Markets under Siege:
How Political Beliefs Move Financial Markets

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Abstract

Can beliefs about politics, particularly the benefits of war and peace, move thick financial markets? During and after the Siege of Paris by the Prussian army (1870-71) we document that the prices of the French 3% sovereign bond (rente) differed persistently between the Bourse in Paris and elsewhere, despite being the most actively traded financial asset in continental Europe. Further, these differences were large, equivalent to almost 1% of French GDP in overall value. We show these differences manifested themselves during the period of limited arbitrage induced by the Siege and persisted until the peace terms were revealed. We show that as long as French military resistance continued, the rente price remained higher in Paris than the outside markets. However, when the parties ceased fire and started negotiating peace terms, this pattern was reversed. Further, while the price in Paris responded more negatively (positively) to defeats (victories), the price responded more to peace events elsewhere.

These specific patterns are difficult to reconcile with other potential mechanisms, including differential information sets, need for liquidity, or relative market thickness. Instead, we argue that these results are consistent with prices reflecting the updating of different prevailing political beliefs in Paris and elsewhere about the benefits of war versus peace. JEL codes: N23, G12, F51.

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1 Introduction

Can beliefs about politics move financial markets? More specifically, do beliefs about the costs and benefits of war impact equilibrium prices, even for highly traded and liquid assets such as sovereign bonds? Or will the actions of “rational” investors drive prices back to fundamentals? Recent research establishes that political views can shape individual investment choices. However, much less is known about how, if at all, political beliefs can shape real-world equilibrium prices in thick markets.

The question of whether political beliefs can shape aggregate market outcomes has been thus far hard to answer, arguably because we typically observe only one price for each asset. Even if we observe prices in multiple markets, which might reflect the beliefs of different investors, arbitrage leads prices to converge rapidly. At least since the introduction of the telegraph, thick financial markets have been characterized by the “law of one price”.

Further, it is often difficult to attribute the actual prices that are realized by that market to political beliefs rather than endowments or the information that those investors may possess. For instance, when financial asset prices change in response to major political events, it is difficult to discern if these shifts stem from political beliefs rather than from anticipated changes in profitability due to new policies, or other macroeconomic changes that accompany political events.

To answer the question of whether political beliefs can shape equilibrium prices, an ideal setting would involve the same asset being traded by different marginal investors with different political views and with the possibility of different equilibrium prices. In this paper, we exploit a historical episode that is a close approximation to that ideal.

In 1870, French financial markets, along with Paris itself, came under siege. The besieging Prussian army cut the telegraph lines out of the city, leaving communications largely entrusted to carrier pigeons and balloons. However, despite the Siege, both the main Bourse in beleaguered Paris and other French stock exchanges (particularly in Bordeaux and Lyon) continued to function. In particular, the most liquid French asset, the three percent sovereign bond, (henceforth the rente), continued to be actively traded in each exchange.

The disruption of arbitrage during the Siege allows us to observe three time series of prices for the same actively traded asset, and provides a unique opportunity to document if and to what extent equilibrium prices diverge in response to different prevailing local political perspectives on the costs and benefits of continued conflict. We also collect and trace detailed information about the information flows in and out of the city, which allows us to rule out the potential role of different information sets.
As previewed in Figure 1, we first document that price differences for the rente between the three exchanges in the early phases of the war (before the Siege) and in peacetime are close to zero and transitory. However, we show that during the Siege, the price of the rente differed persistently between markets in Paris and elsewhere in France. From the start of the Siege on 19 September 1870 until the ceasefire on 28 January 1871, the rente price in Paris was on average 0.94% higher than in Lyon and Bordeaux. This difference becomes particularly accentuated and persistent (Paris was 1.84% higher) after the unlikely victory of hastily drafted French conscripts over Prussian regular troops at Coulmiers led to the recapture of Orleans in early November 1870.

Further, as soon as the ceasefire began and peace negotiations started, these patterns were reversed. Between the Armistice and the signing of the peace treaty (on 26 February 1871), prices in Paris were on average 2.51% lower than elsewhere. These differences are large. They imply a different aggregate evaluation of the value of French government debt equivalent to 0.30% and 0.86% of French GDP during the Siege and peace negotiations respectively.¹ During the Siege, the rente yield in the provinces was 547 bps in Paris and 542 in Paris. During peace negotiations, it was 551 in Paris and 538 in the provinces.

In section 3, we introduce a model that rationalizes price differences (Corollary 1). We assume that investors in and outside Paris had different beliefs about the benefits of continuing the war vs. surrendering and seeking peace. We assume that Parisian investors preferred a prolonged war, fearing that the terms after many defeats would be too punishing. On the other hand, investors outside Paris favored a swift peace agreement. We model this as investors in and outside Paris having different beliefs about the sensitivity of the final peace terms to victories and defeats. Furthermore, our model offers additional testable implications that we take to the data. First, the model predicts that Paris would react more to battle outcomes (Corollary 2). Second, we expect Parisians to react more negatively to the end of hostilities and hold that pessimistic valuation until peace terms are announced (Corollary 3). Lastly, when the (very punishing) terms of the treaty were revealed (proving the Parisians right), we expect the provinces to have a bigger negative response (Corollary 4).

As predicted by the model, the rente price in Paris responded more to the arrival of news

¹To obtain the GDP percentages above, we first estimate that these differences were equal to 0.51% (during the Siege) and 1.45% (during peace negotiations) of the nominal value of bonds. Second, we calculate that the French debt-to-GDP ratio in 1870 was 59.63% (Source for debt: Annuaire Statistique de la France 1966, source for GDP: Lévy-Leboyer and Bourguignon (1990)). Third, we multiply these two numbers to compare the difference in prices to GDP.
Figure 1: Price ratio of the 3% sovereign bond (*rente*) between Paris and other French exchanges

This figure shows the ratio of the price of 3% rente in Paris divided by the average of the Bordeaux and Lyon prices for that same asset (7-day rolling average). Notice three patterns. First, consistent with the law of one price, the price was very similar in Paris and elsewhere (a ratio of 1) before the start of the war and after the defeat of the Paris Commune. Second, the Parisian price deviated and tended to be consistently higher throughout the Siege. Third, this pattern reversed, and the outside price was higher between the Armistice (end of the Siege and the announcement of the terms of the peace treaty).
of the war and less to news about peace than that of Bordeaux and Lyon. In particular, prices fell more in Paris in response to defeats and rose more in response to the unlikely French victory at Coulmiers. On average, the difference in reactions to military events equals 1.56pp. In contrast, right after the news about peace was announced (the Armistice that ended the war), prices outside Paris rose by 4.89%, compared to a 1.08% price decrease in Paris. Finally, the revelation of the onerous terms of the peace treaty one month after the Armistice (which included the loss of Alsace-Lorraine and an indemnity equal to 25% of French GDP) led to a convergence of prices outside to the price in Paris: the reaction to the peace treaty outside Paris was a 4.09% price fall, compared to a much more muted 0.64% decline in Paris (see Tables 3 and 4).²

These differences are consistent with the different political beliefs of the marginal investors in Paris and the two outside stock markets, specifically reflecting differing views on the gains from continuing the war versus suing for peace. In section 2.2, we show that our interpretation of events is consistent with the historical record, including the impressions of contemporaries. Parisians believed that a successful war of attrition against the Prussians was necessary to get an acceptable peace. The Parisian populace would not accept a humiliating treaty, leading to political unrest. In contrast, provincials saw little benefit to continuing the war and believed that a quick peace treaty was the best they could do.

To the best of our knowledge, this is the first paper to document the presence of price disparities due to differences in political beliefs. We argue that the key source of disagreement that many in France faced was a dynamic trade-off common to many decision-makers facing the prospect of defeat in war-time: between continuing fighting today to secure a better peace in the future or suing for peace to avoid the costs of continued conflict.³

Further, we describe how these specific patterns cannot be reconciled with other potential mechanisms, including differential information sets, need for liquidity, or relative market thickness. First, we show that different information environments cannot explain price differences. The Siege limited communication between Paris and the rest of the world but did not completely stop information sharing. We track when Paris prices appear in a Bordeaux newspaper and find that Bordeaux prices did not converge in response to this information. Neither did prices in Paris converge when news from outside entered the city. Interestingly, ²Devereux and Smith (2007) describes this payment as “the largest transfer in history”. It is hard to overstate the size of the indemnity: it was equivalent to 2.5 times the annual government budget (Devereux and Smith (2007)) and around 1.67 times the size of French yearly exports (Gavin (1992)). See also Dehdari and Gehring (2022); Occhino et al. (2008).
³For a broader discussion of dynamic trade-offs leading to war see Fearon (1996).
the price divergence was even more pronounced during the peace negotiations, when the exchange of information was more regular than during the Siege.

We also describe why our results are hard to explain by differences in liquidity. We calculate price differences for the most liquid dual-listed assets: an Italian bond, an Austrian railroad stock, and the debt and equity of two French railroads. None of these assets present the same patterns as the rente. Since price differences are unrelated across assets, market-wide differences in liquidity are unlikely to be at play.

Our results are also unlikely to be explained by short-term fluctuations due to political beliefs moving thin markets in the regional exchanges. Paris had the deepest financial market in France, and one might expect belief shocks to have less of an effect there. We document instead that during the Siege, the opposite was true, with Paris responding more strongly to war news than elsewhere.

Wealth inequality makes our results more striking. Even though the rente was relatively widely held, the economic elite owned almost all of it. One might expect elites all over France to broadly share similar political beliefs and attitudes. Yet, we find that different prevailing political views of the broader Parisian public and that of others elsewhere began to be translated into substantially and persistently different equilibrium prices as the Siege progressed.

Our paper is closely related to a growing literature showing that political views affect people’s investment decisions, giving rise to heterogeneous beliefs in the market. Investors of different political leanings often disagree about which policies give them the largest economic benefits. For example, U.S. investors from Democrat- and Republican-leading ZIP codes appear to invest more in (risky) equities when their party is in power, suggesting investors think the market will do better when there are economic policies in place that are consistent with their own beliefs (Bonaparte et al. (2017) and Meeuwis et al. (2022)). There is also a growing literature showing that political beliefs affect the actions of financial professionals, which in turn affect investor behavior (Cassidy and Vorsatz (2021), Hong and Kostovetsky (2012), Hutton et al. (2014), Kempf and Tsoutsoura (2018), Kempf et al. (2023), and

\footnote{37\% of Parisians who died with positive wealth held French government bonds, but the wealthiest 5\% owned 84\% of those bonds (calculations made using Piketty et al. (2006)’s replication data.}

\footnote{Relatedly, Cookson et al. (2020) use an investor social media platform to show that Republican investors were less pessimistic during the Covid-19 pandemic, Bernstein et al. (2020) show that Republican-leaning voters are more likely to own houses exposed to sea level rises, and Laudenbach et al. (2020) show that investors in former East Germany, who have grown up with a Communist ideology, invest less in the stock market than investors in West Germany.}
At the same time, it is an open question whether such differences of beliefs affect market-wide pricing (and thereby aggregate investment decisions). In particular, prior research finds that the effects of beliefs on investment decisions tend to be driven by a small sub-sample of investors who actively rebalance their portfolio, are economically small on average, and can take months to materialize (Meeuwis et al. (2022)). Particularly in thick markets, one might expect cooler (less-partisan) heads to prevail in equilibrium and to arbitrage away any partisan impact on prices such that, in equilibrium, asset prices are unbiased.

Further, as noted above, the share prices of companies that are politically affiliated or that may benefit from the policies of a new regime often do move with political events such as elections, but it is less clear whether this is the result of belief disagreement or instead reflects news that also affects future cash-flows (e.g., Fisman (2001); Faccio (2006); Mattozzi (2008); Addoum and Kumar (2016); Girardi (2020)). Compared to this literature, by exploiting the existence of three concurrent price series for the same asset in locations with different prevailing political views, our paper provides evidence linking large and persistent equilibrium price-differences in a liquid and actively traded asset directly to differences in political beliefs.

Our paper is also related to an established literature on the importance of differences of beliefs for investment decisions (see, among others, Miller (1977), Harrison and Kreps (1978), Jarrow (1980), Harris and Raviv (1993), Kandel and Pearson (1995), Hong et al. (2006), and Hong and Stein (2007)). Recent empirical work suggests that differences in beliefs are significantly related to trading activity but that economic effects are small (e.g., Ameriks et al. (2020), Giglio et al. (2021), and Cookson et al. (2020)). Further, the evidence that differences in beliefs have aggregate (pricing) implications is limited. There are some exceptions. There is evidence from dual-listed shares that is at least consistent with differ-

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6 Another literature establishes this for economic forecasts, but effects on individual consumption decisions are mixed (Conover et al. (1987), Gerber and Huber (2009), Gillitzer and Prasad (2018), and Mian et al. (2017)).

7 Two papers show price effects of different political beliefs: Dagostino et al. (2020) on loan pricing and Baldauf et al. (2020) on real estate. Our findings apply to a homogeneous and liquid asset.

8 Further, the existing empirical evidence is predominantly based on the recent increase in U.S. political polarization. We show economically meaningful effects in a different setting in response to political disagreement related to the costs and benefits of war and peace.
ences of beliefs affecting equilibrium prices (Froot and Dabora (1999)). Compared to this literature, our paper provides direct evidence that differences of political beliefs can have economically significant equilibrium pricing effects.

Our paper also relates to a literature examining where differences in beliefs emerge. There is growing evidence that personal experience is important (e.g., Bordalo et al. (2022), Vissing-Jorgensen (2003), Greenwood and Nagel (2009), Choi et al. (2009), Malmendier and Nagel (2011), Malmendier and Nagel (2016), Koudijs and Voth (2016)). There is also evidence that social networks and peer effects matter (e.g., Hong et al. (2004), Hong et al. (2005), Bursztyn et al. (2014), Bailey et al. (2018) and Bailey et al. (2019)). Burnside et al. (2016) provide a theoretical model in which investors can get ‘infected’ by others’ beliefs. In our setting, negative war experiences notwithstanding, many on the Parisian ‘street’ perceived continued French resistance as preferable for securing a better peace. Compared to this literature, our evidence suggests that these popular beliefs in Paris even infected the local economic elite (who likely set asset prices on the margin) such that their beliefs deviated from that of economic elites elsewhere.

Our paper also builds upon a literature that explores the relationship between war and finance (see Jha and Van Rensselaer (2021) for an overview). Financial markets, by aggregating the beliefs of investors, can provide important information to political decision makers. As conflict, and particular defeat and its aftermath, is economically destructive and can lead to increased risk and uncertainty (e.g., Barro (2006); Besley and Mueller (2012); Verdickt (2020); Wang and Young (2020)), broad asset prices can drop substantially in the face of conflict (Rigobon and Sack (2005); Schneider and Troeger (2006); Zussman et al. (2008); Jha

\textsuperscript{9}For example, Baker et al. (2012) show that price differences between dual-listed shares are correlated with differences in the principal components of a number of local sentiment proxies. Jia et al. (2017) show that dual-listed shares in Hong Kong and mainland China respond differently to analyst forecasts depending on their location. Moreover, firms that more analysts cover see a lower return correlation between the two share classes. In addition, Koudijs and Voth (2016) show that different experiences of margin-lenders during the Panic of 1773 differentially affected haircuts on future margin-loans in an over-the-counter setting with search frictions. This appears to have had implications for market-wide haircuts.

\textsuperscript{10}For example, Willard et al. (1996) and Calomiris and Pritchett (2016) examine how currency and slave prices in the US Civil War responded to war events as means to gauge public opinion of the chances of Union victory. Mitchener et al. (2015) use bond prices to predict victories in civil wars. Frey and Kucher (2000) and Ferguson (2006) look at bond prices around WWII and WWI, respectively. We contribute to this literature by reinforcing that the ‘smart money’ may actively disagree, and such responses can be significantly influenced by the changing beliefs of the marginal investor rather than necessarily reflecting a broader consensus.
and Van Rensselaer (2021)). The informative aspect of financial markets can be further reinforced when decision-makers are themselves invested in broad financial assets, aligning their interests with the broader economy as well (Jha (2015); Jha and Shayo (2019); Jha et al. (2020)). Both of these effects can lead asset prices to moderate the political behavior of individuals, including elites. Our paper shows, however, that this potential moderating effect depends significantly on the political views of marginal investors.

We first provide some brief historical background on the Franco-Prussian war, the politics of France during the Siege, the exchanges, and the information flows. Next, we provide a parsimonious theoretical model to better understand price differences in and outside Paris and to derive additional empirical predictions. We then turn to our main empirical results: price differences and differences in the reaction to events. We also rule out the role of different information sets or liquidity shocks. Finally, we discuss the implications of our findings and avenues for future research.

2 Historical Background

2.1 The War

The Franco-Prussian War of 1870-71 was the greatest conflict in Europe between the end of the Napoleonic Wars and the First World War (Clodfelter (2017)). Though the war lasted less than half a year, it was a turning point in European history. France saw the death of an empire and the birth of a republic, Germany emerged as a unified state, and the stage was set for more global conflicts to come (Horne (2012)). In short, the Prussian prime minister, Otto von Bismarck, successfully provoked the French to declare war to unite Germany by manipulating the language of a diplomatic communication, the so-called ‘Ems telegram’ on July 13, 1870. This incensed German public opinion and, in turn, provoked the French to declare war on July 16, 1870.

The war was initially very popular on the Paris streets and among representatives of the French imperial parliament – with “war fever” among some, combined with concerns about a rising Germany (Wawro (2003), p. 38). Importantly, the French rente price did not reflect the war fever outside the Bourse, and the rente fell a dramatic 9.97% both in and outside Paris in the lead-up to the war (see the time series of the rente price in Figure A.12). Indeed,

\[ \text{Jha and Van Rensselaer (2021) take a sample of all inter-state wars in which at least one participant had an active stock market with daily returns between 1900-2020. They find that, on average, there is a 2.5\% fall in the three-day cumulative abnormal returns when a war begins in the countries involved.} \]
France was ill-prepared for war, both diplomatically and militarily. Though not apparent \textit{ex-ante}, two strategic missteps ensured a French defeat. First, French imperial forces squandered their early numerical advantages by failing to seize the initiative, relying too much on fortified strong points such as Wissenbourg and Spicheren that were eventually unable to withstand the Prussian artillery (Wawro (2003)). Second, Emperor Napoleon III split his army, allowing the Prussians to surround them separately. Marshal Bazaine’s army contested a major battle at Gravelotte before he withdrew to the fortress-city of Metz, where he was besieged. Napoleon III’s own force withdrew towards Mars-la-Tour and ultimately Sedan, where it was also surrounded. After a disastrous battle there on September 1st, 1870, leading to around 122,031 French deaths, wounded, or captured (Clodfelter (2017)), the French Emperor rode alone through the Prussian lines to seek terms of surrender.

The capture of the Emperor delegitimized the remaining Imperial regime. A group of revolutionaries ascended the steps of the Hotel de Ville in Paris to declare the deposition of the Emperor and the creation of the Third Republic. To put pressure on the French authorities to negotiate terms, Prussia laid Siege to Paris on September 19, 1870.

2.2 The Siege and the Politics

The political divide between left-wing Paris and conservative rural France predated (and outlived) the Franco-Prussian war. Figure 2 shows the left and center-left outperformed in Paris in all seven free elections from 1848 to 1885, and that the gap was particularly high in 1871. Since the marginal investor was rich, we restrict the sample to the 1\% richest arrondissements (for Paris) or communes (for the rest of France). We use Cagé and Piketty (2023)’s data both for income and election results. \footnote{For example, in 1871, we only the 1\textsuperscript{st}, 6\textsuperscript{th}, 7\textsuperscript{th} and 8\textsuperscript{th}, and 16\textsuperscript{th} arrondissements. The classification of parties is also from Cagé and Piketty (2023). For example, in 1871, Radical candidates were the left, and Republicans and Moderate Republicans the center-left. In the appendix, figure A.2 shows the votes for all communes (not just the richest 1\%), and figures A.3 and A.4 show the votes for the left (excluding center left) for the richest 1\% and all communes respectively.} In the appendix, figure A.1 shows the percentage of deputies in the National Assembly identified as leftist, republican, or liberal in Paris versus in the rest of France. Paris consistently elected more left-wing representatives.

Left-wing Paris and conservative rural France fundamentally disagreed about the benefits of war and peace. After the Battle of Sedan, it was clear to almost everyone that France would have to come to terms if there was to be peace. However, the nature of those terms was much less clear. The Republicans in Paris felt that continuing a war of attrition against
The Prussians would ultimately improve final peace terms and increase the likelihood that the (Parisian) population would accept the peace deal. For many outside Paris’ walls, and indeed around the world, however, a common view was that the costs of war dominated the potential gains from continued resistance, and France should seek peace as soon as possible.

The divergence in beliefs between Paris and the rest of France appears to have emerged after the Battle of Coulmiers on November 9, 1870. In response to the defeat and capture of almost all of France’s (largely Bonapartist) professional arm, the new Republican government instituted a levee en masse – new conscription of citizen-soldiers like those who had saved the Revolution in the 1790s (Ferguson (2000)). New conscript forces were raised around France. A proof of concept came in Coulmiers on November 9, 1870. In the first clear victory of French arms during the war, French levees surprised Prussian regulars, leading them to temporarily abandon Orleans.

The disagreement between Paris and the rest of France is well documented in the literature and was apparent to contemporaries. For example, in his account of the Siege, Horne writes: “From the very first, the war was markedly less popular in the provinces than in Paris.” (Horne (2012) p. 39). Ironically, despite claiming to be staunch republicans, the junta in Paris was aware that their pro-war view was a minority one for French voters in
general, and they consistently delayed holding elections that would return a more pacifist government. The Italian foreign minister complained that “The obstacle to peace is Paris,” because politicians there will not “accept certain conditions that the French nation might be disposed to accept.” Wawro (2003) writes: “...many of the neutral powers had begun to resent the French provisional government’s intransigence and its unwillingness to hold national elections that, according to Italy’s foreign minister, ‘would return an assembly with a strong pacific current’ ” (p. 246). When Jules Favre, the French minister for foreign affairs, sent a messenger to the Germans to start armistice negotiations, he asked for secrecy: “God only knows what the Parisian populace will do to us when we are compelled to tell them the truth” (Horne (2012), p. 239). Another contemporary observed: “There is a danger. And that is, one doesn’t know whether, the capitulation having been signed, it will not be rejected by the virile portion of Paris.” (Horne (2012), p. 241).

Contemporaries also noticed that this disagreement caused bond prices in Paris and the Rest of France to diverge. After the ceasefire, an anonymous financial analyst for The Times of London wrote:

“It is worth noting that during the time Paris was [surrounded], prices ruled higher than those in the principal provincial bourses... This was probably owing to the conviction being entertained by Parisians that armies from the provinces would relieve them, whereas outside that was known to be a delusion. But since the capitulation the Bordeaux prices have been better that those of Paris... The explanation no doubt is that at Bordeaux the armistice was considered morally certain to lead to peace, whereas in the capital that was not clear.” (The Times, February 15, 1871).

It is certainly possible that, as the Times analyst argued, there were two sources of disagreement: the first about the probability of winning against the Prussians on the battlefield, the second about the likelihood of the French population accepting the Peace treaty. A simpler explanation for the divergence in prices is that Paris and the Rest of France disagreed about the sensitivity of peace conditions to French success on the battlefield, which is what we explore in our theoretical model in Section 3.


14German Chancellor Bismarck predicted that stringent peace conditions, including seizure of large parts of Alsace and Lorraine, would humiliate France and lead to future war, but he was overruled by his generals (see Dehdari and Gehring (2022).)
The battle of Coulmiers would be the only significant victory by the French conscript armies. Soldiers lacked training and discipline and faced a series of defeats. Attempts to break the Paris siege from the inside were also repelled. Eventually, with starvation in the offing, a breakdown of military discipline, and the threat of revolution, Parisian authorities agreed to an Armistice and the calling of elections on January 28, 1871.

France elected representatives to a National Assembly on February 8, 1871. Consistent with our interpretation and with the views of contemporaries during the Siege, the provinces, overwhelmingly rural and conservative, elected a pro-peace majority. Paris, on the other hand, elected mostly republican, pro-war candidates. The Treaty of Versailles was announced on February 28. The conditions were harsh: the loss of Alsace-Lorraine and payment of a five billion francs indemnity. This sum was equal to 25% of France’s GDP and 2.5 times its yearly government budget, to be paid over three years. On March 1, the Assembly voted to ratify the peace treaty. Table A.2 confirms that a majority of the representatives elected in Paris (Seine district) voted against ratification, while, apart from one abstention, all the representatives elected in Bordeaux (Gironde) and Lyon (Rhone) voted in favor. This was not a done deal however. As we explore in companion work, the onerous peace conditions sparked a Civil War in France between the so-called left-wing Commune in Paris, that refused to accept the terms of peace, and the new French conservative government that supported the Versailles treaty.

2.3 The Bourses and the Information Flows

The Paris financial market was “the leading financial center in continental Europe throughout the nineteenth century (Hautcoeur and Riva (2012) pg. 3).” We compare asset prices in Paris to that of two regional exchanges, Lyon and Bordeaux, which were the longest-established stock exchanges in France after Paris. During normal times, there was real-time information sharing and active arbitrage via telegraph between Paris and the regional exchanges. Information delays were minimal, and

15Horne (2012) (p. 254) writes: “… the contenders fell into two principal groups, the ‘list for peace’ and the list for continuation of the war. If the latter comprised principally the left-wing firebrands of Paris, those standing on the ‘list for peace’ were essentially conservatives from rural France”. Among the left-wing firebrands were the writer Victor Hugo, the Italian patriot Giuseppe Garibaldi, and the future prime minister Georges Clemenceau, who would make the recovery of Alsace-Lorraine a career goal (finally achieved in 1918).

16The Lyon exchange was the first provincial exchange to gain the right to establish a trading floor in 1845 (Ducros and Riva (2014),6-7). Bordeaux did so in 1846. Using commissions as a measure of transaction volumes, Ducro and Riva suggest that the Lyon stock exchange had about 1/10 of the volume of trading of the exchange of Paris in 1870 (Ducros and Riva (2014), p.34)
arbitrageurs could take opposite positions in different markets that would clear within minutes. This was further facilitated by the presence of futures markets that obviated the need for arbitrageurs to take expensive spot positions. However, with the start of the Siege and the cutting of telegraph connections between Paris and the rest of the world, real-time information sharing disappeared. Instead, news now depended upon balloons, carrier pigeons (carrying micro-filmed messages), and smugglers crossing enemy lines.\textsuperscript{17} After the Siege ended, telegraph connections were not reintroduced, though the Prussians did allow people in and out of the city. It would only be on May 28, 1871, that the telegraph lines were repaired and restored.\textsuperscript{18}

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This table shows the (inverse) frequency and delay of information flows in and out of Paris. During the Siege, hydrogen-filled balloons left Paris with mail, official communications, and homing pigeons. Those pigeons were sent back to Paris with private mail and official communications. Both during the Siege and subsequent peace negotiations, a Bordeaux newspaper printed Paris prices, and a Parisian newspaper printed news from the outside. The mean (inverse) frequency measures how often news arrived through each medium. The maximum is the largest time interval without news from that source. ‘Delay’ measures how old were the prices and news observed at the time they arrived in Bordeaux and Paris, respectively. Sources: \textit{La Gironde}, 1871-03-03 (roll-call), and \textit{Journal Officiel}, 1871-02-14 and 19 (representatives and their districts).

In Table 1, we show the amount of time between instances in which news from outside the Prussian cordon was reported in Paris (and vice versa) during the Siege and the subsequent peace negotiations. During the Siege, on average, balloons landed outside Paris every 2.71 days. Starting in October, pigeons arrived in Paris every 3.32 days on average. We also report

\textsuperscript{17}Even for the Rothschilds besieged in Paris, communications were extremely difficult, and they depended on the balloons as well, with significant delays. For example, on December 10, Alphonse de Rothschild received a letter dated October 21 (Ferguson (2000), pg 203). The Rothschilds were only able to restore regular letter correspondence even between their constituent banking households on February 3, 1871, onward (Ferguson (2000), pg 203).

\textsuperscript{18}Private telegraphic communication between Paris and Bordeaux was restored on June 25 and between Paris and Lyon on June 23 (La Gironde, 1871/06/23-25, Le Salut Public 1871/06/23).
how often the Bordeaux newspaper La Gironde printed the prices of the Paris Bourse: every 4.15 days during the Siege, and every 1.78 days during peace negotiations. Lastly, we report how often Le Figaro, a Parisian newspaper, printed news from the outside world: every 3.17 days during the Siege, falling to every 2.13 days during peace negotiations.

More importantly, we can establish the average delay in information transmission from the Bordeaux and Paris newspapers. During the Siege, the median price printed in Bordeaux was five days old, with the 25th and 75th percentiles at four and six days. The median news from outside reported in Paris was seven days old, with the 25th and 75th percentiles at five and nine days. The delays were shorter during peace negotiations, with a median of three days for Paris prices in Bordeaux and four days for outside news in Paris.

Though Paris and the outside world continued sharing information, significant information delays did limit arbitrage between Paris and the regional markets. Moreover, the physical clearing of accounts was likely restricted in the absence of reliable information channels. These limits to arbitrage implied an upper and lower bound in cross-market price differences. Within these bounds, prices in Paris and elsewhere could differ to reflect the beliefs (and other conditions) of the marginal investor in those markets specifically.

In section A.4, we simulate a trading strategy that aims to exploit price differences. Due to price volatility and uncertainty in the information flows, risk-free arbitrage was not possible. Even with assumptions very favorable to traders, they only obtain moderate Sharpe ratios, between 0.47 and 0.85 (today’s traders in the city of London get a Sharpe ratio of 0.7 on average (Coates and Page (2009)). This suggests that arbitrageurs could have acted to bring prices closer together but stopped when risk and uncertainty started to dominate arbitrage opportunities.

Further, in a detailed analysis of the micro-filmed messages transported by carrier pigeons into Paris, we provide evidence that though some agents were actively arbitraging, this activity was minimal (see Appendix A.3). This suggests that there was little pressure in Paris and the regional markets to push prices even further away from one another, and that belief disagreement largely remained within the arbitrage bounds.

We focus on the French 3 percent sovereign bond (hereafter, the rente). The rente had

---

19 For example, take a symmetric information delay of five days. An arbitrageur would have to use five-day-old information from the other market to take a position that he could only offload five days into the future. Such a “round-trip” of ten days was risky, especially during the Siege and its aftermath as prices were volatile. Indeed, during the 18th century when information traveled by sailing boats, similar delays led to substantial price differences between cross-listed assets (Koudijs (2015, 2016)).

20 This is similar to the so-called “gold points” during the Classical Gold Standard period, see Officer (1993) for example.
a nominal value of 100 francs, and its interest was 3% annually, paid quarterly. During the
nineteenth century, the rente was the most liquid security in France (Nouveau Tableau de
la Bourse de Paris. Conseils aux spéculateurs (1858), pp. 63-66) and, indeed, the most
actively traded asset in continental Europe.\footnote{Rentes represented 7.7 million francs of the
capitalization of the Paris Bourse in 1870 compared to 5 million for stocks (Viaene (2002)).
For an excellent overview of French sovereign debt, see Hautcoeur (2007) and other volumes in
that series.}

Further, the rente was broadly held.\footnote{Hautcoeur (2007) points to the “democratization of the rente”
over the 19th century (p.331), as successive governments reduced the minimum denomination that
could be registered from 50 Francs in 1831 to merely 3 Francs according to the Finance Law of
July 1870.} In 1872, 37% of all Parisians who died with positive wealth held French government
debt (comprising 10% of all Parisians who died that year). The total value of those bonds was
equivalent to 12% of all inherited wealth. However, ownership was concentrated among richer indivi-
duals. The richest 5% held 84% of French public bonds (our calculations using Piketty et al. (2014)’s
replication data).\footnote{Another way to approximate the rente’s popularity is by looking at
subscriptions. The number of primary subscriptions to the last-prewar rente issuance (1868) was
832,798 (having risen from 99,224 in 1854). Further, the number of separate registrations of rentes
(inscriptions) in the General Ledger in 1870 was 1,254,040, reflecting a sum of 358,087,510 Francs
(Hautcoeur (2007) p.333-34). Naturally, both these figures could, to some extent, reflect large
investors making multiple subscriptions and registrations, and as Hautcoeur argues, the actual
number of individual proprieters is hard to know for sure. However, Leroy-Beaulieu suggests a
ballpark of 550,000 or 600,000 individual investors before 1870. (Hautcoeur (2007), p.335).}

3 Model

3.1 Motivation

In this section, we introduce a parsimonious model to understand price differences in and
outside Paris, and we derive additional testable predictions for the responses to war and peace events. Proofs are in the Appendix.

Crucially, we assume that investors in and outside Paris had fundamentally different
beliefs about the benefits of war vs. peace. In particular, we assume that investors in Paris
believed that a successful war of attrition against the Prussians was necessary to get a durable
peace. Without it, final peace terms would be so unfavorable that the (Parisian) population
would not accept this, leading to prolonged political unrest. In contrast, investors outside
Paris saw little benefit to continuing the war of attrition and instead believed that a quick
peace treaty was the best they could do and that this would eventually be accepted by the
population. We model this as investors in and outside Paris having different beliefs about the sensitivity of the final peace terms to French successes or losses on the battlefield.

3.2 Setup

Individual investors $i$ price debt securities. They perceive the following value functions being in war ($V_{i,t}^w$) or peace ($V_{i,t}^p$):

\[
V_{i,t}^w = -\Omega + \left[ \delta \pi E_t V_{i,t+1}^w + (1 - \pi) E_t V_{i,t}^p \right],
\]
\[
V_{i,t}^p = \frac{\Gamma_{i,t}}{1 - \delta},
\]

with $\Omega$ the flow cost of war, $\delta < 1$ investors’ discount rate, and $\pi$ the probability of moving from war to peace. We assume that these parameters are the same for each investor $i$. Further, from investors’ perspective, $\Omega$ and $\pi$ are exogenous. For simplicity, we assume them to be the same in each period. We assume that being in peace is an absorbing state. Importantly, we allow investors to disagree about $\Gamma_{i,t}$: the flow net-benefits from peace (peace benefits minus indemnity installments, or “peace conditions”) that would materialize if the war ends in $t$.

We assume that every period has a battle that the French can win or lose. The probability of a win is given by $Pr^w$ which is perceived the same by all $i$. Peace terms are a function of past wins and losses. For tractability, we assume that

\[
\Gamma_{i,t} = \alpha_i^{W_t - L_t},
\]
\[
with W_t = \sum_{\tau=1}^{t} w_\tau \text{ and } L_t = \sum_{\tau=1}^{t} \ell_\tau,
\]

the number of wins $w_\tau$ and losses $\ell_\tau$. We assume that $\alpha_i \geq 1$ such that wins improve and losses worsen peace conditions. Therefore, $\alpha_i$ captures the expected sensitivity of peace conditions to the war score. Crucially, this parameter differs between investors. Before any fighting starts, the peace conditions are given by $\Gamma_0 = 1$ which is a normalization (think of $\Omega$ as the flow costs of war relative to the initial flow benefits of peace). Depending on the number of wins and losses, and their impact on peace conditions, $\Gamma_{i,t}$ can become bigger or smaller than 1.
For example, suppose investor \( j \) thinks that results on the battlefield have no effect on peace conditions, then \( \alpha_j = 1 \) and \( \Gamma_t = \Gamma_0 = 1 \). If investor \( i \neq j \) thinks that war results can change peace conditions, then \( \alpha_i > 1 \). As long as \( W_t > L_t \), \( \Gamma_{i,t} > 1 \).

### 3.3 Results

For simplicity, we assume that losses (wins) are i.i.d. Then, expectations are given by:

\[
E_{i,t} \Gamma_{i,t+1} = \left[ Prw \alpha_i + \frac{(1 - Prw)}{\alpha_i} \right] \Gamma_{i,t} = \gamma_i \Gamma_{i,t},
\]

where parameter \( \gamma_i \) measures the expected change in peace conditions from continuing to fight.

**Lemma 1.** If \( \alpha_j = 1 \), we have \( \gamma_j = 1 \). If \( \alpha_i > 1 \) and \( Prw > 1/2 \), \( \gamma_i > 1 \).

**Lemma 2.** As long as \( Prw > 1/2 \), \( \partial \gamma_i / \partial \alpha_i > 0 \) and \( \partial \gamma_i^2 / \partial \alpha_i \partial Prw > 0 \)

As long as the probability of a win is sufficiently large, a larger \( \alpha_i \) means that continuing to fight will lead to better expected peace conditions. The sensitivity of peace conditions with respect to \( \alpha_i \) increases in \( Prw \). That is, the higher the probability of success, the greater the impact of \( \alpha_i \) on expected peace conditions.

**Proposition 1.** The security’s value at time \( t \) while still at war is given by:

\[
V_{i,t}^w = \frac{-\Omega}{1 - \delta \pi} + \frac{(1 - \pi) \delta \gamma_i}{(1 - \delta)(1 - \delta \pi \gamma_i)} \alpha_i^{W_t - L_t}
\]

The solution is well-defined as long as \( \gamma_i < 1/\delta \pi \). The value after the end of hostilities in \( t \) is given by Eqn. (2).

**Proposition 2.** If markets are fully integrated and there are no short-selling constraints, the equilibrium value of the security in \( t \) while at war or after the end of hostilities is given by:

\[
V_t^w = \sum_i \omega_i V_{i,t}^w \quad V_t^p = \sum_i \omega_i V_{i,t}^p
\]

with \( \omega_i \) the weight of each investor \( i \).

If two markets with respective investors \( i \in I \) and \( j \in J \) are not integrated, local prices
will reflect local beliefs:

\[
V_{I,t}^w = \sum_{i \in I} \omega_i V_{i,t}^w \quad ; \quad V_{I,t}^p = \sum_{i \in I} \omega_i V_{i,t}^p
\]

(8)

\[
V_{J,t}^w = \sum_{i \in J} \omega_i V_{i,t}^w \quad ; \quad V_{J,t}^p = \sum_{j \in J} \omega_j V_{j,t}^p
\]

(9)

3.4 Empirical Predictions

We assume that investors in Paris and the rest of France had different beliefs about how success or failure on the battlefield shaped peace conditions. For simplicity, we assume that investors in a particular location all shared the same beliefs. In particular, we assume \(\alpha_C > \alpha_R\), where \(C\) denotes Paris and \(R\) the Rest of France.

**Corollary 1.** As long as \(W_t - L_t > (W_t - L_t)^*\), with \((W_t - L_t)^* < 0\), the market with the largest \(\alpha\) will have the highest valuation in war. The difference in valuations while at war increases in \(P^w\).

This corollary suggests the following interpretation of events. Initially, investors in both locations believe \(P^w\) to be small (close to 1/2). As a result, price differences between the two locations are limited. After the Battle of Coulmiers, and the subsequent recapture of Orleans, there was a nationwide upward reevaluation of \(P^w\). Even though the battle itself did not dramatically change France’s position in the war, this was the first time that a citizen army proved that it could be victorious on the battlefield. As a result, a substantial price difference between Paris and the Rest of France emerges.

The next corollaries establish three additional predictions from this framework for how we expect prices in Paris and the Rest of France to respond to war events:

**Corollary 2.** As long as \(W_t - L_t > (W_t - L_t)^{**}\), with \((W_t - L_t)^{**} < 0\), the market with the largest \(\alpha\) will have the strongest response to wins or losses on the battlefield.

The market with the largest \(\alpha\) sees larger benefits or costs for the final peace conditions from wins or losses. As a result, news from the battlefield will lead to stronger responses.

**Corollary 3.** Suppose hostilities end in \(t\). If \(L_t > W_t\), the market with the highest \(\alpha\) will have the lowest valuation. Further, it will have a more negative (less positive) response to the end of hostilities.

\(^{24}\)If we allow beliefs within a given location to differ, we can apply log-linear approximations to Eqns. (2) and (6) to still arrive at a closed-form solution. This leads to qualitatively equivalent results as long as the weighted average of beliefs in Paris and the Rest of France differ in a systematic way.
After hostilities ended, there is no further chance of future wins. That means that the current score on the battlefield pins down peace conditions. If there were more losses than wins, the market with the highest $\alpha$ will then have the lowest valuation, and a more negative (less positive) response to the news. Valuations do not converge as the true value of $\alpha$ has not been revealed yet. This corresponds to Paris having a lower valuation than the Rest of France after the signing of the armistice, when hostilities ended but final peace conditions were still uncertain.

**Corollary 4.** The response to news about the final peace conditions will be negative if $L_t > W_t$ and the expected $\alpha$ is smaller than the realized one.

After the signing of the Versailles treaty, the true $\alpha$ is revealed. If the Rest of France believed in a lower $\alpha$, they will now receive a wake-up call. That is, the lack of military success has a much bigger effect on final peace conditions than expected. As a result, they will have a more negative response.

# 4 Empirical Results

In this section, we first provide more extensive evidence of the price divergence between Paris and the Rest of France. Next, we provide formal tests of the model’s additional predictions, formalized in corollaries 2 through 4. Finally, we explore a number of alternative explanations for our findings.

## 4.1 Persistent Price Differences during the Siege

We hand-collected daily prices for the 3\% *rente* for 1870 and 1871 for three cities with the most established stock exchanges in France: Paris, Lyon, and Bordeaux. Our original sources are the *Cours Authentique* (Paris), the *Cours Officiel* (Bordeaux), and the newspaper *La Salut Public* (Lyon) (see figures A.5, A.6, and A.7 for an example.) We always use the first price of the day. All price differences are calculated as the Paris price minus the price in the other exchange on the same day.

Figure 3 shows the distributions of the differences between the rente price inside and outside Paris in five time periods in the years 1870 and 1871: during peacetime (in green), the war period before the siege (in purple), the first and second parts of the siege before and after the Battle of Coulmiers (orange and blue, respectively), and the period of negotiations.
between the Armistice and the Versailles Treaty (yellow). Table 2 shows the average daily differences.

In peacetime, the distribution of differences between the rente prices inside and outside Paris was tight and centered almost perfectly around a zero mean. This is consistent with the law of one price. However, during the Siege, Parisian prices diverged and were higher, with a mean price difference of 0.51 Francs relative to those outside Paris (se=0.11). After the Battle of Coulmiers (the second part of the Siege when beliefs diverged) the price difference became starker (0.98 francs, se=0.088). T-tests indicate that price differences during the Siege and peace negotiations are statistically significant.

Figure 4 looks at the raw price series and zooms in on price differences between the start of the Siege and the Versailles Treaty. It suggest that price differences are persistent over time. At the beginning of the Siege in September 1870, the rente price in and outside Paris remained quite similar, but by the beginning of November, prices diverged. From then on the rente had a persistently higher price in Paris than in other exchanges at almost all times over the nearly three months remaining of the Siege.

Between the Armistice and the Versailles Treaty, this pattern inverted. On January 28, 1871, the national government agreed to an Armistice with the Prussians, and negotiations over a peace settlement began. Now, Parisian traders undervalued the rente relative to those outside the Siege cordon. The difference in prices went from +1.025 on January 25 to -1.025 on February 1, and it subsequently became even more negative. During this period, the average price difference was -1.45 francs (se = 0.15). This difference is equal to 2.66% of the Paris price.\(^{25}\)

Another way to quantify these differences is as a percentage of country risk (defined as the differences in yields between French debt and the relatively safer British debt). Details are in Table A.3.. The difference in country risk between Paris and the provinces was equal to -2.31\%, -4.44\%, and 6.59\% during the entire Siege, the second part of the Siege, and the peace negotiations respectively (i.e. the yield was higher in Paris during peace negotiations). Figure A.15 depicts yields for rentes in Paris and the provinces, as well as yields for British consols.

\(^{25}\)Differences between Bordeaux and Lyon were not as pronounced. During the Siege, rentes were more expensive in Lyon than in Bordeaux (by 0.33 francs, p-value = 0.017). During the peace negotiations, they were more expensive in Bordeaux (by 0.41 francs, p-value = 0.019). Figure A.11 shows prices for Bordeaux and Lyon separately. Arbitrage between the two provincial exchanges was hindered by the breakdown of the telegraph system. Tables 6 and A.5 suggest that Bordeaux prices incorporated information from Lyon (but not from Paris) and therefore we do not explore the role of beliefs in the differences between Bordeaux and Lyon.
Figure 3: Density of price differences of the 3% rente between Paris and other French exchanges

This graph shows the distributions of daily price differences between Paris and elsewhere for four periods: the first part of the Siege (September 18 to the French victory at Coulmiers on November 15, 1870), the second stage of the Siege (November 15, 1870 to January 28, 1871), the peace negotiations (January 28, 1871 to March 1, 1871), and peacetime (January 1, 1870 to July 15 1870, and May 31, 1871 to December 31, 1871). The differences are calculated by subtracting the average between the Bordeaux and Lyon prices from the Paris price. As expected, differences are small and centered in zero during peacetime. The first part of the Siege shows a wide variance centered around zero. Prices are higher in Paris during the second stage of the Siege and higher outside during peace negotiations. Epanechnikov kernel with Silverman rule-of-thumb bandwidth.
This table shows the average daily price difference between Paris, Bordeaux, and Lyon prices for three different periods. Elsewhere is calculated as the average between the Bordeaux and Lyon price. The standard errors (in parentheses) are the result of a one-sample t-test comparing the sample of daily differences to zero, p-values in brackets. The last row for each period reports the average difference as a percentage of the average Paris price (in the last column). The periods of analysis are: The entire Siege, from 1870-09-18 to 1871-01-28. The second half of the Siege starts after the French victory at Coulmiers (which led to the recapture of Orleans) on 1870-11-15. The peace negotiations went from the end of the Siege until 1871-03-02. Peacetime includes two periods: before the war (1870-01-01 to 1870-07-17), and after the pacification of Paris and restoration of the telegraph (1871-05-30 to 1871-12-31).

<table>
<thead>
<tr>
<th></th>
<th>Paris - Elsewhere</th>
<th>Paris - Bordeaux</th>
<th>Paris - Lyon</th>
<th>Average Paris price</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Peacetime</strong></td>
<td>-0.010</td>
<td>-0.007</td>
<td>-0.018</td>
<td>67.18</td>
</tr>
<tr>
<td>Prob($t : \Delta = 0$)</td>
<td>[0.448]</td>
<td>[0.646]</td>
<td>[0.303]</td>
<td></td>
</tr>
<tr>
<td>% price difference</td>
<td>-0.01%</td>
<td>-0.01%</td>
<td>-0.03%</td>
<td></td>
</tr>
<tr>
<td><strong>Entire Siege</strong></td>
<td>0.511***</td>
<td>0.679***</td>
<td>0.325**</td>
<td>55.33</td>
</tr>
<tr>
<td>Prob($t : \Delta = 0$)</td>
<td>[0.000]</td>
<td>[0.000]</td>
<td>[0.018]</td>
<td></td>
</tr>
<tr>
<td>% price difference</td>
<td>0.92%</td>
<td>1.23%</td>
<td>0.59%</td>
<td></td>
</tr>
<tr>
<td><strong>Second half of the Siege</strong></td>
<td>0.981***</td>
<td>0.803***</td>
<td>1.14***</td>
<td>55.31</td>
</tr>
<tr>
<td>Prob($t : \Delta = 0$)</td>
<td>[0.000]</td>
<td>[0.000]</td>
<td>[0.000]</td>
<td></td>
</tr>
<tr>
<td>% price difference</td>
<td>1.77%</td>
<td>1.45%</td>
<td>2.06%</td>
<td></td>
</tr>
<tr>
<td><strong>Peace negotiations</strong></td>
<td>-1.45***</td>
<td>-1.72***</td>
<td>-1.23***</td>
<td>54.4</td>
</tr>
<tr>
<td>Prob($t : \Delta = 0$)</td>
<td>[0.000]</td>
<td>[0.000]</td>
<td>[0.000]</td>
<td></td>
</tr>
<tr>
<td>% price difference</td>
<td>-2.66%</td>
<td>-3.16%</td>
<td>-2.26%</td>
<td></td>
</tr>
</tbody>
</table>
In sum, there is statistically significant evidence that prices for the *rente* were persistently higher in Paris during the war (especially after the Battle of Coulmiers) and higher elsewhere during peace negotiations. Further, these price differences were economically significant.

Figure 4: Prices of the 3% *rente* in Bordeaux, Lyon, and Paris

This graph shows the prices of the 3% French sovereign bond (the *rente*) inside and outside Paris between September 18th 1870 (the start of the Siege) and April 1st, 1871. The outside price is an average between Bordeaux and Lyon. The graph shows that Parisians were higher during the war, but the situation was reversed after the end of hostilities. Price differences during the Siege were salient during the later months of the conflict. Prices converged again when the terms of the peace treaty (and the cost of the war) became public.

### 4.2 Differential Responses to War and Peace

To test the hypothesis that the persistent price differences we observe are due to differences in political beliefs about the benefits of war and peace, we examine how prices were updated
in response to new information. The testable predictions from our model are summarized by Corollaries 2 through 4.

Corollary 2 states that prices in Paris should respond more to news about wins and losses. This follows from Paris investors’ presumed belief that final peace conditions (the terms of the treaty as well as the probability of the population’s acceptance of it) would be relatively sensitive to success on the battlefield. As we have discussed, arbitrage between Paris and markets elsewhere was interrupted as early as September 19, 1870. This means that it is possible to observe responses in individual markets that are not contaminated by the responses in other markets. Corollary 3 states that Paris should have responded more negatively (less positively) to the armistice, which marked the end of military conflict and French hopes for military success. Corollary 4 states that the Rest of France should have responded more negatively to the announcement of the details of the Treaty of Versailles, which revealed the extraordinary cost demanded by Prussia.

To measure the reaction to events, we reconstruct when each city found out about each news event using contemporary local newspapers. We also used the journal of a Parisian stockbroker, Jacque-Henri Paradis (1872), who kept and published a detailed account of life in Paris and the markets during the Siege.

Our war events are battles identified by Wawro (2003), which we classify as major or minor, and as defeats or victories (see section A.7 in the Appendix for details about selection and classification). We end up with seven major military events (six defeats and one victory). As peace events, we include the announcements of the Armistice on January 28 and the Versailles Peace treaty on February 26, 1871.

We focus on two-day returns for the rente. Returns in day \( t \) are calculated as: \( \log(p_t) - \log(p_{t-2}) \). We choose a two-day window because that is the shortest period within which we can place the arrival of a specific piece of news.

Figure 5 illustrates the steps in our methodology. It shows the rente prices in Paris, Bordeaux and Lyon after two important war events: the firs Fall of Orleans and the Battle of Coulmiers, which led to the (temporary) recapture of Orleans. For each event, we searched

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26Specifically, *Le Figaro* (Paris), *La Gironde* (Bordeaux), *Le Salut Public* and *Le Journal Des Dépêches* (both Lyon), which are available in a digital format for the entire period.

27For example, news of the fall of Orleans was printed in *Le Figaro* on Saturday, October 15. The stock market traded for a couple of hours around noon (approximately 12 A.M. to 2 P.M., Monday to Saturday), and newspapers were distributed in the early morning. By choosing the two day time frame we incorporate the possibility that Thursday’s news could have arrived between the printing of the Friday newspaper and the Friday stock market or after the Friday stock market. Since the response could be incorporated into prices on either Friday or Saturday, we compare the Saturday price to the Thursday price.
This figure shows *rente* prices in three markets around the Struggle for Orleans that was the main hope for the relief of Paris. Note that prices fall more in Paris in defeat (graph 1) and rise more in victory (graph 2). The shaded area covers the two-day period when news could have arrived.
This figure shows rente prices in three markets around peace events. As expected, prices rise more in Rest of France after the armistice (graph 1) and fall more when the terms of the peace treaty are revealed. The shaded area covers the period when news could have arrived.
the local newspapers for the first mention and confirmation of the event. With Paris under siege, rumors would sometimes arrive quickly but the confirmation of news would arrive considerably later than in Bordeaux and Lyon. In our baseline specification, we add up the returns after the first mention and the confirmation of an event. As described above, we allow a two-day window for news to be reflected in the reported rente price.

Responses in Paris, Bordeaux and Lyon tended to differ. In Paris, the news of the first fall of Orleans was met by a fall in the rente price of 0.90%, whereas in Bordeaux the response was a more muted 0.45% fall, and in Lyon the price actually increased by 0.45%. The French victory at Coulmiers raised the Paris price by 2.15% (1.27% after the first mention and 0.88% after the confirmation), whereas the price in Bordeaux only rose by 0.83% and the price in Lyon actually fell by 0.89%.

Figure 6 does the same exercise for the two peace events – the announcement of the Armistice, and the disclosure of the terms of the Versailles treaty. The price in Paris rose with rumors of the Armistice before falling when the rumors were confirmed, leaving a 0.36% overall gain. The gains in Bordeaux and Lyon, in contrast, were much higher (4.27% and 5.51%). When the details of the Versailles treaty became public, prices dropped outside Paris, the price of the rente in Bordeaux and Lyon dropped by -4.75% and -3.43%, respectively. The Paris price, on the other hand, barely moved with a slight fall of just 0.64%.

Table 3 displays these comparisons for all major war and peace news events during the Siege. For each event and market, it reports the two-day return for on the rente on the day in which news was printed in a particular city. Responses that are consistent with our hypotheses are in bold: Paris should experience larger absolute returns for war events (more positive for victories and more negative for defeats), while markets in the Rest of France should react more strongly to news about peace. Notice that this pattern holds for 7 out of the 9 major events. Table A.4 extends Table 3 by including minor and pre-Siege battles.

Table 4 reports the results of two-tailed t-tests on the average difference in price responses. The null hypothesis is that the differences are equal to zero on average. We show comparisons between Paris and Bordeaux, Paris and Lyon, and Paris and the Rest of France (i.e., the average between Bordeaux and Lyon). We always compute differences in the direction our hypothesis predicts.\footnote{For example, we expect prices to decrease more in Paris when news of the first battle of Orleans (a French defeat) arrive. Therefore, we predict \( R_{outside} > R_{paris} \). We calculate that \( R_{outside} - R_{paris} \) is in fact bigger than zero (0.90 percentage points). On the other hand, we expect prices in Paris to increase more when news about the battle of Coulmiers (the French recapture of Orleans) arrives. Therefore, we predict \( R_{paris} > R_{outside} \). We likewise calculate that \( R_{paris} - R_{outside} \) is in fact bigger than zero (0.91 percentage points).}
Table 3: Events and rente returns in three cities

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Paris Board</th>
<th>Lyon Board</th>
<th>Paris Board</th>
<th>Lyon Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>War events</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strasbourg No</td>
<td>1870-09-28</td>
<td>-2.33%</td>
<td>-0.94%</td>
<td>0.88%</td>
<td></td>
</tr>
<tr>
<td>First battle of Orleans</td>
<td>1870-10-11</td>
<td>-0.90%</td>
<td>-0.45%</td>
<td>0.45%</td>
<td></td>
</tr>
<tr>
<td>Metz No</td>
<td>1870-10-27</td>
<td>-3.42%</td>
<td>-1.90%</td>
<td></td>
<td>1.90%</td>
</tr>
<tr>
<td>Coulmiers Yes</td>
<td>1870-11-09</td>
<td>1.27%</td>
<td>0.88%</td>
<td></td>
<td>0.83%</td>
</tr>
<tr>
<td>Amiens No</td>
<td>1870-11-27</td>
<td>-0.81%</td>
<td>-0.54%</td>
<td>0.45%</td>
<td></td>
</tr>
<tr>
<td>Treaty of Versailles</td>
<td>1871-01-28</td>
<td>-1.44%</td>
<td>-0.56%</td>
<td>-1.08%</td>
<td>4.27%</td>
</tr>
<tr>
<td>Vietnam</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4.51%</td>
</tr>
<tr>
<td>Peace events</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Armistice Yes</td>
<td>1870-12-02</td>
<td>-1.43%</td>
<td>-1.08%</td>
<td>-2.27%</td>
<td></td>
</tr>
<tr>
<td>Armistice No</td>
<td>1870-11-27</td>
<td>0.27%</td>
<td>-0.64%</td>
<td>-4.75%</td>
<td>-3.43%</td>
</tr>
</tbody>
</table>

This table shows the two-day returns in the three markets to war and peace events. Returns are calculated as: \( \log(p_t) - \log(p_{t-2}) \) for news printed on day \( t \). Since news arrived on different days to each market, they do not necessarily correspond to the same calendar date. In bold, the events for which our hypothesis holds: bigger responses for war events in Paris, and bigger responses for peace events in the Rest of France. To calculate the averages we multiply the returns to defeats and the negative peace event by -1.
Table 4: Differences between Paris and the outside in responses to events

<table>
<thead>
<tr>
<th>Differences in two-day returns to rentes, in percentage points</th>
<th>Paris v Outside</th>
<th>Paris v Bordeaux</th>
<th>Paris v Lyon</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>2.05***</td>
<td>1.74**</td>
<td>2.36***</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>(0.53)</td>
<td>(0.59)</td>
<td>(0.60)</td>
<td></td>
</tr>
<tr>
<td>Without rumors (only confirmations)</td>
<td>1.85**</td>
<td>1.59**</td>
<td>2.09**</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>(0.63)</td>
<td>(0.66)</td>
<td>(0.71)</td>
<td></td>
</tr>
<tr>
<td>Only main battles</td>
<td>1.56**</td>
<td>1.10*</td>
<td>2.02**</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>(0.54)</td>
<td>(0.53)</td>
<td>(0.69)</td>
<td></td>
</tr>
<tr>
<td>Main battles + minor battles</td>
<td>1.05*</td>
<td>0.75</td>
<td>1.36**</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>(0.52)</td>
<td>(0.55)</td>
<td>(0.56)</td>
<td></td>
</tr>
<tr>
<td>Placebo (pre-Siege battles)</td>
<td>-0.91*</td>
<td>-1.22</td>
<td>-0.59</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>(0.46)</td>
<td>(0.69)</td>
<td>(0.39)</td>
<td></td>
</tr>
</tbody>
</table>

This table shows that differences in responses to events between Paris and the outside are statistically significant. Each coefficient represents a one-sample t-test. We set up differences in the direction our hypothesis predicts, so positive differences are evidence in our favor (in bold). We compute returns as: \( R = \log(p_t) - \log(p_{t-2}) \), for news printed on day \( t \). We show the robustness of our estimates to restricting the sample to only war events. *\( p<0.1; **p<0.05; ***p<0.01. \)
For our baseline specification, the average difference between Paris and the Rest of France (over 9 events) is 2.05 percentage points (se = 0.53). As a robustness check, we only use confirmations, and we find an average difference of 1.85 pp. (se = 0.63). We also report the same result including only war events, and we find a positive (but somewhat smaller) significant result (1.56 pp.) These results are also robust to including minor battles.

4.3 Who was right?

The muted response in Paris to the details of the Versailles treaty suggests that beliefs in Paris were the “correct”. We further explore this in Figure 7, which shows rente price frequencies (each observation is a daily price) for January (the last month of the war), February (the month of negotiations, since it starts with the Armistice and it ends with the peace treaty), and March 1871. The figure shows that Parisians accurately priced the peace treaty. During January and February, Parisians accurately predicted post-treaty prices. The average difference between Parisian January and March prices is 0.10 francs (p-value = 0.50), and the difference between Parisian February and March prices is 0.08 francs (p-value = 0.54). Outside Paris, investors first undervalued the rente (the average difference between January and March outside prices was -1.41, p-value = 0.00), and then overvalued it relative to its post-treaty price (the average difference between February and March outside prices was 1.03, p-value = 0.00).

4.4 Different information sets

When the Siege of Paris started, the Germans cut off information flows in and out of Paris. The telegraph lines were cut, and neither people nor goods were allowed to pass through Siege lines. However, Parisians successfully managed to smuggle information into and out of the city. The principal way to get news out of the city was by aerial balloons, and the main way to receive it was via carrier pigeon (Horne (2012), ch. 8). These two were sometimes supplanted with runners who dared to dodge the Prussians, and diplomatic mail. Given that these means of communications are unreliable and slow, a remaining concern is that the difference in prices we observe is due to different information sets. In other words, Parisians or those outside its walls may have been ignorant about facts that influenced the price of the rentes.

We argue that price differences are explained by political beliefs and not purely by information. That is, even when investors inside and outside Paris were in possession of the
This figure shows rente price frequencies in Paris and outside for January, February, and March 1871. Therefore, it includes the month of peace negotiations (February) and the months before and after. It shows that Parisians accurately priced the costs of peace. Outside investors, on the other hand, experienced high volatility, underpricing rentes before the end of the war, and overpricing them during peace negotiations.

First, Parisians and those elsewhere had full knowledge that their prices were systematically different. In Bordeaux, Paris prices were printed often (see below). In Paris too, a financial analyst noted with worry how much lower the prices were in Bordeaux and Lyon ([*Le Figaro*], November 6, 1870).  

Second, the differences are even more stable in the period of peace negotiations, despite more regular information flows. After the Armistice, telegraph service was still not restored and mail was slow and unreliable due to backlog and Prussian restrictions. However, Prussians allowed people to leave and enter the city. During this period, four-day-old Paris prices were printed daily in Bordeaux, but prices failed to converge until after peace terms were announced.

Third, we show below that information flows between Paris and the outside did not drive prices closer to each other. Bordeaux prices did not converge to Paris prices when the latter were printed in [*La Gironde*]. In turn, Paris prices did not converge to external prices when

---

29 An analyst from the *The Times* (quoted above) also noted the difference.

30 *Le Figaro*: 1871-01-31, p. 4; 1871-02-07, p. 4; 1871-02-13, p.4; 1871-02-18, p.5, among others.
news from the outside were printed in *Le Figaro*. Also, Paris did not experience abnormal returns on days with incoming news— as measured by pigeon arrivals or news from outside reported by *Le Figaro*.⁴¹

### 4.4.1 The External Exchanges do not converge to the Paris price

In this section, we show that even when a Bordeaux newspaper printed the price of the *rente* in Paris, the price did not converge. Before the Siege, the Bordeaux newspaper *La Gironde* printed daily prices of a few securities in the Paris and Bordeaux markets. During the Siege, Paris prices were printed less regularly. Between September 19, 1870, and January 28, 1871, Paris prices were printed 30 times (an average of one every 4.4 days). The information was also lagged, the median Paris price during the Siege was reported 6 days later (see Table 1 for more details about information transmission).

We measure the Bordeaux market response to these printed prices. We once again focus on two-day changes in prices.⁴² We calculate the changes in price difference for each instance of a printed price as:

\[
\Delta \text{price difference}_t = |p^B_t - p^P_{\text{print},t}| - |p^B_{t-2} - p^P_{\text{print},t}|
\]

Were \( p \) denotes the *rente* price, the superscripts \( P \) and \( B \) denote Paris and Bordeaux, and the subscript \( \text{print}, t \) denotes that the Paris price was printed in Bordeaux on day \( t \) (but it was on average five days old). The first term captures the difference before and after the price was reported, and the first term the difference before. If Bordeaux moved closer to the reported Paris price after receiving news, the change in price difference should be negative, since the prices would be moving closer to each other. We find 48 instances of Paris prices printed in Bordeaux during the Siege and the peace negotiations.

Panel A of Table 5 reports the results. The average \( \Delta \text{price difference}_t \) equals -0.028 francs, a very slight convergence. However, it is not statistically significant (p-value = 0.76). The lower bound of the 95% CI (an upper bound for convergence) is -0.215 francs, which is only 18% of the average distance between the Bordeaux and Paris prices during the Siege. Table 5 also reports separate results for the Siege and peace negotiations periods. We do not find convergence in either of these.

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⁴¹We analyze the pigeon messages themselves: as Figure A.24 shows, the word *rente* appears only 28 times in 29,903 messages.

⁴²For a price printed on a newspaper in day \( t \), we know that it arrived before the market opened in \( t \), since trading hours started at noon. However, we do not know whether it arrived before or after trading on \( t - 1 \). Therefore, we compare prices in \( t \) to prices in \( t - 2 \).
Table 5: Absence of price convergence after incoming information to Paris and Bordeaux

<table>
<thead>
<tr>
<th>Panel A</th>
<th>Panel B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bordeaux prices after receiving the Paris price</td>
</tr>
<tr>
<td>Siege</td>
<td>Peace negotiations</td>
</tr>
<tr>
<td>Δprice difference</td>
<td>-0.113</td>
</tr>
<tr>
<td>(0.129)</td>
<td>(0.120)</td>
</tr>
<tr>
<td>Lower bound 95% CI</td>
<td>-0.377</td>
</tr>
<tr>
<td>Mean absolute price difference</td>
<td>1.05</td>
</tr>
<tr>
<td>Observations</td>
<td>30</td>
</tr>
<tr>
<td>Median delay</td>
<td>6 days</td>
</tr>
</tbody>
</table>

This table shows the absence of convergence after incoming news. In panel A, we study whether the price difference between Bordeaux and Paris decreased after the Bordeaux newspaper La Gironde printed Paris prices. In panel B, we study whether the price difference between markets inside and outside Paris decreased after the Parisian newspaper Le Figaro printed news from the outside. Standard errors are calculated from a t-test that compares the sample of changes in price differences to zero. We also report the lower bound of the 95% CI (an upper bound for convergence). The upper bound for convergence is never more than 36% of the mean absolute price difference.

4.4.2 The Paris price does not converge to the external exchanges

The major Parisian newspapers did not systematically report outside prices for the rente, arguably reflecting the fact that rente price discovery tended to happen in Paris itself. We can further show that when Paris got news from the outside world, prices did not converge. To do this, we collected every piece of news from the outside printed in Le Figaro during the Siege and the peace negotiations. In order to identify the days with new information, we classify a day as a “day with news” if the events reported by Le Figaro were more recent than any event reported before. We find that 38 days had information more recent than anything previously reported. We measure the Paris market response to the incoming news. In particular, we test whether prices converged to the average price between Bordeaux and Lyon. We perform the same test as in the previous section.

Panel B of Table 5 reports the results. For the Siege, the average Δprice difference, equals -0.039 francs. It is not statistically significant (p-value = 0.67). The lower bound of the 95% CI is -0.224 francs, which is only 22% of the average absolute price differences. We do detect partial convergence during the peace negotiations. On days with news from the outside, the Paris price moves 0.336 francs closer to the provincial price. However, the 95%
lower bound of this estimate is only equal to 35% of the mean absolute price difference.

4.4.3 There are no abnormal returns on days with incoming information flows

We also show that the rente did not experience abnormal returns on days with incoming news. In Paris, the absolute value of the two-day rente return was not higher on days when a carrier pigeon arrived, nor when Le Figaro printed news from the outside. In Bordeaux, there were no abnormal returns on days when the Paris rente price was printed in La Gironde, or when a balloon with Paris mail landed.

Table 6 shows the effect of different measures of incoming information on abnormal rente returns. As in the rest of the paper, we calculate two-day rent returns, but since we are interested in a measure of volatility, without an expectation of direction, we take the absolute value. Therefore, returns on day $t$ are calculated as $|\frac{p_t - p_{t-2}}{p_t}|$, where $p_t$ is the Paris or Bordeaux price on day $t$. In Table 6 we present four measures of incoming information. First, we use a dummy that equals one if Le Figaro reported a pigeon arrival on that day. Second, a dummy that equals one if news from the outside were printed in Le Figaro (using the same definition as in the previous section). Third, a dummy that equals one if a Paris price was printed in La Gironde. Fourth, a dummy that equals one if there was a balloon landing on that day. Fifth, a dummy that equals one if a Lyon price was printed in La Gironde.

We account for the fact that information flows are not necessarily uniform during the Siege by adding week fixed effects. For example, the early days of the Siege were a period of high price volatility, but there are no pigeon arrivals because the service had not been yet established. We do not find any evidence of increased volatility. The coefficients are largely indistinguishable from zero.

In summary, we do not find that the rente had increased volatility when news arrived. Therefore, we can rule out the possibility that the differences in prices were fully explained by some investors knowing facts that others ignore. As figures 5, 6, A.16, and A.17 show, Parisians often knew about the most important events at the same time or a few days later than people outside. Maybe the most clear example are the “peace events” in Figure 6: everyone learned about them at (approximately) the same time, but the reactions are wildly different. Moreover, figures A.18 to A.21 show graphically that there is no correlation between periods with more information flows and the price difference.

33Our results are robust to using a dummy that equals one if there was a pigeon arrival documented by a historian (Hayhurst (1970)) instead of Le Figaro, and to use the number of news reported by Le Figaro instead of the dummy (Table A.6).
On the other hand, absolute returns in Bordeaux are on average 0.489 pp. higher when a Lyon price is printed (we can almost reject the null, p-value = 0.103). The results in Table A.5 indicate that there may also be some price convergence when Lyon prices are printed in Bordeaux. Together, these two results suggest that the (smaller) price difference between Bordeaux and Lyon may have been caused by temporary discrepancies in the information set, and not by permanent differences in beliefs.

Table 6: Incoming information and abnormal returns in Paris and Bordeaux

<table>
<thead>
<tr>
<th>Absolute value of two-day rente returns, in percentage points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel (a): Paris (1) (2) Panel (b): Bordeaux (3) (4) (5)</td>
</tr>
<tr>
<td>Pigeon arrival in Paris 0.020 (0.209)</td>
</tr>
<tr>
<td>Outside news printed in Paris −0.192 (0.182)</td>
</tr>
<tr>
<td>Paris prices printed in Bordeaux −0.270 (0.213)</td>
</tr>
<tr>
<td>Balloon landing 0.016 (0.189)</td>
</tr>
<tr>
<td>Lyon prices printed in Bordeaux</td>
</tr>
</tbody>
</table>

Fixed effects Week Week Week Week Week
Mean DV 1.003 1.003 0.937 0.937 0.937
Observations 133 165 165 133 133
Sample Siege Siege and Siege Siege Siege
negotiations negotiations

This table shows the relationship between incoming information and abnormal returns in Paris and Bordeaux. The dependent variable is the absolute value of the two-day rente return in Paris/Bordeaux: \(|\log(p_t) - \log(p_{t-2})|\). The independent variables are dummies that equal one if: Le Figaro reported a pigeon arrival, Le Figaro printed recent news from the outside, La Gironde printed Paris or Lyon prices, there was a balloon landing. For more specifications see table A.6. Robust standard errors in parenthesis. *p<0.1; **p<0.05; ***p<0.01.

4.5 Liquidity shocks

The purpose of this section is to show that price differences between Paris and the outside were not driven by liquidity shocks. During the period we study, money could not move
freely between Paris and the outside. The demand and supply of money (francs) could have affected the demand and supply of traded securities. If the patterns we described for rentes in section 4.1 were driven by liquidity shocks, other publicly traded assets should display the same behavior. We also show that the price patterns we observe for the rente are not related to food inflation in Paris, and are therefore not a product of Siege-induced scarcity.\footnote{Krishnamurthy et al. (2018) also disentangle the impact of different forces (in their case, ECB policies) on bond yields.}

In this section, we study the price dynamics of two foreign and two French private assets: Italian government debt, an Austrian railroad stock (the Societe Autrichienne), stock for the Lyon et Mediterranee railroad, and a bond for the Midi railroad.\footnote{These are the four assets that have the most days with prices in Paris and either Bordeaux or Lyon during our period of interest (the Siege and the peace negotiations), see table A.10 for a list of assets.} For the foreign assets, we do not expect political disagreements between Paris and the outside to drive price differences. Indeed we do not observe the same patterns as with the rente. The Italian bond does not have a statistically significant difference during the Siege, and it has a difference in the opposite direction during the peace negotiations. The Austrian railroad has a lower price in Paris during the siege (opposite from the rente) and no significant differences during the peace negotiations.

French railroads were exposed to the war, both through the destruction of capital and through their relationship with the government. Different expectations about war and peace may have led to disagreements about their profitability. However, we find it reassuring that we do not find the same patterns as the rente for either of the railroads we analyze. For the Lyon railroad stock, the prices during the Siege are indeed higher in Paris, but there are no significant differences during the peace negotiations. For the Midi bond, prices are indeed lower in Paris during the peace negotiations, but they are also lower during the siege. Table 7 shows these results for all assets (comparable to 2). Figures 8 and A.23 show the prices for all four assets.

In summary, the price dynamics of the foreign assets were very different from the rente’s. This is inconsistent with broad liquidity shocks, that should lead to coincident changes in both price series, driving our results. The dynamics of railroad assets were also different, suggesting that the patterns we observe in section 4.1 are specific to government bonds.

In Figure 9, we further show that the differences in rente price between Paris and elsewhere bear no relation to food inflation in Paris (Figure A.22 shows more food items). Since the city was under Siege, with a limited supply of food, prices increased dramatically over time as the population grew within the population. The price changes for a range of both
Table 7: Price Differences (in francs) between Paris and Elsewhere for Other Assets

<table>
<thead>
<tr>
<th>Period</th>
<th>Italian bond</th>
<th>Lyon et Med RR</th>
<th>Midi RR bond</th>
<th>Austrian RR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entire Siege</td>
<td>0.183</td>
<td>9.82**</td>
<td>-1.24***</td>
<td>-57.3***</td>
</tr>
<tr>
<td></td>
<td>(0.24)</td>
<td>(3.74)</td>
<td>(0.53)</td>
<td>(2.48)</td>
</tr>
<tr>
<td>Prob($t : \Delta = 0$)</td>
<td>[0.447]</td>
<td>[0.01]</td>
<td>[0.023]</td>
<td>[0]</td>
</tr>
<tr>
<td>% price difference</td>
<td>0.34%</td>
<td>1.12%</td>
<td>-0.43%</td>
<td>-8.16%</td>
</tr>
<tr>
<td>Second half of the Siege</td>
<td>0.24</td>
<td>9.42</td>
<td>-2.48***</td>
<td>-52.1***</td>
</tr>
<tr>
<td></td>
<td>(0.308)</td>
<td>(5.65)</td>
<td>(0.744)</td>
<td>(3.13)</td>
</tr>
<tr>
<td>Prob($t : \Delta = 0$)</td>
<td>[0.442]</td>
<td>[0.102]</td>
<td>[0.002]</td>
<td>[0]</td>
</tr>
<tr>
<td>% price difference</td>
<td>0.45%</td>
<td>1.16%</td>
<td>-0.86%</td>
<td>-7.39%</td>
</tr>
<tr>
<td>Peace negotiations</td>
<td>1.65***</td>
<td>2.36</td>
<td>-7.78***</td>
<td>-1.24</td>
</tr>
<tr>
<td></td>
<td>(0.204)</td>
<td>(3.22)</td>
<td>(0.724)</td>
<td>(1.58)</td>
</tr>
<tr>
<td>Prob($t : \Delta = 0$)</td>
<td>[0]</td>
<td>[0.472]</td>
<td>[0]</td>
<td>[0.444]</td>
</tr>
<tr>
<td>% price difference</td>
<td>2.89%</td>
<td>0.29%</td>
<td>-2.73%</td>
<td>-0.16%</td>
</tr>
<tr>
<td>Peacetime</td>
<td>0.207</td>
<td>-1.15***</td>
<td>0.02</td>
<td>0.701</td>
</tr>
<tr>
<td></td>
<td>(0.123)</td>
<td>(0.324)</td>
<td>(0.108)</td>
<td>(0.484)</td>
</tr>
<tr>
<td>Prob($t : \Delta = 0$)</td>
<td>[0.142]</td>
<td>[0]</td>
<td>[0.879]</td>
<td>[0.149]</td>
</tr>
<tr>
<td>% price difference</td>
<td>0.35%</td>
<td>-0.12%</td>
<td>0.005%</td>
<td>0.09%</td>
</tr>
</tbody>
</table>

This table shows the average daily price difference between Paris and the provinces (the average between the Bordeaux and Lyon price when both are available). The standard errors (in parentheses) are the result of a one-sample t-test comparing the sample of daily differences to zero, p-values in brackets. The last row for each period reports the average difference as a percentage of the average Paris price. In bold, assets-periods for which the differences are significant and in the same direction as the differences in rente prices. The periods of analysis are: The entire Siege, from 1870-09-18 to 1871-01-28. The second half of the Siege starts after the French victory at Coulmiers (which led to the recapture of Orleans) on 1870-11-15. The peace negotiations went from the end of the Siege until 1871-03-02. Peacetime includes two periods: before the war (1870-01-01 to 1870-07-17), and after the pacification of Paris and restoration of the telegraph (1871-05-30 to 1871-12-31).
These graphs show the prices of the Italian 5% bond and the Societe Autrichienne (Austrian railroad) stock. For the Italian bond, we use prices in Bordeaux, for the Austrian railroad, we use the average of Bordeaux and Lyon.
commodities and luxuries within the Siege are largely uncorrelated with the rente price change.\footnote{For example, the correlation over time of the butter price and the rente price difference is 0.012 (p-value=0.96), see Table A.7 for correlations between other food prices and the rente price difference. Interestingly, food prices do tell us something about beliefs about the war in Paris. In particular, prices started to decrease around mid-January, as Parisians anticipated the surrender and hoarders increased supply (Sheppard (1874), pg. 229). Around the same time, rente prices decreased in Paris, suggesting that Parisians were pessimistic about peace.} Thus, the rente price does not seem to reflect a desire for liquidity by either the rich or the poor as food prices rose.

![Figure 9: Rente and food prices in Paris](image)

This figure compares food prices (see Figure A.22 for more other food items) in Paris to the price of the rente in Paris and outside (average of Bordeaux and Lyon). It shows that the differences we observe in the price of government bonds are not related to food inflation in Paris. The correlation over time of butter price and the rente price difference is 0.012 (p-value=0.96), see Table A.7.

5 Discussion

To the best of our knowledge, this is the first paper to document that the presence of persistent differences in equilibrium market prices can arise due to differences in political beliefs, and can do so even for one of the most actively traded assets in history. With increasing political polarization and the emergence of echo chambers in news provision and social interactions (e.g., Flaxman et al. (2016); Gentzkow and Shapiro (2010)), market prices have the potential to provide much-needed non-partisan metrics of the effects of political
decisions on the economy. Our results point to both the possibilities but also the limitations of this approach. When the French declared war on Prussia, there was much support, both on the street and among political elites. Nevertheless, the price of the French rente fell, consistent with the smart money, both in Paris and around the world, providing a corrective to “war fever”.

Yet, our results suggest that, as Paris was isolated by the Siege, the marginal trader began to see war news through the political perspective of those around her. Traders in Bordeaux read Parisian prices printed in the newspaper, but they ignored them and let their political beliefs color their assessment. This suggests an under-explored but potentially important social value to the dual listing of financial assets for companies across borders. This may be particularly relevant for aligning expectations among economic and political decision-makers in countries perceived to be in great power competition. A focal contemporary example is that of the United States, where many are concerned about a rising China, much like France and Germany in 1871. Though it caused the deaths of more than 180,000 soldiers, contributed to the deaths of more than 250,000 civilians, and created lasting animosities that would make the great conflicts of the twentieth century more likely, the Franco-Prussian War may still have lessons to teach us that might help support peace.

On how social diversity may make asset markets less prone to bubbles in on-line lab experiments, see also Levine et al. (2014).
References


Flaxman, Seth, Sharad Goel, and Justin M. Rao, “Filter Bubbles, Echo Chambers, and Online News Consumption,” Public Opinion Quarterly, 03 2016, 80 (S1), 298–320.


la Follye, De, Recueil des dépêches télégraphiques reproduites par la photographie et adressées à Paris au moyen de pigeons voyageurs pendant l’investissement de la capitale, L’inspecteur des Télégraphes, 1871.


Morlaix, Recueil des dépêches télégraphiques officielles publiées pendant la durée de la guerre 1870-1871.
Nouveau Tableau de la Bourse de Paris. Conseils aux spéculateurs

Nouveau Tableau de la Bourse de Paris. Conseils aux spéculateurs, 1858.


A Appendix

A.1 Proofs

Proof of Lemma 1. If $\alpha_j = 1$, it directly follows from Eqn. (5) that $\gamma_j = 1$. Further, Eqn. (5) indicates that $\gamma_i > 1$ if

$$Pr^w > \frac{1}{1 - \alpha}.$$ 

Therefore, $\alpha_i > 1$ and $Pr^w > 1/2$ guarantee that $\gamma_i > 1$. $$\square$$

Proof of Lemma 2. The derivative and cross-derivative are given by

$$\frac{\partial \gamma_i}{\partial \alpha_i} = Pr^w - \frac{1}{\alpha_i^2} (1 - Pr^w) \quad (10)$$

$$\frac{\partial^2 \gamma_i}{\partial \alpha_i \partial Pr^w} = 1 + \frac{1}{\alpha_i^2} > 0 \quad (11)$$

As long as $Pr^w > 1/(1 + \alpha_i^2)$, $\partial \gamma_i / \partial \alpha_i > 0$. Given that $Pr^w > 1/2$, this holds for the smallest possible value of $\alpha_i = 1$ and therefore for all $\alpha_i$. $$\square$$

Proof of Proposition 1. Equation (6) follows directly from iterating forward Eqns. (1) and (2). $$\square$$

Proof of Proposition 2. This follows directly from market clearing. At the equilibrium price an equal weight of investors should be willing to sell or buy the security. If markets are integrated, this should hold globally. Otherwise, this will hold locally. $$\square$$

Proof of Corollary 1. We first transform the valuation expressions, adding a constant:

$$\hat{V}_{C/R,t}^w = V_{C/R,t}^w + \frac{\Omega}{1 - \delta \pi}.$$ 

from where we can write

$$\frac{\hat{V}_{C,t}^w}{V_{R,t}^w} = \frac{\gamma_C}{\gamma_R} \frac{1 - \delta \pi \gamma_R}{1 - \delta \pi \gamma_C} \left( \frac{\alpha_C}{\alpha_R} \right)^{W_t - L_t}.$$ 

(12)

Lemma 2 implies that $\gamma_C > \gamma_R$ if $\alpha_C > \alpha_R$. Therefore, we also have that $1 - \delta \pi \gamma_R > 1 - \delta \pi \gamma_C$. That means that there exists some $(W_i - L_t)^* < 0$ at which $V_{C,t}^w = V_{R,t}^w$. For any $W_i - L_t > (W_i - L_t)^*$, $\hat{V}_{C,t}^w > \hat{V}_{R,t}^w$.

The fact that difference in valuations while at war increases in $Pr^w$ follows directly from Lemma 2 which indicates that $\gamma$ is more sensitive to $\alpha$ for larger values of $Pr^w$. 

50
Proof of Corollary 2. The change in valuation after a win, conditional on remaining in war, is given by:

\[ V_{t+1}^w | w_t - V_t^w = \left( \alpha - 1 \right) \frac{(1 - \pi) \gamma \delta}{(1 - \delta)} \frac{(1 - \delta) (1 - \delta \pi \gamma)}{\Gamma_{i,t}}. \] (13)

Parts A and B are both strictly increasing in \( \gamma \) and therefore in \( \alpha \). Part C is increasing in \( \alpha \) if \( W_t \geq L_t \). Therefore, there exists some \((W_t - L_t)^* < 0\) at which \( \partial (V_{t+1}^w | w_t - V_t^w) / \partial \alpha = 0 \). For any \( W_t - L_t > (W_t - L_t)^* \), \( \partial (V_{t+1}^w | w_t - V_t^w) / \partial \alpha > 0 \). Results for losses are symmetric.

Proof of Corollary 3. This follows directly from Eqns. (2) and (4). Formally,

\[ \frac{V_{C,t}^p}{V_{R,t}^p} = \left( \frac{\alpha_C}{\alpha_R} \right)^{W_t - L_t} < 1. \]

After the end of hostilities, valuations are given by

\[ V_t^p = \frac{\alpha^{W_t - L_t}}{1 - \delta} \]

If \( L_t > W_t \), this expression is decreasing in \( \alpha \).

Proof of Corollary 4. This follows directly from Proposition 1. Formally, the return to news about an armistice (end of hostilities; realization of \( W_t - L_t \)) is given by:

\[ V_{t+1}^p - V_t^w = \frac{\Omega}{1 - \delta \pi} - \frac{\delta \gamma - 1}{(1 - \delta)(1 - \delta \pi \gamma)} \Gamma_t. \] (14)

The first element is positive: the armistice means that further costs of war are avoided. As long as \( \delta \gamma > 1 \) (the expected payoff from a win \( \gamma \) is larger than \( 1/\delta \)), the second element is negative. This element captures the lost benefits of war, which, in expectation, should lead to more wins than losses as long as \( \alpha > 1 \). This second element is increasing in \( \gamma \) and therefore in \( \alpha \).
### A.2 Additional tables and figures

#### A.2.1 Miscellaneous additional tables and figures

<table>
<thead>
<tr>
<th></th>
<th>French gov bonds</th>
<th>Equity</th>
<th>Real Estate</th>
<th>Foreign gov bonds</th>
<th>French priv bonds</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of Parisians who owned...</td>
<td>10</td>
<td>10</td>
<td>5</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>% of Parisians with positive wealth who owned...</td>
<td>37</td>
<td>36</td>
<td>17</td>
<td>10</td>
<td>29</td>
</tr>
<tr>
<td>... as % of total wealth</td>
<td>12</td>
<td>17</td>
<td>34</td>
<td>3.1</td>
<td>10</td>
</tr>
<tr>
<td>% of ... owned by richest 5%</td>
<td>84</td>
<td>88</td>
<td>92</td>
<td>88</td>
<td>85</td>
</tr>
<tr>
<td>% of ... owned by richest 10%</td>
<td>95</td>
<td>97</td>
<td>99</td>
<td>97</td>
<td>96</td>
</tr>
<tr>
<td>% of ... owned by women</td>
<td>41</td>
<td>38</td>
<td>44</td>
<td>31</td>
<td>45</td>
</tr>
</tbody>
</table>

This table uses Piketty et al. (2014)’s replication data to report basic descriptive statistics about French government bonds and other assets. It uses a stratified sample of wills of people who died in 1872.
Figure A.1: Proportion of republican, liberal, or leftist deputies in the National Assembly from Paris and the rest of France.

This graph shows that Paris consistently elected more leftist deputies than the rest of France. Each observation corresponds to an election year (every post-Napoleonic election of the 19th century is included).

Figure A.2: Votes for the left and center-left in all communes and neighborhoods

This graph shows the percentage of votes that left and center-left parties obtained in each election. Data are from Cagé and Piketty (2023).
Figure A.3: Votes for the left in the richest communes and neighborhoods

This graph shows the percentage of votes that the left (excluding center-left) obtained in each election, in the 1% richest arrondissements (for Paris) or communes (for the rest of France). Both income and voting data are from Cagé and Piketty (2023).

Figure A.4: Votes for the left in all communes and neighborhoods

This graph shows the percentage of votes that the left (excluding center-left) obtained in each election. Data are from Cagé and Piketty (2023).
Table A.2: Votes for the ratification of the peace treaty

<table>
<thead>
<tr>
<th></th>
<th>Paris</th>
<th>Bordeaux</th>
<th>Lyon</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>6</td>
<td>14</td>
<td>12</td>
<td>546</td>
</tr>
<tr>
<td>No</td>
<td>31</td>
<td>0</td>
<td>0</td>
<td>107</td>
</tr>
<tr>
<td>Did not vote</td>
<td>6</td>
<td>0</td>
<td>1</td>
<td>23</td>
</tr>
</tbody>
</table>

This table shows the number of deputies in the National Assembly voting for and against the ratification of the peace treaty on March 4, 1871. The treaty was ratified with the votes of the conservative, rural, and provincial majority. The Parisian Republican left opposed it.

Figure A.5: Original Source: the published Paris rente price in the daily Cours Authentique, Dec 1st, 1870.
Figure A.6: Original Source: the published Bordeaux *rente* price in the daily *Cours Officiel*, Dec 1st, 1870.

<table>
<thead>
<tr>
<th>Fonds Français</th>
<th>AU COMPTANT</th>
<th>en LIQUIDATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 1/2%, jours, 1er Octobre 1870</td>
<td>52 70 85 90</td>
<td>52 70 78 60</td>
</tr>
<tr>
<td>Emprunt 1870, justification octobre obrigations 6%</td>
<td>53 35 40 50</td>
<td>53 35 40 50</td>
</tr>
<tr>
<td>Régistre, mémoire, bull, negociable, du</td>
<td>13 00</td>
<td>13 00</td>
</tr>
<tr>
<td>4 1/2%, jours, 22 sept 1870</td>
<td>51 70 85 90</td>
<td>51 70 78 60</td>
</tr>
<tr>
<td>petite caisse</td>
<td>53 35 40 50</td>
<td>53 35 40 50</td>
</tr>
<tr>
<td>Obligations de Trafic</td>
<td>112 50 115</td>
<td>112 50 115</td>
</tr>
</tbody>
</table>

Figure A.7: Original Source: the published Paris *rente* price in the daily newspaper *Le Salut Public*, Dec 1st, 1870.

<table>
<thead>
<tr>
<th>Bourse de Lyon du 1er Déc. (4h 1/4 a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>56 75</td>
</tr>
<tr>
<td>91 65</td>
</tr>
<tr>
<td>4 1/2 Francs</td>
</tr>
</tbody>
</table>
The colors denote the party or faction of the majority of deputies elected by each department. From more to less bonapartist (or from right to left): Green - government, white with dots - government liberal, blue with horizontal stripes - liberal opposition, red with vertical stripes - democratic opposition, orange with diagonal stripes - radical opposition. Parisians (zoomed in in the upper left) were way more likely to vote for the left.
Figure A.9: Original Source: “Table of Balloons Leaving Paris during the Siege, 1870-1871”

This map shows the early battles in the East, the Siege of Paris, and the attempts to relieve Paris from the Southwest.

### A.2.2 Additional graphs and tables on price differences

Table A.3: Three ways to quantify the price differences

<table>
<thead>
<tr>
<th></th>
<th>Entire Siege</th>
<th>Second half of the Siege</th>
<th>Peace negotiations</th>
</tr>
</thead>
<tbody>
<tr>
<td>As a % of price</td>
<td>0.92%</td>
<td>1.77%</td>
<td>-2.66%</td>
</tr>
<tr>
<td>As a % of GDP</td>
<td>0.30%</td>
<td>0.58%</td>
<td>-0.86%</td>
</tr>
<tr>
<td>As a % of country risk</td>
<td>-2.31%</td>
<td>-4.44%</td>
<td>6.56%</td>
</tr>
</tbody>
</table>

This table shows three ways to quantify the price differences between the provinces and Paris (always as Paris minus the provinces). First, as a percentage of the price. Second, as a percentage of GDP. Third, as a percentage of country risk. We calculate country risk as the difference in yields between the French rente and the (arguably risk-free) British consol.
Figure A.11: Prices of 3% government bonds in Bordeaux, Lyon, and Paris

This graph shows the prices of 3% French government bonds in Paris, Bordeaux, and Lyon between 1870-09-10 and 1871-04-01. The differences between Bordeaux and Lyon are smaller and not as persistent as the differences between Paris and the provinces.
The graph shows the prices of 3% French government bonds inside and outside Paris between 1870-01-01 and 1871-12-31. The outside prices are an average between Lyon and Bordeaux. The shaded area corresponds to the period we analyze (zoomed in in Figure A.13). The events depicted are, in chronological order: the Ems telegram (a diplomatic incident), the start of the war (the French declaration of war), three French defeats that happened within three days (Wœrth, Spicheren, and Wissembourg), the inconclusive Battle of Gravelotte, the Battle of Sedan where Napoleon III was captured, the beginning of the Siege of Paris, and the accession of the Government of National Defense. The figures show the dates of significant events and the corresponding price movements.
The graph shows the prices of 3% French government bonds inside and outside Paris between 1870-09-01 and 1871-12-31. Outside prices are an average between Lyon and Bordeaux. All the events we use in section 4 are depicted here.
This graph shows the prices of 3% French government bonds in Paris between 1865 and 1876. In blue, bimonthly prices from DIFI. In red, daily prices collected by us for 1870 and 1871. The purpose of this graph is to display rente prices over a longer time period, and to show that our independently collected data matches DIFI's.
Figure A.15: Bond yields in France and Great Britain

This graph shows the yields for the 3% French government bond in Paris (green) and in the provinces (blue, average of Bordeaux and Lyon). It also shows the yields for the British 3% consol (red). The graph shows that French debt had country risk priced in before the war, that the country risk greatly increased with the start of the war and with the early defeats, and that the differences between Paris and the provinces constitute a noticeable part of the total country risk (equivalent to 4.44% and 6.56% during the second part of the Siege and the peace negotiations respectively). The British consol, on the other hand, was only minimally impacted by the war. Source for British consol yields: Bank of England (2023).

A.2.3 Additional graphs and tables on price responses to events
Table A.4: More events and two-day returns in three cities

Positive Days for news to arrive | Days for news to arrive | Return | Return | Return
---|---|---|---|---
Pre-Siege battles
| Date | Paris | Bordeaux | Lyon |
|——|——|——|——|
| Saarbrucken | Yes | 1870-08-02 | 1 | 2 | 2 | -0.00% | 0.69% | 0.00% |
| Weissenburg | No | 1870-08-04 | 3 | 2 | 2 | -2.59% | -0.15% | -0.51% |
| Spicheren | No | 1870-08-06 | 3 | 2 | 2 | -2.71% | -3.72% | -2.82% |
| Worth | No | 1870-08-06 | 3 | 2 | 2 | -2.71% | -3.72% | -2.82% |
| Borny-Colombey | No | 1870-08-14 | 2 | 2 | 2 | -2.13% | -1.81% | -3.97% |
| Mars-la-Tour | Yes | 1870-08-16 | 3 | 3 | 3 | -0.31% | 0.83% | 2.22% |
| Gravelotte | No | 1870-08-18 | 3 | 3 | 3 | -3.19% | -4.40% | -3.79% |
| Beaumont | No | 1870-08-30 | 5 | 5 | 5 | -7.52% | -12.33% | -8.50% |
| Noisseville | No | 1870-08-31 | 1 | 1 | 1 | 1.79% | 1.45% | 0.80% |
| Sedan | No | 1870-09-01 | 1 | 3 | 3 | 3 | 0.16% | -7.52% | -12.33% | -8.50% |

Minor battles
| Date | Paris | Bordeaux | Lyon |
|——|——|——|——|
| Chevilly | No | 1870-09-30 | 2 | 2 | 2 | -2.33% | 1.83% | 0.88% |
| Bellevue | No | 1870-10-07 | 1 | 1 | 1 | 2.29% | -0.89% | 1.34% |
| Thionville | No | 1870-11-24 | 13 | 6 | 4 | -1.43% | 0.00% | -0.27% |
| Villiers | No | 1870-12-02 | -2 | -2 | 2 | 3 | 3 | 0.00% | -1.63% | 0.53% | -1.33% | -0.54% |
| Beaugency | No | 1870-12-10 | 7 | 0 | -1 | 10 | 4 | 3 | 3 | 0.00% | -0.80% | 0.46% | 0.45% | 0.91% | 0.18% |
| Buzenval | No | 1871-01-19 | 3 | 3 | 3 | -1.48% | -0.28% | 0.38% |

This table shows the two-day returns in the three markets to minor and pre-Siege battles (so it is an extension of Table 3). Returns are calculated as: \[
\log(p_t) - \log(p_{t-2})
\] for news printed on day \(t\). Since news arrived on different days to each market, they do not necessarily correspond to the same calendar date.
This figure shows rente prices in three markets around war events. The shaded area covers the two-day period when news may have arrived. Therefore, the response to the event happened within the shaded area.
This figure shows rente prices in three markets around war events. The shaded area covers the two-day period when news may have arrived. Therefore, response to the event happened within the shaded area.
A.2.4 Additional graphs and tables on the role of information

Table A.5: Price convergence after Lyon prices are printed in Bordeaux

<table>
<thead>
<tr>
<th></th>
<th>Siege negotiations</th>
<th>Peace negotiations</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δprice difference</td>
<td>-0.200* (0.100)</td>
<td>-0.002 (0.143)</td>
<td>-0.137* (0.082)</td>
</tr>
<tr>
<td>Lower bound 95% CI</td>
<td>-0.400</td>
<td>-0.230</td>
<td>-0.301</td>
</tr>
<tr>
<td>Mean absolute price difference</td>
<td>0.953</td>
<td>0.716</td>
<td>0.903</td>
</tr>
<tr>
<td>Observations</td>
<td>55</td>
<td>24</td>
<td>79</td>
</tr>
<tr>
<td>Median delay</td>
<td>4 days</td>
<td>4 days</td>
<td>4 days</td>
</tr>
</tbody>
</table>

In this table we study whether the price difference between Bordeaux and Lyon decreased after the Bordeaux newspaper *La Gironde* printed Lyon prices. Standard errors are calculated from a t-test that compares the sample of changes in price differences to zero. We also report the lower bound of the 95% CI (an upper bound for convergence).
Figure A.18: Balloon arrival dates and Prices

This figure shows the price of the rente inside and outside Paris during the Siege. Hydrogen-filled balloons traveled from Paris to the provinces, the dots represent days with balloon landings.

Figure A.19: Pigeon arrival dates and Prices

This figure shows the price of the rente inside and outside Paris during the Siege. Carrier pigeons traveled from the outside to Paris with both official correspondence and private mail, the dots represent days with pigeon landings.
Figure A.20: Days with Paris prices printed in Bordeaux and Prices

This figure shows the price of the rente inside and outside Paris during the Siege. The dots denote the days when the Bordeaux newspaper *La Gironde* printed the Paris prices.

Figure A.21: Days with news from the outside in Paris and Prices

This figure shows the price of the rente inside and outside Paris during the Siege. The Parisian newspaper *Le Figaro* often printed news from outside. The dots represent the “day with news”, i.e. days when the events reported by *Le Figaro* were more recent than any event reported before.
Table A.6: Incoming information and abnormal returns in Paris

<table>
<thead>
<tr>
<th></th>
<th>Panel (a): Paris</th>
<th>Panel (b): Bordeaux</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Pigeon arrival reported in historical source</td>
<td>$-0.033$</td>
<td>$0.254$</td>
</tr>
<tr>
<td>Any outside news printed in Paris</td>
<td>$-0.022$</td>
<td>$0.170$</td>
</tr>
<tr>
<td>Number of outside news printed in Paris</td>
<td>$0.005$</td>
<td>$0.016$</td>
</tr>
<tr>
<td>Paris price printed in Bordeaux</td>
<td>$-0.270$</td>
<td>$0.213$</td>
</tr>
<tr>
<td>Lyon price printed in Bordeaux</td>
<td>$0.256$</td>
<td>$0.262$</td>
</tr>
</tbody>
</table>

Fixed effects: Week Week Week Week Week
Mean DV: 1.003 1.003 1.003 0.937 0.937
Observations: 133 165 165 165 165
Sample: Siege Siege and peace negotiations

This table shows the relationship between incoming information and abnormal returns in Paris, as a robustness check of table 6. The dependent variable is the absolute value of the two-day rente return in Paris/Bordeaux: $|\log(p_t) - \log(p_{t-2})|$. The independent variables are: a dummy that equal one if a historical source documented a pigeon arrival (from Hayhurst (1970)), a dummy that equals one if Le Figaro reported news from the outside (regardless of how old), the number of outside news reported by Le Figaro, and dummies that equal one if LA Gironde printed Paris and Lyon prices. Robust standard errors in parenthesis. *p<0.1; **p<0.05; ***p<0.01.
A.2.5 Additional graphs and tables on the role of liquidity shocks

Figure A.22: Rente and more food prices in Paris

![Graph showing food prices and rente prices over time.]

This figure compares more food prices (as a complement to Figure 9) in Paris to the price of the rente in Paris and outside (average of Bordeaux and Lyon). It shows that the differences we observe in the price of government bonds are not related to food inflation in Paris.

Table A.7: Absence of correlation between food prices and price differences

<table>
<thead>
<tr>
<th></th>
<th>Butter</th>
<th>Potatoes</th>
<th>Eggs</th>
<th>Rabbit</th>
<th>Fowl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correlation</td>
<td>0.277</td>
<td>-0.135</td>
<td>0.123</td>
<td>0.073</td>
<td>0.355</td>
</tr>
<tr>
<td>rente price</td>
<td>(0.248)</td>
<td>(0.330)</td>
<td>(0.299)</td>
<td>(0.332)</td>
<td>(0.331)</td>
</tr>
<tr>
<td>difference and</td>
<td>[0.282]</td>
<td>[0.693]</td>
<td>[0.688]</td>
<td>[0.830]</td>
<td>[0.315]</td>
</tr>
</tbody>
</table>

This table shows the absence of a correlation between food prices in Paris and the difference between rente prices in Paris and outside. Coefficients are correlation coefficients. Standard errors in parentheses and p-values in brackets.
These graphs show the prices of the Lyon et Mediterranee railroad stock and the Midi railroad bond. For Midi, we use prices in Bordeaux, for Lyon et Med, we use the average of Bordeaux and Lyon.
A.3 Was there arbitrage? Reading pigeon messages

To study the prevalence of arbitrage, we take advantage of the fact that pigeon messages were photographed and their text is known today (Hayhurst (1970)). In order to look for messages that may include either trading instructions or confirmations, we digitized the messages included in a published collection of messages.\(^38\) We searched the messages for seventeen words that were likely to be included in trading messages.\(^39\) Out of a total of almost thirty thousand digitized messages, we found 902 that included one of our keywords. We read those 902 messages, and found that only 22 were speculative trading instructions or confirmations.\(^40\) Of those 22 messages, 14 concerned French government bonds.

We only found 10 messages that were both concerning French government bonds and were specific enough as to allow us to evaluate how profitable the trades were.\(^41\) We did not find the trades to be very profitable: only half of them had a positive return, with an average return of 0.13%.

We cannot rule out speculative trading messages that were cryptic enough to hide from our analysis. After all, investors had an incentive to keep their trades secret. Moreover, since messages were charged by the letter, they used abbreviations and shorthand that may hinder our search. Still, after extensive analysis of the messages we concluded that trading was not a common topic and that arbitrage was rare. The word cloud of private messages in figure A.24 shows that messages were chiefly concerned with reassuring family or inquiring about the health of loved ones. A word cloud of official messages in figure A.25 also shows an absence of trading-related topics.

\(^38\) Recueil des dépêches télégraphiques reproduites par la photographie et adressées à Paris au moyen de pigeons voyageurs pendant l’investissement de la capitale, available at https://gallica.bnf.fr/ark:/12148/bpt6k5499951n.texteImage.

\(^39\) The seventeen words are: action, obligations, intérêt, marché, échange, vend, impot, paiement, banque, offre, credit, Rothschild, compagnie, rente, achet, terme, and comptant. In English, they are stock, obligation, interest, market, exchange, sell, tax, payment, bank, offer, credit, Rothschild, company, rent, buy, term, and spot.

\(^40\) A typical example of a message that we did not classify as speculative trading was: “send news olivier take care of your cash if you need money could sell part of the loan annuities” (our translation).

\(^41\) Two examples of specific trading instructions/confirmations were: “buy rents with all available funds”, and “just bought an annuity to the value of fifty thousand francs at fifty-three and three-quarters”.

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Notice that private communications by carrier pigeon chiefly concerned reassuring family or inquiring about the health of loved ones (bien [N=14733], sante [N=4580]), acknowledging receipt of previous messages (e.g., receu, recevons, lettre(s)) and other basic questions. Though argent (money) appears 1134 times, rente only appears 28 times in the private corpus.
The *rente* was not mentioned in government to government Pigeon communications during the Siege.
A.4 Why was there no arbitrage? Simulation exercise

In this section, we ask why the price differences remained, despite the fact that both Parisians and provincials were aware of them. We simulate a trading strategy that aims to exploit price differences. We compute two strategies: that of a trader residing in Paris, who receives Bordeaux prices via pigeon and sends trading orders via balloon; and that of a trader residing in Bordeaux, who reads Paris prices in the local newspaper and sends trading orders via pigeon.

Simulation of arbitrage from Bordeaux:

1. We randomly draw one of the 38 Paris prices printed in the Bordeaux newspaper *La Gironde*. This price is $n_1$ days old.

2. If $Price_{Paris} - Price_{Bord} > t$, the investor buys rentes in Bordeaux and sends a pigeon message to Paris ordering to sell an equal amount of bonds there.

3. If $Price_{Bord} - Price_{Paris} > t$, the investor sells rentes in Bordeaux and sends a pigeon message to Paris ordering to buy an equal amount of bonds there.

4. We randomly draw a pigeon travel time to capture uncertainty in how long it would take, $n_2$ days.

5. To capture the ex-ante uncertainty associated with returns, we draw returns from a random $n_1 + n_2$ days period.

The investor faces three sources of uncertainty: What happened to the Paris price in the $n_1$ until reported, how long would it take to reach Paris $n_2$, and the return over $n_1 + n_2$ days. We assume investors form beliefs from past returns, so we draw returns from the past for each iteration of the simulation. After repeating this procedure 10,000 times, we calculate the average return and its standard deviation to calculate the Sharpe ratio as $E(return)/sd(return)$, as a measure of the performance of the investment.

Simulation of arbitrage from Paris:

1. We randomly draw one of the 41 pigeon arrivals in Paris. Despite scant evidence of arbitrage in these messages, we assume that they contain Bordeaux prices. This price is $n'_1$ days old.
2. If $Price_{Paris} - Price_{Bord} > t$, the investor sells rentes in Paris and sends a message via balloon to Bordeaux ordering to sell an equal amount of bonds there.

3. If $Price_{Bord} - Price_{Paris} > t$, the investor buys rentes in Paris and sends a pigeon message to Bordeaux ordering to buy an equal amount of bonds there.

4. We randomly draw a balloon travel time to capture uncertainty in how long it would take, $n'_2$ days.

5. To capture the ex-ante uncertainty associated with returns, we draw returns from a random $n'_1 + n'_2$ days period.

Investors in Paris face the same three sources of uncertainty as investors in Bordeaux, and we run the same simulation to get a Sharpe ratio. In our simulation, it seems safer to trade from Paris than from Bordeaux, since balloons are much more reliable than pigeons. However, it should be noted that the first exercise is grounded on actual Paris prices printed in a Bordeaux newspaper, while in the second one, we are only assuming that pigeons carried prices. We were not able to find a systematic report of provincial prices in Paris.

Table A.8 reports results from our simulation exercise. Taking all possible trades, investors in Bordeaux and Paris get Sharpe ratios of 0.471 and 0.848, respectively. The ratios become higher if investors only trade when price differences are sufficiently high, 1.066 and 1.368 from Bordeaux and Paris, respectively. These numbers do not take into account transaction costs (such as brokerage or pigeon fees) and assume that investors had a complete understanding of the pigeon and balloon systems (including expected travel times) from the start.

For comparison, today’s traders in the city of London get a Sharpe ratio of 0.7 on average (Coates and Page (2009)), and experienced traders get 1.02. In summary, our simulation shows that risk-free arbitrage was not possible, and investors would have taken a considerable risk to make a profit out of it. We cannot rule out all trades, and it is possible that inter-city trade made the price differences smaller.
Table A.8: Simulation of a trading strategy that exploits price differences

<table>
<thead>
<tr>
<th>Min price diff to make a trade (in francs)</th>
<th>From Bordeaux Sharpe ratio</th>
<th>Number of days with trades</th>
<th>From Paris Sharpe ratio</th>
<th>Number of days with trades</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.471</td>
<td>38</td>
<td>0.848</td>
<td>41</td>
</tr>
<tr>
<td>0.25</td>
<td>0.599</td>
<td>31</td>
<td>1.057</td>
<td>35</td>
</tr>
<tr>
<td>0.5</td>
<td>0.685</td>
<td>27</td>
<td>1.111</td>
<td>34</td>
</tr>
<tr>
<td>0.75</td>
<td>0.991</td>
<td>20</td>
<td>1.240</td>
<td>30</td>
</tr>
<tr>
<td>1</td>
<td>1.066</td>
<td>19</td>
<td>1.368</td>
<td>24</td>
</tr>
</tbody>
</table>

This table shows the results of a simulation of an arbitrage strategy. For example, if a Parisian investor receives news of lower prices in Bordeaux, she can sell rentes in Paris and send a balloon message to Bordeaux to buy rentes there. The simulation randomly draws news from the outside (either a pigeon in Paris or a Paris price printed in Bordeaux, \( n_1 \) days old), a travel time for the trading order (\( n_2 \) days), and returns from a random \( n_1 + n_2 \) day period, for 10,000 iterations. We then compute the Sharpe ratio as \( E(\text{return})/sd(\text{return}) \). If investors only make trades for bigger price differences, Sharpe ratios are higher, but they also have fewer opportunities to make trades.

A.5 War and default in the nineteenth century

In this paper, we show that after four months of persistent price differences between Paris and the provinces, prices mostly converged when the peace terms were announced. We argue that peace conditions (and in particular, the size of the indemnity) were a key source of disagreement. The sheer size of the indemnity supports this view: the payment was equivalent to 25% of French GDP, and Devereux and Smith (2007) called it “the biggest transfer in history.” The most famous case of defeat, reparations, and default is Germany after World War I. However, this example was unavailable to contemporaries.

Table A.9 lists the cases of European defaults between 1800 and 1870 in Reinhart and Rogoff (2009) dataset. With the exception of Greece, Portugal, and Spain, they are all associated with international wars. Most of them date to the Napoleonic wars. There are two relevant and more recent examples. Prussia defaulted on its debt in 1850 following its defeat in the First Schleswig War. The Peace of Prague stipulated that Prussia had to pay reparations worth 20 million thalers. Austria defaulted on its debt in 1868 following its defeat in the Austro-Prussian War. Austria suspended debt amortization, wrote down its debt by 5%, and further imposed a permanent tax on coupon payments of 16% (Dinger 1870, p. 89). Not listed by Reinhart and Rogoff (2009) is Italy in 1868, when a permanent tax
of 8.8% was levied on coupon payments, which constitutes default (Dinger 1870, p. 122). This was in response to financial difficulties brought about by the war with Austria in 1866 (Houghton 1889).

In sum, it must have been well known to investors at the time that military defeat could lead to problems with debt repayment and subsequent writedowns on sovereign bonds, even by relatively developed countries.

Table A.9: List of European default episodes between 1800 and 1870

<table>
<thead>
<tr>
<th>Country</th>
<th>Start</th>
<th>End</th>
<th>International war?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>1802</td>
<td>1816</td>
<td>Napoleonic Wars</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1802</td>
<td>1814</td>
<td>Napoleonic Wars</td>
</tr>
<tr>
<td>Germany</td>
<td>1807</td>
<td>1807</td>
<td>Napoleonic Wars</td>
</tr>
<tr>
<td>France</td>
<td>1812</td>
<td>1812</td>
<td>Napoleonic Wars</td>
</tr>
<tr>
<td>Germany</td>
<td>1812</td>
<td>1814</td>
<td>Napoleonic Wars</td>
</tr>
<tr>
<td>Sweden</td>
<td>1812</td>
<td>1812</td>
<td>Napoleonic Wars</td>
</tr>
<tr>
<td>Spain</td>
<td>1820</td>
<td>1820</td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>1824</td>
<td>1834</td>
<td></td>
</tr>
<tr>
<td>Greece</td>
<td>1826</td>
<td>1874</td>
<td></td>
</tr>
<tr>
<td>Portugal</td>
<td>1828</td>
<td>1828</td>
<td></td>
</tr>
<tr>
<td>Portugal</td>
<td>1837</td>
<td>1841</td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>1837</td>
<td>1867</td>
<td></td>
</tr>
<tr>
<td>Russia</td>
<td>1839</td>
<td>1839</td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>1850</td>
<td>1850</td>
<td>Defeat in the First Schleswig War</td>
</tr>
<tr>
<td>Portugal</td>
<td>1850</td>
<td>1856</td>
<td></td>
</tr>
<tr>
<td>Austria</td>
<td>1868</td>
<td>1870</td>
<td>Defeat in the Austro-Prussian War</td>
</tr>
</tbody>
</table>

This table lists every episode of sovereign default by a European nation between 1800 and 1870 in the Reinhart and Rogoff (2009) dataset.

A.6 Data Appendix

A.6.1 Price data

We hand-collected daily prices for the 3% rente for 1870 and 1871 in three cities: Paris, Lyon, and Bordeaux. Our sources are the Cours Authentique (Paris), the Cours Officiel (Bordeaux), and the newspaper La Salut Public (Lyon) (see figures A.5, A.6, and A.7 for an example).\footnote{The digitized pdfs are available in https://gallica.bnf.fr/ark:/12148/cb32715573v (Paris), gallica.bnf.fr/ark:/12148/cb327155506 (Bordeaux), and https://www.lectura.plus/2996-le-salut-public.html (Lyon).} We always use the first price of the day.

The rente was an annuity that paid three percent annually. The nominal value of the bond was 100 francs, and coupons were paid quarterly on April 1st, July 1st, October 1st, and
January 2nd (0.75 francs each time). They were “considered detached” for listing purposes two weeks before. In Paris, they were always detached on the 16th. In the provinces, it was more irregular. The sources were always explicit about the last attached coupon. We confirm that we got the dates correctly by checking that on “coupon detached” days the prices dropped by 0.75 on average. For all our analysis, we add 0.75 after each coupon detachment day.

Table A.10 lists a subset of assets (those that appeared more liquid after a preliminary examination) and the number of days in which they appear in both Paris and Bordeaux, Lyon, or either. The sample goes from the start of the Siege to the end of the peace negotiations. The “Either” column is always close to the maximum of Bordeaux and Lyon, which indicates that Paris almost always had prices. The table shows that the 3% rente was by far the most liquid asset. There were 133 trading days in Paris during this period, all with rente prices (out of 140 business days). Therefore, we can conclude that the hardships of the Siege did not prevent business as (almost) usual. Using this table we choose the four assets for section 5.4.

Since the rente is an annuity that pays three percent per year, we calculate the yield as \( \frac{3}{\text{price}} \). We obtained yields for UK consols from FRED \(^{43}\). We calculated the country risk as the difference between the rente yield and the consol yield.

### A.6.2 Information flows

In the paper, we use five sources of data to account for information flows: balloons, pigeons, prices printed in La Gironde (Bordeaux), news from the outside printed in Le Figaro (Paris), and news about war and peace events in Le Figaro, La Gironde\(^{44}\), and Le Salut Public (Lyon).

First, balloons. Our source for balloon departures and arrivals is the map in figure A.9\(^{45}\). We always assume that news arrived at Bordeaux or Lyon at least twenty-four hours after the balloon landed. Therefore if a balloon landed in the afternoon of day \( t \), we assume it arrived in Bordeaux or Lyon before trading day \( t + 2 \) (trading hours were a couple of hours around noon). If it landed in the morning, we assume it arrived before trading day \( t + 1 \). We discard three balloons that were lost at sea, five that were captured by the Prussians, and one that landed in Norway.

Second, pigeons. We have two sources: First, a research assistant looked for mentions

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\(^{43}\)Available at https://fred.stlouisfed.org/series/LTCYUK

\(^{44}\)Available at https://gallica.bnf.fr/ark:/12148/cb32782567n

\(^{45}\)Map published by the freres Mangin et Goddard, Bibliotheque nationale de France: Ge C 2743. Available at https://gallica.bnf.fr/ark:/12148/btv1b53029817h
Table A.10: Number of days with prices both in Paris and another city

<table>
<thead>
<tr>
<th>Asset</th>
<th>Type</th>
<th>Number of days with Paris price and...</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3% Rente</td>
<td>French gov bond</td>
<td></td>
</tr>
<tr>
<td>Midi Railroad</td>
<td>French private bond</td>
<td></td>
</tr>
<tr>
<td>Soc Autrichienne Railroad</td>
<td>Foreign equity</td>
<td></td>
</tr>
<tr>
<td>Lyon et Mediterranee Railroad</td>
<td>French equity</td>
<td></td>
</tr>
<tr>
<td>Italian 5%</td>
<td>Foreign gov bond</td>
<td></td>
</tr>
<tr>
<td>Orleans Railroad</td>
<td>French equity</td>
<td></td>
</tr>
<tr>
<td>Midi Railroad</td>
<td>French equity</td>
<td></td>
</tr>
<tr>
<td>Suez Canal</td>
<td>French equity</td>
<td></td>
</tr>
<tr>
<td>Credit Mobilier Espagnol</td>
<td>Foreign equity</td>
<td></td>
</tr>
<tr>
<td>Est Railroad</td>
<td>French equity</td>
<td></td>
</tr>
<tr>
<td>Credit Mobilier</td>
<td>French equity</td>
<td></td>
</tr>
<tr>
<td>Espagne 3%</td>
<td>Foreign gov bond</td>
<td></td>
</tr>
<tr>
<td>Ouest Railroad</td>
<td>French equity</td>
<td></td>
</tr>
</tbody>
</table>

This table shows the number of days when we observe a price in Paris and a price in either Bordeaux or Lyon. We focus on the period from the start of the siege on September 18th, 1870 to the announcement of the peace treaty on February 28th, 1871. The assets in this list were pre-selected based on their apparent liquidity.

of pigeons in Le Figaro and recorded their arrival dates in Paris. Out of forty-one pigeon arrivals, the articles only specified departure dates for ten of them. Therefore, in section 5.3.2 (“The Paris price does not converge to external exchanges”), we do not use pigeons and use news instead. We did use those ten observations to obtain the mean and variance of pigeon travel times, which we used in section A.4 (“Why was there no arbitrage? Simulation exercise”). The second source for pigeon data is Hayhurst (1970), who reports arrival and departure dates separately and does not link them.

We also digitized the text of pigeon communications starting on November 30th, 1870, from an official report of the Direction of Mail and Telegraphs (la Follye (1871)).\footnote{Available at https://gallica.bnf.fr/ark:/12148/bpt6k5499951n} We read many of these messages from the original looking for trading instructions, not finding any. Using the OCR version, we performed the analysis described in A.3 (“Was there arbitrage? Reading pigeon messages”). We also used these messages for the word cloud A.24. The second world cloud (Figure A.25) uses official messages, also from an official report (Morlaix (1871)).\footnote{Available at https://gallica.bnf.fr/ark:/12148/bpt6k54385608}

Third, La Gironde reported Paris and Lyon prices, our most direct measure of information.
flows. We checked that prices printed in Bordeaux coincide with those originally reported in Paris and Lyon. We also added coupon payments to these prices.

Fourth, we collected news from the outside reported by Le Figaro with the help of a team of research assistants. The city and the date were often stated in the byline. We needed to rule out stories that debated or analyzed events long past (for example, the blame for the defeats in August or for the surrender of Metz was debated for our entire period). In order to identify the days with new information, we classify a day as a “day with news” if the events reported by Le Figaro were more recent than any event reported before. We used these data in sections 5.3.2 and 5.3.3.

Fifth, for a pre-defined list of war and peace events, we searched local newspapers (Le Figaro in Paris, La Gironde in Bordeaux, and Le Salut Public in Lyon) for the first mention and the confirmation, which we used in section 5.2.

A.6.3 Events

In section 5.2 (“Different Responses to War and Peace”) we study price reactions to events. To achieve this, we first needed a list of relevant events and when the news of each event arrived in each city.

To compile the list, we start with the two peace events: the Armistice and the announcement of the Treaty of Versailles. For military events, we first required that they happen after the start of the Siege (which excluded the war’s most important battles, such as Sedan and Gravelotte). Second, we excluded battles whose outcome was not known in Paris by the date of the Armistice (this requirement led us to exclude the battles of the Lisaine River, St. Quentin, Belfort, and Le Mans). Third, we exclude battles without a clear winner (Hallue River, Bapaume, and Chateaudun).

After considering these restrictions, our list of battles comes from Wawro (2003)’s definitive history of the Franco-Prussian War, which we also use to classify them into major and minor. In particular, we go through each page of Wawro’s book and classify major battles as those that he treats with separate chapters or sections with the battle name listed in capital letters in his book. Minor battles are those that are mentioned only once or in passing. For robustness, we also include minor battles that were mentioned in Clodfelter (2017) or in Parisian newspapers. We classify Siege breakout attempts from Paris as minor battles because we are not confident about the date when the information arrived in Paris (Chevilly, Bunzeval, and Villiers). Since the fighting was happening close to the city, Parisians had a

48 All issues available at https://gallica.bnf.fr/ark:/12148/cb34355551z/date
continuous flow of information, making it harder to date the events. We ended up with seven major and six minor battles. We also include ten pre-siege battles for a placebo specification (see tables 3 and A.4).

To measure the reaction to events, we need to know when each city found out about each news event. Our sources are the newspapers Le Figaro (Paris), La Gironde (Bordeaux), Le Salut Public and Le Journal Des Dépêches (both Lyon).49 We also used the journal of a Parisian stockbroker, Jacque-Henri Paradis (1872), who kept and published a detailed account of life in Paris and the markets during the Siege.

A.6.4 Miscellaneous data

In this subsection, we describe six secondary data sources.

First, we obtained food prices from the journal of an American in Paris, Nathan Sheppard, who recorded prices of many food items with a weekly frequency. We used the items with the most observations: butter, potatoes, eggs, fowl, and rabbit (items such as beef disappeared completely after a few weeks of the Siege, and items such as cats only appeared in the last few weeks). We used this information in section 5.3 (“Liquidity”).

Second, the political affiliation and department of each representative to the National Assembly from 1816 to 1893. The source is a dataset in the website of the Assemblée nationale50. It should be noted that this period encompasses many different regimes, with and without free elections, and with different extensions of the franchise. Also, even though the electoral rule allowed for candidates to run in more than one district, the database only lists one per candidate, which we use. The legislators classified as Parisians are those from the Seine departments. For party affiliation, we classified “leftists” and “conservatives”, and discarded those who we could not classify. We calculated the ratio in figure A.1 as the number of leftists over the sum of leftists and conservatives. The left affiliations are: leftist, republican, socialist, liberal, mountain, Danton, and opposition (to Napoleon III). The conservative affiliations are: right, monarchist, Bonapartist, legitimist, and conservative. Therefore, the graph shows the ratio of leftists to conservatives, excluding moderates. The graph looks very similar if we depict leftists as a percentage of the total (not reported in the paper).

Third, we obtained election results and income from Cagé and Piketty (2023)51 We downloaded results for every election they have during the Second and Third Republics

49 These newspapers were chosen because they were available in a digital format for the entire period.
50 Available at https://www2.assemblee-nationale.fr/sycomore/recherche
51 Available at unehistoireduconflitpolitique.fr.
(eighteen elections between 1848 to 1936). We used their classification of parties, and in the figures, we report the percentage of votes that go to the left and center-left (figures 2 and A.2), or just to the left (figures A.4 and A.3). We obtain similar results when we use the percentage of votes going to the right and center-right. We also use their data to restrict our sample to the richest communes (in Paris, arrondissements). We use the percentiles they report, using only those above the 99th percentile in figures 2 and A.3. Using a lower threshold makes the political difference between Paris and the provinces more striking because even the poorest Parisian neighborhoods (which are very left-wing) have incomes comparable to the top 10% richest communes.

Fourth, votes for ratification of the peace treaty (table A.2). We also used departments: Seine (Paris), Gironde (Bordeaux) and Rhone (Lyon). Our sources are La Gironde, 1871-03-03 (roll-call), and Journal Officiel, 1871-02-14 and 19th (representatives and their districts).

Fifth, table A.1 uses Piketty et al. (2014)’s replication data to report basic descriptive statistics about French government bonds and other assets. It uses a stratified sample of wills of people who died in 1872. Their data includes the amount in francs in each will for each asset category (French and foreign, equity and bonds, public and private, and all their combinations, plus real estate). Their anonymized data does not include the top 1%. Therefore, we assumed that the portfolio composition of those in the 99th percentile is the same as those in the 98th percentile. We are thankful to Piketty et al. (2014) for making their data public.

Sixth, in section A.5 (“War and Default in the Nineteenth Century”) we used default episodes from Reinhart and Rogoff (2009).52

52Available at: https://carmenreinhart.com/this-time-is-different/