The Common Currency Effect on International Trade: Causal Evidence from an Accidental Monetary Union

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Abstract

This paper provides, for the first time, quasi-experimental evidence on the causal effect of currency unions on international trade. Following the original findings by Rose (2000), pointing to a large pro-trade effect of currency unions, a large literature has developed around the size and significance of the "Rose Effect". However, this literature has largely been unable to address the self-selection and endogeneity bias implied by membership of a currency union (Head and Mayer, 2014). I fill this gap in the literature by exploiting an exogenous variation in the membership of the closest historical predecessor to the Euro, a pan-European French Franc zone that existed throughout the 19th century. In 1861, most of present-day Italy was annexed by Piedmont-Sardinia, following random political and military events. This prompted the annexed states to exogenously join a common currency with France and its satellites. I rely on new data and structural gravity equations to estimate a causal effect in the order of 35%. This is notably smaller than the 100% average point estimate in the literature. However, contrary to a recent literature discarding Rose's results as purely driven by endogeneity bias (Campbell, 2013), my findings corroborate the broad policy implications of Rose's seminal work.

Keywords: Rose effect, Currency Unions and Trade, Gravity Regressions for Policy Analysis, Natural Experiment, Italian Unification

JEL classification: F15, F33, F54, N73

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1. Introduction

In a path-breaking study, Rose (2000) first provided an estimate of the effect of currency unions on bilateral trade. Looking at post-WWII currency areas, he suggested their pro-trade effect to be as high as 300%. A vast literature has since attempted to dispute, with some success, Rose's seminal findings. Despite those efforts, the Rose Effect has managed to survive. In their meta-analysis, sampling 37 estimates using structural gravity equations, Head and Mayer (2014) computed an average estimated effect of 136%.

One key reason why Rose's insights have been met with skepticism is the endogeneity bias implied by the decision to join a currency union. As noted by Head and Mayer (2014) the literature's findings "should not be interpreted as *preferred* estimates of the causal effects of the policy variables". This is an important point, given that trade creation is commonly considered as the key benefit stemming from the establishment of currency unions. Whether a causal Rose Effect exists is therefore a topical policy question, as pressure to leave the Euro Area has mounted in several European nations and new projects of monetary integration are considered around the world, particularly in Africa.

This paper fills an important gap in the literature by providing for the first time quasi-experimental evidence on the Rose Effect. The issue of "systematic selection into common currencies of countries with peculiar characteristics" was raised early on by Persson (2001). However, those concerns have so far only partially been addressed by the literature using matching techniques, deeming experimental evidence "practically impossible" to obtain (Persson, 2001). Indeed, in order to infer causality on the effect of currency areas, one would ideally need countries to randomly join a common currency. As it is unlikely that we will observe a random adoption of the Euro any time soon, I turn to the history of European monetary integration to make causal inference tractable.

My identification strategy relies on a quasi-experimental setting involving what is probably the closest historical precedent to the Euro Area. Since the Napoleonic period and throughout the 19th century, the French Franc monetary standard was adopted by several European nations, resulting in a large common currency area which, following its institutionalization in 1865, became known

as the Latin Monetary Union. Around 1861, a major exogenous variation in the membership of the French Franc zone occurred. It was brought about by the sudden unification of the Italian peninsula by the Kingdom of Piedmont-Sardinia, following random diplomatic and military events. Piedmont was a long-standing French satellite state, home of a large Francophone minority and, importantly, an early adopter of the French Franc at the beginning of the 19th century. This meant that the Italian states annexed by Piedmont-Sardinia suddenly found themselves to be part of an accidental currency area with France and its French-speaking satellites.

This makes an ideal set-up for drawing causal inference. The unexpected character of the Italian unification, and the fact that it involved a mechanical extension of Piedmont-Sardinia's institutions to the annexed states, mean that their policy preferences could not be endogeneized. Furthermore, based on standard determinants of foreign-exchange rate regime choice, it would have been highly unlikely for the Italian provinces annexed by Piedmont to endogenously join a common currency with France in a no-unification counter-factual scenario.

I estimate the effect of this exogenous shock to trade costs by merging newly collected data on Italian trade at the regional level around unification with a large bilateral trade data matrix. Relying on structural gravity equations, the estimated causal Rose Effect is large and significant, with a preferred estimate at 35%.

My results are markedly lower than the average point estimate in the literature and around 1/3 of recent estimates carried out with theory consistent gravity equations by Glick and Rose (2016) and Larch et al. (2018).

However, opposite to recent findings by Campbell and Chentsov (2017), I argue that the Rose Effect is not completely driven by endogeneity. On the contrary, relying on a credibly causal quasi-experimental setting, my findings confirm the original policy implications of the Rose literature.

The paper is organized as follows. Section 2 surveys the literature on the Rose effect, with a focus on the endogeneity issue; Section 3 focuses on the historical context of the Italian unification as an exogenous shock; Section 4 covers the identification strategy; Section 5 details the empirical

specification; Section 6 describes the data; Section 7 provides baseline results, robustness checks and looks closely at potential threats to the identification strategy; Section 8 discusses the results with respect to external validity and potential channels and Section 9 concludes.

2. Trade Effect of Monetary Unions and Endogeneity Bias

The seminal contribution of Rose (2000) - finding that a currency union (CU) triples trade - sparked an intense academic debate. The magnitude of the effect appearing implausible[1], a subsequent literature attempted to "shrink" the CU effect, based on sample selection and data issues[2]. This prompted a response by Glick and Rose (2002) confirming a very substantial CU effect (doubling of trade). Baldwin (2006) provides an interesting methodological critique of this early literature as well as its own estimate of the Euro's trade effect at around 5-10%. In particular, early estimates were performed using gravity equations inconsistent with international trade theory, as they did not take into account unobserved bilateral heterogeneity as well as general equilibrium effects such as multilateral resistance (Anderson and Van Wincoop, 2003). Another issue with early results in the literature lied in the estimate of log-linear equations through OLS, which Silva and Tenreyro (2006) show to be biased in the presence of heteroskedasticity. In a subsequent paper, Silva and Tenreyro (2010) find no statistically significant effect of the Euro on trade through a gravity equation estimated through Poisson-Pseudo Maximum Likelihood (PPML).

Glick and Rose (2016) responded once again to the above criticism by performing the estimate on a larger dataset, confirming the overall message of their early findings: the overall CU effect is about 100% and of 50% in the case of the Euro. In a recent meta-analysis of the literature, Rose (2017) notes that the vast differences in the estimates of the Euro effect lie in sample size and that, if a large enough sample is considered, the results are consistent with a substantial pro-trade effect of currency unions. A recent response by Larch et al. (2018) has however once again highlighted that the estimated effect for the Euro can be highly sensitive to the econometric specification, while confirming an effect of 100% for non-EMU currency unions.

[1] Including to Rose himself.
[2] See Nitsch (2002), among others.

A more substantial critique to Glick and Rose's results and their policy implications is represented by endogeneity bias and self-selection into (or out of) currency unions. In this respect, instrumental variable approaches were attempted early on by Rose (2000) and Alesina et al. (2002) but were later abandoned due to unconvincing identification assumptions (Baldwin, 2006). More convincingly, Persson (2001) first implemented matching techniques to address systematic differences between countries that adopt common currencies and those that do not. Other attempts to partially overcome endogeneity include diff-in-diff-inspired approaches focusing on the selection of relevant control groups (Micco et al., 2003; Silva and Tenreyro, 2010), on controlling for "third factors", trends (Berger and Nitsch, 2008) and propensity to treatment and self-selection (Wolf and Ritschl, 2011).

A key motivation to the present paper lies in the findings by Campbell (2013) and Campbell and Chentsov (2017). They adopt an original critique to the Rose Effect literature, by focusing heavily on endogeneity bias. Short of having quasi-experimental evidence at their disposal, they take a close look at the context in which CU switches occur in Rose's dataset. They argue that the literature's results are systematically driven by endogeneity and coincident factors to CU switches, such as decolonization, warfare, the fall of the Berlin wall or the wider European economic integration processes. They do not find any statistically significant Rose Effect once "intuitive" control groups are implemented and CU switches coterminous with war are excluded from the sample.

In this paper, I therefore fill a key gap in the literature and address the endogeneity bias issue by relying on a unique historical quasi-experiment. This is in line with previous attempts to provide causal evidence on the effect of the exchange rate regime, exploiting historical exogenous shocks (Lopez-Cordova and Meissner, 2003; Mitchener and Voth, 2011). My approach is very close to the one adopted by Frankel (2008), who analyzes the fortuitous adoption of a Euro hard peg by the African countries formerly pegged to France[3]. To my knowledge, the present paper is however the first attempt to use a natural experiment to specifically investigate the causal effect of common currencies on trade using the original definition used by Rose (2000) of a 1-on-1 irrevocable exchange rate.

[3]Tenreyro (2010) however notes the paper's identification strategy does not necessarily comply with the parallel trend assumption.

3. Historical Background

Following the Italian unification in 1861, several formerly independent Italian states became part of a wider European currency union which, in many respects, represents the closest historical precedent to the Euro. This French Franc area was originally formed by France and its neighboring states, Belgium, Switzerland and Piedmont-Sardinia.

I argue that this historical episode provides an ideal environment to estimate the causal effect of currency unions on trade. Section 3.1, describes the role of France as an international monetary anchor in the mid-19th century. Section 3.2 highlights how the 1861 Italian unification in-itself was a highly unpredictable exogenous shock. On the one hand, it was not driven endogenously by cultural, political or economic ties among Italian states. On the other hand, it unexpectedly materialized following a number of random political and military events.

My identification strategy is built around the unintended consequences of this exogenous shock on bilateral trade costs and is discussed later on in Section 4.

3.1. France as an International Monetary Anchor in the 19th Century

The paper's quasi-experimental setting lies in the exogenous adoption of the French Franc by several Italian pre-unitary states, following their annexation by the Kingdom of Piedmont-Sardinia, a long term adopter of the French Franc.

Piedmont-Sardinia's currency had been intrinsically equivalent to the French Franc since the beginning of the 19th century, when it had briefly become a French *dèpartement* under Napoleonic occupation. After the congress of Vienna and the demise of the First French Empire, both Belgium and Piedmont-Sardinia maintained the French monetary standard: the Sardinian Lira, the Belgium Franc and the French Franc were equivalent to 4.5 grams of pure silver or a fixed equivalent in gold as part of a bimetallic standard. The currency of each country circulated widely in the three states, at times with legal tender status. Switzerland joined the "club" in 1850, when the Swiss Franc was introduced as the monetary unit of the Helvetic Confederation. In fact, a *de facto* common currency

among Francophone European states predates by a few decades the 1865 International Monetary Convention[4], better known as the Latin Monetary Union[5].

In many respects, the French Franc currency area I examine in this paper represents the closest historical precedent to the Euro, given both its geographic spread and economic rationale.

The technocrats of the French Second Empire clearly understood monetary fragmentation as a cost to trade and international financial transactions. The key policy maker behind the international expansion of the Franc, Félix Esquirou de Parieu, was in many ways a European federalist *ante litteram*. Heading French monetary diplomacy, he wanted to achieve for international finance transaction costs what Michel Chevalier had achieved for tariff reduction with the 1860 Cobden-Chevalier treaty. He was determined to create a European, or even global, monetary standard around France.

As noted by Flandreau (2000), the key driver for the international spread of the French Franc relates to French surging capital exports. Following the establishment of the Second French Empire and the economic reforms of Napoleon III, France became a major supplier of foreign borrowing, increasingly competing on equal footing with Great Britain. Even though Esquirou de Parieu's grand project of monetary diplomacy came to a halt following France's defeat in the war against Prussia in 1870, strong momentum built up in the 1860s in favour of harmonization of the international monetary system around the French Franc. Several European and Latin American nations made gradual steps towards the adoption of the French Franc in the late 1860s, including Spain, Austria-Hungary and Romania, while the Papal States and Greece formally achieved membership of the Latin Union in 1866 and 1868 respectively.

[4]For a detailed discussion see among others Einaudi et al. (2001) and Flandreau (1995).

[5]The Latin Union arose from the need to coordinate the intrinsic value of lower denomination coins following the change in the relative price of silver and gold, which prompted Switzerland to debase some of their lower denomination coins. The persistence of small variations in the intrinsic value of some denominations does not concern the policy treatment at hand here, as they did not meaningfully increased transaction costs. The fact that small denomination coins circulated across borders shows that they were accepted at face value. This therefore posed a fiscal problem for the French government which undergo Gresham Law-driven influxes of debased small denomination coins from its neighbors.

3.2. The Italian Unification as an Exogenous Shock

Even though the Italian unification provides the catalyst for its quasi-experimental setting, the paper is not concerned with the reduction in trade costs between Italian states stemming from unification. Indeed, it would be impossible to disentangle the common currency effect between, say, Tuscany and Sicily with other features of political unification. The Italian unification is only indirectly of interest here, to the extent it had important unintended consequences: the exogenous adoption of French institutions by the annexed Italian states. It is however crucial to analyze how the Italian unification as a centralized state *in-itself* was an highly unlikely outcome, brought about by random diplomatic and military events. This provides a first layer of exogeneity and the foundation for the paper's key identification assumptions detailed in Section 4.

3.2.1. Lack of Cultural, Political and Economic Ties among Pre-Unitary Italian States

In 1814, leading Austrian statesman the Prince of Metternich defined Italy as a mere "geographical expression". This definition remained true in 1859, when the outburst of the Second Austro-Sardinian War paved the way, in the space of a few years, to the establishment of a full-fledged political, economic and monetary union as part of a centralized Italian state. This outcome was very much unexpected even a few months before it actually unfolded in 1861[6].

Prior to unification, Italian states had very loose, if any, cultural, political and, above all, economic ties. Culturally, the Italian language was essentially a literary language limited to a small minority. Prominent Italian linguist De Mauro (2017) estimated that at unification Italian speakers amounted to less than 2% of the population[7]. Piedmontese Prime Minister Cavour himself, often depicted as the hero of the Italian unification by popular history, had a at best a weak command of the Italian language, preferring to express himself in French or in the Piedmontese dialect. Despite extensive journeys across Europe, he had little interest for the Italian peninsula, and allegedly never traveled further South than Florence.

[6] Chapter 1 of Barbagallo (2017) extensively reviews this "unforeseen union".

[7] With an upper bound estimate of 10% if the speakers of central-Italian dialects and the clergy are included.

Figure 1: Italy Before and After the 1861 Unification

Politically, eight separate sovereign or semi-sovereign states existed (Figure 1), with no particular perception of a common belonging. A process of divergence in terms of political regimes started out in the 1840s, with Piedmont-Sardinia embracing constitutional monarchy and international integration while the rest of the peninsula remained under the absolutist regimes of direct or indirect Austrian rule, the Pope or, in the South, the Bourbon monarchy.

Economically, the lack of pre-unitary ties is also striking. In the 1850s, intra-Italian trade was 15-20% of the total international trade of the Italian states. However, trade across the borders of the Northern Po Valley (Federico and Tena-Junguito, 2014) between Piedmont and Lombardy-Venetia alone accounted for more than half of this figure. Lack of regional trade is unsurprising when considering the absence of railways along the peninsula, the poor state of the roads and widespread protectionism. Monetary standards differed in each pre-unitary state[8], alongside unit of measures and degrees of financial development. This contrasts with the experience of pre-unitary Germany, where gradual monetary integration pre-dates unification by a few decades.

[8] And even within states, as two different monetary standards were in force in the Kingdom of the Two Sicilies, one for the continental part and one for the island of Sicily.

3.2.2. Unintended Consequences of the Austro-Sardinian War of 1859

While there clearly was no endogenous process behind the sudden unification of Italy, the historical literature also shows how random military and diplomatic events actually led to this outcome (I provide in Appendix B more details on the events as well as a timeline). To be clear, I am not arguing that some sort of Italian integration process was unlikely to get under way by the mid-19th century. What, based on historical scholarship, was however highly unlikely, is the establishment of a fully centralized Italian state by 1861.

A unification process like the one that would materialize in 1861 was neither expected nor desired by policy makers, both in Italy and abroad. While radical nationalist groups had unsuccessfully attempted to foster unrest in the peninsula since the beginning of the century, the idea of a unified Italy was described as "silly non-sense" by the Prime Minister of Piedmont-Sardinia Cavour as late as 1856. The closest thing to unification the political mainstream had in mind before the war of 1859 was the creation of some sort of confederation of Italian states that would be better able to counter Austrian influence in the peninsula. This is in line with what Cavour and Napoléon III negotiated in 1858 as part of a military pact against Austria. They agreed on territorial expansion of Piedmont in Lombardy and Venetia and the creation of a loose Italian confederation. This remained the most likely outcome - following Austria's defeat in 1859 - as late as November 1859 when in the Treaty of Zurich France and Austria agreed on Piedmont's annexation of Lombardy but not Venetia and reiterated a commitment to an Italian confederation under the Presidency of the Pope.

The key factor explaining the turn of events which, between January 1860 and March 1861, led to the proclamation of the Kingdom of Italy is the threat of revolution in Central and Southern Italy. First, fears of geopolitical instability led France to accept Piedmont's annexation of Tuscany and Romagna by mid-1860. Second, the unexpected success of Garibaldi's militias against the army of the Bourbon's monarchy in the Two Sicilies made the establishment of a revolutionary government in Naples a distinct possibility. This pushed both Cavour and the Great Powers to support the annexation of the South by Piedmont in October 1860.

The unexpected character of the unification had important implications for its implementation, which provides the basis for my identification strategy.

4. Identification Strategy

The paper's identification strategy is based on two key assumptions. First, the way the Italian unification was implemented indirectly caused an unexpected, "accidental" reduction in bilateral trade costs between Francophone Europe and the Italian territories annexed by Piedmont (Section 4.1), as the latter exogenously adopted the French Franc monetary standard. Second, in a no-Italian unification counterfactual, those same annexed Italian regions would have been unlikely to endogenously choose to join the French Franc standard (Section 4.2).

Section 4.3 describes more in details the nature and dynamics of the policy treatment, including potential sources of heterogeneity. A discussion of potential threats to the identification strategy coming from coincident factors to the policy treatment is provided later on in Section 5.2.

4.1. Implementation of the Italian Unification

The "Piedmontisation" process through which the Italian unification was implemented is an important part of the identification strategy.

As discussed above, the creation of a confederation among Italian states had long been part of the political discourse by the time the Italian unification occurred. High heterogeneity among pre-unitary Italian states would have indeed warranted a gradual approach to unification and a federal setting, not unlike what Germany experienced in the first half of the 19th century. Nevertheless, the unexpected outcome of the Austro-Sardinian War of 1859 meant that unification took the form of a fully centralized state established in less than five years. This reflected Piedmont-Sardinia's haste in consolidating a relatively weak position, where a tiny - if resourceful - buffer state was suddenly annexing territories with a population more than five times its own, with the looming threat of external aggression from Austria.

The only way this centralized state could be created in such a short time frame, was through a so-called process of "Piedmontisation". Instead of creating new institutions, by 1865 Piedmont-Sardinia's administrative structures and laws were fully transposed - without any amendment of substance - to the rest of the Italian peninsula. This included the adoption of a common Italian currency intrinsically equivalent to the French Franc as the sole legal tender in 1863.

Crucially for the identification strategy, this blanket, automatic extension of Piedmontese institutions to the rest of Italy ensures that the preferences of the annexed states, particularly in terms of monetary standard, could not have been endogenized.

Table 1: Implementation of the Italian Unification

Date	Event
1859-1860	The annexed territories are ruled by revolutionary "provisional governments", sovereignty is progressively transferred through plebiscites; the Piedmontese tariff system is swiftly extended to the new territories with few temporary exceptions.
1st of January 1861	The *laissez-faire* tariffs of Piedmont-Sardinia are applied uniformly in all the annexed territories.
1860-62	The National Bank opens branches in the annexed territories, multiple currencies circulate as legal tender.
1st of January 1863	The French-Franc based Piedmontese Lira, now renamed Italian Lira, becomes the only legal tender. The metric system becomes the official system of measurement for all annexed territories.
2nd of April 1865	A unified Civil Code, based on the Piedmontese code, comes into force in all annexed territories.

Source: Romeo (1984).

Of course, "Piedmontisation" implied a number of policy shocks. In particular trade policy changed dramatically in some annexed states, as the tariffs of Piedmont-Sardinia were fully applied in all territories by end of 1860. However, I will show that this is not a concern (Section 5.2) for the purpose of identification. First, the timing of the different steps of "Piedmontisation" helps disentangle the trade policy shock from the monetary unification one. While intra-Italian trade barriers were abolished as soon as 1859-1860, as part of an Italian custom union aligned to the Piedmontese tariffs, a more gradual approach was adopted as far as monetary unification was concerned (Table 1). Second, and more importantly, the trade policy shock is multilateral in nature,

as tariffs are reduced equally across partners, making the adoption of the French Franc standard the only factor to bilaterally affecting transaction costs between treated pairs.

4.2. OCA Criteria and "No-Unification" Counterfactual

Despite the fact that their adoption of the French Franc standard was "accidental" and their own preferences could not have been endogeneized, the identification strategy would still be endangered if the Italian states annexed by Piedmont were more likely to endogenously self-select into a common currency with France. It is therefore important to consider what might have happened in a no-Italian unification counterfactual scenario.

I rely on previous work (Vicquéry, 2018), where I analyze the determinants of exchange-rate regime choice over two centuries of European history, to show that it would have been highly unlikely that the annexed Italian states would have self-selected into the French Franc zone in a no-unification counterfactual. The key empirical take-away of Vicquéry (2018) is that Optimum Currency Area (OCA) criteria - and in particular shock symmetry - are good predictors, up to two decades in advance, of the key monetary arrangements of the 19th century, such as the Gold Standard or the German unification. However, Italy is a clear outlier in this respect. Sicily, the continental Italian South and, to a lesser degree, Tuscany, were both substantially less correlated with French shocks and traded less with France compared to Piedmont-Sardinia and other polities in the French sphere of influence.

In Table 2, I report the key inputs of the model as well as the odd-ratios obtained with a probit estimation for selected treated pairs. The model predicts a 0% chance of Southern Italy joining a currency arrangement with France or Belgium. The probability is higher for Tuscany but remains orders of magnitude lower than for pairs of regions which will also eventually join a common currency arrangement in the 19th century[9]. German pre-unitary states, for example, would have been a much better candidate to monetary integration with France, based on standard determinants of exchange-rate regime choice.

[9]Excluding Southern Italy and Portugal, pairs of countries which will eventually join common currency arrangements typically exhibit P(CU_{ijt}) well in excess of 0.5 on average.

Table 2: Selected Treated Pairs and OCA Criteria

	Piedmont-Sardinia	Tuscany	Romagna	Two Sicilies
	Bilateral Trade per Capita in 1854-1858 (GBP)			
France	1750.63	804.11	168.28	562.48
Great Britain	441.26	753.78	184.29	625.93
Ratio FR/UK	3.97	1.07	0.91	0.90
	Bilateral Co-Movement of Nominal Shocks (1852-1858)[a]			
France	0.46***	0.35***	-	-0.41
Great Britain	0.55***	0.57***	-	1.41***
	Bilateral Estimated Probability of Adopting a Common Currency (1852-1858)[b]			
France	40.59%	7.80%	-	0.00%
Belgium	66.65%	9.40%	-	0.00%

[a] FX factor coefficients estimated through a Frankel-Wei regression in Vicquéry (2018).
[b] Fitted value of P($CU_{ijt} \mid X_{ijt}\theta$) for pairs i,j estimated in Vicquéry (2018).

4.3. Nature and Dynamics of the Policy Treatment

The policy treatment I examine is fully consistent with the original definition of a currency union in the Rose literature. The Italian monetary unification effectively introduced an irrevocable 1-on-1 exchange rate on metallic currency between the annexed regions and other adopters of the French monetary standard.

Section 8 will provide more details on the possible channels through which the policy treatment could have reduced bilateral trade costs, as well as more perspective on the external validity of the estimate. It is for now important to stress that commodity-based monetary systems like the ones in use in the mid-19th century are better thought of as currency band regimes fluctuating within a floor and a ceiling, rather than pegs: volatility in the exchange rate exists to the extent that there are transaction costs to the shipping of metal across countries. Commonly considered theoretical channels in the Rose Effect literature include a reduction in transaction costs, increase in price transparency and competition, as well as lower exchange rate volatility and trade finance costs (Baldwin, 2006). The adoption of the French monetary standard could have in principle resulted in lower trade costs vis-á-vis other members of the standard through all those channels.

A recent study of the trade effect of the Latin Monetary Union (Timini, 2018), focusing on the post-1860 period and relying on RICardo data at the national level only, highlighted how the looseness of the arrangements in place to coordinate the currency area and solve conflicts among members meant that its effect might have been heterogeneous over time and geography. This might particularly apply to the present paper's analysis in the latter part of the treatment period I consider, from 1866 to 1869.

A potential source of heterogeneity in the policy effect is represented by the establishment of the Latin Union in 1865. The latter provided for further harmonization of smaller denomination "fractional" currency, which were until then characterized by equal face values but might have differed in actual metal content across the zone. An increase in the treatment effect coming from this further step in the harmonization of the monetary standard of members should however not be necessarily expected. The Latin Union arose precisely from the wide circulation of debased coins, which posed a fiscal problem for governments issuing coins with higher intrinsic value.

A second potential source of heterogeneity lies in the impact of the 1866 financial crisis on Italy. Following another war with Austria and a fiscal crisis, the Italian government introduced some capital controls and a parallel paper currency, in-convertible into and trading at a discount with respect to the metallic Lira and its Latin Union equivalents. This implied substantial monetary instability but not necessarily a weakening of the treatment effect. The disruption to trade finance during the crisis meant that international transactions were likely - at least in the period this paper is concerned with - to be invoiced and settled in metallic currency only, possibly increasing the relative transaction cost of trading with non-Latin countries with respect to Latin ones.

Finally, recent research by Chen and Novy (2019) has highlighted the underlying heterogeneity to the estimates of the Rose Effect in the literature. While data availability prevents me from adopting their theory-consistent framework to investigate variable trade cost elasticity, I discuss heterogeneity in my results with respect to their findings in Section 7.3.

5. Empirical Strategy

5.1. Gravity Equation Specification

I estimate a theory consistent structural gravity equation, accounting for multilateral resistance terms (Anderson and Van Wincoop, 2003) and time-invariant unobservables

$$ln\, X_{ijt} = \lambda_{it} + \psi_{jt} + \mu_{ij} + \beta \mathbf{z}_{ijt} + \gamma Franc_{ijt} + \epsilon_{ijt} \tag{1}$$

where X_{ijt} denotes flows to importer i from exporter j at time t; λ_{it} and ψ_{jt} denote time-varying importer-time and exporter-time fixed effect respectively, controlling for time-varying exporter (importer) specific factors, including relative price changes; μ_{ij} is a pair fixed-effects absorbing any time-invariant pair-specific factor; $\mathbf{z}_{ijt}$ and $\mathbf{w}_{ij}$ denote respectively time-varying and time-unvarying pair specific factors; $Franc_{ijt}$ is a dummy variable taking value of 1 once both i and j share the Franc as a common currency and η_{ijt} is a residual error.

The same equation can be written in multiplicative form and estimated using PPML, which is shown to be preferable to estimate log-linear elasticities (Silva and Tenreyro, 2006)

$$X_{ijt} = exp\,(\lambda_{it} + \psi_{jt} + \mu_{ij} + \beta \mathbf{z}_{ijt} + \gamma Franc_{ijt}) + \epsilon_{ijt} \tag{2}$$

I follow Larch et al. (2018) in selecting Equation 2 as my preferred specification and in multi-way clustering standard errors at the exporter, importer, and year levels. In some specifications, I allow for bilateral pairs μ_{ij} to trend, following Campbell (2013) and Campbell and Chentsov (2017).

5.2. Coincident and Confounding Factors

Third factors correlated with switches into or out of common currencies have been shown to represent a potentially important bias in the estimation of the Rose effect (Campbell, 2013). As outlined above, the Italian unification shock implied a number of policy changes that could potentially bias my estimate of the common currency effect. Despite the low ex-ante probability of treated regions to self-select into the French Franc, other confounding factors could also have been at play. I provide a preliminary discussion of those potential threats below and address each of those threats in Section 7.2.

1. **Trade Policy:**

   The period at hand witnessed to a general trend of liberalization of trade, which has been traditionally understood to take effect following the signature of the Cobden-Chevalier treaty by Britain and France in 1860, a few years before the start of my treatment period. There is disagreement in the literature over whether Cobden-Chevalier actually had pro-trade effects (Becuwe et al., 2018), it occurred once trade liberalization was already well under way (Tena-Junguito et al., 2012) or actually put a stop to the deepening of trade liberalization (Accominotti and Flandreau, 2008). What is however a clear feature of trade liberalization in the 1860s is its multilateral character, as Most Favoured Nation (MFN) clauses became widespread. This means that as long as one controls for the presence of a free-trade treaty, changes in trade liberalization should be absorbed by importer-year fixed effects.

   This is also true for the trade policy shock implied by the Italian unification. While the adoption of a French Franc standard led to a bilateral reduction in trade cost, the extension of Piedmont's tariff implied a multilateral, symmetric reduction of trade costs across all partners at the same time. I provide evidence that the assumption of multilateral tariff changes is verified in the data, by computing effective post-unification tariff changes for the annexed Italian states for France and Great Britain.

   I also run several robustness checks, exploiting the lag between the extension of the tariff system and monetary unification and testing for an heterogeneous effect of the trade treaties

coming into force in the Italian states following annexation.

2. **French Capital Exports:**

   A major development throughout the period is the rise of France as a capital exporter. In this respect, one might be worried that the estimated common currency trade effect could simply reflect a recycling of capital exports from France, regardless of the adoption of a common currency. I make sure this is not the driver of my results by running a French Franc "placebo" on recipients of French capital that made formal steps towards but did not eventually adopt a French Franc standard in the 1860s.

3. **Adoption of the Metric System:**

   An unintended consequence of the Italian unification which might bias the common currency effect estimate is represented by the adoption of the metric system's units of measure by the annexed Italian territories. I address this potential bias testing whether I can detect any effect between Italian states and non-French Franc metric system adopters.

4. **Napoleonic Occupation:**

   Finally, French occupation during the Napoleonic period could represent a potential confounder, as most of the Italian French Franc adopters were at some point directly or indirectly part of the French Empire before 1812 and common "French institutions" could correlate with trade. It is important to note that path-dependency and self-selection into French institutions driven by the Napoleonic period, which can explain the behavior of the original, partly French speaking, members of the French Franc zone, had very likely subsided by the 1850s. Among the countries that endogenously made formal steps towards adoption of the French monetary standard in the 1860s, only the Papal States experienced a significant period of Napoleonic occupation. At the same time, within-Italy experiences under Napoleonic occupation varied substantially in terms of length and institutional legacies. Even though, time-invariant confounders are absorbed by high-dimensional fixed effects in my preferred specification I run two distinct robustness check to ensure my results are not confounded. First, I explicitly control for the duration of Napoleonic occupation in some specifications, excluding pair-specific fixed-effects. As a further robustness check, I show that balancing the duration of Napoleonic occupation across treated and control pairs using a propensity score

also confirm my baseline results.

6. Data

6.1. Trade Data

6.1.1. Reconstructing Coherent Pre and Post-Unification Italian Trade Data

A key contribution of this paper is to provide a first reconstruction of coherent trade data for each major pre-unitary Italian states by destination before and after unification, between 1852 and 1869. While official statistics on trade by pre-unitary state exist and were recently surveyed by Federico and Tena-Junguito (2014), they rarely provide flows by destination. More importantly, no official statistics on international trade at the pre-unitary state level were collected post-unification by the Kingdom of Italy.

I get around this problem by relying on statistics compiled by foreign consulates in Italy, drawn from archival and printed sources. French consulates around the world collected an impressive amount of data since the beginning of the 19th century. In 1841, a ministerial circular by Foreign Affairs minister Guizot required French consuls abroad to compile standardized tables on the *Etats de Commerce et de Navigation* of their catchment area, to be sent to Paris annually. The standardized tables included a matrix of trade value by destination/provenance and - even if inconsistently - product. Crucially, recording of detailed trade statistics at the pre-unitary Italian state level continued well into the unification period.

I am therefore able to construct a bilateral trade matrix for four major pre-unification regions, Tuscany, Naples, Sicily[10], Romagna[11] as well as for Piedmont for most years between 1852 and 1869.

Appendix C discusses in more details the sources of the data as well as their shortcomings and

[10] While part of the same polity, the continental South and Sicily had two different custom administrations.
[11] The Eastern part of the Papal States annexed by Piedmont-Sardinia in 1860.

how I address them. It is however important to stress three features of the data.

First, I stop observing trade between Italian pre-unitary states post-unification. As discussed above, this is of largely irrelevant to identification as it would have been in any case impossible to disentangle an intra-Italian common currency effect from the different aspects of political unification occurring at the same time.

Second, I do not observe overland trade for pre-unitary Italian states. This is in any case of little relevance to the trade of Central-Southern Italy in this period, as the vast majority of its trade occurs by sea. Also this implies, if anything, a downward bias on the treatment effect. This is because if overland trade increases, causing a spurious decrease in trade in my data, this is likely to disproportionately affect French Franc bordering countries such as France and Switzerland. I however test in some specifications whether excluding other likely affected countries - Austria and the Zollverein - changes my results.

Third, I address missing reporting in some years and measurement error by estimating gravity equations both on the whole dataset and on a "collapsed" dataset, where I average bilateral trade over eight periods of three or two years, so that all pre-unitary states are reporting within each period.

6.1.2. Other Trade Data

The estimation is carried out on a relatively large bilateral trade matrix for nineteen polities obtained by merging my newly collected data at the Italian regional level with the bilateral trade data of the RICardo project database (Dedinger and Girard, 2017) for fourteen countries: Great Britain, France, Belgium, the Netherlands, the United States, Sweden, Russia, Spain, the German Zollverein[12], Portugal, Austria, Turkey, the Papal States[13] and Greece[14].

[12] When not reported at the Zollverein level, I sum the trade of all the reported members of the custom union.

[13] To which I subtract the trade flows of the Eastern region of Romagna in the pre-unification period.

[14] All of these polities are reporters in the dataset with the exception of Austria, Turkey, the Papal States and Switzerland, which means that the bilateral trade among those pairs is not observed in the dataset.

6.2. Common Currency Treatment Dummy

- **Franc** The treatment dummy variable is coded to be equal to 1 when the importer (exporter) is an Italian state adopting Piedmont-Sardinia's currency following annexation and the exporter (importer) is one of France, Belgium or Switzerland. While the common currency started *de jure* on the 1st of January 1863, I conservatively code the dummy to switch to 1 in the year The Economist magazine[15] begins to quote trade finance instruments on a given pre-unitary state in Sardinian or Italian Lire. This occurs in 1861 for Tuscany, in 1862 for Romagna and on the 1st of January 1863 for the continental South and Sicily. In some specifications, I also add to the dummy trade flows between annexed Italian states and the endogenous new-comers to the Franc area in the 1860s, Greece and the Papal States.

- **Franc (Endogenous):** In some specifications I also estimate a common currency effect for pairs that endogenously adopted the French Franc with a dummy that is coded to be equal to 1 for pairs formed by France, Belgium, Switzerland, Piedmont, Greece and the Papal States. Only the addition of the latter two makes the estimate possible as the other pairs are time-invariant.

In some specifications, I code both Franc dummies so as to include trade flows with incoming adopters of the French Franc, the Papal States after 1866 and Greece after 1868.

6.3. Time-Varying Pair-Specific Controls

Given the high definition fixed-effects specification of my gravity equation, the only controls needed are time-varying pair-specific trade costs.

- **FTA** is a dummy that takes value of 1 once a country pair signs a treaty explicity providing for a reduction in tariffs, according to the extensive Trade Agreements Database by Pahre et al. (2012).

[15] Or Währungen der Welt (1991) in the case of Romagna.

- **War (Allied)** are dummy variables that takes value of 1 in the years where a country pair is at war with each other (allied with each other and actively engaged in a war), according to the Correlates of War dataset by Sarkees and Wayman (2010).
- **Metric System** is a dummy that takes value of 1 once a country pairs adopt the French Metric System of measurements.

6.4. Pair time-unvarying and multilateral time-varying variables

Pair time-unvarying as well as multilateral time-varying variables, including bilateral distance and common language and border dummies and population size are not included in the gravity equation as they are fully absorbed by fixed effects. However, I report them in order to assess observable differences between French Franc adopters and non-adopters and look closely to potential time-invariant confounders. In this respect, Napoleon is a variable equal to the product of the respective years of Napoleonic occupation experienced by the country pair, based on Boudon (2003). Polity2 is the sum of the Polity2 score of political authocracy vs. liberty, according to the Polity (2012) project, for a country pair. A higher score means a higher combined level of political liberty[16]. Using the sum of the years of occupation or dichotomous variables equal to 1 if both countries have been occupied does not meaningfully alter the results. Population data are from Mitchell (1998).

7. Results

7.1. Baseline Results

Table 3 shows baseline results, estimating Equations 1 and 2 using the whole dataset or a "collapsed" sample. The estimated common currency effect is large and precisely estimated, with OLS unsurprisingly producing higher and less precise estimates compared to PPML. My preferred

[16]Technically, this variable is time-variant at the pair level. However, low time variation means it is most of the time collinear with the gravity equation's fixed effects and thus discarded from regressions.

specification, PPML with bidirectional pair, exporter-year and importer-year fixed-effects with collapsed data in column (4), points to a 35% Rose Effect. Reset tests (Silva and Tenreyro, 2006) confirm PPML should be preferred, as misspecification is rejected.

Table 3: Baseline Results

	(1) OLS	(2) OLS	(3) PPML	(4) PPML
Franc	**0.414***	**0.379****	**0.355*****	**0.302*****
	(0.204)	**(0.147)**	**(0.0756)**	**(0.0772)**
FTA	0.116	0.0177	0.0288	**-0.0691***
	(0.0749)	(0.108)	(0.0305)	**(0.0192)**
Observations	3,801	1,882	4,350	2,074
R-squared	0.932	0.985	0.938	0.988
Sample	All Years	Collapsed	All Years	Collapsed
Implied Franc Effect	0.513	0.427	0.460	0.353
RESET Test (P-Value)	-	-	0.0245	0.108

Bidirectional pair, importer-time and exporter-time fixed effects, war and allied dummies included in all specifications but not shown. Multi-way clustered standard errors reported in parenthesis. ***, ** and * denote statistical significance at the 0.01, 0.05 and 0.1 levels respectively.

Table 12 tests the robustness of my preferred estimate to variations in the specification of the gravity equation[17]. As shown by Campbell (2013) and the literature he surveys, positively estimated effects on trade policy variables can hide secular trends at the pair level. Column 1 in Table 12 allows for pair-specific trends in the gravity equation and yields again an estimate close to 35%. The same is true in Columns 2 and 3, introducing unidirectional pair-fixed effects, with and without a pair-specific trend, and in Columns 5 and 6 looking at the sensitivity to the treatment of missing data.

In Table 13 I test the sensitivity of my baseline results to changes in the "control" trade flows. As shown by Rose (2017) this can widely affect the estimates of the common currency effect. Excluding large non-European countries (USA, Russia, Turkey) from the sample as they might be less comparable to treated countries. This tends to lower somewhat the estimated effect to 25%. I also try excluding from the sample non-French Franc countries that are more likely to trade with

[17] The same estimates performed on the complete dataset as opposed to the "collapsed" one yield similar results.

Italy overland (Austria-Hungary and the Zollverein), as given the nature of my trade data this might be a source of upward bias in the effect[18]. There is no sign of such bias as estimates are substantially higher, between 45% and 55%.

I also verify that my results are not driven by any specific country. As in Micco et al. (2003), I drop in turn every country in the sample. Coefficients estimated while dropping one country at a time are plotted in Table 14. The estimated coefficient remains precisely estimated and mostly close to 0.3. This exercise however highlights patterns of heterogeneity that will be examined more closely below.

Table 4: Adding New Joiners and Endogenous Franc Pairs

	(1) PPML	(2) PPML	(3) PPML	(4) PPML
Franc (Exogenous incl. New Members)	**0.305*** **	**0.309*** **		
	(0.0784)	**(0.119)**		
Franc (Exogenous excl. New Members)			**0.304*** **	**0.314** **
			(0.0752)	**(0.137)**
Franc (Annexed Italy and New Members)			**0.338***	0.206
			(0.192)	(0.192)
Franc (Endogenous)	**0.301*** **	-0.0791	**0.309*** **	-0.0964
	(0.116)	(0.171)	**(0.119)**	(0.151)
FTA	**-0.0685*** **	-0.0280	**-0.0685*** **	-0.0279
	(0.0200)	(0.0458)	**(0.0206)**	(0.0693)
Observations	2,074	2,074	2,074	2,074
R-squared	0.988	0.993	0.988	0.993
Sample	Collapsed	Collapsed	Collapsed	Collapsed
Pair-specific Trend	NO	YES	NO	YES
Implied Franc Effects:				
Exogenous incl. New Members	0.356	0.362	-	-
Exogenous excl. New Members	-	-	0.355	0.369
Annexed Italy and New Members	-	-	0.402	0.228
Endogenous	0.351	-0.0761	0.362	-0.0919

Bidirectional pair, importer-time and exporter-time fixed effects, war and allied dummies included in all specifications but not reported. Columns 2 and 4 allow for a pair-specific trend. Multi-way clustered standard errors reported in parenthesis. ***, ** and * denote statistical significance at the 0.01, 0.05 and 0.1 levels respectively.

Table 4 introduces a Franc dummy for pairs that endogenously selected into the French Franc

[18]Even though, as noted in Section 6, if there is a bias, its sign is very likely to be negative overall, as most of Italian overland trade is likely to have French Franc countries as destination.

area. This is only possible when coding the dummy including the 1860s newcomers to the Franc area, the Papal States and Greece, making the variable time-variant and non collinear with pair fixed-effects[19]. The estimated coefficient for the endogenous Franc effect is remarkably similar to the exogenous one, when using my preferred specification in columns 1 and 3. However, the effect turns negative and statistically insignificant once I introduce pair-specific trends in columns 2 and 4. This suggests progressive integration with the French bloc as a possibly important source of endogeneity bias, comforting the identification strategy.

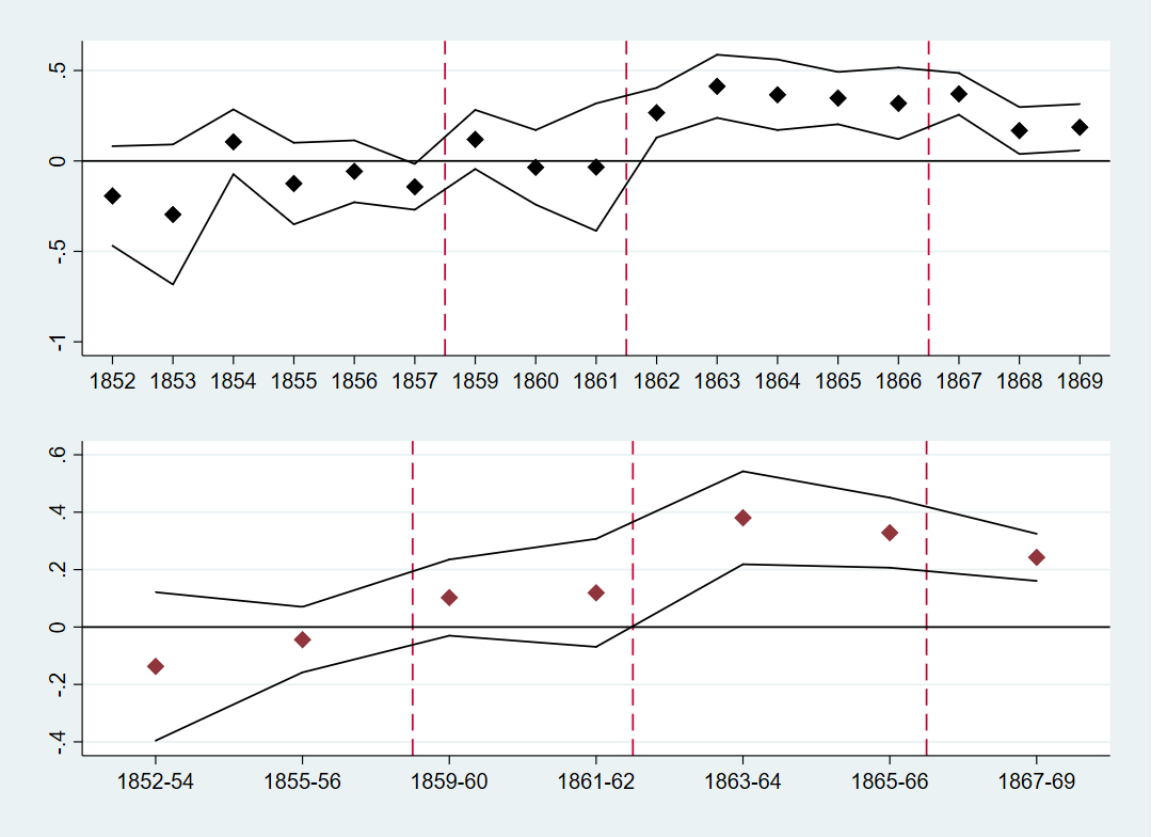
Adding new-comers to the exogenous Franc dummy yields similar results to the baseline. Separating out the effect between annexed Italian states and new-comers in columns 3 and 4 however signals an interesting difference with respect to the endogenous Franc dummy. While the introduction of pair-specific trends in column 4 makes the estimate statistically insignificant the coefficient remains large. This might be related to the reduction in trade costs between the annexed Italian states and the new-comers being more exogenous compared to the larger members of the French Franc area.

7.2. Parallel Trends

It is crucial to my identification strategy that the parallel trends assumptions between treated and control trade flows is fulfilled. Figure 2 provides reassuring evidence that this is the case by plotting leads and lags of the estimated coefficient. No common currency effect can be detected prior to the start of actual circulation of the French Franc monetary standard in the annexed Italian territories. It is particularly reassuring for the identification strategy that no change in the estimated effect can be detected between 1859 and 1861 when the new currency is still to be circulated but new trade tariffs are already in full operation in the annexed territories. I will turn more closely to the issue of the coincident shock to trade policy below.

[19]This is because legacy members of the Franc area, Belgium, Piedmont-Sardinia and Switzerland, entered into a common currency with France years before the start of my sample period.

Figure 2: Leads and Lags of the Franc Effect



Lead and lags of the Franc effects estimated with PPML bidirectional pair, exporter-year and importer-year fixed-effects, using the whole sample (Top Panel, equivalent to Column 3 in Table 7.1) and the collapsed sample (Bottom panel, equivalent to Column 4 in Table 7.1). The first dotted line denotes the beginning of the Austro-Sardinian War and the military events that will lead to the Italian unification. The second dotted line denotes the Italian unification in 1861. The third dotted line denotes the Italian fiscal crisis of 1866.

7.3. Heterogeneity

Figure 2 also allows to explore heterogeneity in the estimated effect along the time dimension. As highlighted above, two sources of potential heterogeneity might be at play after 1866, with further harmonization of coinage with the Latin Union convention on the one hand, and the Italian fiscal crisis of 1866 introducing a parallel in-convertible currency on the other hand. It is crucial to note that only the bottom panel in Figure 2 should be analyzed in this view[20]. The slight decline observed in the coefficient for 1867-1869 might signal an increase in relative trade costs related to the payment-system implications of the Italian fiscal crisis. However, this is not clearly backed by contemporaneous evidence in the consular reports I rely on to build my dataset. While the disruption is clearly mentioned as an increase in trade costs, it seem to be qualitatively portrayed as decreasing the trade costs between Italy and the French Franc area relative to non-French Franc countries. This is due to the fact that international transactions started to be carried out with shipping of physical currency[21], which enjoyed legal tender across the French Franc area only.

Heterogeneity in the Rose Effect along the cross-sectional dimension plays an important role in the most recent reassessment[22] of the Latin Monetary Union trade effect by Timini (2018). He finds the Latin Monetary Union effect to be driven by hub-to-spoke flows between France and the other members, with no role for spoke-to-spoke flows. Table 5 shows this is not the case when looking at the exogenous French Franc pairs, as, if anything, estimated effects are significantly stronger for trade flows between Belgium (Switzerland) and the annexed Italian states.

Asymmetric effects are also shown to be a crucial feature of the Rose Effect in recent work by Chen and Novy (2019). Relying on a theoretical framework allowing for variable trade cost elasticity, they find the common currency effect to be strongly heterogeneous across and within country pairs, with higher effects found for smaller import shares. Both dis-aggregated estimates by the direction of flows in Table 5 and within pairs effects in Table 15 seem to be broadly consistent

[20] The top panel does not accurately portray heterogeneity over time as it does not correct for missing reporting by treated Italian states, which are more frequent after 1865 (See Table 17).

[21] See various comments related to bullion and currency shipping in Ministère du Commerce (1878), "Royaume d'Italie".

[22] Which importantly focuses on what I characterize in this paper as the "endogenous" members of the French Franc area and relying on national level data.

Table 5: Heterogeneity by Trade Flow Direction

	(1) PPML	(2) PPML	(3) PPML	(4) PPML
Franc (France Imports)	**0.371*** **	**0.658*** **	**0.303*** **	**0.523*** **
	(0.123)	**(0.241)**	**(0.114)**	**(0.167)**
Franc (France Exports)	**0.269****	0.0418	**0.215***	0.00520
	(0.132)	(0.139)	**(0.125)**	(0.132)
Franc (Belgium Imports)	**0.575*** **	**0.882****	**0.460*** **	0.448
	(0.128)	**(0.358)**	**(0.157)**	(0.315)
Franc (Belgium Exports)	**0.800*** **	**0.869*** **	**0.792*** **	**0.866*** **
	(0.170)	**(0.186)**	**(0.140)**	**(0.175)**
Franc (Switzerland Imports)	-0.0321	**1.279*** **	-0.0665	**1.362*** **
	(0.334)	**(0.443)**	(0.232)	**(0.432)**
Franc (Switzerland Exports)	**1.316****	**2.394*** **	0.671	**3.269*** **
	(0.519)	**(0.447)**	(0.443)	**(0.508)**
Observations	4,350	4,350	2,074	2,074
R-squared	0.985	0.990	0.988	0.993
Sample	All Years	All Years	Collapsed	Collapsed
Pair-specific trend	NO	YES	NO	YES

Bidirectional pair, importer-time and exporter-time fixed effects, FTA war and allied dummies included in all specifications but not reported. Multi-way clustered standard errors reported in parenthesis. ***, ** and * denote statistical significance at the 0.01, 0.05 and 0.1 levels respectively. The estimates separate out the estimated Franc effect depending on the direction of trade flows of legacy members. As in the rest of the paper, only exogenous pairs involving a legacy member and an annexed Italian state are considered.

with their theoretical predictions, particularly when looking at France. The effect tends to be significantly higher for small import shares, or in other words trade flowing to France from the smaller treated countries, compared to large import shares.Chen and Novy (2019) show similar bilateral asymmetries can be found looking at Euro area members.

7.4. Trade Policy Shock

I now turn to potential coincident third factors that could be biasing my estimate of the trade effect of the exogenous adoption of the French Franc.

In principle, the adoption by the annexed Italian states of Piedmont-Sardinia's *laissez-faire* trade policy could represent a concern. However, as highlighted above, given the multilateral nature of trade liberalization in the period I consider, changes in trade policy should be systematically absorbed by exporter-year and importer-year fixed effects, particularly after 1860 with the proliferation of MFNs clauses. This assumption is consistent with estimated effects of the FTA dummy in all the specifications shown so far, as no pro-trade effect of bilateral trade treaty can be found. Furthermore, looking at the leads and lags of the Franc effect reassuringly suggests that no effect can be detected in the few years where the new tariff regime was already in place but the French monetary standard still had to be implemented.

I now further test the robustness of my assumption regarding the multilateral nature of the trade policy shock implied by the Italian unification.

First, I explicitly test whether the change in bilateral trade costs following the adoption of Piedmont-Sardinia's tariffs was the symmetric for France and Great Britain vis-à-vis all annexed Italian states individually. There is no doubt for this to be true *de jure*. The diffusion of MFN clauses ensures that any bilateral change in tariff is applied to all partners conditional on them having a FTA treaty. However, it might still be the case that, given product-mix differences across partners, the impact of a multilateral trade policy could yield a *de facto* asymmetric change in trade costs. For example, it would be a particular concern in case Piedmont's tariffs were already more favorable to Francophone countries' product mix or became so with new treaties being signed

post-unification. I test whether the assumption of a symmetric multilateral trade shock holds by computing a measure of post-unification effective tariff change T between each annexed Italian region i a partner j for n products k as

$$T_{ij} = \sum_{k=1}^{n} w_{ijk} s_{ik} \tag{3}$$

where w_{ijk} is the share of product k in the the total export of partner j to Italian region i and s_{ik} is the post-unification percentage change in tariff for product k in Italian region i. I am able to calculate T for all Italian regions in my sample vis-à-vis France and Britain across 19 products, relying on the archival data sources discussed in Appendix C and the data on pre and post-unification tariffs by product and region compiled by Stringher (1889).

Table 6: Product-Mix Weighted Post-Unification Change in Tariffs by Partner

	Tuscany	Romagna	Naples	Sicily
Weighted Tariff Change				
France	3%	-14%	-46%	-21%
Great Britain	-4%	-19%	-53%	-43%
Equal Mean T-Test (P-Value)	0.684	0.843	0.837	0.374
Imports Coverage	79%	70%	57%	51%

Source: Stringher (1889), Ministère du Commerce (1878).
The first two rows compute the change in tariffs brought by the adoption of Piedmont's tariff across 19 products, weighted by the share of each product in the total bilateral imports between each region and France/Great Britain. The third row reports the p-value of a equal mean t-test between weighted tariff reduction for France and Great Britain by region. Imports coverage denotes the share of imports covered by the 19 products considered.

As shown in Table 6, the difference in the post-unification effective change in tariffs vs. France and Great Britain is statistically insignificant for all Italian annexed regions. This confirms the assumption of a symmetric change in trade costs coming from the post-unification tariff shock, which should be therefore absorbed by fixed effects. If anything, the computed weighted tariff changes would indicate a downward bias in my Rose Effect estimates. Indeed, the tariff shock seem to have marginally favored Britain, compared to France. As shown in Figure 6, this was driven by larger tariff reductions in products disproportionately exported to Italy by Britain relative to France, such as Iron Ore, Wool and, to a lesser extent, Cotton.

Second, Columns 5 and 6 of Table 7 further explore any differential effects coming from the FTA treaties exogenously extended to the annexed territories by Piedmont, compared to the average FTA effect. I estimate separately from the Treaty variable a Piedmont-treaties dummy turning to 1 when an annexed territory "inherit" a trade treaty as part of the Italian unification. No statistically significant effect can be detected, while the Franc effect remains stable.

Table 7: Coincident Factors

	(1) PPML	(2) PPML	(3) PPML	(4) PPML	(5) PPML	(6) PPML
Placebo Franc	-0.0573	-0.0929				
	(0.124)	(0.138)				
Metric System			-0.0252	0.157		
			(0)	(0.166)		
Franc					0.350***	0.292***
					(0.0769)	(0.0774)
FTA Annexed Italy					0.0823	0.0271
					(0.101)	(0.100)
FTA Excl. Annex. Italy					0.0282	-0.0701***
					(0.0358)	(0.0239)
FTA	0.0253	-0.0744***	0.0243	-0.0763***		
	(0.0299)	(0.0188)	(0)	(0.0261)		
Observations	4,350	2,074	4,350	2,074	4,350	2,074
R-squared	0.985	0.988	0.985	0.988	0.985	0.988
Sample	All Years	Collapsed	All Years	Collapsed	All Years	Collapsed
Implied Franc Effect	-	-	-	-	0.419	0.339

Bidirectional pair, importer-time and exporter-time fixed effects, war and allied dummies included in all specifications but not shown. Multi-way clustered standard errors reported in parenthesis. ***, ** and * denote statistical significance at the 0.01, 0.05 and 0.1 levels respectively. Columns 1 and 2 perform a placebo Franc test using Austria and Spain as placebo-treated. Columns 3 and 4 test whether the Franc effect could be actually driven by the adoption of the metric system. Columns 5 and 6 separate out the FTA dummy for FTAs extended to Italian annexed territories.

7.5. Other Coincident Factors

Other important coincident factors include the rise of France as a capital exporters and the adoption of the metric system by the annexed Italian states.

Regarding the former, it is possible that I might be picking up a spurious effect related to

France's rising role as a capital exporter, regardless of the adoption of the French Franc monetary standard. I address this by running a "placebo French Franc" estimate, where I test whether I can detect an effect for trade flows between the original members of the French Franc bloc and Spain and Austria after 1862. Those countries were highly reliant on French capital and made formal steps towards the adoption of a French monetary standard and Latin Union membership, without ultimately joining. As can be seen in columns 1 and 2 in Table 7 no "placebo Franc" effect can be detected.

With respect to the metric system, I exploit the fact that several countries were metric system adopters but did not have a French Franc monetary standard. I therefore test whether I can detect any trade effect during the treatment period between the annexed Italian states and the Netherlands, Portugal and Spain. Columns 2 and 3 in Table 7 show that such effect is either negative or not statistically significant.

7.6. Confounding Factors and Balancing

Finally, I address the possibility that confounding factors are biasing my results. Propensity score based methods are helpful in this respect, as they allow to build a control group with similar probability of treatment to the treatment group in observational studies. They were previously employed in the context of the Rose Effect literature by Chintrakarn (2008) and Wolf and Ritschl (2011). While the treatment is arguably exogenous, and is shown to be with respect to classical determinants of exchange rate choice the control group exhibits significantly different characteristics across several dimensions, including distance, degree of political autocracy, population size and, importantly, years of Napoleonic occupation, a possible confounder. Column 1 in Table 8 controls directly for such time-invariant factors by estimating the gravity equation without pair fixed-effects. Furthermore, I implement an Inverse Probability of Treatment Weighting estimation to balance co-variates across these dimensions and provide a control group closer to the treatment one. To do so, I first intuitively drop from the control group, in order for it to become closer to the treated pairs' characteristics, non-European countries, bilateral flows that already shared the French Franc before the beginning of the sample and biletaral flows among very large countries

(the sample's top 5% in terms of product of population).

I then estimate a propensity score P as the fitted values of a probit model of French Franc adoption

$$P(Franc_{ij} \mid Z_{ij}\theta) = 1 - \Phi(-Z'_{ij}\theta) \tag{4}$$

where Z is a set of potential confounders to to be balanced, including distance, the quadratic distance, the minimum and maximum population in 1958 within the pair i and j and variables Polity2 and Napoleon. I then weight the sample by 1/P for treated pairs and 1/(1-P) for control pairs. The balancing of covariates obtained through this weighting procedure is shown in Figure 9: the standardized difference in most covariates is substantially reduced, particularly for the years of Napoleonic occupation, with the difference between treated and control groups becoming statistically insignificant.

Table 8: Estimates Controlling for Time-invariant Co-variates

	(1) No Pair FE PPML	(2) PPML - IPT Weighted	(3) PPML - IPT Weighted
Franc	**0.3427****	**0.402*****	**0.339***
	(0.162)	**(0.134)**	**(0.184)**
FTA	**-0.157***	**0.173****	**0.126***
	(0.942)	**(0.0769)**	**(0.0696)**
Napoleon	0.0249		
	(0.0368)		
Observations	2,323	1,101	1,091
R-squared	0.9084	0.9898	0.9898
Sample	Collapsed	Collapsed IPTW	Collapsed IPTW
Pair FE	NO	YES	YES
Pair-specific Trend	NO	NO	YES
Implied Franc Effect	0.408	0.494	0.404
RESET	0.083	0.756	0.715

Importer-time and exporter-time fixed effects, war and allied dummies included in all specifications but not reported. Controls for distance, common language and border, population size, polity2 score included in column 1 but not reported. Column 2 and 3 are estimated on a reduced sample, balancing average Napoleonic occupation, distance, polity2 score and bilateral population size across treated and non-treated pairs. Multi-way clustered standard errors reported in parenthesis. ***, ** and * denote statistical significance at the 0.01, 0.05 and 0.1 levels respectively.

Estimating the gravity equation on a sample balanced on key covariates, as shown in columns 2 and 3 of Table 8, provides treatment effects above the baseline estimate at around 40%.

Table 9: Balancing of Co-Variates Before and After IPT Weighting

	Original Collapsed Dataset			Inverse Propensity Weighted Dataset			
	Franc Pairs	Control Pairs	P-Value	Franc Pairs	Control Pairs	P-Value	St. Diff.
Napoleon	242	59.34	0.000	101.41	91.08	0.489	0.076
Distance	1065.445	1966.106	0.000	1307.67	1259.79	0.257	0.099
Polity2	-4.023	-7.657	0.000	-9.13	-8.57	0.568	-0.075
Population	47,700	220,000	0.000	49,678	51,850	1	-0.035

The table report the average of selected co-variates across Franc and non-Franc bilateral pairs, before and after the sample is weighted as described in Section 7.6.

8. Discussion

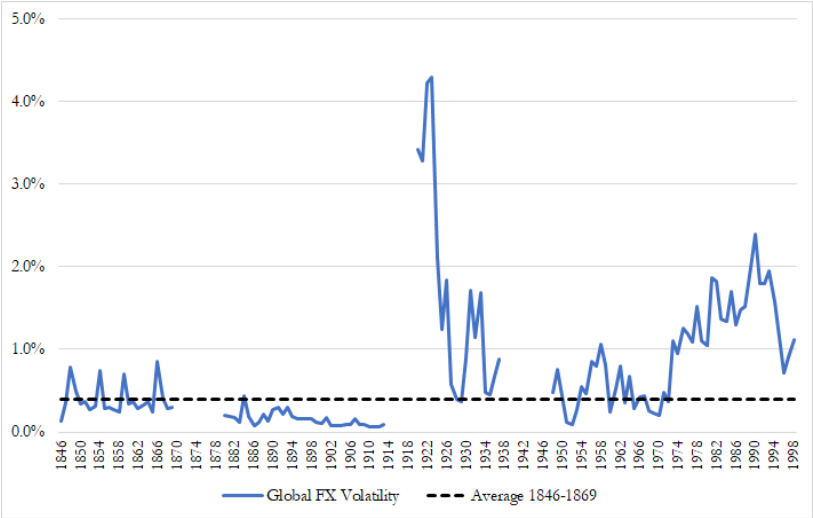
I now turn to a short discussion on the relevance of the paper's results in the context of the wider literature on the Rose effect. I also tentatively highlight some channels that could explain the common currency pro-trade effect I find.

8.1. Comparison with Existing Estimates

The paper's setting raises the issue of my results' comparability with existing estimates of the Rose effect. In particular, one might question the external validity of the treatment effect I examine. Indeed, the latter occurs in a context of commodity-based currencies linked to a metallic parity, where the role of FX volatility - a key plausible mechanism for a pro-trade Rose effect - might not come as intuitive. On the contrary, I will show below how transaction costs related to FX volatility in the period I examine are in line with those experienced during most of the common currency observations in the Rose literature.

Far from suppressing volatility, the behavior of the FX market during this period closely

Figure 3: FX Volatility Now and Then



Source: Global Financial Data, Vicquéry (2018).
Annual average of the standard deviation of weekly log-returns for key currencies against the dominant reserve currency. Key currencies are defined as the ones quoted in The Economist in January 1846 for the 1846-1914 period (12 currencies, GBP numéraire) and in January 1920 for the 1920-1999 period (17 currencies, USD numéraire).

resembled the one of "bands" exchange rate regimes[23]. Metallic currencies' exchange rates typically fluctuated between upper and lower bounds, represented by transaction costs to arbitraging[24], according to money demand conditions.

Figure 3 quantifies FX market volatility for key currencies over one and a half century, providing a snapshot of different volatility regimes. It notably shows how FX volatility in the pre-Gold Standard period was in line with the levels observed during the Bretton Woods period, with a standard-deviation of weekly FX log-returns at around 0.5%. The present paper's environment is therefore in line with the one where the majority of currency unions observations considered by the literature occurs: based on the computation of currency unions switches by De Sousa (2012), the Bretton Woods period represents 35% of the sample but 55% of currency union observations (65% excluding the Euro) in the dataset commonly employed by the Rose effect literature.

Furthermore, it is important to stress how the spread of the French Franc throughout Europe in the mid-19th century was well understood by its promoters as a mean to reduce international

[23]Given technological obstacles to the existence of a spot market, FX transactions in the 19th century were carried using a short-term negotiable instrument, the "bill of exchange".

[24]If the metallic parity is credible, arbitrageurs would self-stabilize the exchange rate around the metallic parity, but arbitrage would only kick-in once the deviation from parity is close to the cost of physically shipping metals.

transaction costs in a context of trade globalization and European integration (See Section 3.1), with striking parallels with the recent EMU process.

Table 10 provides some more elements of comparison between the present paper's results and the wider literature, as I replicate the key estimate by Glick and Rose (2016) for different sub-periods using PPML and high-definition fixed-effects[25]. Estimates of the Rose effect in columns (1), (2) and (3) might be suggestive of heterogeneity in the effect related to different regimes in FX transaction costs.

The estimated coefficient in the moderately volatile pre-Gold Standard and Bretton Woods periods are very similar at around 30%, while the effect is much higher (above 100%) once the more volatile post-1973 period is included. However, the picture is significantly more blurred once slight changes to the sample are made in columns (4) and (5).

Table 10: The Rose Effect Now and Then

	(1) Pre-Gold Standard	(2) Bretton Woods	(3) Post-WWII	(4) Post-1973	(5) Post-WWII
Period	1852-1869	1948-1972	1948-2013	1973-2013	1948-2013
CU Considered	French Franc	All	All - No EMU	All - No EMU	All
% of CU Dyads	3.2%	2.5%	1.6%	1.1%	1.6%
Sample	Collapsed Dataset	G&R (2016)	G&R (2016)	G&R (2016)	G&R (2016)
Estimated Effect	**0.302*****	**0.274*****	**0.716*****	**0.215***	**0.155*****
FX Volatility	0.41%	0.48%	1.35%	1.42%	1.35%

Column (1) reproduces the estimate in Table 1 Column 4. Estimates in Columns (2) to (5) are performed on the dataset by Glick and Rose (2016) using PPML, controlling for FTAs, colonial relationships and importer-year, exporter-year and importer-exporter fixed-effects and standard errors clustered at the exporter, importer and year levels. Source for FX volatility is detailed below Figure 3.

A key reason to compare my results with the wider literature would be to gather some evidence on the size (and direction) of the endogeneity bias in the latter. It would be tempting to conclude, looking at meta-analyses as well as recent state-of-the-art estimates by Glick and Rose (2016) and Larch et al. (2018) - putting the Rose effect at close to 100% - that this bias is sizable. Nevertheless, as shown in Table 10, estimates based on data by Glick and Rose (2016) can be fairly sensitive to

[25]The estimate in column (3) therefore replicates column (5) in Table 1 of Larch et al. (2018).

slight changes in specification and dis-aggregation of various currency unions. This could indicate that the Rose effect I obtain through a well identified quasi-experiment in the present paper might actually not be as low, in relative terms, as it might be suggested by a comparison with recent *preferred* estimates in the literature.

8.2. Channels

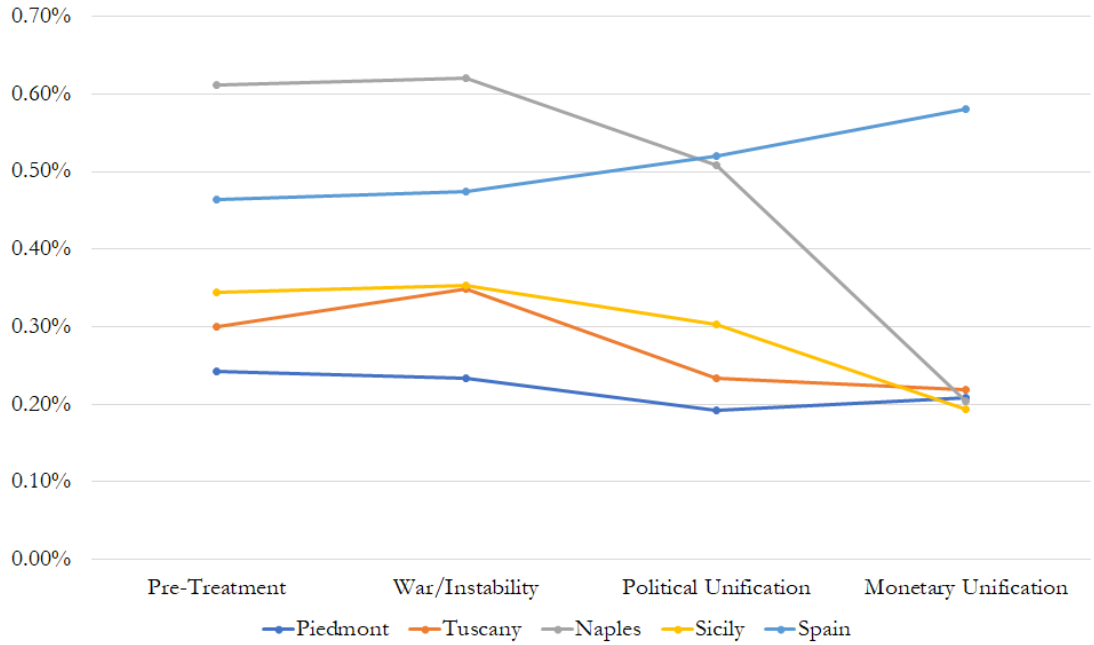
Channels commonly considered in the literature (Baldwin, 2006) include FX volatility, transaction costs related to the use of different currencies, as well as an increase in market transparency and efficiency. Thanks to FX market data collected in previous work (Vicquéry, 2018), I am able to provide some quantification for the first two factors for three of the treated Italian regions I consider: Tuscany, Naples and Sicily. I can compare their developments around the monetary unification shock with those of Piedmont, a longstanding member of the French Franc zone, and Spain, a comparable peripheral country which does not adopt the French Franc.

Overall, the shock had a strong impact on both volatility and transaction costs but with some heterogeneity: it was significantly stronger in the more peripheral Southern regions of Italy compared to Tuscany. This is the mirror image of those regions having a much lower ex-ante probability of joining the French Franc zone based on foreign-exchange regime determinants as discussed above. Figure 4, shows bid-ask spreads on trade-finance FX instruments quoted in London. Transaction costs for treated regions converged to the levels of Piedmont, but only after monetary unification and from different levels: while convergence for Tuscany and Sicily reflected a decrease of about 10bp in the spread, this figure was closer to 40bp for the continental South.

Data on FX and trade-finance instruments also show how the treatment specifically reduced transaction costs between the annexed Italian regions and the French Franc area. Figure 5 shows how the correlation of returns of trade-finance instruments quoted in London between the same countries and France dramatically increased following their adoption of Piedmont's currency[26]. The monetary unification shock is sizable for Tuscany, where co-movement with France increase by about 20pp following treatment, but dramatically larger for Southern Italian regions, where

[26] I examine this in detail in a separate paper (Vicquéry, 2018).

Figure 4: Bid-Ask Spread on Trade-Finance Instruments Quoted in London



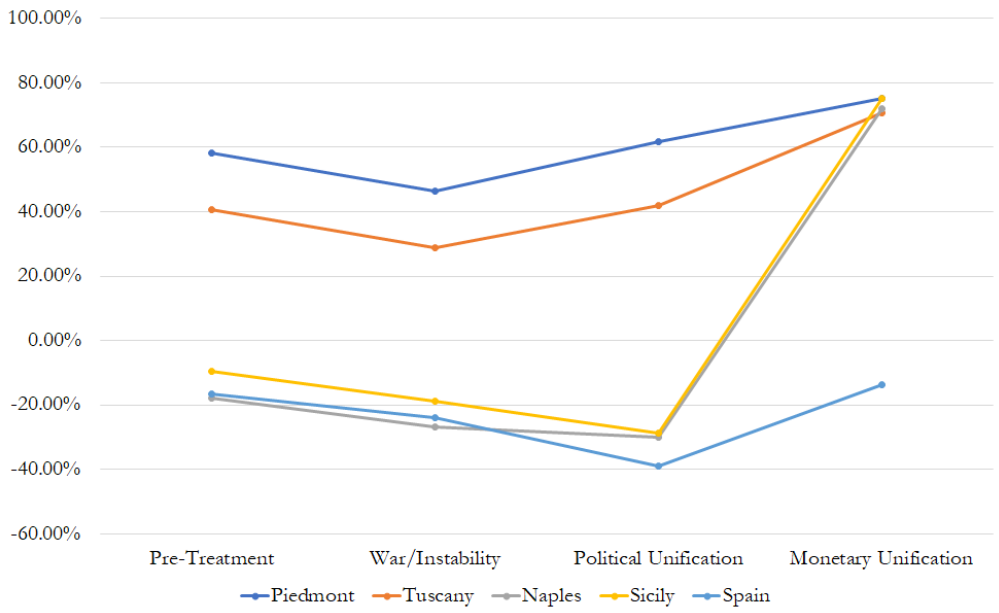
Source: Vicquéry (2018). Bid-Ask Spread on 3-Months Bills of Exchange quoted in The Economist averaged across key periods. Pre-Treatment: 1952-1958. War/Instability: 1859-1860. Political Unification: 1861-1862. Monetary Unification: 1863-1865. Period definition for Tuscany reflects a slightly different timing of events described in Section 6.

co-movement with France used to be strongly negative before treatment.

All in all, the above data can be interpreted as evidence of alternative channels through which a pro-trade Rose effect might materialize, beside reduction in volatility and increase in market transparency. In particular, the Italian monetary unification shock allowed annexed regions to benefit from significantly easier access to French trade finance, as signaled by a marked increased of money market co-movement.

Furthermore, the pattern of heterogeneity in the magnitude of the monetary unification shock shown by financial data fits well with the heterogeneity in the estimated effect shown in Table 14. Tuscany experienced milder shifts in the currency and money markets following monetary unification and is shown to increase the treatment effect once dropped from the dataset.

Figure 5: Co-movement of Returns vs. France - Trade Finance Instruments Quoted in London



Source: Vicquéry (2018). Correlation of 3-Months Bills of Exchange's return vs. France as quoted in The Economist across key periods. Pre-Treatment: 1952-1958. War/Instability: 1859-1860. Political Unification: 1861-1862. Monetary Unification: 1863-1865. Period definition for Tuscany reflects a slightly different timing of events described in Section 6.

9. Conclusion

This paper fills an important gap in the literature on the trade effect of common currency by providing for the first time a causal estimate of the Rose Effect relying on a quasi-experiment.

The estimated effect is large and significant, around 35%. The identification strategy, which relies on an exogenous variation in the membership of the 19th century French Franc monetary bloc, is resilient to a wide range of robustness checks. Importantly, coincident factors are shown not to be driving my findings.

The effect is significantly smaller than the average one found in the Rose Effect literature according to recent meta-analyses (Head and Mayer, 2014; Rose, 2017), suggesting that endogeneity bias might have been playing a role in previous work. Nevertheless, my results are relatively close to the lower bound of recent correctly specified estimates such as in Glick and Rose (2016).

All in all, my results seem to corroborate the broader policy implications of Rose's seminal paper. A common currency is found to have a causal pro-trade effect in the context of what is probably the closest historical precedent to the current process of European monetary integration.

References

Accominotti, O. and Flandreau, M. (2008). Bilateral treaties and the most-favored-nation clause: the myth of trade liberalization in the nineteenth century. *World Politics*, 60(2):147–188.

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

Anderson, J. E. and Van Wincoop, E. (2003). Gravity with gravitas: a solution to the border puzzle. *American economic review*, 93(1):170–192.

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

Barbagallo, F. (2017). *La questione italiana: il Nord e il Sud dal 1860 a oggi*. Gius. Laterza & Figli Spa.

Becuwe, S., Blancheton, B., and Meissner, C. M. (2018). International competition and adjustment: Evidence from the first great liberalization. Technical report, National Bureau of Economic Research.

Berger, H. and Nitsch, V. (2008). Zooming out: The trade effect of the euro in historical perspective. *Journal of International Money and Finance*, 27(8):1244–1260.

Boudon, J.-O. (2003). *Histoire du Consulat et de l'Empire: 1799-1815*. Perrin.

Campbell, D. L. (2013). Estimating the impact of currency unions on trade: solving the glick and rose puzzle. *The World Economy*, 36(10):1278–1293.

Campbell, D. L. and Chentsov, A. (2017). Breaking badly: The currency union effect on trade.

Chen, N. and Novy, D. (2019). The currency union effect on trade: early evidence from emu. *CEPR Discussion Paper*, (12954).

Chintrakarn, P. (2008). Estimating the euro effects on trade with propensity score matching. *Review of International Economics*, 16(1):186–198.

De Mauro, T. (2017). *Storia linguistica dell'Italia unita-Storia linguistica dell'Italia Repubblicana*. Gius. Laterza & Figli Spa.

De Sousa, J. (2012). The currency union effect on trade is decreasing over time. *Economics Letters*, 117(3):917–920.

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.

Einaudi, L. et al. (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.

Fenoaltea, S. (2011). *The reinterpretation of Italian economic history: From unification to the Great War*. Cambridge University Press.

Flandreau, M. (1995). Was the latin monetary union a franc zone? In *International monetary systems in historical perspective*, pages 71–89. Springer.

Flandreau, M. (2000). The economics and politics of monetary unions: a reassessment of the latin monetary union, 1865–71. *Financial History Review*, 7(1):25–44.

Frankel, J. A. (2008). The estimated effects of the euro on trade: why are they below historical effects of monetary unions among smaller countries? Technical report, National Bureau of Economic Research.

Glick, R. and Rose, A. K. (2002). Does a currency union affect trade? the time-series evidence. *European Economic Review*, 46(6):1125–1151.

Glick, R. and Rose, A. K. (2016). Currency unions and trade: A post-emu reassessment. *European Economic Review*, 87:78–91.

Head, K. and Mayer, T. (2014). Gravity equations: Workhorse, toolkit, and cookbook. In *Handbook of international economics*, volume 4, pages 131–195. Elsevier.

Larch, M., Wanner, J., Yotov, Y. V., and Zylkin, T. (2018). Currency unions and trade: A ppml re-assessment with high-dimensional fixed effects. *Oxford Bulletin of Economics and Statistics*.

Lopez-Cordova, J. E. and Meissner, C. M. (2003). Exchange-rate regimes and international trade: Evidence from the classical gold standard era. *American Economic Review*, 93(1):344–353.

Mack Smith, D. (1958). *Garibaldi e Cavour nel 1860.[Trad. di P. Gori].* Einaudi.

Marks, L. F. (1959). Rapporti di consolati e legazioni inglesi in italia dal 1830 al 1870 sulle condizioni economiche e sociali. *Archivio Economico dell'Unificazione Italiana*, I(IX, 3):1–31.

Micco, A., Stein, E., and Ordoñez, G. (2003). The currency union effect on trade: early evidence from emu. *Economic policy*, 18(37):315–356.

Ministère du Commerce, F. (1878). Faits commerciaux. *Annales du Commerce Extérieur*.

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

Mitchener, K. J. and Voth, H.-J. (2011). Trading silver for gold: Nineteenth century asian exports and the political economy of currency unions. *Costs and Benefits of Economic Integration in Asia*, pages 126–48.

Nitsch, V. (2002). Honey, i shrunk the currency union effect on trade. *World economy*, 25(4):457–474.

Pahre, R. et al. (2012). Politics and trade cooperation in the nineteenth century. *Cambridge Books*.

Persson, T. (2001). Currency unions and trade: how large is the treatment effect? *Economic Policy*, 16(33):434–448.

Polity, I. (2012). Polity iv project: Political regime characteristics and transitions, 1800-2012. *On-line (http://www. systemicpeace. org/polity/polity4. htm)*.

Romeo, R. (1984). Cavour e il suo tempo voi. *Bari, Laterza*.

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

Rose, A. K. (2017). Why do estimates of the emu effect on trade vary so much? *Open Economies Review*, 28(1):1–18.

Sarkees, M. R. and Wayman, F. (2010). *Resort to war: 1816-2007. Correlates of War*. Washington DC: CQ Press.

Silva, J. S. and Tenreyro, S. (2006). The log of gravity. *The Review of Economics and statistics*, 88(4):641–658.

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

Stringher, B. (1889). La politica doganale negli ultimi trent'anni. *Giornale degli Economisti*, pages 127–170.

Tena-Junguito, A., Lampe, M., and Fernandes, F. T. (2012). How much trade liberalization was there in the world before and after cobden-chevalier? *The Journal of Economic History*, 72(3):708–740.

Tenreyro, S. (2010). Comment on" the estimated effects of the euro on trade: Why are they below historical effects of monetary unions among smaller countries?". In *Europe and the Euro*, pages 212–218. University of Chicago Press.

Timini, J. (2018). Currency unions and heterogeneous trade effects: the case of the latin monetary union. *European Review of Economic History*, 22(3):322–348.

Vicquéry, R. (2018). Are optimum currency areas endogenous? evidence from the italian and german unifications. Technical report, London School of Economics.

Währungen der Welt, I. (1991). Europäische und nordamerikanische devisenkurse 1777-1914.

Wolf, N. and Ritschl, A. O. (2011). Endogeneity of currency areas and trade blocs: evidence from a natural experiment. *Kyklos*, 64(2):291–312.

Appendices

A. Results Appendix

Table 11: Descriptive Statistics - Collapsed Sample

	Non-Treated Flows			Treated Flows			All Flows		
Variables	**N**	**Mean**	**S.D.**	**N**	**Mean**	**S.D.**	**N**	**Mean**	**S.D.**
Imports	4695	33,500	101,000	275	7,877	11,000	4970	32,100	98,600
Distance	6408	1,966.11	1,847.02	432	1,065.45	313.02	6840	1,909.22	1,802.83
Border	6408	0.06	0.23	432	-	-	6840	0.05	0.22
Language	6408	0.10	0.29	432	-	-	6840	0.09	0.29
Population_i	6408	15,679	16,725	432	9,046	12,753	6840	15,260	16,580
Franc	6408	-	-	432	0.43	0.50	6840	0.03	0.16
Franc (End.)	6408	0.03	0.18	432	-	-	6840	0.03	0.17
FTA	6408	0.22	0.41	432	0.50	0.50	6840	0.24	0.42
Napoleon	6408	59.34	111.99	432	242.00	161.73	6840	70.88	123.98
Polity2	6408	- 7.66	8.45	432	- 4.02	8.06	6840	- 7.43	8.47
War	6408	0.01	0.09	432	-	-	6840	0.01	0.08
Allied	6408	0.01	0.10	432	-	-	6840	0.01	0.09

Table 12: Robustness to Different Specifications

	(1) PPML	(2) PPML	(3) PPML	(4) PPML	(5) PPML
Franc	**0.316****	**0.291*****	**0.326*****	**0.141***	**0.437*****
	(0.131)	**(0.0504)**	**(0.121)**	**(0.0817)**	**(0.164)**
FTA	-0.0278	**-0.0781*****	-0.0409	**-0.0599*****	-0.0261
	(0.0424)	**(0.0172)**	(0.0267)	**(0.0158)**	(0.0408)
Observations	2,071	2,088	2,088	2,170	2,170
Estimator	PPML	PPML	PPML	PPML	PPML
Sample	Collapsed	Collapsed	Collapsed	Unreported to 0	Unreported to 0
Pair-specific Trend	YES	NO	YES	NO	YES
Symmetric Pair FE	NO	YES	YES	NO	NO
Implied Franc Effect	0.371	0.337	0.385	0.151	0.548
RESET Test (P-Value)	0.000	0.00215	0.000	0.115	0.000
R-squared	0.9877	0.972	0.977	0.977	0.9897

Importer-time and exporter-time fixed effects, war and allied dummies included in all specifications but not reported. Columns 1, 4 and 5 include bidirectional pair fixed-effects. Columns 1 and 2 include unidirectional (symmetric) pair fixed-effects. Columns 1, 3 and 5 allow for a pair-specific trend. Multi-way clustered standard errors reported in parenthesis. ***, ** and * denote statistical significance at the 0.01, 0.05 and 0.1 levels respectively.

Table 13: Estimates Across Different Control Groups

	(1) Only Europe	(2) No Overland	(3) Both	(4) Only Europe	(5) No Overland	(6) Both
Franc	**0.220****	**0.449*****	**0.327****	**0.204****	**0.369*****	**0.272****
	(0.106)	**(0.0782)**	**(0.136)**	**(0.101)**	**(0.0901)**	**(0.127)**
FTA	-0.0137	0.0155	0.0823	-0.0678	**-0.0818***	0.0117
	(0.0671)	(0.0307)	(0.0738)	(0.0854)	**(0.0489)**	(0.0739)
Observations	2,944	3,484	2,248	1,422	1,654	1,082
R-squared	0.990	0.993	0.996	0.992	0.994	0.996
Sample	All Years	All Years	All Years	Collapsed	Collapsed	Collapsed
Implied Franc Effect	0.246	0.567	0.387	0.226	0.446	0.312
RESET	0.0104	0.395	0.0398	0.0157	0.483	0.499

Bidirectional pair, importer-time and exporter-time fixed effects, war and allied dummies included in all specifications but not reported. Multi-way clustered standard errors reported in parenthesis. ***, ** and * denote statistical significance at the 0.01, 0.05 and 0.1 levels respectively. Columns 1, 3, 4 and 6 exclude non European partners (USA, Russia, Turkey) from the control group. Columns 2, 3, 5 and 6 exclude partners more exposed to overland trade with Italy (Austria, Zollverein) from the control group.

Table 14: Estimates Obtained Dropping one Country at a Time

Country	Franc	Country	Franc
Austria	0.291***	Russia	0.357***
Belgium	0.254**	Sardinia	0.326***
Britain	0.282**	Sicily	0.294***
France	0.640***	Spain	0.285***
Greece	0.302***	Sweden and Norway	0.311***
Naples	0.290***	Switzerland	0.310***
Netherlands	0.337***	Turkey	0.277***
Portugal	0.306***	Tuscany	0.392***
Romagna	0.260***	USA	0.202**
Papal States	0.296***	Zollwerein	0.352***

Bidirectional pair, importer-time and exporter-time fixed effects, FTA, war and allied dummies included in all specifications but not reported. Multi-way clustered standard errors reported in parenthesis. ***, ** and * denote statistical significance at the 0.01, 0.05 and 0.1 levels respectively. The coefficients shown correspond to estimates obtained dropping one country at a time from the sample and can be compared to the overall coefficient obtained in column 4, Table 3.

Figure 6: Weighted Tariff Reduction Across Italian Regions by Major Product and Partner

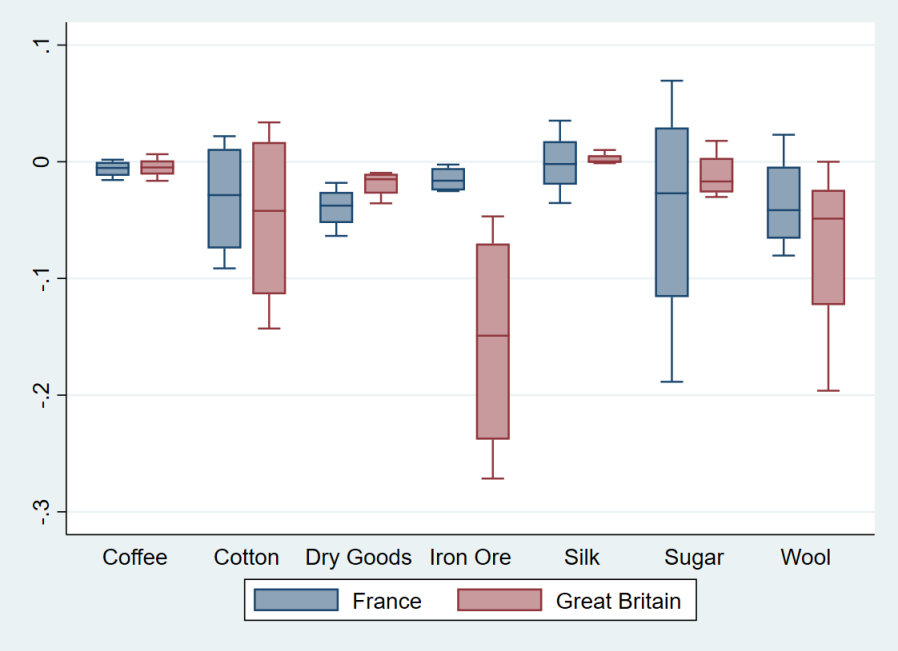


Table 15: Bilateral Asymmetries

Exporter-Importer	Franc Estimate	Exporter-Importer	Franc Estimate
France-Tuscany	0.0538	Tuscany-France	0.229
	(0.148)		(0.153)
France-Romagna	**1.576*****	Romagna-France	**2.680*****
	(0.266)		(0.318)
France-Naples	0.0978	Naples-France	**0.718*****
	(0.199)		(0.233)
France-Sicily	0.298	Sicily-France	**0.566*****
	(0.183)		(0.136)
Belgium-Tuscany	**1.266*****	Tuscany-Belgium	0.0631
	(0.158)		(0.232)
Belgium-Naples	**1.255*****	Naples-Belgium	**0.500****
	(0.296)		(0.226)
Belgium-Sicily	**0.252***	Sicily-Belgium	**0.707*****
	(0.139)		(0.119)
Switzerland-Naples	-0.450	Naples-Switzerland	**1.625*****
	(0.299)		(0.215)

Bidirectional pair, importer-time and exporter-time fixed effects, FTA war and allied dummies included in all specifications but not reported. Multi-way clustered standard errors reported in parenthesis. ***, ** and * denote statistical significance at the 0.01, 0.05 and 0.1 levels respectively. The table compares bilateral asymmetries in the estimated effect when separate coefficients can be estimated without incurring in colinearity issues.

B. Historical Appendix

Piedmontese Prime Minister Cavour, an influential figure in European diplomatic circles, is without doubt the key character behind the events that unfolded in the Italian peninsula around the unification. Nevertheless, Cavour never planned for Italy to become unified nor pursued territorial expansion towards the South of the peninsula before events forced him in that direction(Mack Smith, 1958). He described as "silly non-sense" the mere idea of Italian unification in a letter to a close adviser as late as 1856. The goals of Cavour were, more practically, territorial expansion into Lombardy-Venetia and a weakening of Austrian influence in the peninsula.

Conservative elites in Northern Italy might have been attracted to the idea of an anti-Austrian Italian confederation put forward by moderate intellectuals such as Vincenzo Gioberti. However, they largely opposed Italian nationalism as a dangerous, radical proposition. Their views and interests contrasted markedly with the ones of the small extremist groups of conspirators who supported the Italian national cause. Unification and Italian nationalism were largely championed by secret networks of far-left republicans such as Giuseppe Garibaldi and Giuseppe Mazzini, often resorting to terrorism and unrest. Several attempts to foster popular revolts in favor of Italian nationalism failed miserably in the fifty years preceding unification, due to lack of broad-based support.

Paradoxically, that same fear of political instability, which was inherently associated with Italian nationalism in the first part of the 19th century, ultimately pushed the Piedmontese elite to support the creation of a centralized Italian state, in the aftermath of the war against Austria in 1859.

In 1858 Cavour and Napoléon III met in Plombières to negotiate France's military support against an imminent Austrian attack on Piedmont-Sardinia. The two statesman agreed, in case of victory against Austria, on Piedmont territorial expansion into Lombardy and Venetia and on the creation of a loose Italian confederation. This was very far from the centralized political, economic and monetary union that unfolded only a couple of years later.

The success of the French-Piedmontese armies in the first stage of the 1859 campaign led, as

expected, to the annexation of Lombardy by Piedmont-Sardinia. However, several unintended developments tilted the course of events towards Italian unification.

First, Napoléon III dropped his support for Piedmontese expansion into Venetia, frustrating Cavour's ambitions. Central and Eastern Italy are to remain under Austrian influence and an Italian confederation presided by the Pope is to be created. This partial disavowal of the original French-Piedmontese pact made the conservative Piedmontese elite keener on bolder initiatives against the status quo.

Second, anti-Austrian riots took place in several cities in central Italy in the second half of 1859. Faced with the risk of revolution in neighboring states and the opportunity of further territorial expansion, Cavour skilfully secured the annexation of the smaller Italian duchies as well as the Granduchy of Tuscany and the Romagna territories by March 1860.

Third, in May 1860, Garibaldi's private militias landed in Sicily. Cavour secretly opposed the expedition and unsuccessfully attempted to stop to it by requesting the intervention of France. However, the Sicilian and Neapolitan army unexpectedly collapsed against an out-numbered Garibaldi. As Garibaldi's expedition was able to march on Naples by August 1860, Cavour was once again forced to adapt. The threat of a revolutionary government in Naples pushed Cavour and the great powers to support the annexation of the Two Sicilies by Piedmont-Sardinia in October 1860. As a result, in March 1861 the Kingdom of Italy was officially formed, paving the way for the unification process.

Table 16: Timeline of the Italian Unification

Date	Event
July 1858	Secret French-Piedmontese pact negotiated by Napoléon III and Prime Minister Cavour, supporting Piedmont's expansion into Lombardy and Venetia against Austria.
April 1859	French-Piedmontese war on Austria.
May 1859	Anti-Austrian unrest in central Italy; pro-Piedmont revolutionary governments take power in Tuscany and Romagna.
June 1859	Austria evacuates Milan.
July 1859	Peace of Villafranca: France partially reneges on its promises. Lombardy is to be annexed by Piedmont but not Venetia. Tuscany and Romagna should remain under Austrian influence. An Italian confederation presided by the Pope is to be created. Cavour resigns in protestation to the missed annexation of Venetia.
November 1859	Treaty of Zurich: France and Austria reiterates their commitment to the principles of the Peace of Villafranca, while Piedmont is largely excluded from the negotiation table. Lombardy is nominally ceded to France and transferred to Piedmont.
December 1859	Diplomatic crisis, as pro-Piedmont governments in central Italy refuse to hand power back to Austria. Cavour is recalled to head the cabinet. He exploits French-British rivalries to overrule the Peace of Villafranca and obtains the annexation of Tuscany and Romagna through plebiscites, in exchange for French annexation of Savoy and Nice.
May 1860	Revolutionary militias led by Garibaldi land in Sicily. Cavour opposes the expedition.
August 1860	The unexpected collapse of the Two Sicilies Kingdom against Garibaldi forces Cavour to adapt; the threat of a revolutionary republic in Naples is defused by the annexation of the South by Piedmont.
March 1861	The Kingdom of Italy is proclaimed.

Source: Romeo (1984).

C. Data Appendix

C.1. Sources

As the most detailed original source compiled by French diplomats is sometimes missing from the Archives of the French Foreign Office, I rely on three distinct sources:

1. Where available, I employ the original *Etats de Commerce et de Navigation*'s statistical tables from the French Foreign Ministry Archives in Paris. Most of them are filed in the *Affaires Diverses Commerciales* series of the French *Archives Diplomatiques*, under "Varia", *Cartons* 654-660. Others are filed with the *Correspondance Consulaire et Commerciale* series, within each Consulate's correspondence. The original tables offer the highest level of details but were filed inconsistently and are missing for various years/countries.

2. Fortunately, a high number of the trade reports received by the Foreign Ministry were later published by the Ministère du Commerce (1878) as part of the *Annales du Commerce Extérieur*, a printed publication aimed at a business audience. The statistical tables contained in the *Annales* were at times condensed and provided less details in terms of trade partners but, combined with the original tables, they still allow to build a bilateral trade matrix for most of the years and partners I consider.

3. Finally, I employ equivalent reports from the British consulates in Italy to fill some of the reporting gaps in the dataset. Those reports were very similar in nature to the French ones, likely relying on the same local sources, and were published inconsistently in the Parliamentary Papers[27].

C.2. Shortcomings of the data

My dataset has, by construction, two key limitations. First, intra-Italian trade stops being recorded post-unification and is therefore discarded from the dataset. In any case, this is of little

[27] For a detailed survey of the British consular reports on Italian trade see Marks (1959).

relevance for the paper's objective, as it would have been difficult to disentangle an intra-Italian common currency effect from the reduction in trade costs coming from other aspects of unification.

Second, Italian trade data in my dataset only refer to trade by sea. This is due to the nature of the consular trade data, which were recorded at the ports. This could potentially introduce a bias in my estimates, as the development of a national railway system starting in 1861 is likely to have increased overland international trade: I could then see trade with some partners spuriously declining as it shifts from maritime to overland transportation. However, this is likely to be only marginally relevant for the Central-Southern regions of Italy I consider. Overland trade was non-existent pre-unification. Post-unification, the Italian railway system was developed with a military, rather than economic, rationale. It remained substantially costlier than sea shipping and is normally considered to have been unable to foster the rise of an integrated national market in the first decades of unification (Fenoaltea, 2011). In any case, an increase in overland international trade is likely to imply a downward bias to the estimate of the common currency effect. Indeed, France and Switzerland being bordering countries, they should be proportionally more affected by this potential shift from sea to overland trade compared to the majority of "control" trade partners in the sample. As a robustness check, in some specifications I exclude from the sample non-treated countries, such as Austria and Germany, that are more exposed to an increase in overland trade from Italy and could bias the estimated effect upward.

C.3. Missing Observations and Data Aggregation

I address missing reporting of trade and measurement errors in my original data aggregating up trade flows in a "collapsed" dataset. The latter is sampled by averaging trade at the ij level over three or two years periods. This not only ensures that within each period every treated Italian state reports at least once but also likely reduce measurement errors that are bound to exist in historical sources. This sample leaves me with three pre-treatment periods between 1852-1858, one period corresponding to the wars and annexation process (1859-1860), one period post-unification but before monetary unification, and three post-unification treatment periods.

Truncated reporting in my Italian sources (the smallest partners are not always reported) means

that some of the missing values in the trade matrix are not actually zero. Furthermore, some bilateral flows are not observed by construction, either because they concern intra-Italian flows post-unification or pairs of countries that are both not reporting trade (eg. Turkey and the Papal States). When this is the case, I follow Glick and Rose (2002) and exclude missing values from the sample[28]. In the full sample, this leads to 4970 actually recorded flows out of 6840 theoretical trade flows.

Table 17: Sampling and Missing Reporters by Year

Year	Period	All Italian States Reporting[a]	Collapsed Sample[b]
1852	Pre-Unification	NO (Naples)	1852-1854
1853	Pre-Unification	YES	
1854	Pre-Unification	YES	
1855	Pre-Unification	YES	1855-1856
1856	Pre-Unification	YES	
1857	Pre-Unification	YES	1857-1858
1858	Pre-Unification	YES	
1859	Annexation (North)	NO (Sicily)	1859-1860
1860	Annexation (South)	NO (Naples)	
1861	Unification	YES	1861-1862
1862	Unification	NO (Naples)	
1863	Monetary Unification	YES	1863-1864
1864	Monetary Unification	YES	
1865	Monetary Unification	YES	1865-1866
1866	Monetary Unification	NO (Romagna)	
1867	Monetary Unification	NO (Tuscany)	1867-1869
1868	Monetary Unification	NO (Sicily)	
1869	Monetary Unification	NO (Sicily)	

[a] Missing State reported in parenthesis.
[b] Trade data are collapsed over three or two years period so that in every period all annexed Italian states report at least once.

[28] However, I also show that my results are robust to turning NA flows that are not zero by construction into zeros.