



Working Papers in Economic History

April 2010

WP 10-05

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Keywords: Bilbao, stock exchange, origins, integration, capital markets, Spain.

JEL Classification: N23, N24, E44, F36

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Version: 22 April 2010.

ABSTRACT

This paper presents first results of our more recent research on the Bilbao stock exchange from its foundation in 1890 up to the Spanish civil war. We examine the stock market's origins and follow its evolution over the first half century of existence. To this end we introduce some of the stock exchange indexes we have calculated for Bilbao and put them into comparative perspective with the existing series on general economic and industrial activity and the indexes for other Spanish exchanges for the period considered. Finally, we contrast the degree of market integration associated to the existing Spanish exchange indexes. We find strong support for considering the Bilbao Stock Exchange index an industrial index and little evidence of capital market integration between the principal Spanish exchanges before the 1920s.

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[†] both Rojo Cagigal and Houpt acknowledge financial support from Spanish Ministerio de Educación y Ciencia proyecto SEJ2006-08188/ECON and Dirección General de Universidades e Investigación, Consejería de Educación, Comunidad de Madrid, Proyecto 06/HSE/140/2004, Houpt also acknowledges financial support from the Spanish Ministerio de Ciencia e Innovación proyecto "Consolidating Economics" within the Consolider-Ingenio 2010 programme. Excellent research assistance has been provided by Juana Lamote de Grignon Pérez, Deborah Itriago, Raúl Sánchez-Kobashi Meneses and Fernando Morthera. We have received outstanding assistance from Marisol Arnáiz and Víctor Arroyo in the BBVA Archivo Histórico and Maripaz Alonso in the Biblioteca Bolsa de Madrid. Our thanks to Mikel Tapia, Stefano Battilossi and Nacho Peña who have read and whose comments have improved earlier versions of this paper. The usual disclaimer applies to the errors that may remain.

1. Introduction

The research presented examines why and how the Bilbao stock exchange was formed and documents its early history up to the outbreak of the Spanish civil war in July of 1936. The objective of this paper is threefold. We introduce a monthly stock exchange index for Bilbao which complements others available for Madrid and Barcelona. We give a detailed description of the indexes we have constructed with daily price data, so that indexes for Barcelona and Madrid may be reconstructed in a similar way in the future —especially for the interwar period. And we conclude with formal contrast of the degree and evolution of regional stock exchange integration in Spain.

Over the last twenty years Spanish financial historians have carried out a systematic reconstruction of stock exchange indexes: Hoyo (2007) for Madrid; Tafunell (1991), Castañeda and Tafunell (2001) and Hortalá (2004) for Barcelona; and most recently Cuevas (2009) for Valencia. Nevertheless, as Montero (2006:12) has commented fairly recently, there are no such monthly or weekly indexes available for the Bilbao exchange. All in all, the history of the Bilbao Stock Exchange has received little scholarly attention, although some approximations have been made. However, their focus has been mostly descriptive or narrative. Some work has been done on the organizational history by Torrente Fortuño (1966) but there are no analytical studies which investigate the exchange in its origins and its evolution up to the Spanish Civil War. A minor exception has been Montero (2006) in a more recent contribution which nevertheless reflects little more than a hastily assembled collection of archive notes and anecdotes collected 25 years ago. No in depth analysis to date has been forthcoming. Our research aims at filling that gap and this paper presents the progress made to date.

The article is organized as follows. The next section examines the origins of the Bilbao stock exchange and the institutional framework within which it emerged. The second section presents the exchange's microstructure and its evolution over time. Section three introduces the method we have used for constructing our indexes and makes basic comparisons with related macroeconomic variables and other regional indexes. The penultimate section examines the degree of market integration we can infer by including our index in the group of existing indexes and the final section concludes.

2. The Bilbao stock exchange and the institutional framework within which it emerged

The drive to establish a formal exchange in Bilbao began in the late 1880's. It was led by a group of brokers who enlisted the support of prominent businessmen from finance, banking, mining, shipping

and industry before approaching the government in 1890. Before that Bilbao had been one of a number of informal exchanges which had developed in various Spanish provinces in the 1850s and 1860s, driven mainly by the construction of railways and emerging regional banking and public services¹. These informal stock exchanges —*bolsines*— which set up in Bilbao, Santander, Saragossa, Seville and Valencia were small local markets, quite different from the official exchange in Madrid or the ‘free’ exchange in Barcelona.² They were regulated by commercial law and traditional licensed brokers held the monopoly on stock trade. Some of these *bolsines* continued to subsist throughout most of the 20th century.

By the 1870s Spain had developed a network of exchanges which mixed three different types of markets: a French style official stock exchange (Madrid); a private stock market similar to those in Common Law countries (Barcelona); and small local stock markets in other cities, regulated by the institutions created centuries ago. This complex regulatory framework was the result of a fusion of forces in which imported foreign elements interacted with the previously existing institutional settings. The result was not a hybrid system but a triple scheme in which three different regulatory models coexisted.³

Like many other countries at the time, Spain had liberalized incorporation laws in the last half of the 19th century to meet the demands of the emerging industries and services, which gave an important boost to security trading. In parallel the 1885 Code of Commerce introduced principles of economic freedom such as the liberty to create markets or the freedom of profession and contributed to consolidating this triple system. Accordingly any group of people could spontaneously organise a market without legal authorisation, and article 74 of the Code stated that any merchant could operate in any stock trade without the explicit intervention of licensed or official stock brokers. The only difference was that free middlemen had no public authority to attest transactions. Only licensed brokers or official stock brokers, both designated by the government, could notarize commercial transactions, but this did not mean that they held a monopoly: unlicensed ‘free’ stock brokers could perform the same deals but without the legal notarization.⁴ Consequently the 1885 Code recognized *de facto* the existence of the ‘Mercado Libre de Valores de Barcelona’ —the Spanish market in which free brokers operated massively. At the same time it consolidated the statist model of the Madrid Stock Exchange and did not change the main features of the existing local stock exchanges. Although theoretically free brokers could operate in the latter two exchanges, for

¹ See Tortella (1973).

² Montero (1991), Gutiérrez Sebares (2001), Cuevas (2001), Hoyo (2001) and Hortalá (2004).

³ See Rojo Cagigal (2008) for a detailed discussion of the origins of this unique triple system.

⁴ See Duque Domínguez (1986), Fugardo Estivill (1999).

reasons we have not been able to reveal, official and licensed brokers retained the monopoly that they had traditionally held there, respectively.

The Bilbao stock exchange in its modern form was founded in 1890 when a group of brokers, merchants and industrialists constituting a joint-stock company submitted a proposal to create an official exchange to the Spanish government. The Spanish executive was interested in extending the official stock market model established by the Code to other provinces in Spain because it improved the scope for the placement of public debt and the initiative was approved immediately. The Bilbao Stock Exchange (BSE) was officially founded on the 21st of July, 1890 and began operating in February of 1891, becoming the second official exchange in Spain, sixty years after Madrid.⁵ The founding of an official exchange in Bilbao has usually been regarded by historians as a natural consequence of the rapid industrialization process which took place in the Basque region during the last third of the 19th century.⁶ Its creation is seen as an answer to the need to raise capital for nascent demand of mining, shipping and industrial concerns. Iron ore exports had accelerated after 1876, and the expansion of local heavy industry and the merchant shipping sector had held pace. Industrial development seemed the driving force for the creation of a formal capital market, more so if we take into account that until then the local banking industry had not performed a very satisfactory role in financing industrialization. Self-finance and the reinvestment of profits from iron ore exports and trade, urban proprietors, rentiers or banks from other Spanish regions had constituted the main sources of industrial capital until then.⁷ All this could lead us to believe that the Bilbao stock exchange had been set up to better provide capital for the rapidly expanding mining and shipping business and the emerging manufacturing sector.

Much to our surprise however, the analysis of the early market structure does not reveal a bouyant demand for private securities. Data show that, between 1891 and 1897, 68.5% of trading volume was carried out on public debt; 17.8% on company bonds; and just 13.7% on private stocks, of which an important part were stocks of a state monopoly, the Compañía Arrendatoria de Tabacos.⁸ According to these sources, less than 10% of the market volume was devoted to private stocks linked to Basque industrialization. In iron ore mining, very few companies were organised as Spanish joint-stock companies, and many of those that did were foreign owned.⁹ Most firms were family-run companies or owned by investment groups in which reinvestment of profits continued to prevail. In the shipping sector, although 74 of the 77 companies created between 1879 and 1889

⁵ See Torrente (1966).

⁶ Montero (1996).

⁷ See Valdaliso (1993).

⁸ Montero (1994), p. 52.

⁹ Orconera, Luchana Mining, Franco-Belga, etc.

were joint-stock companies, none of their stocks appeared on Bilbao's trading floor before 1898. The companies were relatively small and ownership was extremely concentrated, so that very few stocks were ever traded. In the iron and steel industry, ownership was also highly concentrated, and market transactions similarly scarce. The shares of the main iron and steel enterprise, Altos Hornos de Bilbao, were traded with little regularity before 1895; and those of the second most important company, Sociedad La Vizcaya, did not appear on the market until 1898. This evidence suggests that trading in mining, shipping and the major steel companies —at the time the more dynamic sectors— reveals little demand for risk capital.

Combining these observations with those of the remaining sectors the existing demand gives no indication as to why an official market was preferred to a free informal stock exchange or the traditional local exchange that had existed before. There is nevertheless an important issue to be stressed. The 1885 legislation had introduced more economic freedom whereby official exchanges could be created in any Spanish city and new brokers (official vs. licensed) gained immediate control over them. These new official brokers were required to deposit greater guarantees than in the informal exchanges but in return they received the monopoly of public debt trading. This change in legislation introduced a potential strategy of opportunistic behaviour on behalf of the richest brokers in the existing licensed brokers associations organised in traditional local markets. The commercial regulations of 1885 created an incentive for prosperous brokers —wealthy enough to pay a surety 10 times higher than that of a licensed broker— to promote an official exchange and thereby become official stock brokers which entailed attaining the monopoly on public debt trade. This was a particularly interesting strategy taking into account that many of these exchanges served mainly as a marketplace for trading public bonds.¹⁰ Creating an official exchange whereby more successful brokers could exclude their less well off competitors from bond trade became a looming threat. In 1887, Valencia's licensed brokers came to an agreement to avoid this kind of self-interested behaviour and consolidated a formal stock trading centre. That is, they negotiated and set down their stock exchange on the basis of their previous trading system in order to avoid the installation of an official exchange.¹¹ Differently in Bilbao a small group of licensed brokers saw an opportunity to take advantage of the new legislation and obtain a monopoly on public debt trading. Their initiative was accompanied by three favourable circumstances: the rest of the licensed brokers remained disorganised; the promoting group received support from some of the more dynamic economic elites; and finally they could count on the government's interest in promoting new channels for

¹⁰ See Montero (1994) for Bilbao, Cuevas (2009) for a detailed discussion for the case of Valencia or Gutiérrez Sebares (2001) for Santander.

¹¹ Cuevas (2001), pp. 5-6.

placing and trading public debt. Thereby, the BSE emerged as a split within the local licensed stock broker association (Colegio de Corredores de Comercio).¹² This initiative and the further evolution of the exchange over the first decades of its existence discussed below shows a strong resemblance to the strategy adopted by Parisian *agents de change* operating in a similar legal framework who captured the State and then lobbied successive governments to enlarge the scope of their monopoly.¹³

3. Microstructure

The adoption of a French-style model by the Bilbao Exchange had an important impact on its later evolution. The high degree of power accumulated by official brokers over time was one of the most relevant characteristic of its institutional development during the first third of the 20th century. Once Bilbao had obtained the status of an official market, the official brokers immediately demanded their legal monopoly on public debt trading, and no longer tolerated trading by non-official brokers.¹⁴ They also began exerting pressure to get the State to extend the monopoly to all trading. Bilbao's official stock brokers attained that objective in 1910, when a decree established that in all cities with official exchanges the Ministry of Public Works would appoint no more new licensed brokers —their direct competitors. This sentenced the non-official brokers to extinction. Actually by 1928 only official stock brokers operated in Bilbao. The decree also limited the maximum number of official stock brokers to 50 for Madrid and 40 for Bilbao supposedly to promote a more stable income for them and reduce speculation. It also meant the *de facto* consolidation of the monopoly on stock trading by official stock brokers.

The official agents also established strong entry barriers. Access to the profession required an entrance exam and a substantial surety deposit. In addition to that the 1928 Stock Exchange Regulations introduced further barriers. They required a 4/5 majority from association members for obtaining access to examination. By the same regulation official brokers could now designate clerks or trainees who traded in their name, i.e. increase the volume of individual trading they could handle and maintain the limit established for the number of official brokers, even as the volume of trade increased. In practice, it became common for official stock brokers to choose their sons as trainees.

¹² It is probable that something similar occurred in Barcelona in 1915: the Association of the Mercado Libre de Valores affirmed in 1926 that the creation of an official exchange in Barcelona was the result of a split within the Casino Mercantil. Asociación del Mercado Libre de Valores de Barcelona, Anuario de 1926, p. 15. The official stock exchange in Barcelona coexisted with the Mercado Libre between 1915 and July of 1936. See Hortalà i Arau (2004).

¹³ Neal and Davis (2005), p. 298.

¹⁴ See Torrente Fortuño (1966), pp. 109-111.

These later went on to occupy their father's position after death or retirement. At least five out of the eleven new official stock brokers nominated in the 1930s were direct descendants of former official brokers.¹⁵

The official agents extended their control over the entire stock exchange institution. As we have mentioned before, the BSE had been founded by a joint-stock company, the Sociedad Anónima Bolsa de Comercio de Bilbao. But in 1892 this company transferred all their competences concerning entrance and trading fees to the official stock broker association, el Colegio de Agentes de Cambio y Bolsa. The founding joint-stock company survived because this was required by law, but the Colegio became the true owner of the Exchange. The Colegio was the corporation which brought together all the official agents. It had its own legal entity and was financed by dues collected from the agents calculated as a percentage of their earnings; entrance fees; and listing duties.¹⁶ The government of the Bilbao Stock Exchange was vested in the *chambre syndicale* —Junta Sindical— in charge of enforcing internal regulations, conflict-solving, publishing the official bulletin and listing new stocks.

The agents also extended their control to the stock exchange building. Between 1891 and 1905 trading moved through several locations in the old city centre: the Arriaga theatre, an office space in the Plaza Nueva and a room inside the Banco de Bilbao headquarters. In 1903 the Junta Sindical had decided to construct a building in the Ensanche, the new urban expansion area. The neo-classical building was inaugurated in 1905 and it continues being the BSE's main office until today. The Colegio was the original owner of the building, but the official brokers exerted pressure to hold individual property shares of the building. In 1922 they met that purpose by creating of a joint-stock company, the Sociedad Anónima La Concordia, which owned the building and whose stocks could only be sold in case of death or retirement.¹⁷ To sum up, the new official middlemen managed to eliminate competition from licensed and free brokers and established strong barriers to entry in the profession. They became the *de facto* owners of the building and even took measures so that their positions could become almost hereditary. This is in sound contrast to Barcelona's stock market situated in the other emerging industrial region in Spain, where the division between the property of the building and traders was maintained; licensed brokers, official brokers, free middlemen and banks competed with one other; and access to trading was generally open.

The BSE was governed by three official regulatory legislations up to the Spanish Civil War. The first two were sanctioned by royal decrees in 1890 and 1902. They were similar to those in force in Madrid but not exactly the same. From its origins the rules and regulations of the BSE followed very

¹⁵ Rodríguez Sastre (1944), Torrente Fortuño (1966).

¹⁶ Montero (1996), p. 66.

¹⁷ Torrente Fortuño (1966), p. 185.

closely upon those of the Madrid Stock Exchange [MSE]. This provided the exchange from its beginnings with clearly set parameters according to which business on the exchange was to be carried out. These practices had been in place for 60 years in Madrid when they were adopted and avoided the cumbersome process of developing own procedures by trail and error. A third regulatory legislation was imposed in 1928 and was a literal copy of the Madrid Stock Exchange Regulations. Thereby Bilbao lost some of its control to Madrid at the end of the 1920s, i.e. the authority to list new stocks, which was transferred completely to Madrid in 1928.¹⁸

Trading was done face-to-face on a trading floor. As we have seen before, BSE was a 'listed' exchange. Listing was one of the main functions regulated by official exchanges, and only listed stock could be traded. Whereas listing of public debt required a previous government authorization, private stocks were first admitted by the exchange's Junta Sindical and later ratified by decree. The BSE authorities could list their own stock until 1928. After that date a new General Stock Exchange Regulation centralized this function for all three official exchanges —Barcelona, Bilbao and Madrid— in the Madrid Stock Exchange's *chambre syndicale*. Prices were determined using an open outcry auction method: a potential buyer bid a specific price for a stock and a potential seller asked a specific price for the stock. When the bid and ask prices matched, a sale took place on a first-come-first-served basis, if there were multiple bidders or askers at a given price. Once a sale had been made, the details of the transaction were recorded by each individual broker and then reported to the Stock Exchange register to be quoted on the slate.

At the end of the trading session all brokers on the floor gave a full report of their trading activities, and the Stock Exchange authorities recorded all sales including the closing price and the trade volume for each traded security. Trading took place in exchange rings (*corros*) designated for different securities and types of operation. The Junta Sindical established when and where these *corros* worked. The *parquet* —an elevated wooden ring with a balustrade— was reserved to official stock brokers.¹⁹ Sessions were held Monday through Saturday from 11 am to 12.30 pm, with the exception of national and local holidays. After the opening of the new building in 1905, the Junta decided to celebrate two additional sessions (*bolsines*) from 10 to 11 and from 16 to 18 hours. Other changes were made in the following years adapting to trading activity and regulatory changes. From the end of February 1921 to October 1923 —a period of very low trading—, there was no session on Saturdays, which holds true for all summer sessions after 1923. We know that from 1921 on, sessions were divided into three time slots: the first one for fixed interest securities trading, the

¹⁸ See Rodríguez Sastre (1944), pp. 99-139.

¹⁹ Rodríguez Sastre (1944), pp. 67-71.

second for foreign exchange and the final session for all securities. Between 1914 and 1936 the highest annual number of sessions was 284 in 1918 and the lowest 228 in 1922.²⁰

Article 67 of the Code of Commerce established that a wide range of products could be traded on an official exchange: public and municipal debt, private bonds, private securities, bills of exchange, freights, insurances, currencies, precious metals and merchandise. In practice, official exchanges traded mainly in securities and, but to a much lesser extent, in foreign currencies.²¹ Spot deals were the most common trading operation. Forward transactions —usually 3-month deals— increased during booms, although rarely represented more than a third of total traded volume.

As we have stated previously, during the early years of functioning as an official bourse the Bilbao exchange was primarily a market for public debt. However, in the latter years of the 19th century and the first decade of the 20th century all Spanish stock exchanges played an expanding role as private capital markets. This transformation was a direct consequence of the concentration processes in the banking sector, heavy industry, shipping activity and the insurance business. At the same time the expansion of the electricity sector, which required important network investments, gave an important impulse to equity issuance and trading.

In Madrid, for example, the number of listed companies increased from 60 in 1896 to 105 in 1906²², with a growing importance in mining, chemicals and industry in the overall trade volume.²³ Trading in equities on the Madrid Stock Exchange increased from 57.5 million 1913 constant pesetas in 1899 (highest volume registered during the 19th century) to 297 million in 1900. During the first decade of the 20th century the volume of equities traded never dropped below 200 million, and up to the Spanish Civil War, with the exception of 1915, it never dropped below 100 million.²⁴ This transmits the idea of an important leap forward during the change of centuries.

In the Barcelona Exchange an important number of shares from companies in the mining sector and the electricity industry entered the trading floor, which changed the traditional structure of this market. This put an end to what Fontana denominated the 'old Barcelona Exchange'.²⁵ The previous predominance of railroad, public services, banks and insurances stocks was reduced by equities from mining, electricity, metalworking, chemicals, and construction enterprises.²⁶

²⁰ *Boletines de Cotización Oficial de la Bolsa de Comercio de Bilbao and Información.*

²¹ This is true throughout the period with the exception of a speculative phase from 1920 to 1923, when foreign currency trading (marks, pounds and francs) was high in the BSE.

²² Carreras and Tafunell (2005), p. 823.

²³ Hoyo (2007), statistical appendix 2, pp. 153-154, although the weight of public stock trading was still overwhelming.

²⁴ Hoyo (2007), statistical appendix 1, p. 151.

²⁵ Fontana (1961), p. 61.

²⁶ Hortalá (2006).

The change was even more significant in the Basque region. The BSE experienced a rapid conversion from a small market which traded predominantly in public debt securities into an important market in private securities. The banking sector experienced a process of formation, merging and capitalization. Two important banks, Banco de Vizcaya and Crédito de la Unión Minera, were founded and their securities started being traded regularly on the Exchange. In the iron and steel industry, the local economic elites merged two of the largest enterprises into Altos Hornos de Vizcaya, which became a dominant firm oligopoly on the Spanish market.²⁷ Investment also increased in the electricity (founding of Hidroeléctrica Ibérica, Hidroeléctrica Española, Unión Eléctrica Vizcaína), shipbuilding (Compañía Euskalduna) and the shipping sector (Naviera Sota y Aznar, Naviera Vascongada, Marítima Unión, Marítima del Nervión). The capitalization of Biscayan economy had received an important boost in 1898 with the repatriation of Spanish capitals from Cuba and the Philippines. Valdaliso has calculated that 18 % of the capital invested in joint stock companies between 1886 and 1913 was provided by *indianos* (repatriates).²⁸

Table 1. Comparison of the securities traded on the Bilbao and Madrid Stock Exchanges, 1916 – 1935 (millions of pesetas and percentages)

	Publ. Debt Bonds		Company Bonds		Equities		Total	Index
Bilbao								
1916	43	19,9%	59	27,2%	115	52,9%	218	100
1920	33	9,8%	43	12,6%	263	77,6%	339	156
1925	58	26,0%	62	27,8%	102	46,1%	221	102
1930	70	28,1%	40	16,2%	139	55,7%	249	115
1935	62	25,4%	42	17,0%	141	57,6%	245	112
Madrid								
1916	410	71,9%	12	2,1%	148	26,0%	570	100
1920	565	51,6%	60	5,5%	470	42,9%	1095	192
1925	520	52,5%	90	9,1%	380	38,4%	990	174
1930	620	23,5%	75	2,8%	1940	73,6%	2635	462
1935	1130	51,0%	160	7,2%	925	41,8%	2215	389

Source: Memorias de la Cámara de Comercio, Industria y Navegación de Bilbao, corresponding years.

Table 2. Trading Volume Bilbao Stock Exchange, 1916-1935 (millions of pesetas)

	1916/1919	1920/1923	1924/1927	1928/1931	1932/1935	TOTAL
FIXED INTEREST	415,60	391,86	583,55	510,76	272,63	2174,40
Public debt	214,57	237,63	360,86	330,74	177,75	1321,55
Company bonds	201,03	154,22	222,69	180,02	94,88	852,86
EQUITIES	1237,95	406,17	401,85	622,85	378,86	3047,67

²⁷ Fraile (1991), pp. 133-6.

²⁸ Valdaliso (1993), pp. 167-8.

Banks	164,26	180,52	78,87	32,95	42,91	499,50
Railways	75,20	17,08	50,38	90,43	75,76	308,84
Shipping companies	428,42	31,97	28,84	36,39	28,83	554,45
Mining companies	63,17	7,38	55,95	43,71	10,17	180,38
Industry	482,47	159,19	133,69	318,05	143,22	1236,62
Electricity	24,43	10,04	54,11	101,32	77,98	267,87
TOTAL	1653,54	798,03	985,40	1133,61	651,50	5222,07

Source: Memorias de la Cámara de Comercio, Industria y Navegación de Bilbao, corresponding years.

From the end of the 19th century up to the First World War the Bilbao exchange experienced a gradual transformation from a small market which traded predominantly in public debt and state monopoly stocks into an important market in equity securities. As shown in Table 1, by the interwar period the BSE had become a market basically focused on private bonds and shares. Equity shares drove its trading compared to that from Madrid, which in turn retained its traditional role of providing public finance. The traded volume of public debt in Madrid was more than 50% of the total volume during the first third of the 20th century, until the Spanish Civil War. In Bilbao public debt represented only a quarter of the total trading volume between 1916 and 1935 (see Table 2). The ratio of fixed income security trading to equity trading remained fairly constant throughout the period, with a moderate increase in the 1920s and a slight relative reduction in the early 1930s. Later it coincides with the general movement in trading. The overall pattern is a strong expansion of equity trading during bull markets, especially in shipping, industry and banks, accompanied by a lesser increase in bonds and public debt. Both 1917-1920 and 1927-1930 show such sharp increases in trading mainly in equities. During downswings we observe inverse behaviour, strong decreases in equity trading and increases in the fixed interest security share of trading. This reflects, as in other stock markets, both speculation looming due to the public's obsession with making a quick fortune and refuge into fixed interest securities during bear markets.

It is of particular interest to stress that the Bilbao Stock Exchange was essentially an industrial exchange trading mainly in equities. Over the end of the long nineteenth century the BSE had become specialized in industrial and banking stock trading. The six top stocks in terms of trading volume were industrial shares: Unión Resinera Española (resin manufacturing industry), Altos Hornos de Vizcaya (iron and steel), Duro Felguera (iron and steel), La Papelera Española (paper), Siderúrgica del Mediterráneo (iron and steel) and Unión Española de Explosivos (explosives). All of these industries operated their businesses nationwide. The industrial shares constitute almost 24 % of total volume for the period examined, shipping companies put up for around 11 %, but mainly

because of intensive trading in the immediate post-war years.²⁹ Banks were next in importance with approximately 10 % of total trading, mostly in the 1920-1923 speculative bubble. Railways had a percentage of almost 6 %, but most of the company bonds in circulation and most of the 16 % of total trading volume in company bonds were railway bonds. Both national railway companies, such as Ferrocarril del Norte and Ferrocarril de Madrid-Zaragoza-Alicante, and smaller regional railroads, such as Ferrocarril de Bilbao a Portugalete, Ferrocarril de Santander a Bilbao and Ferrocarriles Vascongados were traded. Electricity as a business matured over the period examined, especially from the 1920s on, and equities had acquired an average of 5 % and a maximum of 11 % of trading in the mid thirties. Mining companies composed around 3 % of total volume. They were characterized by their low levels of capitalization, heavy foreign business interests and the precipitous fall of the international demand for Spanish iron ore at the beginning of the 20th century.³⁰ Very large state sponsored monopoly enterprises were created towards the end of the 1920s, Telefónica (telecommunication sector) and CAMPSA (petroleum industry), can be included in that list. They explain both the important increase of industrial trading in Bilbao in 1928-1931 (Table 2) and the exceptional predominance of equity share trading in Madrid in that period (Table 1).

4. The BSE Indexes

We have calculated a battery of stock exchange indexes to perform comparisons to other exchanges in Spain and a detailed analysis of market evolution. To this purpose, we have collected daily closing price quotes of stocks traded for all listed equities on the Bilbao Stock Exchange from its origins in February 1891 to July, 18th, 1936 (sessions were suspended then due to the outbreak of the Spanish Civil War). Data from 1891 to 1913 was taken directly from the official stock exchange registers and from 1914 to July of 1936 information was taken from the Bilbao Chamber of Commerce's official journal, *Información*, which published fortnight summaries of closing price quotes and traded quantities. Missing summaries have been reconstructed with quotes and quantities taken directly from the official daily stock exchange register. Quotes from stock exchange sessions, including the closing price and total amount of each stock traded, were recorded in a daily trade summary drafted and published by the Stock Exchange authorities. These were the quotes published by *Información*. This has been contrasted to be the closing price —*el último cambio*— taken from those daily published trading summaries.³¹ Missing data has been completed and outliers have been double-

²⁹ For the evolution of the shipping sector, see Valdaliso (1991).

³⁰ See Montero (1990) and Escudero (1998) for a closer description of the mining cycle.

³¹ The Real Orden de 22 de enero de 1902 oblige the governing committee of the Exchange to publish all transactions that have take place during the trading session in a daily stock market bulletin. These include trading values and closing

checked with the original stock market registers. The summaries in *Información* also include information on the daily traded quantities of each stock expressed in current pesetas, from which we were also able to infer the number of shares traded.³² This information is quite unique for the period we are examining and has been useful both for constructing the weighted liquidity and capitalization price index for 1914 to 1936 and for fitting models to returns in other ongoing research.³³

The long index, ranging from February 1891 to July 1936, represented in Figure 1 is a monthly un-weighted price index. Figure 1 plots the index together with the monthly series available for Barcelona, Madrid and annual series for Santander and Valencia. Two forces motivate this index: detailed information on shares issued and paid out capital are not easily available for the period before World War I and more important still, all other high frequency Spanish stock indexes for the time period previous to WWI are monthly un-weighted average price indexes and any comparisons we would like to perform oblige us to use this type of index.

The long un-weighted BSE index averages the end of the month quotes of five equities in 1891 and increases that to eleven by 1900. We maintain eleven securities until 1914 and from 1914 to 1936 we increase the average to 20 equities. For the latter period these are the most regular, most liquid and highest capitalized shares traded.³⁴ The index is calculated as a mean of the equity price series expressed in percentages of their nominal share value. Series have been rescaled to levels when entering the index to avoid sudden jumps but maintaining their variation with respect to the previous month.³⁵

Figure 1. The unweighted monthly BSE index together with the available indexes for Barcelona, Madrid, Santander and Valencia, February 1891 – July 1936.

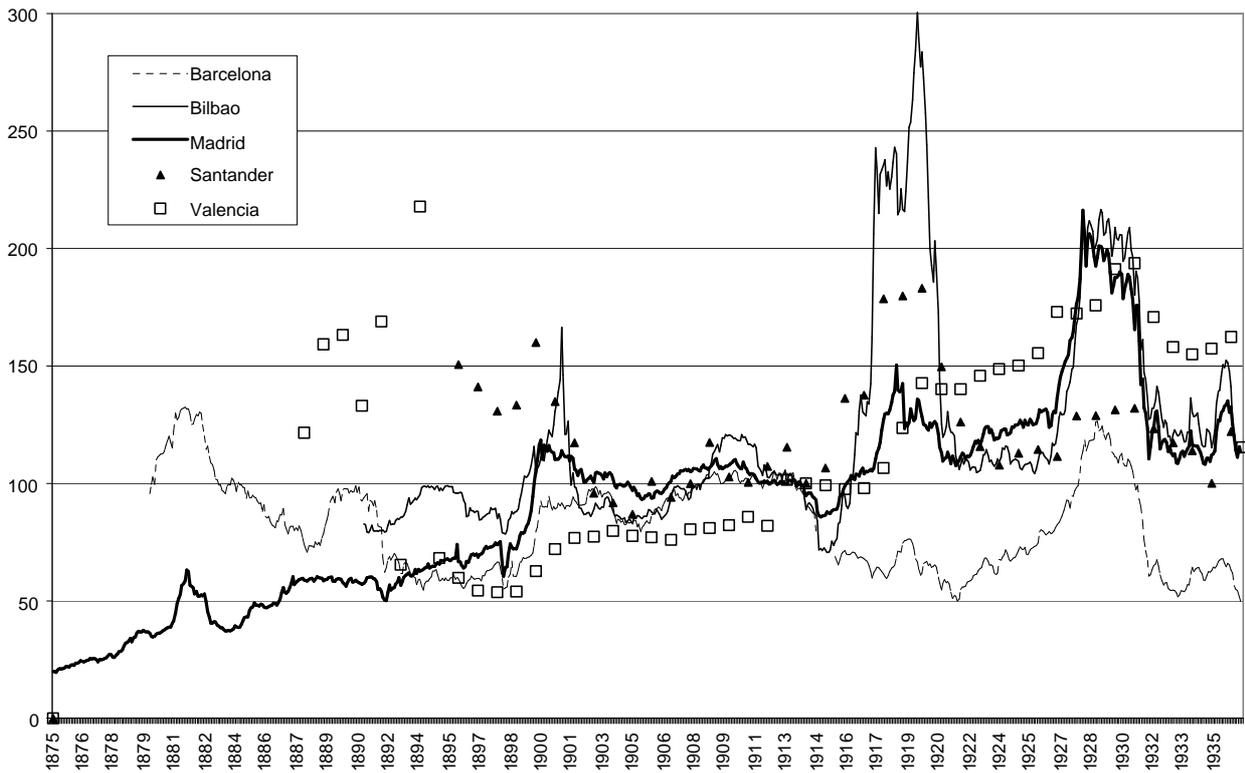
price quotes. The Real Orden de 1 de Julio de 1916 explicitly prohibits newspapers and magazines from publishing quotes other than those published in the official stock market bulletin.

³² According to our primary source, the value reported was in fact equal to the number of stocks traded multiplied by the nominal paid-up capital of each stock. Thus, calculating the number of stocks traded required the collection of detailed information about the nominal capital, number of issued shares and paid-up capital of each of the selected stocks for the period 1916-1936.

³³ See Battilossi and Houpt (2006, 2009).

³⁴ They are almost the same as those included in the weighted indexes we have calculated. Differences are due to the time period for which we have calculated both. The weighted indexes start in 1914. For the unweighted index we have maintained stocks included until then beyond 1914 to avoid an unnecessary number of entrances and exits of equities in the index. See Appendix A.

³⁵ If the equity which exits does so at a level of 200 in the month of June and the share which enters registered a return of 5 % from May to June, we have rescaled the price series of the share which enters to a level of 210.



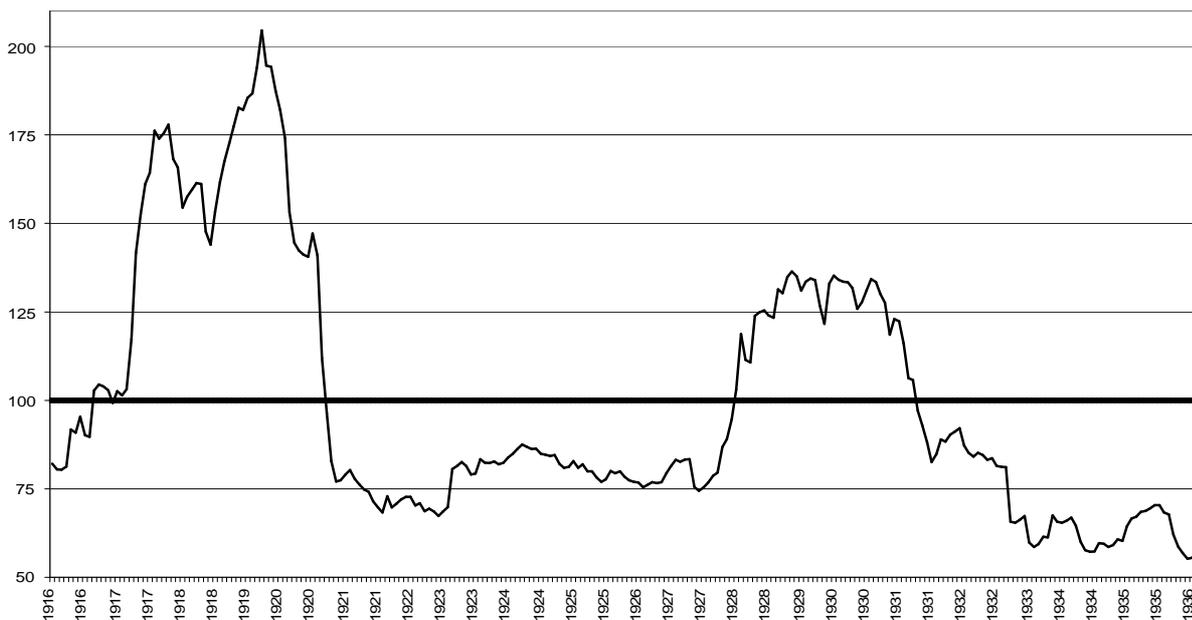
Sources: Cuevas (2009), Martínez Méndez (2008), Gutiérrez Sebares (2001), Revista de la Bolsa de Madrid (1994)

Our point of departure for calculating both weighted and unweighted indexes was to select those equities —265 in all— that showed a regular trading frequency at some point between 1914 and 1936: 16 bank securities, 21 railway stocks, 50 electrical securities, 32 mining company shares, 46 shipping company stocks, and 100 industrial securities. We then went on to assume that the high incidence of very infrequent trading can be regarded as evidence for thin markets. Including a high number of these infrequently traded stocks in the market index would reduce returns' variance considerably, thus introducing a strong bias in favour of stability. In this case there was a clear trade-off between including an important number of equities in the index and calculating an index which reflects the volatility of this secondary capital market. We sidestepped this trade-off by calculating three different indexes: two market indexes similar to those used today —a price-weighted Dow-Jones type index and a capitalization weighted S&P type index— and a third comprehensive index which covers an important amount (65) of the regularly traded stocks to see how their par value evolves over time. For calculating all three indexes we decided to exclude the stocks which reported trading prices and volumes for less than 12 out of the 26 possible fortnights for any of the years between 1914 and 1936. We hereby reduced the approximately 265 reported equities to 101. Even within this reduced sample, however, the problem of infrequent trading persisted as a possible source of bias. For this reason, we focused on weekly rather than daily observations, in an attempt

to reduce the slippage stemming from daily sampling yields without sacrificing too many observations.³⁶ For these 101 series we then identified when equities quoted prices regularly on a weekly basis throughout prolonged periods and chose the 65 most regular stocks. Finally we extrapolated price information for those weeks in which they quote less than 12 fortnights.³⁷

These 65 equities have been the basis for the calculation of all the indexes constructed for 1914 to 1936 and the complete listing is given in appendix A.³⁸ We have also used these 65 stocks to construct a comprehensive BSE-65 index which weights each of the price series by their paid out capitalization and uses price series expressed as the percentage of the price quote in terms of the paid out share. This index therefore shows 'above' or 'below' par market valuation for the basket of all the issued shares of these 65 equities.³⁹ Figure 2 below presents this monthly BSE-65 between 1916 and July of 1936.

Figure 2. BSE 65 capitalization weighted monthly index, January 1916 to July 1936



If we concentrate on the par level of 100, we find that the basket of the 65 most regularly traded stocks fell below its paid-out value between December 1920 and April 1928 and after July 1931. It came very close to approaching the 50 % level in June of 1936. Strikingly the value of the

³⁶ “Our choice of a weekly observation interval was determined by several considerations. Since our sampling theory is based wholly on asymptotic approximations, a large number of observations is appropriate. While daily sampling yields observations, the biases associated with non-trading, the bid-ask spread, asynchronous prices, etc. are troublesome. Weekly sampling is the ideal compromise, yielding a large number of observations while minimizing the biases inherent in daily data.” Lo and MacKinlay (2001) pp. 26-27.

³⁷ We maintain the last price quoted.

³⁸ The stock price indexes are all value-weighted and have been adjusted for stock splits, new issues, paid out capital, capital reductions, etc. Prices for each equity have been expressed as a percentage of paid out capital.

³⁹ BSE-65 weighted with capitalization.

basket remains below par value for most of the period analyzed, the exception being the two booms. Compared to BSE 20 unweighted this index is less volatile and more sluggish, especially in the expansion phases, but it sheds an interesting light on the joint performance of the 65 more regularly traded stocks over time.

These same selected 65 stocks have also been used to construct a market index weighted by capitalization and driven by liquidity and capitalization for 1914 to 1936. For each stock a summary indicator of liquidity and market capitalization (ILC) has been estimated annually as follows:⁴⁰

$$ILC = p_{it}q_{it} + \alpha_m p_{it}v_{it} \quad (1)$$

where $p_{it}q_{it}$ is the average market capitalization of stock i , $p_{it}v_{it}$ is the average trading volume of stock i , and α_m is the ratio of the average market capitalization and trading volume ($p_{mt}q_{mt}/p_{mt}v_{mt}$). Each year stocks have been ranked according to their ILC, and the 20 stocks with the highest ILC value have been included in the index. In other words, the most liquid and most highly capitalized securities available in the Bilbao stock exchange at each point of time have been used to construct a capitalization-weighted index. Stocks have been taken out of the index and others have been added according to the changes in their ILC ranking, and their persistence in the ranking. When possible we have tried to maintain a similar magnitude of capitalization and a similar sectoral representation but always choosing within the highest ranking ILC's. This index will be left in store until its counterparts for Barcelona, Madrid or Valencia become available.

All indexes for the interwar period have been calculated both weekly and monthly. The ILC 20 index has also been the basis for constructing an unweighted index and moving it back in time to the very origins of the exchange. This is the long BSE index we have introduced earlier. Moving back in time we have tried to maintain both criteria of including regular trading stocks and avoiding an excessive number of entrances and exits. Appendix A gives a detailed summary of the stocks included. It also shows how exactly we moved back from a 20 stock average in 1914 to 11 stocks in 1900 and down to 5 stocks in 1891.

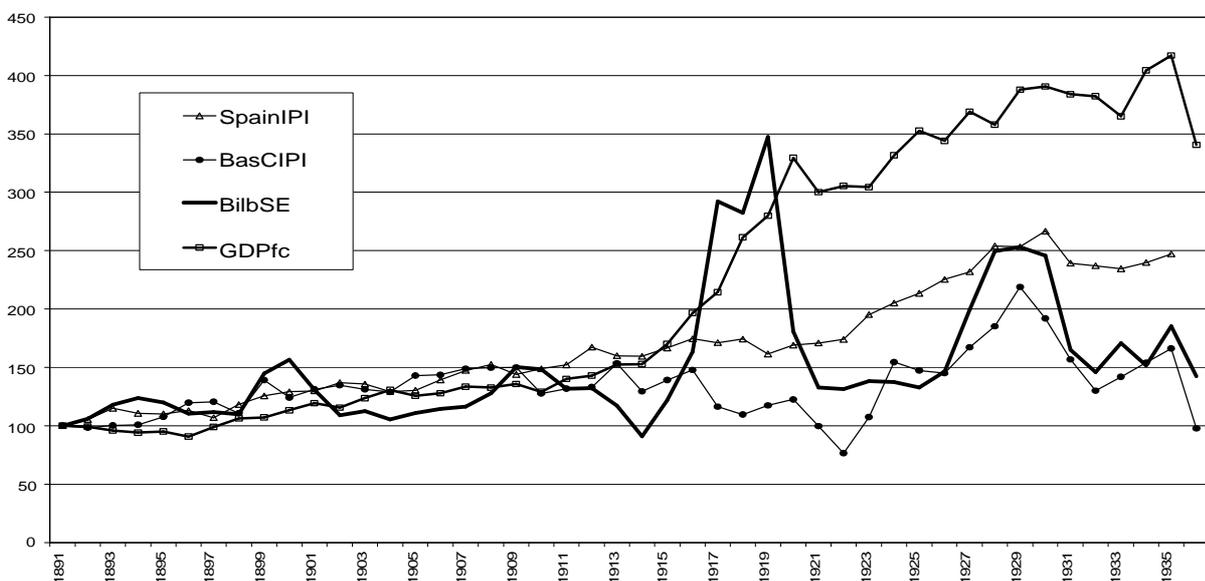
5. Assessing performance

Of the three indexes calculated to date, the long BSE unweighted index, the BSE 65 weighted index and ILC 20 weighted index —both for the interwar period only—, we will now examine in more detail

⁴⁰This is the procedure the Milan Stock Exchange uses to calculate the MIB 30. It allows choosing the most liquid and most highly capitalized stocks listed on the Italian Stock Exchange. <http://www.ihs.ac.at/fin/finix/mibdescrip.html>

the simplest, longest and easiest to compare: the long BSE unweighted index. A first approximation to assessing its performance is a long-term comparison with other macroeconomic series which are exposed to the same economic fundamentals. Figure 3 shows the monthly unweighted BSE index together with Spanish GDP and the Spanish and Basque Country Industrial Production Index. We see that up to the First World War, the BSE index follows the common trend of GDP at factor costs, the national industrial production index and the Basque Country industrial production index with slight oscillations above and below their levels. From that point on, we can distinguish two periods. A speculative phase which swung beyond the war and a readjustment phase in which the index aligns with the Basque industrial production index calculated by Parejo Barranco (2004). These findings suggest two conclusions: The BSE index follows the common economic trend up to the First World War both in terms of the general economic cycle and industrial production and, secondly, after the war the index is strongly tied to the evolution of industrial production both anticipating and following its movement. This underlines our perception of the BSE index as an industrial index which images an exchange in which investors are exposed primarily to the industrial business cycle.

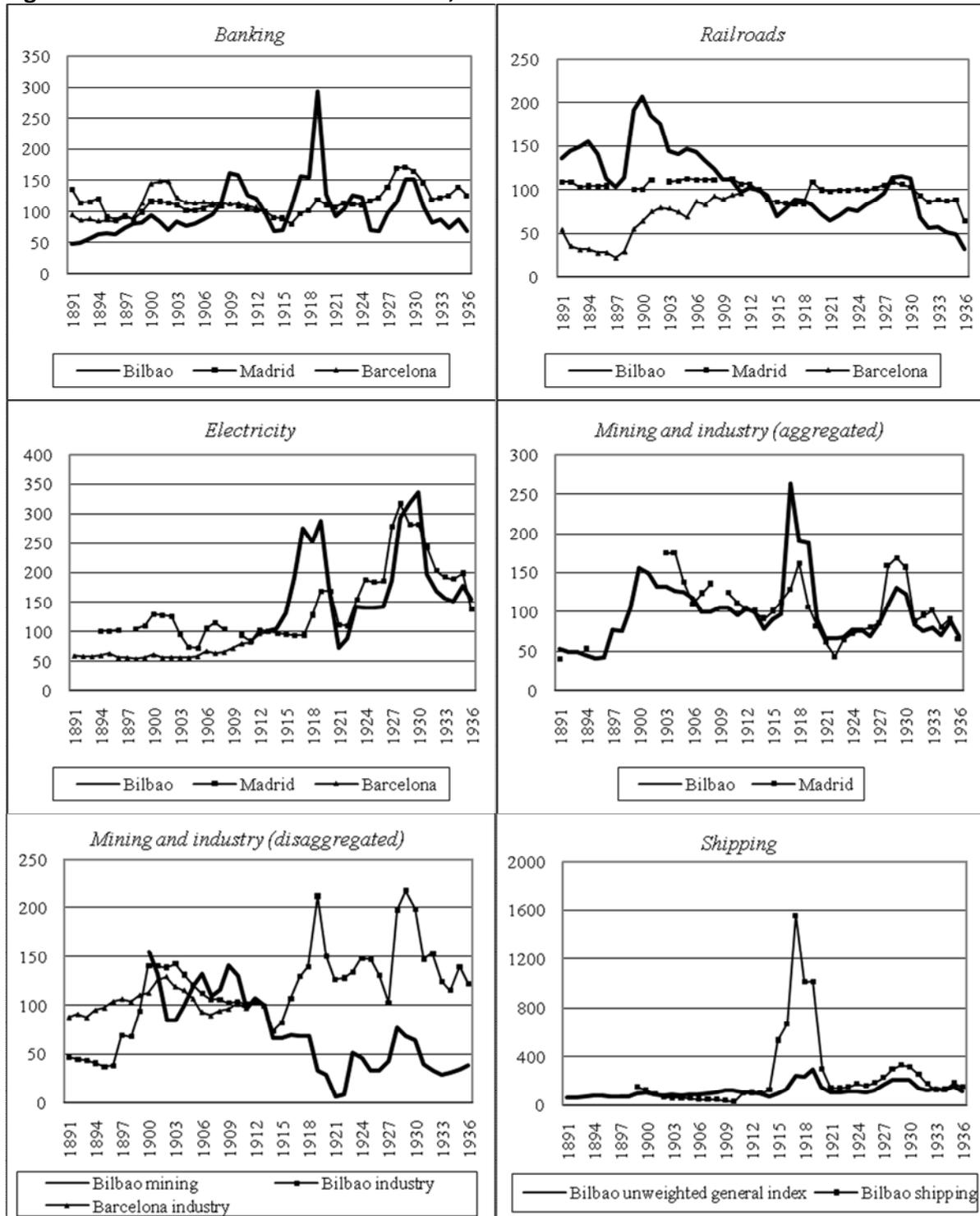
Figure 3. Bilbao Stock Exchange versus Economic and Industrial Growth, 1891-1936



Sources: Prados de la Escosura (2003), Parejo Barranco (2004), Carreras (2005).

A second approach to contrasting the verisimilitude of the index is disaggregating it into sectoral indexes and comparing them to those that exist for Barcelona and Madrid. We hereby try to examine if the indexes' components were driven by similar forces and where existing differences could stem from.

Figure 4. Annual sectoral indexes: Bilbao, Madrid and Barcelona



Four sectors mark a difference during the World War I interlude: banking, industry, electricity and shipping. The status of neutrality during the war was especially favourable to Bilbao, the closest major Atlantic port to the contending nations. The primary beneficiaries were mixed banks with heavy interests in industry and electricity but foremost the shipping industry which made enormous profits with skyrocketing freights.

Railways, on the other hand, follow the same overall declivity in all of Spain. It was more pronounced in Bilbao as some of the railways included in its index were tied to mining activities which initiated their final phase of depletion over the first third of the century. This explains their higher initial level and faster fall. The short recovery in the late 1920s would be tied to the overall stock exchange boom in those years. Railways received their *coup de grâce* when the Second Republic withheld all the support they had received from previous administrations. Throughout the 1930s they faced growing competition from road transport, falling revenues and little manoeuvring ground for reducing expenditures.

Electricity was definitely one of the more dynamic sectors, both in levels and trends. Reinvestment opportunities from other sectors in Bilbao during the war boom explain the early differences to Madrid. Both indexes move in unison thereafter. The same co-movement holds true for industry especially when we separate the mining activity in clear retrocession. We find that the difference to other Spanish indexes can be traced back to the World War I boom driven by the favourable conditions it provided especially for shipping; the higher incidence of mining stocks and the earlier move into the electricity sector. Comprehensively the index holds coherent in these comparisons.

6. Testing for capital market integration between Bilbao, Madrid and Barcelona: 1891 to 1936.

Having established a certain degree of coherence for the Bilbao index, this part of our analysis examines the degree of integration of the Bilbao Stock Exchange with the other two major stock exchanges for which we have equivalent data.⁴¹ A second question to be assessed is the evolution of secondary market integration over time.

Our point of departure is the assumption that two trading markets are integrated if price changes in one market are manifested in price response similar in magnitude and direction in another. We are therefore testing the smooth transmission of price signals and information across spatially separated markets.⁴² Specifically we are concerned with finding whether assets of equal risk provide investors with the same expected return across integrated markets. We will perform two tests for market integration: a macro test to see whether the index series for the three markets

⁴¹ Weekly series are not available yet for any of the other exchanges. The quarterly series provided by Tafunell (1991) have been scrutinized by calculating quarterly series for Bilbao. The results using quarterly data for Bilbao and Barcelona from 1891 to 1914 confirm those presented at the end of this section.

⁴² Golettie et al. (1995)

are cointegrated, and a micro test in which we examine the integration of quotes for 16 equities listed on both the Madrid and Bilbao market for the period we previously identified as integrated.

Macro test

This section examines the stock market integration in the major secondary capital markets before the Spanish Civil War: Barcelona, Bilbao and Madrid. We use the un-weighted monthly indexes available for the three exchanges to apply cointegration tests to both bivariate and multivariate models between February 1891 and July 1936.⁴³ Cointegration will test for long-run co-movement in the indexes which the literature has associated to market integration; in particular, the existences of cointegration between stock price indexes has been attributed to a reduction of spatial restrictions on stock investment and ownership, contagion behaviour between markets and strong economic ties within regions.⁴⁴ These forces should be increasingly present during Spain's slow economic catch-up to Europe—in the latter part of the long 19th century— driven first by the dynamics of the first globalization and in the interwar period impelled by the growing availability of information and emergent democratization in the 1930s. As mentioned above the three series submitted to testing are monthly. The index for Barcelona is taken from Martínez Méndez (2008). It is the 8 equity unweighted index calculated by Prat de la Riba (1936) for January 1880 to December 1913 spliced with the 22 equity unweighted index based on monthly averages of daily spot market quotes calculated by the Institut d'Investigacions Econòmiques for January 1916 to July 1936.⁴⁵ The series for Madrid is taken from Revista de la Bolsa de Madrid (1994). It is an unweighted index which uses monthly averages for up to 66 equities over the time period considered. Finally the Bilbao unweighted index is based on 5-11-20 equity price series registering their last monthly quote.⁴⁶

Finding cointegration would confirm that the indexes move together over the long run with occasional short-run divergences which adjust back to a common path as one would expect in integrated markets. If Spanish national economy at the time was moving from a number of

⁴³ Pairwise tests are presented in Appendix B.

⁴⁴ Chan et al. (1997); Kanas (1998); see also Choudry (1996) who sustains that Multivariate long-run relationships are due to some underlying factors which systematically affect all markets: deregulation and liberalization of markets, improvement and development of communication technology, activities of interregional companies, interregional investors, interregional trade or trade imbalance, reduced inflation and lower nominal interest rates

⁴⁵ Martínez Méndez (2008) "Otras estadísticas de referencia", pp. 12-13.

⁴⁶ Following Richards (1995: 637) all series are ex-dividend to allow for cointegration. See Appendix A for an exact account of which series are included.

segregated regional markets towards a single national market, we could also expect to find a growing integration of the Spanish financial markets.⁴⁷

The table below summarizes some of the standard descriptive statistics.

Table 3. Descriptive statistics for Barcelona, Bilbao and Madrid monthly stock indexes, 1891-1936

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
Barcelona	78,82	72,20	126,40	49,80	18,41	0,43	2,02	38,02
Bilbao	122,77	108,29	300,39	75,23	44,97	1,69	5,19	36,30
Madrid	109,51	107,17	216,26	50,06	32,06	0,83	4,29	98,70

We begin by testing for the presence of unit roots in the individual indexes using the Augmented Dickey-Fuller [ADF] test and the Philipps-Peron [PP] test in levels and in first differences with and without constant and trend.⁴⁸ Non-stationarity is a necessary precondition for cointegration, just as all series must be integrated of the same order. The null of unit root cannot be rejected in levels as the values of the ADF and PP statistics are above the 99 % critical values, the series in first differences allow us to reject the null hypothesis of unit root under all three specifications. We conclude that all indexes are non-stationary of order I(1).⁴⁹

Table 4. Unit Roots tests

Index		Level			First difference		
		(1)	(2)	(3)	(1)	(2)	(3)
Madrid 1875.01 to 1936.07	ADF	-2,0327	-3,2393	-0,1920	-74748,0	7,5136	-5,9488
	lags	14	14	14	9	9	9
	PP	-1,8794	-2,2650	0,0207	-24,2011	-24,1901	-24,2279
Barcelona 1880.01 to 1936.07	ADF	-2,2511	-2,3654	-1,2247	-8,5486	-8,5420	-8,5320
	lags	6	6	6	5	5	5
	PP	-2,0322	-2,2374	-0,8543	-22,3213	-22,3155	-22,3332
Bilbao 1891.01 to 1936.07	ADF	-2,7597	-3,1418	-0,8180	-7,2408	-7,2447	-7,2466
	lags	7	16	7	6	6	6
	PP	-2,4840	-2,6670	-0,7212	-16,9804	-16,9599	-16,9945

Note: (1) with constant; (2) with constant and trend (3) without constant and without trend; lag length for ADF is Akaike information criteria plus 2. Pantula et al. (1994). Bold type: unit root hypothesis rejected at a 99% confidence level

⁴⁷ Fratzscher (2002) has found that developed equity markets are progressively more integrated than emerging markets. The measure of market segmentation tends to be larger for emerging markets than the developed markets, which is consistent with larger barriers to capital flows into or out of emerging markets. Gilmore et al. (2008, p. 20).

⁴⁸ We add Phillips-Perron tests because they incorporate an automatic correction to allow for auto-correlated residuals.

⁴⁹ This result applies to the time series with and without trend and/or constant.

The Johansen procedure has been used to test for long run relationships between indexes. This test is based on maximum likelihood estimation of the vector error correction model (VECM) and determines the rank of the coefficient matrix of a vector auto-regression of the series, with the rank indicating whether there is cointegration as well as the number of cointegration relationships. Lag lengths have been determined by the Akaike information criterion which is indicated in each panel together with Schwarz information criterion. Table 5 indicates that there is no significant evidence of a cointegration relationship between Spanish exchanges over the entire period.

Table 5. Johansen cointegration test for monthly stock indexes Barcelona, Bilbao and Madrid

Number of cointegrating vectors Barcelona-Bilbao-Madrid	Trace test		Max. eigenvalue test		Conclusión	Sensitivity to specification
	Statistic	5% CV	Statistic	5% CV		
Panel A: 1891.02 to 1936.07						<i>Lag L. AIC (4) SC (3)</i>
0	19,952	29,797	9,940	21,131	No cointegration	for all specifications
1	10,012	15,494	6,813	14,264		
2	3,198	3,841	3,198	3,841		
Panel B: 1920.01 to 1936.07						<i>Lag L. AIC (4) SC (2)</i>
0	49,904	29,797	38,655	21,131		
1	11,249	15,494	9,196	14,264	1 cointegr. Eq.	for all specificatio1ns
2	2,052	3,841	2,052	3,841		
Panel C: 1920.01 to 1929.12						<i>Lag L. AIC (9) SC (2)</i>
0	44,153	29,797	36,181	21,131		
1	7,972	15,494	6,358	14,264	1 cointegr. Eq.	for all except intercept and trend which has 2
2	1,614	3,841	1,614	3,841		
Panel D: 1930.01 to 1936.07						<i>Lag L. AIC (2) SC (1)</i>
0	29,937	29,797	21,408	21,131		
1	8,529	15,494	6,043	14,264	1 cointegr. Eq.	only for no intercept no trend and intercept no trend
2	2,486	3,841	2,486	3,841		

Note: we have applied possible specifications with and without intercept/trend in the cointegrating term and with or without intercept in VAR equations. The results shown here are for intercept in CT and VAR.

For the 1920s the three exchanges are strongly cointegrated and converge in the sense that the official stock markets are stationary in two directions and non-stationary in one direction. In other words, two indexes can be expressed in terms of another index. Even though these regional markets are dispersed and spatially segmented, prices are linked together indicating that they form a single market. The 1930s show a reversal with barely significant evidence for one cointegration relation and significance depending on the specification. Additional caution is required as there may be a small sample bias resulting from the use of 67 observations only, which would lead us to under-reject the existence of cointegration relations when they indeed do not exist.

Although we do find some evidence for market integration in the 1920s, we must conclude, that for the major part of the period examined markets were mainly driven by regional domestic factors. Linkages between equity markets may be time varying and episodic and this would require a method which detects structural breaks such as that applied by Gregory and Hansen (1996) or Escribano and Ángel (2000). Given the little we know about how the series for Barcelona and Madrid have been calculated, we prefer to recalculate these series before applying more sophisticated analysis to what may be simply poor data.

Microtest

A second test —to confirm our findings of higher market integration for the 1920s— is performed on a micro level. In other words, we test whether quotes for the same stock in Bilbao and Madrid adjust to the same price between 1918 and 1933. Therefore We have collected the monthly closing price for 16 frequently-traded stocks which were traded on both exchanges.

Financial theory suggests that under competitive market assumptions —large number of traders, perfect competition and no transaction costs— there should be no room for systematic arbitrage profits. If markets are fully integrated the law of one price should hold i.e. in the long run we should observe $p_t^{\text{Madrid}} = p_t^{\text{Bilbao}}$. In other words, although asset prices each follow random walk processes and despite the obvious objections to perfect competition conditions (in practice there are risk averse agents, transaction delays, imperfect and asymmetrical information and constraints on stock trading), it would be reasonable to assume asset prices as I(1) processes and the difference between them as I(0) processes.

This can be contrasted by proceeding as follows. First, we will contrast whether the individual price series are stationary I(1) processes. Then we will go on to define a difference series $p_t^{\text{Madrid}} - p_t^{\text{Bilbao}}$ as u_t . If we find u_t to be I(0) —a stationary process—, the Madrid and Bilbao price series can be considered cointegrated. What this suggests is that there is a long-term equilibrium, where p_t^{Madrid} and p_t^{Bilbao} may fluctuate differently in the short run, but their long run equilibrium relationship will maintain both series united. The short run error correction mechanism corrects deviations. This will be discussed in the following section.

The data set used is composed of time series of the monthly closing price quotes for the shares of 16 high trading companies from January 1918 to December 1933. The data was collected

from sources quoted before and financial yearbooks, which published the official quotes for the stocks on the Madrid stock exchange.⁵⁰

We use the Augmented Dickey Fuller test to contrast whether the price of each share was an I(1) process when considered in level. The null hypothesis – the series has a unit root – is accepted in favor of non-stationarity for all shares' prices in levels. The second step to a simple test for co-integration was to examine the price differential between the Bilbao and Madrid stock market for each share. If the price differential can be shown to be stationary, the non-stationary price series for Bilbao and Madrid are co-integrated [Engle and Granger (1987)]. All price differences rejected the ADF test for unit root.

Additionally, we used a second contrast. We ran OLS regressions and unit root tests on the residuals⁵¹:

$$p_t^{Bilbao} = \alpha + \beta p_t^{Madrid} + u_t \quad (1)$$

With the exception of the CHADE series the data showed that t statistics for all shares' residuals were less than the critical value, allowing us in all other cases to reject the null hypothesis of a unit root. Columns two through five show that the share quotes for both exchanges are non-stationary. Column six and seven report on the β coefficient of the OLS regression which defines the long run relationship between Bilbao quotes on Madrid. The cases of high statistical significance show the expected coefficients very close to one. Columns eight and nine show the ADF test results for the residuals from the regression. Out of the sixteen equities, two have an insufficient number of observations to perform the test, CHADE does not allow rejecting the unit root test, Banco de España rejects the hypothesis at a 95 % level and all other assets at 99 % level. The prices of 80 % of the examined shares traded in both Bilbao and Madrid are cointegrated, i.e. they move together in the long run.

⁵⁰ The data for Madrid had been collected from the Anuario Financiero y de Sociedades Anónimas.

⁵¹ As the test operates on the residual of an estimated model we use the Engle-Granger cointegration test with the critical values provided by Engle and Yoo. Brooks (2002), pp. 391-2 & 676. Critical values for 2 variables and more than 100 observations are -4 at 0,01%, -3.37 at 0,05% and -3,02 at 0,10%.

Table 6. Co-integration test Bilbao Madrid Stock exchanges, 15 commonly traded shares, 1918-1933.

Company	Stock Exchange				Regression		Unit root test	
	Bilbao		Madrid		Coefficient		Residual	
	t-stat	Prob.	t-stat	Prob.	t-stat	t-stat	Prob.	
Banco Central	-1,31	0,625	-1,99	0,291		*	*	*
Banco Hispano Americano	-2,04	0,269	-1,53	0,515	1,01	87,13	-12,17	0,000
Banco de Espana	-2,48	0,121	-2,27	0,182	0,88	25,90	-3,63	0,006
Hidroeléctrica Espanola	-2,86	0,052	-0,99	0,752	0,99	109,73	-9,48	0,000
CHADE	-2,03	0,275	-1,93	0,319	1,00	32,15	-2,16	0,223
Sevillana	-3,34	0,015	-1,38	0,587	1,01	40,15	-8,50	0,000
MZA	0,04	0,960	-1,06	0,731	0,98	89,54	-5,32	0,000
Norte	-0,20	0,935	-1,03	0,743	1,00	269,42	-13,83	0,000
Riff Nominativo	-1,3E+06	0,639	-0,78	0,819	1,00	86,89	-9,35	0,000
Riff Portador	-1,9E+06	0,314	-1,3E+06	0,639	0,96	71,94	-8,94	0,000
AHV	-2,2E+06	0,224	-2,96	0,041	0,99	270,12	-9,24	0,000
Duro Felguera	-1,4E+06	0,588	-2,6E+06	0,104	1,03	107,50	-9,32	0,000
UE Explosivos	-1,5E+06	0,545	-1,3E+06	0,649	1,00	413,47	-6,63	0,000
SECN	-0,17	0,938	*	*	0,90	23,71	*	*
Telefónica	-0,81	0,812	-1,5E+06	0,538	0,98	45,77	-6,54	0,000
CAMPSA	-1,7E+06	0,415	-1,8E+06	0,383	0,98	52,04	-7,14	0,000

Note: * insufficient number of observations. Bold face: unit root test for OLS regression residuals cannot be rejected.

Error correction model

In order to identify the adjustment behaviour and dominance of markets we have added a second contrast, a two-step Engle-Granger co-integration exercise to identify the short run adjustment behaviour of the two markets. The model is defined by the following two equations:

$$\Delta p_t^{Bilbao} = \gamma_1 ECT_{t-1}^{BM} + \sum_{i=1}^n \beta_i \Delta p_{t-i}^{Madrid} + \varepsilon_t^{Bilbao} \quad (2)$$

$$\Delta p_t^{Madrid} = \gamma_2 ECT_{t-1}^{MB} + \sum_{i=1}^n \beta_i \Delta p_{t-i}^{Bilbao} + \varepsilon_t^{Madrid} \quad (3)$$

Where p_t^{Bilbao} and p_t^{Madrid} are the stock quotes in Bilbao and Madrid respectively, ECT_{t-1}^{BM} and ECT_{t-1}^{MB} are the residuals obtained from the estimate static equation (1) lagged one period — \hat{u}_{t-1} . The corresponding coefficients γ_1 and γ_2 measure the speed of adjustment of each price to the long run equilibrium relation.

Table 7. Error correction model for 14 company stocks traded on the Bilbao and Madrid Stock Exchanges, 1918 – 1933 monthly observations.

	OBS	LAGS	R ²	Error corr term		Residual tests [p values]		
				γ	SE	AR 1-2	ARCH1	B-J Norm
Δ AHV-B	118	3	0,147	0,632	0,181	0,686	0,004	0,084
Δ AHV-M	118	3	0,342	-1,715	0,206	0,275	0,000	0,000
Δ Banco Central-B	115	1	0,320	-0,180	0,042	0,794	0,891	0,000
Δ Banco Central-M	115	1	0,058	-0,124	0,050	0,021	0,042	0,000
Δ Banco de España-B	191	1	0,121	-0,208	0,049	0,031	0,969	0,000
Δ Banco de España-M	191	1	0,003	-0,026	0,045	0,359	0,440	0,000
Δ Banco Hispano Americano-B	183	2	0,215	-0,809	0,134	0,110	0,308	0,000
Δ Banco Hispano Americano-M	183	2	0,015	0,015	0,107	0,008	0,976	0,000
Δ CHADE-B	48	1	0,204	-0,767	0,262	0,548	0,046	0,279
Δ CHADE-M	48	1	0,037	-0,046	0,257	0,235	0,284	0,174
Δ Duro Felguera-B	187	1	0,013	0,204	0,112	1,000	0,161	0,000
Δ Duro Felguera-M	187	1	0,307	-0,720	0,113	1,000	0,478	0,000
Δ FC Norte-B	191	1	0,159	-0,129	0,221	0,659	0,882	0,000
Δ FC Norte-M	191	1	0,011	0,324	0,220	0,287	0,610	0,000
Δ Hidroeléctrica Española-B	71	1	0,017	-0,295	0,426	0,891	0,000	0,013
Δ Hidroeléctrica Española-M	71	1	0,102	-0,640	0,417	0,523	0,000	0,000
Δ CAMPSA-B	59	1	0,171	-0,817	0,227	1,000	0,623	0,391
Δ CAMPSA-M	59	1	0,060	-0,480	0,246	0,159	0,815	0,141
Δ FC MZA-B	191	1	0,089	-0,207	0,070	0,870	0,795	0,000
Δ FC MZA-M	191	1	0,012	-0,017	0,069	0,220	0,810	0,000
Δ Riff portador-B	61	3	0,230	-1,217	0,286	0,828	0,804	0,202
Δ Riff portador-M	61	3	0,040	0,141	0,288	1,000	0,388	0,272
Δ Sevillana de Electricidad-B	56	1	0,417	-0,811	0,166	0,458	0,880	0,000
Δ Sevillana de Electricidad-M	56	1	0,195	-0,028	0,137	0,007	0,427	0,297
Δ Telefónica-B	78	1	0,075	-0,461	0,300	0,059	0,000	0,000
Δ Telefónica-M	78	1	0,155	-0,604	0,307	0,670	0,006	0,000
Δ UE Explosivos-B	190	2	0,228	-2,916	0,510	0,869	0,000	0,000
Δ UE Explosivos-M	190	2	0,138	2,149	0,512	0,139	0,000	0,000

 significant at a 99 % level
 significant at a 95 % level

Estimates for the 14 company shares considered are presented in the table above. We show the estimated ECT_{t-1} coefficients, γ_1 and γ_2 , in column five, they are shaded in dark grey if they are significant at a 99 % level and in light grey at a 95 % level. Columns seven through nine test the regression residuals for autocorrelation [Breusch-Godfrey Serial Correlation LM Test – no serial correlation up to order 2], heteroskedasticity [no ARCH up to order 1] and normality [Jarque-Bera]. These results are presented in p values. The number of lags for the RHS lagged variables is determined using the Akaike and Schwartz information criteria.

In Bilbao the short run behaviour of AHV, Banco Central, Banco de España, Banco Hispano Americano, CHADE, FC Norte, CAMPSA, FC MZA, Riff, Sevillana de Electricidad and Explosivos – eleven out of the fourteen stocks— seem to adjust to deviations from the long run equilibrium path. Seven out of these eleven stocks adjust rapidly at more than 50 % in one period. There is no

statistical evidence for adjustment in three stock quotes, Duro Felguera, Hidroeléctrica Española and Telefónica and these can be considered weakly exogenous.

In Madrid only four stock quotes adjust to deviations: AHV, Banco Central, Telefónica and Explosivos. The remaining 10 stocks could be treated as weakly exogenous. AHV is the only company with headquarters in Bilbao (and important shareholders living in Madrid). All other companies have their headquarters in Madrid. These very different results do not reflect a geographic component as found recently by Pirinsky and Wang (2006) that link price formation first in the company's home market. Moreover they may reflect a higher degree of arbitrage in Bilbao, i.e. different trading patterns in equity markets in Bilbao. Likewise, the reaction of the Bilbao exchange is more dynamic than Madrid. As a working hypothesis we may propose that the stock exchanges linked to dynamic industrial product, labour and capital markets, such as those to be found in Catalonia and the Basque Country, showed a higher degree of efficiency in adjusting to deviations from the long run equilibrium path they shared with Madrid.⁵² Regulation does not explain these differences, because during the time period considered all three exchanges were governed by the same institutions.

7. Concluding remarks

In the first part of this analysis we have been able to trace the origins of the Bilbao stock exchange to a maneuver to secure monopoly rights in public debt trading made by a privileged group of brokers at the right moment of time and question the *a priori* hypothesis that the exchange's formation responded to the capital needs of a nascent industrial region. In the following section we have described how the Bilbao stock exchange evolved into a truly industrial exchange tied to the regional business cycle of Basque industry. Strangely enough, the securities included in the indexes we have estimated represent firms that did their business on a national level. This may imply either that Basque economy was driven by national industry or that Basque economy was driving national industry—the first option being more credible.

The last part of the research we present here examines the degree of regional capital market integration. When comparing the existing indexes for Bilbao, Barcelona and Madrid we find some evidence for market integration in the 1920s, but, for the major part of the period examined, markets seem mainly driven by regional domestic factors. Given the questionable quality of the other series we are comparing with, this is a preliminary result. On a micro level we find that the Bilbao stock exchange linked to a dynamic industrial area, with better developed labour and capital markets showed a higher degree of efficiency in adjusting to deviations from the long run

⁵² This needs to be formally contrasted with data from Catalonia.

equilibrium path they shared with Madrid. Nevertheless, our findings at the present state of research do put a general capital market integration in Spain before 1920 very much in doubt.

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Appendix A. Equities included in Bilbao stock market indexes.

	BSE Index (1891.02-1936.07)	BSE 65 (1916.01-1936.29)
Banks		
Banco Agrícola Comercial		19.47-29.45
Banco Central		20.24-36.29
Banco de Bilbao	1891.02-1936.07	16.02-36.29
Banco del Comercio	1891.02-1901.05	
Banco de España		16.01-36.29
Banco de Vizcaya	1901.06-1936.07	16.01-36.29
Banco de Vizcaya - Serie B		29.51-36.29
Banco Hispano Americano	1916.01-1936.07	16.03-36.29
Banco Urquijo Vascongado	1916.01-1936.07	19.01-36.29
Banco Vasco		18.04-25.34
Crédito de la Unión Minera	1901.10-1915.12	16.01-25.06
Banco Asturiano	1900.01-1901.09	
Electrical companies		
CHADE - Serie A & B		29.44-36.29
Electra de Viesgo	1933.08-1936.07	16.04-20.46; 23.11-36.29
Eléctricas Reunidas de Zaragoza		28.03-36.29
Hidroeléctrica Española	1916.01-1936.07	16.01-20.11; 22.16-36.29
Hidroeléctrica Ibérica	1916.01-1936.07	16.01-21.02; 22.01-36.29
Sevillana de Electricidad		22.25-23.28; 27.09-31.40; 33.23-36.29
Unión Eléctrica Vizcaína	1916.01-1933.07	16.01-22.38; 23.39-33.27
Railways		
Compañía del Norte	1916.01-1936.07	16.01-36.29
Ferrocarril MZA		24.50-36.29
Ferrocarril de Bilbao a Portugalete	1891.02-1899.12	
Ferrocarril de Santander a Bilbao	1896.05-1936.07	16.02-1931.27; 33.41-36.29
Ferrocarril La Robla	1916.01-1936.07	16.01-36.29
Ferrocarriles Vascongados	1916.01-1936.07	16.01-36.29
Mining companies		
Argentífera de Córdoba		17.07-30.07
Minera Dícido		16.01-19.38; 23.04-30.05
Hullera Vasco Leonesa		17.28-34.4
Hulleras de Sabero y Anexas	1900.01-1904.09	16.01-20.52; 22.01-36.29
Minas de Cala	1904.10-1915.12	16.01-20.24; 24.03-30.53; 33.21-36.29
Minas de Irún y Lesaca		17.12-35.51
Minera Setolázar		28.13-29.05
Minera Setolázar Intransferibles		29.22-36.29
Minera Setolázar Portador		29.23-36.29
Minera del Riff		23.24-28.20
Minera del Riff Nominativas		28.21-36.29
Minera del Riff Portador		28.21-36.29
Sierra Menera Serie A con opción B		27.33-36.29
Shipping companies		
Naviera Amaya		23.42-36.29
Naviera Bachi		16.02-36.29
Compañía de Navegación Vizcaya		19.16-36.18
General de Navegación		19.29-33.46
Naviera Iturri		18.01-20.45; 24.25-27.18
Marítima Bilbao		17.40-36.29
Marítima del Nervión	1916.01-1936.07	16.01-36.29

Marítima Unión	1916.01-1936.07	16.01-36.29
Naviera Euzkera		17.40-18.33; 19.32-20.51; 26.04-36.21
Naviera Guipuzcoana		17.23-20.20; 1924.27-36.29
Naviera Mundaca		17.51-36.29
Naviera Sota y Aznar	1916.01-1936.07	16.01-36.29
Naviera Vascongada	1900.01-1936.07	16.01-36.29
Vasco Cantábrica de Navegación		16.03-20.14; 25.40-31.10
Manufacturing & others		
Altos Hornos de Vizcaya	1902.10-1936.07	16.01-36.29
Altos Hornos de Bilbao	1891.02-1899.12	
La Vizcaya	1898.01-1899.12	
Media ponderada	1900.01-1902.04	
Babcock & Wilcox		23.29-36.29
Basconia	1916.01-1936.07	16.01-36.29
Bodegas Bilbaínas		16.02-17.05; 19.02-36.29
CAMPetróleosSA		28.35-36.29
CATabacos	1891.02-1902.07	
Compañía de Alcoholes		22.14-29.07
Duro Felguera		16.35-36.29
Azucarera Ebro		31.48-36.29
Euskalduna		16.03-20.43; 22.17-31.03; 33.51-36.29
Papelera Española	1902.08-1936.07	16.01-36.29
SE Construcción Naval		26.08-36.29
Seguros La Polar		27.50-33.01
Seguros Aurora	1900.03-1915.12	
Siderúrgica del Mediterráneo		22.27-36.29
Telefónica - Preferentes		27.30-36.29
Unión Española de Explosivos	1897.07-1936.07	16.01-36.29
Unión Resinera Española	1916.01-1936.07	16.01-36.29

Appendix B. Pairwise Johansen cointegration tests for stock exchange indexes in Barcelona, Bilbao and Madrid.

Number of cointegrating vectors	Maximum eigenvalue test		Trace test		Conclusion	Sensitivity to specification
	Statistic	5% CV	Statistic	5% CV		
Barcelona-Bilbao						
Panel A: 1891.02 to 1936.07						
0	9,860	15,494	6,399	14,264		
1	3,460	3,841	3,460	3,841	no cointegration	for all specifications
Panel B: 1920.01 to 1936.07						
0	36,414	15,494	34,321	14,264		
1	2,093	3,841	2,093	3,841	1 cointegr. Eq.	for all specifications
Panel C: 1920.01 to 1929.12						
0	28,172	15,494	27,995	14,264		
1	0,177	3,841	0,177	3,841	1 cointegr. Eq.	for all except intercept and trend which have 2
Panel D: 1930.01 to 1936.07						
0	15,889	15,494	12,228	14,264		
1	3,660	3,841	3,660	3,841	no cointegration	for all specifications
Barcelona-Madrid						
Panel A: 1891.02 to 1936.07						
0	8,325	15,494	5,719	14,264		
1	2,606	3,841	2,606	3,841	no cointegration	for all specifications
Panel B: 1920.01 to 1936.07						
0	12,264	15,494	10,655	14,264		
1	1,609	3,841	1,609	3,841	no cointegration	for all specifications
Panel C: 1920.01 to 1929.12						
0	9,979	15,494	9,891	14,264		
1	0,088	3,841	0,088	3,841	no cointegration	all except intercept and trend
Panel D: 1930.01 to 1936.07						
0	8,820	15,494	6,386	14,264		
1	2,430	3,841	2,434	3,841	no cointegration	for all specifications
Bilbao-Madrid						
Panel A: 1891.02 to 1936.07						
0	12,352	15,494	8,534	14,264		
1	3,817	3,841	3,817	3,841	no cointegration	for all specifications
Panel B: 1920.01 to 1936.07						
0	37,344	15,494	34,044	14,264		
1	3,300	3,841	3,300	3,841	1 cointegr. Eq.	for all specifications
Panel C: 1920.01 to 1929.12						
0	20,564	15,494	17,057	14,264		
1	3,506	3,841	3,506	3,841	1 cointegr. Eq.	all except intercept and trend
Panel D: 1930.01 to 1936.07						
0	20,564	15,494	17,057	14,264		
1	3,506	3,841	3,506	3,841	1 cointegr. Eq.	all except intercept and trend