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Did Bullionism Matter? Evidence from Cadiz Shadow Market for Silver, 1729-1741

DID BULLIONISM MATTER? : EVIDENCE FROM THE CADIZ SHADOW MARKET FOR SILVER, 1729-1741•

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The market requires that exchanges are voluntary and the law may restrict the workings of a given market. This is the case with Castile bullionist regulations, which led to an illegal bullion market in Early Modern Cadiz. This paper focuses on the structure of this illegal bullion market in order to understand the logic of silver outflows. Arbitrage is explained by the presence of an oligopsony power that depressed the price of silver in Cadiz and created a systematic bias between domestic and international market prices. The lesson that emerges from this paper is that understanding the specie-flow mechanism in the Early Modern Period demands the comprehension of the bullion market structure for the place and time examined.

INTRODUCTION

The discovery of America was followed by a flow of precious metals to Spain and Portugal, and from there throughout the world. Historiography has reconstructed the quantities of gold and silver transferred from the Old World to the New World in the Early Modern period, but what is the reason of bullion outflows? This paper answers this question. In particular, it examines the logic of silver outflows from Cadiz to London in the first half of the 18th century.

Castile enacted bullionist laws during more than four centuries, from the Late Middle Ages to mid-19th century: fixed prices and bans on export. But these measures did not avoid the export of silver and caused a great deal of smuggling. This paper aims at understanding the logic of silver outflows focusing on the smugglers' point of view: arbitrage. In this regard, the archive of the merchant house *Roux* (Marseille), probably the best preserved 18th century commercial archive in Europe, has made possible the reconstruction of the specie-point mechanism for silver – the Old Mexican pieces of eight - between Cadiz and London as exactly practiced by contemporary merchants. The

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discovery of half-monthly data on silver black market in Cadiz for the period 1729-1741 has been a milestone in order to understand the logic of silver outflows.

Empirical results for arbitrage equation puzzle our knowledge of the specie-point mechanism: from 1729 to 1737 there was a systematic bias between the implicit spot exchange rate and the arbitrated parity, which made arbitrage systematically profitable. On the contrary, from 1737 to 1741 the bias was corrected because the Spanish government reacted to illegal bullion outflows with a devaluation, which equalized the exchange rates and the arbitrated parity.

This research explores both theoretically and empirically the reasons for the apparent mispricing for the first period and the effect of the devaluation on silver prices for the second period. The outcome is that bullionist regulations configured an oligopsony structure in Cadiz that had the power to drive down silver prices below the international price (i.e., London price). Oligopsony agents were the most important foreign merchants in Cadiz, organized in family networks which were price-makers; structure was maintained because the long-run international networks created entry barriers in the business of illegal export of bullion. Secrecy was preserved because both sides of the market cheated the Spanish government: importers from the Spanish American colonies saved the high import tax and exporters to the main European bullion markets ignored the ban against exports.

Nevertheless, oligopsony power had a floor, which was the Official Parity (i.e., the number of units of account per coin). Below the Official Parity, the pieces of eight were used as money and went out from the commodity market. The devaluation of 1737 should be understood as an increment of the Official Parity that equalized legal domestic prices to the international market price for eliminating oligopsony power.

Some main lessons emerge from this paper. First, understanding the reasons of the specie flows in the Early Modern period demands comprehension of the specie-point mechanism. Second, the construction of the silver-points requires the location, collection and manipulation of the right data: market prices, exchange rates and costs of arbitrage. And third, the interpretation of the arbitrage results needs to focus on the

special microeconomic features of the bullion market structure. This is an original approach which will provide a lot of insight into the workings of commodity money.

The first section describes the Castilian bullionist rules of the law oriented to avoid bullion outflows: fixed prices and bans on export. The second section analyses the specie-point mechanism in the institutional setting of bullion controls: the case of silver Pieces of Eight between Cadiz and London during the period 1729-1741. Arbitrage equation shows a systematic bias between the spot exchange rate and arbitrated parity corrected by the 1737 devaluation. The third section describes the structure of the illegal bullion market in Cadiz: the oligopsony foreign merchants drove down silver prices below the international price. The last section explains the workings of the specie-point mechanism in the case of the oligopsony structure before and after devaluation. The appendix details the construction of the silver points.

1. WHY SMUGGLING? CASTILIAN BULLIONIST LAWS AND THE WORKINGS OF LEGAL BULLION EXCHANGE IN CADIZ.

Castilian economic policy in Early Modern Age was dominated by the strategy of controlling the gold and silver from the American colonies. After the America discovery, bullionism was consistent with the expansionist and imperialist interests of Castilian monarchy. Bullionism had created the mirage of precious metals mining wealth as the measure of economic success[1]. And bullionism remained the essence of state economic policy during sixteenth, seventeenth and eighteenth centuries, reinforced through stagnated legislation and immobile institutions.

The system developed in the early 16th century remained until the end of the 18th century enshrined, almost sacralized. Innovation was unacceptable because it would have meant to accept that somehow fundament structures once admirable were failing. Inordinate reverence for past institutions was widely accepted and symptomatic of declining imperial projection[2]. This chapter describes the stagnated legislation and immobile institutions which preserved bullionism.

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[1] Stein and Stein (2000), p. 6.
[2] Stein and Stein (2000), p. 159.

1.1. The Castilian bullionist rules of the law

Economic thought considers bullionism as the economic theory that defines wealth by the amount of precious metals possessed. Bullionism was the predominant theory in European monetary policy until the end of the 16th century. But Castile enacted bullionist laws during a longer period that lasted until mid-19th century. These regulations had their origin in Late Middle Ages and, due to the America discovery, endured until the independence of the colonies. Contemporary Castilian economists clung to the principle of bullion accumulation into Castile[3]; legislation reflecting contemporary political economic thought. Castile bullionist legislation was characterised by a chaotic form and anachronistic contents based on the successive ratification of previous laws. Concretely, two types of bullionist rules regulated bullion exchange with the aim to avoid bullion outflows: fixed prices and bans on export.

Fixed prices prohibited the exchange of gold, silver or billon coins at a different price than the oficial paritythe number of units of account per coin[4]. The aim of these laws was to prevent the exportation of bullion[5]. Fixed price was regulated by the Mint Regulation of the year 1497 that was in force until the reform of the monetary system in 1848[6]. Successive regulations modified the official parity of gold and/or silver regarding the unit of account, but maintained the prohibition of using a higher price for specie than the official parity through the recurrent expression: "we order the value [equivalence with the unit of account] and *no more*".

Fixed prices endured almost four centuries and step-by-step government toughened the penalties for those who did not comply with the regulations. In mid-18th century the penalty was the lost of the occupation and the confiscation of all goods, from which one third was the reward for the informer. Additionally, these laws included

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[3] Larraz (1943)

[4] *Cap 18 aut 16 tit 21 lib 5 R* year 1652, ratified in *aut 40 tit 21 lib 5 R* year 1704 and *ley X lib IX tit XVII NR* year 1743. Fixed prices also affected to ingots that should be exchanged in the Mint at the fixed Price. Larruga (1787-1800), vol. 3, pp. 44

[5] "*porque somos informados que es tanta la codicia, que hay en sacar la moneda de oro de nuestros reinos que así extranjeros como naturales tiene por trato de recoger la moneda de oro y dar por ella más de lo que vale, por la llevar a otros reinos y ganar por ella, sin temor de las penas de nuestras leyes contenidas, que por las leyes de nuestro reino está proveído que por las monedas no se pueda llevar más de lo que valen*" (*ley VI, tít 18, lib 6 R* year 1550)

[6] The Mint regulation was compiled in *Ordenanzas que regulan las Casas de Moneda de 13 de Junio de 1497*. This regulation prohibited the exchange of silver at a higher price than the Mint Price, but there is not any reference to gold. Gold was regulated next year (*Ley IV, tit 18, lib 5 R* year 1498). The reform of the monetary system in 1848 was compiled in *RD de 15 de abril de 1848*.

the penalty of the lost of naturalization papers because government considered foreign people as responsible of bullion export[7]. The consequence of this regulation was the absence of a legal bullion market with free prices. As contemporaries claimed at the end of 18th century: "*España es absolutamente el solo país de Europa donde no se hace el comercio de materias de oro y plata, y donde se carece de casas particulares autorizadas para este trato*" (Larruga, 1787-1800, vol. 3, pp. 49-57):

The absence of a legal bullion market with free prices was complemented with bans on the export of bullion[8]. The prohibition to export bullion started in times of King *Juan I* (1358-1390) and remained until mid-19th century[9]. The penalty from *Juan I* reign to 1761 was the sentence of death and the confiscation of all goods for the offender and collaborators. The denunciator received one quarter of the goods confiscated[10]. The regulation of 1761 changed the penalties. A penalty of eight years of prison and a pecuniary fine was stipulated for the first illegal export. Ten years of prison and the double of the pecuniary fine for the second infraction and life imprisonment in Africa and confiscation of all goods for the third infraction, for offender and collaborators (and if the convicted offender was a public server, the penalty was the lost of occupation and 10 years of prison in Africa). The denunciator received one-third of gold or silver seized[11].

The exporter needed a licence to legally export bullion. Licences were issued to by the Treasury Department (*Consejo de Hacienda*)[12]. Licence did not pay fees. The legislation recognized that bullion exporters tried to export the precious metal without the registration or paying duty-guards a bribe. To avoid businessmen to cheat, the licence should contain the following information: the name of the exporter, the quantity

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[7] In 1498 the penalty was a pecuniary fine, from which one quarter was the reward for the informer (*Ley IV, tit 18, lib 5 R*). In the law of the year 1550 the government increased the pecuniary fines and added a flog penalty for a second time infraction and the permanent exile for a third time infraction (*Ley VI, tit 18, lib 6 R*). In the law of the year 1609 the government increased again the pecuniary fine and added 3 years of exile for the first time infraction (*Ley XVI, tit 18, lib 5 R*). In the laws of the years 1652, 1704 and 1743 the penalty was the lost of the occupation, the confiscation of all goods and the lost of naturalization papers (*Aut 16 tit 21 lib 5 R* year 1652, ratified in *aut 40 tit 21 lib 5 R* year 1704 and *ley X lib IX tit XVII NR* year 1743)

[8] The bans on export are compiled in *tit. XIII, lib IX, NR*: "*de la saca prohibida del oro, plata y moneda del Reyno*"

[9] Beggining: Quadernos de Guadalaxara de D. Juan I y D. Enrique III. End: According to Alcubilla (1868, vol. 9, p. 305), the free export of gold and silver in both ingots and coins was permitted from 1849 (RR.OO. 2 November 1849).

[10] Pragmática 14 Octubre 1624. Madrid.

[11] Capítulo 28 de instrucción 22 Julio 1761 and Cédula del Consejo de Hacienda de 23 Julio de 1768.

[12] Pragmática 13 Septiembre 1628. Madrid.

of bullion, the reason of export, the time needed to the transport and the port of destination. The exporter should show the bullion to the Mayor, who checked it against the licence and wrote in the duty-passport the word "fulfilled" [13]. Licences had an expiration date to avoid a black market for them. Selling or transferring a licence was forbidden, and the infraction had the same penalty (for the buyer or assignee) than the export without a licence. To transport gold or silver among Spanish ports was forbidden. Transport of ingots into Spain by land only was permitted thought places that had a Mint. In this case, the exporter needed a return-passport (*tornaguía*) which demonstrated that bullion came back from the Mint. Transport of coins into Spain by land only was permitted if they were exchanged for goods and required a passport and a return-passport detailing what had been bought and where. The falsification of the return-passport had a penalty of 6 years of prison in Africa.

1.2. The workings of the legal bullion exchange

The Castilian legislation forbade free exchange of gold and silver. Legal exchange of the precious metal from American colonies was regulated through the institution which administrated trade with colonies: The *Casa de Contratación* (House of Trade[14]). Merchants should register the bullion as soon as the vessel tied up in Cadiz –and paid the import tax for both ingots and coins. The precious metal was registered in the *Casa de Contratación* and kept in the Treasure Chamber, which had thick walls, strong doors, double bars of iron in windows and night guards. The treasure chest had three locks which had to be opened simultaneously with three different keys watched over by the three judge-officials of the *Casa de Contratación* -the factor, the treasurer and the comptroller[15]. The coins were returned to their owners after the registration. The ingots were sold at auction in the *Casa de Contratación*: suppliers were the owners of bullion arrived from America and demanders were the "*compradores de oro y plata*" (gold and silver buyers), who bought both King's bullion and individuals' bullion. The owner of the bullion received a receipt for the gold and silver deposited

[13] Ley de 13 diciembre de 1760.
[14] The literal translation of *Casa de Contratación* is "House of Contracting". Hamilton (1934) translated it as "House of Trade".
[15] Hamilton (1934), p. 25

The *compradores de oro y plata* were individuals in the 16th century, but from the beginning of the 17th century a new legislation obligated to create limited partnership companies which should be approved by the *Casa de Contratación* and should deposit there a certain amount of money as insurance for depositors[16]. The *compradores de oro y plata* bought the bullion in order to refine at the monetary fineness, because Castilian Mints only minted the ingots received at the monetary fineness, and then sent the ingots to the Mint for minting[17]. The Mint charged the brassage and seigniorage[18], the *compradores de oro y plata* charged the refining commission and the rest of the ingot minted was given to its owners through the Treasurer of the *Casa de Contratación* [19].

The refining commission was a fixed amount which covered the refining cost in the case of the King's bullion, and a variable charge which depended on the price of auction in the case of individuals' bullion. In the 16th century the biddings were spirited[20] and the profit for *compradores de oro y plata* should have been small because the price paid to them by the Mint minus the refining cost represented the maximum auction price. Additionally, the *compradores de oro y plata* had to bid for bars without previous assay, a system which had a great risk in case that the American bullion had a lower fineness than what was marked[21]. This happened repeatedly and provoked the bankruptcy of many *Compradores de Oro y Plata.* In 1563 there were fifteen *compradores de oro y plata*, but in 1615 bankruptcies had reduced them to eight, and in 1620 there were only 3 companies[22].

In the 17th century, the *compradores de oro y plata* demanded to the *Casa de Contratación* to make the assay previously to auction to avoid cheating in fineness (although silver continued being sold without assay, just with the mark from America). The reduction of the number of the *Compradores de oro y plata* stabilized the price in

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[16] *Cédula* 11 October 1608. Veitia (1672), p. 251.
[17] *Recopilación de Indias, lib. IX, tít. XXIV, ley XIII.*
[18] Brassage was the fee charged by the Mint to cover the coinage costs. Seigniorage was the revenue to the King for coinage.
[19] Hernández Esteve (1986) and Donoso Anes (1996) explain the accounting process of legal bullion exchange through the *Casa de Contratación*.
[20] Hamilton (1974), p. 27
[21] Ingots came marked from American colonies because the bullion extracted had to be assayed to pay the extraction tax. The extraction tax for precious metals was 20% (*quinto Real* - Royal fifth), and it was reduced to 10% (*diezmo Real* – Royal tenth) in 18th century (in 1716 for Mexico and in 1735 for Peru). Haring (1939), p. 198.
[22] Hamilton (1934), p. 31.

the 17th century[23]. Gold was sold at 608 *maravedis/peso (Castellano) of 22 ½ carat* to the *Compradores de Oro y Plata* and at 611 *maravedis/peso (Castellano) of 22 ½ carat* to the Mint, which means a margin of 0.5%[24]. Net profit (deducted refining cost) was 0.18% for silver and 0.2% for gold[25].

In the 18th century, Bourbon Kings reformed the Mints' functioning, and permitted individuals to take ingots directly to the Mint, without using the *Compradores de Oro y Plata* as intermediaries. The Mint provided to individuals the refining service if needed[26]. Then, the price for ingot continued being the Mint price, although it now comprised a fixed refining commission (without the auction margin). To sum up, during the Early Modern period, bullion should be exchanged at the fixed Mint price in Castile, which was the total ingot minus the brassage minus the seigniorage and minus the refining commission.

This particular way to deal with bullion created a systematic registry of bullion inflows from the American colonies to the *Casa de Contratación*, registries of quantities valued at fixed prices. These registries have been exploited by scholars who have developed the Spanish monetary historiography. Therefore, the Spanish monetary historiography for Early Modern period is a story of quantities: Quantities of gold and silver imported by Europe from America through Spain; quantities counted by Hamilton in his seminal book "American treasure and the price revolution in Spain" (1934). These quantities counted by Hamilton were brought down by Morineau (1985). The divergence in results originates from the different sources consulted. Hamilton used the official registers in the *Casa de Contratación*, whereas Morineau focused his research on Dutch mercantile gazettes, consular reports and merchants' correspondence. And Morineau's quantities were re-counted by García-Baquero (1996) for 18th century, using the data obtained from the registers of the different vessels. Counting accurate quantities is difficult due to the very high level of smuggling.

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[23] Alvarez Nogal (1999), p. 89.
[24] Veitia (1672), p. 257.
[25] Veitia (1672), p. 251.
[26] *Nueva Recopilación, Libro V, titulo XXI, Auto LIX, 16*, Madrid 9 Juny 1728: "*permito que cualesquier personas, de qualquier estado, i condicion que sean, puedan libremente comprar oro, i plata para llevarlos à labrar à las Casas de Moneda de estos mis Reinos i de los de Indias, i no para extraerlos à Dominios extraños. (…). Si algun particular necessitare de Oficina para afinar, ò beneficiar el oro, ò plata, que traxere à labrar, se le franquearán prontamente*"

Castile legislation had, therefore, a deep bullionist spirit oriented to avoid bullion outflows. However, these measures did not prevent silver exportation and caused a great smuggling. All the American bullion was not registered in Spain, but it was illegally exported from Spain to the rest of Europe. The estimation of the silver illegally exported was around 70% during the first half of the 17th century[27] and 50% in the mid-18th century[28]. And so, throughout the whole 18th century, as it already happened in previous periods, the fraud appeared as an inevitable consequence of the bullionist regulations. All the copious legislation decreed on this matter lost its effectiveness for the reason of smuggling[29].

What logic explains silver outflows? To answer this question we should introduce the research into the logic of the black bullion market. The Spanish sources are a wrong approach because they are legal sources which just contain the logic of the legal bullion exchange and the reports against smuggling (*Archivo General de Indias* and *Archivo General de Simancas*). Understanding the logic of the silver outflows requires focusing on the point of view of the merchants who practiced the smuggling. Merchant House *Roux* archive is one of the best 18th century commercial archive, which contain more than 5.000 letters of Cadiz correspondents for my period of study (1729-1741), plus invoices, notes of cargo, ledgers, etc. This extremely rich archive has made possible to reconstruct specie-point mechanism for silver between Cadiz and London as exactly contemporary merchants practiced. It has shed much light about the logic of silver arbitrage in 18th century. Next section shows the empirical results of arbitrage equation and the appendix describes the construction of the silver the points.

2. THE PUZZLE: SPECIE POINT MECHANISM WITH BULLION CONTROLS (CADIZ-LONDON, 1729-1741)

This section shows the accurate reconstruction of the silver arbitrage practised by contemporaries according to *Roux* banker's archive. The merchant house *Roux* operated from 1 October 1728 to 3 February 1843. *Roux* practised a polyvalent business

[27] Serrano Mangas, F. (1989), p. 316
[28] Morineau (1985), p.375
[29] García Baquero (1988), p. 223-224

that embraced many commercial activities: trade, insurance, banking, etc. He worked either for his own account, for joint-accounts with partners from other cities, or still as a commissioner. His network was compounded by more than 1,900 correspondents, and his activity was developed in a vast geographical domain (360 places): Europe, Levant, Barbary Coast, Antilles and South America -through his Cadiz correspondents. The archive of the merchant house *Roux* is a remarkable 18th century commercial archive kept in *La Chambre de Commerce et d'Industrie de Marseille*. Its 1,320 bundles contain 78,274 documents of correspondence, 14,516 of accounting and 23,216 of commercial matters (sea and land transport, weaponry, food, raw material and manufactured goods)[30].

The arbitrage with bullion was denominated "bullion trade" ("*commerce des matières*")[31], and its success lied in the application of double-entry bookkeeping and the knowledge of local units of mass and account for the world geography[32]. The documents in the accounting section of the archive "arbitrage accounts" ("*comptes d'arbitrage*") illustrate the arbitrage of silver as a co-operative business: arbitrage was done between two or three partners from different cities, who bought pieces of eight in Cadiz and usually sold them in other European centre, such as London, Paris, Marseille, etc. The first partner was *Roux* merchant house in Marseille, the second partner was its correspondent in Cadiz, and the third partner was a banker from a European centre (Lyon, Paris, Amsterdam, etc). This co-operation was a distinctive feature of the 18th-century French partner-ship, a consequence of the lack of fixed assets and investments. The ordinary co-operative relationship was the joint venture which set up operations for merchant-houses in different cities on a joint account ("*compte en partage*") or half/third shares ("*compte à demi*" or "*compte a tiers*") [33]. The profit, as the difference between buying prices in Cadiz and selling prices abroad, was shared among the partners[34].

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[30] Rebuffat (1965, section L.IX).
[31] *Matières* was the French word for bullion in 18th century according to *Roux* archive. This same word is still used in the Rothschild archives in mid-19th century. See Flandreau (1995), pp. 193-225
[32] Double-entry bookkeeping system (ou a l'italienne) in Ricard, 1732, p. 521-600. *Roux* "exported" the system of double-entry bookkeeping for arbitrage with specie to his correspondents abroad. For example, J. A. Henry, correspondent in Constantinople explained (1778): « *Nous allons suivre votre méthode de tenir le compte d'arbitrage en deux colonnes ce qui sera beaucoup plus facile (…) Par cette méthode actuelle, le tout se trouve remis dans un seul compte »* and Peschaire from Naples (1784) : « *J'ai déjà fait le compte à demi sur mes livres exactement comme vous me l'indiquez, ce qui est, en effet, la manière la plus succincte et la plus claire* » (Carriere, pp. 767-779)
[33] Taylor, pp. 483-484
[34] Fond Roux, L. IX liasse 53: compte arbitrage.

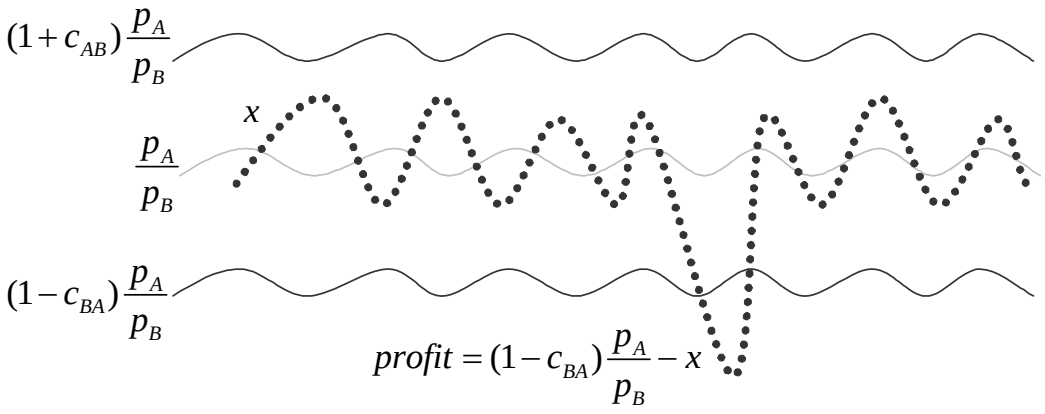
We have reconstructed silver arbitrage practised by contemporaries. How can we measure arbitrage with specie? The single arbitrage equation measures silver flows between two centres *A* and *B* (Flandreau, 1996, p. 422 and 2004, p. 59):

$$(1-c_{BA})\frac{p_A}{p_B} \leq x \leq (1+c_{AB})\frac{p_A}{p_B} \qquad (2.1)$$

where p_A denotes the silver market price in centre *A*; p_B is the silver market price in centre *B*; x is the spot exchange rate between *A* and *B*; c_{BA} is the cost of trading silver from centre *B* to centre *A*; and c_{AB} is the cost of trading silver from centre *A* to centre *B*.

When is arbitrage profitable? If the exchange rate goes down the lower band $\left((1-c_{BA})\frac{p_A}{p_B} > x\right)$, exporting silver from centre *B* to centre *A* is profitable (see Figure 2.1.); and if the exchange rate goes up the upper band $\left((1+c_{AB})\frac{p_A}{p_B} < x\right)$, exporting silver from centre *A* to centre *B* is profitable.

Figure 2.1.: the violation of the lower silver point



Arbitrage equation means the Law of One Price for silver specie, which states that different prices of silver will tend to equalize. If the silver point were violated, we would expect that arbitrageurs would buy silver in the centre with the lowest market

price and sell it in the centre with highest market price, which would adjust prices to eliminate arbitrage profitability.

Arbitrage has been empirically analysed for the 19th century. What do we know about the arbitrage process according to literature? Suppose exporting silver from centre *B* to centre *A* is profitable $\left((1-c_{BA})\frac{p_A}{p_B} > x \right)$. In a first step, the arbitrageur will buy silver in centre *B* in exchange for domestic banknotes. In the second step, he will sell the silver in centre *A* in exchange for a bill of exchange (in centre *A* on centre *B*). In the last step, he will cash the bill of exchange in centre *B* in exchange for domestic banknotes, and he will have more banknotes than at the beginning. The difference between the original and final amount of banknotes is the profit.

We know the logic of arbitrage in the 19th century, when banknotes existed but, how was the process of arbitrage in the 18th century, when banknotes did not exist? Let us reconstruct arbitrage in the 18th century through one example obtained from the "account of arbitrage" ("*comptes d'arbitrage*") in the *Roux* archive[35] (figure 2.2 schematizes the logic of arbitrage): in 1728, three partners, *Raymon Bruny et Cie*[36] from Marseille, *Brethous Clock et Cie* from Cadiz and *Guillaume Louis de Surmont* from Amsterdam had a joint-arbitrage-account ("*compte a tiers*") in Amsterdam. As a first step, *Brethous Clock* bought the silver in Cadiz in exchange for a bill of exchange in Cadiz on Amsterdam. The seller of silver in Cadiz cashed the bill to have a credit balance in Amsterdam, while *Bruny, Clock &Louis de Surmont* had one entry on the debit side of the joint-arbitrage-account ledger. In a second step, *Bruny*'s correspondents sold the silver in Paris (and in London) in exchange for bills of exchange in Paris (or London) on Amsterdam. The buyer of silver reduced his credit balance in Amsterdam, while *Bruny, Clock &Louis de Surmont* cashed the bills in Amsterdam thus having one entry on the credit side of the joint-arbitrage-account ledger. Finally, the profit was calculated as the difference between the entries on the credit side and the entries on the debit side. This profit was shared among the three partners after deducting costs.

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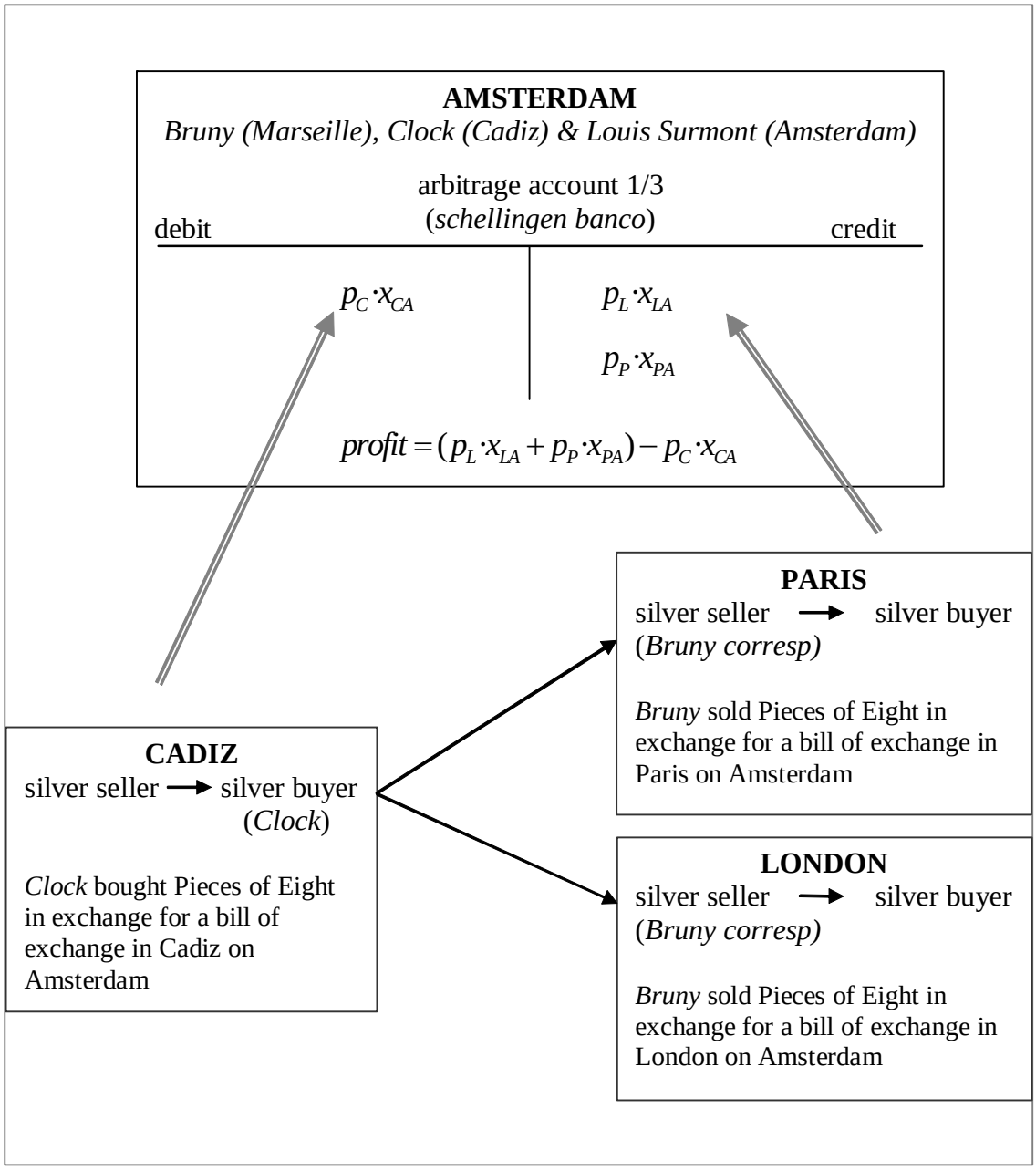
[35] This example is one of the two only examples of specie arbitrage accounts preserved for our period of study as the accounting registers were destroyed in a fire in 1941. Rebuffat (1965), p. 89.

[36] Raymon Bruny was Roux's uncle. The 1 October 1728 he transferred the merchant house *Raymon Bruny et Cie* to his two nephews, Jean-Baptiste-Ignace and Pierre-Honoré Roux. The new merchant house was named *Jean-Baptiste, Honoré Roux et Cie*. Rebuffat (1965), p. 89.

Figure 2.2.: Scheme of arbitrage according to the arbitrage account



Source: *Fond Roux, L. IX, Compte arbitrage, liasse 53*

Arbitrage with specie was, therefore, a multilateral business in the 18th century. International trade was based upon multilateral payments[37]. Silver, as any other commodity, followed the logic of multilateral international payments.

The great negotiability of foreign bills of exchange drawn on the main centres allowed multilateral settlement. Flandreau *et al.* (2009a) have recently measured the

[37] Heckscher (1950), Sperling (1965).

degree of multilateralism in mid-18th century: 18% of links between cities were direct, 75% had to pass through an intermediary centre, and 7% needed two intermediaries[38]. The main centres were the connecting hubs: Amsterdam, Paris and London. Therefore, it is not surprising that silver arbitrage was settled through the main centres (Amsterdam in our example).

How is the equation of the multilateral arbitrage with specie? Suppose that the silver was traded between Cadiz and London and settled through the main centre, Amsterdam, then, the multilateral arbitrage equation is:

$$(1-c_{CL})\frac{p_L}{p_C} \leq x_{CA}\cdot x_{LA} \leq (1+c_{LC})\frac{p_L}{p_C} \qquad (2.2.)$$

where p_L denotes the market price of silver in London; p_C denotes the shadow price of silver in Cadiz; x_{CA} is the spot exchange rate between Cadiz and Amsterdam; x_{LA} is the spot exchange rate between London and Amsterdam; c_{CL} is the cost of trading the silver from Cadiz to London; and c_{LC} is the cost of trading the silver from London to Cadiz.

The multilateral arbitrage equation for specie equals the bilateral arbitrage equation defined in equation 2.1. assuming the arbitrage condition for the triangular arbitrage of bills of exchange, that is:

$$x_{CA}\cdot x_{LA} = x_{LC} \qquad (2.3.)$$

where x_{CA} is the spot exchange rate between Cadiz and Amsterdam, x_{LA} is the spot exchange rate between London and Amsterdam, and x_{LC} is the spot exchange rate between London and Cadiz.

Graph 2.1. shows the stochastic integration for the bills of exchange market, i.e., drawing a hypothetical spot bill between Cadiz-London is equivalent to drawing a hypothetical spot bill between Cadiz-Amsterdam, plus other between London-Amsterdam.

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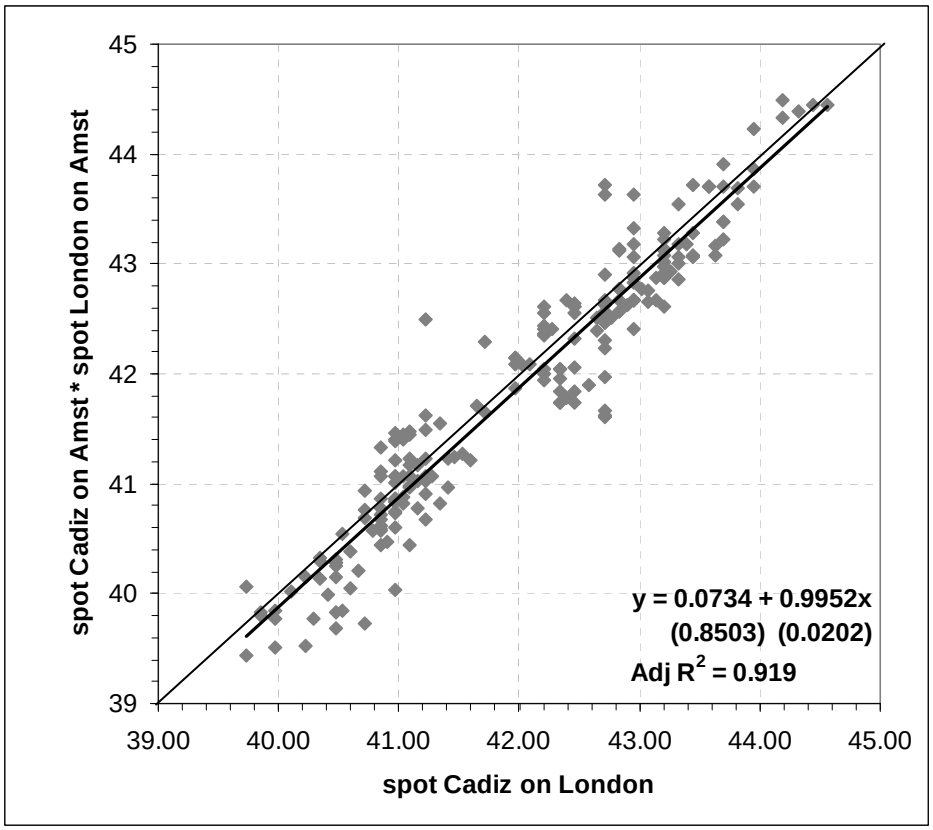
[38] Flandreau *et al*. (2009a), p. 162

Graph 2.1.: scatter diagram spot exchange rate in Cadiz on London – spot exchange rate in Cadiz on Amsterdam multiplied by spot exchange rate in London on Amsterdam, (half-monthly observations) 1729-1741 (pence sterling/peso de plata antigua)



Source: selft-elaboration using Flandreau *et. al*. (2009b) methodology for calculating the spot exchange rate in London on Amsterdam (data from *The Course of the Exchange*), and Appendix methodology for calculating spot exchange rate in Cadiz on Amsterdam and in Cadiz on London (data from *Roux Archive*). Standard error in brackets. Wald test does not reject the null hypothesis of constant equals to zero and trend equals to one.

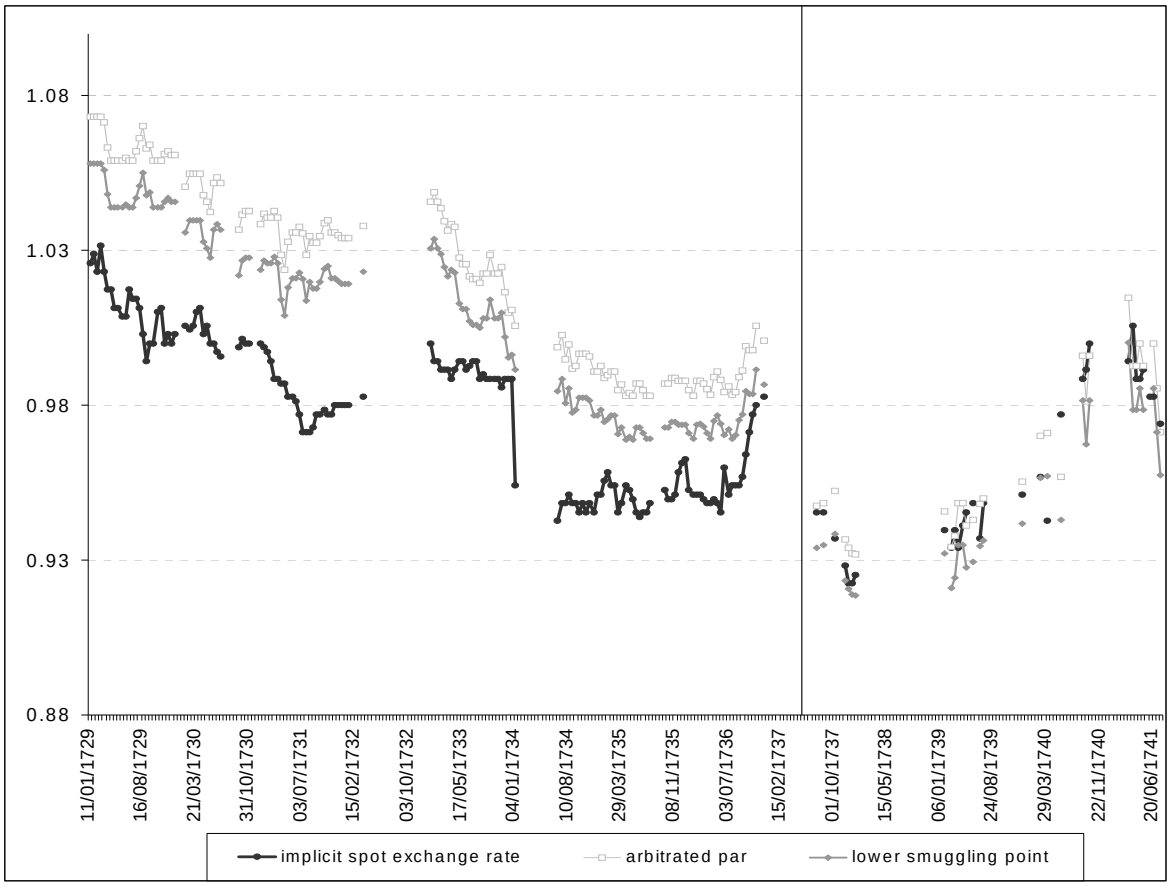
Therefore, as the bill market is integrated, results do not differ considering bilateral or multilateral arbitrage. Contemporaries practised multilateral arbitrage because sellers of silver prefered to have credit balances in the main centres (e.g., Amsterdam) than in Cadiz, not because they obtained an extraordinary profitability through the triangular arbitrage with bills. We prefer to show here the bilateral arbitrage in order to compare results with our knowledge of specie arbitrage for the 19th century. The appendix describes all the details regarding the construction of the bilateral silver points (London-Cadiz).

Why was it profitable to buy silver in Cadiz and sell it in other places, e.g.., London? Does not the Law of One Price hold in silver between Cadiz and London for the period 1729-1741? Let us observe the reconstruction of the lower band of the bilateral arbitrage equation according to equation 4.1. (see Graph 2.2.):

$$(1 - c_{CL})\frac{p_L}{p_C} \leq x \qquad (2.4.)$$

where p_L denotes the market price of silver in London, concretely the American-Spanish coin named the Old Mexican piece of eight; p_C denotes the shadow price of the Old Mexican pieces of eight in Cadiz; $\frac{p_L}{p_C}$ is denominated the arbitrated par of exchange; *x* denotes the spot exchange rate between London and Cadiz and c_{CL} is the cost of trading the silver from Cadiz to London.

*Graph 2.2.: lower band of arbitrage equation between London and Cadiz, 1729-1741 (half-monthly observations), pence sterling/peso de plata antigua (normalized at intrinsic par, 1729-1737,54*8/10=1)*



Source: see Appendix 2

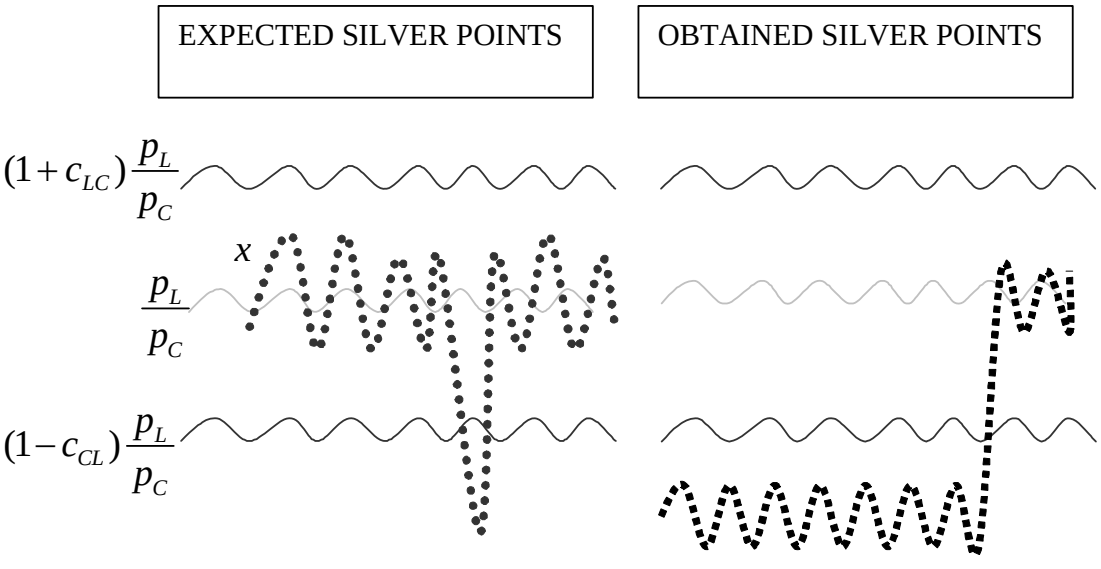
What results can we expect? (see Figure 2.3.). We expect occasional silver point violations adjusted by arbitrage. That is, for a given London-Cadiz exchange rate and the silver price in London, the silver price in Cadiz does not fall lower than the point when sending silver from Cadiz to London becomes profitable.

What results do we obtain? (see Figure 2.3.) According to results in Graph 2.2, we can distinguish two different periods:

- From 1729 to 1737, there was a systematic bias between the implicit spot exchange rate and the arbitrated parity. The bias was greater than costs. Then, the gap between the implicit spot exchange rate and the lower silver point made arbitrage systematically profitable. International markets were connected through smuggling and, therefore, how should we interpret this systematic bias? According to the Law of One Price, arbitrageurs should buy silver at the lowest market price (Cadiz) and sell it at the highest market prices (London), which would adjust prices thus removing arbitrage profitability. Why was it possible to maintain a long-run profitability during nine years without prices adjustment?

- From mid-1737 to 1741, the bias was corrected because the Spanish government reacted to the illegal bullion outflows with a devaluation, which equalized the implicit spot exchange rates and the arbitrated parity. So, what was the role of devaluation in the specie-point mechanism?

Figure 2.3.: Expected vs. obtained silver points



The empirical results puzzle our knowledge of the specie-point mechanism. How could the exchange rate break the lower band systematically during nine years? And what was the role of devaluation in correcting the systematic gap between the exchange rate and arbitrated parity? The key point is that historiography has calculated the arbitrage equation in the 19th century institutional setting of free bullion movements[39]. But, what happens when bullion movements are controlled? What was the effect of bullionist restrictions on the workings of silver points?

If the price of silver in Cadiz is lower than in London, arbitrageur should buy the pieces of eight in Cadiz and sell them in London, which equalizes prices. But we do not observe adjustment. The Law of One Price holds only if markets are competitive. Despite smuggling, persistent differences in the price levels indicate that markets were not competitive. Next section focus on the market structure in order to demonstrate that silver market structure in Cadiz was an oligopsony.

3. THE AGENTS INVOLVED IN THE ILLEGAL EXCHANGES OF SILVER

The Castilian crown concentrated the monopoly of trade with American-colonies through the use of one single port; first, Seville (1495/1503-1717), through the ports of Cadiz and Sanlúcar de Barrameda, and later, directly Cadiz (1717- 1765/1789)[40]. The whole legislation about the trade with America colonies (*Carrera de Indias*) was subordinated to the government's concern to accumulate precious metals in Spain[41]. Cadiz was, therefore, the commercial geo-strategic centre which connected the maritime route Mediterranean Sea - Atlantic Ocean - North Sea - Baltic Sea though the Strait of Gibraltar. Bullion which shipped from New World to Old World should pass through Cadiz. This chapter describes the agents involved in the illegal exchanges of silver in Cadiz and measures the importance of the smugglers regarding the total of the merchants in Cadiz.

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[39] Flandreau (2004)

[40] Bernal (1992), García-Baquero González (1988, 2002)

[41] Girard (1967), p. 33

3.1. The Spanish merchants versus the foreign merchants

Cadiz had a population around 60,000 people in mid-18th century[42]. Its economy was based on trade, and trade was dealt by businessmen who practised wholesale trade and invested capital in speculative activities of trade with America or in the main commercial and financial European centres[43].

These businessmen can be classified in two types of agents, depending on nationality: those who legally could trade with American colonies –Spanish businessmen-, and those who must not –foreign businessmen. Trade with the American colonies was restricted to Spanish nationality because it was "a right of all the Spanish without exception"[44]. These Spanish businessmen who traded with colonies were called "*Cargadores de Indias*" (delivery agents for Indies), they must be registered as members of the guild *Consulado de Cargadores de Indias* (Consulate of delivery agents for Indies)[45], and they could trade for themselves or as commissioners for other Spanish businessmen[46]. The *Consulado de Cargadores de Indias* had judicial, fiscal, financial and administrative tasks. It was the merchants' court for *Casa de Contratación*, the collector of commercial taxes for the Monarch, the moneylender for the Crown and the registry of the merchants with American colonies[47]. Thanks to the guild's registry, we know the names of all *Cargadores de Indias*: in our period 1730-1742, they were 1,250 merchants registered.[48].

Foreign businessmen, however, must not trade with American colonies, neither directly or through *Cargadores de Indias*, because it was considered by government a way to extract precious metals from Castile kingdom[49]. During some periods, trade with American colonies was also permitted to the naturalized foreign merchants[50] and the

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[42] Cadiz was one of the main Spanish cities in 1750: Madrid had (160,000 inhabitants), Granada (70,000), Seville (66,000), Cadiz (60,000), Valencia (60,000) and Barcelona (50,000). Bairoch, Batou and Chèvre (1988), pp. 15-21.
[43] Carrasco (1997) p. 17
[44] "*un derecho de todos los españoles sin excepción*" AGI, Consulados, leg 63A, year 1747, in Bustos, (2005), p. 130
[45] *Real Cédula* 24 may 1686
[46] García-Baquero (1991) pp.69-101.
[47] Heredia Herrera (1989), Bernal (1993), Vila Vilar (1999), Kuethe (1999). Avería was a
[48] Ruiz Rivera (1988), p. 113-130, reproduces the list with the names of *Cargadores de Indias*.
[49] *Real Cédula* 27 July 1592.
[50] Foreign merchants could obtain the naturalization papers if they were catholic, had patrimony, more than 20 years of residence in Castile and 10 years married with a Castilian women. Diaz Blanco and

foreign merchant's sons (named *jenízaros*- foreign father and Castilian mother). But during our period of analysis, the application of the nationality criterion[51] was very strict, and in the period 1730-1742 both naturalized merchants and *jenízaros* were excluded of the guild *Cargadores de Indias* [52]. In 1742 the King accepted to the naturalized foreign merchants and *jenízaros* to trade with America *de iure*, but de facto the conflict between the Spanish against the naturalized and *jenízaros* merchants persisted until the end of the century[53]. Indeed, naturalized and *jenízaros* represented a very small percentage of the total *Cargadores de Indias:* zero during the period 1730-1742 and less than 5% for the period 1743-1823[54].

What was the effect of nationality on the bullion business? Nationality defined both sides of the market: the Spanish merchants introduced the American bullion in Cadiz while the foreign merchants extracted it from Cadiz. Although trade with American colonies must be done by the Spanish merchants, the foreign merchants had the key role though the illegal trade (as much the illegal importations form Europe to Spain and from Spain to American colonies as the illegal exportations from Spain). The foreign merchants have been considered by the Spanish historiography as the "merchants in the shadow", i.e., those who must not trade with American colonies *de iure*, but who obtained the highest net income from the mercantile activity *de facto*[55]: by mid-18th century the foreign wholesale merchants computed more than the 80% of the total net income gained by trade in Cadiz[56].

The Spanish historiography has focused on the Spanish trade with Colonies due to the guild's structure of trade gathered together the sources (*Consulado de Cargadores de Indias*- archive compiled in *Archivo General de Indias*). But we lack of systematic research about trade with Europe, due to the dispersion of sources because

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Maillard Álvarez (2008)

[51] Castilian law considered a man as national if he had been born in Castile (or Aragon) and his father was Castilian. A woman was national if she had been born in Castile (or Aragon) although her father was foreign. Diaz Blanco and Maillard Álvarez (2008)

[52] García- Mauriñó (1991).

[53] García- Mauriñó (1991) p. 268

[54] The *Cargadores de Indias'* registry registered to 50 naturalised mechants, 89 *jenízaros*, 3057 Spanish merchants and 56 *indianos* (55 from the American colonies and 1 from Manila). Ruiz Rivera (1988)

[55] García Baquero (1976), p. 488; Solano (1991), p. 347

[56] Proportion calculated from Campos and Camarero (ed.) (1990), pp. 114-115 (see table 6.1). And the 66% of the total net income gained by trade in Andalusia. García-Baquero (1991), p. 33

the foreign wholesale merchants were not organized in a guild[57]. Luckily, fiscal sources help us to approach to the foreign wholesale merchants group. Specifically, the *Catastro de Ensenada* is a huge statistic done by the Castilian government between 1750 and 1756 in the 22 provinces of the Castilian Crown in order to replace several taxes (*rentas provinciales*) for one single tax proportional to wealth (*contribución única*). Therefore, the aim of this statistic was to know wealth. For this aim, it had 40 questions about wealth on different productive activities, and the number 31 asked for the annual net income of wholesale merchants. The answer for Cadiz broke down net income of wholesale merchants by nationality for the activity of "trade and transfer of bills of exchange" for the year 1753; and, additionally, a correction of the statistic done in 1762 added the number of merchants[58]. Results appear in the table 3.1.:

Table 3.1.: Wholesale merchants' net income according Catastro de Ensenada, 1753

	CADIZ			
Nationality	Wholesale merchants' net income per year for trade and transfer of bills of exchange (1753)		NUMBER OF MERCHANTS (1762)	
	Pieces of eight of old silver	%	number	%
French	710,450	46.04	60	16.17
Italian	149,800	9.71	35	9.43
German	31,000	2.01	3	0.81
Damascene (Swedish & Prussian)	75,500	4.89	11	2.96
Irish (and English)	231,100	14.97	30	8.09
Flemish	74,700	4.84	14	3.77
Spanish- Cargadores de Indias[59]	270,724	17.54	218	58.76
TOTAL	1,543,274	100.00	371	100.00

Source: net income data from the *Catastro de Ensenada* (1753), in Campos and Camarero (ed) (1990), pp. 114-115; number of merchants from the verification of the *Catastro de Ensenada* (1762) in García-Baquero (1988), vol 1, pp.491-492

[57] García-Baquero points out that the colonial trade has been really more much researched by historiography than the trade with Europe due to the comparative availability of sources: "*La verdad es que el comercio colonial disponía de fuentes eficaces, continuas, asequibles y directas*" García-Baquero (1991), p. 34

[58] The statistic done in 1762 also corrected the data regarding net income, but the statistic done in 1771 considered again the data of the statistic done in 1753 as the good data. For this reason we consider data from 1753. See Ruiz Rivera (1988), p. 72.

[59] The Spanish are the *Cargadores de Indias*, but all *Cargadores* registered in the *Consulado* did not appear in the *Catastro de Ensenada*. Those who did not appear, or they did not practise or they had not got enough income, although they were registered as *Cargadores*. Ruiz Rivera (1988), p. 73.

We observe in table 3.1. the predominance of French merchants. They were the most important group of foreign merchants, followed by Irish and Italian. Other nationalities also had representation in the wholesale trade in mid-eighteenth century Cadiz: Damascene (and Swedish and Prussian), Flemish and German. The French merchants represented one quarter of the total merchants and obtained half of the total annual net income per wholesale trade in mid 18th century. Why were French the richest group of wholesale merchants? The situation of foreign merchant in Castile depended on the bilateral diplomatic relations. Tariffs, licenses and bans on import and export discriminated against nationalities. When the political relations broke, the Castilian authorities ordered the embargo of goods and the expulsion of the foreign merchants who lived in the Castilian kingdom. Different nationalities had different privileges depending on the period.

The reason of the settlement of foreign merchant in Castile was the attractiveness of the American precious metals, although their exportation was forbidden[60]. The French had an early settlement in Spain, and the trade relations were intensified with the America discovery. At the end of the 16th century, the French population in Castile was so important that French consulates were created in various Spanish cities -Cadiz (1575), Seville (1578), Barcelona (1578) and Valencia (1593) [61]. The Spanish Succession war gave privileges to the French merchants and expulsed to English protestant merchants[62].

The foreign merchants had a key role in Spanish trade -as we have seen in Table 3.1. The stagnated rules of law which had been defined by the Castilian government to manage trade with America were subverted through complex systems of patronage, corruption, monopoly (and oligopsonies) and collusion strategies[63]. The elites exploited the American empire through a socio-political patronage system facilitated by the rules of the law. And the Crown's dependence upon American precious metal to maintain the American empire perpetuated these rules of the law. The complex systems facilitated both the clandestine European imports and exports, included bullion. Next sub-section

[60] Girard (1967), p. 37.
[61] Girard (1967), pp. 37-42.
[62] Carrasco González (1997), pp. 22-26.
[63] Ringrose D. R. (1996), p. 84.

shows the names of the French smugglers of silver for our period and measures their importance, regarding the total French merchants in Cadiz and also regarding the total merchants in Cadiz (both foreign and Spanish).

3.2. Who is who? Measuring the importance of smugglers of silver

We have seen in the previous section that the French merchants were the most important merchants in Cadiz in the mid-18th century. What was their regional origin? According to a contemporary document made near our period: "*Liste des négocians François établis à Cádiz*" (List of French merchants settled in Cadiz) (2 January 1714), two regions stand out: Bretagne (Saint-Malo) and Provence (Marseille).

On one hand, the route Saint Malo - Cadiz was the maritime link for trade between West France and the Spanish America from the second half of the 17th century[64]. According L'Espagnol (1997), the route Cadiz – Saint Malo constituted one of the great European routes of redistribution of the American silver from the end of the 17th century[65]. On the other hand, Marseille was the French Mediterranean port in the Old Levant route, traditional channel for gold and silver to the East[66]. Flandreau *et al* (2009a) point out the important role played by the Franco-Spanish connection for channelling the American Treasure out of Spain[67]. Merchants families from Bretagne and Provence had sent their related to Cadiz to geographically expand the network to distribute the silver[68].

It is not surprising, therefore, that we have located the Cadiz black market of silver in the Cadiz's correspondence for the Marseille Merchant House *Roux*. Indeed, *Roux* banker was the specialist of arbitraging with bullion in Marseille[69]. Therefore,

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[64] See L'Espagnol (1997), p. 403-493. Malouin prominent commercial, shipping, and financial roles in the War of the Spanish Succession flowed from previous decades of expansion at Cadiz. During the 1650s Malouins had obtained from Spanish government licences to freight silver in wartime to Saint-Malo. The regular shipper was La Lande Magon of Saint-Malo at Cadiz, the great-grand father of one of our main silver smugglers. Stein and Stein (2000), p. 113 and L'Espagnol (1997), p. 125.

[65] L'Espagnol (1997), p. 410.

[66] Braudel (1979), vol. 3, p. 619. Marseille is considered by literature one of the main centre of the Spanish silver smuggling. Bernal (1992), pp. 317-318 and Bustos (2005), p. 390 consider Marseille as one of the main centres of Spanish silver smuggling.

[67] Concretely the Franco-Spanish monetary block consists of Madrid-Cadiz-Lyon-Marseille. Flandreau *et al* (2009), pp. 163-164

[68] It is considered by L'Espagnol as "une véritable "stratégie de filière" des grandes dynasties marchandes dans le commerce de Cadix". L'Espagnol (1997), p. 454

[69] Rambert(1954), vol. 4, p. 480

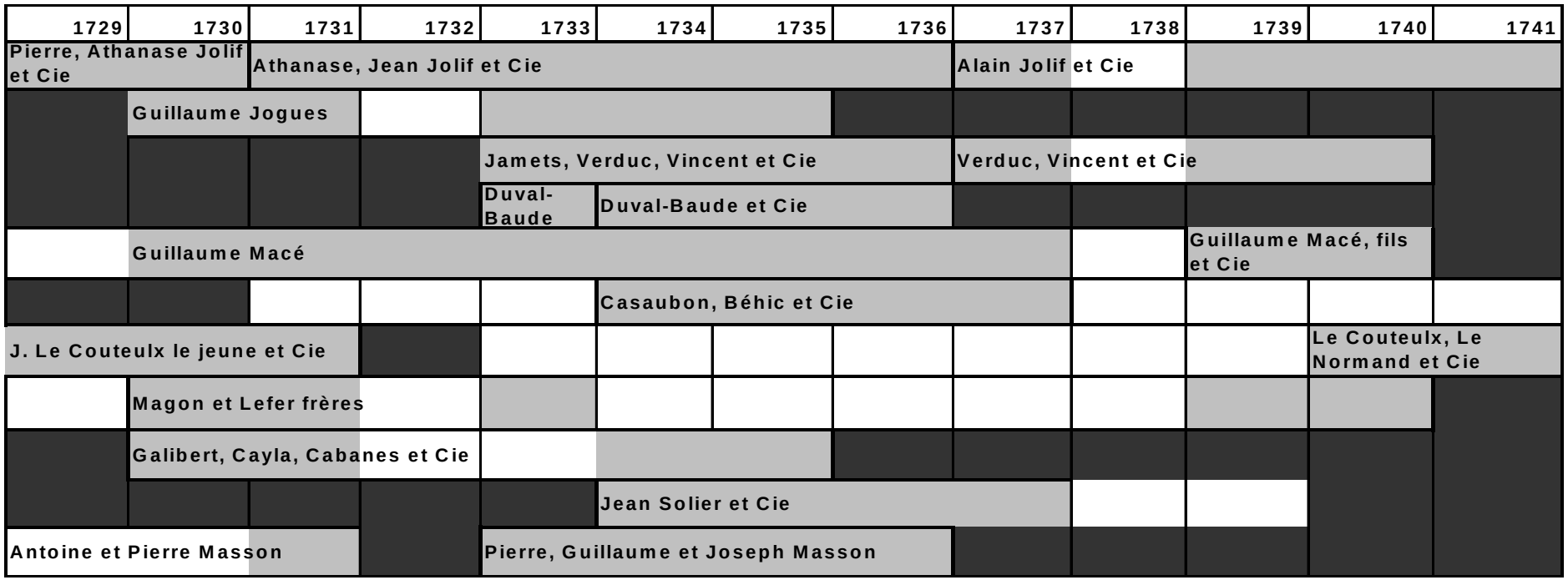
looking at the Cadiz's correspondents who arbitrated with bullion together *Roux*, we are going to achieve a good approximation to the major figures of the silver smuggling business. Who were the smugglers according to *Roux* banker archive? Table 3.2. shows the names of the Merchant Houses which reported the shadow silver quotations to *Roux.* They are the Merchant Houses which reported quotations, and not necessary which arbitrated with silver, although it seems logic that someone who knew and reported black market prices should be involved in the business. The information about the arbitrage carried out is available in the invoices, but not all have been preserved. Then, we can not know the total quantities arbitrated, but the names of the small number of merchants who led the silver smuggling.

Arbitrage with silver was practised as we explained in the previous section: two or three partners from different cities bought the pieces of eight in Cadiz and sold them in other European centre ("*compte à demi*" or "*compte a tiers*"). The first partner was *Roux* in Marseille, the second partner was one of his correspondents in Cadiz, and the third partner was a merchant from a European centre, usually from Amsterdam. This system made possible to share profits and risks. Let us see some examples of the arbitrage partnership[70]:

- 1729: *Tourton Baur et Cie* (Paris)- *Magon et Lefer frères* (Cadiz)- *Roux* (Marseille)[71]
- 1729-1730: *Arnold et Pierre Blesen* (Amsterdam)- *Guillaume Jogues* (Cadiz)- *Roux* (Marseille)
- 1729: *Guillaume-Louis de Surmont* (Amsterdam)- *Brethous Clock et Cie* (Cadiz)- *Roux* (Marseille)
- 1729: *Jacob-Henriquès Medina* (Amsterdam)- *Antoine et Pierre Masson* (Cadiz)- *Roux* (Marseille)

[70] Carrière *et at* (1976), pp. 153-154.
[71] The account of arbitrage showed in the Example 2 of the Chapter 4 (Illustration 4.2. and Figure 4.3.) belongs to *Tourton Baur et Cie - Magon et Lefer frères - Roux* partnership.

Table 3.2.: The Merchants Houses in Cadiz which reported the silver shadow prices to Roux banker, 1729-1741[72]



Black colour means that there is not correspondence for that merchant house in that year; white colour means that there is correspondence but not silver quotation for that correspondent in that year, and grey colour means that there is quotation for that merchant house in that year. Names have been organized according the number of times that they reported the silver black market prices for the whole period (first name, maximum quotations)

Source: Fond Roux L.IX. Section IV: Correspondance passive Cadix, liasses 810-856.

[72] We did not include the merchant houses which only reported prices during one single year: *Cleaude hervé et Cie* (1729), *Brethous, Clock et Cie* (1729), *Pelicot* (1730), *Jacques Gough et Cie* (1734) and *Boby, LeGobien et Cie* (1740).

Therefore, the smugglers in Cadiz used collaborated with other European merchants to distribute the silver outside Spain. According Rambert (1954), *Verduc, Vincent et Cie* could have been the Merchant House which had a higher silver trade with Roux during our period[73]. According invoices, the names more repeated are: *Jean Jolif et Cie, Verduc, Vincent et Cie, Magon et Lefer frères, Joseph Masson, Galibert, Le Couteulx,* and *Guillaume Jogues.*

How important were the smugglers? We measure importance regarding the total French merchants in Cadiz (1) and regarding the total merchant in Cadiz.

We use a contemporary ranking to measure the importance of the smugglers regarding the total French merchants in Cadiz: "*Nous dressâmes... un état de toute la nation, qui fut divisée en 5 classes selon le plus ou le moins de commerce que nous estimâmes qu'un chacun fait... Ces classes seront refaites tous les ans pour y insérer les changements auxquels la nouveauté qu'il pourroit y avoir dans le commerce de ceux qui les composent pourroient donner lieu, et les augmenter des nouvelles maisons qui pourroient s'établir dans la suite à Cadiz sous pavillon françois*" (J.-B. Partyet a Maurepas, 12 March 1736)[74].

Cadiz had in average 60 merchant houses from 1724 to 1790. The top French merchant houses in Cadiz (1st class) represented the 32% of the total in 1724, 16% in 1736 and 24% in 1746. What was the smugglers' position in the ranking? (see table 3.3.) The smugglers were the most important merchant houses regarding the French merchants who lived in Cadiz. All they were first class –although Jolif and Jogues moved from 1st to 2nd class and Lecouteulx from 2nd to 1st class. We have seen in table 3.3. that the top French merchant houses in Cadiz represented the 32% in 1724, 16% in 1736 and 24% in 1746 of the total French merchants in Cadiz and the 100% of smugglers were into this top class. This means that silver smuggling was totally a business of the top French merchant houses.

[73] Rambert (1954), vol IV, p. 481.
[74] Quotation reproduced in Ozanam (1968), p. 269

Table 3.3: smugglers' position in the French ranking, 1724, 1736, 1746

1724	1736	1746
Jolif frères **(1 class)**	Athanas, Jean Jolif et Cie **(2 class)**	A. Jean, L. Jolif et Cie **(2 class)**
Guillaume Jogues **(1 class)**	Guillaume Jogues **(2 class)**	
Jamet et Ollivier (?) **(1 class)**	Jamet, Verduc, Vincent et Cie **(1 class)**	Verduc, Vincent et Cie **(1 class)**
	Duval, Bande et Cie **(1 class)**	
Macé **(1 class)** [75]		
Fortic et Casaubon (?) **(1 class)**	Casaubon, Béhic et Cie **(1 class)**	Casaubon, Béhic et Cie **(1 class)**
Lecouteulx **(2 class)**	Lecouteulx et Lenormand **(1 class)**	Lecouteulx, Lenornmand et Cie **(1 class)**
Magon frères **(1 class)**	Magon et Lefer frères **(1 class)**	Magon et Lefer frères **(1 class)**
	Cayla, Cabanes, Solier et Cie **(1 class)**	Cayla, Solier frères, Verdun et Cie **(1 class)**
Masson **(1 class)**	Masson frères **(1 class)**	Joseph Masson et Cie **(1 class)**

Source: Ozanam (1968), p.348

We have seen that the smugglers were the most important merchants regarding the French merchants settle in Cadiz (table 3.3.), and we saw in the previous section of this chapter (table 3.1.) that the French merchants were the most important group regarding the total of merchants –as French obtained half of the total annual net income per wholesale trade in mid 18th century. Let us see now the importance of the silver smugglers regarding the total merchants in Cadiz.

For that, we use a ranking elaborated by *Consulado* in 1771. It is a list which broke down the names and net income for all wholesale merchants in Cadiz, in order to implement the project of fiscal reform "*contribución única*" started in the 1750s. Results are summarized in table 3.4.

We see in table 3.4 as the French group were the most important group in net income per capita, followed by the German, Irish, Flemish, Italian and Spanish. Only 1% of the total merchants gained a higher net income than 32,000 pieces of eight of old silver, and all them were French. The composition of the French colony was fairly stable -lists available from 16th century show the same names almost every time[76]. Then, we can compare the names of smugglers appeared in *Fond Roux* (1729-1741) with the names listed the project of fiscal reform "*contribución única*" (1771).

[75] Guillaume Macé appears as naturalized in 1745 with the Spanish name Guillermo Macé (Ruiz Rivera, p. 56)
[76] Mauro (1990), p. 280

Table 3.4: wholesale merchants' net income per nationality

Net income (P8 old silver)	FRENCH	GERMAN[77]	IRISH[78]	FLEMISH	ITALIAN	SPANISH
0,000- 7,999	**80**	**14**	**38**	**18**	**43**	**283**
8,000-15,999	**15**	**4**	**4**	**1**	**4**	**1**
16,000-23,000	**6**	**1**	**0**	**0**	**0**	**0**
24,000-31,999	**2**	**0**	**2**	**0**	**0**	**0**
32,000-39,999	**3**	**0**	**0**	**0**	**0**	**0**
40,000-plus	**2**	**0**	**0**	**0**	**0**	**0**
Total number	108	19	44	19	47	284
Net income p.c	6,606	5,605	5,418	3,932	3,198	954

Source: self-elaboration using the list: "*Relaciones de comerciantes remitidas a la Escribanía de Cabildo, a 3 de junio de 1771*" (Archivo General de Indias, Consulados 892 bis), reproduced in Ruiz Rivera (1988), pp. 65-72.

Who were the 5 merchants with highest net income regarding the total of merchants in Cadiz?[79] They were the silver smugglers:

- *Casaubon Domingo, por sí y Casaubon Behic y Cia*: 40,000 pieces of eight of old silver

- *Solier, Marcos, por sí y por Cayla, Solier, Hermanos Cabanes y Compañía*: 40,000 pieces of eight of old silver

- *Verduc, Pedro y Compañía*: 36,000 pieces of eight of old silver

- *Masson, Josèph y Cia*: 35,000 pieces of eight of old silver

- *Lefer, Francisco por sí y Magon y Lefer Hermanos*: 30,000 pieces of eight of old silver

Bullion smuggling was a business for the "top" merchant houses because exporting bullion illegally needs an international network to extract and distribute the bullion outside Cadiz and resist by force the Spanish duty control if needed. Only the top merchant houses could do it, because they were international societies, with

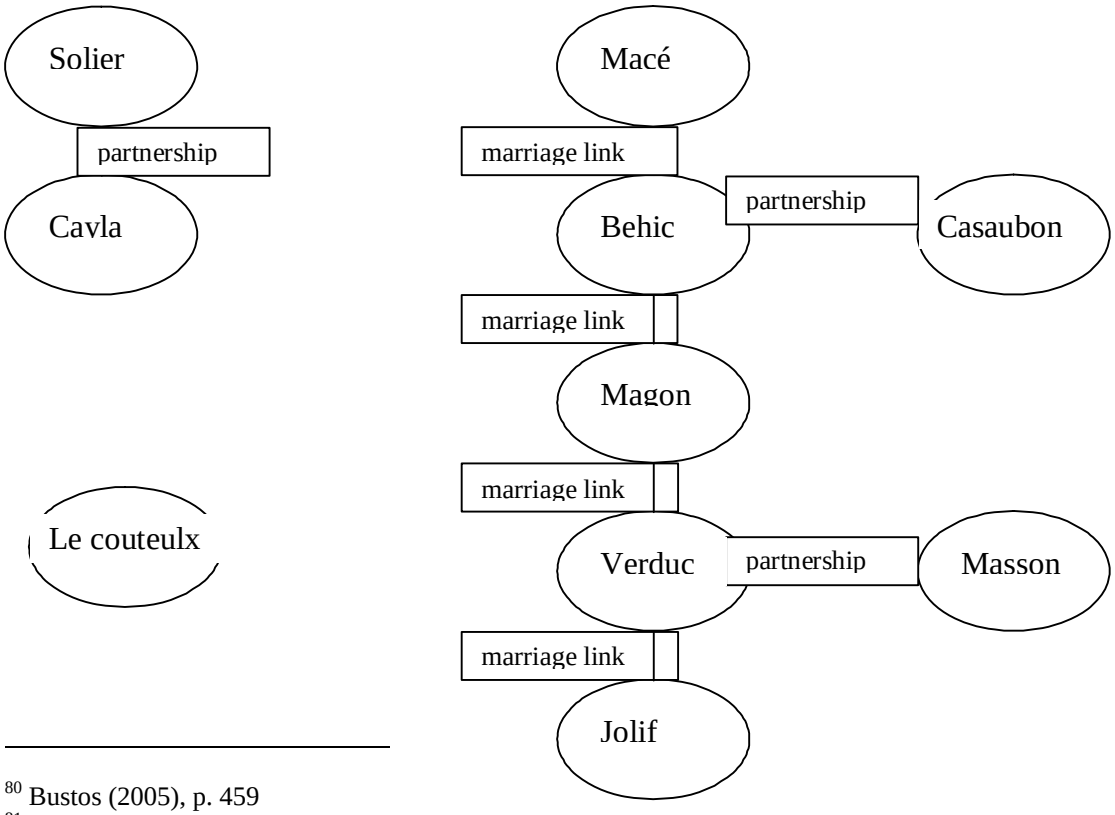
[77] German, Damascene, Swedish and Prussian

[78] Irish and English

[79] The fifth most important merchant was not one of our smugglers: *Gilly, Simón, por sí y su Compañía*. But this merchant house did not exist in our arbitrage period (1729-1741). It appears in the ranking of French merchant houses in Cadiz of 1746. The other smugglers had a lower net income, but higher to the average: *Jolif, Juan y sus hermanos compañeros*: 8,000 and *Maccè, Nicolás, por Guillermo Maccè, Hijo y Cia*: 8,000. *Le Couteulx* did not appear in *Contribución Unica*. Only his partner appeared *Lenormand, Antonio por sí y su compañía*: 18,000; but according to *Almanach Général des marchands* (1772; p. 73), the company was: *Le Couteux, Le Normand & Compagnie*. Guillaume Jogues and Duval-Baude had disappeared in the ranking of French merchant houses in Cadiz of 1746. Ozanam (1968), p. 348.

headquarter in Cadiz and partnership companies abroad[80]. Not surprisingly, the most important merchant houses (net income 40,000 pieces of eight of old silver) were the same names denounced by Spanish authorities as bullion smugglers (1738-1744): *Casaubon, Behic et Compagnie* and *Cayla, Solier, Cabanes et Compagnie*[81]. These smugglers were organized in networks (see Figure 3.1.) and were price maker, as contemporaries recognized: *"Malgré cette division du corps des négocians en gros en 4 classes, par laquelle la première étant composée de 12 maisons, on a lieu de juger que ces 12 maisons sont à peu près de la même portée, je crois cependant devoir, Mgs., vous observer que les maisons des Srs Masson, Verduc, Vincent et Cie, Magon et Lefer, surtout celles des Srs Casaubon, Béhic et Cie, et Cayla, Solier frères, Vendun et Cie, reçoivent plus de marchandises, soit de France, soit du pays étranger, que tout le reste de la nation ensemble; que les Srs Casaubon et Béhic, Masson, Wailsh, Handricx, Sobia et Vande, et Cayla, Solier frères, Vendun et Cie passent pour les plus riches François de Cadiz: que ce sont ces maisons qui réglent principalement le prix du change, ainsi que celle des Srs Le Couteulx, qui est considérable pour cette partie du commerce"* (Partyet à Maurepas, 4 avril 1746, in Ozanam, p. 272-273)

Figure 3.1: smugglers' network



[80] Bustos (2005), p. 459
[81] Archivo general de Indias, sección 5ª, Gobierno, legajo 2479, Indiferente general (microfilm C-1557)

4. THE MODEL AND DATA: THE BEHAVIOUR OF OLIGOPSONISTIC SILVER PRICES WITH DEVALUATION

In this section we will develop a static model of partial equilibrium for commodity-money in order to understand the workings of the oligopsonistic commodity market and the effect of devaluation. First, we will describe the oligopsonistic silver-commodity market. Second, we will add the silver-money market. And, finally, we will analyze the effect of devaluation on the bullionist goal of treasuring silver.

4.1. The oligopsonistic silver-commodity market

We have seen in section 4 that the arbitrage equation represents the Law of One Price for silver specie, i.e., in the absence of transportation and other transaction costs, competitive markets will equalize the price of the silver coin *Old Mexican piece of eight* in two countries, when both prices are expressed in the same currency:

$$p^* = p_C = p_L \cdot x \qquad (4.1.)$$

where p^* represents the international competitive price expressed in one single currency (the Castilian unit of account: *peso de plata antigua*); p_C denotes the shadow market price of silver in Cadiz (*peso de plata antigua*); p_L denotes the market price of silver in London (shilling), and x denotes the spot exchange rate between London and Cadiz (*pesos de plata antigua*/shilling).

The Law of One Price works due to arbitrage opportunities. If the price of silver is different in two markets, then sellers will sell in the market with the highest price and buyers will buy in the market with the lowest price. This will adjust prices and equilibrate the Law of One Price. This mechanism of adjustment implies a model of perfect competition in which both buyers and sellers are price-takers.

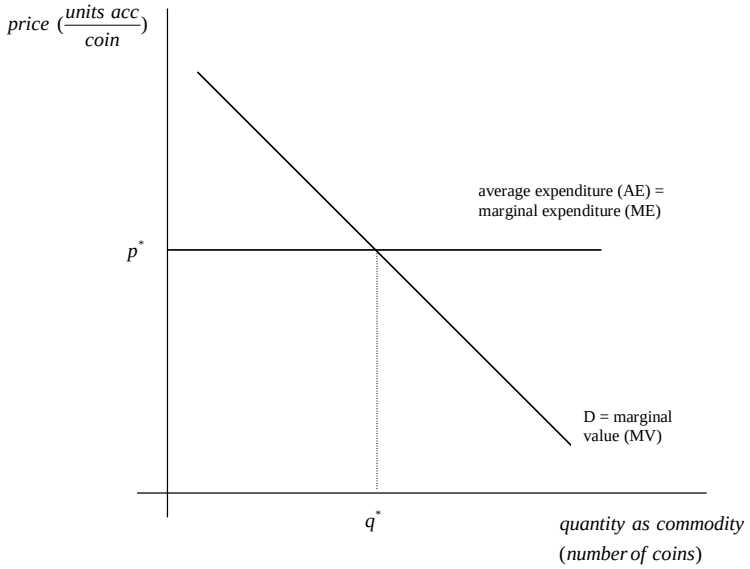
What happens to the Law of One Price in a case of imperfect competition? We have demonstrated that the structure of the silver black market in Cadiz was an oligopsony and buyers were price-makers. Oligopsonistic power enables buyers to purchase silver at a lower price than would prevail in a competitive market. In addition, the quantity purchased is lower under oligopsony than under perfect competition.

Let us draw the silver-commodity market. Suppose you are the merchant-banker who is trying to decide how much silver to purchase. You could apply the basic marginal principle – keep purchasing units of silver until the last unit purchased gives additional value, or utility, just equal to the cost of that last unit.

The individual's demand curve measures the marginal value as a function of the quantity purchased. Therefore, the marginal value schedule is the demand curve for the silver. But the marginal cost of buying additional units of silver depends on whether you are a competitive buyer (case 1) or an oligopsonistic buyer (case 2).

CASE 1: Suppose you are a competitive buyer, i.e., a price-taker (Figure 4. 1.). Then, you take the market price p^* as given. Your marginal expenditure is equal to your average expenditure, which in turn is equal to the market price of silver. The quantity purchased is found by equating price to marginal value, i.e., your demand curve.

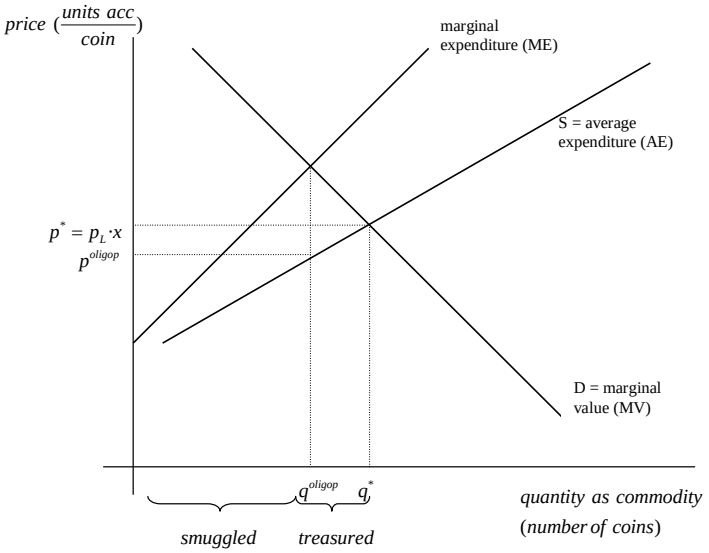
Figure 4.1.: Commodity-silver market (competitive buyer)



CASE 2: Now suppose you are an oligopsonistic buyer, i.e., a price-maker (Figure 4.2.). In order to determine how much silver to buy, set the marginal value from the last unit purchased equal to the marginal expenditure on that unit. The market supply curve shows how much you must pay per unit, as a function of the total number of units you buy. The supply curve is the oligopsonistic average expenditure curve. The average expenditure curve is upward sloping, so the marginal expenditure curve must

lie above it because the decision to buy an extra unit raises the price that must be paid for all units, not just the extra one[82]. The oligopsonistic quantity purchased in Cadiz (q^{oligop}) is localized at the intersection of the demand and the marginal expenditure curve. And the price paid by the oligopsonistic buyer (p^{oligop}) is localized by equating quantity q^{oligop} to the average expenditure (supply) curve. Note that the oligopsonistic price (p^{oligop}) is lower, and the quantity (q^{oligop}) is less than the price and quantity that would prevail in a competitive market (p^* and q^*)

Figure 4.2.: Commodity-silver market (oligopsonistic buyer)



Smuggling connected Cadiz to the international markets (i.e., London). The oligopsonistic price in Cadiz (p^{oligop}) was lower than the competitive price (p^*). Smugglers in Cadiz bought q^{oligop} quantity of silver at the oligopsonistic price (p^{oligop}) and sold it in London at the competitive price[83] ($p^* = p_L \cdot x$).The difference between the

---

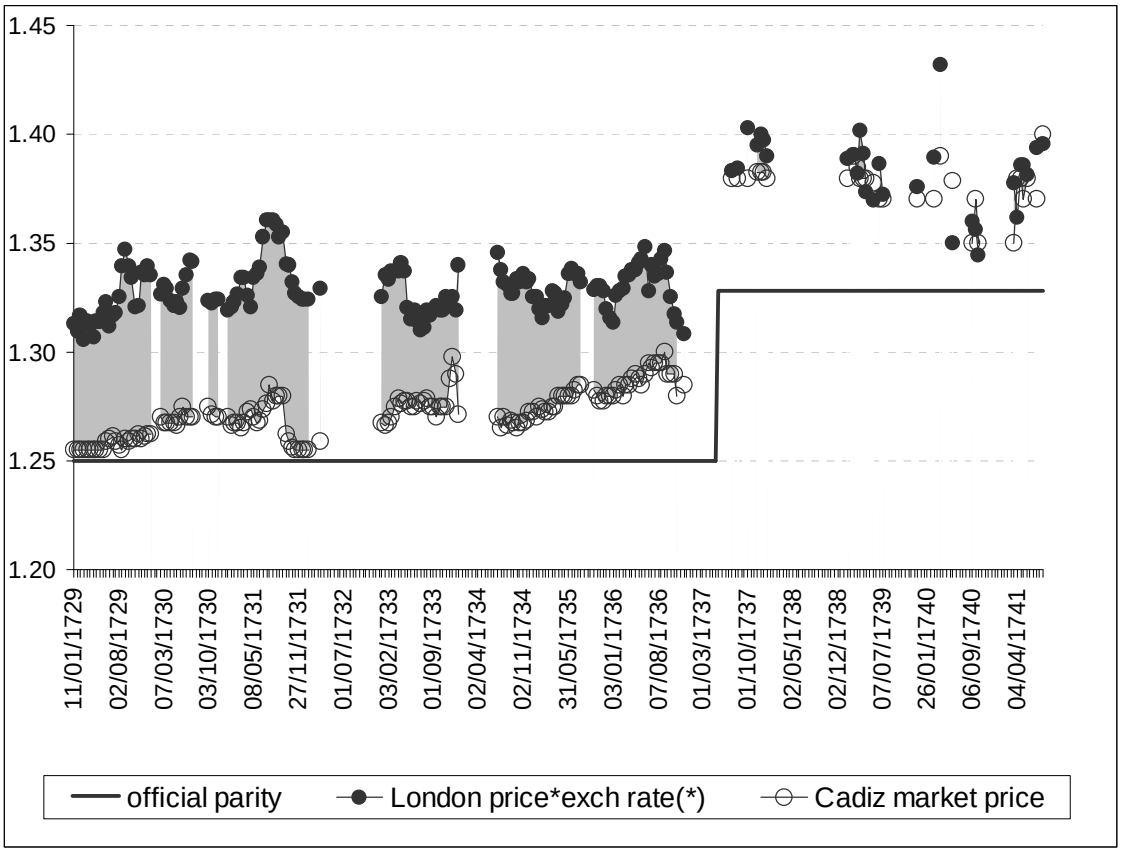
[82] Total expenditure: E=p(q)·q; and marginal expenditure: $ME = \frac{\partial E}{\partial q} = p(q) + q \cdot \frac{\partial p}{\partial q}$. The supply curve is upward sloping, then $\frac{\partial p}{\partial q} > 0$, and marginal expenditure is greater than average expenditure.

[83] Assumes that the London market is a competitive market and its price represents the international price. British law has permitted the exportation of bars and foreign coins in gold and silver since 1663 (Munro,

quantity exchanged in a competitive market (q^*) and the quantity exchanged in an oligopsonistic market (q^{oligop}) is the treasured quantity of silver.

The oligopsonistic power is the capability of the buyer to modify the price of the silver and pay for it less than the price that would exist in a competitive market. The larger the divergence between the competitive price and the oligopsonistic price, the higher the market power of oligopsony and the lower the quantity smuggled. The Graph 4.1. and Graph 4.2. test the oligopsonistic power measured though the mark-down over competitive prices.

Graph 4.1.: Market price of Mexican old pieces of eight in Cadiz and London, 1729-1741 (half-monthly observations), pesos de plata antigua*/Mexican old piece of eight*

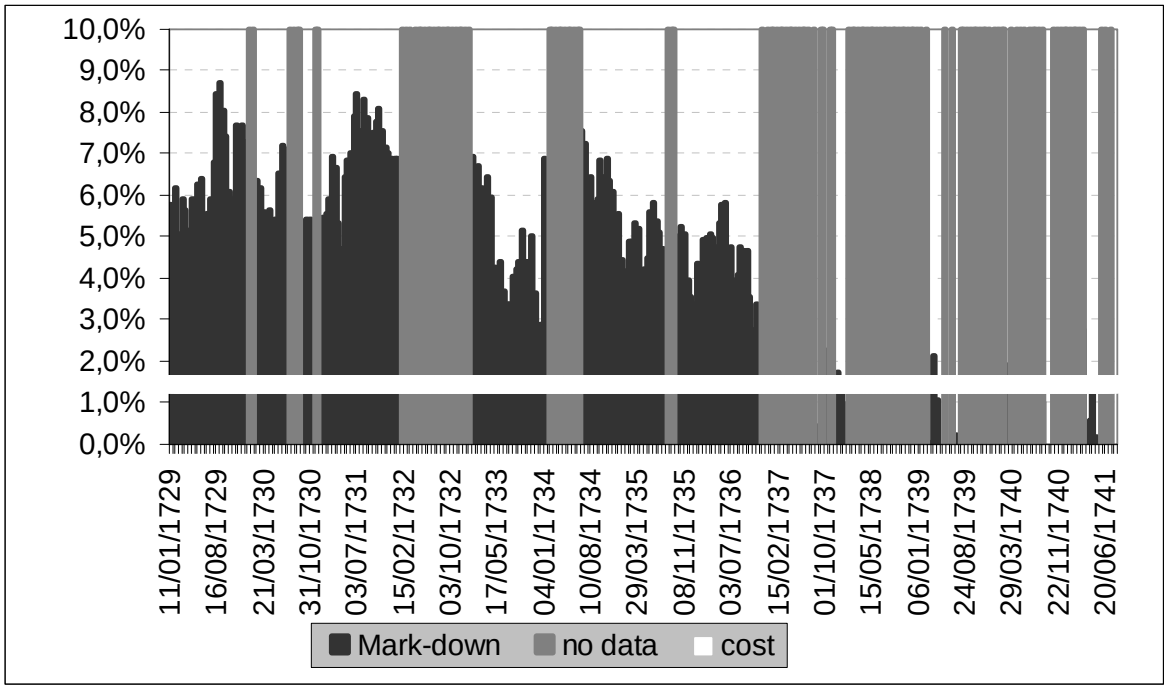


(*) London price is given in units of mass (standard Troy ounce). We converted price per unit of mass to price per coin at legal weight per coin minus abrasion (see Appendix)

Source: see Appendix

1992, p. 212). Our representative coin, the Old Mexican Piece of Eight, had a free quotation in the London Stock Exchange in the 18th century.

Graph 4.2.: Mark-down of the silver arbitrage from Cadiz to London



Source: see Appendix

Graph 4.1. shows a different behaviour of prices before and after the 1737 devaluation. Before the devaluation (1729-1737), the systematic gap between the oligopsonistic price (p^{oligop}) and the international price (p^{*}) measures the oligopsonistic power (the grey area in the graph shows the mark-down). Graph 4.2. shows the mark-down including cost. The larger the gap between the oligopsonistic and the international price, the higher the oligopsonistic power.

But after the devaluation (1737-1741), the systematic gap between the oligopsonistic price (p^{oligop}) and the international price (p^{*}) disappears because the devaluation pegs oligopsonistic and international price.

4.2. The silver-money market and the oligopsonistic silver-commodity market

In order to understand the meaning of the devaluation, we should specifically include the money market in the picture. The silver market is decomposed in the commodity-silver market and the money-silver market. The commodity-silver market has previously been explained as an oligopsony. The money market will be explained now.

The money demand is defined according to the Cambridge equation:

$$M^d = k \cdot P \cdot Y \qquad (4.2.)$$

where M^d is the nominal money demand, k denotes the Cambridge coefficient, Y is the real income and P is the general price level.

The nominal money demand is equal to the number of coins (q_{money}) multiplied by the price of coins (p):

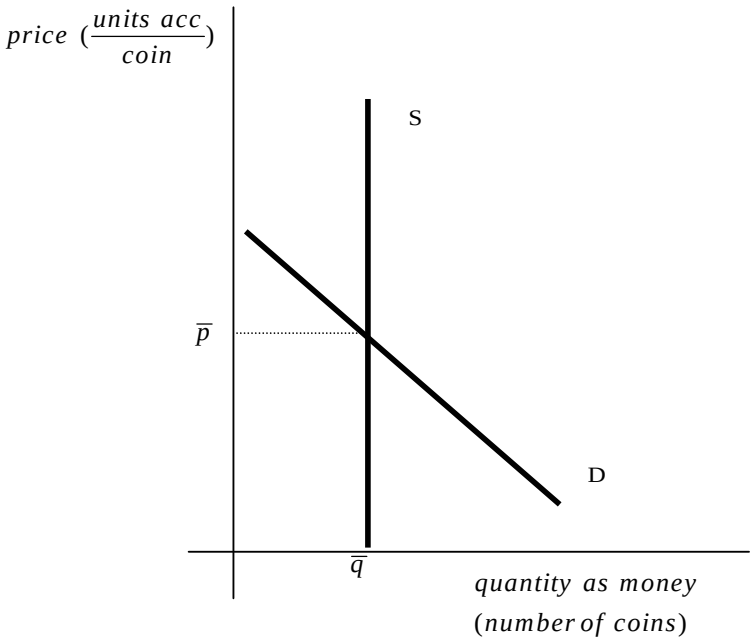
$$M^d = p \cdot q \qquad (4.3.)$$

The money-silver demand is a decreasing function of the silver price (equ. 4.2. plus equ. 4.3.):

$$q^d{}_{money} = k \cdot \frac{P}{p \cdot} \cdot Y \qquad (4.4)$$

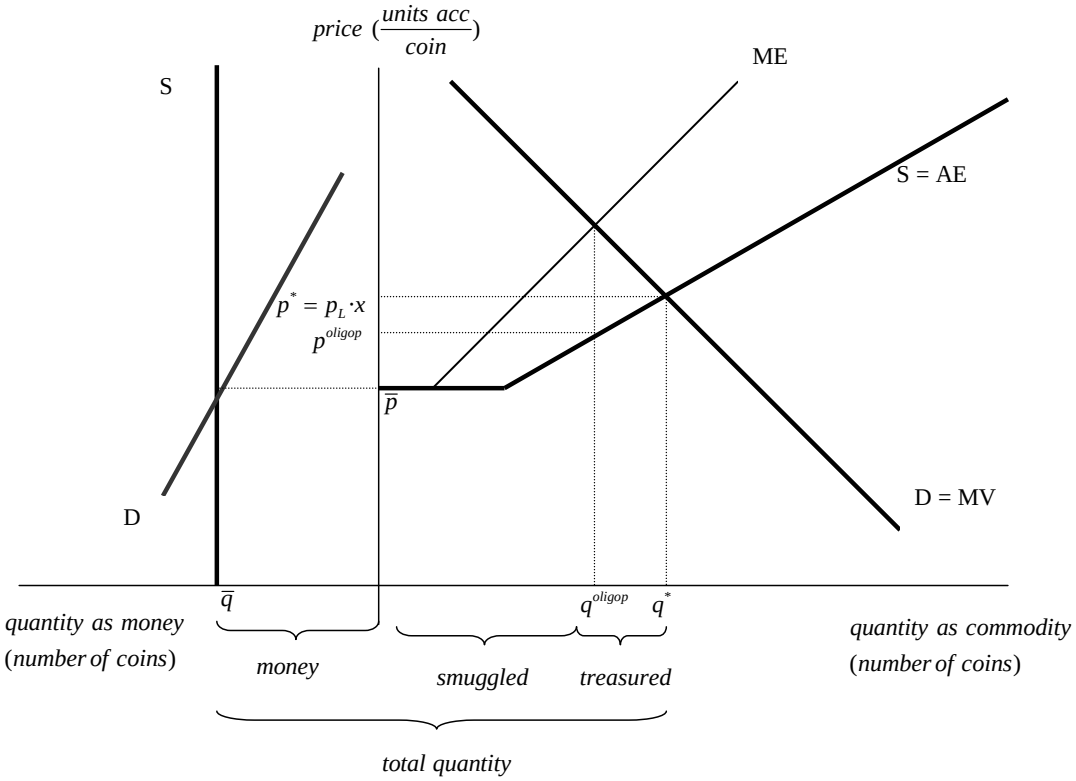
Figure 4.3. draws money-silver market. For the sake of simplification we will suppose that money supply is exogenous (M^s) and money market is in equilibrium at the official parity $\overline{p}$.

Figure 4.3.: Money-silver market



Let us joint the commodity-silver market (Figure 4.2.) and the money-silver market (Figure 4.3.) to observe the effect of the official parity on the commodity-silver supply curve (Figure 4.4.)

Figure 4.4.: Money-silver market and commodity-silver market



The commodity-silver supply curve is a kinked supply curve because for any market price lower than the official parity ($\forall p \le \overline{p}$), suppliers would use the coins in the money market at the official parity ($p = \overline{p}$) and they would not offer them in the commodity market. The official parity modifies the form of the supply curve, which becomes:

$$S: \begin{Bmatrix} p = p(q) & \forall \overline{p} \le p(q) \\ p = \overline{p} & \forall \overline{p} \ge p(q) \end{Bmatrix}$$

Then, the oligopsonistic price is enclosed between the international competitive price and the official parity. The international price is the maximum price because the oligopsonistic markdown is equal to zero at the international price. And the official parity is the minimum price (maximum markdown) because below the official parity ($\overline{p}$), sellers would use the coins as money at the official parity and would not sell them as commodity:

$$p^* \ge p^{oligop} \ge \overline{p} \qquad (4.3.)$$

The floor of the commodity-silver market price gives the government the possibility to apply an exchange rate policy oriented to the bullionist aim of avoiding silver outflows. Results will depend on the level of the Official Parity, as it will be explained in the next section.

4.3. The effect of devaluation in the silver-commodity market

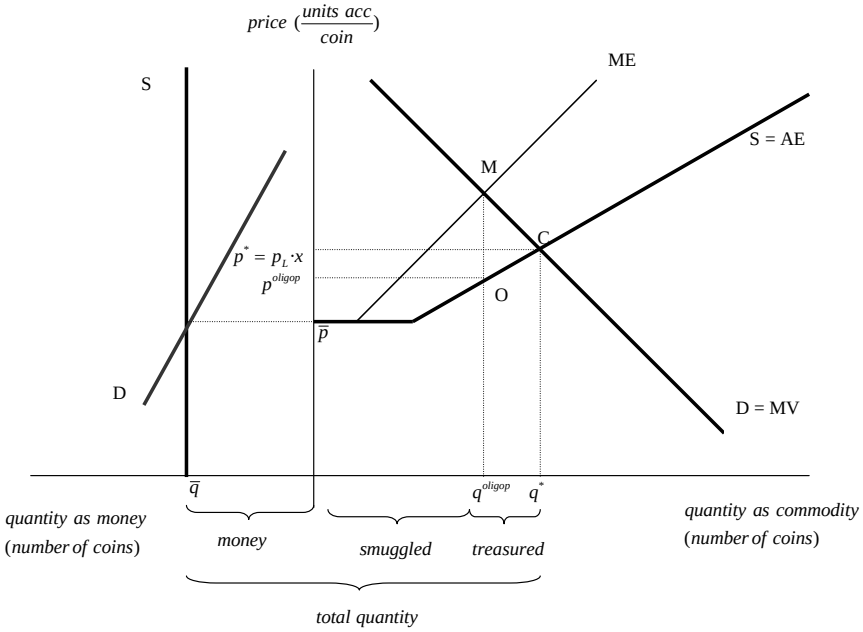
How does a change in the Official Parity affect to the commodity-silver market? It depends on the level of the Official Parity (minimum oligopsonistic price). Actually, we can distinguish three cases, summarised in table 4.1:

Table 4.1.: The effect of the Official Parity value on treasured quantity in an oligopsonistic commodity-silver market

	Official Parity value	**Resulting equilibrium on treasured quantity**
First case	Not higher than the oligopsonistic price	Unchanged from oligopsony
Second case	Higher than the oligopsonistic price but not higher than the price of the intersection of the curves of marginal expenditure and marginal value	Treasured quantity declines
Third case	Higher than the price of the intersection of the curves of marginal expenditure and marginal value	Treasured quantity increases

CASE 1: Figure 4.5. shows the first case, when the official parity is lower than the oligopsonistic price. We point out three points on this Figure: O, C and M. O is the utility maximizing price-quantity of silver combination for the oligopsony (p^{oligop}, q^{oligop}). C is the utility maximizing price-quantity of silver combination when the commodity-silver market is perfectly competitive (p^{*}, q^{*}). M is the point at which marginal expenditure and marginal value intersect, which locates the quantity of silver to be purchased by the oligopsonistic. It identifies the minimum level at which the official parity can be set and still increased the treasured quantity of silver. But in this case official parity ($\overline{p}$) is lower than the oligopsonistic price (p^{oligop}) and, therefore, the minimum price (official parity) does not have any effect on the silver-commodity market.

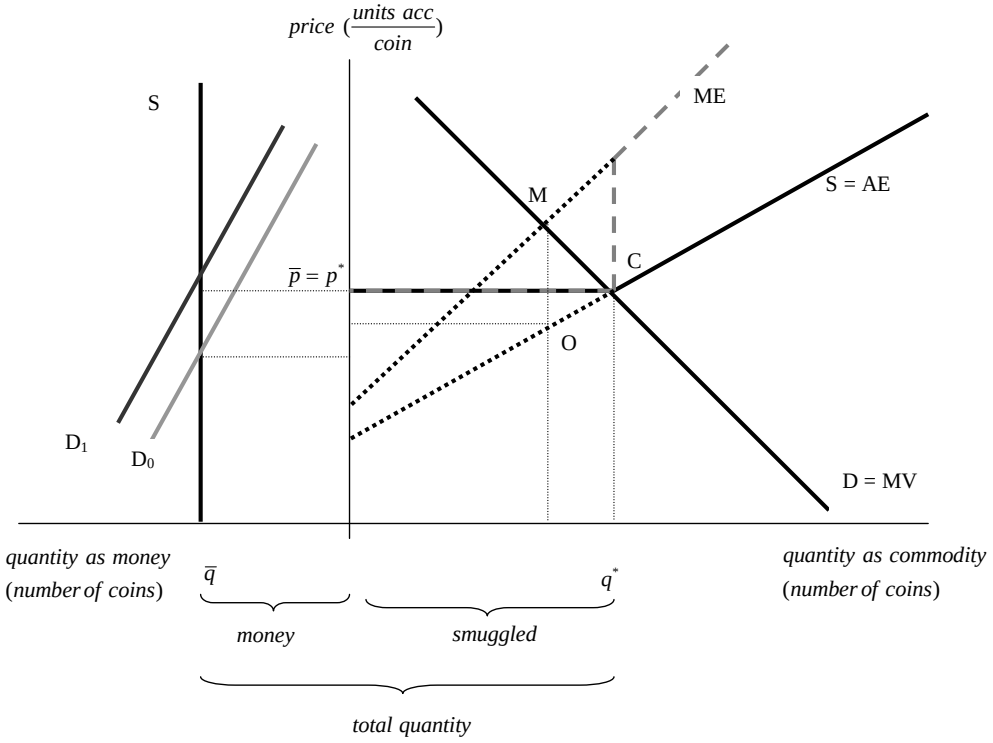
Figure 4.5.: CASE 1- Money-silver market and commodity-silver market when the official parity is lower than the oligopsonistic price



CASE 2: Let us introduce a devaluation which fixes the official parity ($\bar{p}$) at a level higher than the oligopsonistic price (p^{oligop}) but not higher than the price at the intersection of the curves which equals marginal expenditure to marginal value (price at point M), for example at the competitive price (p^*) (Figure 4.6.).

How does the devaluation change the money-silver market? If the devaluation makes that the unit of account represents less quantity of silver than before, the effect is an increment of the general price level. The general price level is driven by the alteration in the relation between the unit of account and the quantity of silver. Then, the devaluation implies an increment in money demand to maintain the purchasing capacity, i.e. the money demand curve moves to the right (to the left in our figure, as the graph is reversed). This entails that the general price level is driven by the quantity of silver (number of coins) instead of by the number of units of account: "*Sums of Money contracted for under such denominations, shall be of such a value, that is, shall have in them so much Silver. For 'tis Silver and not Names that pay Debts and purchase Commodities*" Locke (1691).

Figure 4.6.: CASE 2- Money-silver market and commodity-silver market when the official parity is fixed at the competitive price



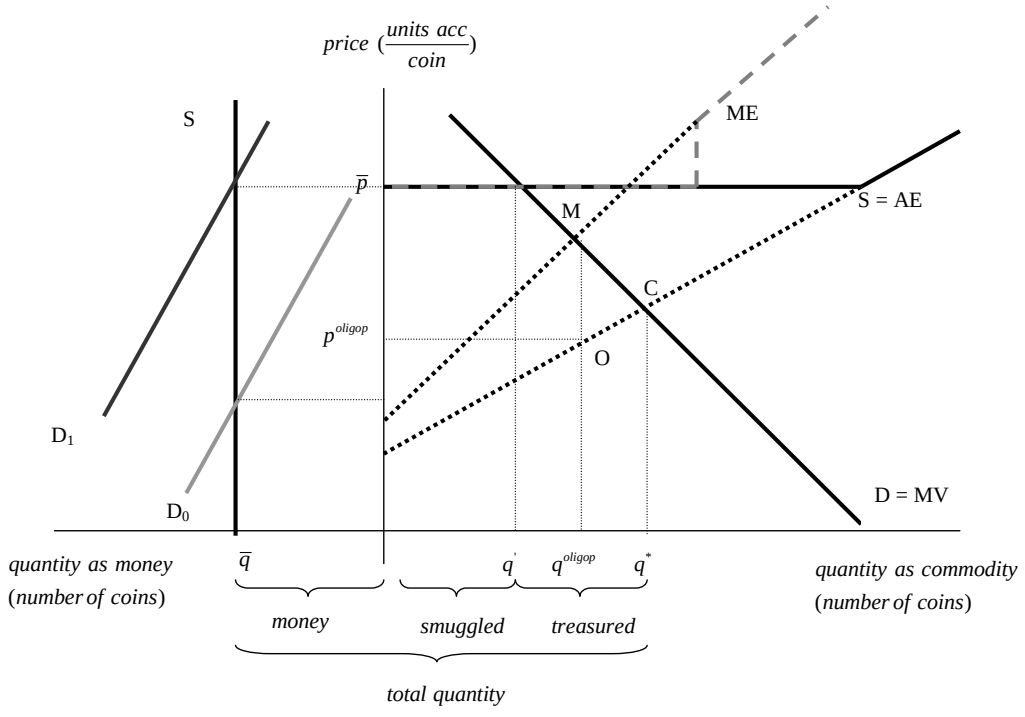
How does the devaluation change the commodity-silver market? The portion of the supply curve lying below the official parity (dotted line) is supplanted by the official parity flat curve (solid line). That is, the new supply curve consists of the official parity solid line from p^* to C, at which point q^* is the quantity of silver purchased; thence it continues at the (solid) portion of the original supply curve. As to the marginal expenditure curve, that portion of the ME curve lying between the vertical axis and C (dotted line) is supplanted by the official parity flat curve, and the remainder of the ME curve remains unchanged (grey dotted line). There is a discontinuity in the ME curve when the exchanged quantity of silver is q^*. The oligopsony is forced to act as the case of perfect competition. That is, the oligopsony pays $p^* = \bar{p}$ and smuggles q^*, exactly the same price and quantity that would occur in the case of perfect competition. If the devaluation fixes the official parity at the competitive price, the mark-down is eliminated, but then the treasured quantity falls down to zero as the smuggled quantity is equal to the competitive quantity.

When the devaluation fixes the official parity ($\bar{p}$) at a level higher than the oligopsonistic price (p^{oligop}) but not higher than the price at intersection of the curves

that equals marginal expenditure to marginal value (price at point M), the treasured quantity is lower now than before the devaluation.

CASE 3: Let us introduce now a devaluation which fixes the official parity ($\overline{p}$) at a higher level than at the point of intersection of the curves that equals marginal expenditure to marginal value (price higher than the point M). In this case, the treasured quantity increases (Figure 4.7.). It is only when the official parity is fixed at a higher level than point M that the smuggled quantity declines from q^{oligop} to q' and the treasured quantity increases $q^{oligop} - q'$. Here is now the bullionist benefit of the devaluation.

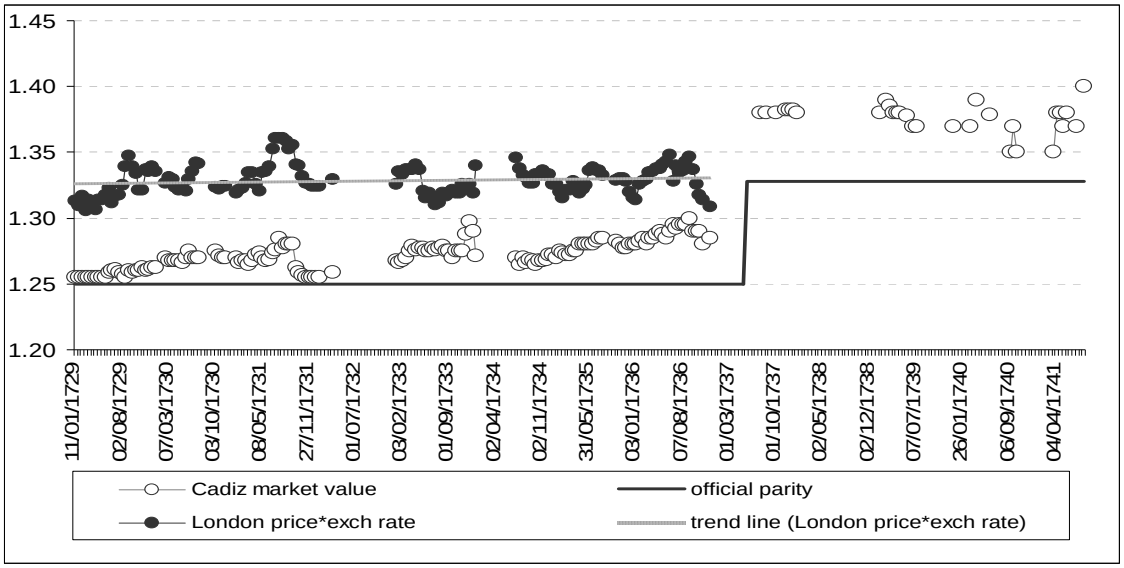
Figure 4.7.: CASE 3- Money-silver market and commodity-silver market when the official parity is fixed at higher level than the point which equal marginal value to marginal expenditure



Summing up, when the official parity is below p^{oligop} there will be no effect on the treasured quantity (case 1); when the official parity is higher than p^{oligop} but lower than the M point, the treasured quantity will decline (case 2); and only when the official parity is higher than the M point, the treasured quantity will increase (case 3).

What did happen in practice? At what level did the government fix the new official parity in the devaluation of 1737? Graph 4.2. shows that the government fixed official parity at the same level than international price.

Graph 4.2.: Linear trend of market price of Mexican old pieces of eight in London, 1729-1741 (half-monthly observations), pesos de plata antigua/Mex old piece of eight

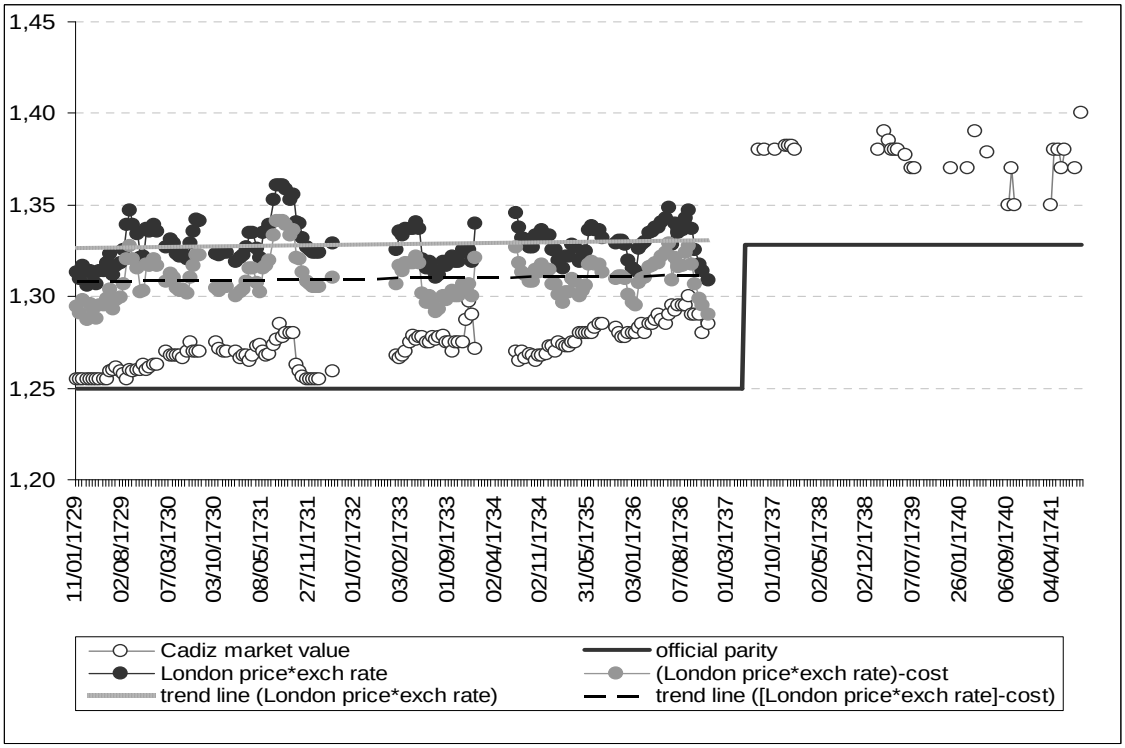


Source: see Appendix

The devaluation fixed the official parity to the international price (case 2). Then, the oligopsonistic power reduced because the mark-down disappeared (graph 4.2.), but the treasured quantity should have dropped to zero, as the smuggled quantity should have increased to the competitive quantity and, therefore, the devaluation should not have achieve the bullionist goal. But in practice London price has to be adjusted by arbitrage cost (see graph 4.3.). The official parity ($\overline{p}$) was higher than the competitive price included arbitrage cost (p^*-*cost*), but we do not know if it was lower or higher than the point of intersection of the curves that equals marginal expenditure to marginal value (point M). Thus, including arbitrage cost, we are not able to determine if we are in the case 2 (official parity lower than M point, so the treasured quantity declines) or the case 3 (official parity higher than M point, so the treasured quantity increases). Focusing on our source, we observe that the frequency of the silver quotations provided by correspondents decreased after the devaluation (graph 4.2. shows the number of blanks). Although there was frequent correspondence, there were not quotations; and we consider this evidence as the indication of not arbitrage. This means that the devaluation

fixed the official parity ($\overline{p}$) at a higher level than M point (case 3) and, therefore, the devaluation was effective to achieve the bullionist goal of increasing the treasured quantity. The long-run effectiveness will depend on the evolution of international price levels. The problem of the exchange rate policy is that the international price is not a parameter but a variable and, therefore, in order to maintain the bullionist political goal, the government must change the official parity from time to time according to the fluctuation of international price.

Graph 4.3.: Linear trend of market price adjusted by arbitrage cost of Mexican old pieces of eight in London, 1729-1741 (half-monthly observations), pesos de plata antigua/Mex old piece of eight



Source: see Appendix

The most important implication of the model is the effect of oligopsony on quantities. Oligopsony limited smuggling *per se* because silver outflows were lower under oligopsony than under perfect arbitrage competition. To some extent, oligopsony was helpful to the government. If it had not existed, pressures from international prices would have been much bigger. Indeed, this may explain why the government implicitly accepted the existence of the cartel. Of course, smuggling was not good from a bullionist point of view but cartelized smuggling was better than competitive smuggling.

APPENDIX: THE CONSTRUCTION OF SILVER POINTS (CADIZ –LONDON, 1729-1741)

The silver point mechanism is defined by the equation:

$$(1-c_{CL})\frac{p_L}{p_C} \leq x \leq (1+c_{LC})\frac{p_L}{p_C} \qquad \text{(A.1.)}$$

where p_L denotes the market price of silver in London; p_C denotes the shadow price of silver in Cadiz; $\frac{p_L}{p_C}$ is denominated arbitrated par of exchange; x denotes the spot exchange rate between London and Cadiz; c_{CL} is the cost of trading the silver from Cadiz to London; and c_{LC} is the cost of trading the silver from London to Cadiz.

In this appendix we explain the variables used to construct the lower silver point. These variables are the silver market prices in London (p_L), the silver market prices in Cadiz (p_C), the arbitrated par of exchange ($\frac{p_L}{p_C}$), the spot exchange rate between London and Cadiz (x_{LC}) and the cost of trading the silver from Cadiz to London (c_{CL}).

Silver market prices in London (p_L)

Data are taken from *The Course of the Exchange*, a twice-weekly financial bulletin that started publishing in the 1690s (McCusker and Gravestijn, 1991). The silver price was measured in shillings (s) and pence (d) units of account per Standard Troy ounce[84]. The Course of the Exchange collected data on silver bars and foreign silver coins, specifically Pieces of Eight (Pillar and Mexican from 1721 onwards; and also Small Pillar and Small Mexican from 1732 onwards). Pieces of Eight were the only coins quoted in financial bulletins in London during the 18th century (until March 1795, when the French New Louis began to be quoted together with the Pieces of Eight).

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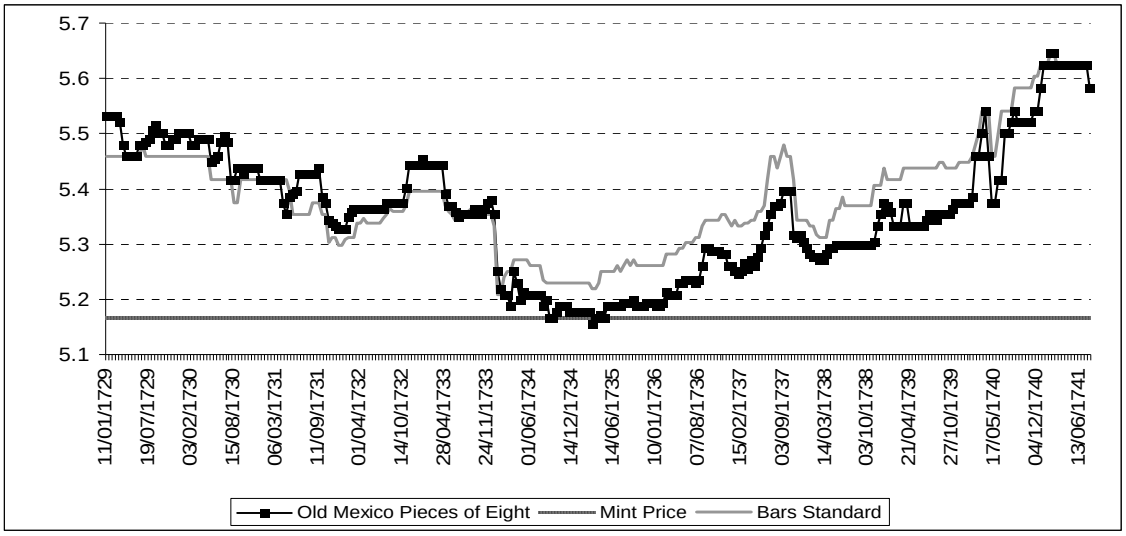
[84] Equivalent units of account are as follow: 1 pound sterling (£-*librae*)=20 shilling, 1 shilling (s-*solidi*)=12 pennies (d-*denarii*). The fineness is the Sterling Standard (Old Standard), which had 92.5% fineness. Fallon (1988, p. 9). Newton (1731): "*The silver Coin contains 11 Oz 2 Pennywt. Fine Silver, and 18 Pennywt. Of Alloy in the Pound*". The equivalences among the units of mass are also shown by Newton: "*That the English Pound Troy contains 12 Ounces; 1 Ounce, 20 Pennyweights; 1 Pennywt, 24 Grains; and 1 Grain, 20 Mites*" (Newton, 1731). One standard Troy ounce is equivalent to 31.103496 grams in the International System of Units. Lemale (1875, p. 189)

We have collected half-monthly prices of Mexican Pieces of Eight at the beginning and the middle of every month - the precise date corresponds to the same date as the Cadiz quotations (Graph A.1.). When quotations are in a range, we convert ranges to the midpoint. England used the Julian calendar but, since Cadiz used the Gregorian calendar, we converted the dates of the Julian calendar (Old Style) into the Gregorian calendar (New Style) in order to maintain homogeneity of the data.

Graph A.1.: Price of Mexican Pieces of Eight on the London Stock Exchange, 1729-1741 (half-monthly observations) shilling/std. Troy ounce



Source: Course of the Exchange for market prices and Feavearyear (1931, p. 346) for Mint Prices.

Silver shadow market prices in Cadiz (p_C)

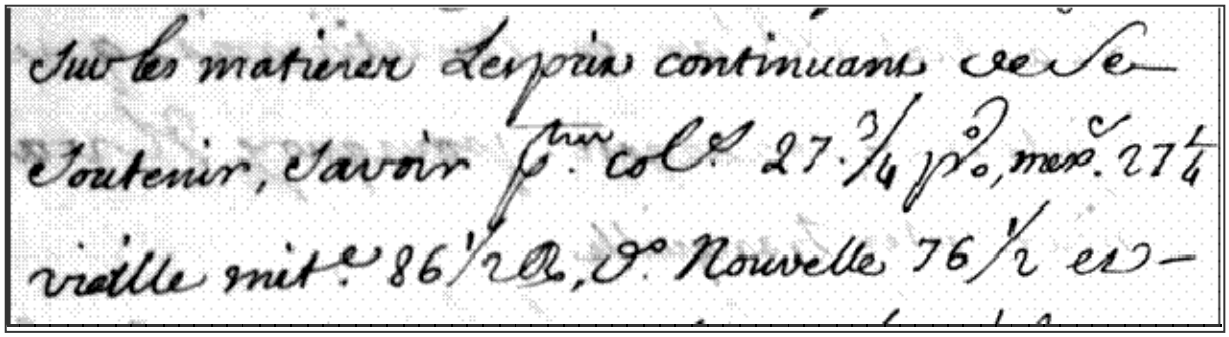
Data are taken from the correspondent's letters kept in Merchant House *Roux* [85]. Cadiz correspondents reported the shadow silver prices and sometimes added a description of the relationship between exchange rates and silver prices, or directly, a recommendation on arbitrage (whether to buy Pieces of Eight or not). Silver prices appeared at the end of the letter, together with the exchange rates and the price of cochineal, or inside the text (Illustration A.1. shows an example of Pieces of Eight quotations inside the text of the letter).

The shadow prices of the pieces of eight were reported in letters from 1729 to 1741, usually by partner-correspondents in Cadiz. But the silver quotations stopped being reported in correspondence after 1741. The preservation of invoices and ledgers

[85] Cadiz correspondence is compiled in Fond Roux L.IX. Section IV: *Correspondance passive Cadix, liasses 810-856.*

in *Roux* and *Compagnie Royale d'Afrique* archives indicate the same logic for arbitrage operations during the whole 18th century. These invoices also show that *Roux* executed the silver arbitrage through the *Compagnie Royale d'Afrique* from its foundation in 1741[86]. Indeed, the correspondence from Cadiz to *Compagnie Royale d'Afrique* points out that the correspondents were precisely the same individuals who worked directly with Roux banker before the foundation of *Compagnie Royale d'Afrique*. Regrettably, only a few letters from Cadiz to *Compagnie Royale d'Afrique* have been preserved and, therefore, the series of shadow silver prices in Cadiz is uninterrupted just from the foundation of the merchant house *Roux*, in 1729, to the foundation of the Compagnie Royale d'Afrique, in 1741[87].

Illustration A.1.: Pieces of eight quotation in Cadiz correspondents' letters



Source: Fond Roux, L. IX *liasse* 819 : letter Guillaume Jogues, 30 October 1730

Cadiz correspondents' letters in the *Roux* archives reported almost half-monthly black market prices of old and new Pillar / Mexican Pieces of Eight. Letters were reported every week or two weeks[88]. We collected half-monthly prices of Old Mexican

[86] *Fond Roux:* L.IX *liasse* 1261; *Compagnie Royale d'Afrique*: L.III *liasse* 1010. The *Compagnie Royale d'Afrique* archive was compiled in 1860 by the *Chambre de Commerce de Marseille*. Rebuffat (1965, section L.III). The *Compagnie Royale d'Afrique* (1741-1793) was founded with 1,200 shares, 800 of them subscribed in Paris and 400 in Marseille (300 of them were subscribed by the *Chambre de Commerce de Marseille*). The *Compagnie* had the monopoly of the coral fishing and the trade of wheat, wool, wax and leathers, which were transported to Marseille to be sold there. It purchases in Barbary Coast were regulated in Pieces of Eight, the only legal tender currency, which needed a great consumption (L.III liasse 1017).

[87] *Compagnie Royale d'Afrique*. L. III. *Liasse* 364: Spanish correspondent letters. The Compagnie Royale d'Afrique archive have also « *cashiers de livraison et reception des piastres* » (L. III, liasse 1014, 1015) and *« reçus du caissier d'achats de piastres et copies de ces reçus , 1741-1744*» (L.III, liasse 444) and « *livre de caisse des piastres, 1741-1794* » (L.III, register 446-448), but these sources are not useful for our research because they are organized by correspondent, without breaking down the unitary price for pieces of eight.

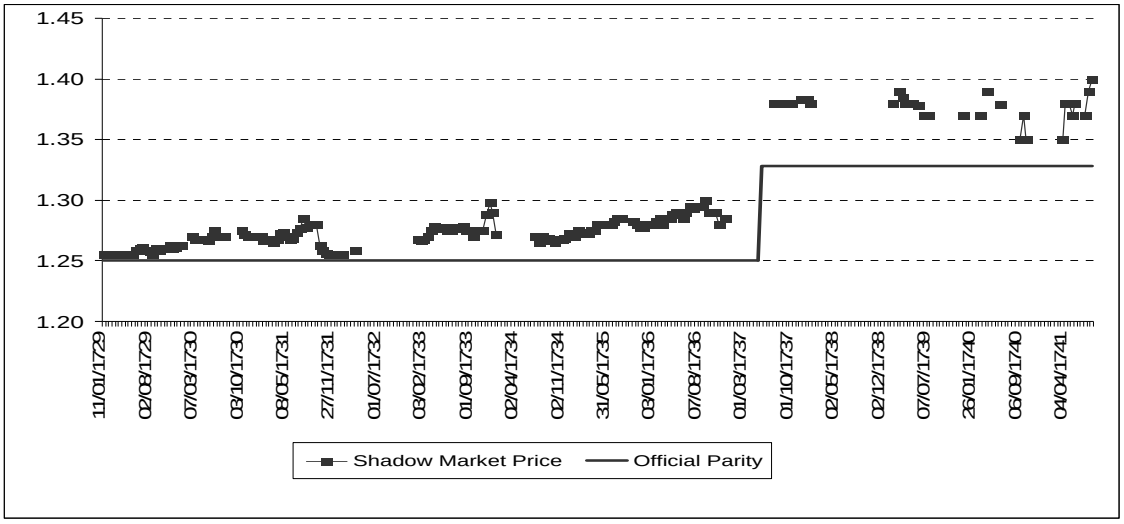
[88] We collected half-monthly prices available in 50 bundles of Cadiz correspondence from 1729 to 1741, which comprise around 5,000 letters. Fond Roux. L.IX, *liasses* 810-856.

Pieces of Eight (Graph A.2.)[89]. When quotations are in a range, we convert such ranges to the midpoint. Prices were reported as the percentage of premium over the unit of account *peso de cambio* (also called *peso de plata antigua* or *peso de plata vieja*) per Old Mexican Piece of Eight coin[90]. The *peso de plata vieja* is an imaginary coin whose legal equivalence with the American Piece of Eight coins was defined in Castilian Legislation as follows (see Appendix 3 for details):

→ from 08/09/1728 to 16/05/1737[91]:1 American Piece of Eight coin=10/8 *peso de plata antigua*

→ from 16/05/1737 to 29/05/1772[92]:1 American Piece of Eight coin= (10 5/8)/8 *peso de plata Antigua*

Graph A.2.: Black market price of Mexican old pieces of eight in Cadiz, 1729-1741 (half-monthly observations), peso de plata antigua/old Mexican piece of eight



Source: Fond Roux, L. IX *liasses* 81-856 for black market price. Appendix 3 for Official Parity

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[89] The Mexico Mint started to strike the silver coin *real* in May 1535, in three-*reales*, one-*real* and half-*real* pieces -and four-*reales* from 1537 (Leyes de Indias (1681), book 4, title XXIII, lawVII-VIII. Pradeau, 2001, p. 35). Old pieces of eight were struck from 1572 to 1734 (cob coins-Equilateral Jerusalem Cross type). These Old pieces of eight stopped striking in 1734, but they remained as legal tender; and New pieces of eight were struck from 1732 to 1772 (milled coins-Pillars of Hercules type) (Autos Acordados (1772), book 5, title XXI, auto 59-60-61-65-70. Pradeau (2001))

[90] "*l'agio [était]… de 33 1/3 pour cent, plus ou moins; c'est –à-dire qu'on donne 100 piastres fortes pour 133 1/3 piastres de change, plus ou moin*" (Ricard, 1732, in McCusker, 1978, p. 100). *Peso de cambio o de plata antigua = Piece of eight of exchange or Piece of eight of old silver*="*El peso escudo, de plata o de cambio, vale 8 reales de plata antigua, 15 reales y dos maravedís de vellon, 272 maravedís de plata o 512 maravedís de vellon. […] El real de plata antiguo que es la moneda más usual en el comercio vale 16 cuartos, 34 maravedís de plata antigua, o 64 maravedís de vellon*" Villabertran (1826), p. 1, and *Autos Acordados (1772), libro 5, título XXI, auto 36, 04/11/1686*

[91] *Autos Acordados (1772), libro 5, título XXI, auto 61*. Ricard (1732), p. 287: "*Il faut savoir que depuis l'année 1686 les susdites Monnoies Réelles ont été augmentées de 25 pour Cent; ainsi l'on fait différence de 25 pour Cent entre les réales,ou Piastres, de nouvelle Plate, & celles de vieille Plate*".

[92] *Novísima Recopilación (1805), libro 9, título XVII, ley 8*, and Innocencio Aparici (1741), pp. 24-26

The arbitrated par of exchange ($\frac{p_L}{p_C}$) and the spot exchange rate (x_{LC})

The arbitrated par of exchange between London and Cadiz is defined by the relative market prices: $\frac{p_L}{p_C}$ [93]. London silver prices are given per unit of mass (standard ounce) while Cadiz silver prices are given per coin. We converted Cadiz prices per coin to prices per unit of mass to calculate the arbitrated par of exchange. Old Mexican Pieces of Eight had the following legal features: 930.56± 3.472 thousandths of fineness and 27.518 grams of gross weight[94]. According to Roux's invoices, coins were always weighted. Abrasion was 1.5% and, therefore, we considered a net weight equal to the legal weight minus abrasion[95].

We assume that the implicit spot exchange rate in London on Cadiz (x_{LC}) is essentially identical to the spot exchange rate in Cadiz on London (x_{CL}). The implicit spot exchange rate between Cadiz and London has been calculated according to the formula (see Appendix 1 –equation A1.8- for details):

$$x_{CL} = a_{CL} \cdot (1 + \frac{n}{365} \cdot r_L) \qquad (\textit{pesos de plata Antigua}/\text{ pence sterling}) \qquad (A.2.)$$

where x_{CL} denotes the implicit spot exchange rate in Cadiz on London, a_{CL} is the exchange rate in Cadiz on London at 60 days, and r_L is the commercial interest rate in London [96].

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[93] Arbitrated par of exchange is a 19th century wording. Flandreau (1996, p.422 and 2004, p. 59). See also Tate (1834, pp. 169-170). Merchants in 18th century used the name "par or equality of exchange" Giraudeau [1756] (1796), p. 15, or the name "accidental par". Newton (1734).

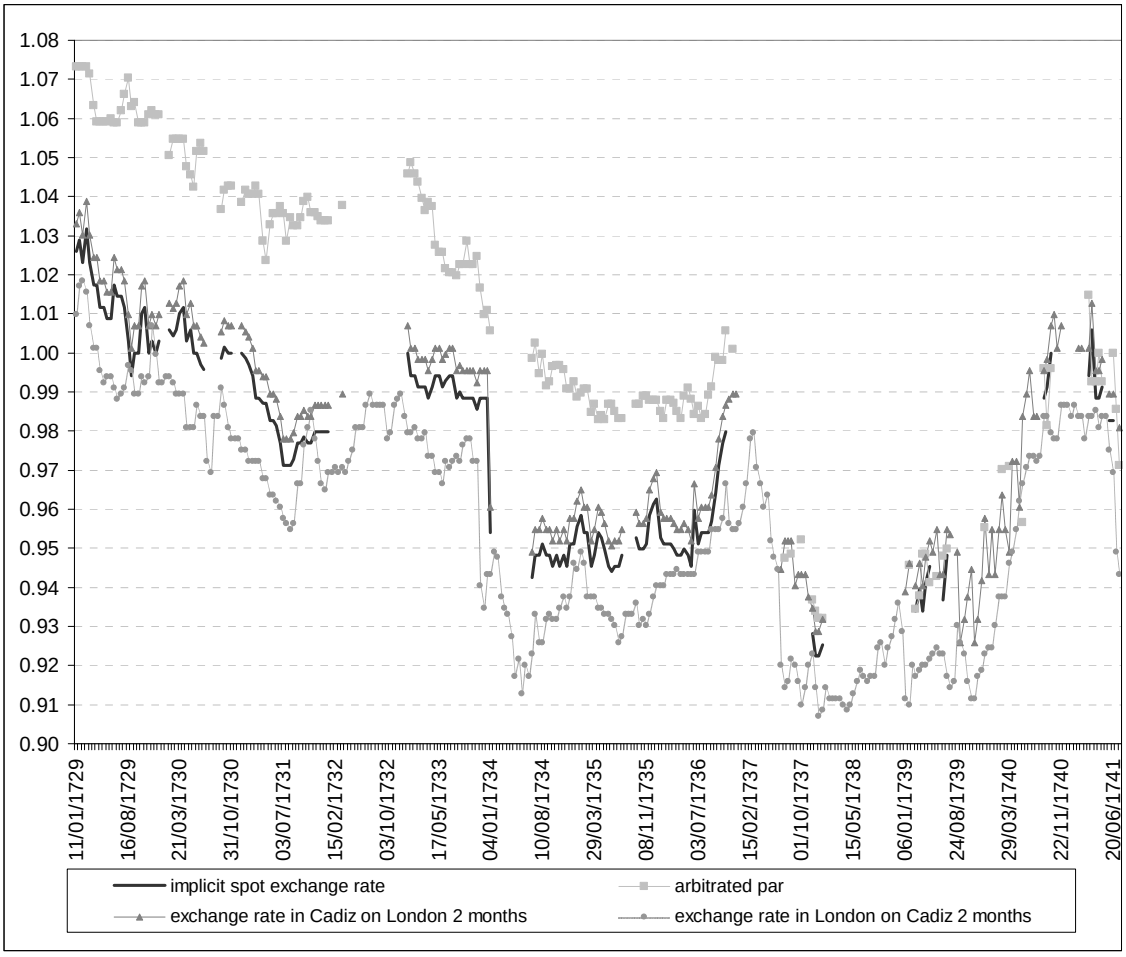
[94] Tale of *real* per Cologne Mark ingot: 67 (8 3/8 in pieces of eight) at 11 *dineros* and 4 *granos* of fineness. Ordinance 13/06/1497, *Recopilación (1640), libro 5, título XXI, leyes 1-74 de las ordenanzas que han de guardar*. (Céspedes del Castillo, pp. 214-215). One Cologne Mark ingot is equal to 230.465 grams. García-Patón (1903), p. 23 (*tablas anejas a la ley de pesos y medidas de 19 de junio de 1849*) and pure silver (100% fineness) is equivalent to 12 *dineros* (1 *dinero* = 24 *granos*). Dasi (1950), vol. 1, p. 21.

[95] Invoices measured weight in Castilian units: 1 *Marco*=8 *Onzas* and 1 *Onza*=8 *Ochavas*. 1 *Marco* is equivalent to 230.465 grams. García-Patón (1903, p.23). One Old Mexican Piece of Eight had a gross weight of 27.518 grams according to Castilian legislation (see Appendix 3) while it had around 27.079 grams according to Fond Roux invoices (i.e., Illustration 2.2.).

[96] Long maturity for bills in Cadiz on London is 2 months (1 Usances; 1 Usance = 2 months), plus 3 days of grace at payment in London (Tate, 1819b, p. 3; Hewitt, 1740, p. 25). The London interest rate is the discount rate of the Bank of England for foreign bills (Clapham 1994,vol. 1, p. 299)

Graph A.3. shows the implicit spot exchange rate and the arbitrated par of exchange. We also added in the graph the exchange rate at 2 months in London on Cadiz and in Cadiz on London, respectively. The graph proves the existence of a gap between the arbitrated parity and the exchange rate for any exchange rate we consider.

*Graph A.3.: arbitrated par of exchange and exchange rate between London and Cadiz, 1729-1741 (half-monthly observations), pence sterling/peso de plata antigua (normalized by intrinsic par 1729-1737, 54*8/10=1)*



Source: see text

Costs (c_{CL})

Costs are taken from Roux's invoices[97]. The total cost is 1.425%, which breaks down in financial costs and freight and insurance:

[97] *Fond Roux L.IX. Section VI : affaires maritimes et commerciales. D. Marchandises. c) Produits manufacturés. Liasses 1,261-1,264 : Monnaies d'or et d'argent : factures*. The invoices, named cost and fee account (« *compte du cout et frais* ») broke down the following information : shipment identification

- Financial costs: they were brokerage (2‰) plus the intermediation cost, which was a brokerage fee (2‰) whether the intermediary was a partner; or a commission (1%) whether the intermediary was a commission agent. For calculations we consider the intermediary as a partner, as it was the usual case according to invoices.

- Freight and Insurance[98]: When organizing a maritime voyage, French ship-owners enlisted as many as sixty participants in the venture, some being merchant houses and bankers, others being professionals, nobles, or stockholders[99]. The freight was defined as a global price for trip and calculated according to the volume (and/or weight) of merchandises. Freight rates fluctuated during the 18th century, they increasing in times of war and decreasing in times of peace. The insurance rate depended on the distance and also fluctuated according to peace or war times, although it decreased in the long run[100].

However, freight and insurance for specie had a different logic. It was constant in the 18th century. The gold and silver from Spain paid a fixed rate of 1% for freight and insurance -and in times of war it was transported for free in the Royal vessels[101].

Freight and insurance for specie was denominated "port on board" ("*port à bord")*, and it was collected directly for the vessels' captains from the sacks which transported the specie: *«Les Piastres en arrivant à Marseille, Gênes, Londres, Amsterdam, etc. payent un pour cent; c'est-à-dire une Piastre effective pour chaque 100 Piastres, que les Capitaines de Vaisseaux prennent des Sacs»* [102]. Additionally, we should add the cost of transporting the sacks from home to the port (1/4‰)

(ship and captain's name, cargo's correspondent sign and the sack's number) and cargo description (type of pieces of eight, quantity and weight per sack, unitary market price, total price, expenses and final price)

[98] Rambert (1954), pp. 556-596.

[99] Taylor, pp. 483-484.

[100] The result of the decline in piracy was a lowering of insurance costs during 18th century. North (1968), p.960

[101] Rambert (1954), pp. 571, 582.

[102] Giraudeau, [1756] (1796), p. 460

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