TRANSNATIONAL CORPORATIONS AND MINING RENT IN THE AMAZON: CURRENT CONDITIONS AND CONTRADICTIONS

ABSTRACT

This article employs the Marxist theoretical analysis of ground rent, focusing upon the case of mining and, in particular, the role of transnational capital operating in the Eastern section of the Brazilian Amazon. In addition to carrying out a critical analysis of such operations, the role of the State and identifying the main aspects and contradictions of these TNCs, it is argued that the two forms of rent, both differential and absolute, constitute the basis of surplus profits for such firms. This paper is centered on an historical analysis of three major mining companies operating in this sector in the Amazon, and thus constitutes the benchmark for our analysis: Vale, ICOMI and Rio do Norte Mining.[1]

Key words: Mining; Ground rent; Amazon; transnational capital; Marxist theory.

RESUMO

Este artigo revisita o aporte teórico marxista sobre a renda fundiária, tendo como enfoque de caso a indústria mineral e, mais especificamente, o capital transnacional estabelecido na região amazônica brasileira na sua porção oriental. Adicionalmente realiza-se a análise critica da grande exploração mineral e o papel do Estado, estabelecendo os principais elementos e contradições das empresas transnacionais. Argumenta-se que as duas formas de renda, diferencial e absoluta, constituem a base para o superlucro dessas firmas. A exposição se centra na análise histórica de três empresas do setor, que serão tratadas enquanto *benchmark* de análise: a Indústria Comércio e Mineração (ICOMI), a Mineração Rio do Norte (MRN) e a Companhia Vale.

Palavras chaves: Indústria Mineral; Renda da terra; Amazônia; Capital Transnacional; Marxismo.

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ÁREA 6: CAPITALISMO E ESPAÇO

[1] The original names are presented in Portuguese with the English translation in parentheses: (1) *Indústria e Comércio de Minérios* (Industry and Trade of Minerals, Inc.), or ICOMI; (2) Mineração Rio do Norte [Rio do Norte Mining Company], or MRN; and (3) *Companhia Vale do Rio Doce, CVRD,(*Sweet River Valley Company*)* though usually just referred to as Vale.

1. INTRODUCTION

One of the main characteristics of the current insertion of the Brazilian Amazon in the global economy is the significant presence of transnational mining corporations in its eastern region. These transnational corporations (TNCs) are key global actors, and are particularly prominent in the extraction, production and export of major strategic minerals. An analysis focused on the Brazilian Amazon's mining sector is justified given that sector's importance for both the region and Brazil as well as its strategic importance for transnational accumulation in the mining sector. Mining constitutes almost 75% of the State of Pará's export portfolio. Moreover, it is not only Pará's largest economic sector in terms of GDP, but also one of the most significant economic sectors in the region.[2]

The mining companies in the region include foreign and Brazilian transnational corporations, most notably Vale or CVRD (see footnote 1 above). In addition, the State and the large Brazilian banks have played crucial roles in the development and control of the mining sector over a number of decades. The structure of the mining industry was established in the late 1960s, but it has undergone several specific changes over the last three decades. These changes constitute the background of this article, which concentrates on analyzing how the main actors involved (the State, the TNCs and the banks) operate in this sector, yielding amazing profits from the exploitation of the natural resources of the region.

The process of centralization played a very strategic role in setting up the mining operations in the eastern region of the Brazilian Amazon. In the subsequent sections, the factors which characterize the mining TNCs which operate in the region are discussed, and the hypothesis is presented that ground rent, in its two main forms of differential and absolute rent, constitutes the basis for the extraordinary profits which these companies reap. The discussion presents an historical analysis and carries out an analysis of three case studies using the data from annual reports and balance sheets published by the three companies mentioned above.

In addition to this introduction, this work is divided into five sections. In the second section, we present several theoretical considerations including the concepts of concentration and centralization, and Marx`s theory of ground rent. This section also discusses the general theoretical characterization of transnational capital and then the specific case of mining. The third section, employing the Marxist concepts of ground rent (both absolute and differential), in the context of mining, seeks to demonstrate its importance for the configuration of this particular sector. In the fourth section, we carry out an analysis of the three main mining TNCs operating in the Amazon,

[2] Pará is the second largest state of Brazil in terms of area.

highlighting the nature of their insertion as well as the role of the State. In the fifth section, we present our final considerations.

2. Theoretical Considerations

2.1 Concentration, Centralization and Transnational Corporations

In this section several key concepts developed by Marx which we deem particularly relevant for understanding the developments in the mining sector in the Amazon in recent decades are presented. The mining sector has always been associated with the need for economies of scale, especially given the high levels of fixed capital, or in Marxist terms, a much higher than average organic composition of capital. Marx first presents this category in his elaboration of the general law of capitalist accumulation in Chapter 25 of Volume 1 of *Capital* (Marx, 1977). It is in this context where he also presents the fundamental processes of concentration and centralization. He argues that the former is really none other than accumulation itself by an individual capital, however, the latter process of centralization, namely, the bringing together of multiple individual capitals achieves a much greater level of concentrated social wealth, and at a speed much beyond that of concentration alone. Marx then argues that in spite of such a greater level, it is the development of the credit system which allows the process of centralization to be much more accelerated.

Much of the history of corporate expansion which took place at the end of the 19th century and early 20th century came to be associated with the terms 'monopoly capital' or 'finance capital'. The latter term had been coined by Hilferding (1981), in his book by the same name, *Finance Capital*, referring to the intertwining of financial and industrial capital, and therefore having a clearly distinct meaning from that which is employed today and associated with the current financialization of the economy. The growth in subsequent decades of large corporations from joint stock companies into multinationals and then in recent decades into transnational corporations and the role they play in the global economy has been unprecedented, especially considering their impact on technological change and scale of production.

In Volume 3 of *Capital,* Marx begins with a clarification of the nature of the third volume in relation to the first two. In describing Volume 1 as the "process of capitalist production" and Volume 2 as "the process of circulation", he goes on to argue that:

> "It cannot be the purpose of the present, third volume simply to make general reflections on this unity. Our concern is rather to discover and present the concrete forms which grow out of the *process of capital's movement as a whole*. ...The configurations of capital, as developed in this volume, thus approach step by step the form in which they appear on the surface of society, in the action of different capitals

on one another, i.e. in competition, and in the everyday consciousness of the agents of production themselves."

Marx thus presents an analysis of competition and develops the general laws of motion associated with the formation of prices of production and the average or general rate of profit. The second section of Volume 3 then presents the tendencies in the rate of profit and competition both between and within industries. However, he does not present the specific analysis of competition in the context of agriculture and mining until other sections on the falling rate of profit, commercial and money-dealing capital have been presented. Thus, it is only in the penultimate section of Volume 3 where Marx develops his analysis of the transformation of surplus profit into ground rent. He has clearly thought through the placement of this last section, and only presents it after having developed the different forms which surplus value takes before considering the concrete form of ground rent in the context of capitalist agriculture. This section on capitalist ground rent is clearly not an afterthought, nor is it to be confused with pre-capitalist forms of rent. Marx has clearly chosen to present it only after all the other categories of developed capitalism have been developed and presented.

2.1 Marx's Theory of Ground Rent[3]

Marx begins his analysis of ground rent with the example of the mill owner, whose property has a waterfall. The key issue is that such a producer will have much lower production costs, as they do not have to pay for energy to run the mill, but are able to take advantage of a natural force in their production process. Thus, the owner of a particular piece of land is thus able to produce with very competitive conditions, namely at lower costs compared to other producers. Marx starts with the case of a waterfall as this constitutes a non-reproducible condition, one which is not generally available. The dominant case which Marx elaborates upon is that of agricultural land with higher fertility than land generally available (often referred to as the worst or marginal land). The result of these lower production costs is surplus profits, or if leased to a capitalist producer, ground rent.

This also clearly applies to pieces of land that have a mine or an oil well, and those with the higher productivity are able to obtain surplus profits, or potentially extract ground rent because they are the owners of this particularly advantageous piece of property which is not reproducible. Let us now consider the specific theoretical categories Marx developed in his analysis of ground rent.

[3] This section is primarily based on Marx's analysis of Ground Rent in Vol. 3 of *Capital*, but also upon lectures and mimeographs given by Anwar Shaikh at the New School during the 1980s (Shaikh, 1982).

2.2 Differential Rent I and II

Marx first considers differential rent to arise from two conditions: (1) differences in fertility and (2) location, i.e. (distance between where the product is produced and the market). The first case dominates especially after the development of transportation and communication. This first category is referred to as **differential rent I** and it is described as the surplus profit which accrues to better lands because of their higher fertility relative to the worst land.

Shaikh has argued that the dominant (or regulating) conditions[4] in industry correspond to the best generally available methods of production (best practiced technique); however, in the case of agriculture it is not simply the method of production, but also the conditions of production. Therefore the regulating or dominant conditions in agriculture correspond to the best available method of production on the best generally available land. However, the best **generally** available land corresponds to the land with the worst or lowest fertility. Since the market price fluctuates around the price of production (POP) of these conditions, the selling price is determined by the price of production on the worst land.

Within an industry, competition enforces the tendency of an equalization of the selling price, therefore, producers on better lands are able to produce more output for a given amount of capital advanced and will have lower unit prices of production. The resulting difference between the worst land's unit POP and the better land's unit POP constitutes surplus profit. This is based on the assumption Marx makes that as a result of competition between industries all producers obtain the general rate of profit as a result of the tendential equalization of the sectoral rates of profit and which he confirms in the section on ground rent (Marx, 1981:779). This surplus profit does not necessarily accrue to the capitalist. Assuming the existence of landed property within the developed capitalist mode of production, this surplus profit will be transformed into ground rent depending on the struggle between capitalists and landlords. However, the **cause** and **determination** of differential rent is not due to landed property, but is based upon **differential productivities** and the influence of the law of value.

The **second form of differential rent** or D.R. II elaborated by Marx is where different productivities result from successive applications of capital applied to the same land, including the worst land. For example, if $100 of capital advanced yields 100 quarters of wheat on the worst land, and the second application of capital of $100 produces 50 quarters of wheat, then the regulating or

[4] In discussions on rent, Shaikh (1982) referred to regulating conditions as those which prevail or which are dominant, and which correspond to the best available technique in industry. However, in the case of agriculture and mining, this must be adapted to correspond to the best available technique on the best generally available land. The latter corresponds to what was referred to as the marginal land by Ricardo and then Marx, also sometimes referred to as the worst land. Thus in the subsequent discussion referring to Shaikh, the terms regulating, dominant or market conditions are used interchangeably, unless specified otherwise.

dominant conditions correspond to the second application, as this now constitutes the worst land or worst investment (application of capital), provided other lands do not produce less than 50 quarters with a subsequent application of $100 of capital. There is then a surplus profit for the first application of capital advanced even for the worst land, as well as for more fertile lands, and this corresponds to D.R. II. Once again, whether or not this surplus profit is transformed into rent for a landlord depends on the capitalist farmer-landlord relation.

2.3 Absolute Rent[5]

Although the worst land can receive D.R. II from the 2nd investment, it implies that investment occurred initially without paying rent. This is in contradiction with the existence of landed property, since a landlord will not lease land for free, even on the worst land. Therefore the formula for the selling price must be modified from the POP on the worst land (POP_w) and becomes $P^* = (POP_w) + AR$, where AR is the absolute rent.

All the laws for differential rent are not altered by absolute rent. The minimum limit is something greater than 0, but if the land is not leased, there is no rent. There is the possibility of not having absolute rent (AR) for certain cases but this is not general and tends to involve cases where capitalist production is not fully established, or where landowners, distinct from capitalist firms have disappeared as a class. The upper limit to absolute rent can be set by the price of the next investment on existing land. The limit will be the next marginal investment whichever has a lower individual price. The limit comes about essentially from the intra-marginal conditions of production and is established in practice, not *a priori*. As argued by Shaikh,

> "It is the same mechanism as differential rent; only it's the next available DR. It's the same laws, the same degree of determinacy but it won`t be observed in advance since the **limits are only tested in practice** in the struggle between landlords and capitalists. However, the determinants are different than the cause. Competition makes a precise determination of the cost of the barrier while **the existence of landed property is the cause**. This is not the case for differential rent, where the **cause is the difference in fertility**. For differential rent, the existence of landed property allows the possible transformation of surplus profit into ground rent. These are not natural laws but result from specific social conditions under capitalism." (Shaikh, 1982)

[5] Absolute rent is based on the supposition of the separation of landowners and capitalist farmers or enterprises. However, over recent decades, the capitalist firm is increasingly both the owner and producer and thus eliminating the case of absolute rent, especially in the case of mining dominated by TNCs. Nevertheless, there are many agricultural producers that are still paying rent to landowners, as well as small scale mining, such as *garimpeiros* in Brazil. Though AR may be declining historically, it is still a relevant category for analysis, and actually deserves more research.

2.4 Rent in Mining

Marx (1981: 910) clarifies that, "Rent of mines is determined just as is agricultural rent." Due to the presence of better mineral substrate (e.g. in the case of iron, the presence of higher levels of hematite) or emergence closer to the topsoil, reducing the cost of transferring the laterite, superior-quality mines allow for the possibility of ground rent, or allow for the possibility of surplus profits. Considering the similarity between agricultural rent and mineral rent, there is the same base for the establishment of prices of production in the mining industry as for that of agriculture. In this sense, the ruling price of production corresponds to the worst or marginal mine (or investment for D.R. II) of the lowest quality. This can be due to the low quality ore or the difficulty of extracting it.

The mining sector was not a specific focus of Marx's analysis as it is minimally mentioned in Chapter 46 of Volume 3. In contrast to agriculture, it is worth noting three specific and interrelated aspects in the mining sector: i) mineral veins are limited and not renewable, as in agriculture, and this impacts the potential for rent, as well as for price trajectories; ii) the difference in quality among ores from different mineral veins can be huge, and iii) the timeframe for the depletion of mines, or the loss of mineral content, defines extraordinary profits only for a rather limited time. The latter leads to an acceleration of the economic use of better quality mines, which paradoxically accelerates their depletion time.

A key issue in the discussion of rent is the side of demand, since increasing demand will tend to push the price up, *ceteris paribus* and therefore allow less productive mines or lands to come into use. In a similar fashion, if there is a decline in demand relative to supply, the worst or least productive mines will have difficulties in earning rent if not the average rate of profit, or will have to seek other means to lower their costs and expenditures, such as through reductions of wages or through the employment of more dubious techniques, which may violate environmental laws or regulations.

Therefore, it is the object of different capitals, each seeking to maximize profitability and gain control of these non-reproducible mining resources. As in all cases of capitalist competition there is the interest in achieving advantages which can result in extraordinary profits above the average rate of profit. The latter being defined as the result of the equalization of sectoral profit rates ($r_{avg}= \Sigma_i S_i / (C + V)_i$).[6] Marx described this tendency to achieve the average profit as taking place over a "period of fat and lean years" (Marx, 1981, Ch. 9), which would probably average out to be around 10-20 years depending on economic cycles.

[6] The notation **avg** refers to average and in this instance the average rate of profit, while S is surplus value, V is variable capital and C is constant capital.

This extraordinary profit derives from the application of labor combined with a specific "natural force or advantage" which makes it more productive. However, labor is not applied to a natural force that is available to all capital in the same branch of production, but instead to a parcel that is non-reproducible and thus subject to control and private appropriation by a particular fraction of capital or by the capitalist State (see Section 3 below). Capitalists can achieve extraordinary profits as a result of owning a particularly productive mine, though the extent of these extraordinary profits will depend upon the balance of power between TNCs, landowners, and the State.

3. The State and Mining TNCs

There is an intrinsic relationship between the State and big capital; however, this observation does not mean that the action of the latter over the former should be understood in a mechanistic way. On the contrary, the State is not external to the economy and its relationships of production, and thus cannot be reduced to simple political domination. In this regard, neither the view that the State is merely the superstructure in relation to the economic base, nor the argument that the State is fully autonomous in relation to the economic base can be considered as acceptable.

State involvement with respect to development projects was historically carried out favoring and oriented toward the accumulation of capital (Mathias and Salama, 1983; Harvey, 2006, 2010; Trindade, 2008). In this sense, state intervention established the most important links facilitating the dynamic process of capitalist accumulation. This proceeded through a range of management mechanisms, and through public policies, establishing the key components necessary for accumulation: the labor force, land and infrastructure.

Centralized power implies a regulation of the market structures by the State and large corporations and especially control over financial resources and investments oriented toward the collective development of the economy, though with certain particular subgroups dominating, depending on the moment. For example, in Brazil today the major interests of finance, agribusiness and transnational mining have a disproportionate role compared to other major actors.

Just as the accumulation of wealth in the form of capital requires the continuous mobilizing of a portion of the labor force necessary for capitalist expansion and the use of means of production, capitalism requires a State in order to regulate and enforce certain social relationships. This is necessary for the proper management for the contractual and spatial organization of capital, such as roads, airports, cities, ports, etc., in addition to the legal apparatus necessary to secure access to specific goods, especially land and labor.[7]

[7] Harvey (1989, 2006) carefully develops the Marxist analysis regarding space management by the State in accordance with the "chaotic" dynamics of capital accumulation. According to that author, "the State assumes the role of general

The interaction of the State with the mining TNCs is established through one of two mechanisms. The first is the legal apparatus of the economic regulation of mining, including not only mining codes and sub-soil property rights but also systems of business and tax regulations. The second is the State's central role in the provision and partial maintenance of the infrastructure necessary to insure smooth operations for the mining companies and transport of the products to be transported within the country or exported out of the country. We shall briefly examine these two aspects in more detail.

Mining codes establish the basis for economic exploitation of the subsoil,[8] and they are crucial in defining the conditions of land access and exploitation, which then determine the possibilities for potential ground rent. The State can either hold the monopoly of the land or transfer it to private capital, which enables a greater or smaller appropriation of ground rent by capital, depending on the type of concession granted by the State, as will be analyzed below. Additionally, the degree of business regulation can be effective with more or less strict antitrust laws, as well as with more effective tax laws regarding corporate assets and profits.

The Brazilian mining code (MC) dates from 1967 and is currently being rewritten.[9] This mining code has expressly neoliberal characteristics or, as Leal (1988: 185) states in his excellent study on the "political aspect of the mineral issue" in the Amazon, the code constitutes the "hand of the State in aid of private development". It is worth noting that in two aspects, the Code's liberalism is based on interaction with transnational capital. First, the mere discovery of deposits allows "precedence in the access of requisition rights over the mining of minerals existing in the area researched". Considering that only transnational conglomerates have the technological capacity for mineral prospecting and searches, this concession is intended to benefit TNCs. Second, though central to the Brazilian case, the MC and the FC (Federal Constitution) do not consider mining assets to be State property.[10] This implies that complete control over mineral rents is granted to the capital exploring those mineral resources, giving TNCs not only the conditions of a normal return but the rights to extraordinary profits derived from the increased productivity of Brazilian mines, as will be demonstrated in the following section.

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manager of production and reproduction of social infrastructures", and that management is the central point for discriminating among the "local, regional, national and supra-national spaces of value flows" (Harvey, 2006: 513-515).

[8] The "governance" of natural resources is an important concern of government policies, especially in the case of conditions involving the "distribution of productivity gains derived from its exploitation"; cf. (in relation to Latin America) the excellent study by ECLAC (2013) for the Union of South American Nations (UNASUR).

[9] Since October 2011, there is a proposal pending by the President's Cabinet (Casa Civil) to rewrite the Mineral regulations (*Código Mineral*). The proposal contains three major elements: i) regarding tax rates and incidence for mineral royalties (CFEM); ii) to limit mines' period of exploitation to 20 years; and iii) to rename the National Department of Mineral Research (*Agência Nacional de Regulação Mineral*—ANP) to the National Agency for Mineral Regulation (*Agência Nacional de Regulação Mineral*—ANRM), cf. Pinheiro (2012); Rittner (2011); Santos (2011).

Before moving to the next section, it is worth taking a closer look at the second aspect, namely the State's role in managing the social infrastructure necessary for capital accumulation in the mining sector. The characteristic feature of large-scale mining (*Megaminería*) is the need for a significant fixed capital investment for the infrastructure necessary. In general, exploration encompasses the step of ore prospecting and processing through the steps of storing and transportation, along with the physical conditions of reproducing the labor force involved directly and indirectly in the production circuit. In the case of mines in the Amazon, almost the entire productive infrastructure necessary for mineral exploration was achieved through State action. This infrastructure included waterways and in the case of iron extraction in Carajás, it also involved access to railways and ports.

4. TNCs and Mining in the Brazilian Amazon

This section of this article focuses on three paradigmatic cases of the intervention of transnational mining capital in the Amazon: (1) the exploitation and depletion of manganese from Serra do Navio in Amapá by the consortium ICOMI/Bethlehem Steel (1957); (2) the exploitation and near depletion of bauxite from Trombetas in Pará by the joint venture *Mineração Rio do Norte* [Rio do Norte Mining]—MRN (1979); and (3) the large-scale exploitation of iron in the largest open-pit mine in the world, in Carajás (also located in Pará), by Vale (1985). This analysis will attempt to examine and apply the general concepts laid out above for the case of mining in the Brazilian Amazon. Of major importance is the specific relationship between the Brazilian State and mining transnationals, whether foreign or Brazilian. In addition to an analysis of the financial aspects, this section will aim to analyze the dynamics of the accumulation of mining companies established in the Amazon.

Transnational mining capital is predominant in the Brazilian Amazon region and large-scale industrial mining has been ongoing for approximately six decades. The industry was launched by the exploitation of manganese in Amapá, which was discovered shortly after World War II and exploited by an association between a Brazilian enterprise (ICOMI) and the US transnational Bethlehem Steel. The first ore was exported in 1957 and just two decades later, the high-grade ore was already depleted. The combined action of the Brazilian State and international capital was central for creating the conditions for mineral exploration. This case may be regarded as the first major case of joint intervention by the Brazilian national State and transnational capital in the Amazon.[11]

[11] For a detailed analysis of the case of the exploitation and depletion of the manganese mines of Amapá, see Leal (1988, 2010); Bunker (2000); Drummond and Pereira (2007); and Coelho (2008).

In the late 1960s, new mineral discoveries were made—particularly in Pará—which were driven by global mining giants (for example, US Steel and Alcan). Parallel to this development, the military government changed Brazilian law to accommodate TNCs operating in Brazil. In the field of mineral exploration, the government`s involvement varied. At times it operated in partnership with transnational corporations and at other times with private national firms, and lastly mining was sometimes carried out by just state enterprises.

Large-scale industrial mineral exploration in the Amazon responded to the interests of both the military government and the large transnationals that were seeking profitable ventures and low-cost sources, being both ore producers and consumers. However, the downside was increases in public debt and socio-environmental problems. The justification for the entry of mining companies into the region was supported through the propaganda of regional development. The State supported and often subsidized mineral exploitation because of the activity's forward and backward linkages within the sector. Mineral exploitation was a driving force, resulting in the promotion of other industries to settle in the region. The idea was to establish a vertical regional concentration in which mining companies would attract companies complementary to the mining sector. If achieved, the anticipated result was a notable advance of regional development as well as transnational accumulation, and the subsequent tendency for companies to expand further and increase vertical integration. The actual development was far from most of the government´s propaganda on the advances to be experienced by the region´s population.

In 1997, after major legal battles, Vale was privatized for R$ 3.3 billion Brazilian *Reales* (BRL) but continued to rely on the presence of the State, directly and indirectly, to increase its production and to expand overseas. Thus, the company consolidated its position as the second-largest mining transnational on the planet, with the assistance of the BNDES (National Bank for Economic and Social Development)[12] playing a fundamental role in the process.

4.1 Financialization the State and Control of Mining in the Brazilian Amazon

Since the 1950s, the solid cooperation between international finance and other industrial groups, in addition to the Brazilian government, has allowed for a strong expansion and tight control of mineral production in the Brazilian Amazon. As mentioned above, Brazil had a military dictatorship from 1964 through 1985, with particularly strong ties to US and international transnational capital, and as a result, the TNCs often had their way, especially in areas such as the Brazilian Amazon, and not just in mining. This allowed for the maintenance of complex conditions which brought about a

[12] BNDES in Portuguese is *Banco Nacional de Desenvolvimento Econômico e Social*.

clear economic dynamism, though exclusively focused on extraction, and with a limited capacity to promote the development of other sectors of the local economy. Therefore this arrangement primarily served the function of expropriating large masses of mineral wealth by foreign TNCs, and transferring them into the circuit of foreign capital. This was possible given the high profitability of the iron, manganese and bauxite (aluminum) mines in this area, and which was due to the particularly high productivity of these mines, as will be seen below.

In order to further evaluate the impact of finance capital as employed by these TNCs, we studied the historic cases of ICOMI, Rio do Norte Mining, and Vale. Financialization, as an expression of international capital, is a key element in mineral exploration and reflects the interests of the transnational mining companies. Capitals established and developed important ties among themselves, the financial sector and the State. Nevertheless, it is the potential surplus profits derived from ground rent, which is the predominant factor in attracting transnational capital. In this sense, it is the accumulation in the mining sector which became established due to the propitious conditions for appropriating ground rent, achieved through productivity gains and major cost reduction for mining enterprises in this region.

4.1.1 The Rapid Exhaustion of the Serra do Navio manganese mine

The exploitation of manganese at the Serra do Navio mine in Amapá state[13] can be considered a paradigmatic case, be it due to its uniqueness regarding its financial engineering or because of the structural characteristics established through its operations, which became the basis for the particular economic intervention in the Amazon. Leal (1988:178) emphasizes the ***particularity*** of the action by the State for this and similar projects, namely where it assumes the responsibility for various costs of installing the enterprise, whereas the national and international private capitals provide expertise in mineral exploration. In the specific case of the consortium of ICOMI with Bethlehem Steel, the secured loans guaranteed by the Brazilian government from the Export-Import Bank of the United States (Ex-Im Bank) in order to establish ICOMI. (See Leal, 1988: 133-134; Bunker, 2004: 93; and Monteiro, 2005:120).

The project was divided into three integrated components: the mine itself; the waterway for transporting ore or mineral; and the port for loading. In the case of the waterway, referred to as the North Canal, was built with State resources and managed by the Brazilian Navy. The North Canal was constructed at zero cost to the mining company, which was extracting the manganese, and the waterway had been designed primarily for exporting the manganese from Amapá (Leal, 1988: 179).

[13] The state of Amapá is one of 27 federal units in which Brazil was divided. The additional ones which constitute the Brazilian Amazon are: Pará, Amazonas, Acre, Roraima, Rondônia and Tocantins.

Based on data from ICOMI and the Amapá government (fn maybe), Leal (1988: 180) observed that "the World Bank was paid over a period of 20 years 350% more than what was paid to the "State" and Federal governments combined with royalties and taxes." A couple of points should be considered. First, the infrastructure for both ore exploitation and transportation were paid and carried out by the government. Second, the mine was close to being depleted in a period of just 30 years (check on numbers and facts). Thirdly, consider the amazing amount of wealth that was transferred to transnational capital for the purposes of accumulation outside of Brazil. In Table 1 below we can observe the royalty payment policy (currently known as Financial Compensation for Exploiting Mineral Resources)[14] which varied substantially. It is also worth noting that the mining rents were almost entirely captured by the foreign transnational and by the international financial sector according to the World Bank and the Export-Import Bank.[15]

Table 1—Manganese (Production, Value and Royalties Paid)—1957/1973

Year	Price (U$) (1)	Exports (Tons) (2)	Value of Production (U$) (3)	Royalties Paid (U$) (4)	% Royalties (5)
1957	77,26	668.276	51.632.282	2.091.656	4,0
1960	80,15	760.398	60.946.322	1.746.015	3,0
1965	78,35	796.053	62.373.063	1.261.057	2,0
1966	79,78	760.986	60.710.419	1.186.543	2,0
1969	52,63	1.046.709	55.086.054	842.627	2,0
1970	52,63	1.284.306	67.590.275	958.908	1,0
1971	63,99	1.631.981	104.425.846	1.378.928	1,0
1972	61,55	1.107.145	68.149.357	1.015.575	1,0
1973	76,40	1.226.757	93.724.576	1.227.653	1,0

Source:

Sources: (1) e (2) UNCTAD STAT (2014), available at: http://goo.gl/Fx6D7W; (3) e (5): ICOMI, extracted by Leal (1988, p. 180).

The depletion of the ore in record time is related to two principal aspects. The State providing social infrastructure for capital established a pattern, which as a rule, will be repeated in mining operations in the Amazon. There is the double advantage for capital of appropriating mineral rents and reducing the amount of money which must be invested in fixed capital, which reduces liquidity. This enables a higher rate of rotation of their capital in mining, resulting in the acceleration of mine exploitation and their depletion in record time. Secondly, from the demand side, US iron and steel producers were under pressure. This was particularly notable during the Cold War and the intense period of geopolitical competition with the former Soviet Union. There

[14] The name in Portuguese is *Compensação Financeira pela Exploração de Recursos Minerais* or CFEM.

[15] The exploitation of manganese ore in Amapá lasted approximately 40 years, ending in 1997. According to Drummond and Pereira (2007), the gross revenue of ICOMI throughout the extraction period was $3.37 billion (1994 dollars). Under the firm's contract, it reinvested approximately $120 million and paid, by way of royalties, approximately $131 million.

were also the demands by European post-war reconstruction, spurring the exploitation of high-grade manganese sources for steel making. For over a decade, this increased need led to a rise in international iron ore prices, stimulating more intense exploration of iron ore from Amapá, due to its high quality. Thus, the capital of ICOMI/Bethlehem Steel appropriated extraordinarily high rents, with intensive exploitation of the mines involved, and had no concern about the depreciation of fixed capital assets after the mines depletion, a point which is in common with the other two cases considered below.

4.1.2 Rio do Norte Mining and the contradiction between local development conditions and the financial interests of transnational capital

Historically, global aluminum production has been controlled by just a few TNCs. Until the 1970s, the so-called "Six Sisters" that constituted the aluminum cartel were responsible for almost 75% of world production; ninety-five percent of this being concentrated in the G8 (cf. Tarsitano Neto, 1995:76). Beginning in the late 1980s and during the 1990s, the aluminum industry underwent a significant restructuring. Initially, there was a major transfer of production away from the central countries. The relocations tended to be countries with the dual advantage of multiple energy sources (e.g., hydroelectricity, coal, gas) and large deposits of bauxite; most significant among those countries were Brazil, Venezuela and Australia.[16]

The establishment of the mining-metallurgical complex on Amazonian soil, creating the various steps necessary for the production of primary aluminum, was part of this international movement of spatial relocation. State action was instrumental in promoting the implementation of these projects, and this sector received high priority during the 2nd National Development Plan.[17] As several authors (e.g., Leal (1988); Wolf (1996)) note, the State acted to facilitate the association of national companies (public or private) with large transnational corporations, guaranteeing significant subsidies and institutional and financial flexibility. This process resulted in the establishment of two aluminum producers in the Amazon and their processing of bauxite into aluminum: (1) ALBRÁS/ALUNORTE, located in the municipality of Barcarena, near Belém; and (2) *Alumínio do Maranhão* [Maranhão Aluminum], or ALUMAR, located in São Luis, Maranhão.

Similarly, [Rio do Norte Mining (MRN) relied on the participation of the Brazilian government, in association with foreign capital, to implement mining projects. At the end of 1971,

[16] In the year 2013 Brazil accounted for 9.4% of total world production, with the firm MRN accounting for 65.82% of Brazil's production. The largest world producers are Australia (36.3%), Guinea (15.7%), Jamaica (10.4%) and Brazil (9.4%).

[17] In Portuguese this Plan is referred to as the *Segundo Plano Nacional de Desenvolvimento*—PND II, and it was for the period 1974 to 1978.

Alcan initiated the Trombetas project, which was soon after suspended due to a crisis in the global aluminum market. The delay in that project culminated in an intervention by the Brazilian government. Starting in June of 1972, Vale and Alcan initiated talks to form a joint venture aimed at restarting the project (BUNKER, 2000). Thus, the Brazilian state, through Vale, acquired 40% of MRN's shares and took responsibility for implementing the project[18].

The extraction and processing of metallurgical bauxite, as carried out by MRN, is the initial phase of the aluminum production cycle. Processing, which is electricity-intensive—and is the primary cost component—also involves an intermediate phase of producing alumina, from which primary aluminum is finally obtained. MRN supplies bauxite for both production processes. Since the late 1990s, most of the bauxite produced in Porto Trombetas is transformed into alumina inside Brazil. Together, Alunorte and Alumar consume approximately 5.5 million tons of bauxite per year (See Annual Report, MRN, 1995). MRN's remaining production is exported to various countries, primarily Canada, the US and Venezuela.

The spatial relocation and restructuring undergone by the aluminum industry led to profound changes in the pricing mechanisms of the entire production chain. The oscillating character of prices is an indicator of strong disagreements within the industry. There has been a lack of stability in light of frequent shifts in the competitive struggle, and which is moving toward greater concentration. The trends of bauxite and aluminum prices in the 1990s and 2000s tended to be downward, though with significant oscillations and this was mainly due to two reasons: (1) the expansion globally of production plants; and (2) the unloading of a large amount of aluminum and bauxite in the international market by Russia and the US. This resulted in the creation of "new models of competition through reductions in operational costs and an attempt to adjust supply to demand" (Monte and Adamian, 1995).

It was only after the mid-2000s that the stimulation of China's growth was evident in the demand for aluminum, and producing a strong increase in international prices, as occurred with the case of iron as well. From the middle of the 2000s, the stimulus of growth in China also made its presence felt in the metal processing of aluminum, as well as for iron, through a strong stimulus via international commodity prices. It is necessary to recognize the role of China given its importance with respect to trade and investment and infrastructural projects in the short and medium term for both Brazilian and Latin American development. This is in the sense that the Chinese model of

[18] MRN's shareholding structure has been in place since the 1970s, when its shareholders' agreement was signed. That agreement divided the company as follows: Vale (40%); BHP Billiton Metais (14.8%); Rio Tinto Alcan (12%); Brazilian Aluminum Company (Companhia Brasileira de Alumínio/ CBA) (10%); Alcoa Brazil (8.58%); Norsk Hydro (5%); Alcoa World Alumina (5%); and Abalco (4.62%). In 2011, Vale (post-privatization) sold its stake in MRN and other companies in the aluminum sector, (See the Vale Annual Report, 2012).

accumulation has had a favorable impact on the world structure of the prices of primary products *commodities*, through its impulse on the demand side.

The down side is the lack of incentive for production and improved competitivity of manufactured goods, which contributes toward the reprimarization of Brazil´s export profile (See Cooney et. al, 2016). The data from the WTO shows an explosive growth from 9.7% in 2000 to 16.8% in 2008 of the participation of Asia in the trade with Central and South America, to a large extent exports of primary products, principally agricultural and mineral *commodities* (See IPEA (2010b, p. 150-151) e Martins (2011, p. 141-143).

In "joint venture" projects such as MRN, there was often an intense internal dispute because the interests of purchasing partners ("take or pay" system) are increasingly located on the downstream end of the production chain, with the use of secondary aluminum and the production of alloys for use in advanced technology industries. Companies operating with the mineral *in natura* or even with primary aluminum operate with lower profit margins, since their profitability is limited by higher production costs, on the one hand, and downward pressure from purchasing partners, on the other hand.

4.1.3 Vale sets the standard of transnational intervention in the Amazon

Vale, which was the former state enterprise, *Companhia Vale do Rio Doce*, is Brazil's largest transnational corporation. The establishment of the "North System" in the mid-1980s, which was focused on iron exploitation in Carajás, Pará, defined a strong shift in the company's strategies of competition and expansion.[19] The Carajás-Iron project, begun in 1980, featured three types of funding. The first was the company's own resources, which accounted for approximately 46.2% of the total (approximately US$ 2.35 billion). Secondly, was financing via the domestic financial market. This was essentially the public institutions of BNDES, the National Housing Bank (BNH) and the Special Agency for Industrial Financing (*Agência Especial de Financiamento Industrial*). This second source accounted for approximately 21.7% (US $1.105 billion) of the total. Lastly, international financing accounted for approximately 32.3% (US $ 1.638 billion) (Saad Filho, 2011; Silva, 2012). With the privatization of Vale, services and amortization of Vale´s debt remained State-owned, whereas patrimony and financial assets were privatized.

Vale's shareholding structure is composed of Valepar and BNDESPAR. Valepar is a consortium of five companies, which in 1997 acquired the control of the then-CVRD from the Brazilian government as part of the first stage of that company's privatization. Valepar was a

[19] For a valuable source for information on the trajectory of Vale before and after privatization, and the establishment of the North System of mineral exploration in Carajás, see Santos (2011: 156-175).

company formed with the sole purpose of holding a significant stake in Vale and it holds almost 53% of the company's common shares. BNDESPAR is the investment arm of BNDES and holds 6.7% of the common shares. The remainder of the company's shares is traded on the market. Of note, the Brazilian government owns 12 golden shares, which are special shares with veto power over certain corporate decisions, such as changes of name, head-office location and corporate purpose.[20]

What is observed from the continuity of a certain degree of State control with respect to Vale is that the State, which, in general, only regulates economic activities since the 1990s in accordance with neoliberal reforms, is not present in Vale's power structure.[21] The government exerts only indirect influence on this native TNC, and likewise for the structure of the mining market. Voting and decision-making powers ultimately influence the allocation of financial resources, investment and production. An example is the impasse over the construction of the Araguaia-Tocantins waterway (southeast of Pará), in which it was agreed that a portion of the investment would be funded by the Vale group. However, the company's lack of interest in assuming these costs, along with the dynamics of the market itself, led the company to decline to participate in the initiative, causing the federal government to press for its implementation, albeit without much effectiveness. Another example was the attempt to establish *Aços Laminados do Pará* [Rolled Steel from Pará] (ALPA) in the municipality of Marabá. The State, through a regional development policy, attempted to convince the company to build its steel hub in the region, but as in the previous case, the company's strategic and trade interests, along with market and feasibility factors, lowered expectations related to beginning construction.

Table 2 – Principle Mineral Export Companies in the State of Pará (%)

Firms	2004	2005	2007	2008	2009	2010	2014
VALE S/A	31,14	36,39	36,32	43,16	51,93	59,26	67,34
ALBRAS ALUMINIO BRASILEIRO S/A	18,92	15,98	14,27	9,97	8,54	7	4,48
ALUNORTE ALUMINA DO NORTE DO BRASIL S/A	8,32	8,78	14,25	12,66	14,06	10,19	8,92
RIO DO NORTE Mining SA	3,35	3,06	2,36	2	1,07	1,36	1,47
RIO CAPIM CAULIM SA	2,85	2,36	1,73	1,74	1,75	1,24	1,01

Source: SEDEX/ MIDIC (2015). (Author's calculations).

[20] Although the federal government sold Vale in 1997, it continues to have certain influence and control for key decisions.

[21] In the mining sector, the neoliberal reforms were characterized as providing tax incentives and favorable legal frameworks. Specifically, the many adaptations of the Mining Code, facilitated the obtaining of mining rights, including and especially for the purpose of using those rights for speculation purposes (See ECLAC (2013: 29-30).

Vale's iron exports from Pará have grown exponentially in recent years, and thus helping Pará to continue to maintain a trade surplus for the State. According to data from MDIC (Ministry of Development, Industry and Trade, 2015) in 1996, Pará was the seventh-largest exporting state, and it held the ninth position in 2003. From that year onwards, mineral production and exports (primarily iron) grew significantly, and in 2010, sales to the rest of the world made Pará the sixth-largest exporter among Brazilian states. Pará had a total of US $12.8 billion in exports with imports at roughly US $1.2 billion, and thus finishing 2010 with a balance of US $11.6 billion. No período mais recente mantêm-se o perfil minero exportador daquela unidade federativa, sendo que em 2013 o estado do Pará foi responsável por 6,55% do valor FOB exportado pelo Brasil, sendo relevante frisar que as commodities minerais representaram naquele ano aproximadamente 14,5% do valor exportado brasileiro.

4.2 Ground Rent and Surplus Profit of TNCS in the Amazon

As addressed above, variability in the profitability of mines is related to the location, accessibility and quality of the ore available in the subsoil. In the case of the Amazon, it was common to discover deposits with high mineral content, and this lead to an increased competition among large capitals or TNCs in terms of access. Each company ultimately sought to try to gain control of these mines so as to guarantee the advantages of converting ground rent into surplus profits which such non-reproducible resources can offer. The superior characteristics of Amazonian mines have produced an investment race among transnational mining companies. Today, Brazil is the recipient of one-fifth of the world's mining investments, and the Amazon is the mining industry's frontier in Brazil.[22] According to the Brazilian Mining Institute,[23] "mining companies will invest roughly US $24 billion between 2012 and 2016 to increase the production of iron ore, bauxite and other metals found in the Amazon basin" (ECLAC, 2013; Lyons and Kiernan, 2012).[24]

In terms of the Amazon being a frontier of accumulation, there are several major driving forces. In addition to the mining sector, the production of soy and livestock has experienced substantial growth, all contributing to the increase in the demand for both means of production and

[22] In fact, Latin America as a whole became the primary destination for mining investment worldwide in 2010, and this shift started back in 1991, at which point investment in mineral exploration increased 500% in just 8 years (see Borg, 1998).

[23] In Portuguese, this institute is Instituto Brasileiro de Mineração (IBRAM).

[24] In the case of iron ore, for example, it should be noted that world reserves have reached 310 billion tons, of which Brazil holds 6.1%, behind China and Australia. However, "considering the high grade of iron ore, 64% on average, the country has a unique position given the fact that Australia has 59% on average, and that for China, it is less than 40%." (BNDES, 2003). It is noteworthy that the Amazon contains the highest concentration of iron on the planet, and that the reserves of the Carajás complex are more than 17 billion tons, along with a high level of Fe_2O_3, reaching 66% of the world total.

labor. Such an increase in demand comes to have an influence on lands which are adjacent to either the mining deposits or agricultural producers, and this has a direct impact upon the use of such lands and this has contributed towards a number of serious agrarian conflicts.

Mining companies' environmental discourse generally advertises mining as an economic activity that "spares trees", but three characteristic effects of mining activity contradict such an argument. First, mining involves the obligatory removal of vegetation cover, which is sometimes replaced with "secondary forest". This is generally poorer in biodiversity compared to "primary forest". Second, mining involves the construction of roads and railways to transport minerals, which have side effects on the valuation of the surrounding lands and the acceleration of their deforestation, whether for illegal logging or to transform pastures for livestock, thus rendering those lands as available for the expansion of the agricultural frontier. Thirdly, the increase in the demand for electricity for mining activities has led to the mining TNCs and the Brazilian government to promote the construction of hydroelectric dams, leading to major environmental impacts and conflicts in recent years.

It is worth emphasizing that the capitalists in the mining sector are able to continue receiving surplus profits as a result of the differential productivities in mining and as a result of the government concession guaranteeing them the right to access mines or subsoil. In this manner the subsoil comes to constitute a propitious space where such companies with sufficient capital can appropriate much more than what was initially intended or established by government legislation allowing for such public concessions. In this way, the mining capitalists appropriate differential rent, made possible by the mines with high grade ore tucked away in the Amazon subsoil. The total profit available for individual capitals is constituted by the average profit combined with the two main components of ground rent, namely absolute and differential rent, which they do not have to pay to a separate owner of the mine or land. Another aspect which deserves mention is that the level of this extra profit is given by the difference between the productivity of individual mines and the productivity of the worst mines in operation globally. This was described above in the theoretical discussion of ground rent in Marx.

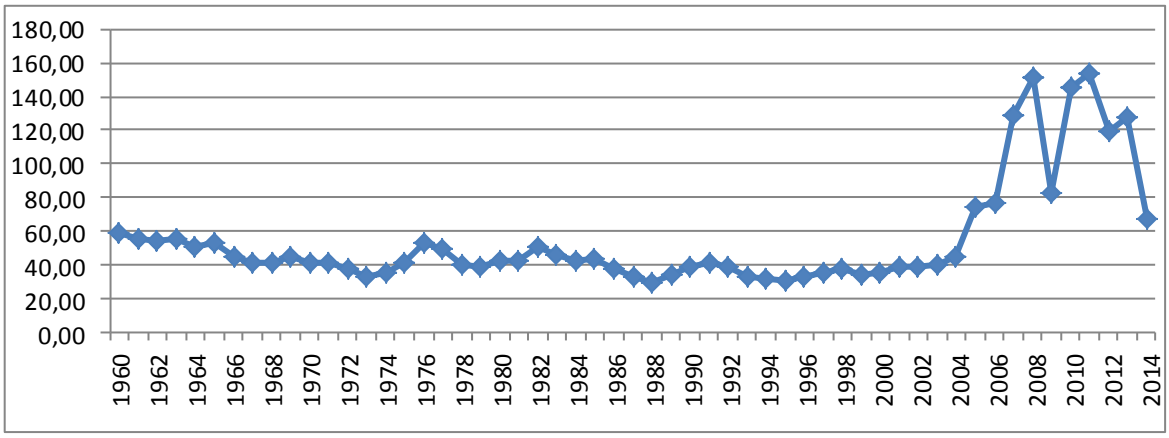
Although it may appear that mineral rent is a component of the final price as a result of most mining production, mineral ground rent is not a production cost. In fact, as described above in Section 2, is the result of the difference in productivity between a better mine and the productivity of the marginal or worst mine in operation (one which is still able to obtain the average rate of profit in general). In fact, there is only absolute rent contained in the market price, since it is the low productivity of the worst mine which allows other mines to obtain a differential rent, and it is the next marginal conditions which establish the level of absolute rent, something that can only be

established in practice, not *a priori*. If there is a case where the market price rises, as a result of higher demand, or a decline in productivity for the worst mines, there will tend to be an increase in rent, but this increase in rent is not the cause of the increase in price. Rather, it is the increase in price which leads to an increase in rent, in other words, the causality operates in exactly the opposite direction.

The price rises because the less-productive mines, which have higher costs, are brought into operation or continue in operation because of the level of demand. Thus, if the demand increases such that new less productive mines have to come into operation, which has been the case since the early 2000s, due to the significant increase in the demand for minerals, especially given China`s amazing growth. As first presented by Ricardo and confirmed by Marx, it is the less productive or marginal conditions which provide the basis for establishing a new price. Thus, mineral rent arises only because there is a differential in productivities, and in general a uniform selling price.

Thus the differentiation in terms of costs means there are a range of differential rents obtained by different mines, the highest quality ore receiving the highest levels of rent, as some would call the "benchmark" mines. This would apply to the case of the large deposits of iron ore in the largest open pit iron mine in the world, namely, Carajás, Pará. The Chinese are mining iron ore with increasingly lower iron content and high production costs, currently approximately US $100/ton. In Brazil, raw material is mined at an average of US $20 per ton, and in the Carajás mines, ore with 66% iron content may be mined for as low as at US $15/ton (Pinheiro, 2012; Freitas, 2013).

Figure 1 Iron Ore Price (US$ cents/dmtu*)



Source: WORLD BANK (2015). *Unit dry metric ton unit (dmtu) stands for mt 1% Fe-unit

Considering the relationship between the Chinese mines (mines with lower productivity and quality) and the Carajás mines, the high differential rent that Vale appropriates can be estimated approximately. In 2010, Vale had a net margin[25] of 38.8% (Valor 1000, pp. 25, 54-55), largely derived from the high differential rent appropriated in the Carajás mines.[26] The shift upward as of 2000 in the demand by China is reflected in the increase in price as can be observed in the Figure above. This is just one example of the impressive levels of profit achievable by TNCs operating in the Amazon.

5. Final Considerations

Throughout this article, we have attempted to theoretically and empirically approach the relations between transnational mining capital operating in the Amazon and the implications with respect to the appropriation of the different forms of ground rent. Our key findings can be summarized in three areas. The first area involves the relationship between the State and mining TNCs and this is established through two main mechanisms. The first being the legal apparatus for regulating mining activity, ranging from appropriation of soil, subsoil, etc. as well as systems of business regulation and fiscal control. Secondly there is the State's central role in providing and maintaining infrastructure necessary for mining activity, for example the huge hydroelectric dams being constructed in various parts of the Amazon.

The second area refers to the mining rent which has its own particularities and produces a range of effects. The first is that the veins of mineral ore are limited, which is a rather important issue when considering the accumulation dynamics related to ground rent. Second, there is often a notable difference in ore quality among different mineral veins and this produces two important effects which influence the entire subsequent production chain. There is the compensation for transport costs, and the struggle of who controls access to mines and transports to and from these mines. Thirdly is the depletion of mines, or mineral non-renewability, which on the one hand brings about extraordinary profits though for only a limited period of time. There is thus the paradox of a process which often leads to an accelerated economic expansion as in the case of the use of the mines and followed by an accelerated period before the mine is depleted.

[25] The net margin represents the ratio between net gain (net profit or loss) and net operating income (amount obtained by deducting, from the gross revenue taxes, discounts and refunds) in percentage terms.

[26] As a speculative exercise, we could approximately calculate the mineral rent, assuming the costs listed as close to the average ratio of international value. Thus, the Carajás mineral rent would be given as part of the company's net margin by the following relationship: [PCM (Production Cost of the Chinese Mine) - PCC (Production Cost of Carajás)/BP (Benchmark Price)] * NM (Net Margin). Therefore: PCM = US$15/ton; PCM = US$100/ton; BP = US$146/ton and NM = 38.8%, thus, LF (Land Rent) = [(100-15)/146] * 38.8 = 22.58%, i.e., more than half of the net profitability of the company was due to mineral rent.

The third area is that the case of the Amazon, with the frequency of finding deposits with high mineral content, has meant that the region has established the basis for fierce competition among different TNCs. These transnational corporations ultimately seek to control and appropriate these non-reproducible resources to the best of their advantage, so as to obtain surplus profits, and without considering the impact on local populations or the environment. The accelerated depletion of the Amazonian mines is the direct result of the high extraordinary rents made possible by their specificities, coupled with the accommodation of the Brazilian State to transnational capital.

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