Monetary Blocs, Optimum Currency Areas and European Monetary Integration: Evidence from the Italian and German Unifications (1846-1870)

Roger Vicquéry*

London School of Economics

May 2017

Abstract

Recent developments in Europe have inspired renewed interest in monetary unions and the Optimum Currency Area (OCA) framework. I analyze from an OCA perspective the wave of European monetary integration occurring in the third quarter of the 19th century, between the creation of the Second French Empire and the adoption of the international gold standard. Relying on an "anchor-client" framework of international monetary integration and using a Frankel-Wei factor model of foreign-exchange co-movements, I estimate the ex-ante costs of forming a monetary union for a number of international and national monetary arrangements, including the Italian and German monetary unifications.

My results indicate that Italy was not an OCA at unification, given the high costs of monetary integration between Northern and Southern Italy. On the other hand, shock symmetry amongst pre-unification German regions is in line with the OCA framework. I link this evidence to post-unification regional divergence in Italy and Germany in the 19th century and highlight some channels through which monetary unification might have contributed to the arising of the Italian Southern Question. The paper's findings cast a doubt over the magnitude of the OCA endogeneity mechanisms first put forward by Frankel and Rose (1998).

I also find the core of the European monetary system to be strongly bipolar, suggesting that international monetary integration around the British gold standard was not inevitable and confirming the economic rationale of the French project of a Latin Monetary Union.

Keywords: Optimum Currency Areas, Monetary Unions, Anchor Currencies, Italian and German Monetary Unification.

JEL classification: F45, F36, F33, F31, N13, N23.

*PhD Candidate (LSE). E-mail: r.h.vicquery@lse.ac.uk. I thank Joan R. Rosés for his supervision and seminar participants at the LSE for comments and suggestions. Preliminary draft, please do not cite without permission.

1. Introduction

The creation of the Euro Area, according to some the "world's largest economic policy experiment" (Baldwin, 2006), as well as the crisis the common currency has experienced since 2010 have inspired renewed research interest in international monetary integration and the optimum currency areas (OCA) framework. Particularly, the issue of estimating the costs of monetary integration has been at the core of the policy debate, both prior to 1999[1] and more recently as the original choice to let Greece and other peripheral nations in the "club" was pointed as the key reason for the currency's existential crisis.

The present paper wishes to contribute to the literature on OCA by looking at past examples of international monetary integration. The first wave of European monetary integration occurring in the third quarter of the 19th century, between the 1848 revolution and the 1870 Franco-Prussian War, is particularly interesting in this respect. On the one hand, as the first globalisation was underway, this period witnessed to the attempt of the French Second Empire to harmonize the international monetary system around a French Franc bloc, as well as to the ultimate rise of the British gold standard in the 1870s. On the other hand, it saw the formation of national monetary unions lasting to this day, in Italy and Germany.

The paper research question is twofold. Firstly, it wishes to assess the ex-ante costs of monetary integration for the long lasting monetary arrangements that came into existence during the period at hand. I opt for an operational definition of those costs based on a anchor-client framework and the symmetry of nominal shocks, following early work by Alesina and Barro (2002) and Bayoumi and Eichengreen (1997). Comparing the measured ex-ante costs to the ex-post outcomes in terms of long run regional divergence

[1] The first of the five "economic tests" to determine the UK's readiness to join the Euro Area is a prime example.

provides evidence on the appropriateness of the OCA framework in assessing the ex-ante suitability of common currency membership. It also provides evidence on the relevance of the endogeneity hypothesis of OCA put forward by Frankel and Rose (1998). From an historical point of view, the analysis should shed some lights on the role of the Italian monetary unification shock in the emergence of the Southern Question.

Secondly, the paper wishes to contribute to the literature on the origins of the international gold standard by looking at the pre-1870 relative influence of England and France on the European monetary system. The existence of a bi-polar monetary system - as opposed to one where "British dominance" would incentivize countries to join the British standard - would tend to confirm Flandreau (1996) view on the emergence of the international gold standard as an "accident of history".

In order to investigate the above research questions, I exploit a newly compiled dataset of twice-weekly foreign exchange bills prices quoted in London on about twenty European cities between 1846 and 1869, including six Italian financial centers representing four pre-unitary monetary zones and three German pre-unitary financial centers. I employ a "Frankel-Wei" factor model to map the co-movements of bills prices within the European monetary system, focusing on the symmetry of nominal shocks between the core (London and Paris) and the periphery.

My main findings indicate that the monetary union between Northern Italy and the Kingdom of the Two Sicilies was not an OCA. I therefore argue that the establishment of a centralized Italian monetary union, in the presence of differing trade specialization and asymmetric shocks, is likely to have played a role in the arising of the Italian "Southern Question". On the other hand, shocks within German regions where largely symmetrical, suggesting substantially lower costs from monetary integration.

It follows that the OCA endogeneity mechanism highlighted by Frankel and Rose

(1998) did not play an important role in the experience of the Italian and German monetary unions. Indeed, the monetary union faring worst ex-ante in terms of OCA criteria still exhibits to this day a worst track record in terms regional divergence and shock synchronization. The paper also confirms the key role of political will and integration in determining the sustainability of monetary unions, regardless of economic factors.

Looking at the broader economic history of the European monetary system, I additionally find that the pre-gold standard European monetary system was largely bi-polar, with rising French monetary dominance from the 1850s onward. The absence of substantial British dominance on the European monetary system, particularly in Germany, points to the rise of an international British gold standard as not being inevitable, opposite to what a strand of the literature has argued (Eichengreen, 1998). This is also consistent with the economic rationale to the French project of a Latin Monetary Union put forward by Einaudi (2001).

Section 2 provides a discussion of the literature on currency areas and the history of European monetary integration in the 19th century; Section 3 describes the newly collected dataset exploited in the paper; Section 4 details the empirical framework and discusses my results.

2. International Monetary Integration: Theory, Practice and History

This section provides a literature review, focusing on theoretical aspects of the OCA framework (Section 2.1), its empirical operationalization (Section 2.2) and the relevance of the pre-Gold Standard historical context for the debate on international monetary integration (Section 2.3).

2.1. Optimum Currency Areas and Anchor Currencies

The question of the optimal number of currencies globally has first been analyzed by the pioneering work of Mundell (1961). Its Optimum Currency Area (OCA) framework still remains the main theoretical prism through which international monetary integration is analyzed[2]. Mundell's original insight stresses two opposing forces shaping the microeconomic benefits and macroeconomic costs of monetary integration and, consequently, defining OCA. On the benefits side, sharing a common currency reduces transactions costs in trade of goods and services and financial exchange. Indeed, similarly to a language, a currency implies network externalities and increases its utility with its usage. A seminal contribution by Rose (2000) found empirical evidence on the positive trade effect of currency unions, even though its magnitude and significance have been the subject of much discussion Tenreyro (2007). The focus of the present paper is however on the cost side of the Mundell's framework: monetary integration implies a loss in monetary policy independence for the regions taking part in it. This means that regions within a monetary union are vulnerable to shocks that are asymmetric to the ones experienced by the union as a whole, hence highlighting the importance of factor mobility and price flexibility to facilitate the smoothing process of such shocks.

The theoretical costs of monetary integration were substantially downplayed alongside the decline of keynesianism and the Barro and Gordon (1983)'s critique of discretionary monetary policy. The theoretical underpinnings of the OCA framework have since been updated accordingly. Alesina and Barro (2002) notably introduce the notion of "anchor-client relationship" as a key driver of international monetary integration. Indeed, currency areas arrangements around the word mostly involve a large and stable "anchor" country whose currency is adopted by smaller, less credible "clients". Barro and Alesina argue

[2]De Grauwe (2016) and Mongelli (2008) provide an extensive literature review on the evolution of the framework

on the one hand that there is then a major benefit to monetary integration which was overlooked by the original OCA framework: adopting the currency of an anchor country "buys" credibility for the client country, also providing a commitment to stability that is harder to disown (it is costly to reintroduce your own currency once you adopt a new one). Conversely, they underline how the benefits of independent monetary policy for most countries are likely to be low due to the time inconsistency problem of monetary policy: this not only means that the costs to monetary integration are on average lower than assumed by the original OCA framework. It also follows that, within the anchor-client framework, they essentially depend on the degree of price and output co-movements with respect to a potential anchor.

While Alesina et al. (2002) do not go as far as including the Euro Area in the "anchor-client" framework, the "German dominance hypothesis" was at the core of the policy debate prior to the introduction of the Euro. It was first argued empirically by Giavazzi and Giovannini (1988) that pre-Maastricht Europe essentially was a "Deutsche-Mark" zone with Germany in the role of the anchor country setting monetary policy for the whole region. Their results were disputed, notably emphasizing German monetary "independence" rather than "dominance" (Fratianni and von Hagen, 1992). Nevertheless, it is well accepted that the French initiative to accelerate European monetary integration during Mitterand's presidency, in exchange for acceptance of German reunification, was predicated on the fact that it would have helped dilute German monetary "dominance", re-equilibrating the balance of economic power within the Franco-German "couple" (Vernet, 2003).

2.2. Operationalizing the Optimum Currency Area Framework

It is true that both the benefits and costs of the OCA framework discussed above might be endogenous (Frankel and Rose, 1997), implying that a currency union might become

optimal ex-post. Nevertheless, both the policy mechanisms (Maastricht criteria) that led to Euro adoption as well as the doubts regarding the "sign" (Krugman, 2001) and "magnitude" (Silva and Tenreyro, 2010) of this endogeneity justify the literature's interest in assessing the ex-ante optimality of monetary unions. Particularly, a number of empirical contributions have attempted to estimate the ex-ante costs of monetary integration within an OCA setting.

In order to operationalize the OCA framework in the paper's period of interest I borrow from two approaches. First, I argue that monetary integration in the pre-Gold Standard period, similarly to most recent monetary unions, involved an anchor-client relationship. Alesina et al. (2002) explore the potential of monetary integration across the globe with respect to key anchor currencies, looking at the symmetry of the business cycle between "candidate" countries and each of the anchor countries. They find evidence of the existence of a dollar and a Euro monetary blocs, but no signs of a yen one. I take a similar approach in the paper with however a different variable of interest as a proxy for synchronization. The latter is inspired by Bayoumi and Eichengreen (1997), who intuitively argue that the costs stemming from fixing the exchange rate are best approximated by the ex-ante variability of this same exchange rate with respect to potential currency union partners, this variability being in turn empirically linked to OCA relevant variables.

My empirical operationalization of the ex-ante costs to monetary union in the pre-Gold Standard historical context can then be summarized as follows. I assume that monetary independence as well as business cycle synchronization with respect to anchor currencies can be proxied by the co-movements in foreign exchange returns on various European regions with respect to those same anchor currencies. I use the empirical framework first employed by Frankel and Wei (1994) to identify the "dominance" of anchors on other countries' nominal shocks.

The higher the dominance is, the lower the costs of monetary integration are, given

that shocks are synchronized and monetary independence is already low. Therefore, an OCA can be proxied as an area composed of regions with similar dominance with respect to the same anchor(s). Finally, I tentatively link anchor dominance to a key OCA variable: trade integration.

2.3. Monetary Integration at the Eve of the First Globalisation (1848-1870)

The historical period following the rise of the French Second Empire in 1852 witnessed to a wave of monetary integration in Europe both at the international and national levels.

First, incentives to international monetary integration were provided by an unprecedented rise of international trade and financial linkages. On the one hand, the *laissez-faire* policies of Napoléon III led to widespread trade liberalisation following the signature of the Cobden-Chevalier treaty in 1860. On the other hand, capital exports from both England and France started to increase markedly in the 1850s (Lévy-Leboyer, 1977). Second, a technocratic ideology, on the rise in France and across Europe, emphasizing the need for international norm harmonisation, from unit of measures to currencies, is also likely to have contributed to the shift to further international monetary integration (Einaudi, 2001).

Looking at "national" monetary integration, the French Emperor approach to the nationality issue, as well as the rise of Bismarck's Prussia and Cavour's Piedmont, allowed for a radical process of political (and therefore monetary) unification to take place in both Italy and Germany. A number of sovereign states disappeared in the process each with their own monetary standards. The Italian unification is particularly worthy of attention in the light of the OCA empirical literature. Not only the Italian monetary union managed to survive to this date despite persistently divergent regional patterns. It also provides

a rare example of "random" monetary integration on the back of military events. Very little economic integration existed pre-unification between the North and the South of the Italian peninsula. The annexation of Southern Italy by Piedmont occurred in order to prevent the rise of a revolutionary government in Naples and was not part of the long term strategy of the Piedmontese government. Indeed, the agreement that Cavour and Napoléon III had negotiated before going to war with Austria in 1859 (Barbagallo, 2013) merely saw Piedmont becoming the leader of a loose Italian confederation under French influence. The centralized political, economic and monetary Italian union that ensued Garibaldi's military enterprises therefore does not suffer from the endogeneity issue that usually characterizes economic integration processes.

2.3.1. International Monetary Integration: the Gold Standard and the Latin Monetary Union

While I outlined above the powerful forces at work, from the 1850s onward, in favor of international monetary integration, the reason why the British gold standard prevailed internationally in the 1870s has long been debated by the economic history literature. The "fundamentals" (Kindleberger and O'Keefe, 2001) and "transaction costs" (Redish, 1995) hypotheses, which imputed the switch to gold to the technical flaws of the alternatives standards (Bimetallism and Silver) have long represented the literature's consensus.

Eichengreen (1998), on the other end, emphasizes the role of network externalities in shaping monetary geography: even if we were to believe that the gold standard was technically superior, in order for the switch to happen a powerful shock, namely the Franco-Prussian war, had to dramatically reduce the network externality effects which existed in favor of the regimes it competed with. In this respect, Eichengreen argues that "Germany tipped the balance", and that the country's shift to gold was largely justified by the influence of the British markets and London finance on the rising German trade and

industrial sector.

Flandreau (1996), provides an alternative view on the rise of the international gold standard. If he agrees that network externality plays a key role in shaping international monetary geography, he dismisses the inevitability of the international gold standard. Indeed, he argues that not only bimetallism was not vulnerable to the magnitude of shifts in relative prices of gold and silver observed throughout the 19th century (contrary to what the Kindleberger's "fundamentals" hypothesis argues) but also offered a high degree of international monetary stability thanks to France's role in maintaining a stable relative price of gold and silver. Neither gold nor the British standard international adoption where therefore meant to be, as it is shown by the preferences expressed by the Paris international monetary conference of 1867 (in favor of a debasement of the British Pound, bringing it in line with the 25 French Franc coinage).

Indeed, Flandreau and Oosterlinck (2012) empirically show how the persistence of bimetallism appeared as perfectly credible to investors as late as 1874, even after the German switch to gold. The turn to an international gold standard should then be considered as the product of a number of random events. Those include the Franco-Prussian war, the subsequent French indemnity and, above all, the lack of monetary cooperation between France and Germany in the aftermath of the latter country decision to adopt a gold standard. Hoping that it would push Germany to retract its decision, France put a temporary stop to its bimetallic price guarantee: this was a mistake from the French point of view as, by allowing silver to depreciate, it precipitated the demise of bimetallism.

The French attempt to shape the international monetary system around the French Franc promoted by the Second Empire with the 1865 monetary convention[3], commonly

[3]The participants to the convention were France, Belgium, Italy and Switzerland. Greece would join later on in 1868. A number of other countries, from Europe to South America, informally conformed, to different degrees, their monetary standard to the one of the convention, without however never officially joining it.

referred to as the Latin Monetary Union, has received relatively less academic attention. The monetary geography of Europe prior to the convention already showed a substantial convergence of France's neighbors to its monetary standard. Belgium and Piedmont adopted the Franc Germinal system following their annexation as *départements* during the First Empire and kept it as their own after 1815, while Switzerland freely adopted it in 1850. The relative failure of the French project of global monetary unification, which came to a sudden halt following the 1870 defeat to Prussia, as well as the long standing view that it was largely a manifestation of diplomacy and imperialism through monetary means (Willis, 1968) have long hided this episode of monetary history from the attention of the economic literature. More recent works (Flandreau, 2000; Einaudi, 2001) have emphasized the economic motives and rationale to monetary integration around France. Indeed, the main impetus to the initiative came from the free-trade party inside the *Conseil d'Etat*, headed by Félix Esquirou de Parieu, a technocrat who "wished to be the Michel Chevalier of international currency". As discussed above, the expansion of French international trade and finance provided strong economic incentives for France to promote the initiative and other countries to join it. Flandreau particularly argues that the 1865 monetary convention was predicated on the willingness of France to compete with London, on the back of rising external surpluses, as a global capital exporting center. Indeed, the French authorities were aware that London's financial role allowed Britain to gain a double advantage, in terms of dividend and interest payments as well as in furthering trade relations (as capital exports were mostly employed to buy goods from core countries).

A number of countries, including Spain and Austria-Hungary in the late 1860s, agreed to move towards a French monetary standard as part of a wider package of trade liberalisation and provision of loans from Paris, highlighting the relevance of Alesina and Barro (2002)'s "anchor-client" framework in the context of 19th century international monetary integration. The Italian authorities explicitly referred to their country's dependence on French trade and finance when justifying their choice of post-unification monetary stan-

dard in 1862 (Roccas and Sannucci, 1990). If then, as highlighted above, the British gold standard was not necessarily meant to become global, it is perfectly reasonable to assume that, had France avoided the 1870 defeat[4], the European monetary geography of the first globalisation might have substantially differed from the one that effectively materialized.

The present paper will contribute to the above debate by measuring the relative British and French monetary dominance on the European monetary system prior to the Franco-Prussian war. A high relative level of British dominance, indicating high synchronization of business cycles and low costs stemming from tying monetary policy to Britain, would point to the British standard as being to some extent ineluctable. Indeed, in line with Eichengreen (1998)'s approach highlighted above, countries would have had a lot of incentives to switch to it at the first opportunity. On the other hand, evidence of bipolarity in the European monetary system and of high relative French dominance would confirm, in line with Flandreau (2000)'s view of bimetallism, that monetary integration might have as well occurred around the French monetary standard.

2.3.2. "National" Monetary Integration: Italy and Germany

International monetary integration in the 19th century proceeded parallely to "national" political and monetary integration. Both the Italian and German monetary unifications have received little attention from the perspective of the OCA framework. An exception, in the case of Italy, is represented by Foreman-Peck (2005), who provide a number of descriptive evidence pointing to the pre-unitary Italian states, and particularly the Northern and Southern ones, not forming an OCA. Federico and Tena-Junguito (2014) also highlight the weak intra-Italian trade integration pre-unification, suggesting an unfavorable cost-benefit analysis for monetary unification, particularly for the relatively more

[4]The 5 billion war indemnity translated into France having to sell its foreign holdings and put a temporary stop to new capital exports.

protectionist South. As mentioned above, a centralized Italian political and economic union was not what Piedmont and France wanted to achieve through their diplomatic and military efforts in the late 1850s: a French-dominated confederation of Italian states was the outcome negotiated by Cavour with Napoléon III at Plombières in 1858. Full unification in 1861 only came about following the military initiative of Garibaldi's revolutionary militias, in order to avoid a republican insurrection in Southern Italy. Germany, on the other hand, achieved monetary unification following a long process of political and economic integration started at the beginning of the century (James, 1997) culminating in the creation of the German Empire in 1871.

The present paper will try to determine to what extent the monetary geography which materialized following the "spring of nations" in Italy and Germany was consistent with the OCA theory. This is estimated, in line with the anchor-client OCA framework outlined in Section 2.2, by estimating pre-unification anchor currencies' dominance on each of the Italian and German financial centers in the sample. Different magnitudes of British and French dominance would indeed point to high macroeconomic costs of monetary integration. While one would expect Italian regions to be subject to substantial French dominance, the standard account of the rise of the international gold standard would imply high British dominance for German places, which would have prompted Germany to "tip the balance" in favor of the gold standard (Eichengreen, 1998) in 1873.

3. Data

3.1. Sources

In this section I provide an overview of the original data collected for this paper. I exploit a newly collected database of foreign-exchange bills prices quoted in London

on 21 European financial centers. The quotes have been manually collected from The Economist from 1846[5] to 1869. Two quotes per financial center were recorded each week (on Tuesday and Friday), including a minimum and a maximum price which we interpret as bid-ask prices in line with Flandreau and Jobst (2005). With the exception of Paris and Amsterdam, which were also quoted "on sight", all quotes are for a 3 months maturity. Table 1 summarizes the European cities for which FX-bills prices are included in the dataset and, if applicable, the year during which the quote is introduced[6]. All in all, the dataset is composed of 102,930 bid-ask observations, resulting in around 26,000 weekly observations exploited the analysis.

Data on international trade employed in Section 6 have been retrieved from the RICardo database (Dedinger and Girard, 2017)[7], except for data on French trade with pre-unitary Italian states for some years which were taken from Fohlen (1963). Population data are taken from Mitchell (1998).

3.2. Descriptive evidence

The sample is uniquely suited to analyzing the ex-ante suitability of the international monetary integration processes occurring in the mid of the 19th century. It notably includes five Italian financial centers both before and after the country's monetary unification. Similarly, the dataset allows for the analysis of symmetry of nominal shocks across financial centers which will become part of a fixed exchange rate regime or a monetary union either at the end of the period we cover (Latin Monetary Union) or immediately afterwards (German Monetary Union, the international Gold Standard). This section

[5]When the "Course of Exchange" table starts to be published on a consistent basis. The analysis stops in 1869 as the Franco-Prussian War of 1870 marked a dramatic regime change in the international monetary system, as discussed in Section 2.3.

[6]I discard quotes on centers such as Bordeaux, Copenaghen or Venice which are recorded for only very brief intervals within the period of interest.

[7]I use trade with the Zollverein for the German-French bilateral trade and with the port of Hamburg for German-British bilateral trade

Table 1: List of Financial Centers Included in the Sample

Financial Center	**Polity**	**Availability**
Vienna	Austria-Hungary	Whole Period
Trieste	Austria-Hungary	Whole Period
Antwerp	Belgium	Whole Period
Paris	France	Whole Period
Marseille	France	Whole Period
Hamburg	Free City	Whole Period
Frankfurt	Free City (Prussia after 1866)	Whole Period
Leghorn	Tuscany (Italy after 1860)	Whole Period
Milan	Italy	1860-1869
Genoa	Sardinia (Italy after 1860)	Whole Period
Amsterdam	Netherlands	Whole Period
Rotterdam	Netherlands	Whole Period
Lisbon	Portugal	Whole Period
Oporto	Portugal	Whole Period
Berlin	Prussia	1865-1869
Petersburg	Russia	1847-1869
Madrid	Spain	Whole Period
Cadiz	Spain	Whole Period
Naples	Two Sicilies (Italy after 1860)	Whole Period
Palermo	Two Sicilies (Italy after 1860)	Whole Period
Messina	Two Sicilies (Italy after 1860)	Whole Period

Notes. Paris and Amsterdam quoted at both "sight" and three months maturity.

provides some descriptive evidence on the state of the European monetary system and of both inter and intra-national monetary integration during the period of interest. Three features of the data are of particular interest.

Firstly, the European monetary system appears divided between a low nominal volatility "core" and a high volatility "periphery". Table 2 shows how the regions which will form the core of the international Gold Standard in the 1870s already shared similar levels of monetary stability about two decades earlier, between 1852 and 1858[8]. It is interesting to note that Northern Italy, which will not stably join the Gold Standard once part of unified Italy, also seems to belong to the "core" group, while the South of the peninsula clearly exhibits volatility levels in line with the system's "periphery". Inconvertible paper standards (Russia and Austria-Hungary) or weaker credibility of the metallic anchor (Spain and possibly Southern Italy) are obviously associated with the highest levels of volatility, while the four financial centers belonging to the bimetallic "Franc zone" show markedly lower levels of FX variability.

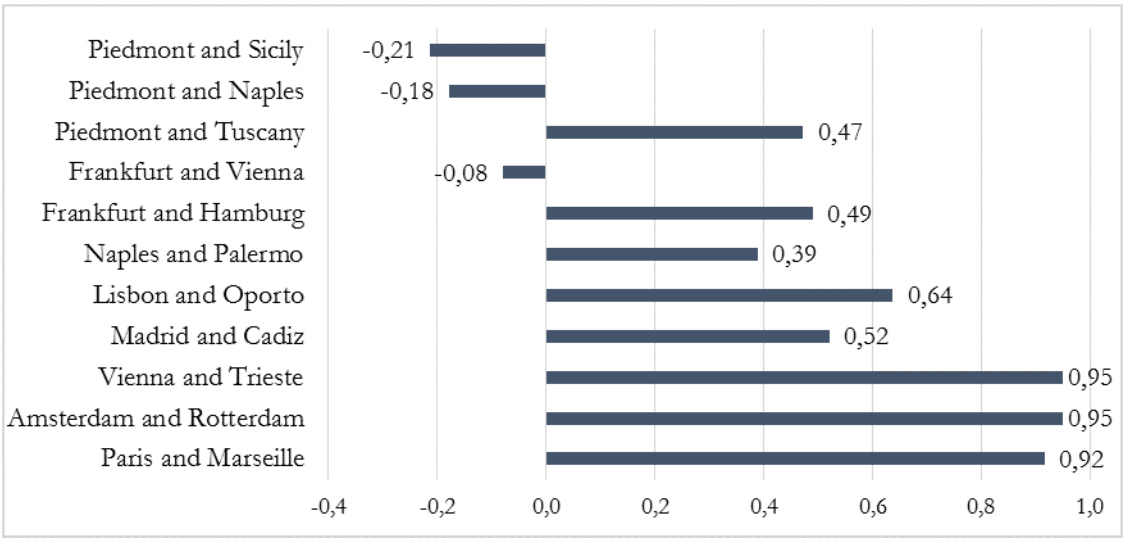
Table 2: Standard Deviation of Weekly Foreign-Exchange Bills Returns Quoted in London by Monetary Standard (1852-1858)

Gold		Silver		Bimetallic		Paper	
Oporto	0.16%	Amsterdam	0.15%	Anvers	0.13%	Vienna	1.26%
Lisbon	0.20%	Leghorn	0.17%	Genoa	0.13%	Trieste	1.41%
		Frankfurt	0.18%	Marseille	0.14%	Petersburg	1.64%
		Hamburg	0.22%	Paris	0.14%		
		Cadiz	0.26%				
		Messina	0.28%				
		Palermo	0.28%				
		Madrid	0.29%				
		Naples	0.44%				

Secondly, co-movements between regions belonging to or about to form a monetary

[8]The 1852-1858 period was selected as relatively stable from a political standpoint, between the 1848 uprisings and the start of the Italian Independence Wars in 1859.

Figure 1: Coefficient of Correlation of Foreign-Exchange Bills Weekly Returns Between Selected European Financial Centers (1852-1869)*



*1852-1858 for Italian financial centers

zone provide some preliminary evidence regarding the fulfillment of the OCA criteria. Figure 1 shows how some of the "candidate" regions to the Italian monetary union recorded negative levels of FX-bills returns correlation in the pre-unification period, pointing, in line with Foreman-Peck (2005)'s findings, to a strong asymmetry of shocks between Northern and Southern Italy. Conversely, pre-unification nominal co-movements between German financial centers are in line with those recorded within long standing national monetary unions of the time. In this respect, it is interesting to note a relatively high degree of heterogeneity in nominal co-movements within national monetary unions. While they are almost perfectly aligned in France and the Netherlands, they appear to be markedly lower in Spain, Portugal or the Two Sicilies[9].

Finally, the data also show heterogeneity in the levels of intra-national money market integration. Table 3 shows the average difference in the value of the local currency in different financial centers which are part of the same monetary zone (as an example,

[9]The Kingdom of the Two Sicilies was however closer to a confederate state, with different units of measure of metals and legal tenders between the continental part of the Kingdom (Ducat) and Sicily (Oncia).

between 1846 and 1852 a French Franc was worth on average 0.17% more in Paris than in Marseille). While this pricing differential seems to decline over the course of the period at hand, there is a neat differentiation between very low spread within the French national monetary union and the relatively high ones observed in longstanding national markets such as Spain and Portugal. At the same time, the spread between the value of the French Franc in Paris and of the Franc Germinal based currencies of Belgium and Piedmont is in the same order of magnitude of the one recorded within national monetary unions[10].

Table 3: Average Intra-Monetary Zone Spread Against the British Pound*

	National Monetary Unions						**Franc Germinal Zone****	
	Paris vs. Marseille	Vienna vs. Trieste	Madrid vs. Cadiz	Lisbon vs. Oporto	Palermo vs. Messina**	Genoa vs. Naples***	Paris vs. Anvers	Paris vs. Genoa
1846-52	0.17%	0.14%	1.61%	0.33%	0.31%	-	0.22%	1.41%
1852-58	0.05%	0.35%	0.75%	0.41%	0.20%	-	-0.31%	0.50%
1859-65	0.04%	0.08%	0.33%	0.27%	0.09%	0.05%	-0.13%	0.50%
1866-69	0.06%	0.05%	1.01%	0.05%	-0.03%	0.01%	0.19%	7.82%

** The figures in the table represent the difference in the amount of British Pounds one could buy for one unit of local currency in two different centers of a monetary zone.*
*** Quoted in Sicilian Once until 1863 when the Italian Lira takes over.*
**** Calculated only from 1863 onward when both centers start to be quoted in Italian Lire.*
***** Latin Monetary Union from 1865 onward. The Italian Lira becomes inconvertible in 1866.*

Of particular interest is, again, the case of unified Italy. Despite the marked asymmetry in nominal co-movements between pre-unitary Northern and Southern Italian financial centers highlighted above, the pricing of the Italian Lira is very homogeneous across the peninsula from the onset of monetary unification in 1863. The difference in the price of the Italian Lira between Genoa and Naples is by 1866-69 lower than the difference in the price of the French Franc between Paris and Marseille. Looking at Sicily, while a spread in the pricing of the Oncia of around 20bp persisted pre-monetary unification between Palermo and Messina, this difference disappears completely with the introduction of the Lira. Also, convergence between Italian financial centers occurs not only in the level of the exchange rate but also in its co-movements across Italian regions. Table 4 shows how the FX-bills

[10]The declaration of inconvertibility of the Italian Lira following the beginning of the Italo-Austrian war of 1866 represents a game changer in this respect as it prompts a sharp devaluation of the Italian currency.

returns correlation amongst Italian centers increases dramatically post-unification.

While a detailed analysis of intra-Italian monetary integration and of the monetary unification process is outside of the scope of the paper, the above descriptive evidences are, at least apparently, at odds with the existing literature. The homogeneous pricing of the Lira across the peninsula since 1863 particularly contrasts findings by Toniolo et al. (2003), highlighting very low level of financial markets integration well into unification, as well as Collet (2013), who finds that international investors remained skeptical about the credibility of the Italian union decades after 1861. Given the geopolitical and financial uncertainty surrounding the Italian unification we might speculate that the administrative measures provided by the 1862 Monetary Unification Law were stringent enough to prompt investors in the London foreign-exchange bills market not to discriminate amongst different Italian places.

The move to inconvertibility in 1866 is commonly understood to have positively contributed to Italian monetary integration (Toniolo, 2014), if anything by further empowering the Banca Nazionale[11] as the core of the monetary system. It indeed appears, looking at Table 4, to have had a positive effect on nominal co-movements between Piedmont and Tuscany (the coefficient of correlation of FX-bills return changes from 0.75 between 1862 and 1866 to 0.97 in the inconvertibility period we examine). However no inconvertibility effect is detectable for the correlation of FX-bills returns between Piedmont and the South, which become very close to 1 as soon as monetary unification is implemented in 1863. It is important to consider in this respect that formally demonetized pre-unitary currencies continued to circulate in Southern Italy at least until the 1880s (De Mattia, 1959), likely contributing to regional monetary fragmentation, something that should be investigated further. For now, I would tentatively argue that, as the Italian Lira did not started to circulate widely in Southern Italy until later in the 19th century, its quote on Southern

[11] The former Piedmontese bank of issue which will continue to co-exhist with other minor banks of issue until the creation of the Banca d'Italia in 1893.

cities between the paper's period of interest (1863-1869) reflects the fundamentals of the Northern part of the unified kingdom .

Table 4: Coefficient of Correlation of Foreign-Exchange Bills Weekly Returns Between Pairs of Italian Financial Centers Before and After Unification

Naples and Sicily[a]	Piedmont and Tuscany	Piedmont and Naples	Piedmont and Sicily[a]
From 1852 to Invasion[b]or Piedmontese Administration[c]			
0.48	0.45	-0.31	-0.25
From Invasion[b]or Piedmontese Administration[c]to Annexation[d]			
0.78	0.44	-0.32	-0.66
From Annexation[d]to Monetary Unification[e]			
0.54	0.50	-0.45	-0.45
From Monetary Unification[e]to Inconvertibility[f]			
0.96	0.75	0.98	0.97
From Inconvertibility[f]to December 1869			
0.98	0.97	0.99	0.99

[a] Simple average of Palermo and Messina.
[b] 11th of May 1860 for Sicily, 19th of August 1860 for the continental South. The former date is used for the Naples and Sicily correlation.
[c] Tuscany comes under Piedmontese administration from the 27th of April 1859.
[d] Formal annexation following a plebiscite on the 11th of March 1860 for Tuscany and the 21st of October 1860 for the South.
[e] The Lira becomes the national currency on the 1st of January 1863.
[f] Inconvertibility of the Lira declared on the 1st of May 1866.

4. Econometric Analysis

In this section, I present the results of my econometric analysis, in which I study the drivers of foreign-exchange bills co-movements in the European monetary system between 1846 and 1869. I start by presenting the empirical framework (Section 4.1), largely based on so-called Frankel-Wei regressions. I will discuss the results in three steps.

First (Section 4.2.1), I try to identify to what extent the European monetary system was unipolar, driven by movements in the British Pound, or bipolar, with the French Franc also

playing a large role. Second (Section 4.2.2), I assess whether candidate regions to monetary union shared the same anchor currency or not. As highlighted in Section 2.2, given the role of "anchor-client" relationships in driving international monetary integration this is a powerful indicator of OCA as it proxies the magnitude of the macroeconomic costs they might face from monetary integration. Third (Section 4.2.3), I attempt to explain the estimated dominance of the two key anchor currencies of the pre-Gold Standard European monetary system, the British Pound and the French Franc, focusing on the trade integration channel.

4.1. Empirical Framework and Hypotheses

4.1.1. Identifying Drivers of Foreign-Exchange Bills Co-Movements

The paper's core empirical analysis is based around the well established Frankel-Wei framework (Frankel and Wei, 1994), a "work horse" model of international macroeconomics which has long been used to investigate de-facto exchange rate regimes, infer implicit peg weights but also the relative strength of global anchor currencies (Bénassy-Quéré, 1999; Frankel and Wei, 2008). On the latter point, recent works (Subramanian and Kessler, 2013; Fratzscher and Mehl, 2014; Shu et al., 2015) have explored the rise of the Chinese reminbi as a global anchor currency, finding evidence of an increasingly tripolar international monetary system. Their methodology can be easily adapted to the present paper's research questions.

A standard Frankel-Wei regression can be written in its most general form as:

$$\Delta \, ln \, \frac{X_t}{Numéraire_t} = \alpha + \sum_i \beta_i \, \Delta \, ln \, \frac{Reference_{i,t}}{Numéraire_t} + \gamma_t' \mathbf{\Pi}_t + \epsilon_t \tag{1}$$

where the log of returns of the exchange rate of country X expressed in a numéraire currency at time t is regressed on the log of returns of the exchange rate of one or more reference currencies at time t, again expressed in terms of a common numéraire (typically the Swiss Franc or the SDR are employed); α is a constant allowing for trends in the returns of the left hand side currency over the period at hand, while $\mathbf{\Pi}$ is a vector of control variables and ϵ_t an error term. The β_is are our coefficients of interests as they represent each of the reference currencies weight (factor) in the unconditional movements of a currency of interest. It follows that if a currency of interest adhered to a perfectly stringent peg to the reference currencies on the right hand side of the equation our β_is factors would sum up to 1.

My baseline econometric specification is an adaptation of Fratzscher and Mehl (2014)'s global factor model of foreign exchange returns, including a British Pound factor and a French Franc factor as the two main reference currencies of the pre-Gold Standard international monetary system plus a regional currencies factor, all expressed in terms of Dutch Guilders, which I select as the numéraire currency. In its most complete form, the model reads:

$$\Delta e_{i,t} = \alpha_i + \beta_{i,t}^{GBP}\Delta e_t^{GBP} + \beta_{i,t}^{FFR}\Delta e_t^{FFR} + \beta_{i,t}^{REG}\Delta e_t^{\widehat{REG_i}} + \gamma_t BIDASK_t + \tag{2}$$
$$+ \delta_t^{BOE} BOE_t + \delta_t^{BDF} BDF_t + \epsilon_t$$

where $e_{i,t}$ is the log of financial center i's foreign-exchange bill return against the Dutch Guilder in week t; α is a financial center fixed effect (again capturing possible trends in the returns); BIDASK is a control for the overall liquidity conditions, proxied by the average bid-ask spread observed in the London foreign-exchange bill market in week t; BOE and

BDF control respectively for weekly changes in the Bank of England and the Banque de France's base rates (expressed in percentage points); finally, the superscripts GBP, FFR and REG denote the British, French and a regional factor specific to i, again all expressed in terms of returns against the Dutch Guilder[12]. The regional factor is constructed as the average of the foreign-exchange bills returns of a particular region, excluding financial center i itself so that it is not on both sides of the equation. I group financial centres in three regions based on both geography and the descriptive evidence collected in Section 3.2: a Western European region (Marseille, Anvers, Hamburg, Frankfurt and Berlin), a Southern-Central European one (Vienna, Trieste, Genoa, Leghorn as well as Naples, Palermo and Messina after 1863) and a Mediterranean-Peripheral one (Madrid, Cadiz, Lisbon, Oporto, Petersburg as well as Naples, Palermo and Messina until the end of 1862). Given the high collinearity of some of the financial centers belonging to the same polity, I actually exclude from both the panel estimate and the regional factors' computation some financial centers[13].

A common problem of Frankel-Wei regressions is to ensure that the factors are exogenous to one another. Following again Fratzscher and Mehl (2014), I apply two identification assumptions which address this issue and allow for an easier interpretation of my factors' coefficient. First, I consider both the British and the French factors as exogenous, reflecting both countries' dominant role in the pre-Gold Standard European monetary system. Indeed, not only it would seem too conservative an assumption to consider the French factor to be endogenous to the British one[14], particularly given the leading role of French capital exports in the 1860s, but to make such an assumption would also make our

[12]The quote is obviously the Paris one for the French Factor.

[13]Hence, as an example, Trieste and Messina do not enter into the regional factor of, respectively, Vienna and Palermo (and vice-versa) and are excluded from the panel estimate. The same applies to all Italian financial centers post-unification: their regional factor is exclusively composed of Vienna's returns and only Genoa is kept into the panel estimate post-1863. Finally, Marseille does not enter the panel analysis, given high collinearity with the Paris' quote.

[14]Reassuringly, running a Granger-causality tests does not suggest one-way causality between the two factors.

coefficient of interests less easily interpretable[15]. Second, we assume the regional factor to be endogenous to both the British and the French ones and we therefore derive it in two stages, first regressing it against the British and French factors,

$$\Delta e_t^{REG_i} = \alpha_i \; + \; \beta_t^{GBP} \Delta e_t^{GBP} \; + \; \beta_t^{FFR} \Delta e_t^{FFR} \; + \; \omega_t \tag{3}$$

and then plugging Equation 3's residual ω_t in Equation 2, as a proxy for the autonomous regional factor of financial centre t, where then

$$\Delta e_t^{\widehat{REG_i}} = \omega_t \tag{4}$$

To summarize, the regional factor employed in Equation 2 is orthogonalized to movements in both the British and French factor, allowing to control for the purely exogenous regional movements. This is particularly crucial given not only the likely influence of the two main capital exporters on nominal co-movements across Europe but also the formal link of some European currencies to the British (Portugal) or the French (Belgium, Piedmont and then Italy) metallic standards.

[15]Indeed, orthogonalizing the French factor with respect to the British one would imply that any collinearity between the two factors will be entirely attributed to the British factor.

4.1.2. Economic Intuition in the Context of the pre-Gold Standard European Monetary System

Before stating the key hypotheses that will be tested, it is important to better explicit the above model's economic intuition in the context of the pre-Gold Standard period. The estimated factor coefficients reflect[16] the degree of monetary policy autonomy enjoyed by the country of interest. As mentioned above, a perfectly inflexible interest rate would translate into reference currencies' factors summing up to 1 and to a perfect fit of the regression. Conversely, the lower the factor coefficients the higher the degree of monetary policy autonomy: as discussed in Section 2.1 in the context of the "German dominance" hypothesis debate, very few countries enjoy a truly independent monetary policy. The magnitude of the coefficients can theoretically be influenced both by policy and economic "fundamentals". Policy typically influences them through the choice of a foreign exchange regime, for example a peg explicitly or implicitly targeting a certain basket of reference currencies, as well as foreign-exchange reserves interventions by the central bank. The more flexible the authorities let the foreign exchange regime be, the more fundamentals come into play, possibly translating into high co-movements with reference currencies of regions with which the country enjoys trade or financial relations. Obviously, it is hard to disentangle policy and fundamentals[17] as they are endogenous: the authorities would indeed be wise to choose their peg basket based on fundamentals.

The economic intuition of the model is not fundamentally different when applied to the pre-Gold Standard historical context but a few qualifications apply. First, our dataset returns' refer to three months foreign-exchange bills rather than pure exchange rates. Foreign bills were the most widely used medium of international financial transactions

[16] Depending on how free capital movements are, as monetary policy autonomy can be gained by imposing transaction costs on capital movements.

[17] This is sometimes achieved in the literature by controlling for foreign-exchange interventions and the degree of flexibility of the exchange regime (Subramanian and Kessler, 2013).

throughout modern times, only starting to decline at the end of the 19th century (Denzel, 2010). A three months foreign-exchange bill sold in London would differ from, say, a forward three months exchange rate, in that it would involve an immediate down payment in London with the promise of receiving, in the foreign financial center, the local currency equivalent in three months time. Second, most currencies remain on a metallic standard throughout the period at hand. The credibility of the metallic anchor of each currency is therefore a key determinant of the bills' price behavior. If the currency is credibly convertible into a given metal and capital can freely flow, foreign exchange bills prices in London reflect the money market conditions of foreign centers and benefit from a self-stabilizing mechanism due to the intrinsic value of the currency. Indeed, movements in local demand for money would be followed by offsetting capital flows which would stabilize the bill price in line with the metallic anchor of the currency[18]. What we therefore observe, on average, are nominal shocks that are able to affect bill prices within the transaction costs "bands"[19]. Symmetry of nominal shocks would therefore translate into positive correlation of bill returns, while asymmetric shocks would yield negative correlation. Intuitively, currencies operating in environments with similar fundamentals or highly integrated between each others would tend to experience similar shocks. It follows that our approach is consistent with the operationalization of the Optimum Currency Area framework around the concept of nominal exchange rate shocks variability first proposed by Bayoumi and Eichengreen (1997).

What if the monetary authorities choose (or were forced to) exert more monetary autonomy, by weakening the credibility of the metallic anchor, or even severing it altogether with a paper standard? This is the exception within the paper's dataset, with non

[18]As argued by Foreman-Peck (2005), a panic in say Palermo would trigger a sell-off of its bills, which will increase their returns and, as long as the faith in the metallic anchor is present, will encourage capital flows to benefit from higher yields. However, contrary to Foreman-Peck, I argue that this is not, on average, a reflection of "monetary autonomy with regional differences in interest rates" as returns movements across Europe largely reflect movements in London and Paris.

[19]Indeed, the capital flows mentioned above would only kick-in once the return on the transaction approaches the cost of physically shipping metals across financial centers.

convertible paper standards in force in Russia, Austria-Hungary and post-1866 Italy as well as possible temporary credibility issues regarding the metallic anchor elsewhere in the periphery (Denzel, 2010). Of course, "active" monetary policy within a largely metallic based monetary system is hard to control for in the context of our weekly frequency model and would translate into a much higher volatility for the affected currencies, making the estimation of the true factor coefficients harder. Nevertheless, to the extent that the relaxing of the metallic anchor means that market participants' expectations and fundamentals would play a larger role in driving fluctuations, the above intuition linking fundamentals to the symmetry of bills returns movements still holds.

To summarise, the factor coefficients, the βs estimated through Equation 2, represent the degree of synchronization between the anchor and the financial centers of interest. While policy choices such as the decision to share the monetary standard of the anchor country might also impact the factor coefficients, I would argue that, particularly given the endogeneity issue between fundamentals and exchange rate regime choice highlighted above, fundamentals are the key driver of the factors I estimate.

4.1.3. Key Hypotheses: British vs. French Dominance and Ex-Ante Optimum Currency Area Assessment

From the above discussion it follows that the βs in Equation 2 would provide evidence regarding unipolar or bipolar monetary "dominance" in the pre-Gold Standard monetary system. In other words, in order to answer to the second leg of the paper's research question, confirming or infirming the British dominance hypothesis, we would need assess whether β^{FFR} is positive and significant and compare its strength relative to β^{GBP}, as well as their evolution over time.

Moreover, comparing the βs estimated in a single equation, financial center by financial

center, would provide for a granular mapping of the symmetry of shocks across the system. This would answer to the first leg of the paper research question, estimating the costs stemming from monetary integration for the regions about to form a currency area. Based on the descriptive evidences developed in Section 3.2, we would expect the pre-unitary factor coefficients for Northern and Southern Italy to differ, indicating high costs from monetary integration, while the ones of the three German financial centers should point to unified Germany being closer to an OCA.

4.2. Results

This section presents the results of my econometric analysis. Equation 2 is first estimated in a panel setting (Section 4.2.1) and then individually for each financial center (Section 4.2.2). Finally, the estimated British and French factors are tentatively explained as outcome variables in Section 4.2.3.

4.2.1. Frankel-Wei Panel Regression: The Rise of French Dominance in the European Monetary System (1852-1869)

Table 5 reports baseline estimates for the three factors model of Equation 2 using a fixed effect estimator for the 1852-1869 period[20]. Specifications including only the two anchor currencies factors, the three factors alone and controls are included. At a first glance, looking at columns (1) to (3), the British factor loading explains the bulk of bills returns movements and, at around 0.9, implies that a 1% appreciation appreciation of the British Pound *vis-à-vis* the numéraire currency translates into an almost identical movement in the sample's currencies. The French factor is on the other hand very small and statistically insignificant, while the Regional factor is almost four times smaller than the British one.

[20] I exclude the period around the 1848 spring of nations.

The adjusted-R^2 are in the order of 5%-9%, relatively small but in line with Fratzscher and Mehl (2014) and the the high data frequency. Those results do not however automatically indicate an overwhelming British dominance on the whole European monetary system.

Turning to columns (4) to (6) of Table 5, where the sample is restricted to the "core" of the European monetary system [21], qualitatively identified looking at foreign exchange returns' volatility in Table 2, the results are strikingly different. The British and French factors are very similar, at respectively 0.39 and 0.35 in the fullest specification, with a smaller loading for the regional factor. The explained variance is also markedly higher at around 20% in column (6).

The European monetary system therefore appears as selectively bipolar, with France being on equal footing with Britain as long as we consider a tighter monetary system confined to Western and Central Europe, and Britain taking a predominant role when more peripheral economies are taken into account. This would be to some extent consistent with the capital exports patterns observed later in the 19th century, with France lending to European polities while Britain targeted the Empire and more peripheral countries (Fishlow, 1985).

Having discussed the relative economic magnitude of the British and French factors over the whole period, it is particularly interesting to compare it over time. Tables 7 (whole sample) and 8 (core financial centers) show again the three factors model of Equation 2 estimated by key periods[22]. British dominance is again apparent when looking at the whole sample, with the factor loading being comprised between 0.8 and 0.99 over the period. The sudden fall of the British factor loading, with a parallel rise of the regional

[21] Composed of Anvers, Hamburg, Frankfurt, Berlin, Genoa, Leghorn, Lisbon. Oporto and the post-unification Italian centers are excluded in order to avoid collinearity issues.

[22] The first column (1846-1852) covers the unstable period of the spring of nations till the end of the Second French Republic; the second covers a relatively stable period going from the creation of the Second French Empire to 1858; the third column covers a period of accelerated international integration from 1858 to 1865; the fourth columns covers a very volatile period with both a financial crisis hitting the London market and the Italian Lira declared inconvertible in 1866.

Table 5: Equation 2 Panel Estimation (1852-1869)

	All Financial Centers[a]			Core Financial Centers[b]		
	(1)	(2)	(3)	(4)	(5)	(6)
British Factor	**0.893*** **	**0.903*** **	**0.908*** **	**0.365*** **	**0.377*** **	**0.392*** **
	(0.0704)	**(0.0695)**	**(0.0761)**	**(0.0480)**	**(0.0465)**	**(0.0487)**
French Factor	0.06094	0.054374	0.051005	**0.373*** **	**0.359*** **	**0.349*** **
	(0.0786)	(0.0778)	(0.0751)	**(0.0498)**	**(0.0481)**	**(0.0472)**
Regional Factor		**0.192*** **	**0.191*** **		**0.128*** **	**0.122*** **
		(0.0382)	**(0.0377)**		**(0.0417)**	**(0.0419)**
Bid-Ask Spread			-0.11502			**-0.206** **
			(0.1181)			**(0.0908)**
Bank of England			-0.00012			**-0.00025** **
			(0.0002)			**(0.0001)**
Bank of France			0.000128			0.000085
			(0.0003)			(0.0001)
Observations	10,550	10,550	10,550	5,123	5,123	5,123
Adj. R-squared	0.055	0.088	0.089	0.097	0.191	0.198

Notes: Constant and fixed effects included in all the specifications. Robust standard errors are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% respectively.

[a] All financial centers included except the ones mentioned in Footnote 13 due to collinearity issues.

[b] Anvers, Hamburg, Frankfurt, Berlin, Genoa, Leghorn, Lisbon. Leghorn exits the sample once it starts being quoted in Italian Lire in 1860

factor one, apparent in column (4) of Table 7 could be justified by both the 1866 London financial crisis and the break of the Austro-Prussian war in the same year, which forced cash-strapped Italy to declare the Lira inconvertible.

Turning to Table 8 we observe on the other hand how the French factor loading starts to rise dramatically during the Second French Empire, doubling between 1852 and 1865. This does not seem to occur at the expense of the British factor loading, which remain constant up to 1865, but is rather the reflection of higher monetary integration in the core of the system around the two main anchors, the sum of the British and French factor increasing from 0.6 to 0.8 between 1852 and 1865. This again confirms the hypothesis of a highly bipolar "core" of the European monetary system, with France contributing almost entirely to the overall rise in monetary integration over the period.

The pattern that materializes in 1866 is harder to interpret. Looking at column (4a) of Table 8, the British factor loading collapses and becomes statistically insignificant, the French one remains stable and the regional factor rises dramatically. I attribute this result to the events unfolding in one of the core financial centers, Genoa, which experienced a dramatic regime change with the start of the 1866 Austrian war (making the movements in the Italian bills more dependent on their autonomous regional factor which includes Austria) and the declaration of inconvertibility of the Lira (which appears to sever the co-movements of the Lira with the British Pound but not the French Franc, see Table 9). When removing Genoa from the sample (Column (4b) of Table 8), however, another regime change appears to have taken place as the French factor loading is halved when compared to the previous sub-period in column (3). Looking again at the more granular analysis in Table 9, this is to be attributed to changes in Portugal's fundamentals, perhaps following the London crisis, as its bills' movements started to become strongly negatively correlated to the French ones. If we then assume that, due to a regime change in 1866, both Portugal and Italy do not belong anymore to the system's core, we can see that in column (4c), where

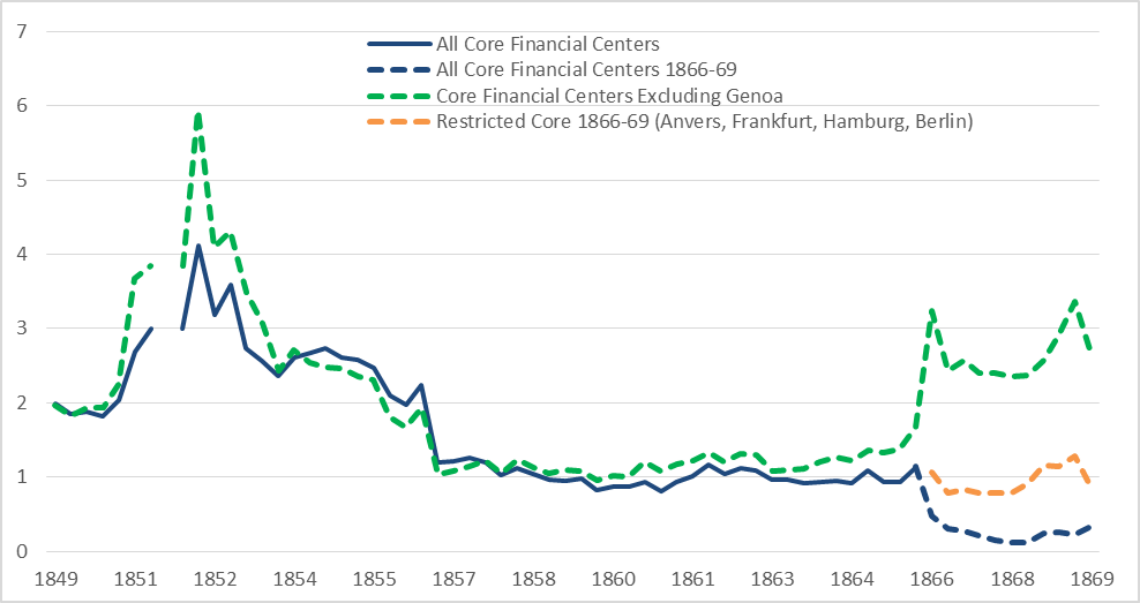
only Germany and Belgium are included, the relative size of the factor loadings remains relatively stable compared to the previous periods. On the other hand, the economic magnitude of the factor loadings is smaller for this restricted core, perhaps reflecting greater monetary policy autonomy.

Figure 2 summarizes the relative size of the British and French factor loadings over time. The ratio of the two factors clearly shows how, following the rise of French dominance in the first years of the Second Empire, the core of the European monetary system is almost perfectly bipolar until 1865. I interpret the events of 1866 as a regime change which changes the composition of the European monetary core, as Italy and Portugal start to exhibits a drastically different behavior from that year (this can be easily seen by comparing the two extreme dotted lines in Figure 2). If, after 1866, we then start to look at a "restricted" core[23], formed by Belgium and Germany's financial centers only, the system's bipolarity still holds.

All in all, my results confirm Flandreau (1996)'s critique to the view that the arising of an international gold standard was inevitable. Indeed, except for the very first period I examine, corresponding to the Second French Republic, there is no sign of overwhelming British dominance amongst the future members of the gold standard core. On the contrary, the core of the European monetary system appears as strongly bipolar, with evenly balanced British and French dominance. It can therefore be argued that there was no fundamental reason for international monetary integration around the British gold standard. Based on the relative influence of the two main anchor currencies, a pattern of international monetary integration around France might have been as likely.

[23]Which cannot be shown prior to 1866 date as Berlin's quote is not available

Figure 2: Relative Size of Anchors' Dominance (British Factor / French Factor)*

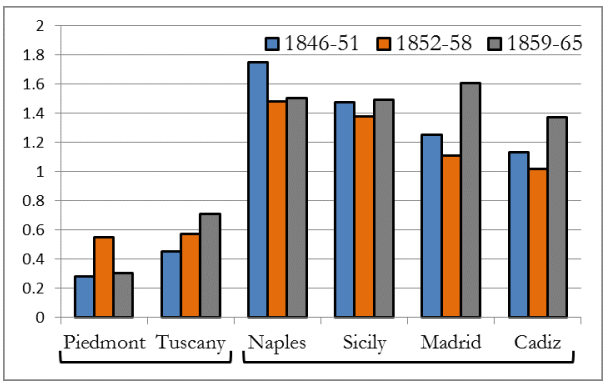


*The lines are obtained by computing the ratio of β^{GBP} over β^{FFR} from Equation 2, estimated through 4-years rolling regression. Core Financial Centers: Anvers, Frankfurt, Hamburg, Berlin, Genoa, Leghorn, Lisbon. Leghorn drops from the sample as soon as it starts to be quoted in Italian Lire in 1860.

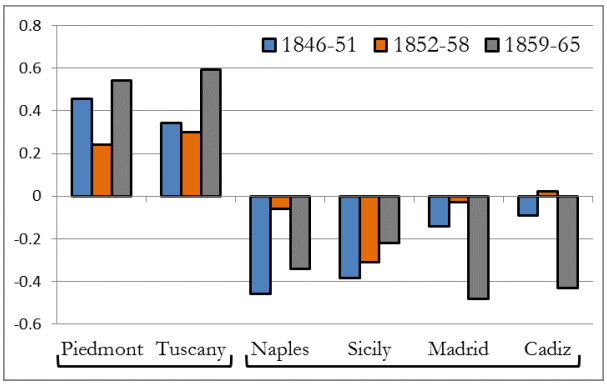
4.2.2. Frankel-Wei Individual Regressions: Assessing Macroeconomic Costs of Monetary Integration

I now turn to a more granular analysis of monetary dominance, estimating Equation 2 individually for each financial centers. This allows for an easy comparison of dominance patterns, particularly looking at similarities in the estimated coefficients across financial centers about to form a monetary union. Before analyzing more closely the cases of Italy and Germany, it is helpful to summarize the results of Table 9 more generally.

First of all, coefficient across the financial centers that will ultimately join the gold standard are, with the exception of Portugal, relatively similar, showing similar levels of British and French dominance (the two Northern Italian financial centers also appear to belong to the same group until the start of Lira inconvertibility). This provides evidence of low costs of monetary integration for the gold standard core which is in line with them



(a) British Factor Loading



(b) French Factor Loading

Figure 3: Italy: High Macroeconomic Costs of North-South Monetary Integration
* Estimate ends in 1861 for Tuscany and 1863 for the Southern places, when they start to be quoted in Italian Lire. Sicily represents the simple average of the factor loadings estimated for Palermo and Messina.

ultimately sharing the same monetary standard from the 1870s onward. As far as the Latin Monetary Union is concerned, while its original members (Belgium and Piedmont) are subject to a high level of French monetary dominance, consistent with the economic rationale of the Union.

Secondly, the patterns of high British dominance for the more peripheral countries is confirmed. Financial centers adopting an inconvertible paper standard in Austria-Hungary and Russia generally exhibit a statistically significant British factor loading close to or even above 1, with no statistically significant French dominance. The same pattern of very high British dominance can be seen in the Iberic peninsula, where however a statistically significant negative French factor loading can also be observed. While this is not really surprising in the case of Portugal, a British client state largely dependent on London for its trade and finance, the results for Spain are rather more puzzling. Indeed, Spain was not only the recipient of a large share of French capital exports at the end of the 1860s but also made formal steps towards an application for membership of the Latin Monetary Union (the same can be said of Austria-Hungary) (Flandreau, 2000).

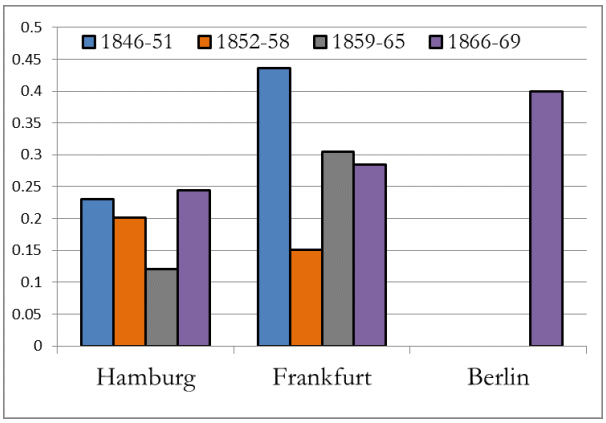
The analysis of factor loadings for the Italian financial centers provides strikingly neat

results, summarized in Figure 3. On the one hand, Northern financial centers in Piedmont and Tuscany register very similar patterns in terms of the magnitude and the relative size of the estimated anchor currencies' factor loadings. We can therefore assume that they shared similar fundamentals, fostering business cycle synchronization, and that they therefore exhibited low costs of reciprocal monetary integration. On the other hand, we see the opposite picture when comparing the factor loadings of Northern and Southern Italian financial centers. Not only the magnitude of the British factor is very different, with much higher British dominance in Southern Italy alike other peripheral regions in Europe. The estimated coefficients for the French factor also implicitly show a high degree of negative correlation of the shocks experienced by the two regions. I therefore argue that unified Italy was not an OCA and that the centralized monetary union established in 1862 likely entailed significant costs for its regions. It is likely that Italy would have been better off under the con-federal design, implying looser monetary integration, imagined by Cavour and Napoléon III in 1858.

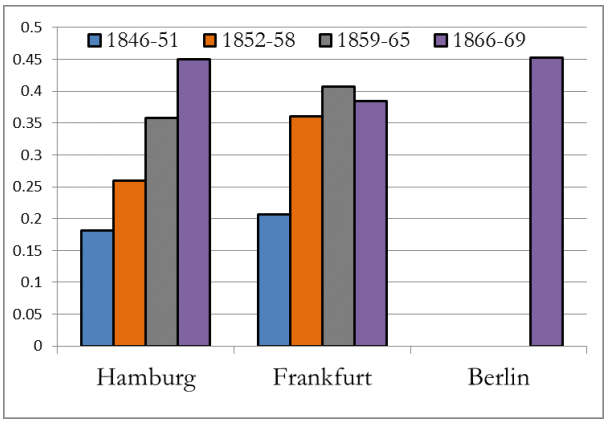
Figure 3 actually shows how the estimated monetary dependence *vis-à-vis* the two key anchor currencies indicate that Southern Italy and Spain were an order of magnitude closer to being an OCA than Northern and Southern Italy. The proximity between Southern Italy and Spain actually provides an opportunity to speculate about the channels through which the high costs of monetary integration I have estimated might have contributed to regional divergence in Italy and to the arising of the "Southern Question". Indeed, while Spain and Southern Italy likely shared similar trade specialization, which would explain the symmetry highlighted in Figure 3, their exchange rates policies and terms of trade developments diverged markedly following the Italian unification. The unified Kingdom of Italy, inheriting the high war debts of Piedmont, had to pursue widespread monetization, resulting in higher inflation than its partners, as well as a "gold shadowing" policy (Tattara, 2003) aimed at maintaining access to foreign financial markets. This combination resulted in a substantial real appreciation of the Italian Lira, in the order of

30% from unification to WWI (Ciocca and Ulizzi, 1990), which is likely to have significantly magnified negative terms of trade shocks for the agricultural South in the context of the international agrarian crisis of the 1880s. Spain also suffered from the same deflationary pressures from agricultural production in the New World but was able to cushion the shock on its terms of trade through a devaluation (Sánchez-Alonso, 2000), an adjustment tool that was unavailable to the Italian South. There, the adjustment took place through extensive labour migration, which would have been accompanied by an hysteresis phenomenon on the Southern output, possibly contributing to the widening GDP per capita gap observable by the turn of the century (Felice, 2013). All in all, I would argue that the Italian case provides some perspective on the ex-post endogeneity hypothesis of OCAs (Frankel and Rose, 1998), which predicts that optimality might be achieved after monetary unification as the union's regions start to trade and integrate with one another. The Italian union was certainly sub-optimal ex-ante and, opposite to what the endogeneity hypothesis would suggest, still remains to a large extent so, more than one and a half century after unification. On the other hand, this seems to further point to political integration as the key determinants of currency areas sustainability (Bordo and Jonung, 1999).

Opposite to the Italian situation, we observe that, a few years before monetary unification in 1871, German financial centers showed similar anchor currencies' factor loadings (Figure 4). The estimated coefficients of interest roughly follow the same time pattern, with a relatively stable British factor and a French factor tripling in Frankfurt and doubling in Hamburg over the period. The relative magnitude of the two factors loadings varies at times substantially from one financial center to another but again with a common pattern. If the British factor dominates the French one until the beginning of the 1850s, all three German financial centers witness a higher French dominance ever after (albeit at different degrees). This is, once again, at odds with the hypothesis that Germany belonged to a British monetary bloc, therefore making the arising of an international gold standard inevitable. Germany, and even Prussia, which is commonly understood to have taken the



(a) British Factor Loading



(b) French Factor Loading

Figure 4: Germany: Low Macroeconomic Costs of Monetary Integration
Berlin's quote only available from 1866 onward.

lead in the shift to gold, where actually slightly more synchronized with the French rather than the British fundamentals.

My results also point to Germany being much closer to an OCA, given the similarity in synchronization with respect to the key anchors, than Italy. Of course, ex-ante endogeneity plays a much bigger role in the German case as the German states had been integrating economically, and started to harmonize their monetary standards (Holtfrerich, 1993), since the beginning of the century. The behavior of the regional factor, which becomes statistically significant only at the very end of the considered period, however signals some regional idiosyncrasies, as the coefficient is negative for Frankfurt (-0.11) while positive and similar for Hamburg and Berlin (See Table 9). Still, the lower macroeconomic costs of monetary integration are in line with the lower level of regional GDP per capita divergence, compared to Italy, that Germany registers by WWI (Iuzzolino et al., 2013).

4.2.3. Explaining Monetary Dominance

In this section I extend the analysis and attempt to explain the factor loadings estimated in Section 4.2.2, providing tentative evidence on the determinants of the heterogeneity

in the region-specific elasticities with respect to the key monetary anchors estimated above. Table 6 reports pooled OLS estimates of those determinants. I take in turn all the estimated β^{GBP} and β^{FFR} for each individual financial center[24] on the left hand side and try to explain them by looking at variables consistent with the economic intuition of the OCA framework. Ideally, I would like to explain the estimated coefficients by fundamentals that should increase synchronization across regions, namely trade and financial integration with respect to each of the anchor. The former can reasonably be approximated, in the absence of GDP data, by the total bilateral trade per capita between the individual financial center and the anchor (See Section 3.1 for a description of data sources). As consistent data on bilateral financial linkages are not available across the regions in the sample, I take the bilateral trade balance per capita as a proxy of the financing provided by the anchor to the region of interest (as a trade deficit with England or France likely involved financing from the anchor country). I also control in some of the specifications for a monetary standard dummy, taking the silver standard as the reference. The results are not meaningfully different if only the statistically significant factor coefficients are included on the left hand side.

The fullest specification seems to work well for Britain as all the main variables are statistically significant and have the right sign (Table 6). On the other hand, the results for the French factor estimation are more problematic. While there is a strong association between high French dominance and total bilateral trade with France, the coefficient becomes insignificant once the monetary standard controls are included. This might suggest a collinearity issue between our trade variables and monetary standards, which would be unsurprising (as an example the regions with a bimetallic standard also share a border with France). Also, the bilateral trade balance does not seem to be related to the estimated French factor. By indicating that monetary integration with France was more

[24]Financial centers in Germany, the Two Sicilies, Portugal, Spain and Austria-Hungary are averaged and treated as a single country.

about trade than financial integration, this result is at odds with Flandreau (2000), who argues that financial linkages were key in the expansion of French monetary diplomacy.

All in all, the results presented in this section are more suggestive than definitive. However they show that our estimated British and French factor have an underlying economic rationale consistent with the OCA framework outlined in Sections 2.2 and 4.1.2.

Table 6: Determinants of the Heterogeneity in the Estimated Individual Factors

	British Factor				French Factor			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Trade per Capita	0.115		0.148	**0.193*** **	**0.154*** **		**0.153*** **	-0.00825
	(0.0783)		(0.0939)	**(0.0685)**	**(0.0345)**		**(0.0292)**	(0.0733)
Trade Balance per Capita		-0.0158	0.0635	**0.208*** **		0.129	0.00682	0.141
		(0.0676)	(0.0797)	**(0.0499)**		(0.109)	(0.102)	(0.171)
d_Bimetallic				**-0.709*** **				**0.479** **
				(0.119)				**(0.189)**
d_Gold				**0.253** **				-0.305
				(0.0980)				(0.193)
d_Paper				0.223				-0.169
				(0.185)				(0.163)
Constant	-0.906	**0.811*** **	-1.402	**-1.983***	**-0.792*** **	0.0758	**-0.786*** **	0.0853
	(1.137)	**(0.0660)**	(1.374)	**(1.022)**	**(0.225)**	(0.0485)	**(0.189)**	(0.397)
Observations	83	83	83	83	93	93	93	93
R-squared	0.029	0.001	0.035	0.348	0.218	0.031	0.218	0.282

Robust standard errors are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% respectively.

5. Conclusion

In this paper, I have empirically analyzed the patterns of European monetary integration occurred at the eve of the first globalisation. Using a modified Frankel-Wei model of global foreign-exchange co-movements, I have identified the symmetry of shocks of key European regions with respect to the two main economies of the time, Britain and France.

On the international level, my results show how the European monetary system was far from being subject to complete British dominance. The influence of France in the system rose markedly following the establishment of the Second Empire and remained on par with the British one in the core of the system up to the Franco-Prussian War. I

therefore argue that, in line with Flandreau (1996)'s analysis of the French crime of 1873, the rise of an international monetary system around the British monetary standard was not inevitable. I also show that, based on my measure of the symmetry of shocks, Germany did not have more incentives to join the British standard than the French one, contrary to what Eichengreen (1998) has argued.

On the national level, I assess the ex-ante costs of monetary integration for two long lasting national monetary unions, Italy and Germany. Based on each country's regions symmetry of shock with respect to the key anchors, I find evidence of high macroeconomic costs of monetary integration for the Italian union while the German one seems to be closer to an OCA. I provide a tentative link between my findings and the emergence of the Southern Question by emphasizing the possible damages to the South growth potential stemming from adverse terms of trade shocks and the inability to fully adjust as part of the Italian monetary union.

Three main implications for the OCA literature can be drawn from the paper's analysis of the origins of the Italian and German monetary unions. First, the assessment of the ex-ante costs of monetary integration is in line with the ex-post outcomes, measured at the eve of WWI, in terms of regional convergence in Italy and Germany. This confirms the appropriateness of the OCA framework in assessing the ex-ante suitability of currency area membership.

Building on the first point, there are little signs of OCA endogeneity following monetary unification when looking at Italy and Germany. Indeed, the monetary union faring worst ex-ante in terms of cost-benefit still exhibits to this day a worst track record in terms of shock synchronization and divergence. This does not mean that no OCA endogeneity mechanism have been at play but points to them not being of the order of magnitude needed to completely offset the adverse starting point of the Italian monetary union.

Finally, the paper's findings confirm the key role of political will and integration in determining the sustainability of currency areas. The Italian experience notably shows how a divergent monetary union, prompted by military annexation and then sustained through political integration, has been able to survive for more than one and a half century despite exhibiting from the onset relatively high macroeconomic costs and low microeconomic benefits.

References

Alesina, A. and Barro, R. J. (2002). Currency unions. *The Quarterly journal of economics*, 117(2):409–436.

Alesina, A., Barro, R. J., and Tenreyro, S. (2002). Optimal currency areas. *NBER macroeconomics annual*, 17:301–345.

Baldwin, R. E. (2006). The euro's trade effects. *ECB Working Paper Series n. 594*.

Barbagallo, F. (2013). *La questione italiana. Il Nord e il Sud dal 1860 a oggi*. Editore Laterza.

Barro, R. J. and Gordon, D. B. (1983). Rules, discretion and reputation in a model of monetary policy. *Journal of monetary economics*, 12(1):101–121.

Bayoumi, T. and Eichengreen, B. (1997). Ever closer to heaven? an optimum-currency-area index for european countries. *European economic review*, 41(3):761–770.

Bénassy-Quéré, A. (1999). An empirical analysis. *Exchange Rate Policies in Emerging Asian Countries*, 13:38.

Bordo, M. D. and Jonung, L. (1999). The future of emu: what does the history of monetary unions tell us? Technical report, National bureau of economic research.

Ciocca, P. and Ulizzi, A. (1990). I tassi di cambio nominali e 'reali'dell'italia dall'unità nazionale al sistema monetario europeo (1861-1979). *Ricerche per la storia della Banca d'Italia*, 1:341–68.

Collet, S. (2013). A unified italy?-sovereign debt and investor scepticism. *Mimeo, Available at SSRN*.

De Grauwe, P. (2016). *Economics of monetary union*. Oxford University Press.

De Mattia, R. (1959). *L'unificazione monetaria italiana*, volume 2. Industria libraria tipografica editrice.

Dedinger, B. and Girard, P. (2017). Exploring trade globalization in the long run: The ricardo project. *Historical Methods: A Journal of Quantitative and Interdisciplinary History*, 50(1):30–48.

Denzel, M. A. (2010). *Handbook of world exchange rates, 1590-1914*. Ashgate Publishing, Ltd.

Eichengreen, B. J. (1998). *Globalizing capital: a history of the international monetary system*. Princeton University Press.

Einaudi, L. (2001). *Money and politics: European monetary unification and the international gold standard (1865-1873)*. Oxford University Press on Demand.

Federico, G. and Tena-Junguito, A. (2014). The ripples of the industrial revolution: exports, economic growth, and regional integration in italy in the early nineteenth century. *European Review of Economic History*, page heu007.

Felice, E. (2013). *Perché il Sud è rimasto indietro*. Il Mulino.

Fishlow, A. (1985). Lessons from the past: capital markets during the 19th century and the interwar period. *International organization*, 39(03):383–439.

Flandreau, M. (1996). The french crime of 1873: An essay on the emergence of the international gold standard, 1870–1880. *The Journal of Economic History*, 56(4):862–897.

Flandreau, M. (2000). The economics and politics of monetary unions: a reassessment of the latin monetary union, 1865–71. *Financial History Review*, 7(01):25–44.

Flandreau, M. and Jobst, C. (2005). The ties that divide: a network analysis of the international monetary system, 1890–1910. *The Journal of Economic History*, 65(04):977–1007.

Flandreau, M. and Oosterlinck, K. (2012). Was the emergence of the international gold standard expected? evidence from indian government securities. *Journal of Monetary Economics*, 59(7):649–669.

Fohlen, C. (1963). *Il Trattato di commercio franco-italiano del 17 Gennaio 1863*. Archivio economico dell'unificazione italiana, Serie I. Archivio economico dell'unificazione italiana.

Foreman-Peck, J. (2005). Lessons from italian monetary unification. Technical report, Oesterrichische Nationalbank Working Paper n. 113.

Frankel, J. and Wei, S.-J. (2008). Estimation of de facto exchange rate regimes: Synthesis of the techniques for inferring flexibility and basket weights. *IMF Economic Review*, 55(3):384–416.

Frankel, J. A. and Rose, A. K. (1997). Is emu more justifiable ex post than ex ante? *European Economic Review*, 41(3):753–760.

Frankel, J. A. and Rose, A. K. (1998). The endogenity of the optimum currency area criteria. *The Economic Journal*, 108(449):1009–1025.

Frankel, J. A. and Wei, S.-J. (1994). Yen bloc or dollar bloc? exchange rate policies of the east asian economies. In *Macroeconomic Linkage: Savings, Exchange Rates, and Capital Flows, NBER-EASE Volume 3*, pages 295–333. University of Chicago Press.

Fratianni, M. and von Hagen, J. (1992). German dominance in the ems: The empirical evidence. *Open economies review*, 3(1):127–128.

Fratzscher, M. and Mehl, A. (2014). China's dominance hypothesis and the emergence of a tri-polar global currency system. *The Economic Journal*, 124(581):1343–1370.

Giavazzi, F. and Giovannini, A. (1988). Modèles du sme: l'europe n'est-elle qu'une zone deutsche mark? *Revue économique*, pages 641–666.

Holtfrerich, C.-L. (1993). Did monetary unification precede or follow political unification of germany in the 19th century? *European Economic Review*, 37(2-3):518–524.

Iuzzolino, G., Pellegrini, G., and Viesti, G. (2013). Regional convergence. In *The Oxford Handbook of the Italian Economy Since Unification*. Oxford University Press.

James, H. (1997). Monetary and fiscal unification in nineteenth-centuray germany: What can kohl learn from bismarck? Technical report, International Economics Section, Departement of Economics Princeton University.

Kindleberger, C. P. and O'Keefe, R. (2001). *Manias, panics, and crashes*. Springer.

Krugman, P. (2001). Lessons of massachusetts for emu. *International Library of Critical Writings in Economics*, 134:41–61.

Lévy-Leboyer, M. (1977). *La position internationale de la France. Aspects économiques et financiers, 19e–20e siècles*. Paris: Editions de l'Ecole des Hautes etudes en sciences sociales.

Mitchell, B. (1998). *International historical statistics: Europe 1750-1993*. Springer.

Mongelli, F. P. (2008). European economic and monetary integration, and the optimum currency area theory. Technical report, Directorate General Economic and Financial Affairs (DG ECFIN), European Commission.

Mundell, R. A. (1961). A theory of optimum currency areas. *The American economic review*, 51(4):657–665.

Redish, A. (1995). The persistence of bimetallism in nineteenth-century france. *The Economic History Review*, 48(4):717–736.

Roccas, M. and Sannucci, V. (1990). *L'Italia e il sistema finanziario internazionale: 1861-1914*. Laterza.

Rose, A. K. (2000). One money, one market: the effect of common currencies on trade. *Economic policy*, 15(30):08–45.

Sánchez-Alonso, B. (2000). Those who left and those who stayed behind: explaining emigration from the regions of spain, 1880–1914. *The Journal of Economic History*, 60(03):730–755.

Shu, C., He, D., and Cheng, X. (2015). One currency, two markets: the renminbi's growing influence in asia-pacific. *China Economic Review*, 33:163–178.

Silva, J. S. and Tenreyro, S. (2010). Currency unions in prospect and retrospect. *Annu. Rev. Econ.*, 2(1):51–74.

Subramanian, A. and Kessler, M. (2013). The renminbi bloc is here: Asia down, rest of the world to go? *Journal of Globalization and Development*, 4(1):49–94.

Tattara, G. (2003). Paper money but a gold debt: Italy on the gold standard. *Explorations in Economic History*, 40(2):122–142.

Tenreyro, S. (2007). On the trade impact of nominal exchange rate volatility. *Journal of Development Economics*, 82(2):485–508.

The Economist (1846-1869). The Economist Historical Archive, 1843-2013.

Toniolo, G. (2014). *An Economic History of Liberal Italy (Routledge Revivals): 1850-1918*. Routledge.

Toniolo, G., Conte, L., and Vecchi, G. (2003). Monetary union, institutions and financial market integration: Italy, 1862–1905. *Explorations in Economic History*, 40(4):443–461.

Vernet, D. (2003). Mitterrand, l'europe et la réunification allemande. *Politique étrangère*, pages 165–179.

Willis, H. P. (1968). *A history of the Latin Monetary Union*. The University of Chicago Press.

A. Appendix

Table 7: Equation 2 Panel Estimation - All Financial Centers[a]

	1846-51	1852-58	1859-65	1866-69
	(1)	(2)	(3)	(4)
British Factor	**0.826*** **	**0.815*** **	**0.987*** **	**0.827*** **
	(0.0749)	**(0.0758)**	**(0.1256)**	**(0.2513)**
French Factor	0.088024	0.124277	-0.063022	0.087496
	(0.0746)	(0.0773)	(0.132)	(0.227)
Regional Factor	**0.062*** **	**0.058*** **	**0.096*** **	**0.505*** **
	(0.0177)	**(0.0089)**	**(0.0207)**	**(0.0798)**
Bid-Ask Spread	-0.117755	-0.006141	-0.009579	-0.16537
	(0.1355)	(0.0763)	(0.3423)	(0.2381)
Bank of England	-0.000177	0.000112	-0.000011	-0.00038
	(0.0004)	(0.0004)	(0.0002)	(0.0011)
Bank of France	0.001365	0.00002	-0.000245	0.001593
	(0.0016)	(0.0004)	(0.0005)	(0.0023)
Observations:	2,937	4,230	4,049	2,295
R-squared:	0.089	0.087	0.061	0.213

Notes: Constant and fixed effects included in all the specifications. Robust standard errors are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% respectively.

[a] All financial centers included except the ones mentioned in Footnote 13 due to collinearity issues.

Table 8: Equation 2 Panel Estimation - Core Financial Centers[a]

	1846-51	1852-58	1859-65	1866-69	1866-69	1866-69
	(1)	(2)	(3)	(4a)	(4b)	(4c)
British Factor	**0.408*** **	**0.397*** **	**0.410*** **	0.118	**0.505*** **	**0.299*** **
	(0.0686)	**(0.0466)**	**(0.0652)**	(0.1875)	**(0.0914)**	**(0.1026)**
French Factor	**0.197*** **	**0.288*** **	**0.394*** **	**0.407** **	**0.188** **	**0.328*** **
	(0.0727)	**(0.0445)**	**(0.0711)**	**(0.1790)**	**(0.0932)**	**(0.1068)**
Regional Factor	**0.0361** **	**0.024*** **	**0.054** **	**0.403*** **	**0.078*** **	**0.078** **
	(0.0172)	**(0.0063)**	**(0.0220)**	**(0.0944)**	**(0.0272)**	**(0.0396)**
Bid-Ask Spread	-0.05177	-0.055961	-0.1335	-0.14813	0.032592	0.031298
	(0.0661)	(0.0361)	(0.1258)	(0.2339)	(0.0503)	(0.0595)
Bank of England	-0.000279	**-0.0005** **	-0.0002	0.000277	-0.000153	-7.44E-05
	(0.0005)	**(0.0002)**	(0.0001)	(0.0006)	(0.0002)	(0.0002)
Bank of France	0.001701	**-0.00053** **	-8E-05	0.001675	0.000536	0.00045
	(0.003)	**(0.0002)**	(0.0002)	(0.0013)	(0.0005)	(0.0006)
Observations:	1,460	2,005	1,876	1,254	1,045	836
R-squared:	0.093	0.257	0.299	0.354	0.342	0.346

Notes: Constant and fixed effects included in all the specifications. Robust standard errors are reported in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% respectively.

[a] Anvers, Hamburg, Frankfurt, Berlin, Genoa, Leghorn, Lisbon in equations (1) to (4a). Leghorn exits the estimation once it starts to be quoted in Italian Lire in 1860. Genoa is excluded in equation (4b) corresponding to the beginning of the inconvertibility period of the Italian Lira. Both Genoa and Lisbon are excluded in equation (4c).

Table 9: Equation 2 Estimated Individually for Each Financial Center (Part 1)
Robust standard errors not reported. ***, ** and * denote statistical signficance at the 1%, 5% and 10% respectively.

	British Factor				French Factor				Regional Factor			
	1846-51	1852-58	1859-65	1866-69	1846-51	1852-58	1859-65	1866-69	1846-51	1852-58	1859-65	1866-69
Hamburg	**0.231*****	**0.201****	**0.120***	**0.244*****	**0.181****	**0.260*****	**0.358*****	**0.450*****	0.043	0.033	0.021	**0.058*****
Frankfurt	**0.436*****	**0.151****	**0.305*****	**0.285*****	**0.207*****	**0.361*****	**0.407*****	**0.384*****	0.002	**0.042***	-0.00	**-0.11*****
Berlin	-	-	-	**0.400*****	-	-	-	**0.453*****	-	-	-	**0.074*****
Antwerp	**0.241*****	**0.344*****	**0.179*****	**0.569*****	**0.491*****	**0.391*****	**0.619*****	**0.256*****	0.032	**0.024****	**0.019***	**0.087*****
Marseille	**0.152*****	**0.126*****	**0.078****	**0.340*****	**0.635*****	**0.679*****	**0.798*****	**0.499*****	0.024	**0.021****	**0.019****	**0.022***
Genova	**0.281*****	**0.550*****	**0.305*****	0.013	**0.458*****	**0.241*****	**0.543*****	0.282	**0.063*****	-0.00	**0.008***	**0.048****
Livorno	**0.454*****	**0.572*****	**0.707*****	-	**0.344*****	**0.300*****	**0.595****	-	**0.032*****	0.005	**0.013****	-
Naples	**1.749*****	**1.482*****	**1.505*****	-	**-0.46*****	-0.06	-0.34	-	**0.400*****	**0.175****	**0.841*****	-
Palermo	**1.439*****	**1.367*****	**1.498*****	-	**-0.37*****	**-0.34*****	**-0.25***	-	**0.352*****	**0.467*****	**0.601*****	-
Messina	**1.513*****	**1.392*****	**1.482*****	-	**-0.40*****	**-0.28*****	-0.19	-	**0.308*****	**0.432*****	**0.618*****	-
Milano (Lira)	-	-	**0.258*****	0.240	-	-	**0.581*****	0.256	-	-	**0.021*****	0.025
Livorno (Lira)	-	-	**0.219*****	0.050	-	-	**0.626*****	0.184	-	-	**0.020*****	**0.043***
Palermo (Lira)	-	-	0.105	0.406	-	-	**0.807*****	0.095	-	-	0.007	**0.038***
Naples (Lira)	-	-	**0.178***	0.246	-	-	**0.725*****	0.067	-	-	0.011	**0.047****
Messina (Lira)	-	-	0.124	0.208	-	-	**0.785*****	0.241	-	-	0.011	0.015
Madrid	**1.254*****	**1.110*****	**1.609*****	**1.119*****	-0.14	-0.03	**-0.48*****	0.300	**0.387*****	**0.173*****	**0.215*****	**0.274*****
Cadiz	**1.135*****	**1.017*****	**1.370*****	**1.262*****	-0.09	0.023	**-0.43*****	-0.27	**0.401*****	0.047	**0.230*****	**0.079****
Lisbona	**1.154*****	**1.159*****	**1.320*****	**1.237*****	-0.17	-0.16	-0.10	**-0.22***	**0.243****	**0.186*****	**0.113*****	**0.089*****
Oporto	**1.063*****	**1.065*****	**1.120*****	**1.558*****	-0.16	-0.06	-0.05	**-0.54*****	0.069	**0.076*****	**0.164*****	**0.056****
Petersburg	**0.444****	**1.920*****	**1.451*****	0.679	**-0.27***	-0.42	0.013	-0.24	**0.280***	**0.394****	**0.471*****	**0.614*****
Trieste	**0.652*****	**0.662*****	0.701	**0.943***	0.148	0.262	-0.59	-0.03	**0.209****	0.178	0.900	**0.407*****
Vienna	**0.671*****	**0.714*****	0.714	**1.066***	0.216	0.203	-0.57	-0.02	**0.256****	0.157	0.883	**0.406*****

Table 10: Equation 2 Estimated Individually for Each Financial Center (Part 2)
Robust standard errors not reported. ***, ** and * denote statistical signficance at the 1%, 5% and 10% respectively.

	Bid ask				Bank of England				Banque de France			
	1846-51	1852-58	1859-65	1866-69	1846-51	1852-58	1859-65	1866-69	1846-51	1852-58	1859-65	1866-69
Hamburg	0.132	-0.07	0.056	-0.03	-	**-0.00090*** **	**-0.00031** **	-0.00023	-	0.000226	-0.00016	**0.000930***
Frankfurt	0.052	-0.07	0.056	**-0.20*** **	-	**-0.00054** **	-3.96744	0.000449	-	-0.00029	**-0.00062*** **	0.001014
Berlin	-	-	-	**0.088***	-	-	-	-0.00021	-	-	-	**0.001492** **
Antwerp	0.041	-0.04	0.069	**0.134*** **	-	**-0.00044*** **	-5.39719	0.000235	-	-0.00017	**-0.00033** **	**0.000691***
Marseille	-0.03	**-0.10*** **	-0.05	0.003	-	**-0.00076*** **	**-0.00031*** **	-0.00011	-	**-0.00105*** **	**-0.00083*** **	**-0.00092*** **
Genova	-0.00	0.009	**0.123***	**-1.93*** **	-	**-0.00072*** **	-8.06414	0.000870	-	**-0.00080*** **	**-0.00079*** **	-0.00295
Livorno	-0.09	**-0.13***	**-0.38** **	-	-	**-0.00073** **	-0.00063	-	-	**-0.00068***	**-0.01804*** **	-
Naples	-0.17	**-0.75*** **	0.099	-	-	0.000637	-3.26740	-	-	-0.00078	0.000133	-
Palermo	-0.11	-0.10	-0.25	-	-	0.000129	7.595547	-	-	**0.000756***	0.000083	-
Messina	**-0.19***	-0.12	-0.10	-	-	0.000488	-6.32712	-	-	0.000354	5.334916	-
Milano (Lira)	-	-	0.017	**-1.41*** **	-	-	-0.00014	0.000155	-	-	**-0.00050*** **	-0.00252
Livorno (Lira)	-	-	0.069	**-1.95*** **	-	-	-0.00016	0.000638	-	-	**-0.00051*** **	-0.00212
Palermo (Lira)	-	-	-0.02	**-1.10*** **	-	-	-0.00028	0.000780	-	-	**-0.00057** **	-0.00404
Naples (Lira)	-	-	-0.00	**-1.64*** **	-	-	-0.00026	0.000880	-	-	**-0.00054** **	-0.00311
Messina (Lira)	-	-	-0.00	**-1.48*** **	-	-	-0.00025	0.000354	-	-	**-0.00057** **	-0.00284
Madrid	-0.07	0.024	0.173	0.002	-	0.000633	8.694969	**0.001254***	-	**0.000893***	0.000297	0.000856
Cadiz	0.160	-0.08	0.026	-0.07	-	**0.000742** **	-1.45223	-7.13333	-	-0.00064	**0.000816** **	-0.00094
Lisbona	-0.08	-0.09	0.025	0.048	-	0.000247	4.250382	-0.00040	-	-0.00034	8.172098	0.001287
Oporto	0.101	0.012	0.109	**0.173** **	-	-0.00002	0.000152	-0.00031	-	0.000190	5.861490	0.000188
Petersburg	**0.661*** **	0.290	0.530	**0.820** **	-	**0.003649*** **	**0.001072***	**0.005523*** **	-	**0.003117** **	0.001348	-0.00435
Trieste	**-0.34** **	-0.06	**-2.73*** **	**-1.84*** **	-	-0.00094	0.000295	**-0.00454** **	-	**-0.00211** **	**-0.00332***	-0.00036
Vienna	**-1.98*** **	-0.25	**-2.50*** **	**-1.93*** **	-	-0.00084	-0.00010	**-0.00595*** **	-	**-0.00274*** **	**-0.00380** **	0.001015