of engineers and technicians, skilled and semi-skilled workers, and an even larger number of unskilled workers. As such, railway building and operations signalled a profound change in a labour market hitherto conditioned largely by the needs of plantation export agriculture. The paper analyses these consequences by examining railway company recruitment policies and the experience of construction crews in a slave-based economy.

There is a relatively large bibliography on the building of railways in Brazil. There is also a vast literature on the process of the abolition of slavery and transition to free labour. Surprisingly, the relationship between export agriculture, railway construction and the process of framing free labour relations has not yet been carefully studied. The literature on railway building, the abolition of slavery and the constitution of a free labour market often alludes to the effects of railways on the `labour question'. These references, however, are very general and lack specificity. In existing studies on Brazil, railways are usually analysed within the context of a group of larger social and economic changes that point to the consolidation of capitalist relations of production. That is, the great expansion of coffee cultivation, the massive inflow of immigrants, industrialisation, urbanisation and the diffusion of market relations, all of which were clearly favoured by railway building. Within the context of these broad transformations, which appear to be more evident from the 1870s, particularly in the coffee region, the process of abolishing slavery and of establishing a free labour market was accomplished.[1]

[1] See, for instance, E.V. Costa, *Da Senzala á Colônia*, 2nd ed São Paulo, Ciências Humanas, 1983; R.E. Conrad, *Os últimos anos da escravatura no Brasil*, Rio de Janeiro, Civilização Brasileira/INL, 1975; S. Silva, *Expansão cafeeira e origens da indústria no Brasil*, São Paulo, Alfa-Ômega, 1976; W. Cano, *Raízes da concentração industrial em São Paulo,* São Paulo, Difel, 1977; F.A.M. Saes, Estrada de Ferro e Diversificação da Atividade Econômica na Expansão Cafeeira em São Paulo, 1870-1900 in T. Szmrecsániy (ed.), *História Econômica da Independência e do Império*, São Paulo, HUCITEC/FAPESP, 1996, pp. 177-196; L.B.R. Garcia, *Rio Claro e as Oficinas da Companhia Paulista de Estradas de Ferro: trabalho e vida operária, 1930-1940,* unpublished PhD Thesis, UNICAMP, 1992; L.R.P. Segnini,

With respect to the labour question, many authors mention the significant role played by railways. Firstly, railways eased the pressures of increasing labour demand. They permitted the re-location of thousands of workers, previously engaged in backward systems of transport, to other activities within the export agriculture sector.[2] Secondly, by promoting the development of capitalism, railways aided directly and indirectly the formation of free labour relations. The general idea is that the development of capitalistic relations was incompatible with the survival of slavery. Railway enterprises challenged slavery. By promoting immigration and the employment of wage labour, railway construction and operations stimulated the constitution of a free labour market. Thirdly, the existing literature emphasises the new type of work experience offered by large, complex, bureaucratically managed railway enterprises. Significance is also attached to the role railway workers played in the consolidation of the urban labour market and in the development of an organised labour movement.[3]

This study argues that the impact of railway building on the labour question was neither linear nor harmonious. It takes issue with a number of assumptions found in the general literature, revealing tensions and contradictions that have not been adequately recognised. For example, one the one hand, railways helped to economise on the number of workers employed in the transport sector. On the other, by enlarging the

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Ferrovia e Ferroviários: uma contribuição para a análise do poder disciplinar na empresa, São Paulo, Autores Associados, 1982; W.P. Costa, *Ferrovia e trabalho assalariado em São Paulo*, unpublished MA Thesis UNICAMP, 1976.

[2] S.J. Stein, *Vassouras. A Brazilian Coffee County, 1850-1900. The roles of Planter and Slave in a Plantation Society*, Princeton University Press, 1985, p.91, observes that in Vassouras about 20% of the male slaves in a given plantation were deviated from cultivation and employed in coffee transportation. The reallocation of the workers engaged in the mule transport is mentioned in several works, see, for instance, Saes (1996) *op cit*, p.193; C.M. Lewis, *Public Policy and Private Initiative. Railway Building in São Paulo, 1869-1889*, Institute of Latin American Studies, University of London, 1991, p.20.

[3] See, for instance, Saes (1996) *op cit*, pp. 193-195; Garcia, *op cit*, pp.17-18; W. Costa, *op cit*. Studies also mention the role of railway workers helping runaway slaves few years before final abolition, see J.Gorender, *A escravidão reabilitada*, São Paulo, Atica, 1990, pp.175-178; Conrad, *op cit*, pp.293-301; M.H. Machado, *O Plano e o Pânico. Os movimentos sociais na década da Abolição*, São Paulo, Ed. UFRJ/EDUSP, 1994, p.152, 154.

frontier and promoting the incorporation of new lands for coffee cultivation, rail construction increased overall demand for labour in agriculture.[4] This was additional to workers needed for railway building, maintenance and operation. Similarly, while the most of the literature presents the case that, in fostering the spread of capitalism, railways favoured the shift to free labour relations, there is a counter proposition. Namely, by triggering an expansion of agro-export production and demand for labour, railways strengthened the institution of slavery. This contradiction is observed by Saes who states that, `... from one side, railways gave new vitality to slave economy, from another it posed problems for its existence'[5] Hence, this paper questions the idea of an immediate connection between railways and free labour. In the literature on Brazil this relationship is often assumed because of legislation forbidding companies to use slaves in the construction or operation of railways.[6] As will be shown, this prohibition was not always observed.

The paper also contributes to the debate by focusing directly on railway workers, a subject on which very little had been written for the period studied. It concentrates on the men who built the railways, especially during the 1850s, 1860s and 1870s.[7] The few existing works on rail workers feature those employed in activities related to planning, administration, and operations and mainly consider the decades around

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[4] Lewis (1991) *op cit, p*.19.

[5] Saes (1996) *op cit*, p.193.

[6] Legislation preventing the employment of slaves in construction and operation of railways were approved in the 1830s; same dispositions were stated in 1850s legislation and contracts, see O.N. Mattos, Vias de Comunicação in S.B. Holanda, *História Geral da Civilização Brasileira*, São Paulo, Difel, 1971, pp.42-59, p.48; R.J. Katinsky, Ferrovias Nacionais in S. Motoyama (ed.) *Tecnologia e Industrialização no Brasil. Uma perspectiva histórica*, São Paulo, Ed. UNESP, 1994, pp.37-65, p.38; Segnini, *op cit,* p.22.

[7] The set of sources used includes the companies reports (director?s reports and the proceedings for the half-yearly meetings with shareholders) published regularly in contemporary railway magazines. Information was also gathered from articles sparsely published in the same magazines, engineer?s reports and British consular reports.

the end of the nineteenth and the beginning of the twentieth centuries.[8] That is probably why most works emphasise aspects related to the urban economy and capitalistic relations. This study shows that slaves and contract workers constituted the core of construction crews in many regions.[9] In Brazil, during the third quarter of the nineteenth century, the project for transforming the pattern of labour relations was largely based on a framework of long, fixed contracts and repressive legislation, irrespective of whether workers were Brazilians, immigrants or former slaves.[10]

Export Agriculture, Railways and Labour

Railway building in Brazil started only in the 1850s. The inauguration of the first section of the 14.5km railway from the port of

[8] For instance, Garcia, *op cit*; Segnini, *op cit*; C.R. Spindel, *Homens e Máquinas na Transição de uma Economia Cafeeira*, Rio de Janeiro, Paz e Terra, 1980.

[9] Chinese and Indian coolies, Irish, Caribbean and Canary Island immigrants, as well as serfs and convicts were employed in the construction of railways in various countries, such as United States, Cuba, Equator, Russia. See, among others, W. McAfee, *California's Railroad Era, 1850-1911*, San Marino, Golden West Books, 1973, *pp*.164-166; MM Fraginals, *El Ingenio. Complejo económico, social cubano del azúcar*, Havana, Editorial de Ciencias Sociales, 1978, p.299; O. Zanetti and A. Garcia, *Sugar & Railroads. A Cuban History, 1837-1959*, transl. by F. and M. Todd. The University of North Carolina Press, Chapel Hill, 1987; K.A. Clark. *The Redemptive Work. Railway and Nation in Ecuador, 1895-1930*, Wilmington, Delaware, SRBooks, 1998, p.87, 90; J.N. Westwood, *A History of Russian Railways*, London, George Allen and Unwin Ltd, 1964. Suggestions to employ contract labour on railway construction works in Brazil appeared in several documents, see for instance, *Congresso agrícola. Documentos*. Rio de Janeiro, Typ. Nacional, 1878, several references, for instance p.253; on Asian and European immigrant contract conditions in Brazil see V. Stolcke and M.M Hall, The introduction of Free Labour on São Paulo Coffee Plantations, *Journal of Peasant Studies* 10:2 (1983) pp 170-200; M.L. Lamounier, *Between Slavery and Free Labour. Experiments with Free Labour and Patterns of Slave Emancipation in Brazil and Cuba, c.1830-1888*, unpublished PhD Thesis, London School of Economics, 1993; R.E. Conrad, The Planter Class and the Debate over Chinese Immigration to Brazil, 1850-1893. *International Migration Review* (spring 1975) pp.41-55.

[10] A.Gebara, *O mercado de trabalho livre no Brasil*, São Paulo, Brasiliense, 1988; M.L.Lamounier, *Da escravidao ao trabalho livre*, Campinas, Papirus, 1988; Gorender, *op cit*; influence of slavery on management and labour in railways is observed in R.H. Mattoon, Railroads, Coffee, and the Growth of Big Business in São Paulo, Brazil, *Hispanic American Historical Review*. LVII, 2,2 (1977) pp.273-295, p.292.

Mauá to the Station of Fragoso ` ... was performed festively in the presence of the Emperor on 30 April, 1854'[11]. In spite of previous failures, a new law establishing general regulations for the building of railways was approved in 1852. The provision of a profit guarantee on recognised capital was a key feature of the new law.[12] The 1852 Law was largely a result of pressures made by planters anxious about the end of African slave imports in 1850 (Law Eusebio de Queiroz). Two important concessions were granted. Both were closely connected to export agriculture. One line was to be built in the sugar province Pernambuco, in the Northeast of the country; the another in the coffee region of Rio de Janeiro, in the Southeast. By the end of the century, several lines, extensions and branches had been built, most of them designed to stimulate production for export.

This section of the paper describes the process of railway building in Brazil, focusing on the specific features that shaped construction in the sugar and coffee regions. The different networks, the divergent pace of railway building and the peculiar characteristics of sugar and coffee export agriculture combined to fashion distinct approaches to the labour question in the Northeast and Southeast. Until the early nineteenth century, sugar remained the principal export staple. Sugar cane was cultivated mostly in the North-eastern provinces. From the 1830s, coffee grown in the southern provinces started to become more significant. By mid-century coffee accounted for about 50 percent of the total value of Brazilian exports.[13] Any analysis of the impact of rail construction on the labour

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[11] P.C. da S. Telles, *A history of Brazilian Railways*, transl. By Paul E. Waters. Bromley, P.E. Waters & Associates, s/d, p.17.

[12] Law n. 641, 26 June, 1852. The profit guarantee was composed of two elements: 5% paid by the imperial government and 2% offered by the provinces. Other provisions of the law included (i) a privileged zone of five *léguas* on either side of the line, within which no other company could construct a railway without permission from the original company; (ii) exemption from duties on imported machinery and materials for the building and operation of the line (iii) options on public lands located in the zone of privilege. See J.S. Duncan, *Public and Private Operation of Railways in Brazil*, New York, Columbia University Press, 1932, p.23.

[13] P. Eisenberg, *The Sugar Industry in Pernambuco: Modernisation without change, 1840-*

question during the period has to take into account the distinct features of railways in the sugar and coffee regions.[14]

Between 1850 and 1890 a total of 9,973kms of railway track were built in Brazil, largely to the benefit of southern coffee areas. In 1876, of a total of 2,051kms, 1,193kms were located in the coffee regions of Rio de Janeiro and São Paulo.[15] Between 1875 and 1890, the rail network of São Paulo increased from 655kms to 2,425kms[16]. In contrast, a significant rail system did not develop in sugar areas. By 1883 in Pernambuco, the main sugar province, there were only 256kms of railways in operation and 238kms under construction.[17]

Railway building in the sugar region started with the formation of the English- owned company the Recife and San Francisco Railway Company Limited (RSFR). This was the first company organised in Europe for the construction of railways in the country. At the time, the province of Pernambuco was responsible for almost 50 percent of Brazilian sugar exports.[18] Construction of the first section from the city of Recife to the confluence of the Una and Pirangí rivers, some 124kms from the coast, started in 1855. The line was open to traffic in 1862.[19] The

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1910, Berkeley, University of California Press, 1974, p.34, Table 2.

[14] The close relationship between railways and export agriculture is discussed in S. Milliet, *Roteiro do café e outros ensaios*, São Paulo, 1946; P. Monbeig, *Pioneiros e fazendeiros de São Paulo*, São Paulo, UNESP, 1984; O.N. Mattos, *Café e ferrovias: a evolução ferroviária de São Paulo e o desenvolvimento da cultura cafeeira*, São Paulo, Alfa-Ômega, 1974; Eisenberg (1974) *op cit*, pp.56; distinctions sugar/coffee in F.M.A. Saes, *A Grande Empresa de Serviços Públicos na Economia Cafeeira*, São Paulo, Hucitec, 1986; J. Cechin, *A construção e operação das ferrovias no Brasil no século XIX*, unpublished MA thesis, UNICAMP, 1978, pp.15-32.

[15] *Great Britain, Parliamentary Papers, Consular Reports* (hereafter *PP*) (1877) LXXXIII, 336.

[16] Saes (1996) *op cit*, pp.181; see also data in N. Leff, Economic Development in Brazil in S. Haber (ed.) *How Latin America Fell Behind. Essays on the Economic Histories of Brazil and Mexico, 1800-1914*, Stanford, Stanford University Press, 1997, pp.34-64, p.45.

[17] *PP* (1883) Pt VIII, 1136.

[18] Eisenberg (1974) *op cit*, Table 2 and 3, p.34, 42 resp.

[19] Telles, *op cit*, pp.19-20. The contractor in charge of the works was an Englishman, George Furness. The British consul observed that the works of this railway were not of a ?heavy

idea was to connect Recife to the Falls of Paulo Afonso (c.600kms), creating an integrated system of railways and river navigation that would give access to populated regions of the interior.[20] At about the same time, another line connecting the capital of the province of Bahia, the port of Salvador, to Juazeiro on the São Francisco River, was devised.[21] The Bahia and San Francisco Railway Company Limited (BSFR) Company was organised in London and construction work started in May 1856. The line reached Alagoinhas, about 123km from Salvador, in 1863.[22]

For almost two decades, the poor financial results of the RSFR and the BSFR discouraged new railway investment in the Northeast.[23] According to Eisenberg, the RSFR depended principally upon sugar freight and competed unsuccessfully with water and animal transport. By 1885, `barges' (*barcaças*) were still carrying 40.6 percent of total sugar shipments to Recife, and animals 6.1 percent. Until the end of decade *barcaças* and animals were responsible for almost half of the total sugar shipments. *Barcaças* remained a feasible alternative to the railway. Even in 1893 barges still carried more than one-third of sugar produced in the region. This proportion fell to one-fourth by the end of the decade.[24]

In both the Northeast and Southeast, a number of factors contributed to the early poor performance of railways, most were associated with high construction costs. Poor surveys led to inadequate route planning. Start-up costs were high because labour, material and

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description?. ?A tunnel of 300 yards long, and five iron bridges across small rivers, constitutes its only works?. *PP* (1865) LIII, 362.

[20] Lewis (1991) *op cit*, pp.5-6.

[21] Telles, *op cit*, p.30.

[22] The contractor in charge of the works was an Englishman, James Watson.

[23] In Pernambuco, the extension to Garanhuns (1887); branch line from Glicerio (1894). In Bahia, section Alagoinhas-Juazeiro (1876-mid-90s); extension Alagoinhas-Timbó (1884). Cechin, *op cit*, p.26.

[24] Eisenberg (1974) *op cit*, p.52. Table 13, pp.54-55. By the 1900s, the railways were carrying up to 70% of the states sugar production (*barcaças* 24,8%, animals 2,7%).

equipment had to be imported from Europe. There was a tendency to build to a higher standard than necessary. Problems of building in the coastal escarpment, where companies were operating at the frontier of existing rail technology, drove up costs. There was also corruption. In contrast to the sugar area, however, the network built in the coffee zone was soon relatively profitable, notwithstanding the high cost of complex engineering works.

In 1852, the construction of a line to connect the *Corte* (the city of Rio de Janeiro) to provinces of São Paulo and Minas Gerais was authorised. The construction of the Estrada de Ferro Dom Pedro II (EFDPII) witnessed the beginning of the railway network in the coffee region. The EFDPII was formed in Rio de Janeiro in May 1855: work started in June of the same year. The first section, linking the capital to Belém (62kms), was constructed across fairly level terrain and was inaugurated in March 1858. With a change of level of only 25m, few earthworks were required. The major obstacles consisted of ` ... crossing of a vast expanse of semi-marshy ground and some rivers'.[25] Greater difficulties were encountered in the construction of the second section through the Serra do Mar. Over a distance of 28km, from Belém to Barra do Piraí, there was a change of level of about 500m, requiring the construction of 13 tunnels and several bridges and viaducts. To overcome the technical problems posed by the Serra do Mar, the company contracted American engineers with experience in building railways in mountainous areas.[26] While the EFDPII was being built westward towards the Paraiba Valley, another line was under construction in a northerly direction. Mostly financed with native capital, the Cantagalo Railway from Porto de Caxias to Nova Friburgo was franchised in 1857. The first 34kms were inaugurated in April 1860. The line reached Nova

[25] Telles, *op cit,* p.21. The English contractor E.Price was in charge of the works on the first section

[26] A.C. El-Kareh, *Filha branca de mãe preta: a companhia de estrada de ferro D. Pedro II, 1855-1865,* Petrópolis, Vozes, 1982, p.96.

Friburgo in 1873 and Macuco in 1876. The total length was 152km. It was also difficult to build. The section in the Serra had a length of 12.5km, with a change of level of 887m and a maximum altitude of 915m.[27]

As with other concessions awarded in the 1850s, the EFDPII was an attempt by the government to address planter anxiety about the end of the trans-Atlantic slave trade.[28] At the time, most coffee was produced in the Paraiba Valley and was exported through the port of Rio de Janeiro. Between 1830 and 1850 exports had increased from 1,958,925 *arrobas* to 5,706,833 *arrobas*; in 1860/1, coffee exports from Rio de Janeiro totalled 10,559,473 *arrobas.*[29] Yet, by the time construction work on the EFDPII began, coffee cultivation had already spread along the Paraiba Valley into the province of São Paulo. During the 1860s, São Paulo coffee exports increased considerably. Although *paulista* coffee was exported through the ports of Rio de Janeiro and Santos, the latter was becoming of increasing importance. Of the 2,413,385 *arrobas* of coffee exported from the province of São Paulo in 1862/1863, 1,361,876 *arrobas* were shipped through Santos which was rapidly becoming the main port of the province.[30]

The building of a railway system in the province of São Paulo started with a line connecting the port of Santos to Jundiaí, the entrances to the highland coffee districts. The concession for the construction of the line was granted to the Barão de Mauá in 1856. Two years later Mauá contracted with an English company, Sharpe and Sons, to undertake the works. In 1859 the Sãn Paulo (Brazilian) Railway Company Limited

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[27] Telles, *op.cit*, p.28. Other lines followed the direction of the west, and other deviated to Minas Gerais (network later integrated with the Leopoldina Railway).

[28] El-Kareh, *op cit*, p.33.As observed by Lewis (1991) *op cit*, p.5, it does not mean that planters were financing it.

[29] A. E. Taunay, *História do café no Brasil*, Rio de Janeiro, Departamento Nacional do Café, 1939,v. III, pp.62-63 and v.VI, p.355

[30] Taunay (1939) *op cit*, v.III, p.212 and v. VI, p.355.

(SPR) was formed in London and acquired the concession in 1860. The 139km line, running from Santos to Jundiaí via São Paulo, was inaugurated in 1867.[31]

The SPR did not transverse the area of coffee cultivation: it stopped right where the main coffee plantation area started. According to the contract, the company had the right to extend the line to Rio Claro, but showed no interest in doing so.[32] The task of prolonging the line and building a provincial network was carried forward by five companies formed between 1870 and 1875. All were registered in the province. The Companhia Paulista de Estrada de Ferro (CP), passing from Jundiaí to Campinas reached Rio Claro on August 1876. The extension to Mogi-Guaçu was started in 1876 and pushed on to Araras (1877), Leme (1877) and Porto Ferreira (1880). The Companhia Ituana reached Itú (1873) and continued to Capivari and Piracicaba (1879). The Companhia Sorocabana (CS) reached Sorocaba in July 1875. The Companhia Mogiana (CM) ran from Campinas to Jaguari (1875), Mogi-Mirim (1875) and Amparo (1875). Another line, the Estrada de Ferro São Paulo-Rio de Janeiro (CSPRJ), connected the province to the railhead of the EFDPII at Cachoeira, and was built between 1871 and 1877. Over the following years, branches were constructed in all directions - through established coffee areas and into new zones where coffee would soon be cultivated.[33]

According to Cechin, sugar areas could not develop any significant railway network because of the crisis in cane production that compelled planters to divert capital into the modernisation of the sugarmills, especially between 1860 and 1880. In addition, he observes that, in contrast to coffee, sugar has a larger bulk/value ratio. Consequently, as

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[31] *Herapath's Railway Journal* (hereafter *Herapath*) (1873) XXXV, 512.

[32] It seems that the decision of not going farther than Jundiaí was taken according to the advice of the engineer-in-chief Brunlees, who believed all other lines would become feeders of the São Paulo Railway, *Herapath* (1864) 1003 and *Herapath* (1870) 997.

[33] The CP reached São Carlos (1884), Araraquara (1885), Jau (1887); the Mogiana reached São Simao (1883), Ribeirão Preto (1883), Franca (1888).

the costs of transport were greater, sugar was not profitable enough to attract the capital investment required to build railways.[34] Another point to add to this argument about the differing impact rail transport on the two staples is the nature of processing. Unlike coffee, sugar production required that cane was processed in the countryside. The sucrose content of cane declined substantially if cane was not milled and sugar extracted within 24 to 36 hours after cutting. Hence, central sugarmills were usually located at a transport hub, sometimes close to the coast or on a navigable river in order to make it easier and cheaper to transport cane. Improved transport was most necessary inside the plantations, to carry the sugar cane to the mill. With the passage of time, animal-powered tramways would be used.[35] Coffee was hardly processed to the same degree: modern transport was more relevant off-estate, to move production from the plantation to the port. In addition, the expansion of the coffee frontier necessitated a faster and more reliable system of long-distance transport extending into the interior. During the period, the sugar frontier in the Northeast hardly moved.

Based on arguments about the reliability and cheapness of rail transport, the literature has emphasised the `labour-saving' effects of railways - the freeing-up of thousands of muleteers (slaves as well as free workers) employed on the transport of export staples. A dual impact is assumed: an increase in the supply of workers available for re-deployment to directly productive activities; a reduction in the cost of labour and/or a decline in wages. Hence, railways both enhanced productivity and reduced production costs. The issue is more complex than this. Regional differences and the distinct chronology of railway building have to be taken into account. There is insufficient research to ascertain how, where and when railways contributed to the destruction of earlier systems of transport. What evidence there is suggests that the

[34] Cechin, *op cit*, pp.27-28.

[35] Cechin, *op cit*, pp. 15-16.

shift to modern forms of transport was slow and patchy. In some areas, railways charged more than existing types of transport, particularly river and coastal shipping. Inadequate route planning and breaks of gauges implied higher operating costs and freights; commodities had to be hauled to inconveniently located stations and cargo man-handled from cart to wagon at the railhead or from wagon to wagon at gauge junctions.

Moreover, as stated above, railway made possible the enlargement of the area under cultivation, particularly in the coffee zone. In the end, muleteers were displaced but not necessarily driven out of business. If muleteers gave way to railways in certain areas, new opportunities were available to them in others as the frontier of cultivation advanced ahead of railway construction. And new opportunities for traditional means of transport were not confined to the countryside. In addition to increased demand for labour and transport services around the plantations and at railheads, business grew in some cities. For example, in Recife the RSFR terminated in the business district, about one kilometre from the dockside. The terminal station of the EFDPII in Rio de Janeiro was located even farther from the port. To carry produce to the ships, the railway employed boats, bullock carts, mules, tramways and other forms of transport. Some planters were also owners of systems of animal and water transport and had a vested interest in their survival.[36]

Various authors point to the impact of railways on the costs of transport. There is no doubt that railways permitted a larger quantity of produce to be transported, more quickly and safely. They also often provided cheaper transport, directly or indirectly. Eisenberg observes that in Pernambuco, with the arrival of railways, muleteers reduced charges by a half. However, complaints over the high prices charged for transporting sugar continued.[37] In São Paulo, too, costs of coffee transportation were

[36] Eisenberg (1974), *op cit*, pp.56-57; Cechin, *op cit*, p.27-28.

[37] Eisenberg (1974), *op cit*, p.56.

still very high, especially due to the lack of competition to the SPR.[38]

As shown above, water transport was a feasible alternative to railways in the Northeast for most of the period addressed here. In 1890, 38.2 percent of sugar was still transported to the port of Recife by water. Various forms of animal transport carried 3.9 percent. Railways carried 57.3 percent. Of these, the RSFR, which accounted for 36.4 percent, was the line carrying the most sugar. It was followed by the Great Western, 16.8 percent, and the Estrada de Ferro Central, 4.1 percent.[39] The situation in the South was not very different. In 1855, moving exports entailed some 200,000-mule trips per year from the São Paulo hinterland to the port of Santos[40]. In 1865 it was reported that, beyond Campinas, new coffee plantations `..were opening up more and more land every few months ..[and that]..all the carrying was effected upon the back of mules, so that the drivers had the traffic entirely in their own hands'.[41] In 1867, when the SPR was opened it was reported that the `..mule traffic is still on the road although traffic is large on this very new line'.[42] Three years later the pattern changed. In 1870, engineer Fox reported that traffic had diverted almost entirely to the railway. The volume of goods transported by road` ..is now quite insignificant, only 149 tons of coffee and 200 tons of sugar'.[43]

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[38] Showing the differences between the traffic in Bahia and São Paulo lines an article in *Herapath* observed that: `The prospectus states that 16 pounds per ton is paid by the planters for the transport of coffee from Campinas to Santos, about 98 miles, whilst the cost of freight from Santos to Europe is only 50s per ton …' *Herapath's* (1865) XXVII, 1226. More than a decade later, an article stress the lack of competition and the high fees charged by SPR in contrast to RSFR, *Herapath* (1877) XXXIX, 1149.

[39] Eisenberg (1974) *op cit*, p.52. Table 13, pp.54-55.

[40] W. Summerhill, *Transport Improvements and Economic Growth in Brazil and Mexico* in Haber, *op cit*, pp.93-117, p.97. Mules carried from 250 to 300 pounds about 20 or 25 miles a day , *PP* (1865) LIII, 362.

[41] *Herapath* (1865) XXVII, 370.

[42] *Herapath* (1867) XXIX, 1079

[43] *Herapath* (1871) XXXIII, 351. For comparison, in 1869 (second half-year) 568 tonnes of coffee and 304 tonnes of cotton.

With the expansion of the railways in the 1870s, coffee exports from Santos rose from an annual average of 22,300 tonnes for the triennium 1866-68 to an average of 35,400 tonnes during 1869-71, to 35,900 tonnes in 1872-74 and to 44,300 tonnes in 1875-77.[44] In 1860, some 26,800 coffee bushes were under cultivation. In 1870 the number had increased to 60,462. At this time the railway network amounted to only 139kms, and had not yet reached Campinas, the centre of the new coffee-growing district. Ten years later the number of coffee bushes in the province had increased to 69,540, and railway track length to 1,212kms.[45] What these figures show is that coffee continued to expand, pushing the frontier further inland and increasing the distances that produce had to be transported. Coffee cultivation spread beyond Campinas long before the arrival of the railways.[46] Until the mid-1870s, coffee had to be hauled to Campinas or to Jundiaí or the nearest EFDPII station by mule train if it was to reach the port.[47] Demand for mules in the coffee zone - Brazil's largest market - remained strong until a new round of rail construction in the 1880s. Even after rail supplanted mules as the predominant means of long-
distance freight transport, muleteers had a prominent complementary role, moving products to railway depots and handling goods in areas yet not

[44] Lewis (1991) *op cit*, p.15.

[45] Mattoon, *op cit*, p.286.

[46] In the so-called `old west' (zones Central, Mogiana and Paulista) coffee developed before the arrival of railways. Planters calculated that as far as 200km from the railways tracks muleteers still constituted an economical way of transport, as observed in T. H. Holloway, *Imigrantes para o café. Café e sociedade em São Paulo, 1886-1934*, transl. by E. Malheiros, Rio de Janeiro, Paz e Terra, 1984, p.40-41. By mid-1850s, the *paulista* Paraiba Valley produced 2,737,639 *arrobas* of coffee; the *zona* Central 525,296 *arrobas*, and the *zona* Paulista (Rio Claro, São Carlos) 223,470 *arrobas*, F.A. M. Saes, *As ferrovias de São Paulo, 1870-1940*, São Paulo, HUCITEC, 1981, p.45.

[47] Port of Santos preponderance in coffee export started from the 1880s (A.E. Taunay, *Pequena História do Café*, Rio de Janeiro, Departamento Nacional do Café, 1945, p.146); see also Mattoon, *op cit*, p.277. The railway connecting the province São Paulo-Rio de Janeiro was completed in 1877.

served by railways.[48]

The Men Who Built the Railways

Building a railway is a complex task. It involves great volumes of financial resources, all sorts of machines, engineers, a relatively large skilled workforce, and an enormous quantity of unskilled men. In Brazil, as in most countries in the nineteenth century, railway construction was based on the contract system.[49]

Railway companies rarely employed construction workers directly. Since they were hired, managed, and paid by local, small-scale builders who contracted with the companies to build portions of the line, according to Licht, technically construction labourers do not belong in a study of employees of large-scale organisation. They ` ... deserve full length treatment in their own right'.[50] Studies have shown that trackmen engaged in the construction and maintenance of roadbeds represented the largest single group of employees, around 30 percent of the total number of workers.[51] The absolute number depended, of course, on the length of the line and the complexity of the works. According to Ducker, the track-layers and permanent way gangers needed little skill beyond being able to ` ... hit a spike with a hammer ... [and] ... was universally considered a

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[48] Summerhill, *op cit*, p.97.

[49] Common forms of arrangement were the 'lump sum' contract (where a single contractor was responsible for everything including the 'works of art') and the railway company-supervised section contract (contractors being responsible for different sections and specialists separately contracted for specific tasks, such as bridge, tunnel etc, under the supervision of the company's engineer). Arrangements, however, varied according to the complexity and progress of works as well as the relation with contractors. Contractors also sub-contracted for specific tasks/services with foreign and Brazilian contractors.

[50] W. Licht, *Working for the Railroad. The organisation of Work in the Nineteenth Century*, Princeton University Press, 1983, p. XVII.

[51] See, for instance, Licht, *op cit*, p.33; J. H. Ducker, *Men of the Steel Rails. Workers on the Atchison, Topeka & Santa Fe Railroad, 1869-1900*, Lincoln, University of Nebraska Press, 1983, p.4.

most inferior and arduous form of labour'.[52] Until the end of the nineteenth century, the chief tools used to build a railway were picks, shovels, and gunpowder. It was a very labour-intensive activity.[53]

In spite of a reasonable number of books on railway workers, there are not many studies on the construction crews engaged in the building and maintenance of railways. Most of the studies concentrate on the workers who ran the railways.[54] In the literature on Brazilian railways, references on these workers are rare and scattered. The main reason for the lack of studies may be the great difficulties encountered in tracking down these workers in the sources. As observed, construction workers were not employed directly by railway companies and do not appear in their records.[55] Nor is it easy to trace the records of contractors and sub-contractors who employed the navvies. Contracts were temporary, though they could be long- or short-term, varying according to the nature of the work, the system of pricing, form and rates of pay and - a relevant

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[52] Ducker, *op cit*, pp.4-5.

[53] T. Coleman, *The railway navvies. A history of the men who made the railway*, London, Hutchinson &Co Ltd, 1965, p.50. Coleman also observes that in USA and Canada where labour was scarce machine was used; steam excavators patented in America in 1843, would do the work of 70 men (p.50). One list of the material and tools used by one gang on the construction of the roadbed of the EFDPII reveals its simplicity. It lists for each gang (7 to 15 men) 6 shovels, 6 picks, 3 hoes (*enxadas*), 1 chopper (*machadinha*), and as a level a stone tied to a string. Reprod. in Cechin, *op cit, Appendix* 1.

[54] See about engineers, contractors, and workers operating railways, among others, Licht, *op cit*; Ducker, *op cit*; R.K. Middlemas, *The Master Builders. Thomas Brassey; Sir John Aird; Lord Cowdray; Sir John Norton Griffiths*, London, Hutchinson, 1963; P.W. Kingsford, *Victorian Railwaymen. The emergence and Growth of Railway Labour, 1830-1870*, London, Frank Cass, 1970; F.R. Conder, *The Men Who Built Railways (A reprint of F.R.Conder's Personal Recollections of English Engineers.Ed. by Jack Simmons, 1868)*, London, Thomas Telford, 1983; G.W. Taylor, *The Railway Contractors. The Story of John W. Stewart, his Enterprises and Associates*, Victoria, British Columbia, Morris Publishing, 1988. For workers in the construction, there are several contemporary and later accounts for England, see recent accounts, among others, Coleman, *op cit*; D. Sullivan, *Navvyman*, London, Coracle Books, 1983.

[55] Linch, *op cit*, p.32, comments on the difficulties of getting data on numbers of workers employed in the American rail lines; he calls the attention to the fact that before 1880 federal census ` … enumerators counted only engineers, firemen, conductors and brakemen as "railroad men"'.

point in agricultural economies - the seasonality of work.

Between the 1850s and the 1880s the pace of railway building was frenetic, especially in the 1870s when the project for the abolition of slavery was being implemented. And, as said before, the construction of railways demanded the employment of a great number of men. This section will address two points: first, how railway companies in Brazil managed to complete construction in the face of `labour scarcity'; second, the implications of railway labour demands with respect to the availability of workers for export agriculture. In order to answer these questions, details on the number of workers, their origin and conditions of work, and form of recruitment will be provided.

(a) Construction workers and construction work

Information on the number and origin of railway workers is diffuse and scarce. Scholars have absorbed the discussion of the much-reported scarcity of labour on plantations and assumed that railways faced a similar problem.[56] The evidence, however, shows that railway contractors were well supplied with labour. In the main, shortage of labour seemed to have been a problem only in isolated regions such as the Amazon. There were, nonetheless, difficulties in recruiting skilled workers and obtaining labour for those tasks considered hard or dangerous. In the Northeast, as in Southern areas, contractors usually encountered an adequate *local* labour force, that was both available and could be rapidly trained to undertake semi-skilled tasks. Immigrants were more often sought for administrative, supervisory and skilled tasks.

The seasonal, short-term nature of free worker employment in a slave-based rural economy facilitated the geographic mobility of workers.

[56] Several authors pointed out the problem of labour scarcity for railways; see, for instance, Mattoon, *op cit*, p. 278,289; El-Kareh, *op cit*, p.77; Cechin, *op cit*, p.42; W.Costa, *op cit*, p.73.

This constituted a positive feature for railway contractors anxious to secure a supply of labour. However, if from one side, the seasonal nature of unskilled agricultural employment met the needs of railway contractors, from another, it was a cause of concern at those moments when a stable workforce was need for projects that required a substantial, long-term labour input. As most workers were recruited locally, they strove to maintain links with their subsistence plots, abandoning railway work during the planting and harvesting seasons.

Construction work in the Northeast could rely on the large free population available. Although the continued sale of slaves to the south led some observers to comment on a general scarcity of labour, opinion on the issue was divided. For many contemporaries, the free population could be a great source of labour. But to ensure the availability of this labour, government action was required, namely laws guaranteeing the means of compelling the population to work.[57] While looking for ways of enforcing repressive legislation, planters and government took advantage of special circumstances such as drought and war to obtain cheap labour. In times of drought, for instance, hunger constituted an efficient means of driving workers into the labour market. Labour could be had for little more than a daily food allowance during a drought when *retirantes* were driven from failing subsistence plots.

The builders of the RSFR found no problems in terms of labour recruitment. At the beginning of construction work, the engineer-in-chief reported to the directors that labour was found to be abundant and the general condition of the men employed was very healthy.[58] Addressing shareholders during the half-yearly meeting, the Chairman observed that although it had been thought that great difficulty would be encountered in obtaining labour, he was happy to say that there was no problem: `The

[57] P.L. Eisenberg, *Homens Esquecidos. Escravos e Trabalhadores Livres no Brasil. Séculos XVIII e XIX, Campinas*. Ed. UNICAMP, 1989; Lamounier (1988) *op cit*.

[58] *Railway Times* (hereafter *RT*) (1856) 1208

contractor had obtained an ample supply of labour ...'[59] At the beginning of 1857, the Directors Report of the RSFR observed that ` ... free native labour continued abundant, and the natives employed are becoming daily more skilled and efficient'. At the some 2,000 men were at work on the line.[60] When a dispute between the railway and the contractor resulted in the dismissal of the contractor, the company engineer assumed responsibility for construction and often reported favourably on the supply of labour. In April 1859, engineer Penniston stated that 1,700 men were engaged upon the works and six months later confirmed that the ` ... number of men had been increased'.[61] At the beginning of the 1860s, the British Consul in Recife reported that for the railway works, ` ... to the question as to the supply of labour, the answer is always returned, that any quantity can be procured'.[62]

In 1859, Vignoles, engineer-in-chief of the BSFR, reported that there was no scarcity of native labour, at a time when about 1,200 persons were employed on construction works, and a further 220 labourers on their way to the scene of operations.[63] In November 1859, returns from Bahia showed 1,723 persons were engaged on railway works: the Directors believed that the ` ... supply of labour can be maintained equal to the requirements of the undertaking'.[64] At the beginning of 1860, it was stressed that initial fears that labour recruitment would be a problem had not been realised. There was now no cause for apprehension: `The facilities for obtaining native labour were continuously improving, and that labour was every day becoming more efficient under

[59] *RT* (1856) 1242.

[60] *RT* (1857) 508.

[61] *RT* (1859) 415,1145.

[62] *PP* (1865) LIII, 366.

[63] *RT* (1859) 445,482.

[64] *RT* (1859) 1213.

the direction of the English foremen'.[65] The Bahia Chairman confirmed in 1860 that there were 3,639 men employed in construction work along the 123km route: 2,069 Brazilians, 446 Italians, 107 English, 11 Germans, 4 French, and 2 Swiss.[66] In the second half of 1861, Vignoles reported that the average number of persons employed on the works was about 3,000 and that this supply could be maintained till near the close of the year.[67]

In the Southeast, with a railway-induced expansion of coffee cultivation to the interior of São Paulo in 1870s and 1880s, labour supply problems might have been expected. The evidence, however, shows that for the 1850s and 1860s construction works were well supplied. From the beginning, the SPR reported that: `On the important point of supply of labour and the probable traffic of the line (...) they are in the highest degree encouraging'.[68] In 1861, contractor Sharpe reported to the directors his experience on arriving in Brazil. He had no fear of being able to complete the works within the time specified. As the Chairman reassured shareholders, Sharpe ` ... had purchased an estate close to the line, the buildings on which would be useful for stores and workshops, and he had not experienced *that lack of men which might be expected* (emphasis added). The native labourers were more tractable than he had been led to believe, and they come forward in such numbers that he had to refuse several, considering it would not be prudent to put on more than he had at present employed - about 200'. Moreover, there had been no sickness and ` ... the works were becoming popular among the native labourers, *and numbers were applying daily for employment, so that there was not likely to be any deficiency of labour*' (emphasis added).[69]

Furthermore, the SPR found that during the whole of 1861 there

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[65] *RT* (1860) 432.

[66] Cechin, *op cit*, p.43.

[67] *RT* (1861) 1314.

[68] *RT* (1860) 860.

[69] *RT* (1860) 896 (letter of 4/07/1860).

were plenty of labourers. Shareholders were further reassured in February that chief engineer Brunlees had reported that: `There were plenty of men, and they were employing as many as they conveniently could on the works'. By August: `The supply of labour proves ample, and the Directors have reason to believe that will continue fully equal to the requirements of the works as further progress is made ... From 1500 to 1800 men were employed on the works at the date of the last advice.'[70] In 1861, contractor Sharpe was confident about labour supply and manifested his belief that the line could be finished much earlier than originally contemplated. [71]

Despite some of these confident statements, it is clear that the availability of unskilled labour was related to the seasonal cycle of agriculture. On the 20th of December 1861, according to a report by Brunlees, 2,271 men and 280 horses were employed on construction work: `*The planting season being now over the number of men is daily increasing*' (emphasis added).[72] Half year later, Brunlees recorded the employment of 2,850 men. In December 1862, there were 2,432 men employed in the works, together with 307 mules and bullocks: `*There was a scarcity of labour owing to men leaving, during the plantation season*. The contractors have, however, ... taken active measures to secure themselves against a recurrence of this kind of interruption, and they are now in possession of a better class of workmen than they have hitherto been able to command'.[73] The contractor's returns of 17th June showed that ` ... 4,721 men were employed on the works together with 607 bullocks being a great increase on the number employed in the previous half year'.[74] The increase in the numbers of workers was consistent with

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[70] *RT* (1861) 251,981.

[71] *Herapath's* (1862) XXIV, 132.

[72] *Herapath* (1862) XXIV, 132.

[73] *Herapath's* (1863) XXV, 125.

[74] *Herapath* (1863) XXV, 860.

plans to finish the line some three years earlier than contract date. At the 1864 Ordinary Meeting, it was reported that the weather had been very favourable and the supply of labour abundant.[75] In 1866, shareholders were told that the number of men employed last November was 2,273.[76]

In addition, contractors found it difficult to find an adequate labour force in certain regions and to perform tasks considered very hard, rough, dangerous or requiring skill. For example, labour recruitment was a perennial problem for the Madeira-Mamoré Railway and contributed to the failure of the project in the early 1870s. Workers caught smallpox. There were Indian attacks. Food and medical supplies were in short supply. In 1872, the chief engineer reported that due to a lack of hands, the undertaking was almost impossible. The company gave up ten months later.[77]

Many SPR reports commented on the difficulties of securing labourers in the rainy season and to work on the Serra sections. `The Serra, which in some places rose to a height of 5,000 feet, condensed the moist winds from the sea, and there was either rain or fog on ninety days out of one hundred. The rains were very different from what were experienced in this country: they descended in floods, which could scarcely be conceived by those who had not experienced them.'[78] Natives knew well the increased annoyance of mosquitoes, the great danger of diseases and landslides. During the wet season, some contractors did not risk using expensive imported labourers. When engineer Brunlees visited the works in the Serra in 1860, he observed that the ` ... the contractor considered it prudent to withdraw his European labourers from

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[75] *Herapath's* (1864) XXVI, 841,409.

[76] *Herapath* (1866) XXVIII, 162.

[77] M. F. Rodrigues, *A ferrovia do diabo. História de uma estrada de ferro na Amazônia*, São Paulo, Melhoramentos, s/d, p.97.

[78] D.M. Fox, *Description of the Line and Works of the São Paulo Railway in the Empire of Brazil: with an Abstract of the Discussion upon the Paper* (Excerpt Minutes of proceedings of The Institution of Civil Engineers), London, William Clowes and Sons, 1870, p.34.

this marshy length during the approaching of the wet and unhealthy season'.[79]

A shortage of skilled workers was also often reported. The construction of tunnels, for example, in addition to being considered dangerous (due the frequent accidents) demanded skilled labour. Miners were always reported to be scarce. Immigrants were usually imported to perform the task. However, even for certain (semi-) skilled tasks, contractors could recruit from the local population. The directors of the RSFR, for instance, reported in 1857 that the woodwork of the carriages could be made in Brazil, ` ... for the carpenters and joiners in Brazil are expert workmen'.[80] With time and experience, contractors found it advantageous to train native labour. In 1860, engineer-in-chief Brunlees, inspecting the works of the SPR, reported that there had been no scarcity of labour, ` ... excepting miners ... [but] ... a considerable number of natives and blacks had been trained in the tunnels, and they certainly would make steady, first class workmen'.[81]

Labour demand for construction works seems to have increased considerably from the 1860s onwards. In addition to the great numbers of lines and branches being built, those already in operation also required labour for maintenance work. These labourers were usually recruited in the same way as construction gangs, probably employed by the same sub-contractors. In the end, this meant a further increase in labour demand, and of course, pressure for higher wages.

While a line was being built, a process that could take years, it was common practice to inaugurate railway services on completed sections.

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[79] *RT* (1860) 1152.

[80] *RT* (1857) 507.

[81] *RT* (1860) 1152. By the same time that was also a concern for the engineer of the EFDPII; he was training Brazilians to be miners as well, see El-Kareh, *op cit*, p.77. At the beginning of the works for the Recife and São Francisco Railway, it was reported that some of the locals were really good railway labourers, so that than when they approached the more difficult works, they would have an ample supply of skilled labour to execute them. *RT* (1856) 1242.

This necessitated the hiring of maintenance crews as well as workers to operate trains and staff stations and goods yards. The increase in the number of employees of the EFDPII illustrates the point. During the first half-year in 1858, there were 144 company workers. One year later, the number had increased to 757 and in 1864 the number was 1,061.[82] When the first section entered into operation in 1858, construction work on the second started. Subsequently, work began on the third section in the upper Paraiba Valley. It has to be remembered that most of the construction workers employed by contractors and sub-contractors were not listed as company employees. According to El-Kareh, oscillation in the number of EFDPII employees from one semester to another can be explained by maintenance work on the line. The company had to hire more workers in the rainy season.[83]

Besides those engaged in seasonal maintenance work, very large numbers of construction gangers were obviously required during a building boom when work might extend over hundreds of kilometres. The construction of the EFDPII branch line between Entre Rios and Juiz de Fora (85km) employed 4,500 men in 1871.[84] In the same year, between January and June, the construction of the CP section from Jundiaí to Campinas (45km) required a daily average of 1,031 workers - the number fluctuated between 723 and 1,437.[85]

Increasing demand for labourers was reflected in wages. A table prepared by Penninston, engineer-in-chief in Pernambuco, showed that wages of native labourers before rail construction work began varied from 1s4d to 2s3d per diem; shortly after rates had increased from 2s3d to 3s per diem.[86] In his 1870 report, SPR resident engineer Fox observed that

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[82] El-Kareh, *op cit*, p.72.

[83] El-Kareh, *op cit*, p.72; Cechin, *op cit*, p.49.

[84] Cechin, *op cit*, p.43.

[85] Cechin, *op cit*, p.42.

[86] *PP* (1865) LIII, 366..

there was an increase in working expenses. He explained that: `Notwithstanding the extra outlay incurred with the erection of the additions to the workshops at São Paulo; the enlargement of Jundiahy goods shed, &c., *and the rise of wages, caused by the new railway works* (emphasis added), the total expenditure has been but little over 44% of the gross receipts'.[87] In a study on the CP, Mattoon finds that between 1860 and 1885 the `*diárias*' increased more than a 100 percent in nominal values, or about 46 percent in real terms.[88]

The higher wages available in railway construction attracted workers from several quarters. Slaves, free Brazilians and immigrants sought another source of income from railway work, fitting employment with railway contractors and companies into the agricultural cycle. This reveals the seasonal nature of work available to unskilled labours in a fragmented labour market. For much of the period, the great majority of railway navvies were recruited locally. As already stated, immigrants were more often recruited for administrative, supervisory and skilled tasks. Free Brazilians and slaves performed most of the unskilled work. It is interesting to note the marked presence of free Brazilians, the `native population', in construction works, a fact recorded in several reports.

From the 1830s, either to prevent competition with the agricultural sector for labour or to attract British investment, railway concessions prohibited companies from owning or employing slaves.[89] However, despite this injunction, there are many references which show that the rule was not always followed. It was clear that the prohibition only applied to the railway companies themselves and to the principal contractors. The condition did not apply to other contractors or to the sub-contractors, and various firms providing services for the railways.

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[87] Report from Mr. Fox, Dec. 31, 1870. *Herapath's* (1871). XXXIII, 351.

[88] R.H. Mattoon, *The Companhia Paulista de Estradas de Ferro, 1868-1900: a local railway enterprise in São Paulo, Brazil*, unpublished PhD Thesis, Yale University, 1971, p.199.

[89] The Decree n.100 of October 31, 1835 is the first legal instrument related to railways in Brazil. Same condition is stated in the Law n.641, July 26, 1852. Mattos (1971) *op cit*, p.48.

Many authors argue that this legislation demonstrates the capitalistic features of railway enterprises, assuming that by preventing the use of slaves the law compelled the companies to employ `wage labour'. (In fact, the legislation stated only that the companies should employ `free people'.) Is this evidence of a labour market based on wage labour?[90] Other authors, confronted with evidence of the employment of slaves in the construction and operation of railways, emphasise the great scarcity of labour faced by the railway companies which forced them to draw slaves from export agriculture.[91] But, as proved above, railway companies did not complain about shortages of labour. In his 1870 paper, engineer-resident Fox of the SPR observed that: `Although Brazil is a slave-holding country, free labour was rendered necessary by the terms of the concession, and a scarcity of it was feared as one of the difficulties of the enterprise. Experience proved, however, that labour of one kind or other appeared as it was wanted'.[92]

Contemporaries noted that higher wages in railway work constituted a strong appeal to slaveowners, who would take slaves out of agriculture and hire them to the contractors. Soares observes that in 1860, the construction of railways demanded a not insignificant number ` ... of free men and slaves ... ', who had previously been engaged in agriculture. According to a government official, this was due to the ` ... high *jornais* of 2$000 a 2$500 *diarios* that are offered by the companies...'[93]. At the same time, the Swiss Consul, visiting a coffee plantation in the province of Rio de Janeiro, remarked that the owner cultivated an excellent coffee, but on reduced scale. The *fazendeiro* explained that it was more advantageous to ` ... rent his slaves at 1,800 *réis* a day on the railway works and on the

[90] For instance, W. Costa, *op cit*, p.149

[91] For instance, Cechin, *op cit*, p.46; El-Kareh, *op cit*, pp.77-78.

[92] Fox, *op cit*, p.21.

[93] S.F. Soares, *Notas Estatísticas sobre a Produção Agrícola e Carestia dos Gêneros Alimentícios no Império do Brasil*, Rio de Janeiro, IPEA/INPES, 1977 (1st ed 1860) p.137.

construction of roads ... ' than to occupy them on coffee cultivation.[94] It is important to point out that this was at the peak of coffee cultivation in Rio de Janeiro.[95]

Competition for labour between the agriculture sector and railway enterprises remained during the whole period. In fact, with the prospect of the end of slavery it seemed to have increased. Expanding coffee plantations required an increasing number of workers, and free Brazilians were engaged with greater frequency. Immigrants were also recruited by plantation owners. Yet virtually all of these categories of workers would take seasonal advantage of higher wages paid on railways. Planters, not prepared or unable to pay the same level of wages, continued to resort to traditional `incentives' in order to retain labour. Planters pressed repeatedly for the enactment of repressive labour legislation. But granting workers permission to cultivate plots of land within the plantation in exchange for labour continued to be a powerful means of securing labour supply.

Railway companies lacked these means. Accordingly, the seasonal character of labour supply and an apparent inability to retain workers provoked complaints from contractors and engineers. Good wages were, of course, an incentive to attract workers, but were not a sufficient inducement to keep them. According to the British Consul: `During a portion of the year, moreover, no inducement in the way of high wages will keep the labourers fixed to one spot at a distance from their homes'.[96] Fox recorded a similar pattern in the construction of the SPR.[97] Reporting on the works of the BSFR in 1859, engineer Vignoles commented on the seasonal availability of the native population: `The native Brazilians and

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[94] J. von Tschudi, *Viagem às províncias do Rio de Janeiro e São Paulo*, São Paulo, Martins, 1951, p.109.

[95] Taunay (1939) *op cit*, v. Terceiro, T.I, pp. 62-63.

[96] *PP* (1865) LIII, 366.

[97] Fox, *op cit*, pp.21-22.

the free Negroes seem to be willing enough to work in certain periods, but at those periods only ... [at other times] ... to cultivate their own little holdings at the proper seasons, they quit all the other engagements ... Still, good pay and good treatment, both of which they receive from the contractor, tempt many of them; and at times there is even superabundance of men offering their services, though not always at those times when they are most wanted.'[98]

This evidence points to a strong resistance by workers to cut the link with subsistence, returning to tend their plots during the planting and harvesting season.[99] Workers' unwillingness to compromise subsistence was, however, viewed differently by railway agents and others. Rural labour was often depicted as work-shy. Reflecting this prejudice (and misunderstanding), in rather confused fashion, Fox pointed out that the native Brazilians were ` ... a tractable race, easily managed with ordinary tract, appreciating kind and considerate treatment ... [Yet they have] ... an indisposition to work, partly from the false pride engendered by slavery, and partly from the indolence induced by the absence of incentives to work, when he can easily live in his simple way without it'. However, Fox continued to acknowledge that: ` ... the solid advantages of work, in the shape of good wages regularly paid, induced numbers to leave their cabins and little plantations of bananas, beans, and Indian corn, always, however, to return home at the planting season'. [100]

These perceptions and prejudices on the part of railway engineers

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[98] *RT* (1859) 1198.

[99] Leff uses the term `domestic agricultural sector' instead of `subsistence sector'. According to him, the later term is misleading ` … inasmuch as it also connotes minimal incomes, a condition that may not have applied to people in the interior of nineteenth century Brazil …' , therefore the first term, implying subsistence goods for the domestic/local market. Leff, *op cit*, p.61, fn 12. I will use subsistence plots or generally `agriculture sector', for many of the workers have also their subsistence plots inside the plantations, tending their own plots for their own subsistence or for the local market and performing works for the plantation. In frontier areas landless farmers produced coffee and staple goods for the internal market, see in N. Naro. `Customary Rightholders and Legal Claimants to Land in Rio de Janeiro, Brazil, 1870-1890'. *The Americas*. XLVIII (4), April 1992, pp.485-517. p.487, 505.

[100] Fox, *op cit*, p.22.

mirrored contemporary planter views and prefigured assertions frequently repeated in the traditional bibliography: `the indolence' of the free population, and its loose engagement in the production of export agriculture.[101] As the involvement of the Brazilian population in the construction works of railways seems to have been much greater than the literature acknowledges, it is interesting to consider the subject in greater depth. The free population increased steadily during the nineteenth century. From the beginning of the century, natural reproduction, slave emancipation and immigration ensured that the number of free people in all provinces of the Empire was larger than the number of slaves. In São Paulo, in spite of the growth of the slave population until the 1880s, slaves never constituted more than 30 percent of the total population - even in the most productive coffee zones in the Paraiba Valley and in the west.[102] Until mid-century, when the importation of slaves from Africa was stopped, only a small share of the free population was engaged in export activities. Slaves constituted the bulk of the workforce. Nevertheless, the free population featured in several other activities, directly or indirectly related to export agriculture, such as transport, commerce, crafts, manufacturing and government. Many people were also engaged in producing subsistence goods. While the numbers are impossible to ascertain, it is known that planters employed native labour a number of administrative tasks and for and political reasons. These *agregados* might work as overseers on the estate, serve in the local police and militia and perform a variety of other tasks. As the frontier expanded the number of those employed to clear the land, work considered too dangerous for expensive slaves, grew. From mid-century, with the end of the trans-

[101] For instance, Leff, *op cit*, p.42 repeats contemporaries arguments. There are many studies on *trabalhadores nacionais*; for distinct approaches, see, for instance, Eisenberg (1989) *op cit*; M.S. de C. Franco, *Homens livres na ordem escravocrata*, São Paulo, Instituto de Estudos Brasileiros, 1969; C.M.M.de Azevedo, *Onda negra, medo branco*, São Paulo, Paz e Terra, 1988; H.M de Castro, *Ao Sul da Historia*, São Paulo, Brasiliense, 1987; D.A.S. Moura, *Saindo das Sombras: Homens livres e pobres vivendo a crise do trabalho escravo. Campinas, 1850-1888*, unpublished MA Thesis, USP, 1996.

[102] Eisenberg (1989) *op cit*, pp.224-225.

Atlantic slave trade and the rapid expansion of the coffee frontier, free Brazilians were increasingly employed in export activities.

New writing on free Brazilian workers (*trabalhador nacional*) has revealed the paucity of research on this group of the population.[103] The prejudice of contemporary Brazilian society against the mixed-race, free poor people, invariably presented as `indolent', `vagrant' and `lazy', is now being re-examined. In revealing contemporary opinion and assumptions that *nacionais* lived a marginal existence, these new studies seek to explain the preference of planters for immigrants. New research also attempts to examine the attitude of the free population towards labour in a slave society and in a country with an open frontier. These findings hint at the resistance of the free people to shift from cultural practices based on traditional values, to a more disciplined, methodical labour life. During the period of `transition from slavery to free labour' this resistance exercised both planters and government.

The geographical mobility of the free population, its fluidity, emerges from various sources and has not gone unnoticed in the literature. For many historians, this again indicates the alleged indolent, work-shy, character of free Brazilians. These authors fail to understand the economic and social circumstances in which those people were immersed. They fail to recognise that seasonality of employment was the main cause of workforce instability.[104] In a predominantly agrarian economy, year-round employment was simply not available for the mass of the population.

By mid-1870s, the total population of Brazil was 9,930,478; out of

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[103] Eisenberg (1989) *op cit*, pp.223-244, was one of the firsts to call the attention to the lack of studies, more recently if was still observed by Leff, *op cit*, p.40.

[104]Examining similar features in the Pampas, Amaral analyses the geographical mobility (instability) of labour as a reflection of the seasonal, short-term (job-scarce) nature of employment in the rural economy of Buenos Aires. According to him it was labour demand that was unstable, rather than labour supply. S. Amaral, *The rise of Capitalism on the Pampas*. *The Estancias of Buenos Aires, 1785-1870*, Cambridge University Press, 1998, pp.170-171.

that figure, 1,285,496 were slaves. According to the 1870 census, 33 percent of foreigners dedicated themselves to agriculture in the south; 13 percent to trade; 12 percent were day labourers; nine percent were domestic servants. Of the native population, 40 percent were engaged in agriculture; one percent were merchants; 0.19 percent were involved in manufacturers; 7.54 percent were mechanics, carpenters, smith, dyers, hatmakers, and so forth. The census also shows that 42 percent of the total population lived without any specific occupation (*sem profissão*).[105] The same pattern can be noticed for the province of São Paulo. The occupational table of São Paulo elaborated in the mid-1870s by Godoy gives a total population of 837,354, including 156,612 slaves. Of the total figure, 268,581 are declared to be `with no occupation' (including 33,833 slaves).[106]

Being classified as of no specific occupation did not mean an absence of work. Many times it meant temporary engagements, a non-regular, or non-steady job. Engagement by tasks (*empreitada, locação de serviços*) was a very popular way of employing free people. From the point of view of the free population, the engagement in any kind of temporary work was a way of keeping their freedom. Laws against vagrancy punished with jail or forced labour on public works those who could not give evidence that they had work. Military recruitment laws, issued during the Paraguayan War (1865-70), further stated that those not engaged in export activities could be conscripted into the Guarda Nacional or the Army. Workers on the railways were exempted from military recruitment, giving railway employment an added advantage. From mid-century, there were various attempts to control the free population: repressive legislation based on long-term contracts of services (*leis de locação de serviços*) was applied. This was considered

[105] *PP* (1881) Pt I, 34.

[106] J.F. Godoy, *A Província de São Paulo. Trabalho Estatístico, Histórico e Noticioso*. São Paulo, Governo do Estado, 1978 (1st. ed.1875).p.46.

a way of providing a disciplined, regular and stable labour force.[107]

The role of internal migration in `labour instability' is still not properly understood. Most of the literature has focused on immigration from overseas. Yet internal migration during the 1872-1890 period totalled 453,794 people: some 449,934 foreign immigrants arrived in the country between 1884 and 1890. The following decade, 1890-1900, internal migration reached 412,282 people and the number of immigrants 1,129,315.[108] Examining one of the most important coffee regions, the Campinas area, Moura states that the flow of domestic migrants to this area started in the 1850s and increased in mid-1870s. Between 1854 and 1874, approximately 9,000 migrants from other provinces arrived in Campinas. Coffee expansion and an increasing number of urban activities attracted families and individuals from Rio de Janeiro, Minas Gerais, and Bahia.[109] Railways played a part, making it easier to move. In the *paulista* frontier areas of São Carlos, Araraquara, Ribeirão Preto, the presence of migrants was even more visible. In addition to those who decided to settle as squatters, small farmers, *agregados*, or engaged in public works, there were others who found employment in transport and commercial activities. And there were those who were just passing by (*de passagem*), either because their job implied a temporary stay, such as muleteers, coachmen, *carroceiros* or because they were in search of a new life on the frontier. The attraction of work on railways for migrants was observed in several reports of the *presidentes de provincia*.[110]

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[107] Lamounier (1993) *op cit*, chapter 4. Amaral, op cit, p.177, observes that repression of vagrancy aimed at restricting the legal and illegal activities of free workers, without putting an end to them, since they were part of the informal agreements between landowners and free workers for protection and labour. Vagrancy was easy to see, but the identification of vagrant individuals was difficult

[108] J. M. dos Passos Subrinho, Migrações internas: resistências e conflitos. *XX Congresso Nacional de Economia*. 1992. pp.301-319, p. 301; D. H. Graham e S.B. Hollanda Filho, *Migrações internas no Brasil (1872-1970)*, São Paulo, IPE/USP, 1984, p.34.

[109] Moura, *op cit*, p.116; J.S. Martins, *O cativeiro da terra*, São Paulo, HUCITEC, 1990, p.71

[110] Moura, *op cit*, p.129.

The condition in which this marginal population lived appeared to be even more precarious in the Northeast, given the crisis of export agriculture and the tragedy of recurrent droughts which often displaced thousands of people. This population was employed in plantation labour as well as in public works. Their great numbers and their miserable conditions attracted the attention of many contemporary observers. In 1874 the English Consul in Pernambuco reported that: `The immense number of people without a trade or ostensible means of living is truly astonishing and it would puzzle those who are unacquainted with their habits to know how they could keep their bodies alive'.[111]

Employment on public works was certainly a way of eking out a living. Projects such as the construction of the Camussim-Sobral Railway (Ceará) were ` ... pushed by Government during the drought as a means of affording employment for the starving population'.[112] Another report pointed out that, ` ... the government have been sending many hundreds northward again; the government transport *Purus* conveying many to the Amazonian Vale to work on the Madeira Mamoré Railway'.[113] Many *retirantes* were directed to the south and there they were employed in production of export crops or on public works, especially on the construction of railways.[114]

The presence of immigrants in the construction of the railways has been well researched. Emphasis has been placed on their contribution to the creation of a Brazilian corps of engineers and specialist workers.[115] But most of the references feature skilled labourers. There are fewer accounts of unskilled immigrant workers, just as for the employment of native labour. As shown above, before arrival in Brazil, foreign

[111] *PP* (1875) LXXVII, 85.

[112] *PP* (1880) Pt I, 26.

[113] *PP* (1878-79) LXX, 115.

[114] See Lamounier (1988) *op cit*, p.127; Moura, *op cit*, pp.132-144.

[115] Mattoon (1977) *op cit*, p.290; Cechin, *op cit*, pp.39-40.

contractors had very little information about the condition and population of the country. Many brought with them their own staff of engineers and skilled labourers. In the view of railway builders, immigrant workers provided a more stable and regular workforce and so represented a way of keeping the wage bill under control. This, at least was the thinking of the BSFR contractor.[116] In addition, from the first attempts to build railways, planters had voiced concerns about labour availability. As already indicated, fearing competition for the existing pool of workers, planters required contractors to import immigrants.[117]

There is fragmented data on the importation of unskilled workers for railway constructions: immigrants were of diverse origin - Chinese, Portuguese, Italians, Germans, Belgians, English, and others. There is even less information on the conditions under which these unskilled immigrant labourers were contracted and worked. Contractor Price, in charge of the first section of the EFDPII, imported European workers, but many of them refused to work because of the unhealthy conditions, so he decided to recruit Chinese coolies.[118] Before leaving England, Watson in charge of the BSFR, took steps to obtain the necessary supply of labour, of which he thought ` ... there is a great want in Brazil'. With official authorisation from the Sardinian government his agents engaged 500 men, ` ... who would proceed very shortly to the Brazils, and they were to be followed by 500 more with greatest rapidity possible'. Many of those men were skilled labourers, with previous work experience on the railways of Lombardy and Piedmont. The measure was considered positive by the

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[116] *RT* (1858) 1268.

[117] Most of the contracts included provisions for the importation of immigrants, either as workers or/and as prospective smallholders who would settle down on the lands of the company. See for instance, the obligation to import immigrant workers in the contract agreed between The San Paulo Railway Company and Mr. Sharpe, *Herapath (*1864) XXVI, p.841, 409. By the 1880s, to promote immigration provincial legislation were approved in the coffee areas, requiring all companies to transport immigrants and their effects free of charge. Lewis (1991) *op cit,* p.6,22.

[118] It is often mentioned that more than 5,000 Chinese workers died in the undertaking. Cechin, *op cit, p.43*; W. Costa, *op cit*, p.158.

board of directors as `... their arrival in the Brazils would enable the contractor to carry on the work, and would cause the native to moderate their demands for wages, which were excessive.'[119] A great number of immigrant workers were employed on the construction of the BSFR. An *oficio* of the Minister of Public Works addressed to the Brazilian Minister in London discussed the possibility of retaining in Brazil the 3,000 English workers engaged in the construction of the BSFR when the works were finished. Initially, the government thought that they might be employed in agriculture but later decided to keep them on public works, building roads from sugarmills to railways stations.[120]

Yet, despite these groups contracted directly by the railways overseas, it seems that most unskilled immigrant labourers employed in railway building had entered the country by other means.[121] Cechin notes that the accounts of the SPR Company show an expenditure of 250 *contos* (about one-third of the total expenses) for the import of workers.[122] But Fox observed that in the construction of the SPR men ` ... all nationalities and shades of colour ...' were employed. The largest group were Portuguese. `The hardest working and most numerous, but at the same time most disorderly, class were Portuguese and natives of the western isles. Germans were the steadiest labourers ... Native artisans, such as carpenters, masons and smiths, are inferior workmen; in fact, the

[119] *RT* (1858) 1268.

[120] Aviso n.16 de 5 de abril de 1862 in W. Costa, *op cit*, p.158.

[121] Except in depopulated areas. In the Amazon, for instance, a great number of workers were imported to build the Madeira-Mamoré. The inhospitable conditions of the area made very acute the labour problem. At the beginning of the 1870s the engineers reported food deprivation, fevers and Indian attacks; the company in charge revoked the contract in 1873. That was just the beginning of other frustrated attempts to build the railway. In 1907 the American Company May, Jekill & Randolph started to build the road. The company had just finished a contract to build a railway in Cuba, in which they had employed circa 4,000 Galician workers accustomed to rough conditions. The company decided to bring them along to the Madeira region. From 1907 to 1912 were imported 21,783 workers, from all nationalities, the majority from the neighbouring Caribbean Islands. Workers were in good physical conditions for only the three first months; after that they had to be replaced. Rodrigues, *op cit*, pp. 97, 216-217, 219.

[122] Cechin, *op cit*, p.42.

only artisans worthy of the name in the country are foreigners principally Portuguese, Germans, or Italians. Englishman were indispensable as foremen for plate-laying, &c., also as engine-drivers and fitters.'[123]

In the coffee region, many who entered as agricultural workers with passages subsidised by the government ended up working for railway contractors during the off-season. Rural areas in a slave society could not offer many perspectives to unemployed free labourer. Railway construction provided one of the few job options available. As the CP built toward Rio Claro it encountered ` ... a large number of immigrants without destination, many of whom took work digging trenches': the Company referred to this task as one which was previously "little sought after", suggesting that it was one of the lowest to be had'.[124]

According to the British Consul, after they arrived immigrants served in accordance with their contracts. But in course of time ` ... they become dissatisfied and ambitious, and, gaining experience, assert their independence, eventually all concentrating in the populated centres seeking employment in commercial and industrial undertakings. Railways, tramways, road construction, building, and a variety of such works provide them with employment at a high rate of wages.'[125]

Instability of employment and geographical mobility were experiences that were hardly peculiar to the Brazilian population. By the end of the century, the large number of immigrants who had been directed to the coffee areas of São Paulo encountered similar conditions. It was reported that between 40 and 60 percent of the colonists left the plantations within a year of their arrival in Brazil. Pierre Denis found that it was no exaggeration to say that at least a third of the families employed on plantations leave their places from year to year. At the beginning of twentieth century, he observed that `Towards September one meets them

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[123] Fox, *op cit*, p.25.

[124] Mattoon (1977) *op cit*, p.199.

[125] *PP* (1876) LXXV, 45.

on the roads, most often travelling a foot; the man carrying a few household goods and the woman a newly-born child, like the city labourers at the end of the season.' Worker mobility and instability of labour caused a serious annoyance to the coffee-planter. Denis pointed out that the instability of agricultural labour was the most striking characteristic of rural life in São Paulo. It was a result of the unusual and artificial nature of the hasty development of coffee planting.[126] `Not all the labourers leaving the fazenda after the harvest re-engage themselves upon other fazendas; each year the season of harvest is followed by a fresh concentration of the rural population upon the urban centres. This movement is incessant, and explains why the need of labour is still felt in the country ...'.[127] In reality, the problem was not that of a scarcity of workers, but the lack of steady, regular, reliable employment.

(b) Building railways: the nature of the work

In *The Railway Navvies*, Coleman observes that a *navvy* was not a mere labourer; they created their own world, rules and manners. The nature of their work helped them to create a culture of their own. The existing sources do not give much information on the workers, and the relations that they might have established among themselves. Thus, it is not possible to ascertain if railway workers in Brazil developed some of the characteristics attributed to navvies elsewhere.[128]

However, it seems that the nature of construction work created a favourable atmosphere in which some of the features noted by Coleman could develop. Railway building implied mobility - the need to move with

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[126] P. Denis, *Brazil*, transl. by B. Mill, London, T.Fisher Unwin, 1911, pp.206-207.

[127] Denis, *op cit*, p.214.

[128] Coleman, *op.cit*, p.26; Ducker, *op.cit*. p.6. The word *navvy* came from *navigator*, the name given to canal builders of the eighteenth century. It was inherited by railway construction workers.

the work. It also meant isolation - living far from cities, apart from family and friends, often in distant, frontier regions. Working together, living together in encampments by the line, sharing anxieties, danger and sickness - all helped to create special ties. At the same time, working conditions were precarious. The nature and severity of the work (particularly excavating, tunnelling, blasting and bridge-building) as well as ethnic differences and poverty generated friction within groups of workers and between gangs. The repeated concern of contractors and engineers about security in the encampments, as well as the presence of the police there, testifies to the frequency of disturbances.

Building a railway involved a series of complex tasks. The complete absence of reliable and precise maps made it necessary to undertake a complete geographical and topographical survey of an area before rail routes could be planned. When a definitive survey was available, construction work could start. This included clearing the area, preparing the ground (draining swamps, making the earthworks and so forth), levelling the road bed (including cuttings, embankments and tunnels), masonry projects (strengthening embankments and facing tunnels and bridges, constructing stations and repair depots) and laying the road (ballasting and track-laying). All these undertakings required a very large number of technicians and unskilled workers.

Lines were usually divided in sections, each one under the supervision of an engineer (*chefe de seção*), who had under his control other engineers (*engenheiros residentes*) in charge of smaller sections, some six to nine kilometres in length, according to the complexities of the works. Gangs of workmen under the supervision of a foreman performed the work. Horses and bullocks were employed in preliminary preparation of the earthworks - often a temporary line would be laid. These works required several hundred men. Laying the rails, levelling and ballasting required a smaller number of workers, but it still took 200 men to lay one kilometre of track. Track-laying teams would handle 110 to 140 tonnes of track a day, depending on the weight of the rail. This figure included the

rails, plates, points and sleepers. The rails and accessories were carried from the sheds at the start of the line to the end of the rails by locomotive-hauled wagons running along the temporary line. The task of emptying the wagon and carrying the rails ahead of the line was manual and required workers with physical strength and good co-ordination to avoid accidents. Suppliers delivered sleepers along the line.[129]

Although a general description of work can give an idea of the series of tasks involved in building a railway, it does not tell the whole story. In Brazil, the topography made construction very difficult, especially considering the resources of the time. The lie of the land, the tropical vegetation to be cut away and the heavy downpours in the rainy season (provoking slips, bringing mosquitoes and deadly diseases) made construction and maintenance a dangerous, heavy and costly task. Engineers' reports include rich descriptions of the hardships involved. Fox gives many examples of the problems that appeared during the construction of the SPR, especially in the Serra. He observed that ` ... only those engineers who have made surveys through tropical forests can form a definite idea of the immense labour involved in the exploration and selection of a railway route in a country like Brazil, and especially on the precipitous and rugged sea face of the Serra do Mar.' To add to the difficulties, the Serra ` ... from the deepest gorge to the loftiest peak, is covered with almost impenetrable primeval forests, through which the explorer has to drive narrow paths resembling "headings". The exploring party usually remained in the jungle three weeks at a time living in huts covered with the leaves of the palmetto, exposed to tropical rains and hardships of which it is difficult to convey an adequate idea, and emerging from the woods blanched from want of sunlight, which rarely penetrates the thick gloom of a Brazilian forest.'[130] These circumstances made work in the Serra (particularly building the series of incline planes by which the

[129] Cechin, *op cit*, pp.43-44.

[130] Fox, *op cit*, p.5.

line ascended the escarpment) ` ... a task of no ordinary difficulty'.[131] The earthworks in the Serra were of extraordinary magnitude. `Earthworks of this nature were subject to extensive and sudden slips from the mountain side, and embankment after embankment was carried away during construction, often after completion to the formation level. The only effectual mode of stopping these slips, which threatened permanently to endanger the stability of the line, was by a thorough system of drainage, searching for, and gathering all the water on the upper side of the railway, and conducting it across the line as often as possible in pitched channels set in cement; by pitching the entire surface of the inferior slopes of all embankments, thus preventing wash; and by draining the upper slopes of the cuttings, and securing the same by massive retaining walls'.[132]

Much work was of an experimental nature, such was the lack of knowledge and the novelty of the task. For example, scarcity of suitable building stones in up-country districts led contractors to make bricks on the spot for lining tunnels.[133] In addition, Fox observed that among the factors that tended to increase the difficulties and cost of railway construction in a place like São Paulo, was the haulage of materials. Imported from England, the heavy plant and materials had to be transported to the work site. In May, 1861, Fox met ` ... floundering in the mud a bullock cart with eight oxen and three men, that were seven days transporting a smith's bellows and tools from the foot of the Serra to the railway crossing at Rio Grande, a distance of under 20 miles'.[134]

As already indicated, the construction of the EFDPII was one of the most difficult railway projects undertaken in Brazil. The first section was relatively easy, apart from the swamps and numerous rivers that flooded in the rainy season. Crossing large swamps demanded difficult

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[131] Fox, *op cit*, pp.10-11.

[132] Fox, *op cit*, p.11.

[133] Fox, *op cit*, p.20.

[134] Fox, *op cit*, p.21.

earthworks that cost many lives. Engineer Carlos Alberto Morsing, working on the construction of the railway, reported that: `I entered the swamp, in Belém, in the morning and left the other side on the way to Carapuça, at night, ... having been in water up to the neck all day.' Morsing ended up contracting malaria.[135] The construction of the second section was a much bigger undertaking. It was the first to climb the Serra do Mar: disease, slips and hunger were often reported[136]. The nature of the region required the construction of several bridges, viaducts and tunnels - work for which there was a general lack of skilled personnel and with which contractors were unfamiliar.[137] Thirteen tunnels were built, representing some five kilometres: the total length of the section was 28kms. According to Coleman, tunnelling was the hardest work and remained so throughout the century.[138] The longest tunnel on the EFDPII - 2,238m long, 4,2m wide and 5,8m high - was the most problematic. It took almost seven years to be built, ` ... with progress of about 1m per day'.[139] The scientist L. Agassiz and his wife, who visited the line in April 1865, observed that the difficulties of construction throughout the second section were immense. `It gives one an idea of the labour expended on this railroad, to learn that for the great tunnel alone, now almost completed ..., a corps of some three hundred men, relieving each other alternately, have been at work day and night, excepting Sundays, for seven years. The sound of hammer and pick during that time has hardly ever been still, and so hard is the rock through which the tunnel is driven, that often the heaviest blows of the sledgehammer yield only a little dust - no move in bulk than a pinch of snuff'.[140]

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[135] El-Kareh, *op cit*, p.87; Telles, *op cit*, pp.26-27.

[136] El-Kareh, *op cit*, p.107

[137] Telles, *op cit*, p.36; El-Kareh, *op cit*, p.77, 105-112.

[138] Coleman, *op cit*, p.48.

[139] Telles, *op cit*, p.36.

[140] L. Agassiz (and E. Agassiz), *A Journey in Brazil*, London, Frederick Praeger, 1969,

Tropical disease was another major problem. During the construction of the RSFR disease was a constant concern. In 1856, at the beginning of construction work, several deaths from yellow fever were reported among English and native workers, including the engineer-in-chief.[141] In April 1857, the Chairman told shareholders: `There has been a little sickness among his staff, as was to be expected; but I am happy to say we have lost only about seven men altogether of those sent out from this side'. This was another reason for employing native labourers, according to the Chairman: `If we had imported foreign labour for the whole or the greater part of the works, there would have been a great deal more sickness than we have experienced before the men became acclimatised, and the operations of the contractor would, consequently, have been retarded.' Skilled labourers who died had already been replaced.[142] In November 1859, out of 250 Belgian and German workmen employed on railway works, principally at Pave Tunnel, 115 were under medical treatment in one month'. [143]

At the beginning of the 1860s, the British Consul at Pernambuco pointed out that tropical disease was a major deterrent facing contractors seeking to attract European immigrants to Brazil. His remark was based on the returns of deaths from yellow fever among the Europeans employed in the construction of the railway: out of 175 young workers initially selected for their fitness, 26 died and ten were sent home disabled by the climate. `These man were principally artizans who worked under cover; the number of deaths among the European excavators, of which no exact return can now be obtained, is known to be very large.' It was estimated to be about 60 per cent.[144] At the half-yearly meeting on

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p.57; Appendix, p.528.

[141] *RT* (1856) 1208; and Meeting, year 1858, p.710; more sickness reported *RT* (1861) 532; *RT* (1862) 452, 1434, and others.

[142] *RT* (1857) 507.

[143] *PP* (1865) LIII, 349.

[144] *PP* (1865) LIII, 353.

October 1861, the RSFR Chairman reported that there had been 38 deaths on their staff, a further 15 people had been invalided and about 85 workers had left, having to be replaced.[145] Agent Bayliss observed that on the works upon which he was engaged ` ... 75 per cent of the Europeans sent out were lost by death, by invaliding home, and taking into account a small number whom absconded. He was himself present at the funerals of six of his best men in the short space of ten days...' [146]

As an inducement to endure the harsh conditions of railway construct work, companies offered higher wages to foreign and Brazilian workers, though Portuguese and Brazilians workers were paid the lowest wages. The RSFR paid Portuguese or native carpenters between 4s6d and 5s6d per diem, while the wage paid to an English carpenter varied from 12 to 14 pounds monthly. English workers received higher payments and better conditions. Similar patterns can be observed for the SPR. Both railways offered English workmen better contracts. They were ` ... usually engaged for three years at a salary rising each year, their passage being paid out and home on the expiration of their engagements, or if invalided before that period'.[147] Higher wages also tended to be offered to construction workers. According to Fox, the wages of SPR construction workers varied from 4s6d. to 6s per day: `Labourers engaged on maintenance are now paid from 2s6d. to 3s.'[148] These wage differentials were probably due to the nature of the work. In contrast to construction work, maintenance was generally less dangerous and, in many cases, undertaken by regular employees of the company - this implied greater job security.

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[145] *RT* (1861) 1291.

[146] Fox, *op cit*, pp.46-47.

[147] *PP* (1865) LIII, 366; Fox, *op cit*, p.27. At the EFDPII, skilled Brazilian workers, performing the same tasks and occupying same positions as foreigners received lower wages, El-Kareh, *op cit*, p.76.

[148] Fox, *op cit*, p.22.

Worker behaviour further points to difficulties of recruitment and retention: labourers attempted to escape or refused to work. Lack of food, precarious accommodation, delays on payments or inadequacy of wages and non-fulfilment of contracts were reported. Rebellions and violence often occurred.[149] Conflicts with foreign workers were more visible. These workers benefited from consular protection and had a history of organisation. Besides, they had a formal agreement. Written contracts, freely entered into by workers, were a novelty in the slave order and implied new attitudes towards labour. Not untypical was the contract signed between an English smith and the CP in 1880. It specified that the worker was to remain in the services of the company for three years and was to conduct himself soberly and steadily. For its part, the company was to pay a monthly wage in the currency of Brazil and advanced him a sum of £25 to cover the cost of the passage (this amount would be deducted from first year's salary). On the completion of the contract, the company would pay the cost of the return passage to England.[150] Contracts, however, were no guarantee of compliance by either party.[151]

Engineer Vignoles of the BSFR observed in 1859 how difficult it was to get the `native labour' to work `steadily'. But immigrants could be equally troublesome, as was revealed by the Sardinians contracted by the company. They have given ` ... great trouble, and only have been brought to order by firm and vigorous proceedings ...', following appeals to the government.[152] Contractors and companies alike demanded effective

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[149] Various conflicts mentioned in Lewis (1991) *op cit*, p.39; C.M. Lewis, *Regulating the Private Sector: Government and Railways in Brazil, c.1900*, mimeo, paper presented at the II Anglo-Brazilian Business Conference, 15th.-17th. Sep, 1997, Belo Horizonte, Brazil, pp.6-12; J.C.de Melo, *Railways and the Organisation of the Labour Market*, chapter mimeo, 1994/95; disorders in Alagoas railway, 1880.*PP* (1880) Pt VI, 1489.

[150] Agreement between Messrs. Fry Miers &Co. as agents for the Paulista Railway Company and George Smallbone. Rep. in Mattoon (1977) *op cit*, p.295 (Appendix)

[151] In 1858 there were reports of a strike on the construction of the RSFR; Belgian workers complained that they received lower wages than it was agreed. Melo, *op cit*, pp.221-224.

[152] *RT* (1859) 445,482.

policing.[153] For the engineers, contractors, government officers and police, railway construction workers were a rough breed, difficult to keep under control. As Lewis observes, railway navvies were notoriously given to `...combine in an attempt to raise their daily wages...'.[154] During the construction of the CP, small militia detachments policed all construction operations. In cases of disturbances, interior police chiefs often dispatched urgent telegrams to the capital requesting additional support and ` ... revealing thereby the more turbulent side of railroad construction'.[155] For the authorities, as for planters, the `transition to free labour' was an novel experience, particularly when involving immigrant workers. Even when subject to discretionary application, labour contracts could be a doubled-edged device, granting rights and imposing obligations on both parties.

Conclusion

In focusing on railway building in nineteenth-century Brazil, this essay has attempted to examine the `labour question' posed by the expansion export agriculture. It is important to repeat that the approach differs from that of the existing literature in two respects: first, it addresses only the early period of railway history; second, it considers railway construction rather than railway operations. This framework has yielded a number of challenges to the conventional historiography on the labour question.

In contrast to views expressed elsewhere, this paper has demonstrated that there was no general shortage of labour for the construction of railways in Brazil. Workers were locally available and could be rapidly trained to undertake semi-skilled tasks. There were,

[153] *RT* (1861) 1342.

[154] Lewis (1997) *op cit*, p.10.

however, some exceptions. At the time, it was difficult to find skilled labour and native workers were reluctant to perform tasks considered dangerous.

The seasonal cycle of agriculture conditioned labour supply - for railway building as for other non-rural activities. In spite of the higher wages paid by railway contractors, it was difficult to retain labour during the planting and harvesting seasons. This resistance to abandoning links with subsistence (either by independent cultivators or by those dependent on the plantations for access to small plots) at a time of rapid change in Brazilian society was a notable feature. Echoing views prevalent amongst planters and officials, railway entrepreneurs interpreted this reluctance as an indication of worker indolence or cultural bias against regular employment. In fact, it was the failure of agriculture to generate year-round employment that produced a pattern of instability and geographical mobility. Indeed, railway construction work came to represent an important source of employment for hundreds of poor Brazilians who were driven off the plantations or who could not find work during the back half of the season. By its nature, construction work offered transient employment and also compelled workers to move. Workers `travelled' with the line as construction progressed and, if fortunate, were offered a succession of temporary contracts. In this respect, work on the railways matched the precariousness and impermanence of employment already present in a slave-based, rural society.

Railway building was carried out within a context of acute change in Brazilian society. The market economy, following the expansion of coffee cultivation, introduced new needs and habits. Changing labour patterns were reflected in the increasing participation of native Brazilians in the labour market, the introduction of immigrants, while the gradual emancipation of slaves required new attitudes towards labour, discipline and wages. Continuities remained, however, for those working on the construction of railways. Working conditions, contract terms (often

[155] Mattoon (1971) op cit, p.199.

ignored) and the use of force to keep discipline mirrored attitudes associated with the plantation sector. Thus, despite being presented as a powerful agent for change in the literature, during the period examined in this paper, railways did not fulfil all expectations associated with `labour modernisation'.