

# Resource Extraction in Brazil

## Trade Misinvoicing in the Mining Sector



**Latindadd**   
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## **MEASUREMENT OF CAPITAL FLIGHT IN THE BRAZILIAN MINERAL SECTOR**

This research was conducted by economist Guilherme Spinato Morlin, who has a degree from Universidade Federal do Rio Grande do Sul (UFRGS) [Federal University of the state of Rio Grande do Sul] and who is pursuing a master's degree in Economics at Universidade Federal do Rio de Janeiro (UFRJ) [Federal University of the state of Rio de Janeiro], being advised and coordinated by Instituto Justiça Fiscal (IJF) [Fiscal Justice Institute].

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## 1. Introduction

The issue of using diverse business practices to transfer profits and income internationally while avoiding the payment of taxes should be understood in the context of a globalized economy, which is the result of decades of progressive internationalization of companies – which expanded to several markets – and of production – consisting in the international distribution of stages of production chains between firms that are independent or integrated into the same group.

The major international expansion of large companies, spearheaded by the United States, Germany and Japan, has led to a significant change in trade flows and to the emergence of new forms of competition among business groups. More recently, the productive internationalization of large companies has also been anchored in the processes of sales and financial openness, observed in both advanced and peripheral economies.

This process was reflected in the formation of global production chains, resulting from the strategies the companies adopted for spatial location and from the redirection of foreign direct investment – benefiting mainly China and other Asian economies and causing changes in the international division of labor (IEDI, 2013). Therefore, a movement of mergers and acquisitions – centralization of control – has taken place simultaneously with the diversification and decentralization of production on an international scale.

This internationalization has also happened in a situation characterized by the opening of capital accounts, the raising of international liquidity and the deregulation of the financial market, which has led to greater freedom for international capital flows. This broad process of financial deregulation promoted in recent decades has separated the national wealth and the wealth of the nation's residents, since they are no longer located in the same economic sphere sovereignly regulated by the national State.

At the same time, financial reforms and the change in social commitments made by the State, in a context of raised interest rates of countries with non-convertible currencies – adopted so as to avoid capital flight –, has caused a reorganization of their economies, favoring the strengthening of rentier groups (MEDEIROS, 2003).

The globalization and internationalization of companies, the technological advancement and the high expertise of multinational companies have occurred without the proper monitoring of the tax administrations and related regulatory frameworks.

Thus, the "transnationalization of companies and their location in multi-markets have not been accompanied by an international regulation compatible with the "deterritorialization" of production and with the deregulation and integration of financial markets" (IEDI, 2013, p.7-8). In practice, companies now have a privileged capacity related to the international allocation of their assets, productive and financial resources and even the allocation of the risks they face in their activities. With the intensified trade between related parties, the lending or reordering of assets between companies in the same group and with the generalization of the use of offshore financial centers as a business practice,

important indicators of the growth of capital flight were established for the international transfer of profits and income with the purpose of avoiding and evading taxes.

It is important to note that offshore centers, located in specific sub-national countries or regions that provide different levels of secrecy to private businesses, are fully integrated with the global financial system and carry a significant share of international trade and investment (UNCTAD, 2014a).

While multinationals are geared towards profits on a global scale, tax policies are tied to the interests of national governments. Thus, tax policy decisions impact decisions about the location of the productive activity made by multinationals, while the decisions taken by multinationals influence the size of the tax revenue that countries may earn (CLAUSING, 2009; 2011). The increased mobility of the productive capital has eventually led to tax competition between countries in order to attract investment on production.

As a result, effective corporate tax rates on corporate profits have decreased in both developing and developed countries (UNCTAD, 2014a). One form of compensation was the increased incidence of indirect taxes, such as value-added taxes, which are regressive and have negative impacts on income distribution. The changes associated with this internationalization context make it possible for companies to carry out aggressive tax planning, resulting in the deterioration of the tax base of national States and in the weakening of their sovereignty and governance.

This condition is even more pronounced in developing economies, many of which are passively positioned within the dynamics of the internationalization of production. In the context of the liberalizing policies that began to be introduced in the 1980s, there were profound changes in the internal-external relations of the economies, with significant impacts on peripheral economies. Latin America was especially affected by the changes in the global economy, being the protagonist of the most radical results of this process (MEDEIROS, 2003).

During the 1990s, many countries in the region extensively opened their capital accounts, promoted privatizations, denationalized their infrastructure sectors and reformed their social security systems. Privatization programs, such as the ones in Brazil and Argentina, lead to "an unprecedented denationalization in the global economy" (MEDEIROS, 2003, p. 3).

This change in the international penetration of Latin America has led to an accumulation of large external liabilities while also promoting the growth of private financial assets in foreign currencies.

Many Brazilian companies began to take part in this internationalization process; mining companies were among them. The mineral extraction industry is strategic for the Brazilian economy and takes a privileged share of the country's trade integration. Companies in the extraction industry are also companies that actively invest abroad.

This investigation aims at identifying the loss of resources associated with trade misinvoicing in iron ore exports. As will be discussed, the problem of capital flight and tax loss related to this phenomenon particularly affects developing countries.

Brazil is often mentioned in the literature as one of the countries that are most affected by capital flight. Estimates have shown that transfer pricing has been the main mechanism used for capital flight in developing countries, particularly in the Brazilian case (KAR; LEBLANC, 2013; KAR, 2014). Despite its relevance, the issue of capital flight is still only briefly discussed in the country and is rarely raised in public debates, even in recent circumstances, with growing debate over the problems of offshore companies and international tax havens.

Thus, through greater knowledge on the subject and based on the study of a specific case, we seek to provoke a discussion on important tax issues from the perspective of tax justice. It is, therefore, an alternative conception to that which dominates the media and to the most frequent proposals concerning economic and tax policies. This conception aims to lead to a reordering of the tax base, making the tax system fairer and more equitable. Besides this Introduction, this research consists of three other sections.

Section 2 discusses the problem of capital flight and trade misinvoicing, highlighting the impacts of these issues on developing countries. In Section 3, we present the estimate to measure capital flight associated with trade misinvoicing in iron ore exports. A brief discussion of the methodology is followed by the presentation of the results. Finally, we present synthetic concluding remarks, indicating the contributions of this study.

## 2. Capital flight, Transfer Pricing, Trade Misinvoicing and Other Relevant Tax Issues

### 2.1 Capital Flight

The issue of capital flight is addressed from different approaches in specialized literature. The research focuses either on the problem of capital flight in general, sometimes emphasizing the flight related to the movements of speculative capital that mainly affects developing economies in periods of crisis or instability in external accounts; or it focuses on the capital flight that occurs systematically and results in the loss of tax resources and in the loss of foreign currencies; or it focuses on illicit financial flows, a specific component of the general flight that occurs by illicit means or is related to gains obtained from illegal activities.

One of these illicit methods is misinvoicing of exports and imports and relates to trade or to the commercial intermediation conducted between related companies – i.e., belonging to the same group.

Therefore, capital flight can be understood as a broader phenomenon, which encompasses a set of financial flows from the most speculative movements to international transfers of profits and wealth of residents in general, aiming to avoid or evade taxes.

Nonetheless, the term capital flight was typically used to refer to the movements of outflow of speculative capital, often in reaction to periods of crisis, exchange rate instability or macroeconomic instability<sup>1</sup>.

The flight can be understood as an international financial flow outside a given country, with larger flows being associated with sudden changes in the expectations of international investors.

This phenomenon can generate macroeconomic instability that is not easily reversed, with consequences for the long-term performance of the economy. This has occurred more frequently in developing economies, since in many of them the financial account of the balance of payments tends to be heavily dependent on speculative flows (CUDDINGTON, 1986; MUNHOZ; LIBÂNIO, 2009).

However, it is important to note that capital flight is not restricted to these episodes of crisis or instability. It actually occurs systematically, trending towards growth in recent years, and it is an indicator of the accumulation of wealth in secrecy jurisdictions and is the cause of massive loss of tax and foreign exchange revenues (HENRY, 2012; MEVEL; 'OFA; KARINGI, 2013; ZUCMAN, 2014).

Understanding this face of flight more specifically was prioritized by studies that addressed the causes and the measurement of illicit financial flows. The most widely used notion of illicit flows refers to cross-border flows of money that is illegally-earned, illegally used or illegally transferred from another country. Therefore, this concept exceeds capital flight, since it also involves the flows of resources obtained from illegal activities such as corruption, contraband and criminal activities, even though it also covers illegal capital outflow mechanisms not registered by tax authorities (HOLLINGSHEAD, 2010).

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1. <sup>1</sup> Historically, the massive capital flight has been associated with the phenomenon of financial globalization and to the debt crises of countries belonging to the then Third World in the 1970s and 1980s. It was also visible in recurring exchange rate crises of developing countries, observed mainly in the 1990s (HENRY, 2012).



Nevertheless, studies that focus on measuring these illicit flows are restricted to illicit forms of capital outflow, i.e., to the illicit component of capital flight, as do Hollingshead (2010), Mevel, 'Ofa and Karingi (2013), Kar and LeBlanc (2013), Cobham, Janský and Prats (2014), Kar (2014) and Kar and LeBlanc (2014).

Illicit flows are considered the "most devastating economic issue of Southern countries" (KAR; LEBLANC, 2013, p. iii) due to the economic and social losses they cause. The capital outflow <sup>2</sup> of developing countries in the period from 1980 to 2012 totaled 13 trillion dollars, or, on average, around 405 billion dollars per year (CAR et alli, 2015). These flows followed a growing trend during the period. In the period from 1980 to 1984, the annual outflow was 38.6 billion dollars on average, while from 2000 to 2004 the annual average outflow stood at 394.1 billion dollars, more than ten times higher than the one from the period from 1980 to 1984. This value continued to grow in the following years, until they sharply decreased in 2009.

This decrease was mainly due to the reduced international trade – and therefore due to the reduced capital flight related to trade misinvoicing – in the context of the international economic crisis, but also to reduced sources of resources such as foreign direct investment and new loans (CAR et alli, 2015).

Capital flight of developing countries represented 3.7% of the GDP of these countries in the period from 1980 to 1984. This percentage grew, reaching 6.4% in the years 2000-2004, and kept increasing until the peak value in 2008 (7.2%). Afterwards, there was a decline of this ratio, which stood at 5.1% in 2010 and, more elevated, at 6.2% in the year 2012 <sup>3</sup>.

Many developing economies have resorted to international loans during periods of external imbalance, while undergoing structural adjustments, selling public assets and facing periods of low economic growth in order to reestablish the ability to settle their commitments in international currencies. These countries, however, are net providers of resources to the rest of the world (HENRY, 2012). The net resource transfer was calculated based on the difference between the flows received by developing countries registered in the Balance of Payments and the sum of flows that were recorded and unregistered flows.

The estimate according to this concept revealed that developing countries had a net outflow of resources in most of the years in the series from 1980 to 2012. Especially after the years 2000, the outflow of resources held high values.

2. <sup>2</sup> This outflow is mostly illicit, since the estimates of the study were obtained by summing a component of capital flight via trade misinvoicing and a second component related to leakages of the Balance of Payments. The first component (and main share of capital flight) refers only to an illicit flow, while leakages, estimated through the World Bank Residual Method, despite being mostly illicit, include a small share of licit capital outflow, which is not registered in the Balance of Payments simply due to statistical failures. Therefore, it is possible to consider that the estimate refers mostly – although not exclusively – to illicit flows (CAR et alli, 2015).

3. <sup>3</sup> In a broader time frame – so as to observe the average from a more long-term perspective –, it is possible to note that the outflow of developing countries represented 5.8% of these countries' GDP, on the average between 1980 and 2012. Considering only the period from 2000 to 2012, this percentage was 6.1% (CAR et alli, 2015).

The situation indicates significant, systematic losses of resources by developing countries, with illicit flows accounting for approximately 82% of the net resource transfers from developing countries (CAR et alli, 2015). Even when capital inflows occur unlawfully as if they were part of the registered flows received by developing countries, there is still a net outflow of resources from developing countries to the rest of the world.

Sub-Saharan Africa, the poorest region in the world, incurs a massive loss of resources due to capital flight and has a positive net outflow of resources – even in this more restrictive case where illicit inflows are discounted as if they were legitimate (CAR et alli, 2015).

Mevel, 'Ofa and Karingi (2013) attribute the main components of illicit flows to corruption; illicit activities such as smuggling, drug trafficking, financing of terrorism; and the practice of trade misinvoicing.

However, studies that address the measurement of the illicit component of capital flight indicate that the main flight mechanism in recent decades was trade misinvoicing (HOLLINGSHEAD, 2010; KAR; LEBLANC, 2013; KAR, 2014).

Kar and LeBlanc (2013) estimate that about 80% of the total illicit flows from developing countries are due to the export and import misinvoicing.

This result justifies the importance of investigating the issue of misinvoicing, especially in the case of Brazil, where there is still little technical knowledge about the issue. Few studies address the Brazilian case.

In the decade from 2002 to 2011, it is estimated that developing countries accumulated a total of USD 5.9 trillion in illicit flows, following a growing trend that peaked with the outflow of USD 946.7 billion in 2011 – 13.7% more than in 2010, in real terms (KAR; LEBLANC, 2013).

In real terms, illicit financial flows from developing countries grew by more than 10% per year throughout this decade.

Since this rate is far higher than the growth of the GDP, it is possible to observe that financial flows displace a growing share of the national wealth.

The issue of capital flight is closely related to the issue of concealment of wealth in tax havens. Zucman (2014) estimates that by the end of 2013 a total of 5.8 trillion euros in financial assets and bank deposits was in accounts held in tax havens <sup>4</sup>, figure the author identifies as a historical record.

This value represents 8% of household financial assets on a global scale. In the specific case of the European Union, it is estimated that 12% of household financial assets are allocated to bank accounts in tax havens.

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<sup>4</sup> The global asset-liability imbalance reached 4.8 trillion euros in 2013 and provides a reasonable estimate of the number of offshore household portfolios, referring only to the ownership of financial securities. Therefore, it is also necessary to add the value kept in bank deposits. Based on information provided by the Bank for International Settlements (BIS) and national central banks, there is an estimate that hidden international bank deposits of private citizens totaled a trillion euros in 2013. Combining the two numbers the author found the value of the private financial assets kept in tax havens (ZUCMAN, 2014). This estimate does not take into account other forms of wealth allocated to other types of assets, such as real state or artworks.

The assets located in Switzerland, regarded as the first and still the most important tax haven, totaled 1.8 trillion euros (almost a third of offshore fortunes), while the rest is divided into the other tax havens that are geared towards private banking of ultra-rich individuals.

Singapore, Hong Kong, the Bahamas, the Cayman Islands, Luxembourg and Jersey are particularly noteworthy. Often, the assets located in these regions are generated by Swiss banks<sup>55</sup>.

This estimate is exclusively based on the results obtained from data recorded in official records and information provided by BIS. In order to preserve the rigor of the results, no extrapolation is added to them, as would often be the case in similar studies<sup>6</sup>.

Therefore, this indicates that the true value of hidden assets is higher than the number obtained by the estimate, even though it is not possible to precisely determine this difference.

The fraud of ultra-rich individuals costs 130 billion euros to States across the entire world every year, according to the estimate provided by Zucman (2014).

Here we consider income taxes, inheritance tax – based on the average annual transfers of fortunes – and solidarity taxes on large fortunes levied in some countries. Even though this is not included in the estimate, it should be noted that several countries no longer levy taxes or reduce their rates in order to avoid the evasion of financial resources to offshore locations (or doubting that it is even possible to tax ultra-rich individuals). Therefore, this non-estimated loss also consists of a real cost associated with the practices of tax havens that is met by other countries.

An alternative estimate identified that residents of developing countries had about 4.4 trillion dollars in assets in tax havens in 2011. The same data indicates that this figure was 1.8 trillion dollars in 2005, which shows the accelerated growth of hidden wealth belonging to residents of developing countries.

A considerable share of the wealth of developing countries and especially of poor countries is displaced to secrecy jurisdictions, eroding the tax base of these countries. Sub-Saharan Africa showed the fastest growth of this quantity – according to the study, a yearly growth above 20% (CAR, 2015).

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<sup>5</sup> In the case of Norway, a country with only 5 million inhabitants, its taxpayers are estimated to have more than 35 billion dollars in non-declared bank deposits in tax havens (NÆRINGSLIV, 2010).

<sup>6</sup> Zucman (2014) criticizes the methodology adopted by Henry (2012) to obtain their estimate of the sum of wealth in offshore locations – see Zucman (2014, p. 56). Zucman also argues that the estimates must be based on more precise data and information, recognizing and explaining their limitation, yet without resorting to less accurate information that may exaggerate estimates and make them easily questionable from a methodological standpoint, ending the political role they could play in reporting the cost that tax havens represent to other countries.

## 2.2 Transfer Pricing and Trade Misinvoicing

The concept of trade misinvoicing refers to the manipulation of prices in foreign trade between related companies headquartered in two different countries. This practice enables companies to transfer financial assets between different countries without declaring them to the authorities. With this method, they are able to evade taxes, circumvent capital controls and transfer resources obtained through illicit activities. Although this study emphasizes the deliberate under-invoicing of exports and over-invoicing of imports, generally to avoid taxes, the manipulation of prices in international transactions is also a way of repatriating capital and restoring previously hidden resources.

Table 1 presents the different forms of manipulation that generate illicit flows in international trade and the motivations that may be related to these practices.

**Table 1 - Types of Illicit Financial Flows Associated with the Foreign Trade of Goods**

Flow	Manipulation	Illicit Motivation
<b>Exports</b>	Over-invoicing	<ul style="list-style-type: none"> <li>• Using of subsidy schemes</li> <li>• Unreported repatriation of capitals (from abroad)</li> </ul>
	Under-invoicing	<ul style="list-style-type: none"> <li>• Misappropriation of (illicit) unreported benefits</li> <li>• Offshore misappropriation of money from criminal activities</li> <li>• Evasion of capital controls (including those linked to the repatriation of capitals from the country to foreign countries)</li> <li>• Evasion of foreign exchange controls</li> <li>• Evasion of customs tariffs</li> </ul>
<b>Imports</b>	Over-invoicing	<ul style="list-style-type: none"> <li>• Misappropriation of (illicit) unreported benefits</li> <li>• Offshore misappropriation of money from criminal activities</li> <li>• Evasion of capital controls (including those linked to the repatriation of capitals from the country to foreign countries)</li> <li>• Evasion of foreign exchange controls</li> </ul>
	Under-invoicing	<ul style="list-style-type: none"> <li>• Evasion of customs tariff</li> <li>• Unreported repatriation of capitals (from abroad)</li> </ul>

Source: Grondona (2015)

Transfer prices, prices charged among companies belonging to the same economic group for the transaction of goods and services between related parties, are subject to free manipulation by the companies, without depending on any relation with the prices charged in the market – i.e., between unrelated parties.

This possibility of price manipulation allows corporations to transfer their profits and income between countries, avoiding controls by tax authorities and controls and records related to international capital flows. Through the under-invoicing of exports and over-invoicing of imports, corporations seek to transfer some of their taxable profits to countries with more favored or no taxation.

Thus, profits obtained legitimately can be transferred to tax havens or to other countries, in the search for lower taxes (and, in the case of some countries, bypassing existing foreign exchange controls) (HOLLINGSHEAD, 2010).

In addition to trade misinvoicing, transactions between related parties enable the practice of different mechanisms for the international reallocation of resources and assets, allocation of capital structure and borrowing between related parties. As a result, they affect the size of corporate profits in different jurisdictions and may follow a tax planning that minimizes the payment of levies. The under-invoicing of exports and over-invoicing of imports often involve the use of intermediary companies in the business transaction. Typically, such companies are established in tax havens or in countries with lax commercial and financial rules.

Thus, intermediary companies operate as "re-invoicing centers", that is, they are used to re-price exports so as to allow both under-invoicing of exports in the country of origin and over-invoicing of imports from the country of destination and therefore the misappropriation of earned profits for offshore bank accounts.

One of the consequences of this method is the large volume of commercial transactions registered by countries with favored taxation, sizable volumes that would not be economically justifiable if their role as a commercial intermediary was not taken into account. This can be verified by the fact that, according to the Berne Declaration (2011), companies operating in Switzerland concentrate at least 15 to 25% of the value of global transactions of goods.

Following the same idea, Cobham, Janský and Prats (2014) sought to identify the occurrence of "abnormal" prices in trade between Switzerland and other countries, by comparing prices for each commodity found in trades with Switzerland and a benchmark price established based on the information registered by the other countries.

In fact, the authors found support for the hypothesis that the average price of goods exported to Switzerland is lower than that of goods exported to other jurisdictions; and to the hypothesis that Switzerland declares higher (re-)export prices for the same goods than those declared by other jurisdictions. In addition, Cobham, Janský and Prats (2014) emphasize that there are no clear concrete reasons to explain the important role Switzerland plays in the international trade of goods, since it is a small, expensive country surrounded by land, which does not have any advantages relating to its location or ports and is not close to natural resources.

In fact, most of the Swiss trade does not "involve physical shipments, but "trading" or "transit trade." With this model, "contracts can be concluded, deliveries can be scheduled and ships can be chartered from Swiss offices, but the actual goods... never touch the Swiss soil" (Berne Declaration, 2011, p. 44 apud Cobham; Janský; Prats, 2014). Results of a conservative estimate suggest that business transactions between developing countries and Switzerland cause an annual capital flight from developing countries above 8 billion dollars (Cobham; Janský; Prats, 2014).

Clausing (2011) demonstrates the disproportion between the distribution of employment and the profits generated by subsidiaries whose property is majority-owned by U.S. multinationals. Thus, in 2008 the countries that concentrate most (over 40%) of the jobs created by these companies outside the United States were, in descending order of share, the United Kingdom, Canada, Mexico, China, Germany and France.

On the other hand, the countries where most of the revenue earned (over 40% of the profit) is concentrated, in the same year, again in descending order, were the Netherlands, Luxembourg, Ireland, Canada, Bermuda and Switzerland.

While the change itself is significant – since the only country in both cases is Canada – the author also demonstrates that there is a marked difference in the tax rate the two groups of countries levy.

Thus, although the damages caused by illicit flows to developing countries are often emphasized, it should be noted that such a problem has severe impacts on developed countries as well.

It is estimated that the loss of tax revenue in the United States resulting from transfers of profits and income by multinationals in 2008 is approximately 90 billion dollars, representing about 30% of total tax revenue related to taxes imposed on corporations in the country.

In an alternative estimate made by the same study, the loss of tax revenue totals 57 billion dollars, a figure that represents about 19% of total corporate tax revenue in the United States (CLAUSING, 2011).

Developing countries are severely affected by capital flight through trade misinvoicing. Illicit flows of that nature were small in the beginning of the 1980s. However, they have significantly increased since then, notably after the years 2000 (CAR, 2015).

According to Kar and LeBlanc (2013), trade misinvoicing was responsible for about 80% of illicit financial flows from developing countries between 2002 and 2011. Also in the case of Brazil, there is considerable trade misinvoicing, which has been the main method of capital flight recently.

It is estimated that the under-invoicing of exports and the over-invoicing of imports combined were responsible for an outflow of 180.28 billion dollars between 2006 and 2012. During this period, trade misinvoicing accounted for 95.4% of illicit financial flows and 71% of the overall capital flight (KAR, 2014).

The under-invoicing of exports was the method most widely used by Brazilian entrepreneurs to transfer resources abroad, totaling 122.29 billion dollars between 2006 and 2012, accounting for 67.8% of resources sent abroad through misinvoicing. The other share (32.2%) was sent through the over-invoicing of imports, totaling 57.99 billion dollars (always in real values referring to 2014). Considering a broader time frame, the period from 1960 to 2012, there were important variations in the predominant mechanisms used for capital flight.

During some of the periods, illicit flows were most relevant; in others, legal outflows prevailed. Nonetheless, considering the period from 1960 to 2012 as a whole, it was possible to note that 78.8% of illicit flows happened through prices and transfers (KAR, 2014).

Under Brazilian law, the practice of transfer pricing is considered illegal when it is not accompanied by the necessary adjustments in taxable income. In order to more clearly understand the issue of misinvoicing in Brazil, it is important to briefly explain the Brazilian legislation that governs transfer pricing.

Since 1996 (Law 9,430/1996), Brazil has been adopting legislation that is based on guidelines recommended by the OECD. The legislation briefly establishes that, to calculate the IRPJ (Imposto de Renda de Pessoa Jurídica [Corporate Income Tax]) and the CSLL (Contribuição Social sobre o Lucro Líquido [Social Contribution on Net Profit]), companies located in Brazil must observe the limits established by law to compute their revenues or to appropriate deductible expenses when carrying out sales operations or providing services for related foreign companies or for any company from countries with favored taxation.

Thus, whenever exporters set prices that are lower than the prices defined as parameters, they must appropriate the difference in their taxable profit; importers must also calculate this difference and add it to their taxable profit whenever they set prices that are higher than the parameters. The parameter prices correspond to values determined through the application of specific methods according to different cases.

Although the methods adopted by Brazil to set the parameter prices are based on the guidelines recommended by the OECD, the adjustments made by the country are heavily criticized. These criticisms center especially on the definitions of fixed percentage profit margins for comparison purposes, since they would not necessarily reflect margins adopted in trade, producing only an approximation of normal prices.

The parameter prices seek "normal" prices, which would be charged in transactions between independent companies in a competitive situation. The comparison between the prices charged and these nearly normal prices assesses how much the manipulation of the prices could be affecting the determination of the taxable profit. As a result, taxpayers must submit the differences they found to taxation whenever these differences are used to reduce tax bases.

The generalized exemption of exports, including primary products<sup>7</sup>, makes export much more attractive to this form of tax planning than imports, which are also subject to the Import Tax, in addition to domestic taxes (COFINS, PIS, IPI and ICMS [Contribution for of Social Security Financing, Social Integration Program, Tax on Industrialized Products, and Tax on the Movement of Goods and Services, a VAT type tax])<sup>8</sup>.

In this case, the over-invoicing of imports would only be justified in situations where the difference in taxation on income between the importing country and the exporting country is higher than the cost of import taxes, as well as cases where such over-invoicing happens in purchases of items that are normally not subject to customs taxation, such as services and duties related or unrelated to imported goods.

Another possibility created by the fact that large companies have the ability to manipulate international prices is the reduction of the tax burden on their imports by artificially reducing prices.

This method would be especially attractive for companies taxed by Lucro Presumido [Presumed Profit] (in which case the taxable profit corresponds to a fixed percentage of the revenue and is not influenced by the cost of the goods) or when they negotiate with companies located in countries with higher taxation. However, it must be noted that this arrangement does not correspond to a misappropriation of capital, but to a flow in the opposite direction, even though this inflow occurs on the fringe of the foreign exchange control system.

On the other hand, in regard to exports, any artificial reduction of the price reduces the taxable profit in the country (provided it is not accompanied by the offsetting of the taxable profit under the Law, as discussed above). Thus, by under-invoicing exports companies declare lower revenue than the one they earned; by over-invoicing imports they are actually oversizing their costs. In both cases the net profit registered at the end of the year is reduced and consequently the value of payable Corporate Income Tax and Social Contribution on Net Profit is reduced.

Companies may also organize their capital structure aiming to evade taxes and displace their assets internationally. Since multinationals are able to structure and redistribute their liabilities internationally, they tend to intensify the option for debt. Thus, indebted subsidiaries end up getting tax deductions through the payment of interest, which are paid to companies of the same group in other countries.

<sup>7</sup> The exemption of ICMS (Imposto sobre Circulação de Mercadorias e Serviços [Tax on the Circulation of Goods and Services]) [a value-added tax (VAT) type] on primary and semi-finished products geared towards exports has been in effect since the approval of the Kandir Law (Complementary Law 87/1996). Since this tax is the main source of revenue for the states, the regulatory change has had a strong impact on state finances. ICMS is the tax that generates the greatest income in Brazil, accounting for 20.84% of the total collected in Brazil in 2015 (Receita Federal do Brasil, 2016).

<sup>8</sup> The levying of state and federal import taxes is an instrument that may inhibit over-pricing: "as long as marginal import duties are higher than the marginal rate of corporate tax, there is no advantage in transferring higher import costs to corporate taxes" (KAR, 2014, p. 14). However, the limitation of this instrument indicates that other measures with a regulatory, supervisory nature should play a more important role in reducing capital flight and trade misinvoicing.



It is also important to consider that unreported resources sent abroad also receive unreported income, since tax havens are fully integrated into the international capital market. The income of these financial applications are also not reported in the official records nor subject to taxation. This financial accumulation in secrecy jurisdictions is an indicator of the growth of inequalities on a global scale, a process that happens covertly, which means that increasing inequality is being underestimated in the main indexes that seek to measure it (HENRY, 2012).

Service provision and the trade of luxury goods and specialty products, such as pharmaceuticals, are operations where it is difficult – and sometimes even not possible – to establish a benchmark market price. These goods and services and the specific features of each operation in the case of services are very heterogeneous, and it is difficult to identify the occurrence of trade under-/over-invoicing.

Consequently, these segments become important indicators of capital flight, with a tendency for price differentials (between the price charged and the price that would be charged in a relationship between unrelated companies) to be higher than those seen in business relationships.

This factor also limits the estimation of illicit financial flows, where services are often disregarded, also due to the scarcity of data on the service industry, or are taken into account based on strong assumptions – as do CAR et alli (2015) by intensifying the percentage of under-/over-invoicing in trade for the service industry – or more narrowly – as in Grondona and Burgos (2015), which only consider specific services<sup>9</sup>.

As the new economy grows, centered on the importance of intangible assets and in which intangible resources become more relevant, so does the importance of manipulating the price of these resources. Thus, price manipulation of patents, logos, brands and algorithms becomes more widely used, in a maneuver that is hardly detected since these prices are intrinsically difficult to set.

This is the reason why the giants of tax evasion are the companies of the new economy, Google, Apple and Amazon" (ZUCMAN; 2014; p. 135).

Capital flight and illicit financial flows, as part of a system in which tax havens actively operate to promote the accumulation of resources in their jurisdictions, have been contributing to increasing inequalities and injustices in the world economy. In fact, there is no record in recent history of a period when the concentration of wealth was as high as it is today.

The different forms of tax evasion imply a loss of sovereignty of nations, whose tax policy is restricted in the pursuit of maintaining the tax base – i.e., avoiding the transfer of these resources to other countries with lower taxation or even to tax havens. Tax collection should also be used as a tool to reduce inequalities by levying higher taxes on individuals with higher incomes and by levying taxes on capital income and on property.

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<sup>9</sup> This difficulty in measuring the value of flight through trade misinvoicing and the scarcity of data on services, which tend to be an important indicator of this practice, means that the obtained estimates, restricted to the commercial sector, are smaller. This lack of precision in the estimates underestimates the total value of this mechanism of capital flight.

However, under current conditions these measures are easily circumvented by wealthier families and by companies. Consequently, these families pay less taxes in proportion to their income, and in some cases States end up choosing forms of taxation that ensure collection, although they are more regressive, such as indirect taxes and taxes on labor income.

This process implies a loss of revenue, which can lead to a reduction of public policies and losses in essential services for the population<sup>10</sup>. In the case of developing countries, and among them poor countries, this restriction leads to even more severe consequences. These countries face greater social problems, and a greater share of their population is in conditions of poverty and misery. They end up losing important resources that could be directed towards alleviating poverty, promoting economic growth, and financing public services. It should also be noted that developed countries are also affected.

Public policies and the Welfare State in these countries were essential for the development of societies with a high quality of life and lower inequalities. However, for various reasons, including the aforementioned loss of tax resources, this arrangement is currently weak.

In addition, the size of the offshore economy undermines the consistency of the indicators of inequality, since the omission of such significant slices of the wealth and income of a minority of individuals masks an important part of inequality<sup>11</sup>. Inequality, therefore, tends to be much larger than the indexes suggest and does not necessarily follow the trend they present.

### 2.3 Mineral Sector and Tax Issues

Trade misinvoicing is widely used in the trading of commodities, minerals and basic inputs. Therefore, large companies in the extractive sector are responsible for significant losses in countries rich in natural resources (AREZKI; ROTA-GRAZIOSI; SENBET, 2013; HSU, 2014; CAR et alli, 2015).

The exploitation of reserves of mineral resources represents a favorable possibility in terms of increased production and income in a given country, the benefits of which could be diffused to other sectors of the economy.

However, many countries with a predominantly extractive economy, especially African countries, have experienced growth rates below the world average in the last decades and have not been experiencing the positive effects of extractivism on other sectors of the economy and on social indicators.

10. <sup>10</sup> Public spending can be financed by tax collection, by public debt issuance or by money creation. However, lower collection growth and tax rules related to the control of the public debt have politically justified – mainly in European countries, but also in Brazil and in other countries – the reduction of public services and the weakening of social policy.

11. <sup>11</sup> The accumulation of financial wealth in an economy in which the rate of return on capital often tends to be higher than the rate of growth of production output (and therefore income) is a powerful force that widens inequalities. The transfer of this property through inheritance enhances the long-term effect of the difference between the rates of capital remuneration and the growth rate of the product, also noting that the accumulated distance between the two rates is increasing (PIKETTY, 2014).

According to Arezki, Rota-Graziosi and Senbet (2013), CAR *et alli* (2015) and Ndikumana (2015), this fact is largely explained by the capital flight in these countries – notably illicit financial flows.

Thus, in African countries, heavily dependent on the mineral economy that is exploited by multinational companies, the evasion of income earned in the sector prevents the activity from promoting growth in the other sectors of the economy and also leads to large tax losses, eliminating possibilities of social policy and provision of public services by the State in regions where there are urgent demands for these services.

For these reasons, the growth of the extractive sector in these countries did not represent a generalized economic growth of the economy and did not lead to a beneficial development for the population (AREZKI; ROTA-GRAZIOSI; SENBET, 2013). The Zambian government estimates the loss of USD 2 billion a year (around 15% of the GDP) because of tax evasion by companies operating the country's copper mines.

Transfer prices erode not only the tax base of the country of exploitation but also of the countries of origin of the companies and may also affect countries that import these commodities in large quantities (AREZKI; ROTA-GRAZIOSI; SENBET, 2013; HSU, 2014). Most of the capital flight in Africa is concentrated in oil-rich countries. In addition, capital flight from African countries has grown considerably since the 2000s and has been occurring systematically (NDIKUMANA, 2015).

However, it is not only in the African economies that mining does not produce beneficial results for the growth and development of the countries. In Latin America, a privileged destination for global investment in mineral extraction (receiving 25% of global investment in 2011), mining companies enjoy extensive tax benefits and take advantage of the lack of transparency in order to avoid taxes (LATINDADD, 2013).

Moreover, as we will see in this study, at least in the Brazilian case, mining companies send capital abroad through the under-invoicing of their exports. The mineral sector is very important to many economies in the region and in many cases it is responsible for some of the main products in the exporting pattern of Latin American countries.

Consequently, the practices adopted by companies in the sector have negative effects that largely impact these countries, not only in economic terms but also from a social and environmental point of view<sup>12</sup>. The mineral sector is considered a very representative sector in its share in Foreign Direct Investment received by South American countries and it has a high share of exports of several countries in the region; this share followed a growing trend in the years 2000 (LATINDADD, 2013).

A study carried out by the Norwegian organization Publish What You Pay on the ten largest multinationals in the extractive sector revealed that 34.5% of the over six thousand subsidiaries of these companies are in secrecy jurisdictions, which allows them to hide information about their accounts.

<sup>12</sup> Mining and oil companies relate to numerous socio-environmental conflicts arising from their exploitation and production activities. These companies account for 56.55% of total conflicts of this kind in the Peruvian territory (LATINDADD, 2013).

The same study highlights that multinationals use other resources, such as the creation of subsidiaries to act as owners of assets and brands in opaque jurisdictions such as the Netherlands; pay high administrative fees directing the resources of the company of the group located in the country where the income is generated to a company located in a country with favored taxation; charge transfer prices to transfer resources between different countries; and grant loans among members of the group, sometimes with high interest rates (LATINDADD, 2013).

A particular example is provided by Wiener and Torres (2014) when they analyze the case of the Peruvian company Yannacocha, the country's largest gold mining company.

There was a major incongruity in the company's production costs, while it was known in the market as one of the most profitable mining companies in the world.

Production costs, which remained stable from the 1990s to 2005, began to rise as the price of gold rose. In 2013, when the price of gold soared, the company's registered production cost also soared, reducing taxable profit and thus the value of taxes to be paid by the mining company. Thus, in the same year in which the price of gold rose rapidly, the miner recorded a loss.

Wiener and Torres (2014) conclude their analysis by stating that Yannacocha's revenues are decreased by the accounting, so that the strong rise in the price of gold – especially between 2006 and 2012 – was not reflected in an increase in the value of income tax paid by the company.

In the case of Brazil, the mineral economy also has a very important share of production and, especially, of the country's exporting pattern. In 2005, mineral exports of primary goods represented 11.7% of the total value of Brazilian exports; iron ore exports alone accounted for 7.4% of the value exported in the same year – more than 63.2% of total mineral exports (IBRAM, 2016a; IBRAM, 2016b; MDIC, 2017).

Before the sharp reduction in prices in commodity markets, the share of the mineral economy in exports was even more significant. In 2013, the mineral sector accounted for 16.7% of Brazilian exports.

Iron ore exports in the same year accounted for 13.4% of total exports and over 80% of mineral exports (IBRAM, 2014).

Since the 2000s, mining activity has been rapidly growing, in a context that is very favorable to the growth of demand and with high prices in the international market.

However, the importance of the mineral economy is not compatible with the sum of tax collection it provides.

Comparing the largest mining company in Brazil, Vale S/A, with the largest oil company, Petrobrás, Dalpian et alli (2014) show that in 2008 the collection of indirect taxes and financial compensation of the oil company was 80 times higher than the collection of the mining company. Meanwhile, in the same year, Petrobras' profit surpassed Vale's net profit by only 1.4 times<sup>13</sup>.

<sup>13</sup> Still according to Dalpian et alli (2014, p. 13), in "2008, Petrobrás reported a net income of USD 18.9 billion and Vale, of USD 13.2 billion. During the same period, the first generated indirect tax collection, plus royalties, of R\$ 80 billion, while the second, in the same terms, generated values below R\$ 1 billion."

This specific trait of the tax treatment of the mineral extractive sector stems mainly from its predominantly exporting character.

The Brazilian tax collection consists predominantly of indirect taxes, with more than 50% of the total collection levied on consumption (BRAZIL, 2015). These indirect taxes are exactly those from which export-led production is exempt.

In this case, as shown by Dalpian et alli (2014), mining becomes immune or exempt from several federal taxes and also from the main state tax, ICMS, which characterizes the under-taxation of mining in Brazil.

Thus, mining activity that over time depletes nonrenewable resources and causes negative environmental impacts <sup>14</sup> has not, in many cases, been producing results for economic development. In addition, the income generated by this activity is not shared by society to the extent it should be.

Based on this presentation of basic concepts that involve the issue of capital flight as well as its relationship with the mineral sector, Section 3 deals with the methodology used to measure the under-invoicing of iron ore exports in Brazil and the results of this estimate.

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<sup>14</sup> As is the case of the accident in the city of Mariana, Minas Gerais, Brazil, which happened in November 2015 and killed 21 people, destroyed a village and lead to serious environmental consequences to the region, not yet fully measurable.

### 3. Measurement of the Under-Invoicing of Iron Ore Exports in Brazil

Section 3.1 describes the methodology used to obtain the estimates for the under-invoicing of iron ore exports, presenting the methodological options adopted in this study, given the difficulties of any estimate for transfer prices and trade misinvoicing. These difficulties are widely recognized in the literature, so that different solutions were found<sup>15</sup>.

Section 3.2 presents the results of the estimate and additional data on the destinations and the countries of purchase of iron ore exports.

#### 3.1 Methodology

Since iron ore is a commodity in the international market, price distortions in international trade become more explicit, and it is therefore simpler to identify and estimate the under-invoicing of exports and the over-invoicing of imports.

Considering the high share of iron ore in Brazil's exporting pattern and therefore the high volume of iron ore exports, transfer pricing in these exports translates into an expressive trade under-invoicing. Accordingly, even though the estimate is restricted to only one product, it is the country's main export product, and thus the results we achieved are very relevant to the analysis of capital flight in general.

The commodities market is an international market for the trading of homogeneous goods of uniform quality that are traded in large volumes. The prices set in this kind of markets tend to have global reach and suffer daily fluctuations. These markets trade agricultural products, minerals and energy resources. The existence of an international market price in these markets allows the establishment of a comparison basis for the prices the companies charge in the international transactions of these goods. Consequently, the market price benchmark may be used to ascertain the practice of trade misinvoicing<sup>16</sup>.

However, the iron ore market has specific features that make it more complex when compared to the market of most metals or even other commodities. The lack of substitute products and the concentration of the producer and consumer markets are important characteristics that interfere in the dynamics of this market. The use of iron ore in the steel industry – almost absolute destination of production – requires precise specifications as to the content of iron and impurities, leading to close interaction between producers and consumers. So as the operation of blast furnaces is not interrupted, there is a need to ensure the supply of iron ore, which created the market's trend towards contracts for the long-term supply and the maintenance of stock in steel mills (CANTISANO, 2012).

<sup>15</sup> Grondona (2015) reviews and discusses the different methodologies used to measure capital flight through transfer pricing.

<sup>16</sup> Comparisons made in this way are in line with the arm's length principle advocated by the OECD.

The production of iron ore generates three basic products: fines, that is, non-agglomerated iron ore, and agglomerates in the shape of pellets or sinters. The agglomeration process enables the addition of more value to the merchandise, but it is usually more strongly linked to the destination market, since its transportation is more costly. Therefore, the transoceanic pellet market is restricted to less than 25% of the total produced in the world. For the same reason, the company Vale S.A. installed subsidiaries in China to pelletize iron ore (MOURÃO, 2008).

The estimates made in this study refer to exports of non-agglomerated iron ore, which are more expressive in value and quantity in total Brazilian exports. Non-agglomerated ores are more homogeneous products, allowing the use of the international market price as the benchmark price.

The estimate focused on the measurement of the under-invoicing of iron ore exports. Two complementary methodologies were used to obtain two estimates of the under-invoicing of exports, resulting in two different estimates. Thus, it was possible to compare the two results we obtained, and, given their proximity, they could be considered valid. The results are presented in Section 3.2.

The first estimate was made by comparing the monthly averages of export prices with the monthly averages of the trading prices of iron ore in the international market. Data on the monthly averages of export prices, as well as data on the export quantity and the value of exports, were obtained from the ALICE-WEB system, linked to MDIC - Ministério do Desenvolvimento, Indústria e Comércio Exterior [Brazilian Ministry of Development, Industry and Foreign Trade].

As for the benchmark price in the international market, the series of commodity prices provided by the International Monetary Fund (IMF) was used, with the benchmark defined as the price of non-agglomerated iron ore, composition of 62%, imported by China, through the Tianjin port, in the spot market, in dollars per tonne. Therefore, the international market price includes the freight up to the Chinese market, since China is the main importer of iron ore in the world. Thus, in order to make the Free On Board (FOB) export price and the Cost and Freight (CFR) market price comparable, it is also necessary to add the cost of the freight between Brazil and China to the estimate.

The monthly average of the daily market prices of the transportation price from the Port of Tubarão, Espírito Santo, to Qingdao, China, was used, according to data available in the Platts system. It is thus possible to compare export prices and international market prices for iron ore. The comparison is made by the difference between the international market price and the export price plus the freight cost. When this difference is positive, there is under-invoicing of the exports of the product, and the total under-invoicing in each analyzed month is equal to the product between the price differential and the export quantity in the same period, according to statistics on exports provided by the Alice-Web system. The period under analysis extended from February 2009 to December 2015<sup>17</sup>.

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<sup>17</sup> The choice of period was based on the limited availability of data on freight cost.

The results are presented in real values as of December 2015, updated by the Consumer Price Index All Urban Consumers of the Bureau of Labor Statistics of the United States, since all prices are provided in US dollars.

It is important to note that the method described above is in accordance with the arm's length principle proposed by the OECD and also with Brazilian legislation, Law 9,430/1996, which governs transfer pricing.

According to this Law, in the case of commodity exports, the price charged in exports must be compared with the international market price of the commodity <sup>18</sup>. Thus, it was not necessary to adopt a margin around the benchmark price to estimate the under-invoicing of exports, as this would result in an undue reduction of this estimate.

Using the data on the freight cost for iron ore allows for a more accurate analysis of transfer prices in this sector. Therefore, it was not necessary to use conversion rates between Free On Board export prices and Cost Insurance and Freight prices. The freight cost varied during the observed period. These variations would not be detected in the results with the adoption of a fixed percentage for the conversion of prices.

Since the freight cost varied along with the international market price of iron ore in many periods, the use of this data is even more important. Thus, it is possible to observe how using freight enables an even better observation of the variation of the price differential, noticing the periods in which this differential was greater or lower, more accurately than would be possible by imposing a constant conversion rate throughout the period.

In addition, it should be noted that Brazilian iron ore is recognized for having a higher quality (such as higher iron content in the ore composition), which tends to generate additional payments – premiums – for national mining companies <sup>19</sup>. This additional remuneration means that often the price paid for Brazilian iron ore would be above the international market price of this ore within standard characteristics.

However, it was not possible to incorporate this premium into the estimate, since the premium and the portion of the export iron ore that earns this additional remuneration are not known in detail. Consequently, the measurement we carried out tends to underestimate the value of the under-invoicing of exports.

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<sup>18</sup> As discussed in Section 2.2, the Law is restricted to commercial operations or to the provision of services with related companies established abroad or with companies established in countries with favored taxation. Although it is not possible to identify whether the transactions take place between related companies or not, it should be considered that during the period under analysis more than 80% of iron ore exports were bought by companies headquartered in countries with favored taxation, according to information presented in Section 3.2.4.

<sup>19</sup> The trend of the premium paid also varies according to the conditions of the market. However, specialized news reports record the payment of premiums on the purchase of iron ore with specific qualities. Vale even received an additional compensation of USD 10 per tonne of ore in early 2012, in a period with prices that were favorable for exporters. Starting in 2013, the premiums were around USD 2.50. Also during the most recent period, premiums above USD 2.50 were observed in the purchase of iron ore with specific characteristics (MINÉRIO DE FERRO, 2016a; MINÉRIO DE FERRO, 2016b). However, it was not possible to identify the share of the highest quality ore in total iron exports.



In addition to the impossibility of considering the quality premium, the estimates do not consider the different imported inputs, through which companies can evade capital by over-invoicing their imports, especially when it comes to specialized products and even more when acquiring services.

Finally, the payment of interest on loans abroad can also, from larger quantities, be regarded as another form of capital flight practiced by different companies not considered in the calculation.

The second estimate, in turn, used data provided by the United Nations Commodity Trade Statistics Database (UN Comtrade), a database set up based on the consolidation of official statistics provided by different countries. The data referring to Brazilian exports available at UN Comtrade corresponds exactly to the data obtained in the Alice-Web system and used in the first estimate.

On the import side, on the other hand, we obtained data on the quantity, value and price of iron ore imports from Brazil, as registered in the importing countries. The divergence between the export prices registered in Brazil and the import prices registered in the countries of destination indicates the existence of trade misinvoicing.

It is important to note that in order for export and import prices to be comparable, it was necessary to incorporate the cost associated with freight into the estimate. This adjustment was made using the same series of freight cost used in the first estimate.

There were divergences between the quantities registered in Brazil and in the countries that import Brazilian ore in the data obtained at UN Comtrade. This difference was small in 2010, 2011 and 2012 but was considerable in 2013, 2014 and 2015. Small statistical differences between countries in the volume of exports and imports are associated with problems in the classification of goods or with time issues, since the goods that leave the country in one period may enter another country in the following period.

Thus, the difference observed between 2010 and 2012 does not represent a problem for the estimate. On the other hand, between 2013 and 2015, the difference is due to the fact that the data on Chinese imports <sup>20</sup> is not available in the monthly periodicity used for the estimate, which largely affects the data on the total volume of imports. Therefore, we decided to use the data on the quantity of exports, according to the registration made in Brazil, to obtain the estimate of trade misinvoicing for each month from 2010 to 2015.

It should be noted that UN Comtrade does not provide monthly statistics on iron ore trade for 2009. Thus, data referring to this year were used in its annual averages and were added to the total of subsequent years to make the estimate of trade misinvoicing for the period from 2009 to 2015. The annual value of the estimate for 2009 and the monthly values for the period from 2010 to 2015 were updated according to the U.S. consumer price index. The results we obtained allow a comparison between the two estimates, validating the analysis we performed.

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<sup>20</sup> When we present the behavior of import prices in the main countries of destination of Brazilian iron exports, the annual data relating to China made available at UN Comtrade in the years 2013, 2014 and 2015 is used.

The estimate is restricted to the measurement of trade misinvoicing in iron ore exports. Other forms of capital flight related to the export of other products, the provision of services and lending are therefore not taken into account.

Nevertheless, it is a product that has a very significant share of Brazilian exports in an important sector for the country's economy. Therefore, an analysis focused on the exports of this product is very relevant.

Complementarily, information was obtained regarding the countries of purchase of Brazilian iron ore exports, in order to compare them with the countries of destination of the exports.

Thus, it was possible to identify whether the purchases are made in the countries of destination or if they are made in other countries, highlighting, in this case, whether these countries are tax havens or countries in which some productive or commercial function is performed. These data is presented in Section 3.2.4. The data was requested directly from RFB - Receita Federal do Brasil [Brazil's Federal Revenue Service] for the purposes of this research, in accordance with Law 12,524/2011 in force since May 2012, known as LAI - Lei de Acesso à Informação [Information Access Law].

## 3.2 Measurement of the Under-Invoicing of Iron Ore Exports in Brazil: Results

### 3.2.1 Estimate of the Under-Invoicing of Iron Ore Exports in Brazil

In this first part of the research, we sought to estimate the under-invoicing of iron ore exports (iron ores and concentrates, other than non-agglomerated roasted iron pyrites (pyrite ash), NCM 26011100). The period of analysis was delimited due to the availability of the data needed to obtain the results.

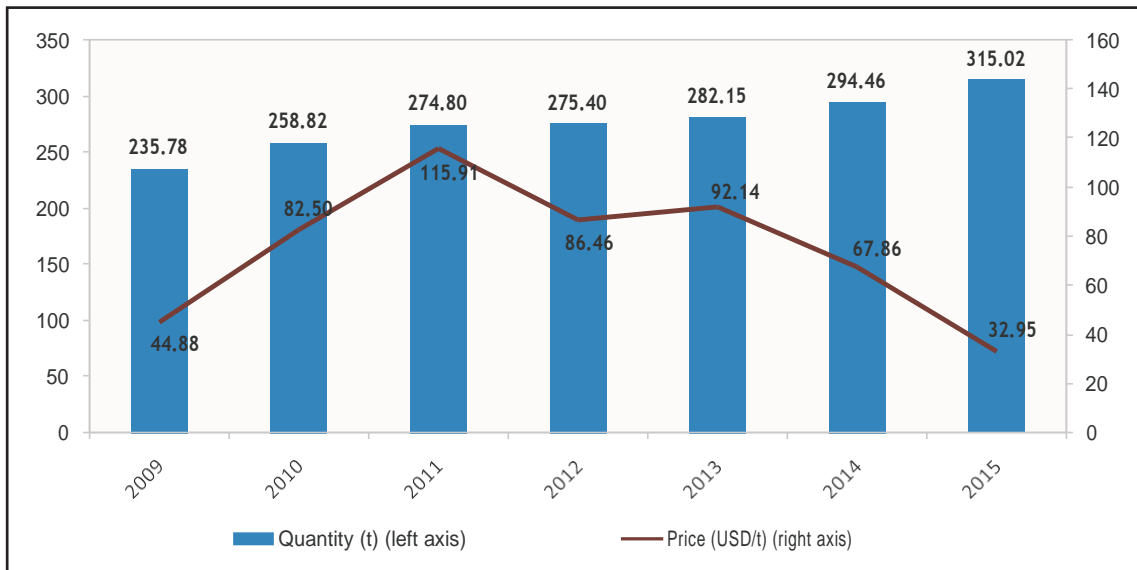
Thus, with respect to the series of data on exports obtained in the Aliceweb system made available by the Brazilian Ministry of Development, Industry and Foreign Trade, the period under investigation begins in February 2009 and ends in December 2015. In turn, the analysis based on the information obtained at UN Comtrade was carried out with the monthly data available as of 2010 and with the annual data for 2009<sup>21</sup>.

According to the data shown in Graph 1, between February 2009 and December 2015 Brazil exported a total of USD 148,526,825,724.04, at December 2015 values. The export quantity increased annually, reaching an export total of 235.8 tonnes in 2009 and 315.0 tonnes in 2015. The average export price varied considerably during this period, starting at 44.9 dollars per tonne in 2009, growing rapidly until it reached 115.9 dollars per tonne in 2011.

Subsequently, the price declined to a lesser extent to 86.5 in 2012 and to 92.1 in 2013; then it followed a downward trend, reaching the lowest value of the series in 2015 (32.9 dollars per tonne on average).

<sup>21</sup> Section 3 discusses the details of the methodologies used to make the two estimates we presented.

Graph 1 - Iron Ore Exports, Export Quantity (in million tonnes) and Export Price (in dollars per tonne).



Source: Drawn by the author. Data from AliceWeb/MDIC; IMF.

Table 2 - Iron Ore Exports in Brazil - 2009 to 2015, in million dollars.

Year	Value of exports
2009	11,671.3
2010	23,137.5
2011	33,442.5
2012	24,517.2
2013	26,386.3
2014	19,965.8
2015	10,358.3

Source: Drawn by the author. Data from AliceWeb/MDIC; IMF.

Note: at December 2015 prices.

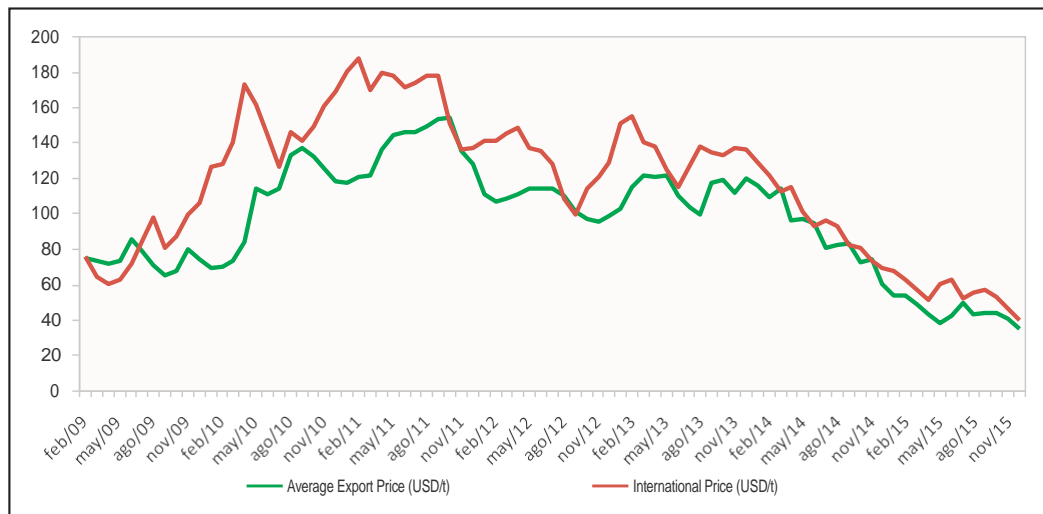
With the oscillations in the price of the commodity, the value of iron ore exports also varied greatly during the period in question. Thus, according to the data presented in Table 2, it can be observed that the export value exceeded 33 billion dollars in 2011, the year in which the average price charged was the highest in the series. However, with the decline in prices, the export value also decreased, reaching 19.9 billion dollars in 2014 and 10.3 billion dollars in 2015. The latter figure was slightly lower than in 2009, although the value in 2015 is associated with an export quantity 33.6% higher than that exported in 2009.

The comparison between the behavior of the average export price registered by the Brazilian authorities and the evolution of the international market price of iron ore reveals a systematic, practically continuous distance between the two prices throughout the period. The greatest distances between the two series were observed in the intervals from April to March 2010 and from January to February 2011. These periods were associated with peaks in the evolution of the international market price of iron ore, peaks that only had a partial, lagged counterpart in the average export price.

In April 2010, the difference reached USD 88.24, the highest value during the period. In most of the series, this difference was above USD 10, with high frequency above USD 20 (40% of the periods).

It is worth noting that there was a reduction in this distance in the last two years, as the international price of iron ore decreased, in line with the movement of commodity prices in the global market, as shown in Graph 2. Nevertheless, a positive, significant difference persisted for most months.

Graph 2 - Average Export Price of Iron Ore Reported to the Brazilian Authorities and Price in the International Market, dollars per tonne.



Source: Drawn by the author. Data from AliceWeb/MDIC; IMF; Platts.

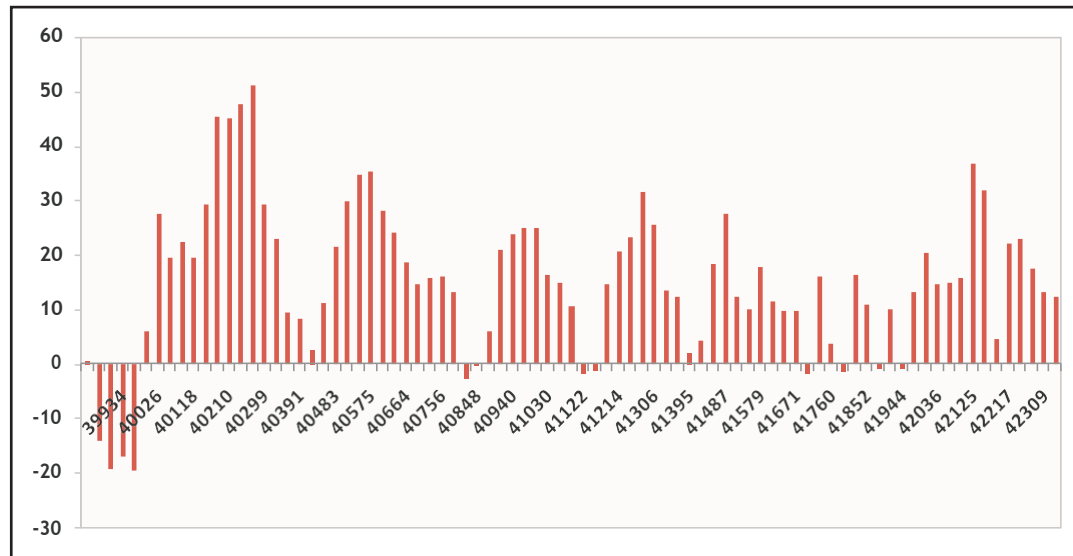
It should also be noted that in other periods the two prices were very close, with moments when the average export price slightly exceeded the international price. These periods are more easily identified in Graph 3, which presents the price differential as a percentage of the international price, where periods in which this differential is slightly below zero are visible.

Most of the time, however, this differential fluctuates between 10 and 25%.

It is also important to note that there were very similar variations in the average export price and the international price of the iron ore commodity. Graph 2 shows that the first one followed the variation of the international price with some lag.

This proximity between the oscillations is also noticed due to the high correlation coefficient between the two series: a coefficient of 0.87.

Graph 3 - Price Differential as a Percentage of the International Market Price of Brazilian Iron Ore



Source: Drawn by the author. Data from AliceWeb/MDIC; IMF; Platts.

Finally, Graph 4 shows the evolution of the under-invoicing of exports identified due to the difference between the average price charged in exports and the international market price of iron ore, taking into account the freight cost.

The value of the under-invoicing for each period was obtained by multiplying the detected price differential by the export quantity during the same period.

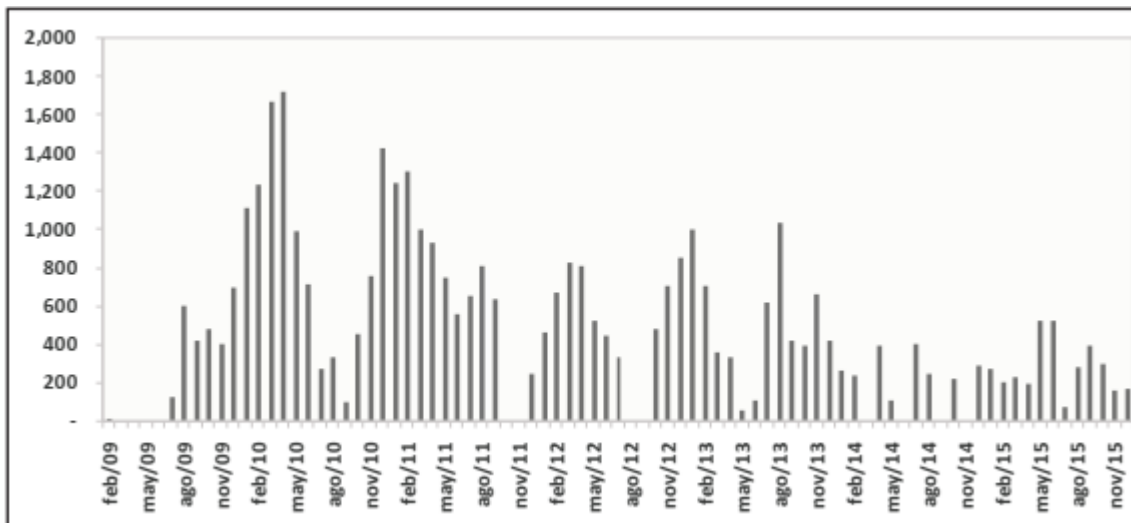
This value followed a downward trend during the analyzed period, due to the decrease in the international price of iron ore and to the reduction of the distance between the charged price and the market price.

The value decreased even with the expansion of the export quantity. It should also be noted that there was not a decrease in this distance between the two prices in 2015 when considered in relation to the market price – as shown in Graph 3; yet it declined in absolute terms.

The persistence of a more stable percentage distance may indicate that the difference between the prices is roughly stipulated as a margin of the international price.

The under-voicing of exports totaled USD 39.132 billion between February 2009 and December 2015, at December 2015 real values. This means an average monthly under-invoicing of USD 471.47 millions. The total value for the period represented 26.4% of the value of iron ore exports registered for the same period.

Graph 4 - Under-Invoicing of Iron Ore Exports in Brazil - million dollars

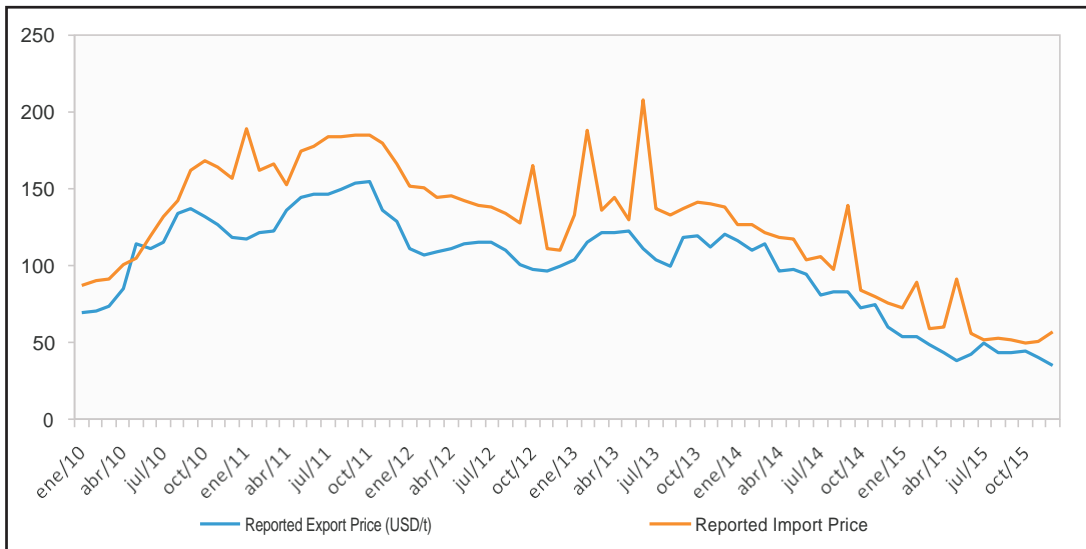


Source: Drawn by the author. Data from AliceWeb/MDIC; IMF; Platts. Note: at December 2015 prices.

The same analysis was carried out using data from the United Nations Commodity Trade Statistics Database (UN Comtrade), in order to compare the results obtained in the different sources of information. This database is formed with official data on foreign trade generated by each country, which is usually passed on directly by the authorities of each country. Thus, the data on Brazilian exports available at UN Comtrade corresponds exactly to the data provided by MDIC in the Aliceweb system. This means that both analyzes used the same data for the quantity, value and price of iron ore exports. In contrast, the other data used here refers to imports reported in the countries of destination of Brazilian exports. Therefore, the values and quantities registered by these countries were added up in order to obtain series of total values and quantities and prices of iron ore imports from Brazil. As mentioned above, this time the analysis period begins in January 2010 and extends until December 2015.

Graph 5 presents the series of the average price of iron ore exports reported to the Brazilian authorities and of the import price of this ore reported in the different countries of destination. It is possible to observe that the evolution of the prices is very similar to that seen in the previous analysis – carried out with the international market price of the commodity –, although there are some different peaks in the series of international prices. Likewise, the existence of a systematic, continuous significant distance between export and import prices is also a common characteristic between the analysis we carried out above and the current analysis. Therefore, in this case there was also a difference between the export price and the import price of iron ore, an indication of the under-invoicing of exports.

Graph 5 - Average Price of Iron Ore Exports in Brazil and Price of Iron Ore Imports in the Countries of Destination - dollars per tonne.



Source: Drawn by the author. Data from UN Comtrade; Platts.

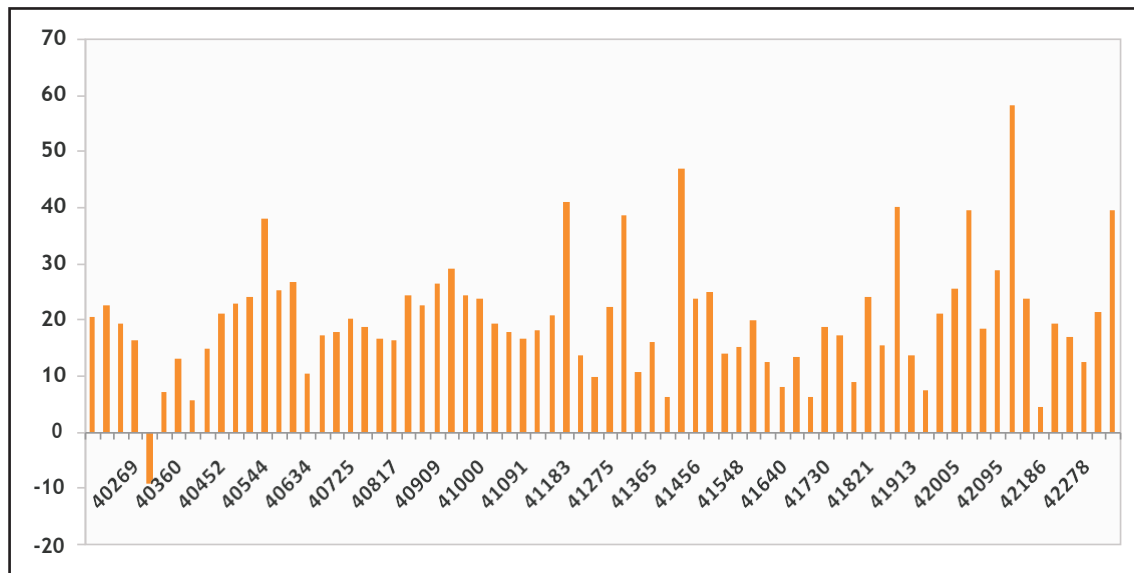
The periods in which the difference between the two prices was higher corresponded to peak periods in the reported import price.

The largest differences were observed in June 2013 (USD 97.1), February 2013 (USD 72.4) and October 2012 (USD 67.4). In addition, it is possible to note that the decrease in the international price of iron ore observed since 2014 had a reflection again in the reduction of the difference between the reported import price and the reported export price.

However, as can be seen in Graph 6, this did not represent a reduction in this distance when it is observed in percentage terms of the import price. This is especially true for the year 2015, which averaged a higher percentage difference than that which had occurred between 2011 and 2013. In 2014, there had indeed been a reduction in that value, although it was not very distant from what was observed in other periods, remaining above the value corresponding to the year 2010. Thus, these annual averages of this distance in percentage terms ranged between 15% (in 2010) and 25.8% (in 2015).

There were similar movements in their fluctuations in the two series of prices from UN Comtrade. The correlation coefficient between the two series is 0.90, indicating a strong correlation between their variations.

Graph 6 - Price Differential as a Percentage of the Import Price of Brazilian Partners



Source: Drawn by the author. Data from UN Comtrade; Platts.

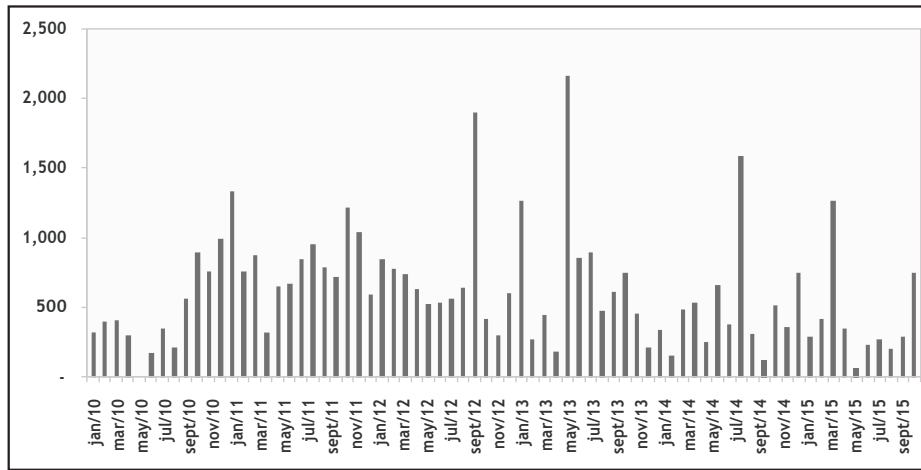
Based on the price differentials observed in the series from UN Comtrade, it was possible to estimate capital flight through trade misinvoicing. However, since this estimate uses the difference between the reported import price in the countries of destination and the reported export price in Brazil, it is not possible to distinguish the extent to which the result we obtained is associated with the under-invoicing of exports in Brazil and to what extent it is due to the over-invoicing of imports in the several countries of destination. Therefore, it is not possible to specify the portion of the estimate that corresponds to the capital flight from Brazil.

The sum of capital flight due to trade misinvoicing in the period from 2009 to 2015 totaled USD 49,064 million at December 2015 values, according to the estimate made from data from UN Comtrade. This value is equivalent to a monthly average of USD 584.1 million. Between 2010 and 2015, the under-invoiced value, according to the same estimate, was USD 45.124 million. This value, in turn, represents a monthly average quantity of USD 626.7 million. The value of under-invoicing of exports between 2010 and 2015 corresponded to 32.7% of the total value of exports for the same period (a more significant share than that obtained in the analysis that used the international market price of iron ore as a benchmark).

Graph 7 shows the evolution of the under-invoicing of exports resulting from the comparison between the import price and the export price of iron ore. It is possible to see that there was a greater under-invoiced value in years like 2011 and 2012. Likewise, it is possible to identify that the periods with the highest under-invoiced value (June 2013 and April 2012) were among the periods that presented the greatest price differential, as seen above. It is also worth noting a reduction in the under-invoiced value in the years 2014 and 2015, despite the increase in the export quantity. This decline is therefore attributed exclusively to the effect of the control of the differential between import and export prices.



Graph 7 - Trade Misinvoicing in Million Dollars.

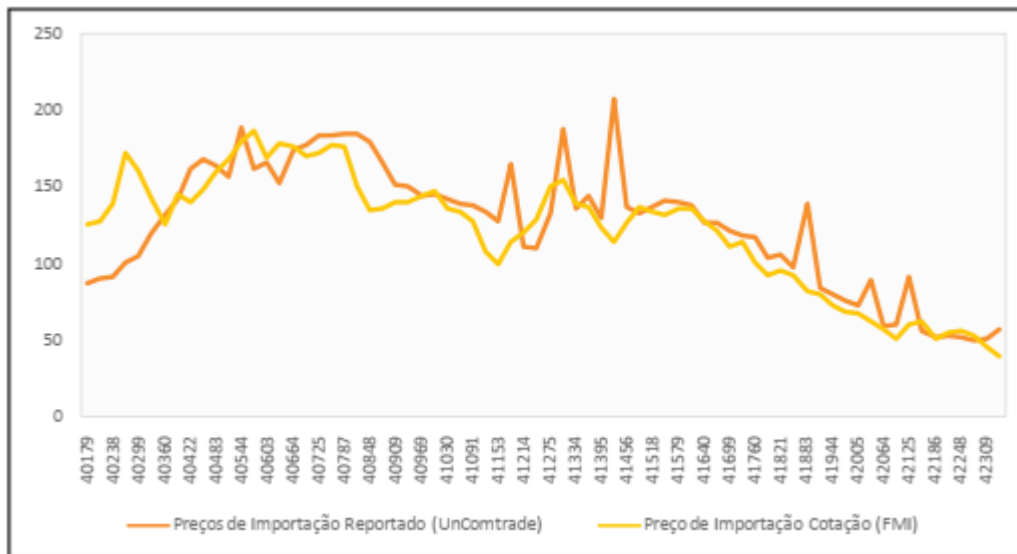


Source: Drawn by the author. Data from UN Comtrade; Platts. Note: at December 2015 prices.

### 3.2.2 Comparison between Two Data Sources

The series of reported import prices based on data from UN Comtrade and the international market price of iron ore followed a very similar trend, as shown in Graph 8.

Graph 8 - Evolution of the International Market Price of Iron Ore and of the Import Price Reported by Brazil's Trading Partners



Source: Drawn by the author. Data from AliceWeb/MDIC; IMF; UN Comtrade.

A striking difference is the peaks in the UN Comtrade series of import prices, observed during the periods of February, April and June 2013 and September 2014. There were also two less pronounced peaks in this series in February and May 2015. The correlation coefficient between the two series for the period from January 2010 to December 2015 was 0.82, which means that there is a high correlation between them.

In this study, we chose to make two similar estimates of capital flight through trade misinvoicing based on data from different sources.

Thus, data from a second source would validate the results obtained in the first estimate. However, the two estimates made here are not directly comparable. The first estimate exclusively accounts for the under-invoicing of Brazilian exports in accordance with Brazilian legislation and with the arm's length principle. In turn, the second estimate uses information reported in importing countries and therefore does not distinguish how much of the price differential is due to the under-invoicing of exports and how much is due to the over-invoicing of imports. Since it does not make this distinction, as expected this estimate presented a higher value than the first one.

The difference between the two estimates was high, nearing 10 billion dollars. Nevertheless, it should be emphasized that the evolution of the series of import prices provided by UN Comtrade and the series of international market prices of iron ore provided by the IMF were very similar, with very close values.

The two series are strongly, positively correlated. Therefore, the UN Comtrade data provides a validation of the statistics on foreign trade used in the first estimate and consequently also of the results obtained in that estimate.

### 3.2.3 Tax Impact of the Under-Invoicing of Iron Ore Exports

In principle there should be no tax impact on the Corporate Income Tax, since legislation on transfer pricing (Law 9,430/95) would fulfill the function of correcting such distortions. However, there were some weaknesses in the legislation in force until 2012, enabling companies to significantly reduce the value of the Income Tax and of the Social Contribution on Profit, by means of tax planning devices.

The legislation in force up to 2012 provided that to determine taxable income companies could use as a parameter price of the exported product "the cost of production plus a profit margin of 15% of the cost" (Law 9,430/95, article 19, paragraph 3, section IV). In other words, if the parameter price was higher than the price charged (export price charged), the difference should be added to the taxable profit. This difference is called adjustment (addition to profit) in the statement of Corporate Income Tax.

In order to circumvent this law and not to pay taxes in Brazil (suppressing the adjustment in the Corporate Income Tax), the companies adopted the mechanism of triangulation with themselves (self-intermediation), through the creation of subsidiaries in tax havens, commonly known as "reinvertors" which began to purchase the iron ore exported by the Brazilian parent company at a low price ("cost + 15%"), re-invoicing it with the market price for the true buyer of the product. Therefore, the profit is transferred to the subsidiary of the Brazilian company located in a tax haven, where taxation is very low or zero. The research carried out by IJF, mentioned in section 3.2.4 of this study, confirms this practice, when it shows that Switzerland is the largest buyer of Brazilian iron ore, that is, it purchases more than 80% of the total exported by Brazil (research carried out by the purchasing country).

However, the destination of this ore is not Switzerland but China, which is the main importing country of the Brazilian mineral, accounting for 66.5% of the export total, according to this study (research made by the country of destination of exports).

It is difficult to estimate the loss of tax collection resulting from this under-invoicing due to the lack of consolidated data of the statement of the Corporate Income Tax. However, a study on transfer pricing carried out in 2015 by Carlos Eduardo Mantovani, by FGV/SP [Getúlio Vargas Foundation], shows that during the years 2011 and 2012, companies did not make any adjustments to their statements of the Income Tax, that is, under-invoicing was not taxed in Brazil. Although the years 2009 and 2010 were not included in Mantovani's study, it appears that under-invoicing has also not been taxed during this period.

Therefore, based on the first estimate of under-invoicing of Brazilian iron ore exports, it is possible to estimate that the loss of tax collection for the period from 2009 to 2012 was USD 9.4 billion, which corresponds to the application of the 34% rate (Corporate Income Tax + Social Contribution on Net Profit) on an estimated under-invoicing of USD 27.6 billion. This value represented an annual loss of collection of USD 2.3 billion on average. In relation to the period from 2013 to 2015, the under-invoicing of commodity exports should not have had an impact on the collection of the Corporate Income Tax from 2013 onwards, since Law 12,715/2012 (amendment of Law 9,430/95) had introduced a new method (PECEX) to calculate the parameter price for companies that export commodities, subject to the market price on commodities and futures exchanges.

Since the adoption of this new legislation, commodity exporters were required to use "the average daily price of goods subject to public prices in internationally recognized commodities and futures exchanges" as their parameter price to calculate taxable profit. Therefore, if there is under-invoicing of iron ore exports, its value should be added to the taxable profit.

In short, the new legislation aimed to end the under-invoicing of commodity exports for tax purposes, requiring taxpayers to adopt the public price traded in commodities and futures exchanges.

It is possible to note, however, as the study carried out by Mantovani shows, that in the year 2013, when the new law was enacted, companies added a R\$ 3,265,063,480.89 to their taxable income (table 3 of the study), equivalent to USD 1.4 billion, which corresponds to only 23% of the estimated under-invoicing.

Thus, it is possible to estimate tax evasion in 2013 quite precisely. Taking into account the current rates of the income tax, 25%, and of the social contribution on profit, 9%, and considering that the total unreported under-invoicing was USD 4,682,611,334, tax evasion that year was USD 1.6 billion.

Although Mantovani's study does not provide the under-invoicing values submitted to taxation in 2014 and 2015, the value of tax evasion can be estimated, considering that for these years the same percentage of 23% of the under-invoiced value would have been submitted to taxation. Thus, the estimated value of the loss of tax collection in 2014 and 2015 can be estimated at USD 560 million and USD 855 million, respectively.

In short, the losses in tax collection totaled USD 12.4 billion in the period from 2009 to 2015, according to the following table:

**Table 3 - Estimate of Tax Losses from 2009 to 2015**

Year	Under-Invoicing in USD				Tax Loss in USD
	Estimated	Taxed	Taxed %	Non-Taxed Value	Corporate Income Tax + Social Contribution on Profit = 34%
2009	2,723,709,246	0	0 %	2,723,709,246	926,061,144
2010	10,760,432,295	0	0 %	10,760,432,295	3,658,546,980
2011	8,097,046,297	0	0 %	8,097,046,297	2,752,995,741
2012	6,068,162,069	0	0 %	6,068,162,069	2,063,175,104
2013	6,077,937,607	1,395,326,273	23 %	4,682,611,334	1,592,087,853
2014	2,138,363,201	491,823,536	23 %	1,646,539,665	559,823,486
2015	3,266,688,973	751,338,464	23 %	2,515,350,509	855,219,173
<b>Total</b>	<b>39,132,339,688</b>	<b>2,638,488,273</b>		<b>36,493,851,415</b>	<b>12,407,909,481</b>

The significant estimated loss refers only to taxes imposed directly on the profit of companies that export iron ore, without considering indirect impacts, such as the loss associated with the (undeclared) financial income obtained from the property resources owned by residents that were sent and invested abroad and losses related to the lack of payment of CFEM (Compensação Financeira pela Exploração de Recursos Minerais [Financial Compensation for the Exploration of Mineral Resources]), which is levied based on the net sales of the activity.

### 3.2.4 Results of the Consultation through Lei de Acesso à Informação [Information Access Law]

The data obtained through the Information Access Law reveal the discrepancy observed regarding the main destinations of iron ore exports and the countries of purchase of the export iron ore. The difference between the country of purchase and the country of destination of exports indicates some form of intermediation in international trade,

which may be based on real or fictitious operations. Table 3 presents the main countries of purchase of the iron ore exported by Brazil in 2015, with the quantities and values they acquired and the shares of each country in the total Brazilian exports of this ore. Accordingly, it is worth noting the share of Switzerland as responsible for the majority of purchases of iron ore in recent years, given that since 2011 the country is responsible for over 80% of purchases in terms of volume and of value of the export iron ore. Comparing Table 3 with Table 5, presented in the Annex, which lists the main destinations for iron ore exports, the divergence between the groups of countries is evident. It is possible to note that only the United Kingdom and China appear in the two tables and yet with very different shares and values in both cases.

The analysis we carried out in this section is supplemented by the study of the evolution of import prices registered by Brazil's main trading partners in the iron market, presented in the Annex, including estimates of transfer prices and capital flight made through the commercial transactions in question. In the case of China, a capital outflow of 27.9 billion dollars was estimated between 2009 and 2015. This figure represented 32.3% of the value of iron ore exports to China that was reported to the Brazilian authorities.

Table 4 - Main Countries of Purchase of Iron Ore in Brazil - in 2015

Country of Purchase	Quantity (t)	(%)	Value (thousand USD)	(%)
Switzerland	272,411,712	85.9	8,714,469	83.8
Austria	29,204,329	9.2	1,077,586	10.4
United Kingdom	8,891,145	2.8	370,584	3.6
Argentina	4,081,749	1.3	113,338	1.3
Singapore	1,233,642	0.4	40,377	0.4
Luxembourg	712,968	0.2	29,932	0.3
China	204,908	0.1	10,396	0.1

Source: Drawn by the author. Data from RFB/LAI

The main countries that purchased iron ore exported by Brazil in 2016, i.e., the countries where the companies that buy this ore are established, were Switzerland, Austria, the United Kingdom, China and Argentina. Switzerland was responsible for the purchase of 83.1% of the total export volume, equivalent to 7,734 billion dollars, that is, 81.1% of the total value of the iron ore exported during the year. Of the more than 247 million tonnes purchased by companies headquartered in Switzerland, 61.9% went to China, 8.3% went to Malaysia, 6.4% were geared towards Japan and 5.7% went to the Netherlands. It is also worth noting that Switzerland itself was not among the destinations for iron ore exports in 2016, and therefore all the ore it purchased was destined for other countries.

In turn, Austria was responsible for the purchase of 27,137,014 tonnes of iron ore, which represented 9.1% of the total iron ore exported by Brazil. Of the Austrian purchases, 58.9% went to China and 14.9% to Japan; only an insignificant quantity (0.2 tonnes) was destined for Austria. The third largest purchasing country, the United Kingdom, bought 13,466,178 tonnes of iron ore, which represented 4.5% of the export quantity in 2016. This was equivalent to 612.7 million dollars. As in the two previous cases, the purchases made by the United Kingdom were almost entirely sent to other countries, mainly to China (53.4%), Bahrain (15.3%), Japan (10.4%) and Mexico (10.2% of the purchased quantity).

On the other hand, the United Kingdom was among the destinations of exports purchased by Switzerland and by Austria, with large quantities that explain their presence among the main destinations of Brazilian iron ore exports.

**Table 5 - Main Countries of Purchase of Iron Ore in Brazil in 2016**

Country of Purchase	Quantity (t)	(%)	Value (thousand USD)	(%)
Switzerland	247,387,718	83.1	7,734,778	81.1
Austria	27,137,014	9.1	893,146	9.4
United Kingdom	13,466,178	4.5	612,718	6.4
China	4,881,960	1.6	152,876	1.6
Argentina	3,070,334	1.0	78,658	0.8

Source: Drawn by the author. Data from RFB/LAI.

China was the fourth largest country of purchase of Brazilian iron ore, despite being the main destination of exports. There is a very large discrepancy between China's share in the purchases and its share as a destination for exports. In the first case, in 2016 the country was responsible for only 1.6% of purchases in quantity and 1.6% in value.

In contrast, in the same period, China accounted for 66.5% of the volume of iron ore exported by Brazil (equivalent to 66.6% of exports in terms of value), according to data obtained through the Information Access Law. Of the 182,807,449 tonnes of iron ore shipped to China in 2016, 153,156,336 tonnes (or 83.8% of the total) were purchased by companies headquartered in Switzerland.

Graphs 9, 10, 11 and 12 present the shares of the countries of purchase and of destination of iron ore exports in terms of volume and value. The comparison between graphs 9 and 10 and between graphs 11 and 12 reveals the aforementioned discrepancy between the composition of exports by countries of purchase and countries of destination of exports and their evolution in the period from 2005 to 2016.

In 2005, most purchases were made in two countries, the Bahamas (58.5%) and the Cayman Islands (36.2%). Both countries presented much lower values in the following years, although they still held a relevant share – between 5 and 10% – for some years. In the case of the Bahamas, the country has a relevant share until 2008, while the Cayman Islands continues to present important values until 2010, as can be seen in graph 9.

Switzerland, in turn, has been responsible for most of the purchases of Brazilian exports in quantity and value since 2007. Its share in this item was zero in 2005. In the following year, however, this share was 7.5% of the export quantity. As of 2007, the country had a much higher share, reaching 68.3% in that year. It increased to surpass 80% in 2011 and remain above this level until 2016. It is possible to note that in 2006, year in which Switzerland started to figure among the countries of purchase of the exports, Vale created the subsidiary Vale Internacional S.A., headquartered in Switzerland, in the city of Saint-Prex.

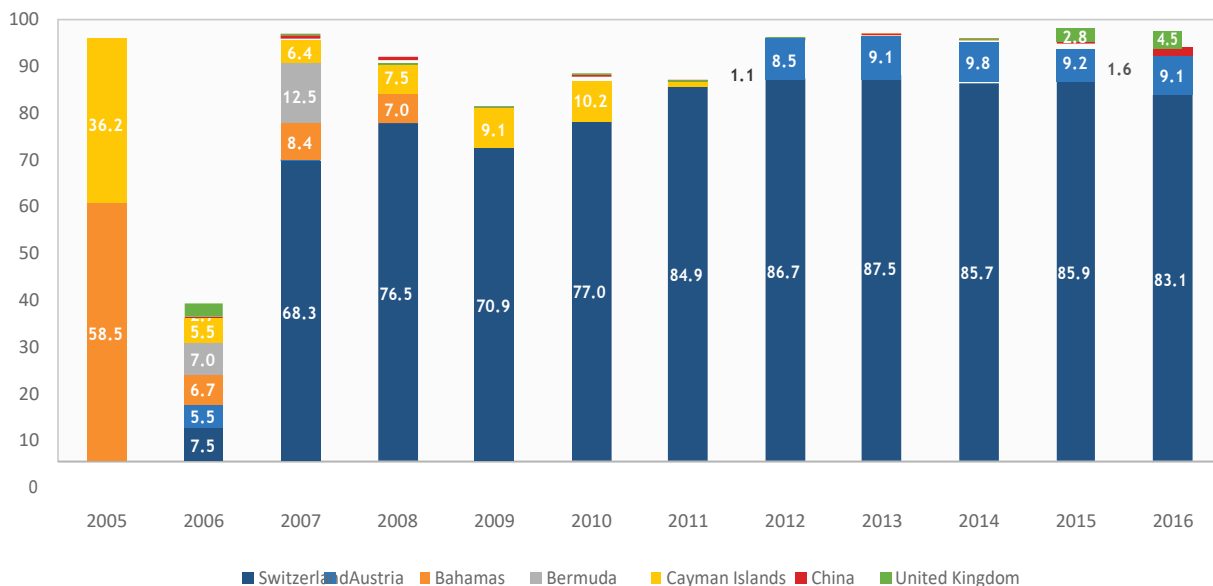
The Swiss office manages marketing and sales departments for iron ore, nickel, copper and coal in Europe, the Middle East and North America (VALE, 2016). The statistics on purchases in Switzerland and the company's high share in iron exports suggest that the Swiss office may have been responsible for a considerable portion of the purchases of the ore exported by Brazil.

Since 2012, Austria has been the second largest buyer of Brazilian iron ore exports, with shares ranging between 8 and 10% between 2012 and 2016.

On the other hand, graph 10, which shows the evolution of the shares in volume of the main destinations of Brazilian exports, reveals a very different composition, with the predominance of countries like China – which accounted for more than 50% of Brazilian exports from 2009 to 2016 –, Japan, South Korea and the Netherlands.

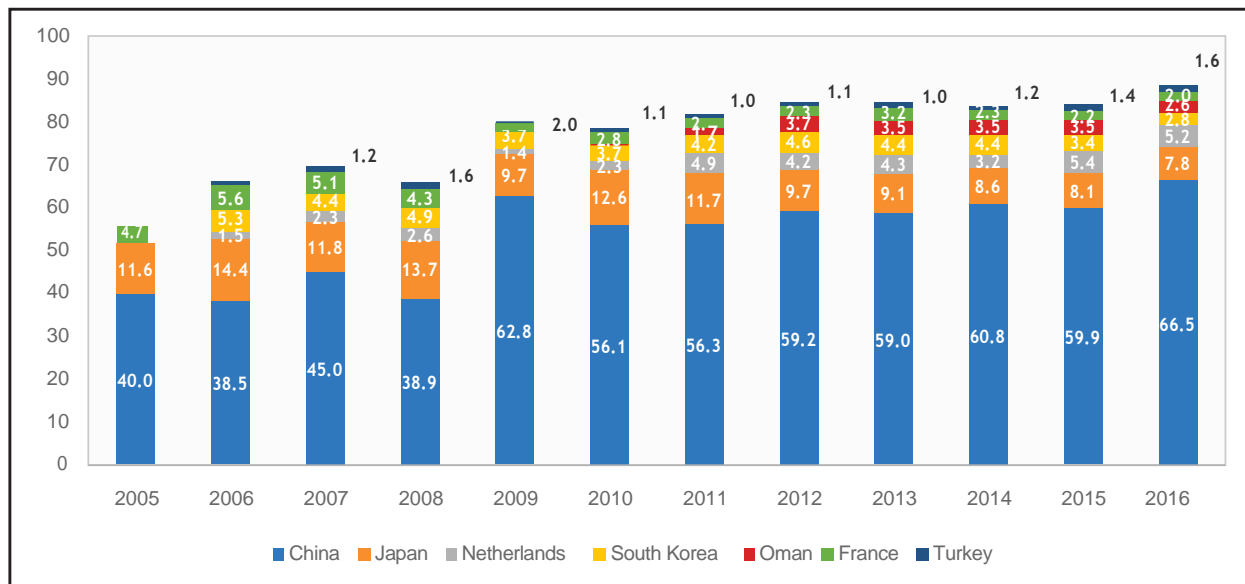
Meanwhile, the main aforementioned countries of purchase are absent from graph 10 and therefore do not correspond to the main countries of destination of exports.

Graph 9 - Countries of Purchase of Iron Ore from Brazil, Share in Volume, Selected Countries, 2005 to 2016 - in %.



Source: Drawn by the author. Data from RFB/LAI.

Graph 10 - Countries of Destination of Iron Ore from Brazil, Share in Volume, Selected Countries, 2005 to 2016 - in %.



Source: Drawn by the author. Data from RFB/LAI.

As expected, Graphs 11 and 12 show similar progressions to those described above. These graphs show the evolution of the shares of the countries of purchase and the countries of destination of Brazilian iron ore exports in terms of the value of exports (and not of the export quantities, as above). Despite the small differences, a greater divergence between the analysis of quantities and the analysis of the value of exports would only occur if there was a large dispersion of the prices charged in the purchases by different countries.

However, this dispersion was small in the case of the main buyers or countries of destination. Hence, the main comments made in the previous paragraph are still valid in this case.

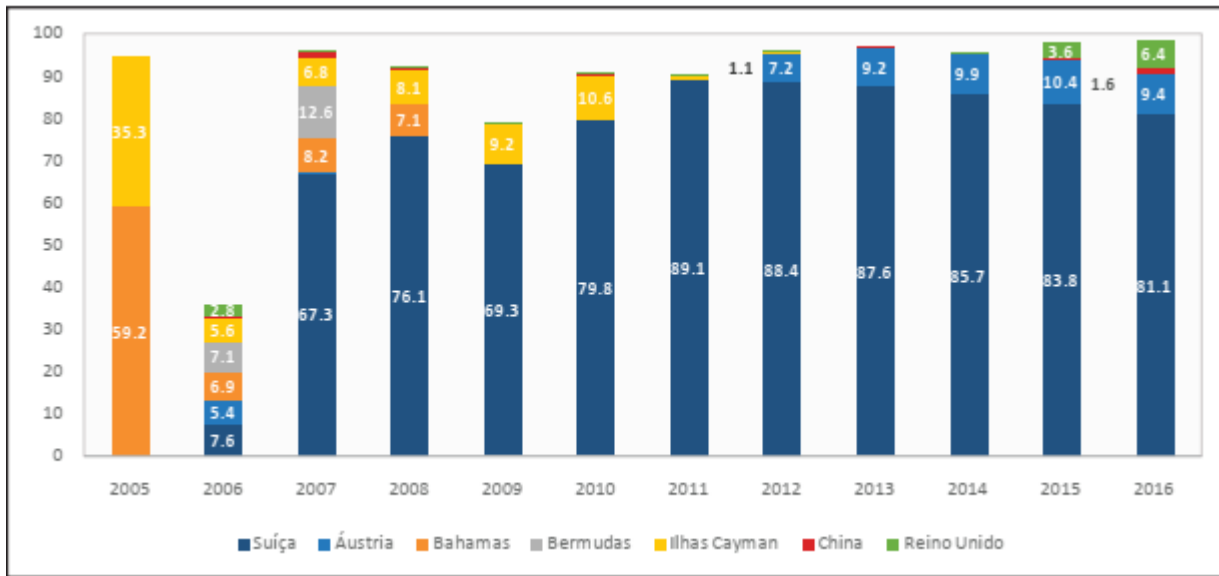
Thus, Switzerland's high share among the countries of purchase of exports from 2007 onwards was observed once again, remaining above 80% from 2011 to 2016.

China was the main destination for exports throughout the series, fluctuating at a higher level since 2009. The group of countries with the lowest share of total exports was also repeated, with percentages similar to those seen in the graphics presenting exports in volume.

Given Switzerland's high share in the purchases of Brazilian iron ore exports, purchases that are almost entirely destined for other countries, a comparison was made between the price trend registered in the exports with Switzerland as the country of purchase, according to data obtained through the Information Access Law, and the yearly average of the international market price of iron ore, according to data from the IMF. The evolution of these variables is shown in Graph 13. Actually, it is possible to observe a positive price differential throughout the series. We estimate that this differential was 7.7 dollars per tonne in 2009.

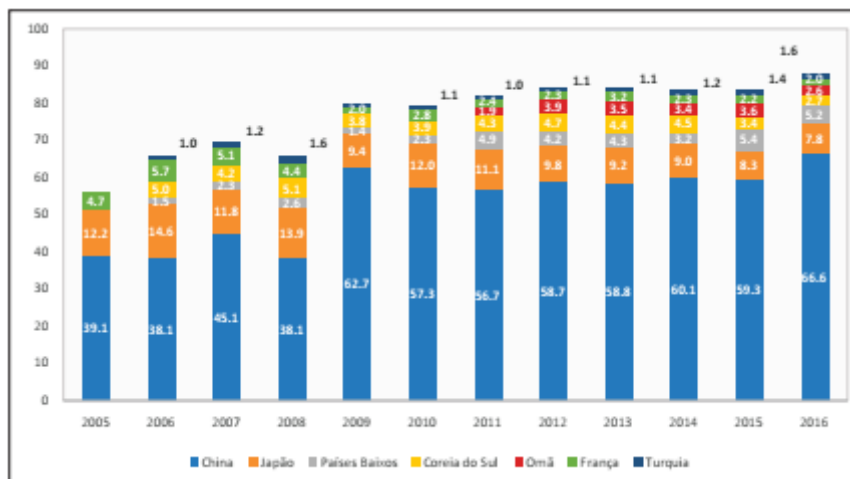


Graph 11 - Countries of Purchase of Iron Ore from Brazil, Share in Value, Selected Countries, 2005 to 2016.



Source: Drawn by the author. Data from RFB/LAI.

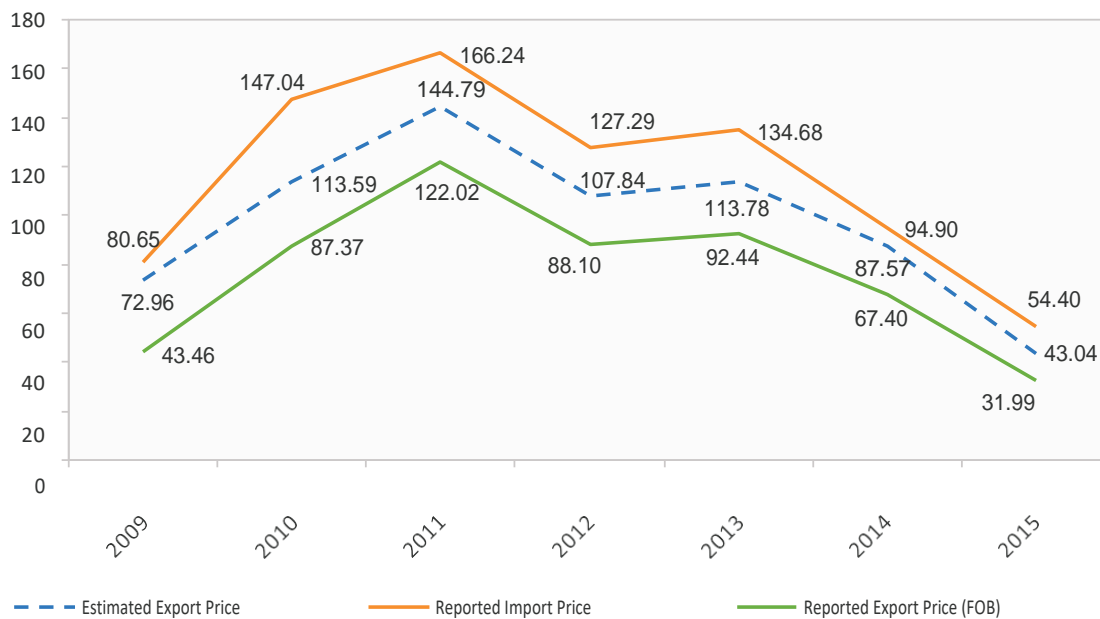
Graph 12 - Countries of Destination of Iron Ore from Brazil, Share in Value, Selected Countries, 2005 to 2016



Source: Drawn by the author. Data from RFB/LAI.

The value increased to 33.4 dollars in the following year. In 2011, the difference decreased to 21.50 dollars, remaining close to that level in the two subsequent years – 19.5 in 2012 and 20.9 dollars in 2013. From 2014 onwards, this differential decreases once again, 7.3 dollars in 2014 and 11.4 dollars in 2015. Based on this information, the under-invoicing of exports purchased by Switzerland was estimated to amount to 28.7 billion dollars from 2009 to 2015. This sum represented 22.7% of the value of Brazilian exports whose purchases were made by Switzerland, according to the estimate made based on the data on exports provided by the Brazilian Department of Federal Revenue through the Information Access Law.

Graph 13 - Export and Import Prices in Brazilian Exports Purchased by Switzerland - iron ore - dollars per tonne.



Source: Drawn by the author. Data from RFB/LAI; AliceWeb/MDIC; IMF; Platts.

## 4. Concluding Remarks

Capital flight and trade misinvoicing represent a serious problem for developing countries, with negative economic and social consequences. These countries lose tax revenue and foreign currencies, resulting in severe obstacles to economic development, to the strengthening of public policies and to the improvement of social indicators.

Meanwhile, some individuals or multinational corporations accumulate wealth that was evaded in secrecy jurisdictions, which, in turn, contributes to widening inequalities. Brazil has also been affected by this phenomenon.

In fact, the few studies on the subject that have addressed the Brazilian case indicate that capital flight and trade misinvoicing are a major problem in Brazil. This fact is corroborated by the results of this study, which found high losses, even focusing on the capital flight in exports of a single product.

However, despite the importance of this topic, it is still not extensively investigated and fully discussed. Existing research did not really have a major repercussion in society and has not been extensively promoted in the media.

Recently, a conservative political agenda emerged in Brazil, focused on the search for balance in public accounts. However, this agenda has been limited to proposals that reduce spending on public services and investment by the public sector. This is the content of Proposed Constitutional Amendment No. 241, approved in December 2016, which limits the growth of federal government spending.

Consequently, it prevents the performance of tax policy in favor of economic growth, in addition to causing the deterioration of essential services for most of the population. In the long run, under the pretext of ending the fiscal deficit and controlling public debt, this agenda seeks to reduce the public functions of the Brazilian State.

At the same time, the problem of capital flight and misinvoicing, which have significant impacts on tax collection, has been ignored in the political discussions on the financing of public spending, as well as many other progressive measures that could be adopted.

Contrary to current trends, Instituto Justiça Fiscal [Tax Justice Institute] has been seeking to promote public debate on tax issues that are relevant to Brazilian society through its work on several fronts, with the idea that improving the tax system, based on the fundamentals of tax justice, is a way to build a just, free, supportive society.

This research is part of this effort, seeking to qualify the public debate through technical production. Greater knowledge on tax issues related to capital flight also allows justifying proposals to correct existing problems.

We estimated that the under-invoicing of iron ore exports resulted in an outflow of 39.132 billion dollars between 2009 and 2015, an average loss of more than 5.59 billion dollars per year. A loss of tax revenue of USD 12.407 billion was associated with the under-invoiced value for the same period, representing an average annual loss of USD 1.900 billion.

The second estimate of the under-invoicing of iron ore exports validated the results of the first estimate insofar as it demonstrated the similarity between the evolution of import prices and the evolution of the international market price of iron ore. In addition, data obtained through the Information Access Law revealed that each year since 2011 more than 80% of Brazilian iron ore exports were purchased by companies headquartered in Switzerland, although these exports have other countries as their destinations.

In fact, Switzerland has a significant share of the global trade of goods, even though the country does not count on advantages relating to cost, location, ports or natural resources. Its area is surrounded by land and the country is territorially small and bears high costs.

However, because it is a tax haven, the country is used to promote illicit financial flows in various ways, as indicated by different studies discussed in this paper. In view of this, we made an estimate of capital flight via the under-invoicing of iron ore exports, according to the prices and quantities of exports that had Switzerland as their country of purchase.

The result was that the under-invoicing of exports purchased by Switzerland totaled 28.7 billion dollars in the period from 2009 to 2015.

This was the first study on transfer pricing in Brazil that uses data obtained through the Information Access Law, in force since 2012. We emphasize that this law provides a promising way to obtain new statistics and information that complements data that is already available publicly, which should be used in future studies on capital flight.

Finally, we found a considerable outflow of resources due to iron ore exports, which is the leading commodity in Brazil's exporting pattern. The identification and measurement of this phenomenon are only a first step to correct the existing deviations. Considering the size of the under-invoicing of exports, the solution to this problem would have important results, with positive consequences for society.

This research sought to contribute to this objective by measuring the loss of resources in iron exports, aiming to propose developments to carry out new studies and to promote public debates about capital flight in Brazil and possible solutions to this problem.

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## Annex - Main Brazilian Partners in Iron Ore Trade

The five main destinations for Brazilian iron ore exports in 2015, according to data reported by the Brazilian authorities to UN Comtrade, were China, Japan, Malaysia, the Netherlands and the Philippines. It should be noted that the data provided by the Brazilian authorities only inform the destination of the exports declared upon shipment, which does not necessarily coincide with the country of purchase of the goods, i.e., the country where the buyer company is established. China, Brazil's main trading partner and a major importer of raw materials on the global market, accounted for more than half of Brazilian iron ore exports – 55.8% in terms of export quantity, as shown in the table below. Japan, Malaysia, the Netherlands and the Philippines accounted for 23.9% of the total export quantity of Brazilian iron ore in 2015. The quantities and the share of each country are described in table 5. Among the destinations for exports, it is also worth mentioning Oman, with 3.3% of exports, equivalent to 10,429,025 tonnes of iron; South Korea, destination that accounted for 3.2% of total exports of iron ore, equivalent to 9,986,431 tonnes; France, accounting for 2.0% of exports totaling 6,406,302 tonnes; the United Kingdom, responsible for 1.6% of exports, which represented 5,047,758 tonnes; and Bahrain, with 1.6% and 4,924,104 tonnes. The remaining 8.6% of exports were distributed among 22 other countries.

Table 5 - Main Destinations of Brazilian Iron Ore Exports in 2015

Country of Destination	Export Quantity (t)	Export Quantity (%)
China	175,738,913	55.8
Japan	23,161,534	7.4
Malaysia	20,874,572	6.6
Netherlands	15,499,705	4.9
Philippines	15,797,099	5.0
Oman	10,419,025	3.3
South Korea	9,986,432	3.2
France	6,406,303	2.0
United Kingdom	5,047,758	1.6
Bahrain	4,924,104	1.6

Source: Drawn by the author. Data from UN Comtrade.

China is the largest importer of iron and the largest steel producer in the world, accounting for just over 50% of the world's steel output. The country has been facing an increasing demand for natural resources, especially iron ore. Japan, in turn, is the second largest steel producer in the world, with 6.6% of the production in 2015, which explains its importance in Brazilian iron ore exports (WSA, 2015; WSA, 2016). Neither Malaysia nor the Philippines are on the list of steel producers released by the World Steel Association, which contains more than 99% of the global steel production. On the other hand,

the Netherlands appears on this list; however, its production is small (6.9 million tonnes) when compared to the main producing countries and to the total world production (WSA, 2015, WSA, 2016).

Malaysia is located in a geographical position that is strategic to the maritime transport of goods destined to Asian countries. The mining company Vale has been operating in Malaysia since 2009, seeking to get closer to its main consumer markets. The company has established the Teluk Rubiah maritime terminal, which has been in operation since 2014. The terminal is made up of a deep water port and a storage and distribution center where different types of iron ore are mixed and adapted according to the needs of steel mills (VALE, 2016).

Malaysia is also a producer and exporter of iron ore, as well as other non-ferrous ores, such as bauxite, coal, tin, feldspar, ilmenite, mica, gold and zircon, and also oil and gas. The exploration of iron ore has gained importance and grown significantly since the end of the 2000s, reaching a production of 9,238 thousand tonnes of this ore in 2014.

Finally, Malaysia is also known as a financial center engaged in attracting resources from Arab countries. A small island in its territory, Labuan is considered a tax haven, allowing foreigners to establish companies, foundations, trusts and bank accounts without the existence of a centralized public registry of such operations.

Another important partner in Brazil, in 2013 the Philippines accounted for 17% of the world's production of nickel, the main mineral commodity produced in the country. Other minerals also stood out in the country's production, such as chrome, copper, gold, sea salt and silver. In 2013, the mining sector contributed with 1.08% of the GDP of the Philippines. The production of iron is less expressive than that of the aforementioned minerals. The country produced 793 thousand tonnes of this mineral in 2013 and 1,148 thousand tonnes in the previous year. Both quantities are well below the iron ore exports recorded each year (see graph 21).

A share of exports registered by the Philippines is possibly related to an intermediary role in the trade with other countries.

Two of Vale's Floating Transfer Stations are installed in the Philippines, in Subic Bay. The redistribution of the iron ore exported by Brazil occurs at these stations: large vessels are unloaded and the ore is loaded onto smaller vessels, which carry it to the Asian countries that are the final destination of exports (VALE, 2016).

The first of the stations was installed in 2012, in the context of growing sales to Asian markets, allowing transportation to ports with insufficient depth to receive larger vessels.

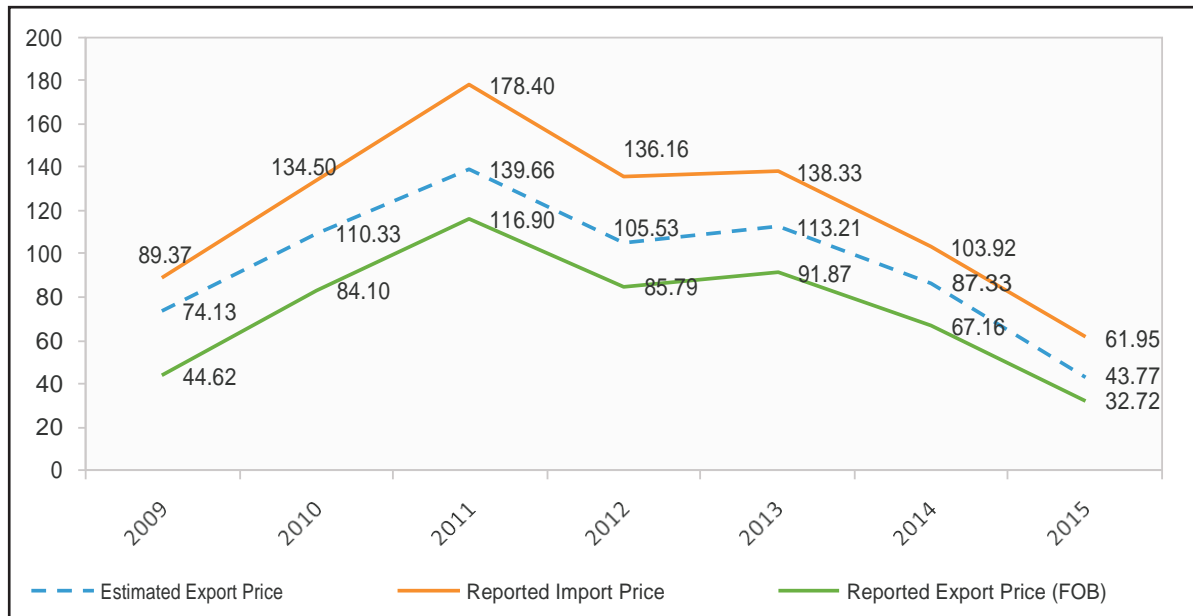
Thus, floating transfer stations are large vessels that allow the redistribution of iron ore. In addition, since 2008, Vale has developed research activities on minerals in the Philippines, seeking new deposits to exploit (VALE, 2016).

The graphs below show the evolution of iron ore prices in the trade relationship between Brazil and its five main partners. We present the price reported in the importing country, the price reported in Brazil for exports and an estimated price based on the export price and freight cost, as detailed in the methodological discussion.



With this information it is possible to observe the evolution of export and import prices, observing the price differential related to trade misinvoicing in trade between Brazil and each of its main partners.

Graph 14 - Export and Import Prices in Brazilian Exports to China - iron ore.

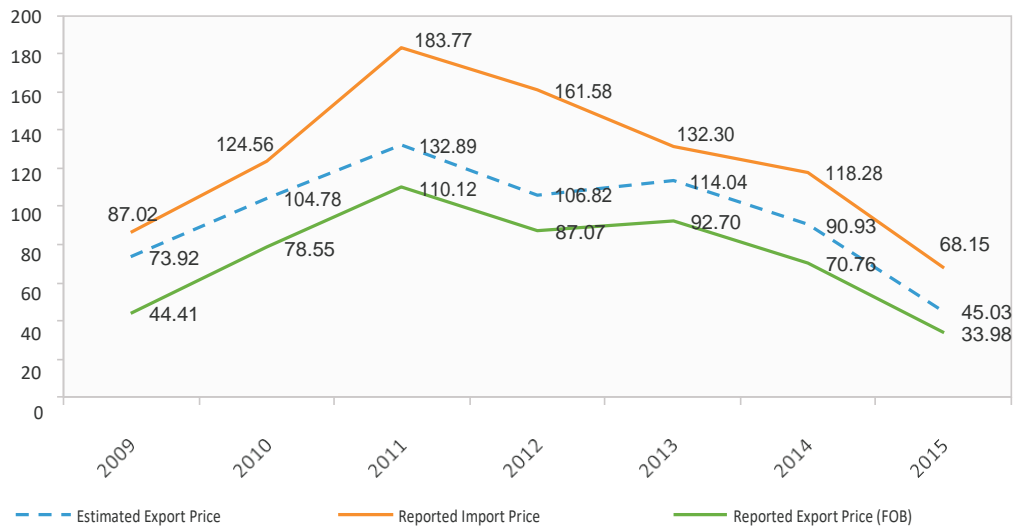


Source: Drawn by the author. Data from UN Comtrade; Platts.

A total capital outflow of 27.9 billion dollars was estimated in the trade relationship with China between 2009 and 2015, representing 32.3% of the value of exports reported to Brazilian authorities.

Since China imports large volumes of iron ore, price differentials ultimately translate into a massive loss of resources. Graph 14 shows that the import price declared to China continuously remained above the estimated benchmark price ("estimated export price"). The difference between the two prices reached 38.7 dollars in 2011 and remained above 15 dollars throughout the series. Although this difference decreased in 2014, it increased again the following year, even as the international price of the commodity continued to decline.

Graph 15 - Export and Import Prices in Brazilian Exports to Japan - iron ore.



Source: Drawn by the author. Data from UN Comtrade; Platts.

In the case of Japan, the outflow of resources related to trade misinvoicing resulted in a total of 5.9 billion dollars from 2009 to 2015. This figure represented 39.7% of the value of iron ore exports declared to the Brazilian authorities. Similarly to the Chinese case, it was possible to observe that the import price remained above the benchmark price. The smallest difference between the two prices occurred in 2009 and was 13.1 dollars, while the largest difference was observed in 2012, 54.8 dollars.

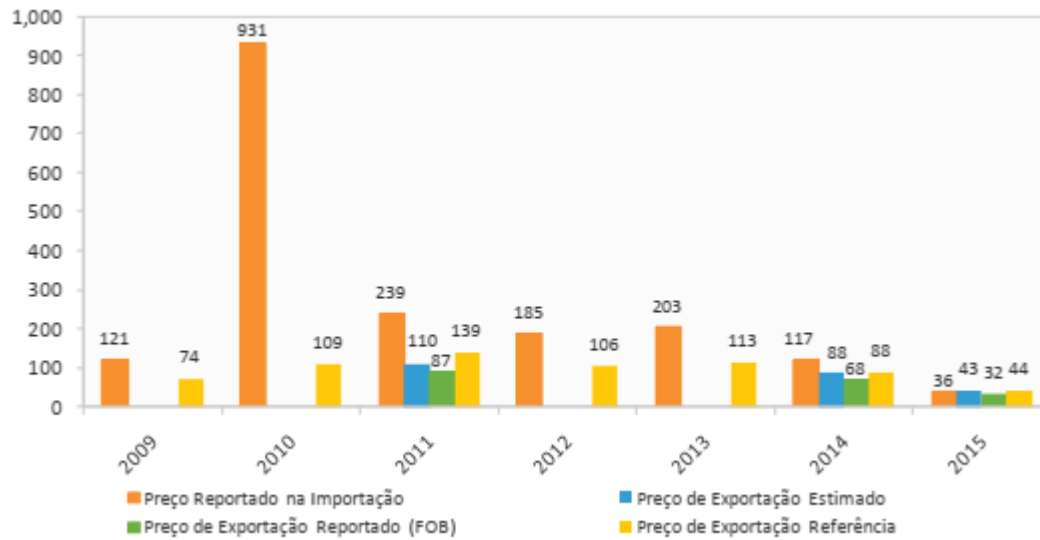
A loss of resources of 133.1 million dollars is estimated in the relationship between Brazil and Malaysia during the period in question. This figure represented 13.9% of the value of Brazilian iron ore exports to Malaysia in the same period.

Although it was one of the main destinations for Brazilian iron ore exports in 2015, Malaysia did not appear among the destinations of exports in the years 2009, 2010, 2011 and 2012.

Nevertheless, the country declared that it received imports from Brazil in those years. This phenomenon may have occurred due to triangulation in trade or to divergences regarding the capture of data in each of the countries.

One possibility, in the second case, is that the exporting company has declared a final destination other than Malaysia, while some intermediary in that country declared the intermediation as an import. This possibility is compatible with the behavior of the country's total exports and imports, where Brazil systematically appears as the main country of origin of the import iron ore.

Graph 16 - Export and Import Prices in Brazilian Exports to Malaysia - iron ore.



Source: Drawn by the author. Data from UN Comtrade; Platts.

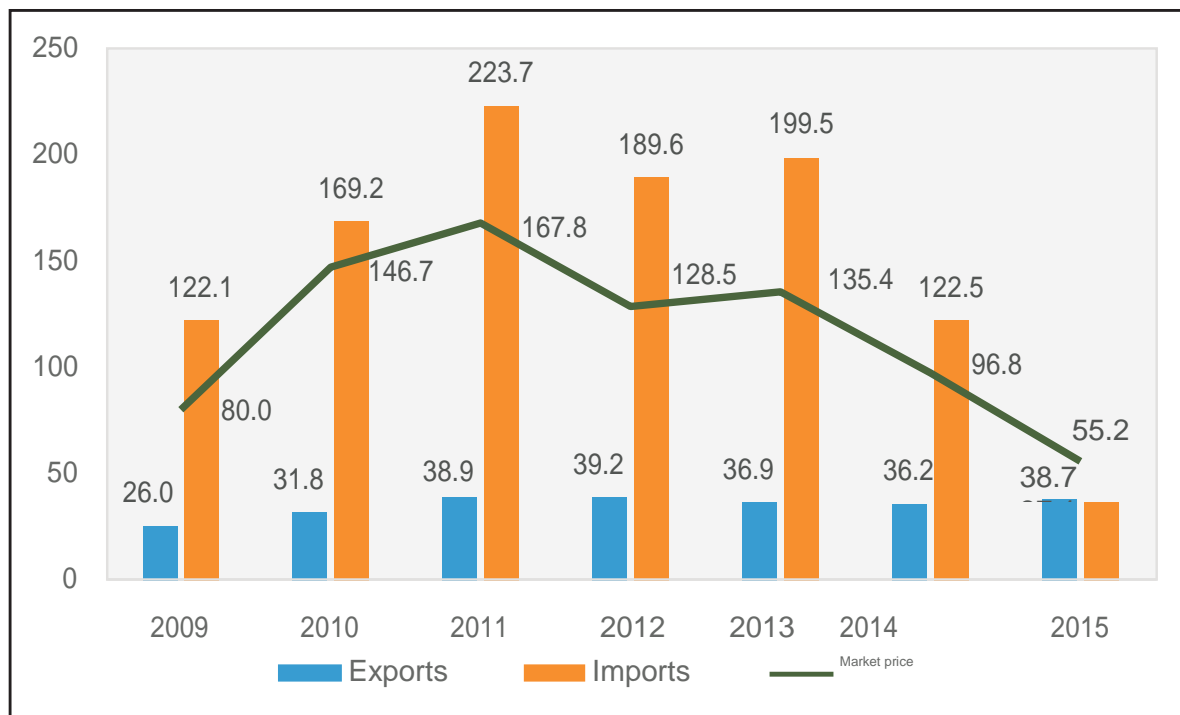
We extracted other relevant information from data provided by UN Comtrade relating specifically to Malaysia and reported by the authorities of that country.

Especially in the year 2015, Malaysia imported a large quantity of iron ore from Brazil (14.2 million tonnes or, in value, 524.6 million dollars), much higher than the quantity observed in previous years – 2.4 million tonnes in 2014 and 1.0 million tonnes in 2013.

This figure draws attention when considering that the country is a producer and exporter of this ore. In 2015, Malaysian iron ore exports totaled 13.2 million tonnes and 509.1 million dollars. Exports had been growing rapidly between 2009 and 2013, when they reached a level of 12.4 million tonnes (455.7 million dollars).

Graph 17 shows the differences between the price of the iron ore imported by Malaysia compared to the price of the export iron ore and the international market price of this ore. The difference between the export price and the import price is large and persistent. Export prices are stable throughout the series at a level well below the international market price. In 2015, with the decline in the international market price of iron ore, the difference between the market price and the export price is relatively small compared to previous periods (a difference of 16.6 dollars in 2015, while it reached 128.9 dollars in 2011 and averaged 90.5 dollars between 2009 and 2014.)

Graph 17 - Export and Import Prices of Iron Ore Exports to Malaysia (UN Comtrade).



Source: Drawn by the author. Data from UN Comtrade; IMF.

Another interesting aspect observed in Graph 17 is the proximity, unlike the previous periods, between the prices charged in iron ore exports and imports in 2015, which is also the only period in which the export price exceeds the import price.

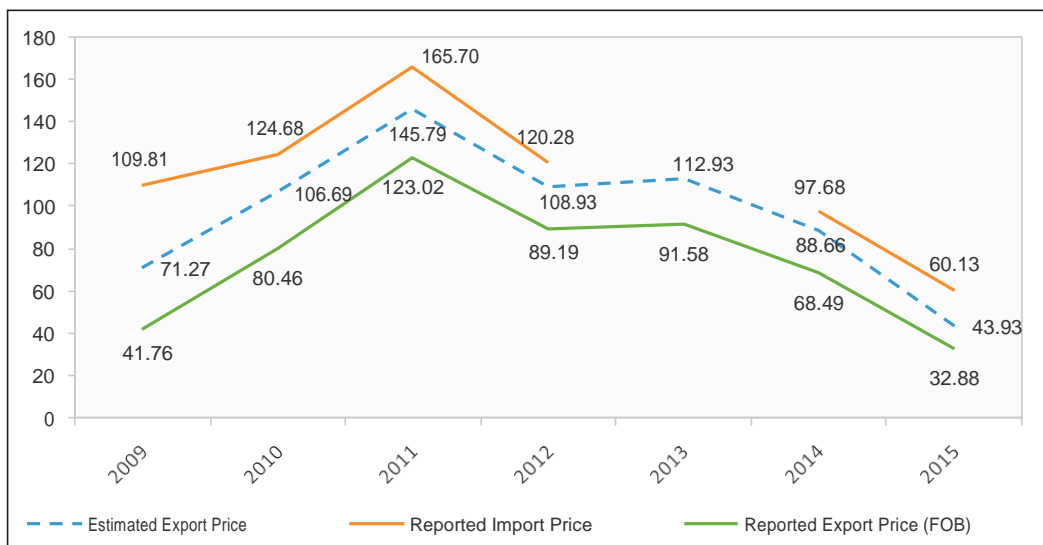
Graph 18 shows the series of prices charged in trade between Brazil and the Netherlands. It is possible to note that the price reported in imports remains above the benchmark price (estimated export price) throughout the series, as in previous cases. The biggest difference is observed in 2009.

The difference decreases in the following periods when the benchmark price increases together with export prices.

In the case of the Netherlands, the outflow of resources related to trade misinvoicing in the period from 2009 to 2015 amounted to 991.3 million dollars, which represented 17.4% of the value of the iron ore exported to the country.

The country did not register imports from Brazil in 2013 – thus there is no import price in Graph 18 for 2013 – although Brazil registered exports to the Netherlands in the same year.

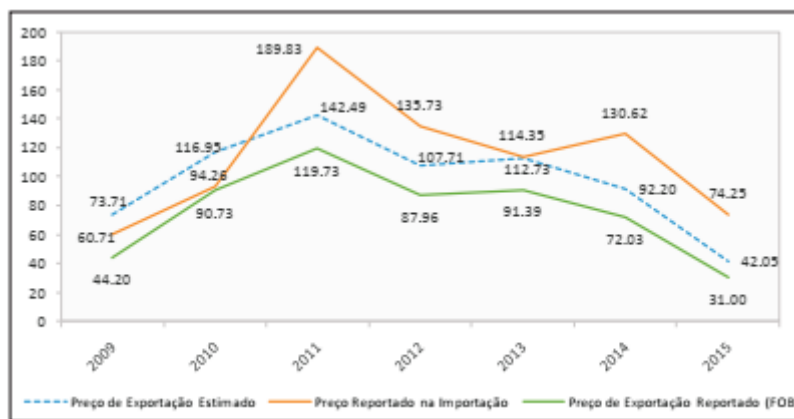
Graph 18 - Export and Import Prices in Brazilian Exports to the Netherlands - iron ore.



Source: Drawn by the author. Data from UN Comtrade; Platts.

The loss of resources in exports to the Philippines amounted to 1.1 billion dollars, that is, 39.0% of iron ore exports to that country. The series evolved slightly differently than in the case of the other trade partners. In the first years, 2009 and 2010, the reported import price was lower than the benchmark price, and in 2013 the import price was very close to the benchmark price. However, the difference between these two prices was higher in the other periods, with its higher value, 47.3 dollars, observed in 2011.

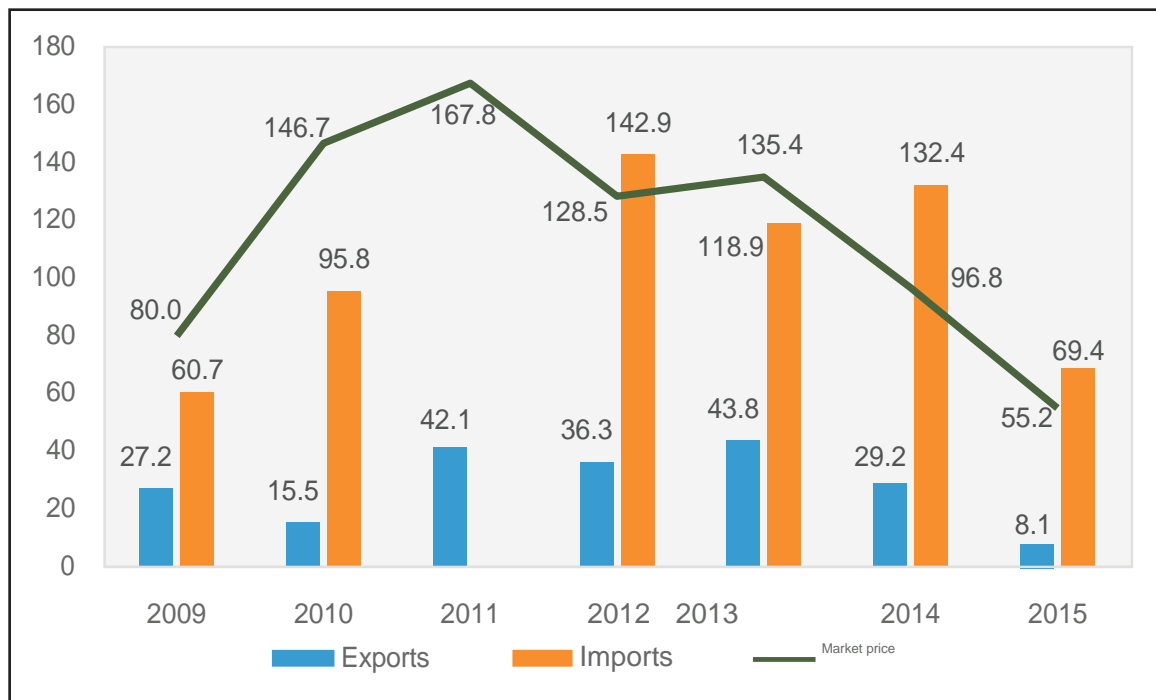
Graph 19 - Export and Import Prices in Brazilian Exports to the Philippines - iron ore.



Source: Drawn by the author. Data from UN Comtrade; Platts.

Graphs 20, 21 and 22 describe the behavior of prices, quantities and values of iron ore exports and imports to/from the Philippines. It is possible to see that export prices remained very low throughout the series, well below the international market price of iron ore. Of particular note are the years 2010, when the export price was 15.5 dollars per tonne, and 2015, when this price was 8.1 dollars per tonne. In 2015, imports in this market were highly different from the behavior in previous periods, as shown in Graph 20.

Graph 20 - Export and Import Prices of Iron Ore Exports to the Philippines (UN Comtrade).



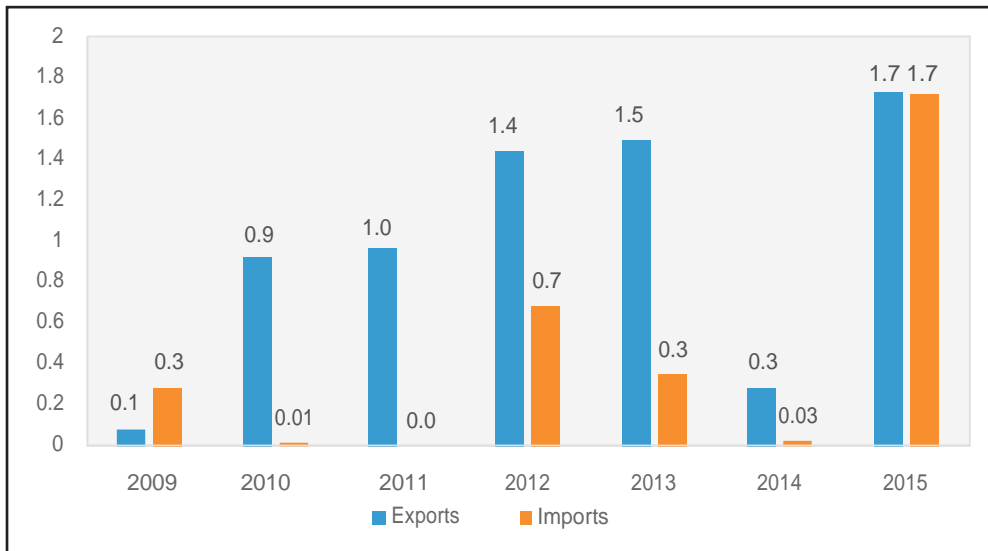
Source: Drawn by the author. Data from UN Comtrade; IMF.

Brazil was the main origin of Philippine imports from 2012 to 2015, accounting for 91.6% of them in 2015 (in terms of quantity).

In the same year, the Philippines exported 1.7 million tonnes of iron ore at very low prices.

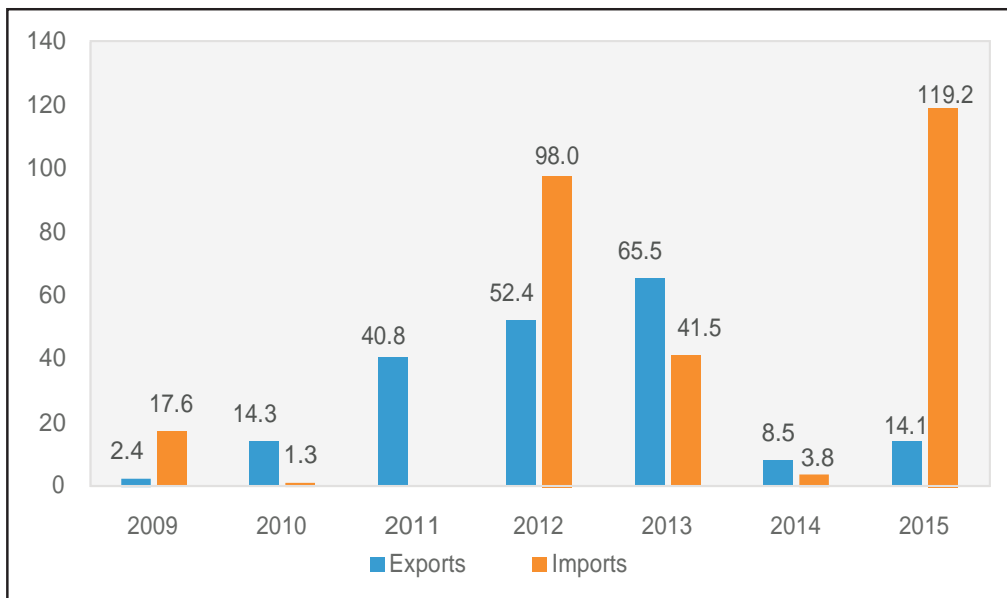
This was reflected in the low value of exports (14.1 million dollars) and in a sharp discrepancy between the value of imports and the value of exports, when the quantities of both of them were almost the same.

Graph 21 - Volume of Philippine Iron Ore Exports from 2009 to 2015, in million tonnes.



Source: Drawn by the author. Data from UN Comtrade.

Graph 22 - Value of Philippine Iron Ore Exports from 2009 to 2015, in million dollars.



Source: Drawn by the author. Data from UN Comtrade.

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