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ABSTRACT

Bimetallism disappeared as a monetary regime in the 1870s. Flandreau (1996) clearly demonstrates that French bimetallism would have been able to withstand the German de-monetization of silver. Could it have withstood if many other countries in the world moved to the gold standard following in the footsteps of Bismarck? The answer is no. By 1875 bimetallism would have been unviable, and the US return to convertibility in 1879 would have made it impossible to sustain true bimetallism. It is difficult to understand the end of the bimetallic strategy as the outcome of a repeated game between rational actors. Rather, it would appear that very few actors had a good model of how the international monetary system worked in practice as of 1873. An attempt to resuscitate bimetallism, with France and the US both bimetallic at the mint ratio of 15.5 to one, would have been tenuous. No wonder then that there were few countries enthusiastic about reviving bimetallism at the International Monetary Conference of 1878. A similar lack of cooperation risks sending the European Monetary Union-as currently constituted-the way of bimetallism.

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Bimetallism vanished as a monetary framework in the late nineteenth century. By 1885 nearly all nations in the world had pegged their currency exclusively to either gold or silver, while a small minority operated a fiat money regime. This is surprising. From at least Roman times, many countries had sanctioned the unlimited monetary use of both silver and gold at a stable fixed exchange rate. This paper investigates the strikingly rapid disappearance of bimetallism that began in the 1870s, and its relation to the international monetary system.

In 1872 Germany de-monetized silver and adopted the gold standard. In 1873, France, the largest bimetallic country in the world, limited silver coinage in a bid to avoid the consequences of Gresham's Law (i.e., "swallowing" German silver and losing its entire gold circulation). This was a departure from strict adherence to bimetallism. And though from 1873 until 1876 French officials said that they were very likely to return to full-fledged bimetallism, that hope hinged on the possibility of reviving bimetallism in the face of the subsequent move to the gold standard by many other countries.

But because of this international shift to the gold standard, a return to bimetallism would have exposed France to Gresham's Law. In this paper I ask how long it would have taken for the French decision of 1873 to become irreversible from an economic standpoint. Essentially I investigate how widespread the adoption of the gold standard had to be to expose France to a complete drain on its gold circulation.

The point of no return depended crucially on the size of the bimetallic bloc. The size of this bloc was directly related to the ability to use silver and gold reserves to cushion changing global precious metal demands at a fixed silver-gold mint ratio. For decades, France was the buyer and seller of last resort of both silver and gold managing to peg the silver price of gold at 15.5 to one. Few other countries of such size maintained bimetallism. The United States abandoned bimetallism in 1873 by de-monetizing silver, but for domestic political reasons it initiated the International Monetary Conference of 1878. The goal was to create a global accord to revive bimetallism. I also ask if the United States, in partnership with France, could have pegged the world price of silver at the old international mint ratio and made bimetallism viable. I argue that such a partnership would have been infeasible.

Contemporaries and Velde and Weber (2000) argued that bimetallism's strength and value was its ability to generate greater price stability than a monometallic regime. On the other hand, bimetallism might be theoretically inefficient when compared to a gold or silver standard if both precious metals have non-monetary uses (Velde and Weber, 2000). If this is true, then bimetallism's failure shows how an efficient institution (i.e., the gold standard in Europe) can displace an inefficient institution. On the other hand, if the sole function of a monetary system is to maintain price stability, the disappearance of bimetallsim was a negative outcome.

I emphasize that the end of bimetallism, and the subsequent geography of the international monetary system, was path dependent. Its ultimate contours were the result of historical events and systematic mis-perceptions about future possibilities by policy makers. History matters for the evolution of the international monetary system. More broadly, this is an excellent case study of new institutional theoretical arguments which suggest that the past heavily influences the long-run evolution and the current state of the economy and its policies and institutions (e.g., North 1997). Using the end of bimetallism as a case in point, it is worthwhile to show how these concepts have empirical salience.

To show how long France could have waited after 1873 and still have been capable of reinstating bimetallism, I use an elegant model of bimetallism pioneered by Flandreau (1996). Flandreau used his model to ask if German de-monetization of silver could have sealed bimetallism's fate. His answer was negative. I ask if France could have continued to peg the silver price of gold while *many other nations* de-monetized silver and moved to the gold standard. The answer uses readily available data on the demands for precious metals for monetary purposes and world stocks of specie.

I find that bimetallism would have become a de facto silver regime by around 1875. That is, had France eliminated its quantitative restrictions on silver coinage after this year, it would have faced a complete drain on its gold circulation at the historical mint ratio of 15.5 to one. And while my result supports Flandreau (1996) and Oppers (1996) who find that Germany's de-monetization of silver could not have destroyed bimetallism, I go further and pinpoint the year in which the allegedly temporary suspension of bimetallism became permanent. Moreover, my finding appears to be reasonably robust to imperfections in the precious metals data. And finally I present, what

is to my knowledge, the first evidence based on a precisely specified model, that the United States and France could not have resuscitated bimetallism in 1878.

I begin with an introduction to the historical events surrounding the end of bimetallism and then propose the counter-factual I analyze. Section 2 provides the analytical mechanics based on the seminal theoretical model of Flandreau (1996). Section 3 uses the model to simulate how long it might have taken for the French decision to become irreversible. Section 4 investigates whether the disappearance of bimetallism could have been remedied by including a larger coalition in the bimetallic bloc. I conclude by discussing the similarities between recent events in the European Monetary Union and the last days of bimetallism.

1 Bimetallism in the Long and Short Run

Until recently, scholars asserted that Germany's de-monetization of silver in 1872 was largely responsible for sharply and surprisingly causing silver to fall in value relative to gold (Friedman and Schwartz, 1963). A second version of the story argued that German de-monetization of silver threatened the viability of bimetallism in France. France reacted by de-monetizing silver thus reinforcing the price effects of Germany's initial move. The idea that the German move threatened bimetallism in France has been rejected by Flandreau (1996) and Oppers (1996).[1]

Bimetallic regimes follow *Gresham's Law*. Concurrent circulation of both metals is impossible if the price of gold in terms of silver is not roughly equal in specie markets and at the government mint. When the market ratio and the mint ratio diverge, the depreciating metal will displace the other metal from the bimetallic country.[2] If the shock is small enough, arbitrage transactions would equalize world prices and the mint ratio, but the bimetallic country would be left with a higher proportion of the once-depreciated metal in its money supply (Flandreau, 1996). However, a large shock to the demand or supply of either metal could end up causing the depreciated metal to make up the entire circulation before the market has re-equilibrated.

French bimetallism apparently did not succumb to Gresham's Law for at least 20 years prior

[1] According to Flandreau, France held 90 percent of the precious metal stocks in the bimetallic bloc. Below, I will use France as representative of the entire bimetallic bloc.

[2] See Rolnick and Weber (1986) for a dissenting view. They challenge the notion that Gresham's Law exists.

to 1872. Flandreau (1995) provides evidence that gold and silver circulated continuously in France during these years despite the gold discoveries of California. Figure 1 shows the market price of gold in terms of silver hugged the mint ratio of 15.5 to one from as early as 1840. Oppers (2000) and Flandreau (1996) have both concluded that France was large enough to peg the market price and that there was a concurrent circulation of both metals in France.[3]

But the global move to gold put bimetallism to the test. The German Empire was the first European country to adopt the gold standard after the monetary conference of 1867. The Germans then attempted to swap their silver reserves for gold with the aid of the bimetallic pledge in France to purchase all silver at a fixed exchange rate. As of 1872 Germany held nearly one-third the amount of specie in France. As a matter of economic principle it should have been easy for France to purchase nearly all of the German silver. Oppers (1996) and Flandreau (1996) have looked more closely at the historical debate, and using theoretical models calibrated to the data, they reject this thesis on historical grounds.[4]

1.1 A Current of Change

The harbinger of the scramble for gold came in 1872 and early 1873. Sweden, Denmark, Norway, Holland and the US all decided in late 1872 or early 1873 to demonetize silver. Still, Flandreau (1996) proposes that it was the *French* suspension of unlimited silver coinage in September 1873 which caused the silver price of gold to rise and not German demonetization. The argument is that French action prevented arbitrage in precious metals markets which would have stabilized the market value of silver. Flandreau asserts that the French limited silver purchases partially in order

[3]Velde and Weber (2000) investigate whether changes in world precious metals supplies endangered bimetallism. Their answer for the 1870s is no. In a finding more closely related to this paper, Velde and Weber also note that the secular fall in the value of silver associated with the rise of the gold standard led to a monometallic (gold) equilibrium by the 1880s. Their model suggests that in any bimetallic equilibrium the market ratio equals the mint ratio which from 1873 was not the case, and yet bimetallism 'survives' in their model for another decade. The quantitative restrictions on silver coinage imposed by France from 1873 would move actors off their first-order conditions in this model, but this is not discussed in Velde and Weber.

[4]Friedman (1990) claims that the United States could almost have resurrected bimetallism at the mint ratio of 16 to one after 1878. Friedman finds U.S. bimetallism would would have resulted in a reasonably constant market ratio just above 16 to 1 after about 1900. Why the Americans could have been more successful than the French has to do with the lower valuation of silver at the mint and the rapidly increasing size of American demands for specie after 1879 associated with rapid growth of overall GDP. The focus of this paper is on France as the key anchor of the bimetallic system in the 1870s and 1880s. I also focus on the French mint ratio of 15.5 to one.

to frustrate their rival's attempt to switch regimes. Residual animosity from the recently concluded Franco-Prussian war no doubt partially contributed to French decision-making. By limiting the free coinage of silver in France, Bismarck's regime change became more difficult. France was able to protect its financial stability and its domestic gold circulation as well as avoid being handed capital losses on silver. But Flandreau emphasizes that some French policy makers perceived the limitation of silver coinage as a 'precautionary and transitory decision' and bimetallism with unlimited silver coinage would soon return. In the end it turned out to be a mis-perception that the French could return to bimetallism. But the French also called their policy a 'wait and see' policy which suggests some contingency planning in the event that the rest of the world moved to gold or bimetallism became unsustainable.

The notion that this move was temporary, whether held by the French themselves or others beyond France, was very likely based on a faulty or incomplete cognitive model, and no one at the time appears to have been able to truly gauge the ability of the bimetallic system to resist shocks to the demands for precious metals. Moreover, and more crucially, French authorities who thought that the policy was only temporary, seem to have mis-read the international strategic setting in which their actions and strategies were being set. Their actions and words seem to ignore the facts on the ground, already evident by January of 1873, that all of France's major trading partners would soon be on the gold standard. Flandreau (1996) argues that the limitation on silver coinage was seen as a signal by the markets and policy makers in other nations of a non-credible commitment to bimetallism in the long-run. Consequently, French action solidified the preference for gold in Scandinavia, Holland and the United States among other nations. These countries preferred to conform to the regimes of their trading partners and to avoid a potential capital loss on their silver reserves in the event of French unwillingness to put a floor on the value of silver. In the case of the US, a forward looking policy anticipating gold and the lack of silver made for the 'Crime of 1873'. And since at this point Germany was set on gold, while France appeared likely to give up bimetallism, many nations opted for gold.[5]

The proximate reason that German and French decisions catalyzed the global mobilization

[5]From the International Monetary Conference of 1867, policy makers learned that France was *not* totally opposed to moving to a monometallic gold standard.

towards gold has to do with the strategic complementarities inherent in the trading and financial systems of the time. Flandreau (1996), Eichengreen and Flandreau (1998), and Meissner (2005) provide evidence that nations both declared it to be, and did indeed act as if it were more beneficial to join the gold standard the greater the proportion of their GDP devoted to trade with countries that were on gold. This network effect existed because coordination on monetary regimes decreased the transaction costs associated with international trade and capital movements. The transaction costs were eliminated in direct proportion to the number and size of a nation's economic partners already on gold.[6]

Germany's move to gold led indirectly to the same decision by the countries of northern Europe. Further, this switch, along with France's probable abandonment of bimetallism, had a global resonance partially responsible for sending the United States (1879), Holland (1875), and the Scandinavians (1874-1875) onto gold. This policy change also pushed Holland and Austria-Hungary to demonetize silver. Belgium, Switzerland and Italy, as part of the Latin Monetary Union, were forced to follow France and limit silver coinage in 1873. Japan, along with many other nations, also began to seriously contemplate moving to gold in the mid-1870s.

And so the original policy in France and Flandreau's finding lead us to a question. If bimetallism was a viable system in the face of the German de-monetization of silver, what sealed bimetallism's fate, and how long did it take for this decision to become irreversible? How many other countries had to switch to gold to make the 'transitory' decision permanent?

1.2 The End of Bimetallism as a Case Study in Institutional Change

In terms of lessons for institutional change, this historical episode is an extraordinary moment. Velde and Weber (2000) argue that bimetallism was inefficient (i.e., welfare dominated by a monometallic standard). The argument relies on a micro-founded model of bimetallism with a

[6]Not only is the econometric evidence from Meissner (2005) consistent with such a theory, but Flandreau (1996) dismisses many of the competing theories on the emergence of the gold standard as incompatible with the historical record. Meissner (2005) finds evidence that coordination on other regimes like silver, or even bimetallism, would have diminished the relative gains from moving to gold as would the numerous switching costs. Meissner (2005) also finds that the folllowing were related to the decision: the need to establish credibility in capital markets, the level of GDP per capita, and other domestic considerations such as the desire to achieve (or inability to avoid) high inflation via inconvertible paper currency.

cash-in-advance constraint and a non-monetary role for precious metals. Assuming an appropriate utility function, (e.g., constant elasticity of substitution between metals), the use of one commodity for money dominates the use of both concurrently.[7] From a macro-historical perspective, bimetallism, an inefficient institution was seemingly viable for a long time. But this regime suddenly came to be replaced by a more efficient arrangement. And though some calculation went into the disappearance of bimetallism, human error and historical circumstance seem to have played a large role.

This historical episode is an example of how mental models, perceptions and historical accidents produce economic outcomes. Douglas North argues 'ideas matter and different perceptions produce different choices . . . the result is that multiple equilibria can ensue.' And more to the point:

> It is belief systems that are the underlying determinant of path dependence . . . (organizations) arise as a result of a given institutional structure (and) have a vested interested in perpetuating that institutional structure . . . The way the institutions evolve reflects the ongoing belief systems of the players . . . Path dependence conceived of in this way, can account . . . for those occasions when abrupt changes in the path of a society do occur. The latter will occur when the belief system is perceived to be inconsistent with the outcomes predicted by that belief system.

The feedback system being described is the transition path from one equilibrium to another, and it is extremely salient in understanding the end of bimetallism.[8] French policy-makers initially seem to have believed that bimetallism was viable in the long-run - no matter what - even after temporarily suspending the unlimited coinage of silver. Ex post this seems like a mis-perception. French policy makers seemingly under-estimated the chances countries would move to gold all

[7] On the other hand, they also suggest bimetallism brings about greater price stability since an increase in one metal would have to accompanied by a decrease in the other commodity money in order to hold the market ratio at the mint ratio.

[8] One question, if we are interested in understanding the regime changes and strategies after 1873 is whether the beliefs and actions might represent a plausible (sequential) equilibrium in the game theoretic sense. A sequential equilibrium requires that beliefs on and off the equilibrium path are consistent or 'sensible' and that strategies be rational given those beliefs. Roughly speaking a set of strategies has to be sub-game perfect (i.e., credible) and beliefs on and off the equilibrium path must be correct according to the dictates of rationality and Bayes rule. The question hinges on whether the French abandonment of bimetallism was an un-expected outcome. More precisely, the question hinges on what probability French policy makers put on reaching a point where they would have to quit bimetallism due to the rest of the world moving to gold.

together and over-estimated the ability of the French monetary system to withstand these changes. French bimetallism, solid for so many years, expired in the wake of these events. In 1876 the Bank of France, facing a massive capital loss on its sizeable silver reserves sponsored the law that fully suspended silver coinage. French officials had determined by then that reintroducing actual bimetallism would be economically risky. In a new and highly relevant paper, Flandreau and Oosterlinck (2012) argue that until 1875 market participants acted as if bimetallism was viable. From 1875, the market became increasingly convinced that bimetallism would fail and the gold standard would reign. The question is then exactly how long after 1871 did it take for bimetallism to become fundamentally non-viable for France?

The next section formally investigates a counterfactual where France attempts to go back to full bimetallism in the face of the global adoption of gold during the 1870s. It turns out that France's "temporary" policy became permanent (and full bimetallism became non-viable) by about 1874. The worldwide shift to gold insured this was so, and the United States' return to gold convertibility in 1879 made a later reversal all the more difficult.

2 A Model of the Bimetallic System

This section formally investigates whether France could have re-instated bimetallism at the official mint ratio of 15.5 to one at any point between 1870 and 1885. I use Flandreau's model of bimetallism which outlines key relationships in precious metals markets. The strategy is to derive a long-run equilibrium condition on the supply and demand of precious metals under which bimetallism remains intact. By adjusting the demands for specie appropriately (i.e., taking into account the given regime changes in the 1870s), I can analyze the consequence of changes in these conditions for the viability of bimetallism. I show that if France had re-instated free silver coinage it would have become a de facto silver standard country after 1874.

The world has two precious metals used for monetary purposes: gold (G) and silver (S). There are three types of countries according to their monetary standard: gold (g), silver (s) and bimetallic (b). Each bloc has an ad hoc monetary specie demand equation as follows

$$M_G^g p_G = k^g p Y^g \tag{1}$$

$$M_S^s = k^s p Y^s \tag{2}$$

$$M_G^b p_G + M_S^b = k^b p Y^b \tag{3}$$

where M_j^i is the monetary specie demand for metal j, $j \in \{G, S\}$, for standard i, $i \in \{g, s, b\}$, k^i is a parameter, Y^i is real output in bloc i, p is the price of output, and p_G is the price of one unit of gold in terms of silver. Flandreau's model also allows for non-monetary demands for precious metals but I will abstract from these demands assuming them to be constant throughout.[9] The setup in its current state takes world money supplies and incomes as exogenous. Money demands can be justified in a cash-in-advance setup.

In addition assume that gold, silver and bimetallic countries have a constant ratio of real output such that

$$Y^g = \beta_G Y^b \text{ and} \tag{4}$$

$$Y^s = \beta_S Y^b. \tag{5}$$

Finally assume that total supply of precious metals is the sum of monetary demands across the different blocs

$$G = M_G^g + M_G^b \text{ and} \tag{6}$$

$$S = M_S^s + M_S^b \tag{7}$$

where G and S are the total world supplies of monetary gold and silver respectively.

Using equations (6) and (7), the model can be solved by adding up demands for both metals and making the appropriate substitutions. This leads to two useful parameters on gold and silver demands

$$m_g^m = k^g \beta_G \tag{8}$$

[9] In discussion, Velde showed that the share of gold in nonmonetary demands fluctuated between 0.57 and 0.52 from 1870 to 1880 and for silver the range is 0.765 and 0.73.

$$m_s^m = k^s \beta_S. \tag{9}$$

Letting $k = k^b$, $Y = Y^b$, G_B be the bimetallic demand for gold, S_B equal bimetallic silver demands, and G_n (S_n) equal gold (silver) bloc demands for gold we can write the following equations

$$G_n = m_G^m(\frac{p}{p_G})Y \tag{10}$$

$$S_n = m_S^m pY \tag{11}$$

$$kpY = p_G G_B + S_B \tag{12}$$

$$G_B + G_n = G \tag{13}$$

$$S_B + S_n = S. \tag{14}$$

These five equations give rise to two key conditions which describe how the specie stock in the bimetallic bloc adjusts to shocks in the demand for precious metals and world supplies of specie. They are

$$p_G G_B = p_G G(1 - m_G) - S m_G \tag{15}$$

$$S_B = -p_G G m_S + S(1 - m_S) \tag{16}$$

where $m_G = \frac{m_G^m}{k+m_G^m+m_S^m}$ and $m_S = \frac{m_S^m}{k+m_G^m+m_S^m}$.

Condition (15) shows, for example, that the gold stock in the bimetallic bloc would increase by $(1 - m_G)$ units for every one-unit increase in the world supply of gold. Additionally equations (15) and (16) also provide a useful set of boundary conditions that must be met if both silver and gold are to be in circulation in the bimetallic country.

A proper bimetallic equilibrium requires that both metals circulate in the bimetallic bloc or $p_G G_B > 0$, and $S_B > 0$. This gives rise to the following inequalities

$$\frac{m_G}{(1 - m_G)} < \frac{p_G G}{S} < \frac{(1 - m_S)}{m_S}. \tag{17}$$

The inequalities from (17) yield upper and lower bounds on the relative levels of silver and gold in the world. Flandreau (1996) estimated m_G and m_S for the years 1850 to 1870 as 0.37 and 0.39 respectively. Prior to 1871, the ratio of gold to silver ($p_G G/S$) was well within the structural limits imposed by the model prior to Germany's de-monetization of silver (Flandreau, 1996). However, the worldwide shift to the gold standard after 1871 had a large impact on those boundaries.

To analyze the situation where France maintains bimetallism and the rest of the world moves to gold, we assume that p_G is held fixed at the historical French mint ratio of 15.5 and that unlimited silver coinage is allowed. When a country moves to the gold standard from the silver standard, it thrusts the lower boundary of condition (17) up towards the world specie stock ratio. As the demand for monetary gold rises, it has to be satisfied by a transfer of gold from the bimetallic bloc. This change would then make bimetallic countries more sensitive to additional increases in the world stock of gold. Whether France could have revived bimetallism is the same as asking if the worldwide shift to gold pushed the lower boundary above the ratio of world gold to silver stocks?

2.1 Comparative Statics for a Shift to Gold from Silver

To assess the shocks to the boundary there are two cases to consider. The first is a move from silver to gold and the second is a move from an inconvertible currency to a gold standard as in the case of the USA.[10] Flandreau analyzes the case when a country joins the gold standard and departs from a silver standard. Assume that this brings a rise in the demand for gold equal to the fall in the demand for silver which in turn equals the entire stock of monetary silver prior to the change. Germany, Holland, and the Scandinavian countries fall into this category of change. This type of switch affects the parameters on the specie demands such that we have

$$\overline{m}_G^m = m_G^m + k_d^g \beta_d \tag{18}$$

[10] I consider only the counterfactual where France maintains free coinage of silver throughout and therefore p_G is fixed at 15.5. I focus only on the lower boundary since a move to gold forces the upper boundary away from the critical region of breakdown.

for the gold demand parameter and

$$\overline{m}_S^m = m_S^m - k_d^s \beta_d \tag{19}$$

for the silver demand parameter. The subscript d indexes the identity of the defecting country or countries. In this case we assume that there was a constant relationship between the bimetallic and the defecting country's demand for specie such that $\alpha = \frac{k_d^s \beta_d}{k}$. If so, the consequence of the defection can be found easily by using the old parameters m_G^m and m_S^m. This yields new expressions for the parameters after defection

$$\overline{m}_G = m_G + \alpha\left(1 - m_G - m_S\right) \tag{20}$$

$$\overline{m}_S = m_S - \alpha\left(1 - m_G - m_S\right) \tag{21}$$

Expressions (20) and (21) can be used to find the lower and upper boundaries after such defections. All one needs to know is the ratio of specie demands for the defectors relative to France and the coefficients m_G and m_S. The new boundaries substitute $\overline{m}_G$ ($\overline{m}_S$) for m_G (m_S) in the boundary conditions.

2.2 Comparative Statics for a Shift to Gold from a Fiat Currency

There is a second type of move to the gold standard not analyzed by Flandreau but which is relevant. In this case a nation adopts gold but is not previously on a silver standard. The consequence of such a defection for the bimetallic country will not be as large since there is presumably little silver this country would "sell" to the bimetallic nation. The effect from this country comes purely through gold demands. This case is applicable for the United States which officially moved from its greenback regime to the gold standard in 1879.[11]

We can see how such a defection changes the lower boundary condition for bimetallism by performing slightly more involved operations than above. Let W be the new lower boundary after

[11]The specie stock of the US grew three-fold between 1877 and 1881 but was constant or declining from 1870 to 1876

the non-silver country has gone to gold so that $W \equiv \frac{\overline{m}'_G}{1-\overline{m}'_G}$. Note that

$$W = \frac{m_G^m + \alpha k}{k + \alpha k + m_G^m + m_S^m} \cdot \left(1 - \frac{m_G^m + \alpha k}{k + \alpha k + m_G^m + m_S^m}\right)^{-1} = \frac{m_G^m + \alpha k}{k + m_S^m}. \tag{22}$$

Similar to expression (18) we use the fact that the defection causes m_G^m to increase by αk but has no effect on m_S^m.

Using the expressions for m_G and m_S, observe that we can write $l = \frac{m_G}{1-m_G} = \frac{m_G^m}{k+m_S^m}$ and $u = \frac{m_S}{1-m_S} = \frac{m_S^m}{k+m_G^m}$. Consequently we have

$$W = l + \frac{\alpha k}{k + m_S^m} = l + \frac{1}{1+\delta}\alpha. \tag{23}$$

The last equality is obtained by solving for m_S^m and m_G^m using the expressions for m_G and m_S above to find $m_s^m = k\delta$, where $\delta = \frac{1+l}{u-l}$.

This expression can be used to find out how a country like the United States affected the lower boundary in Figure 2. Since δ comes from the boundary before the U.S. switch, all we need is α (i.e., the ratio of American specie demands to French demands). The average value of α from 1878 to 1885 was about 0.4.[12]

The theoretical model above demonstrates how changes in demands for precious metals due to regime changes affect the boundary conditions which defined veritable bimetallism. Increased demand for gold from nations transitioning to a gold standard from a silver standard had to be fulfilled by buying gold from the bimetallic bloc while excess silver had to be sold to the bimetallic country.[13] A simple calculation using condition (23) and data on gold and silver stocks shows that defectors to the gold standard from the silver standard must have had a demand for specie, α, of about 31 percent the size of France to make bimetallism inviable. In fact, Germany's specie demand was roughly 27 percent of France's which made bimetallism sensitive to regime changes. This differs from Flandreau (1996) who concluded that the French monetary system would have been robust to the German swtich. His assessment of the ratio of world gold stocks (valued at

[12] That value increased from 0.23 to 0.56 between 1879 and 1885 as the U.S. outgrew its fiat currency episode, established credibility in the capital markets and attracted a large gold reserve.

[13] Arbitrage on precious metals would assure that excess demands were ultimately satisfied in the bimetallic country that held a constant mint ratio.

15.5:1) to silver stocks in 1873 is roughly 1.3. I use data from Commission on the Role of Gold in the Domestic and International Monetary Systems (1982) for gold stocks and from Warren (1935) for silver stocks and find a ratio of 0.77. An intermediate value of 1 was published in Oppers (1996). The next section uses the model with data on specie demands to show that due to changing specie demands by 1875 bimetallism would have become a monometallic, silver standard.

3 The Rise of Gold and the Demise of Bimetallism

In this section I use data on α, (i.e., the ratio of specie demands in different blocs to France), for the countries that moved to gold after 1871. I show how the diffusion of the gold standard affected the viability of bimetallism in France. Table 1 gives a list of countries, the dates at which they adopted gold convertibility, their previous monetary regime and the average amount of specie holdings in those countries relative to France (α). Individually, many nations had quite small specie holdings relative to France. Germany and the US were the two largest countries to make an impact on gold markets. In fact, Table 1 understates the US relative specie demand since by 1885 this ratio equaled more than 50 percent that of France. Table 1 emphasizes that *aggregate* holdings might have been large enough to drain France of all its gold had it reinstated unlimited silver coinage in any year after 1875.

Up to 1878 I use expression (20) to derive the changes on the lower boundary from the model. In 1879 when the United States adopted the gold standard, I use expression (23) and the lower bound from 1878 to show how the American resumption made French bimetallism obsolete.

Figure 2 shows graphically the effects of the increasing demands for gold during the 1870s. The lower boundary (i.e., $\frac{m_G}{1-m_G}$) continually shifted up as each new country joined the gold standard from 1873 to 1879.[14] Given my data on precious metals stocks, the lower boundary is *above* the ratio $p_G G/S$ by 1872 implying France would have held only silver in that year had it reversed or failed to implement its so-called transitory policy. By 1875, the inability of France to maintain bimetallism is definitive.[15]

[14] I do not plot the upper boundary as precious metal production was relatively inconsequential compared to the changes in demands. In any case, that boundary was shifting upwards.

[15] In each case where there is a defection to the gold standard I use the value of α in the given year and the formulas

If Germany had been the only country to switch regimes, the boundary labeled "Germany moves to gold" corroborates Flandreau (1996) and Oppers but only after 1877. This is largely due to a small rise in the relative abundance of gold stocks. Before then, there is a period where bimetallism might have been at risk had unlimited coinage been allowed. It might indeed have been prudent to limit silver coinage. Even after 1877, the difference between the boundary and the stock is not large, and it implies a very fragile bimetallic equilibrium However, because the rest of the world also went to gold, bimetallism at a mint ratio of 15.5 to one was doomed. By 1875 at the latest, the new demands for gold would have been too heavy for France to continue to unilaterally support bimetallism. These estimates are sensitive to my data on the world's gold and silver stocks. Using Flandreau (1996)'s implied ratio of precious metal stocks would have made bimetallism robust through 1885 despite a massive increase in demand for gold induced by the US return to convertibility. Using figures from Oppers (2000) would have made bimetallism sustainable until the US adopted gold convertibility in 1879.[16]

France could not have revived bimetallism after 1873. Policy spillovers that ran between nations' actions sealed bimetallism's fate. France's policy partially persuaded countries like Sweden, Norway, Denmark, Holland, Belgium, Switzerland (the latter two part of the Latin Monetary Union) and even the United States that the time was ripe to move to gold. In the mid-1870s, countries acted on the belief that the major players of Europe and the US would all be monometallic gold in the future. These regime changes shifted precious metals demands and endogenously limited the viability of bimetallism.

Throughout the 1870s, the French called their actions temporary. However, the strategic consequences and the inadequate size of French metallic demands in the face of changing global demands led to an ostensibly unanticipated outcome. Historical events led to a seemingly small change in French policy in late 1873 (i.e., limiting silver coinage in 1873). If it is true that the French policy makers believed they could reverse course and move again to unlimited silver coinage, these beliefs

to adjust to boundaries. I continually adjust the boundaries as the levels of α change. I interpret these regime changes as one-time shocks to the long-run equilibrium parameters m_G and m_S, so year-to-year noise in the level of specie demands should not have a large impact on the main parameters.

[16] At this time I am unable to re-estimate Flandreau's regressions that provided the original bounds on bimetallism and which relied on his data on world precious metals stocks. Unless the annual *changes* in the different estimates of the stocks are highly correlated then different bounds might arise and the conclusions stated above could be different.

did not square with how events ultimately unfolded. When the dust settled, France was forced to completely suspend silver coinage leading the Latin Monetary Union to negotiate a move to the gold standard in 1878.

4 The Resuscitation of Bimetallism?

Due to the immense changes in the demand for gold in the 1870s, the French could not reverse course after 1875. The French reacted to events by suspending all silver coinage in August 1876 which Flandreau and Oosterlinck (2012) interpret as the permanent abandonment of bimetallism. But some policy makers and interest groups, especially those in the United States, clung to the hope of an internationally coordinated revival of bimetallism. Activists conjectured that global cooperation on a bimetallic system would stabilize the world silver price by raising demand for silver and dampening demand for gold. The subsequent attempts to manage regime coordination in the international monetary system provide the building blocks for a case study in international cooperation–or the lack thereof. To assess the economic feasibility of such a program, assuming nations can credibly commit to their actions, we can use the model of Section 2. Specifically we can check if France and the United States could have established enough demand for silver to make bimetallism feasible at a given mint ratio.

Showing that the economics of the situation made bimetallism non-viable is one thing, but it does not imply that the politics of making such a deal were propitious. Beginning in 1876, a tide of support for silver awakened in the United States. Extensive discussion was held in Congress and was documented in the Report of the United States Monetary Commission. Nevada senator, and silver miner, John P. Jones chaired the commission and carried his pro-silver bias into the final draft of the report. The committee strongly supported rehabilitating bimetallism or at least providing a monetary use for silver.[17] In hearings, the commission aimed to find experts that would testify on the feasibility of bimetallism despite silver's massive depreciation and the nearly

[17]The 44th congress elected in 1874 was divided with a democratic majority in the house and a Republican majority in the senate. Jones, a Republican, might have followed the party line in favor of gold had he not been from Nevada and had silver mining interests. Richard Bland, democratic representative of Missouri, after whom the Bland-Allison silver support bill would be named, also served on the commission.

complete abandonment of silver's monetary role in Europe. Specifically, the commission inquired about the strategic ramifications of a U.S. return to bimetallism. The commission asked eminent U.S. economist H.C. Carey '. . . if the United States were to establish the double standard (bimetallism) do you think it would have the effect of confirming France, Italy, Belgium and the other nations . . . in their present policy of employing silver as an unlimited tender?' Carey responded affirmatively, and he also suggested that Great Britain might even be convinced by such a move.

The outcome of these turbulent years, the first of a series of battles between "hard" money advocates and "inflationists", was the Bland-Allison Act of 1878. The Bland-Allison Act is remembered as the act that mandated the government purchase between two and four million dollars of silver each year.[18] An amendment was also inserted into the act calling for an international monetary conference. The goal of the conference was to persuade other nations of the world to re-instate bimetallism.[19] To this end, 12 nations met in Paris in 1878 to discuss the resuscitation of bimetallism.

Reti (1998) and Russell (1898) give an account of the political impediments blocking the revival of bimetallism after 1878. They classify countries into three main policy positions. Countries in Scandinavia, England and then Germany (the last of which refused the American invitation to attend the conference in 1878) immovably advocated gold monometallism.[20] On the other hand, France and the Latin satellites along with Austria-Hungary clung to their 'attitude of expectancy,' and so did not want to re-instate bimetallism until the Germans committed to stop silver sales. Only Italy and one of the two Dutch delegates allied themselves with the Americans in advocating international bimetallism.

As history shows above, the French attitude appears to have been based on the mis-conception that an 'attitude of expectancy' could be reversed at any time. Even at the monetary conference

[18]Recall that in 1871 Germany held about 400 million dollars worth of silver specie.

[19]The irony is that anti-silver forces actually proposed the amendment to hold the conference as a tactic to appease the more rabid free-silver activists and to make it appear as if the President and the Treasury more were sympathetic than they were to their demands.

[20]This sentiment would change later. Germany is noted for having more sympathy for silver in the early 1890s. Political gains by the junker class in the early 1890s led to speculation that Germany might re-monetize silver. Germany's financial panic of 1893 is attributed, in part, to such speculation (Bordo and Eichengreen, 1999).

in August 1878 the French delegate Leon Say disavowed that France would be adopting the gold standard, and he added that if conditions were right France would probably return to bimetallism. But the model shows this was overly optimistic if France stood alone in trying to reverse course. It stands to reason however that bimetallism would have been feasible given some sort of an accord between France and the United States (the two major actors and countries with an historic bimetallic tradition).

At one point, the English economist and bimetallic advocate Stanley Jevons argued that a large bimetallic bloc could stabilize the market price of silver (Reti,1998, p.81). And bimetallic advocates wanted to attract as many participants to the bimetallic bloc as possible (Reti, 1998, p.89). The largest countries with an historical tradition of bimetallism were the United States and France, and so it is interesting to look at the possibility of a French-American agreement.

The data and model used in this paper allow us to gauge the economic feasibility of Franco-American bimetallism in 1878. Supposing that France and the United States had agreed on a mint ratio in 1878, could they have sufficiently dropped the lower boundary condition to bring back bimetallism?

Of course, one of the principle political problems in reaching an agreement in 1878 was agreement on the proper mint ratio. The U.S. proposed 16 to one ("the dollar of our daddies") while France preferred its historical ratio of 15.5 to one. Not coordinating would have left France with silver and the U.S. with gold due to an obvious arbitrage possibility. I assume that this disagreement was overcome and the historical French mint ratio was agreed.

To see the effect of a bimetallic treaty, I assume that U.S. demands for specie are part of the bimetallic bloc after 1878. I also assume that this change does not alter the coefficients in equations (15) and (16). Figure 3 shows that the upper boundary is now just even with the relative specie supply line that determines if a given mint ratio is viable. Bimetallism might have survived, but such attempts would have been tenuous. Any small amount of speculation in the financial and precious metals markets could have given rise to the destruction of such an equilibrium as would small shocks to the relative supplies and demands of gold and silver. Alternatively a mint ratio of 16 to one instead of 15.5 to one would have increased the likelihood of survival of international

bimetallism. Of course, US demand for specie rose briskly in the early 1880s which would have put further downward pressure on the lower boundary making bimetallism more robust.

How should we understand the failure to resuscitate bimetallism if the fundamentals were in place? Using Flandreau's values for the ratio of specie stock would change my conclusion. With his estimates for world precious metals stocks, international bimetallism would have been viable. A solid Franco-American commitment to bimetallism might have altered the regime choices of countries sitting on the fence like Spain, Austria-Hungary, Russia, and possibly even Italy. But the commitment to bimetallism was not entirely credible in all states of the world. No one nation could trust another to stay the course of bimetallism. Prior experience, and especially the years between 1872 and 1875, generated doubt about how solid the bimetallic cushion was even when France, with its enormous reserves, was at the center of the system. Any nation agreeing to adhere to bimetallism could easily be exposed to capital losses on reserves held in the depreciating monetary metal if other nations did not cooperate and honor the pledge to fix the silver price of gold. It would be hard to imagine a binding international accord amongst sovereign nations of the requisite size in the 1870s that could have maintained bimetallism.

5 Conclusions and 'Lessons' from History

French bimetallism failed after 1874 due to unprecedented monetary changes. Historical events, French mis-perceptions and the strategic interaction between nations all combined to bury bimetallism. Leftover rivalry from the Franco-Prussian war limited French willingness to buy German silver during its transition to gold. This limitation on silver coinage partially fed into other nations' strategic calculations. Network externalities pushed many countries in Western Europe, America and Asia onto the gold standard, and provided a radical shift in precious metals demands. After this, France was not large enough to peg the price of silver at the mint despite its large endowment of precious metals. Had France reversed its original policy, it would have shortly become a silver standard country. It is unlikely that the French (mis-) perception that bimetallism could return would have been validated by an international coalition. Even if the United States had gone back to bimetallism in 1879 instead of finally committing to the gold standard, the world's demands for

gold were too strong to make bimetallism viable.

This story is one of long-run institutional change. Napoleon I had instituted bimetallism in 1803, and that system appears to have worked reasonably well until 1872. As we have seen, bimetallism quickly became obsolete after 1874. North's theoretical argument that mis-perceptions can quickly lead to surprisingly important changes in the institutional environment appears reasonable in this case. Bimetallism disappeared partially because of the lack of a true model of how the international monetary system functioned. Once bimetallism was out of the set of rational strategy space for French policy makers, it was upon them to decide for a replacement regime. Ultimately they decided on the gold standard as did nearly all other nations after the 1870s.

Finally it is worth pondering the parallels between the 1870s and recent events in the European Monetary Union. Greece, Spain, Ireland, Portugal and Italy all ran significant current account deficits in the run up to the 2007-08 financial crisis. The strains of re-adjustment within the confines of the single currency have been felt since then. All of the above countries have been required to impose significant austerity in order to facilitate the necessary real devaluation that the sudden stop of capital inflows has required. Default is another option and Greece has already resorted to writing down some of its outstanding sovereign liabilities. By the end of 2011, many commentators projected a Greek exit (grexit) from the monetary union with a very high probability. The ability of other countries to endure has also been questioned.

As pressure in the capital markets mounted (again) in 2012, the European Central Bank and the German chancellor have strongly rejected the possibility that countries undertaking adequate reforms would be forced to exit the monetary union. These statements were intended to build confidence in the ability of the European Central Bank and the European Union to resolve the crisis and to maintain the status quo. By and large, policy makers treated the issue almost as if the crisis were a liquidity crisis. These statements bear a strong resemblance to those of French policy makers who viewed the limitations on silver coinage as temporary measures and argued until 1878 that bimetallism would almost surely make a comeback.

Then, as now, these statements reflected a particular view and assessment of the likelihood of various scenarios. Policy makers were repeatedly optimistic that the status quo was viable

in both episodes. In the 1870s, market pressures and policy spillovers led to the collapse of the bimetallic project in spite of some late attempts at international cooperation. The reasons that cooperation failed are unclear. Bimetallism, as it had functioned for decades prior to 1878, yielded fixed exchange rates and presumably provided the same network externalities as a gold regime. Still, as argued above, bimetallism might not have been a 'perfect' equilibrium. The early 1870s led countries to believe that a credible commitment to bimetallism was impossible. Few policy makers of the time (excepting the forces of inflation in the US and like-minded factions elsewhere) were willing to run the risk of such instability.

As for the European Monetary Union, the crisis boils down first to a distributional issue of who pays for the crisis-the deficit or the surplus countries. History suggests that surplus countries rarely bear the burden of re-adjustment. Going forward, the issue boils down to international cooperation (within the European Union) on a unified banking regulator that could share and spread the risks of modern banking practices. As of November 2012, this project appears to be in jeopardy due to the unwillingness of nations to share the potential costs of a foreign banking meltdown. The other alternative is a transfer/fiscal union that could smooth over negative shocks.[21] As in the 1870s, many view this as a problem of moral hazard. How would the self-proclaimed virtuous (Germans and the Dutch in the current case) insure that the profligate did not over-borrow and burden others with significant transfer payments? Once again, the credibility of national commitments is an issue. In this case, it is easy to be pessimistic about the potential for international cooperation. If compromises could be made such that a loss of fiscal sovereignty could be traded off against other benefits, a brighter future for the single currency might be possible. Without such a deal, the European Monetary Union as established in 1999 is very likely to face the fate of bimetallism.

[21] Bordo, Markiewicz and Jonung (2011) discuss the prospects for a fiscal union in historical perspective.

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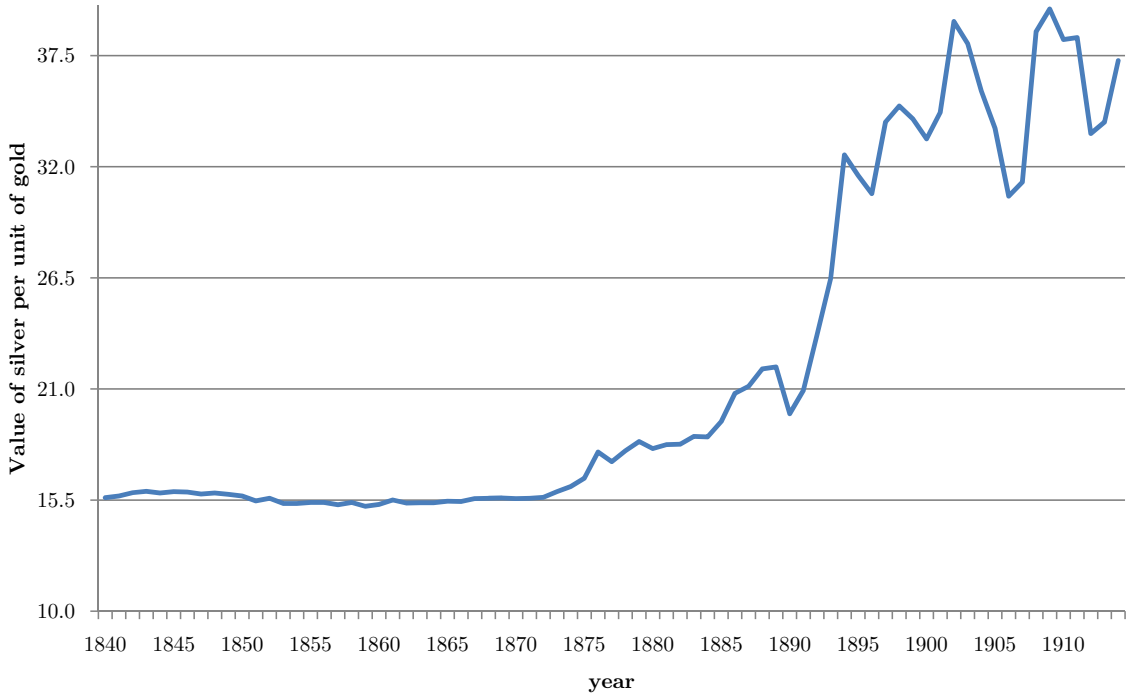
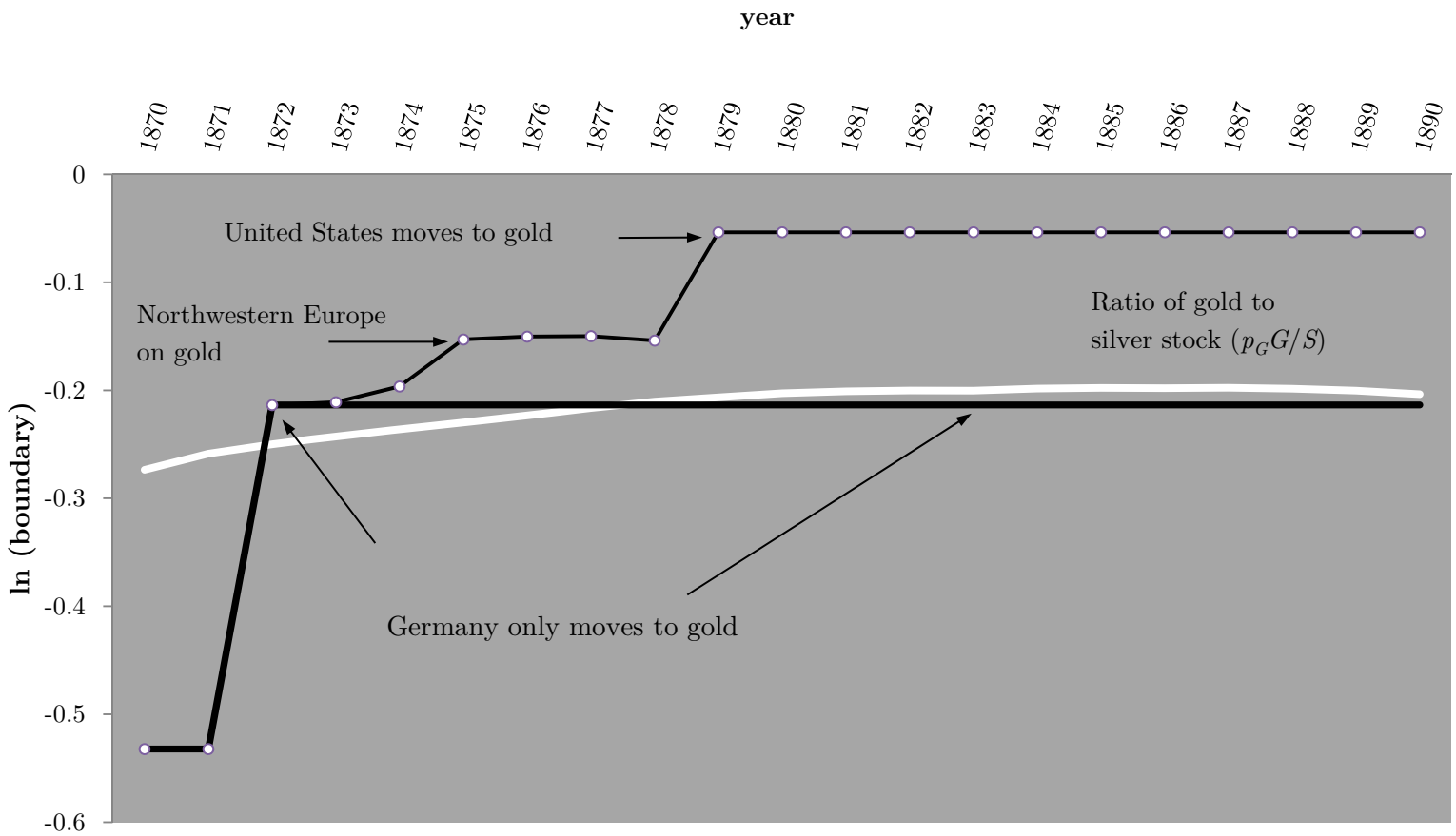
Figure 1: The Silver-Gold Exchange Rate, 1840-1914



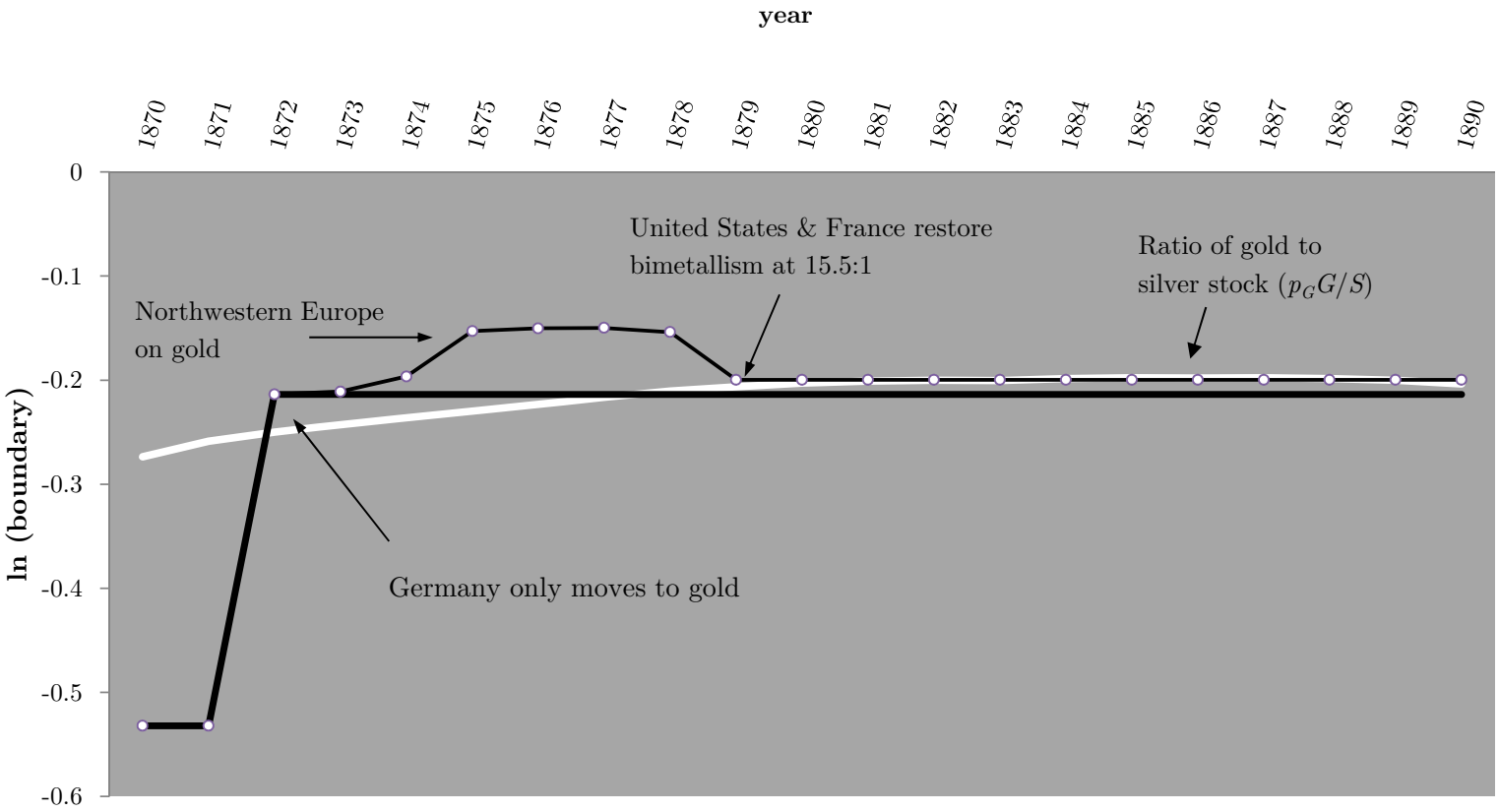
Notes: Original figures were in pence per ounce in London from Gallarotti (1995), and were converted to the gold-silver exchange rate using Laughlin (1891) p. 225.

Figure 2: The Structural Limits of Bimetallism, 1870-1885



This figure depicts the limits of bimetallism in France under two scenarios: Only Germany moves to gold and Germany, Western Europe, and the US move to gold. The limits are derived from the model presented in the text. Sources for gold and silver stocks are the US Report to the Congress on the Role of Gold in the Domestic and International Monetary Systems (1982) and Warren (1935).

Figure 3: A Revival of Bimetallism? France and the US both Bimetallic after 1878



This figure depicts the limits of bimetallism in France under the scenario: Germany and Western Europe move to gold while the US and France restore bimetallism. The limits are derived from the model presented in the text. Sources for gold and silver stocks are the US Report to the Congreess on the Role of Gold in the Domestic and International Monetary Systems (1982) and Warren (1935).

Table 1: Money Demand for Various Countries in the Year of Adoption of the Gold Standard

Country	Date of Adoption of the Gold Standard	Previous Standard	Ratio of Specie Demands to France (α)	
			Oppers and Jones and Obstfeld Data	Flandreau Data
Germany	1872	Silver	.31	0.27
Norway	1873	Silver	0.006	--
Sweden	1873	Silver	.002	--
Denmark	1873	Silver	.002	--
Holland	1875	Silver	.045	--
Finland	1877	Silver	.002	--
United States	1879	Paper	.23	--

NOTES: Dates of adoption and previous regimes come from Meissner (2000).
Estimates of specie demands come from Flandreau (1996), Jones and Obstfeld (2000), Muhleman (1895), Oppers (1996) and Soetbeer (1886).