

How Occupied France Financed its own Exploitation in World War II

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Abstract

Most studies of war finance have focused on how belligerent powers funded hostilities with their own resources. The collapse of the Third Republic in 1940 left Berlin in control of a nearly equally powerful industrial economy. This paper analyzes the policies employed by the German occupation and the collaborating government in Vichy to supply resources to the Nazi war machine. Vichy finance ministers eschewed inflation and promoted bond finance by imposing price and wages control and financial repression. They engineered a huge transfer of resources but at a very high cost. We assess the results of this policy with a neoclassical growth model and discuss the efficiency and sustainability of Nazi exploitation.

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The study of war finance is usually approached by examining how the available domestic resources were used by belligerents. Although incurring huge expenses, warring governments are usually assumed to attempt some optimization of revenue generation on behalf of their population. However, war finance in France during World War II was quite different. The collapse of the Third Republic left Berlin in control of a nearly equally powerful industrial economy. To finance its continuing war on other fronts, the German government sought and secured a massive and, perhaps, unparalleled extraction of resources from France. But, unlike belligerent powers that raise funds from their own population; the Nazis were known to have little interest in the long-term welfare of the countries they occupied. This paper analyzes the policies employed by the German occupation and the collaborating government in Vichy to supply resources to the Nazi war machine.

French policy under occupation was framed by the nation's experience in World War I. Vichy's finance ministers, like their wartime Republican predecessors, feared inflation. To avoid printing money, they favored raising taxes and extraordinary means to induce the public and financial institutions to absorb the massive bond issues required to pay the Germans. In addition to wage and price controls and rationing, the regime used financial repression of institutions and markets to drive funds into the government bond market. Although the outlines of Vichy's fiscal and financial policies are generally known (Milward, 1970 and Margairaz and Bloch-Lainé, 1991), the effectiveness of these policies in transferring over a quarter of annual GDP is not well understood. After comparing the magnitude of Vichy's payment to other episodes of reparations and war finance, we examine how it was funded. The consequences of Vichy's anti-inflationary policy are then reviewed, followed by a study of the financial repression that backed monetary policy. Lastly we employ a neoclassical growth model to assess of the contributions and costs of the various elements of Vichy's policies and some alternatives. We find that the burden imposed on the French economy caused it to shrink at a rapid pace. Furthermore, capital controls, financial repression and wage and price controls played a key role in channeling resources to the government to pay for the occupation.

I. The Magnitude of Vichy's Payments

During World War II, the French economy became a vital part of the German war machine. The systematic exploitation of occupied countries provided very important contributions to the Nazi state. Milward (1970) estimated that for the whole course of the war that Germany was able to extract revenue from all occupied countries equal to 40 percent of the revenue it generated by its own taxation, and of this 42 percent came from France.

Table 1 shows the total payments made to Germany during its occupation of France. As explained in the next section, these payments represent the actual financial transfers to German authorities, rather than their accumulated credits in the Banque de France. Seizures and requisitions, for which Vichy did not provide compensation to the victims, are excluded.¹ Although the measure of GDP is fragile and there was a substantial black market, the total of resources extracted by the Nazis is stunning. Even in the partial first year of occupation, nearly 20 percent of GDP was transferred, rising to well over a third of GDP in 1941 and 1942. The switch from the limited war of Blitzkrieg to a completely mobilized economy led to a higher level of exploitation in 1943 and 1944, another partial year of occupation.

Table 1
French Payments to Germany, 1940-1944

	French GDP (FF billions)	Occupation Costs (FF Billions)	Costs as a Share of GDP (percent)
1939	433		
1940	419	81.6	19.5
1941	392	144.3	36.8
1942	424	156.7	36.9
1943	493	273.6	55.5
1944	739	206.3	27.9

Source: Carré, Dubois and Malinvaud (1972) provide the GDP data, Milward (1970), p. 271 gives the French payments to Germany.

How should the size of these payments be viewed? Some idea of their magnitude can be assessed with two comparisons, the first relative to other war reparations and the second relative to the cost of war for belligerents. Defeat in 1940 was the third French

¹ Milward (1970, pp. 82-3) estimates that German booty from France for 1940-1944 totaled 154 billion 1938 francs, of which 52.4 billion francs were military equipment. Most of this loot was seized in 1940, and more systematic policies of exploitation were deployed.

loss in a modern war where occupation costs or reparations were imposed. After Napoleon's defeat at Waterloo and after the Franco-Prussian war, France was forced to pay reparations for occupation and the cost of the war to the victorious allies in 1815 and to the German Empire in 1871. Table 2 shows White's (2001) calculations of the size and burden of these reparations. For the defeats of 1815 and 1871, the initial estimates of reparations are shown as percentage of one year's GDP and central government tax revenue. Another measure of the burden assumes that reparations were financed wholly by foreign loans so that the burden would become the requirement to service this debt (Cohen 1985). Although the burdens in terms of one year's GDP are high, the payment of interest on a foreign debt imposes a more modest burden, which is optimal in the sense that it smoothes the path of consumption (Obstfeld and Rogoff, 1995). The 1815 and 1871 reparations were paid in full and ahead of schedule by the French government, borrowing partly from abroad. The postwar World War I German reparations were set much higher than earlier French reparations.² However, Germany did not meet its reparations obligations and defaulted. Given that Weimar Germany borrowed even more funds, the effect was to reverse reparations, raising income and consumption (Schuker, 1988). Unlike France in 1815 or 1871 or post-World War I Germany, Vichy had no access to outside capital markets and hence did not have the option to finance its obligations with foreign loans, but as a measure of size, potential debt service reveals that France's burden was nearly double Germany's.³

Table 2
A Comparison of War Reparations

	Indemnities (billions)	Percent of One Year's GDP	Percent of One Year's Tax Revenues	Share of Debt Service to GDP
France 1815-1819	FF 1.65 to 1.95	18 to 21	195 to 231	1.2 to 1.4
France 1871	FF 5.0	25	201	0.7
Germany 1923-1931	DM 50	83	350	2.5
Vichy 1940-44	FF 479	111	805	5.5

Source: White (2001), Klug (1990) and Table 1.

² The Allied Reparations Commission set German reparations at 132 billion gold marks in May 1921. Reparations bonds were divided into three segments A, B, and C. The A and B bonds were worth 50 billion marks, but most experts believed that the C bonds would never be issued. See Schuker (1988).

³ The burden here is $b = (r-n)D/(1+n)GDP$ where r is the interest rate, n is the growth rate and D is the total debt. France is assumed to grow at a slow rate of 1 percent and pay interest at 5 percent. The GDP level of 1939 is used.

Unlike previous reparations, the occupation costs imposed on defeated France in 1940 were open-ended; Hitler was adamant that he would only consider a peace treaty once the war was over. For Vichy, the figure for French reparations is the total sum of reparations paid over the years of occupation; 479 billion French francs is the sum of the real value of the payments.⁴ The base year for comparing the indemnity to GDP and tax revenues is 1939, a year of relatively high employment; its use reduces the burden compared to the war years when national income was lower. The official figures for GDP omit the black market, which would lower the burden. Unfortunately, there are only rough estimates of its size. Sédillot (1985) believed that the volume of illegal transactions were 10 to 30 percent of the legal market, with a peak in 1943.⁵ Reviewing the available evidence, Sanders (2001) concluded that the black market averaged 20 percent of GDP. Using this estimate to increase GDP, the comparable burdens in Table 2 would 75 percent of one year's GDP and debt service would be 4.6 percent of GDP. Even by these adjusted measures, France made a Herculean effort to pay. The burden was far greater those paid in 1815-1819 and in 1871. Although the Nazis compared their demands on Vichy to Germany's post-World War I reparations, France's payments were significantly greater and they produced a real transfer of resources.

German war reparations in Table 2 were largely financed by foreign loans. Like many belligerent powers, Vichy had to finance its payments entirely by domestic taxation, bond issue and money creation. Thus, it is worthwhile to compare Vichy's methods of payment to French finance during World War I, when she had access to foreign markets and to American finance during both World Wars, which was dependent on domestic finance. The difference between Vichy and these other three examples is, of course, that Vichy was not engaged in a patriotic war but in financing a hostile occupying power. Occupation finance for 1940-1944 differs considerably from Republican France's financing of World War I, where most expenditure was covered by short and long-term debt issues. Although the American participation in World War I only began in 1917 and her total expenditures relative to GDP were less, the pattern of financing resembles

⁴ INSEE's (1966, Tableaux XXVIII, p. 405) retail price index is used to deflate Vichy's indemnities. These are official prices and probably understate inflation. The official wholesale prices show even less sign of inflation and hence they were not used.

⁵ At the end of 1942 Pierre Laval informed the German Foreign Minister van Ribbentrop that the black market for agricultural and industrial goods represented 15 and 10 percent of all economic activity. (Sanders, ??).

French finance in the Great War. The most important difference is a greater French dependence on debt relative to taxes. However, the strongest resemblance is between Vichy finance and the United States in World War II, although the United States was less reliant on money creation, utilizing taxes more heavily. Given the rapid decline in French economic activity, this difference is not surprising, but the ability of Vichy to sell bonds to finance its payments to the Nazi war machine certainly is. Did patriotic bond rallies in the United States really do little more than coerced sales under a German gun?

Table 3
A Comparison of War Finance

	U.S. World War I March 1917- May 1919	U. S. World War II	France World War I	Vichy France 1940- 1944
Total Expenditure as Share of Pre-War GDP	43	188	251	111
Share Financed by Taxes	21.5	48	3.7	29.7
Share Financed by Debt	70.6	31	83.3	36.4
Share Financed by Money	9.1	21	13	33.9

Sources: Friedman and Schwartz (1963), Fisk (1922), Ferguson (1998), Goldin (1980), INSEE (1966), Patat and Lutfalla (1990), Toutain (1997).

Was Vichy's policy the best response to German demands? The literature on optimal taxation and seigniorage suggests that if a government commits to raise a given amount of revenue and desires a minimum deadweight loss, it should set its instruments, present and future tax rates and inflation rates, to minimize the present discounted value of the distortions generated by these taxes (Mankiw, 1987; Walsh, 2003). Intertemporal optimality requires that the marginal costs of each tax instrument be equated over time, so that there is "tax-smoothing."⁶ Accordingly, inflation and tax rates should move together and in response to permanent shifts in government expenditures, while temporary movements in expenditure should be covered by debt financing. In this basic model, consumers make labor supply and money demand decisions on the basis of expected inflation with variations in inflation producing distortions. But unanticipated inflation is a form of a lump-sum tax, as it has wealth but no substitution effects. If the public bases its holdings of money on anticipated inflation, the government could avoid

⁶ Also, see Barro (1987, 1989).

distortionary tax costs by inducing surprise inflation. However, the public has an incentive to discover these plans and thus undermine the government's efforts, with resulting distortionary effects. Nevertheless, if a government can commit to a path for anticipated inflation, it will be optimal to respond to unexpected revenue demands by allowing unanticipated inflation. Hence, inflation rates may not closely follow tax rates but unexpected deficits. Walsh (2003) argues that this model explains U.S. wartime finance better than the simple tax-smoothing model.

Vichy's policy makers' allergy to inflation suggests that they did not want to produce any monetary surprises. They treated Germany's financial demands as a temporary imposition---assuming that it would end with the war-----and responded by raising tax rates and funding much of the occupation by bond sales. But, as will be seen, they did not allow the market to adjust but imposed rigorous and distortionary controls to induce the public and financial institutions to buy more bonds.⁷ Their policy appears thus to have veered far from an optimal policy; and to measure the costs of Vichy policy, a detailed examination of the pursued policies is required.

II. The Occupation and How the Germans Were Paid

Blitzkrieg against France began on May 10, 1940. Its spectacular success led to the resignation of the French government and the appointment of Marshal Philippe Pétain, the War Minister as head of government. Pétain sued for peace and signed an Armistice on June 22, 1940. Following the Armistice, nearly half of the two million French prisoners of war, were released. The remaining POWs provided forced labor for their captors (Herbert, 1997). Under the terms of the agreement, the French fleet was disarmed and the Republic was carved up. France lost the departments of Bas-Rhin, Haut-Rhin and the Moselle to the Reich, while the departments of the Nord and the Pas-de-Calais were attached to occupied Belgium and a small zone around Mentone was given to Italy. The remainder was divided into the Occupied Zone, under direct German control, and the Free Zone. Pétain moved the government to Vichy in the Free Zone where the constitution was suspended and plenary powers were granted to the Marshal's government, which retained an army of 100,000. When Allied successes in North Africa revealed the military weakness of the Vichy regime, the Germans marched into the Free

⁷ These policies were not dissimilar to those employed by the United States in both world wars.

Zone in November 1942. However, the government in Vichy retained control of economic policy and taxation and monetary policy was generally uniform across both zones, with laws subject to approval of German authorities if they were to be implemented in the Occupied Zone.

The extraction of resources from France was driven by the changing needs of the Nazi war machine. In the beginning, the policy of Blitzkrieg was designed for a rapid limited war that would not require a total mobilization of the German economy; thus integrating and mobilizing French industry was not essential to Hitler's plans. After an initial period of looting promoted by Hermann Göring, Nazi policy determined that France would be de-industrialized and only limited industries would supply German war needs. The return of France to an agricultural economy coincided with Pétain's atavistic view that the nation could be morally rejuvenated by a return to its true rural nature. Yet, there were policy differences in the Nazi regime; and the German Foreign Office believed that France should provide more resources to the war effort and slowly engineered a shift in policy. The long struggle between visionary goals of a de-industrialized France and the practical need to pursue the war was answered decisively when the Blitzkrieg ground to a halt in the Russian winter of early 1942 and Hitler was forced to accept a total economic mobilization of Germany and its satellites for war (Milward, 1970).

German demands on the French economy followed these broad policy shifts. When the German Army first rolled through the Netherlands, Belgium and finally France, the Reichskreditkassen was created on May 3, 1940 to supply the armies of the Reich with an occupation currency, the Reichskreditkassenschein. The German authorities had no desire for this money to spawn inflation in Germany; so to ensure that burden of inflation fell on occupied territories, strict controls were put in place. The occupation currency could not be spent in Germany or exchanged against the Reichsmark, hoping to bottle up any inflationary pressure in France. The Banque de France had to accept occupation notes and redeem them in francs, charging them as costs of occupation to the French government⁸.

The essential question of what the exchange rate would be for the franc was settled on May 20, when the rate between the franc and the Reichskreditkassenschein was

⁸ In France, the Reichskreditkassenschein were gradually demonetized between April 30, 1941 and December 1, 1943 (Andrieu, 1990, p. 151).

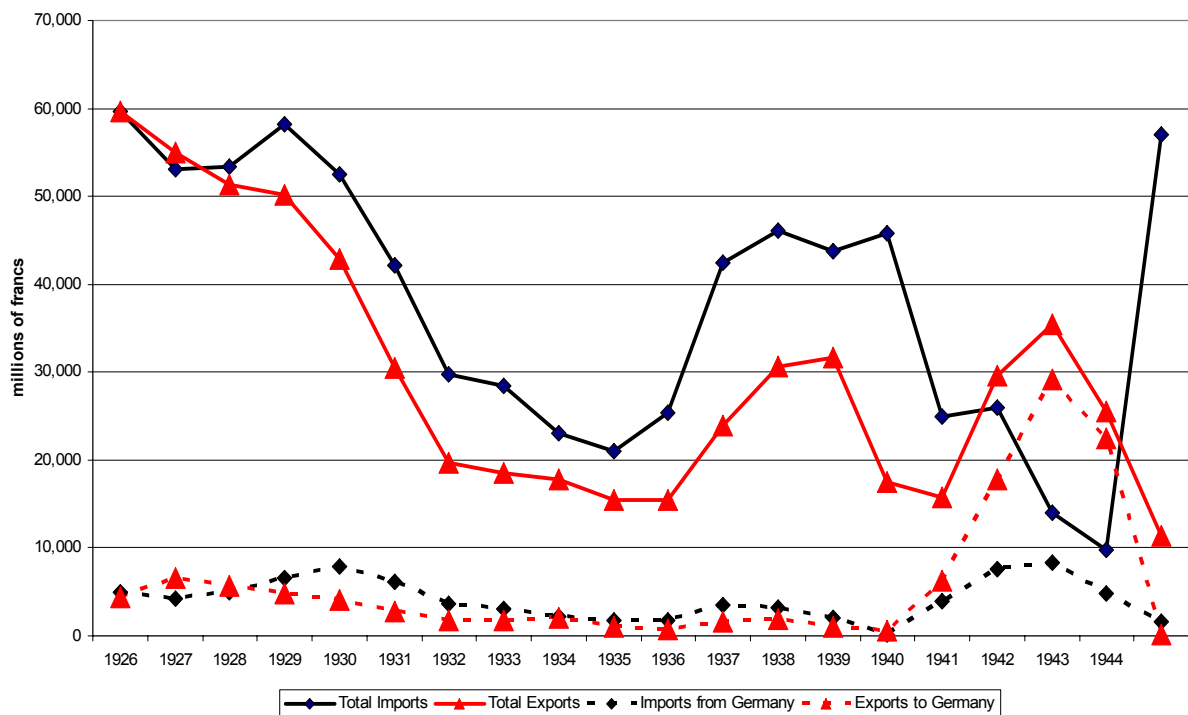
proclaimed to be 20 to one. This exchange rate was later decreed to be the official rate between the Reichsmark and the franc. It was a huge overvaluation for the Reichsmark. According to Milward (1970, p. 55), it was overvalued by 50 percent using the dollar-franc and dollar-Reichsmark rates of June 1940 or 54 to 63 percent using the exchange rates against the pound in 1939. Compared to the exchange rates from September 1, 1939, the overvaluation lay somewhere between 50 and 90 percent (Andrieu, 1990, p. 148). French goods were therefore intended to be cheap for the occupying German army.

Once France was defeated, international trade between the Reich and the vanquished Republic was restructured with a bilateral clearing agreement based on the arrangements that Germany had engineered with Central and Southeastern European countries in the 1930s. Foreign exchange was strictly controlled and allocated for government-approved imports. In early thirties, the economies of these German trading partners were depressed. Neal (1979) argued that these countries could stimulate their economies using the bilateral clearing agreements to run export surpluses with Germany in blocked marks or Sperrmarks. If the central banks bought these marks from exporters, paying out domestic currency at the fixed rate of exchange, it would become an expansionary monetary policy. The greater the export surplus and the higher the exchange rate of the Sperrmarks, the more expansionary the policy. Although costly by transferring resources and offering trade credit to Germany, these costs might easily be outweighed by an expansionary policy in a depressed economy that made productivity gains. Ultimately, rising domestic prices would decrease the competitiveness of domestic goods exported to the German market. Hungary, for example, used its bilateral agreement to reflate its economy; while in countries like Romania, central banks operated on a “waiting principle” and refused to buy blocked markets from exporters until requests for marks from domestic importers of German goods materialized. As there were more blocked marks earned by exporters than those demanded by importers, the shadow price of the blocked marks fell. In some of these countries even the official value of the blocked Sperrmarks declined, and there was no domestic stimulus gained. .

France followed the Hungarian example. Although France had clearing agreements with other countries in the orbit of the Third Reich, Germany became its dominant trading partner. At the end of 1943, France was a creditor to Germany, Norway and Italy for a total of 119.1 billion francs, with Germany accounting 118.8 billion francs.

France had deficits with Luxembourg, the Netherlands, Belgium, Switzerland, Spain and Turkey for a total of 7.6 billion, for a net surplus of 111.4 billion (Bettelheim, 1946). French imports and exports are graphed in Figure 1. Until 1941, Germany's trade with France was a fraction of the total; the Nazi regime then reoriented France's trade. Imports were discouraged by the overvalued exchange rate and controls, yielding a large trade surplus that was financed by payments of the Banque de France to exporters, stimulating the economy. ⁹

Figure 1
French International Trade
1926-1944



Source: INSEE (1966).

The transfer of resources under the bilateral clearing agreement paled before the occupation costs imposed on France. Following the precedents of earlier wars, the Germans required the French to pay for the costs of occupation. However, the charges were set far above the actual cost of occupation, providing the German authorities with

⁹ Despite the obvious costs, Pierre Cathala, the French finance minister from 1942 to 1944 remained one of its fervent advocate. As late as December 14, 1943 Cathala claimed that Germany would one day repay its debts and meanwhile the clearing agreement guaranteed that the production would remain in France instead of being transferred to Germany (Cathala 1948, p. 237).

considerable means to purchase war goods and other products in France. In the Armistice talks in late 1940, the French were stunned and protested when they were informed during the negotiations that they would be obliged to pay occupation costs of 20 million Reichsmarks or 400 million francs a day. Added to these were indemnities paid to owners of property occupied by the German army and compensation for requisitions (Patat and Lutfalla, 1990, p. 98).

According to the French negotiators contesting the occupation costs in 1940, the head of the German economic delegation Hans Hemmen “indicated that the French money payments would be spent in France: but with that money the Germans will be able to buy the whole of France.” He justified the reparations by reminding the French of those imposed on Germany in the treaty of Versailles. He acknowledged that:

The payment demanded is very heavy, and Germany knows by experience how ruinous such charges are. That is why the German government has seen this question from an economic point of view, since at the same time that it has demanded these payments from France, it has proposed to her an economic system which frees France from the anxiety of ruin. (quoted in Milward, 1970, p. 61).

At the outbreak of the war, French real GDP per capita exceeded the level in Germany, and the Germans saw no reason why this difference should be sustained. The willingness of Vichy to collaborate with the Nazis reflected the rough consensus of the majority of the French political class that cooperation was in the long-term national interest. Faced with Nazi ruthlessness and the threat to society on many levels, the French concluded like others in similar circumstances that collaboration was a lesser evil than resistance, permitting a peaceful rather than violent extraction of resources, with the costs of extraction kept quite low for the exploiter.¹⁰

What Hemmen envisioned and the French ultimately accepted was that occupation costs would be paid by the creation of money in the account of the Reichskassen in the Banque de France. If Vichy wished to contain the inflationary

¹⁰ Liberman (date?) found that France contributed approximately half of the income extracted from Occupied Western Europe, although rates of exploitation were higher in the Netherlands, Belgium and Norway.

potential of this policy, the government could issue bonds to the French public and sterilize the creation of francs¹¹.

The occupation charges initially proved greater than the Germans could spend and accumulated as unspent credits in the account of the Reichskreditkassen (Banque de France, Comptes rendus, 1941-1942), a consequence of the relatively limited war pursued by Hitler. The rising unused credits and French protests, combined with an offer to exchange French shares in Polish and Balkan firms desired by the Reich produced new agreement on occupation costs. In May 1941, they were lowered to 15 million Reichsmarks or 300 million francs per day. This moderation of German demands came to an abrupt end when Blitzkrieg failed to deliver the Soviet Union to the Reich, forcing Hitler to begin a complete mobilization of the Germany economy for war. The account of the Reichskreditkassen was quickly drained, and the occupation costs were raised to 25 million Reichsmarks or 500 million francs a day on December 15, 1942. In addition, the Italian occupation of the Southeastern departments was funded with a monthly payment of one billion French francs, which Germany demanded after the collapse of Italy in addition to arrears of 2.8 billion out of a special payment of 3 billion francs (Milward, 1970).

Table 4
How France Financed Germany's Exploitation
(billions of francs)

	Conventional Expenditure	Occupation Costs	Total Expenditure	Taxes	Share of Taxes (percent)	Debt	Share of Debt (percent)	Money	Share of Money (percent)
1939	150.1		150.1	63.4	42.2	42.7	28.4	44.3	29.5
1940	203.6	81.6	285.2	72.0	25.2	77.7	27.2	124.3	43.6
1941	120.8	144.3	265.1	80.2	30.3	91.7	34.6	91.3	34.4
1942	133.2	156.7	289.9	97.3	35.6	75.8	26.1	117.2	40.4
1943	135.3	273.6	408.9	122.1	29.8	142.0	34.7	153.9	37.6
1944	212.8	206.3	419.1	123.5	29.5	220.4	52.6	62.6	14.9

Sources: INSEE (1966), Patat and Lutfalla (1990) and Milward (1970).

¹¹ Milward (1970) has argued that there was a precedent for this policy, going back to 1911 secret agreements between the Banque and the government to provide rearmament credits. Du Parquet (2005) describes this operation. The Governor declared that the Banque was ready to make advances up to 200 million francs and signed a secret convention for 3 billion francs of credit if war broke out. This policy was renewed when the Second World War loomed. An agreement was signed on September 29, 1938, where the Banque would provide the government with advances of up to 25 billion francs in the event of war (Merigot and Coulbois, 1950).

Occupation charges, presented in Table 4, quickly overshadowed ordinary government expenditures. Taxes almost covered conventional expenditures for Vichy. In spite of the shrinking economy and inflation, real tax revenue was nearly constant between 1938 and 1944, ranging from 55 to 59 billion 1938 francs. It constituted a rising burden on the smaller economy, accounting for 14 percent of official GDP in 1938 and 1939, rising to 25 percent in 1943. Taxes on capital and on personal incomes were all increased and the collection methods were improved. For example, in January 1942, the tax on agricultural profits was revised and the revenues rose from some 30 million francs to over a billion for 1942 (Magairaz, 1991, p. 544). In contrast to World War I, war profits were taxed from the beginning. Overall, tax rates on labor rose from 12 to 20 percent and on capital from 11 to 24 percent.

Inflation was the unacceptable tax; and even when war loomed, in November 1940, the inheritance tax was cut and state funding for secondary schools was cut. Inflation, the Minister of Finance warned would endanger “private property so necessary to society and so useful to the state.” (G. Grantham) Most importantly, Vichy did not want to alienate the conservative rentier class. In 1942, the French government engineered a major tax reform to broaden the tax base (Institutions de la France nouvelle, 1942). Before the reform, most revenue was derived by taxes on wages, companies and interest income, with agriculture, property and the liberal professions contributing modestly. The reform increased the revenues from agriculture, eliminating exemptions; and indirect taxes were increased. The tax rate on wages and salaries reached 16 percent, 21 percent for business profits, 24 percent for income for liberal professions, and between 30 and 41 percent for interest income (Nogaro, 1945, p. 86) These higher taxes combined with the shock of defeat and the initial rigid geographical division of France sharply reduced output. The undervaluation of the franc created a big incentive for producers to sell their goods to Germany. To reduce the potential inflationary effects, the French government wanted to impose a hefty profits tax on exports but Germany resisted and a low rate was set (Milward, 1970, pp. 68-70.).

Fearful of inflation and informed by their experience of the 1920s, the primary objective of Vichy’s policy makers was to protect the value of the franc as best they could while under the Nazi boot. Thus, while the overvalued exchange rate and potential inflationary impulse from the occupation charges might seem to have offered an

opportunity to inflate and undermine exploitation of the French economy, it was regarded as an unacceptable policy. Both Vichy finance ministers, Yves Bouthillier and Pierre Cathala, concurred and the latter termed the defense of the franc a “national duty” (Cathala, 1948, p. 65). Bouthillier, like other officials, believed that an accommodating French government would be less onerous than direct German administration. Ultimately, by controlling inflation he would be able to preserve a healthy, stable economy by the end of the war so that France would have a place in the new economic order of Europe. In April 1942, when he was appointed Minister of Finance, Pierre Cathala wondered whether it made sense to pursue a policy aiming at containing inflation. But, he concluded that France would not benefit from an inflationary policy because war would prevent an increase in real production. Inflation would further ruin bondholders and discredit the state (Cathala, 1948, pp. 63-64). The governor of the Banque de France, Yves Bréart de Boisanger and a member of the French delegation to the armistice commission, conceded that “I constantly forced myself not to view the occupation charges from a purely financial point of view. If I had done so, I would have soon demanded that the government suspend payments. I did not do so because I was convinced of the need to reconcile the two countries and I believed that it would be necessary not just to think in terms of solely France’s interest but it would be tightly tied to the question of the economic organization of Europe.” (Magairaz, 2002, p. 51).

Vichy’s policy to hold back inflation was known as the “politique de circuit.” Following the accord between the Banque de France and the French State of August 25, 1940, the bank consented to provide advances to cover the cost of occupation up to a maximum of 85 billion francs (Banque de France, Compte Rendu, 1941, p. 12), which were then provided as credits to the Occupation in the Reichskreditkassen. These limits were continually raised to meet the obligations of the government, even as the Banque de France sought to “sauvegarder la monnaie” (Banque de France, Compte Rendu, p. 17). When the Nazis made payments to French suppliers, the Banque de France was obliged to issue banknotes. To prevent this growing volume of currency from having its full inflationary effect, the French State attempted to “close the circuit” by selling bonds and raising taxes to repay its liabilities to the Banque de France. The Banque and Treasury officials thus nervously watched any leakages from the circuit, and financial regulation was designed to prevent leaks from springing. The more the public could be induced to

hold bonds and money, the easier it would be to contain inflation. Faced with the exactions demanded by the Germans, Vichy policy makers planned to meet them by reducing and transferring the public's purchasing power by limited tax increases and huge bond sales, keeping inflation to a minimum.

Complicating these developments and reducing France's capacity to pay, was the extraction of labor from the French economy. As early as 1940, divisions existed amongst German officials over whether labor should be used in France or be drafted to work in Germany. As long as the Blitzkrieg was proving efficient, the status quo was maintained: French POWs labored in Germany and only minor attempts were made to recruit additional foreign workers (Herbert, 1997). After the failure of Blitzkrieg in Russia, Albert Speer, the new Minister of Munitions set up the administrative machinery for controlling German production in France. To increase labor utilization, Fritz Sauckel was made Generalbevollmächtigter für den Arbeitseinsatz (General Plenipotentiary for the Employment of Labour). Even though he was officially under Speer's supervision, Sauckel was directly subordinate to Hitler (Herbert, 1997, p. 163). Sauckel set up an ambitious recruitment program in April 1942, which was meant to bring quickly an additional 150,000 skilled French workers to Germany.

On May 6, 1942, Hitler ordered conscription to begin and insisted that the French would be paid less than German workers. Believing that it would be most efficiently used in Germany, Sauckel pressured Vichy. Laval responded with a dramatic offer of a "relève" to exchange French workmen for prisoners of war in Germany, with the idea of returning a prisoner for every three workers to stave off a compulsory draft. On June 6, Hitler agreed to replace 50,000 POWs with 150,000 French civilian workers. The relève was announced by Laval on June 22, 1942 in a radio address, where he hinted at dreadful consequences if workers did not respond. Workers were to be combed out by special committees established for that purpose and sent off to Germany. On September 4, 1942, a compulsory labor decree established that all men 18 to 50 and all unmarried women, ages 21 to 35 who worked less than 30 hours were liable for conscription, although the families of those who left voluntarily would receive one-half their nominal wage plus remittances from Germany.

Table 5
French POWs and Civilian Workers in Germany, 1939-1944

	May 1939	September 1941	November 1942	August 1944
French Civilian Workers in Germany	6,669	48,567	134,518	654,782
POWs	None	952,000	931,000	599,967
TOTAL	6,669	1,000,567	1,065,518	1,254,749

Source: Herbert (1997)

These efforts did not satisfy the Germans and, in response, to pressure, Vichy established the Service du Travail Obligatoire or compulsory labor service on February 16, 1943, where all men born between January 1, 1920 and December 31, 1922 were liable for two years service. This coercive approach eventually convinced many Frenchmen to join the resistance. In August 1944, Sauckel decided to launch a new recruitment campaign, which led to a direct confrontation with Speer. Indeed, it soon appeared impossible to both increase production in French factories and at the same time transfer French workers to Germany. Speer managed to limit the transfer of French workers by creating “Speer plants”, whose workers were protected from conscription (Herbert, 1997, p. 275). Nonetheless, the number of Frenchmen working in Germany rose after 1942 as seen in Table 5. In 1944, they represented a workforce of more than 1.2 million men.¹²

III. The Consequences of the “Politique de Circuit”

For the “politique de circuit” to succeed it had to ensure that there was a robust demand for government bonds and inflation did not erode the desirability of holding money. From the very beginning in 1939, the experience of the First World War worried the authorities who sought to control inflation. On November 10, 1939, a law was passed that ordered wages to be frozen at their September 1, 1939 level (Merigot and Courbois,

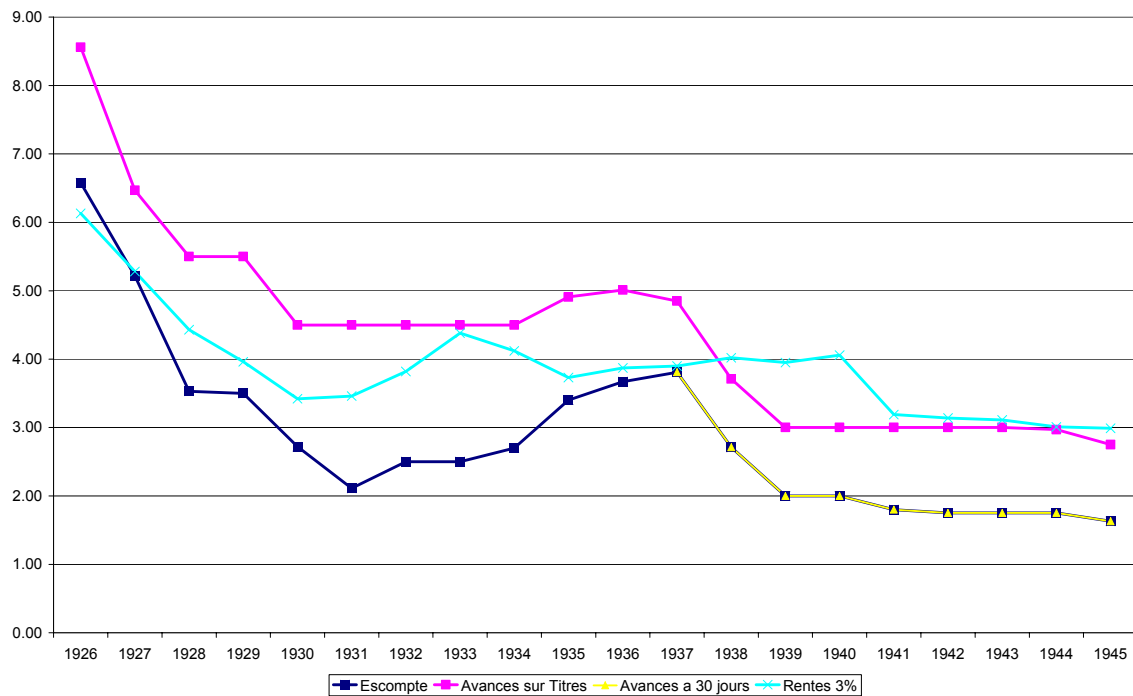
¹² Surveys made by the Germans during the war showed that the productivity level of French workers was usually between 80 and 100% of its German equivalent and far above the productivity of workers drafted from other countries (Herbert, 1997, p. 305). This should however be taken with caution since racist motives certainly influenced the results of the German surveys. For 1939-1945, the French labor force was further depleted by deaths and invalids which were estimated to be respectively 200,000 and 230,000 for the military, 150,000 and 127,000 for the civilian population and for the deported 650,000 and 585,000. Bettelheim’s (1946) older estimate places the total at 964,000.

1950). After the Armistice, a new price and wage freeze was decreed on June 20. Price limits were revised on May 23, 1941, with wages increasing on average by 12 percent for men and 20 percent for women (Mitzakis 1945, pp. 80-81). In real terms, however, wages remained far from their pre-war level. Mitzakis (1945) estimated that, by 1944, wages had risen on average by 60 percent whereas prices---excluding the black market---had officially grown by 150 percent.

Price controls led to shortages and the French government instituted a system of rationing. Under the law of August, 16 1940, comités d'organisation were set up to oversee the production and distribution of raw materials and provide a buffer against German demands. General rationing began with decrees issued on September 12 and 13, 1940, centralizing control of raw materials, rationing gasoline and luxuries, and largely eradicating the boundary between the occupied and free zones. These policies naturally spurred the growth of the black market and tax evasion and increased the demand for currency. As would be expected, price controls were less effective than wage controls, reducing consumption and allowing inflation via the market for uncontrolled goods and black markets. As discussed above, while estimate of the black market are fragile, there is a rough consensus that the market approached 20 percent of French GDP.

Adding to these expected difficulties, the German armed forces and administration paid higher wages than those permitted by regulations for French companies (Milward, 1970, p. 63). Higher wages in Germany also led to a small emigration; but more importantly, German needs for labor and goods partly undermined Vichy's wage and price controls. Furthermore, the drive to sell bonds and channel savings into government securities reduced new capital formation. Frustrated by their inability to meet all of its objectives, Vichy moved towards more of a command economy where scarce inputs and resources were allocated to specific industries.

Figure 2
The 3 Percent Rentes and Banque de France Rates
(percent)



Source: INSEE (1966), Tableau VIII, p. 545

Central to Vichy’s “politique de circuit” was its need to sell bonds---notably the bons du Trésor---and ensure that there was a buoyant demand so that yields remained low. Many of the tools employed by the Republic were taken over and employed by Vichy. Bonds were promoted with public campaigns, but perhaps more importantly a squeeze was put first on the credit markets and then on the capital markets. Like other wartime governments and its republican predecessor, Vichy was fearful of the cost of the new debt and wanted to keep interest rates low. As seen in Figure 2, the Banque de France reduced its key rates on January 3, 1939 as war loomed. The discount rate and the rate on 30 day advances were lowered to 2 percent and the rate on advances against securities was cut to 3 percent. The only other change occurred on March 15, 1941, when the rates were set at 1.75 and 3 percent, remaining unchanged for the remainder of the occupation. These three forms of credit did not play a significant role; discounts and advances in the Banque’s balance sheet declined or stagnated. Only open market operations, which had been legalized in June 1938 increased significantly (Banque de France, *Compte Rendu* 1941 p.9). Although it was not explicit, the government’s goal, assisted by the Banque de France, appears to have been to keep the rentes at

approximately 3 percent, a yield equal to the advances, as the supply of government securities mushroomed.

To ensure that yields and government financing costs remained low, credit provided by financial intermediaries was diverted to the purchase of government securities. The Banque de France aided this effort by using its network of branches to help sell subscriptions, while the banks, savings banks, and the Caisse de Dépôts were pressured to buy bonds, with the result that their portfolios shifted away from commercial and mortgage credit to government bonds (Margairaz, 1991, p. 25, 545-546). According to the French finance minister Bouthillier (1951, p. 298), the main banks now considered themselves be agencies of the French Treasury rather than promoters of industry and commerce. Both Bouthillier and his successor Cathala claimed after the war that as well the banks as the public never felt coerced to buy bonds but did so because they believed in the strength of the French economy and the credit of its state.

However, French financial institutions were, in fact, under enormous pressure. Upon entering Paris in 1940, the Germans created a special unit, the Devisenschutzkommando (DSK) which forced the banks to declare gold and foreign currencies reserves, as well as the accounts held in foreign banks, claims on foreigners and bonds and stocks denominated in a foreign currency. The German military administration appointed Dr. Carl Schaeffer commissioner of the Banque de France and head of a committee supervising the French banking sector and gave him broad powers to regulate all transactions. Bankers were quick to compare this situation with the one prevailing in Germany beginning in 1934. While French bankers were not subject to clearly defined rules (Andrieu, 1990, p. 153), they deduced that holding a large portfolio of French bonds was safe, and probably expected, behavior. More formal regulations were imposed by the law of June 13 and 14, 1941 that established the “organisation de la profession bancaire.” Banks were supposed to place their “surplus funds” in short-term bonds. In 1938, these bonds had accounted for only a third of their portfolios; but by April 1942, they accounted for four-fifths of assets and finally eventually 90 percent at the end of 1943. Rationed consumer goods and the lack of alternative investment opportunities encouraged the public to deposit funds in low interest bank and savings

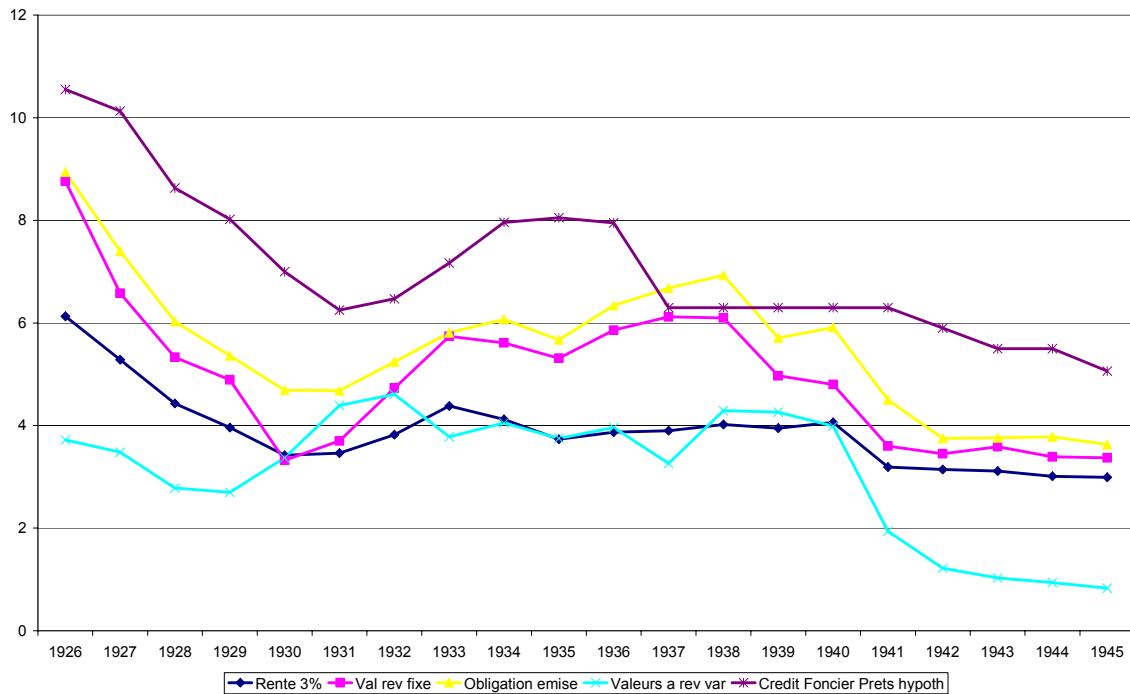
accounts.¹³ To limit disintermediation created by the black market and tax evasion, the government sought to ensure that large transactions were made through the banking system. Laws decreed on October 22, 1940, February 28, 1941, and November 17, 1941 required payments in excess of 3,000 francs to be made only by checks.

Efforts to raise deposits of financial intermediaries that would then absorb more bonds were threatened by the approach of the Allies. Magairaz (2002) identified two “monetary crises” or perhaps more appropriately intermediation crises. First, in September 1942, bank deposits which had grown at same speed as currency slowed abruptly. The second “crisis” erupted in September-October 1943 after the Allies bombarded Nantes. Bank deposits shrank, as the stock and black market gold and foreign currency markets boomed. The Banque de France stepped in with open market operations to prevent a banking panic from starting. Monetary authorities feared that these crises would raise velocity, increasing inflation and undermining the “politique de circuit.”

In general, the low interest policy of the “circuit” was successful in that it kept the nominal yields for government bonds low, as seen in Figure 3. The yields on other bonds fell in line, including yields on fixed income securities, newly issued bonds, and mortgages from Crédit Foncier. But, real rates were considerably lower. Even at the official rates, which certainly are under-estimates, inflation ranged between 17 and 24 percent for 1940-1944, implying very low real rates of interest. Consequently, the capital market boomed. After languishing in the doldrums for all of the thirties, there was a surge of new issues beginning in 1941, evidenced in Table 6. Both private firms and the government took advantage of these circumstances to lower the rate on long-term debts and consolidate short-term debts. The government alone issued 46.4 billion francs, of which only 9.8 billion represented new medium and long term notes (Banque de France, Compte rendu, 1941).

¹³ To adjust to the rising price level, the Vichy twice raised the maximum deposits permitted on individual accounts in savings banks (Banque de France, Compte rendu 1941, p. 3).

Figure 3
Market Interest Rates
(percent)



Source: INSEE (1966), Tableau VIII, p. 545.

Much to the consternation of the Vichy and German authorities, this low interest policy produced a boom in the stock market, which was controlled by a squeeze on equities. As seen in Figure 3, the yield on stocks plummeted below the yield on rentes. The equity premium became a substantial equity discount, reflecting the desire of the public to obtain assets with potential positive real returns. Consequently, there was a boom in new issues, visible in Table 6. The largest banks used this opportunity to augment their capital, helping them to subscribe to government bonds and contributing to the efforts of the government to “fermer le circuit.”¹⁴

¹⁴Crédit industriel et commercial increased its capital by the issue of new shares for cash, raising it from 100 to 200 million francs in May 1941. The Banque nationale pour le commerce et l’industrie (BNCI) which increased from 175 to 350 million francs, while the Société générale at the end of 1942 increased its capital from 650 to 750 million francs. In 1943 Crédit Lyonnais raised its capital from 400 million to a billion francs and augmented its reserves. Plessis, p. 20

Table 6
New Issues in the Capital Market
(millions of francs)

	Equities	Total Bond Issue	New Bond Issues	Local and other government issues and other	Long and Medium Term Treasury Issues	New Treasury Issues
1926	5,566	2,984	Na	1,126	3,013	Na
1927	7,860	5,312	Na	1,420	3,249	Na
1928	14,060	5,518	Na	1,450	10,757	Na
1929	18,262	8,417	Na	1,246	4,676	Na
1930	10,864	13,908	Na	1,437	425	Na
1931	5,386	8,644	Na	4,104	598	Na
1932	3,071	12,434	Na	4,159	5,184	Na
1933	2,517	7,339	Na	4,122	12,446	Na
1934	2,015	6,314	Na	2,975	13,785	Na
1935	2,048	3,970	Na	2,954	7,348	Na
1936	1,410	3,073	Na	1,301	722	Na
1937	2,004	2,832	Na	1,700	14,752	Na
1938	1,679	1,520	1,312	1,630	7,515	7,515
1939	1,728	3,952	3,260	0	5,000	5,000
1940	700	1,321	1,285	0	0	
1941	5,689	27,750	6,850	61	46,360	9,830
1942	7,399	24,118	6,188	1,560	54,344	14,106
1943	6,505	9,000	3,500	160	52,803	49,120
1944	5,557	6,284	5,239	1,722	137,050	137,050

Source: INSEE (1966), Tableau IA, p. 532.

With the boom in the stock market, a squeeze on equities was essential to bond finance (Oosterlinck, 2003). As inflation rose, investors attempted to escape the effects of inflation by investing in real assets and securities, which entitled them to hold real assets that presumably would not be diminished in value by the end of the war. Capital and stock market controls were thus an essential part of the fiscal regime of occupied France. At the outset the Paris stock market was shut down. At first the German authorities were reluctant to reopen the market, fearing that it would serve as a political barometer.¹⁵ The French government countered that without a proper exchange to trade bonds, payment of the occupation charges would be difficult.¹⁶ While the exchange was allowed to open on

¹⁵ "Vortragsnotiz betreffende die Wiederoöffnung der Pariser Börse," August 18, 1940, AJ40 vol. 832 4b.

¹⁶ Ministère des finances, "Note sur l'ouverture de la bourse," August 10, 1940, A140 Vol. 832 4b.

October 14, 1940, the Germans set strict conditions. Trading in stocks and foreign securities was forbidden as were all futures markets.¹⁷

For five months, only the bond market was open in Paris, encouraging new investment in bonds and making it easier for the French government to float bonds. There may have been little enthusiasm in Vichy for the reopening of the stock market, but the growth of a black market in stocks and pressure by brokers persuaded the government to permit stock trading again on March 19, 1941. To prevent equities from detracting from the government bond market, decrees issued in February and March of 1941 limited dividends to a maximum of the three year pre-war high or six percent. Daily price increases were limited to 3 percent (decreases to 6 percent); in April, a tighter regime was imposed with a daily ceiling for price increases of 1 percent (decreases to 3 percent). When these measures did not yield the expected results, the German authorities had recourse to even more extreme methods. Formerly Jewish-owned securities were sold to drive prices down, and the Germans threatened to close the exchange if brokers did not stop prices from rising. Initial public offerings were not initially suppressed, but they were allowed only a maximum dividend rate of 8 percent. This loophole probably contributed to the increase in new offerings. The government could not suppress the equities market as new investment was required to re-equip French industry so that it could provide for the Nazi war machine. This problem became more acute after 1942, when the French economy became integrated in Speer's economic plans.

To induce investors to buy bonds, a capital gains tax of 33 percent for equities and foreign bonds held less than one year was imposed (later reduced to 20 percent and three months); the basic tax on coupons and dividends was set at 30 percent and soon a 5 percent tax on the purchase of all, except fixed-income securities, was added. To monitor transactions, the market was centralized under a new institution, the Caisse Centrale des Dépôts et Virements de Titres, and new issues could not be bearer bonds, the then predominant form, but nominative bonds.

¹⁷ The exchanges located in the Free Zone were not subject to these rules. The result was a shift of trading to the Free Zone exchanges, primarily Lyon and the emergence of a large black market in the Occupied Zone.

IV. Repression of Markets and Financing of the War

Controls imposed on prices and wages, coupled with rationing and the regulation of money and capital markets had the common goal of facilitating Vichy's financial operations. If inflation was kept in check, revenue from seigniorage would not require increasingly rapid rates of growth of the money stock to capture real resources. Controlling prices and rationing should also have left the public with more cash, which if interest rates were kept low, could be channeled to government bonds, especially if the stock and bond markets did not provide attractive alternatives for savings. This repression of markets by the imposition of controls should have operated generally by reducing velocity. Table 7 shows the behavior of velocity from the franc Poincaré stabilization until the end of the Fourth Republic. During the boom period in the late 1920s and early 1930s velocity was high and on average well above two. It declined some during the hard years after 1931, but what is remarkable is the collapse of velocity during World War II before the rapid return to the levels prevailing before the economic collapse of the 1930s.

This decline in velocity gives a rough measure of the effect of controls on the government's ability to raise funds. Rockoff (1981) proposed a simple method by examining how changes in the stock of money in year t $(dM/M)_t$ are affected by controls through the behavior of velocity (V), defined as income (Y) divided by money (M).

The change in the stock of money may thus be written:

$$(1) \quad (dM/M)_t = (dM/Y)_t V_t$$

If controls reduce expected inflation and velocity, they will reduce $(dM/M)_t$ provided that $(dM/Y)_t$ is independently determined. Equation (1) can be rewritten as:

$$(2) \quad (dM/Y)_t = (G/Y)_t (dH/G)_t (dM/dH)_t$$

where G_t is government expenditure and dH is the change in high-powered money. Given that the Germans set occupation costs, G_t can be assumed to be independent; as may $(G/Y)_t$ in the short-run. But the share of spending financed by high-powered money $(dH/G)_t$ may not be independent. In the absence of controls, the government might have relied more on taxes and borrowing. However, this ratio will be assumed to be fixed, particularly as it may have been difficult to raise taxes given the fragile state of the economy. The ratio $(dM/dH)_t$ is a function of the reserve-deposit and currency-deposit ratios. If controls stabilized expectations of inflation, they would tend to increase these

ratios and reduce $(dM/dH)_t$. Thus, the key ratio, $(dM/Y)_t$ was not strongly effected by controls and may have been reduced by them, lowering the need of more money creation. Holding this variable constant in Equation 1 may thus lead to an underestimate of the impact.

Table 7
Income, Money and Velocity, 1927-1958

	Nominal GDP	M2	Velocity
1927	318	132	2.42
1928	337	161	2.09
1929	393	162	2.43
1930	395	170	2.32
1931	361	165	2.19
1932	307	164	1.87
1933	295	153	1.93
1934	247	154	1.60
1935	245	146	1.68
1936	261	165	1.58
1937	338	176	1.92
1938	380	203	1.87
1939	433	256	1.69
1940	419	371	1.13
1941	392	447	0.88
1942	424	589	0.72
1943	493	742	0.66
1944	739	847	0.87
1945	1007	998	1.01
1946	1935	1363	1.42
1947	3395	1694	2.00
1948	5582	2191	2.55
1949	6728	2750	2.45
1950	7640	3189	2.40
1951	9200	3775	2.44
1952	10690	4287	2.49
1953	11180	4794	2.33
1954	11930	5465	2.18
1955	12960	6169	2.10
1956	14380	6817	2.11
1957	16080	7535	2.13
1958	18510	7927	2.34

Source: Patat and Lutfalla (1990).

Note: Toutain (1997) provides a higher estimate of GDP of 415 billion francs for 1938..

Table 8
Estimated Effects of Economic Controls

Year	Actual V_t	First Counterfactual for V_t	Second Counterfactual for V_t	First Estimate of dM/M	Second Estimate of dM/M	Actual dM/M
1940	1.13	1.68	1.63	46.1	44.7	45.0
1941	0.88	1.67	1.57	32.7	30.8	20.7
1942	0.72	1.66	1.51	55.5	50.5	31.7
1943	0.66	1.65	1.45	51.0	44.8	25.8
1944	0.87	1.64	1.39	23.4	19.8	14.2

To calculate the effects of controls, an estimate of what velocity might have been in the absence of controls is required. The average velocity for the period 1927-1938 was 1.97 and for the bad years of 1932-1939, it was 1.77. However, as evident in Table 7, there was a downward drift in velocity before the fall of France. An ordinary least squares regressions of V_t on time for 1927-1939, gives a point estimate of this annual decrease of -0.061 and for 1932-1938 of -0.008 ; though the latter is not significant.¹⁸ Table 8 shows the estimated increases in the money supply that would have resulted under either rate of decline. The procedure uses 1939's actual velocity as a starting point, which is low and hence increases the potential of an underestimate. Nevertheless, the differences are profound, particularly for 1942 to 1943, when Vichy would have apparently needed to increase money stock growth by more than 50 percent to compensate for the absence of controls with the expected consequences for inflation. While these regulations were central to the wartime regime and all countries adopted similar policy packages, this exercise provides some insights into the importance of these regulations to boost the "politique de circuit."

V. Measuring the Cost and Alternatives

The rapid decline in French GDP, even with a substantial unmeasured black market, suggests that the economy could not have sustained the burden for long. What would have been an optimal policy on the part of Vichy? Should Vichy have abandoned financial repression and allowed interest rates to rise? What were the effects of attempts to close the "circuit?" Should Vichy have pursued a policy like Weimar Germany of

¹⁸ The standard errors for the coefficient on time for the two regressions are 0.014 and 0.02 respectively.

financing the occupation with money and generating inflation? What was the effect of the withdrawal of labor from France?

To assess the Vichy's policies and alternate strategies, we begin with Ohanian's (1997; and also McGrattan and Ohanian, 2003) basic model of a wartime economy. However, he did not include the crucial monetary sector, and we expand our version of a neoclassical growth model to include one. In this model, there are a large number of identical, infinitely lived consumers with perfect foresight who have an initial endowment of k units of capital and one unit of time per period, which is divided between n_t hours of labor and l_t hours of leisure. These consumers earn income for labor, capital, and government debt and transfers. They use this income to purchase goods, buy new capital (finance investment), obtain government bonds, and acquire money.

Individuals maximize a lifetime utility function, where money directly enters the utility function¹⁹:

$$(3) \quad V = \sum_{t=0} \beta^t u(c_t, m_t, l_t) \quad 0 < \beta < 1$$

with the time constraint of $n_t = 1 - l_t$. This formulation can avoid the assumption of superneutrality and allows labor supply and consumption to be affected by inflation. An increase in the price level will lower real money balances, which will alter the marginal utility of leisure and the supply of labor, affecting the stock of capital, output and consumption (Walsh, 2003).

Specifically we assume a nested CES utility function:

$$(4) \quad u(c_t, m_t, l_t) = \frac{[a c_t^{1-b} + (1-a) m_t^{1-b}]^{1-\Phi/1-b}}{1-\Phi} + \frac{\Psi l_t^{1-\eta}}{1-\eta}$$

where $0 < a, 1, b, \eta, \Phi, \Psi > 0$ and b, η , and Φ are not equal to one. The term in brackets is a composite consumption good that depends on the level of consumption goods c and real money balances m . In our analysis we chose a much simpler case where $\Phi = b = 1$, preferences over consumption and money are log linear, so that $u = a \ln c_t + (1-a) \ln m_t + \Psi l_t^{1-\eta} / (1-\eta)$ and the consumption and labor decisions are independent of the household's portfolio decision, thus money is superneutral.

¹⁹ In contrast to a cash-in-advance model, this formulation is more general and allows for a interest rate elastic money demand. Other formulations are equivalent; see Feenstra (1986?).

The individuals maximize their utility subject to a wealth constraint and transversality conditions so that the present discounted values of bonds and money converge to zero in the limit. Upper case letters signify nominal quantities, while lower case are real quantities, normalized as $m_t = M_t/P_{t-1}$, for real balances. Bonds (B) are one-period, where the principal and interest are repaid after one period.

$$(5) \quad T_t/P_t + (1 - \tau_{nt})(W_t/P_t)n_t + (1 - \tau_{kt})(D_t/P_t)k_t + [1 + R_t(1 - \tau_{bt})](B_t/P_{t-1})(P_{t-1}/P_t) = \\ (P_t/P_t)c_t + (P_t/P_t)[k_{t+1} - (1 - \delta)k_t] + EX_t/P_t - IM_t/P_t + (B_{t+1}/P_t) + (M_{t+1}/P_t) - \\ (M_t/P_{t-1})(P_{t-1}/P_t)$$

Equation 5 states that income is composed of real transfers, T_t/P_t , after tax real income $(1 - \tau_{nt})(W_t/P_t)n_t$, after tax real capital income, $(1 - \tau_{kt})(D_t/P_t)k_t$, and the bond principal plus after tax real return on government bonds. This income is equal to real goods that are consumed, the increase in capital, less depreciation, δ , (or investment net of depreciation), the new bonds that are purchased (B_{t+1}/P_t) plus real exports less real imports. Given the extensive controls on trade, exports and imports are treated as exogenously determined. The last two terms represent the increased money balances less seigniorage, which may be rewritten as

$$(6) \quad m_{t+1} - m_t/(1 + \pi_t) \text{ or } (m_{t+1} - m_t) + (\pi_t m_t / 1 + \pi_t).$$

so that (5) becomes:

$$(7) \quad t_t + (1 - \tau_{nt})w_t n_t + (1 - \tau_{kt})d_t k_t + \{[1 + R_t(1 - \tau_{bt})]b_t\}/(1 + \pi_t) = \\ c_t + [k_{t+1} - (1 - \delta)k_t] + ex_t - im_t + b_{t+1} + (m_{t+1} - m_t) + (\pi_t m_t / 1 + \pi_t)$$

The government's budget constraint for any given period has real expenditures on goods, real transfers and real payments on bonds (principal and interest) equal to new sales of bonds, labor tax revenues, capital tax revenues, bond tax revenues and the increase in the stock of money:

$$(8) \quad G_t/P_t + T_t/P_t + (B_t/P_t)(1 + R_t) = B_{t+1} + \tau_{nt}(W_t/P_t)n_t + \tau_{kt}(D_t/P_t)k_t + \\ \tau_{bt}(R_t/P_t)B_t + M_{t+1}/P_t - M_t/P_t,$$

which may be re-written as,

$$(9) \quad g_t + t_t + b_t(1 + R_t)/(1 + \pi_t) = b_{t+1} + \tau_{nt}w_t n_t + \tau_{kt}d_t k_t + (m_{t+1} - m_t) +$$

$$(\pi_t m_t / 1 + \pi_t)$$

In equilibrium, the present discounted value of debt converges to zero in the limit, which implies that the present discounted value of all government payments is equal to the present discounted value of all government revenue.

Output in the economy is produced by competitive profit-maximizing firms using a Cobb-Douglas technology:

$$(10) \quad y_t = A k_t^\theta l_t^{1-\theta}, \quad 0 < \theta < 1$$

and income is

$$(11) \quad y_t = c_t + i_t + g_t + ex_t - im_t$$

For a competitive equilibrium, given individual endowments of capital, bonds, and the government budget, there are a sequence of interest rates, factor prices, capital, bonds, money, labor, leisure and consumption where factor prices equal their marginal products, and the net rate of return on government debt and capital is equated so that bonds are held. In this recursive system where there is perfect foresight and a given the path of government spending during the war, transfers and tax rates, individuals choose consumption, labor, and holdings of bonds, capital and money.

The objective behind this neoclassical model is to determine what the relative cost of various Vichy policies and some potential alternatives. Following Ohanian (1997), the perfect foresight competitive equilibrium is computed by numerically solving the system of nonlinear equations that includes the first-order conditions and budget constraints. We use the shooting algorithm described in Ljungqvist and Sargent (2004). To conduct the welfare measurement, the steady state equilibrium first needs to be solved: then we compare various wartime equilibria with the steady state equilibrium. For the first, data from 1938 are used as it is the closest to a prewar full employment year and it is one of the few benchmark years that economic historians have chosen to assemble national income accounts. The war years are from 1940-1944, and the postwar period, 1945-1958, covers the era of the Fourth Republic. The length of a period in the model is one year, while the discount factor β is set equal to .96, for a real rate of interest of 4 percent.

There are three sources for the basic data for the French economy. First INSEE (1966, p. 553) estimated that GNP was 446 billion current francs in 1938, with consumption accounting for 74.2 percent, government consumption 12.7 percent, gross fixed capital formation 13.2 percent, and exports and imports at 10.8 and 11.0 percent.

Among the most widely used figures are those of Carré, Dubois and Malinvaud (1975) who place GDP at 444 billion francs in 1938 and their estimates are used in Pattat and Lutfalla's (1990) monetary study. More recently, in a reexamination of the data, Toutain (1997, p.15, 58-85) estimated that prewar GDP for 1935-1938 averaged 304 billion francs, although there was a huge variation in output in current values rising from 205 to 247, 348, and finally 415 billion francs. On average, Toutain apportions 74.3 percent of national income to consumption, 12.9 percent to government consumption, 15.6 percent to gross domestic capital formation, and 1.3 percent to government capital formation, with exports and imports accounting for 7.0 and 11.1 percent respectively. Local government expenditure is ignored here and central government expenditure for 1938 of 82.3 billion francs is used, and no transfers are assumed, as these were relatively small in peacetime. For wartime and later years, only Carré, Dubois and Malinvaud (1975) provide annual GDP data. Unfortunately, there is no information on aggregate consumption or investment for the war years or the late 1940s. INSEE's retail price index is used as a measure of inflation. As mentioned previously, transfers here are treated only as the transfers that occurred when labor was drafted into Germany and families were given one half their nominal wage. To obtain this transfer, T , labor income is divided by the labor force to obtain the annual wage and one half of this value times the number of labor draftees provides an estimate of T .

Although it would be preferable to have the marginal tax rates, average tax rates are developed here in the absence of a thorough study of the tax structure and its incidence. Tax rates on labor and capital are imputed by taking the total tax revenues levied on each factor divided by their share of national income. The factor shares for 1938 and 1949-1958 are provided by INSEE (1966). For 1938 labor earned 67.7 percent of national income and for 1949-1958 it ranged between 66 and 68 percent. However, there were large changes during World War II, as documented by Piketty (2001). His factor shares closely match INSEE's for the overlapping years, but labor's share rose from 70 percent in 1940 to 87 percent in 1943 before drifting back to approximately 68 percent. Piketty (2001a) provides a decomposition of the state's revenue into taxes levied on capital, labor and mixed sources for 1938 (16.0%, 64.4%, and 19.6%), 1943 (9.3%, 55.1%, and 35.6%) and 1956 (6.2%, 74.4%, and 19.4%). Following his procedure and using the data provided by INSEE (1966) and splitting the mixed revenues between

capital and labor produced a series on the tax revenue from these two factors. The combined effects of the rise in wartime tax rates and the fall in capital's share of income led the tax rate on capital to rise from 11.8 percent in 1938 to a peak of 59.8 percent in 1943, while the tax rate on labor increased from 12.2 to 16.0 percent.

In 1938, Carré, Dubois and Malinvaud (1975, p. 59) put the total population of France at 42.0 million with a labor force of 19.5 million of which 16.4 million were employed in productive sectors, which excluded the unemployed, draftees, and government officials. The number of workers employed in the productive sectors grew slowly between 1935 and 1938 at a rate of 0.7 percent a year. For our purposes, we assume that 16.4 million represents the effective prewar labor force. The war gradually reduced the labor force. First, there was the loss of Alsace-Lorraine, which had population of 1.9 million (Milward, p. 39). Assuming the same rate of labor force participation as the rest of France in 1938, the loss of Alsace-Lorraine would have reduced the labor force by 0.75 million. Some of this population fled or was driven into France as Hitler moved to "Germanize" the region, but this reduction should suffice as it will also cover the other small regions that were lost. Defeat also brought 300,000 deaths (Bettelheim, 1946) and the initial internment of 1.2 million French prisoners-of-war. The POWs are assumed to have been called up to duty and hence were previously productive and should thus be subtracted from the labor force in 1940, leaving a total of 14.1 million workers. According to Carré, Dubois and Malinvaud (1975) the population continued to shrink by perhaps 100,000 per year, and the work force is thus reduced for 1941 and 1942. As seen in Table 5, the last great shock was the relève, which occurred in 1943-1944 and reduced the labor force until Liberation. By 1946, the labor force had recovered to 16.8 million but it then declined to 16.4 million by 1957.

The estimates of M2 are provided by Patat and Lutfalla (1990), while INSEE gives the total nominal debt of the central government. On January 1, 1939, it stood at 423.5 billion francs, climbing to 1333.5 billion by the end of the war. There are no estimates of the capital stock for the late 1930s. Carré, Dubois and Malinvaud (1975, p. 120) estimate the total capital-output ratio in 1949 to be 3.06 and for productive capital 1.93, which then slowly declined in the 1950s, reaching 2.47 and 1.61 by 1959.²⁰ Thus, for our purposes we use the rough estimates of 2 to provide an estimate of productive

²⁰ In 1913, they estimate the capital-output ratio to be 2.81 and the productive capital-output ratio to be 1.61.

capital in 1938. However, we do know that the occupation took its toll on capital, just as it did on labor. Carré, Dubois and Malinvaud (1975, p. 534) set the value of gross productive capital on average at 56 billion francs in 1956 prices in 1921-1930, 59 billion for 1931-1940 and only 15 billion for 1941-1945.²¹

With utility assumed to be logarithmic, the most sensitive parameter appears to be the elasticity of labor supply. In most business cycle models of the U.S. economy, including Ohanian's model (1997) of the U.S. World War II economy, labor elasticity needs to be assumed to be very high in order to mimic the observed behavior of labor and output.²² However if we assume labor supply to be very elastic (for example, $\eta=0.5$) there is a boom in Occupied Vichy, contrary to events. Thus, in line with microeconomic studies, we assume that labor supply is inelastic with $\eta=10$. The leisure preference parameters are set equal to values that imply that the representative household spent one-third of its time working in steady state. The parameters b , Φ , and Ψ are set equal to one. To determine the relative share of consumption and money holding, the parameter a is set at 0.9689 so that the ratio of money (M2) to GDP reflects its initial value of 0.5. The parameter θ , capital's share of total output, is set at 0.33, as implied by the French data while δ , the depreciation rate, is 10 percent that makes the observed postwar capital-output ratio consistent with the steady state capital-output ratio implied by the model. The depreciation rate was estimated by INSEE (1966) to be about 10.6 percent in this period. We set the steady state values so that they approximate pre-war France or post-war France without the emergence of the transfer state. Here the share of government in GDP is 20 percent, $\tau_{nt} = .20$, $\tau_{kt} = .25$ and $\tau_{bt} = .10$ reflect their average prewar values. Lastly, the steady state for inflation is assumed to be zero as policy makers might have expected under a gold standard fixed exchange rate regime that was desired by French policy makers before and after the war. We set the debt to GDP ratio at one, its approximate prewar value.

The addition of money to Ohanian's basic model requires us to make some assumptions about the operation of monetary and fiscal policy. The central challenge is

²¹ In addition, Carré, Dubois and Malinvaud report (p. 151) an estimate of 137.7 billion current francs for fixed reproducible capital in 1913. Taken with Toutain's estimate of GDP of 49.6 billion francs for 1913, there is an implied capital output ratio of 2.78.

²² Microeconomic studies estimate low labor supply elasticities and many models implement a Hansen-Rogerson model where labor is indivisible so workers chose only between full employment or unemployment, providing a high elasticity from the extensive margin of workers moving in and out of the work force (Rebelo, 2005).

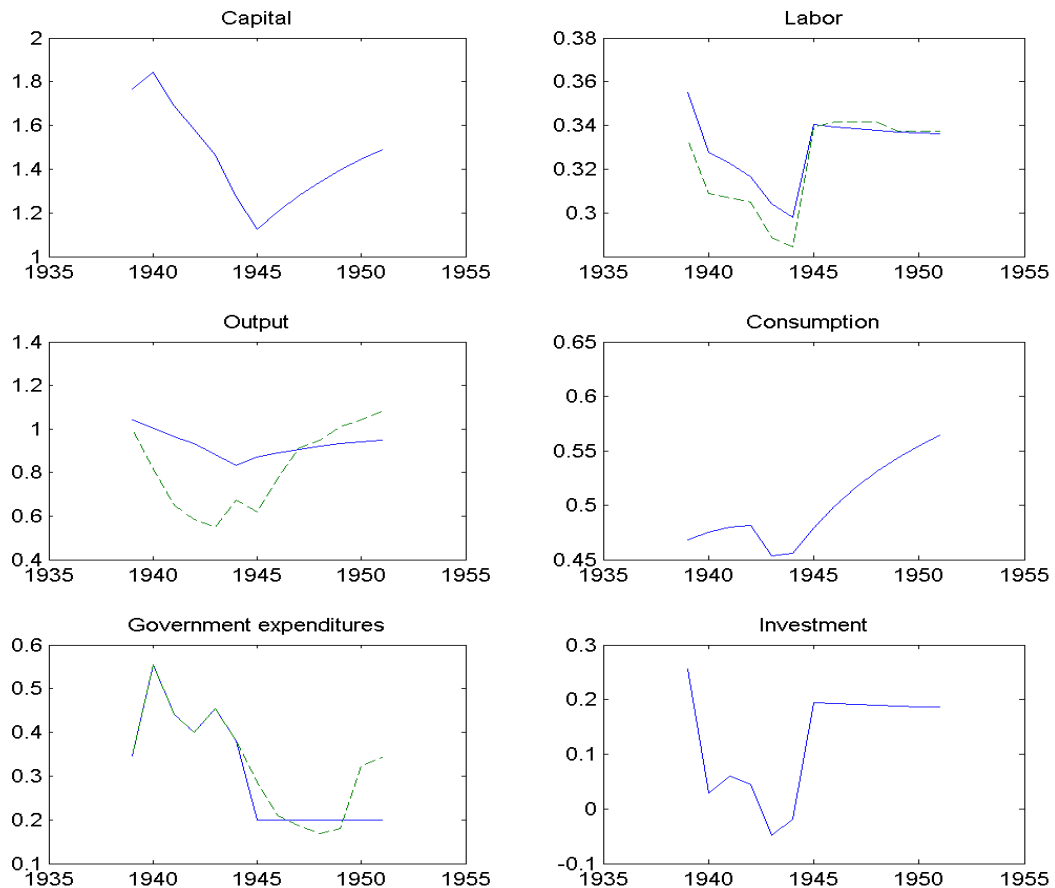
to parsimoniously model the collection of policies---taxation, bond issue, money creation, financial repression, wage and price controls and rationing---that Vichy pursued. To begin we consider an unregulated economy described in our model where tax rates and government expenditures and transfers are set and known in advance. The assumption that government expenditures are given seems a good approximation as Vichy had some conventional expenditures and transfers plus what the Nazis demanded. The Nazis used the funds in their account at the Banque de France to purchase goods in France as their war effort required. They were not interested in some nominal level of transfer but in obtaining real resources. To set what they extracted in the model, we fix the ratio of actual government expenditures to the steady state GDP. The use of actual official output would be somewhat misleading as this omits the black market, which should have figured in the Nazis calculations, as they probably thought of what they could obtain in terms of the some steady state GDP.

Although tax rates were increased, tax revenues approximately covered the conventional expenditures of the government and the financing of occupation payments rested more on the appropriate mix of bonds and money. Therefore, we set tax rates at their actual values for the wartime period. Financing the remainder of expenditure with bonds and money could have been accomplished by many different policy mixes. We consider several simple alternatives. To begin, we examine the case where the nominal money supply was set by the government. However, we do not wish to use the actual figures for money growth because price and wage controls as well as financial repression had the effect of reducing the growth of the money supply. So to examine the effects of setting money growth without controls we use the estimates from Table 8. This predetermined money, the “Rockoff money,” produces our first set results, which is our baseline model.

Figure 4 shows the behavior for the real sector of the economy. As the choices for the real sector are separable from the portfolio decision of households and the financing decision of the government, the results do not change. We set the production function parameter A so that steady state output is one. Thus, in the figures, output, consumption, investment, capital, and debt are presented relative to this benchmark. Labor is set so that the initial supply is equal to one third of a day. The solid lines are

the path of the variables generated by the model, while the dotted lines represent the actual data.

Figure 4
The Real Sector



The movement of these variables tracks the observed data, which is presented in the figures when it is available. In response to the rise in government spending and the removal of labor from France, there is a substantial drop in output, consumption and investment. The decline in output is less than the decline officially recorded, but our higher figures are for an economy where there are no additional constraints such as price and wage controls and rationing and there is no black market. The decline in output is largely driven by the increase in government spending that forces a drop in consumption and investment, which in turn causes a fall in capital. The decline in labor supply is

brought about by higher taxes and by the Nazi regime's forced reduction in the labor force by holding the POWs and drafting French labor for German factories. Higher tax rates, raising the present value of future tax liabilities and higher interest rates contribute to lower consumption. We do not have measures of what actually happened to private capital and consumption, but the fragmentary data suggests that both seriously shrank over the course of the occupation. The model also captures the added burden of occupation payments in 1943, as consumption dips again. These huge losses seem realistic given what we know happened to food rations. According to Milward (1970), the rations for bread, meat and fat in 1943-1944 were 70, 18 and 31 percent of the prewar levels. These were basic necessities and consumption of other perishables and durables collapsed. Although the black market helped to supplement these low levels, it did not make up the difference for the whole population.

We follow Lucas' method of calculating the welfare cost, and define the cost as the additional permanent annual consumption (discounted over time) that would make up the difference between the wartime consumption and the steady state economy. The relative costs of the separate policies can be seen in Table 8. In the steady state, there is naturally no loss. A central question faced by the Nazis was whether to deploy French labor in France or in Germany. They kept a large number of soldiers as POWs; and ultimately, they drafted French workers across the Rhine. If all the variables are set at their steady state levels, and only the imposition on the French economy was the retention of POWs and the labor draft to Germany, the loss would be 2.67 percent of consumption. The additional labor would have made a major improvement to the productive capacity of the economy and hence reduced the loss. If the variables maintained their steady state, and government spending and occupation payments assumed their wartime values, it would cost the economy 10.82 percent. The remaining individual effects are relatively small by comparison. The total cost using "Rockoff Money" or actual money was 14.21 and 14.06 percent. The components almost but do not add up to the totals, which exceed the sum, reflecting the interaction of these distortions on the economy. The difference between the two money measures can be treated as an estimate of the cost of controls in the economy that reduced velocity. The controls thus imposed a burden of 0.15 percent.

Table 8
Welfare Cost of Separate Policies

Loss	Percent
Steady State	0.00
POWs and Relève	2.57
Wartime Government Spending	10.82
Increased Taxation	0.15
Net Exports	-0.47
Wartime Money Growth	-0.53
Wartime Rockoff Money Growth	0.33
Total Cost (Rockoff Money)	14.21
Total Cost (Observed Money)	14.06

The baseline model's effects on asset markets are shown in Figures 5a and 5b, where debt and money are measured as a proportion of steady state GDP. In the model, both the nominal returns on bonds and capital rise well above their steady state levels because of the increased government spending funded by borrowing. The spike in the nominal yields on capital are a result of the higher taxes levied on capital. The after-tax returns are equalized, with the sharply negative real returns, a result of the jump in inflation in 1943. But, it is here that the calibration exercise reveals an underlying fault of the French interwar economy. The key problem is that the debt at the outset of the war appears too high and grows explosively, which is not an equilibrium. Given the steady state values, which are intended to approximate the condition of the French economy, the steady state level of the debt is forty percent of GDP. However, on the eve of World War II, this ratio was slightly over one.

For Figure 5a, we were able to obtain an equilibrium, setting the crucial variables at their wartime values, by allowing real debt to find an initial value that produces a stationary level of debt and real money to reach its level that implies the observed velocity of two. However, this initial level of debt is negative, implying that France needed to enter the war with net assets approximately equal to one year's steady state GDP instead of a net debt of the same magnitude. One interpretation of this result is that France needed to have foreign assets that could be sold; and, in fact, in World War I, both the British and French liquidated much of their huge foreign holdings of securities to finance the war. For Figure 5b, we required real money balances to move to their steady state level, but set real debt at its initial level at the outset of the war. As debt grows

explosively this is not an equilibrium for the economy. Given the path of government spending and other variables, debt must be controlled by something, raising taxes or a default. In fact, after the war there was a massive reduction of the debt through inflation. Actual and modeled debt move together for a few years. The actual ratio of the debt to 1939 GDP rose from 0.98 to 1.44 in 1944. But, while debt continued to grow rapidly in the politically unstable postwar period, inflation surged and the ratio stood at 0.53 in 1950, a huge effective default and a value much closer to the steady state level of 0.40. What this exercise suggests is that there were some important questions of political economy that had not been resolved in interwar France and left her in a relatively weak fiscal position on the eve of the war.

Figure 5a
Real Debt Converges to a Stationary Level

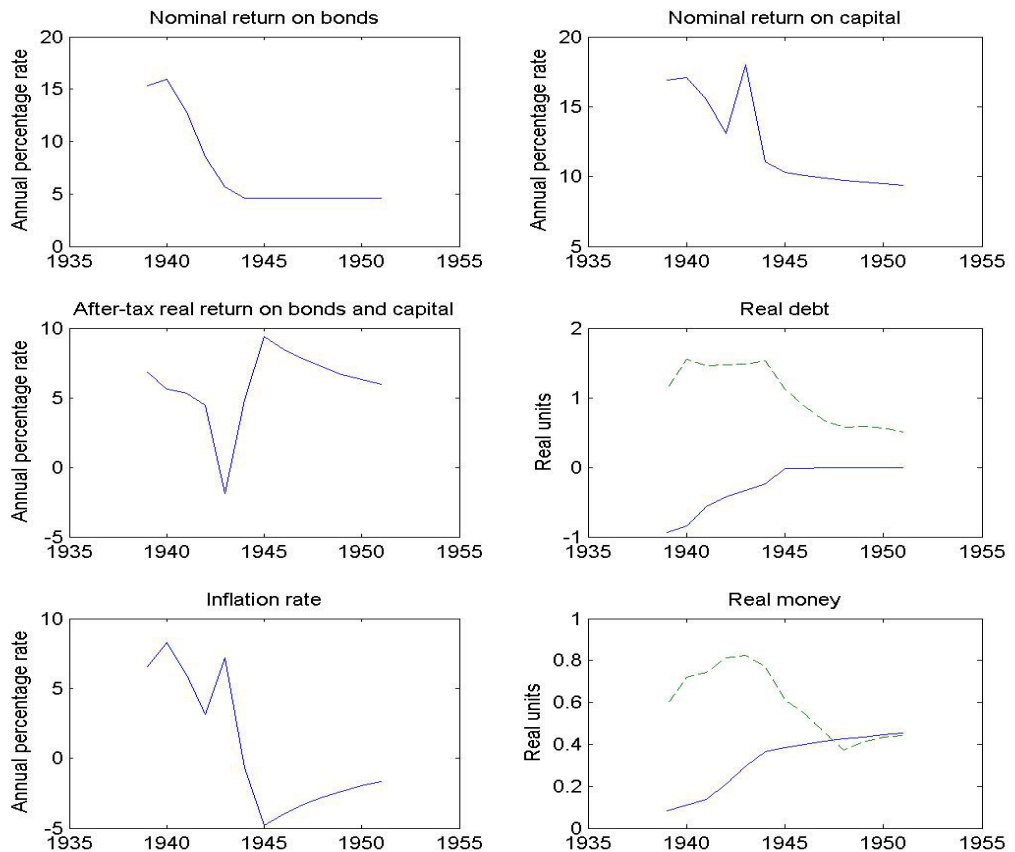
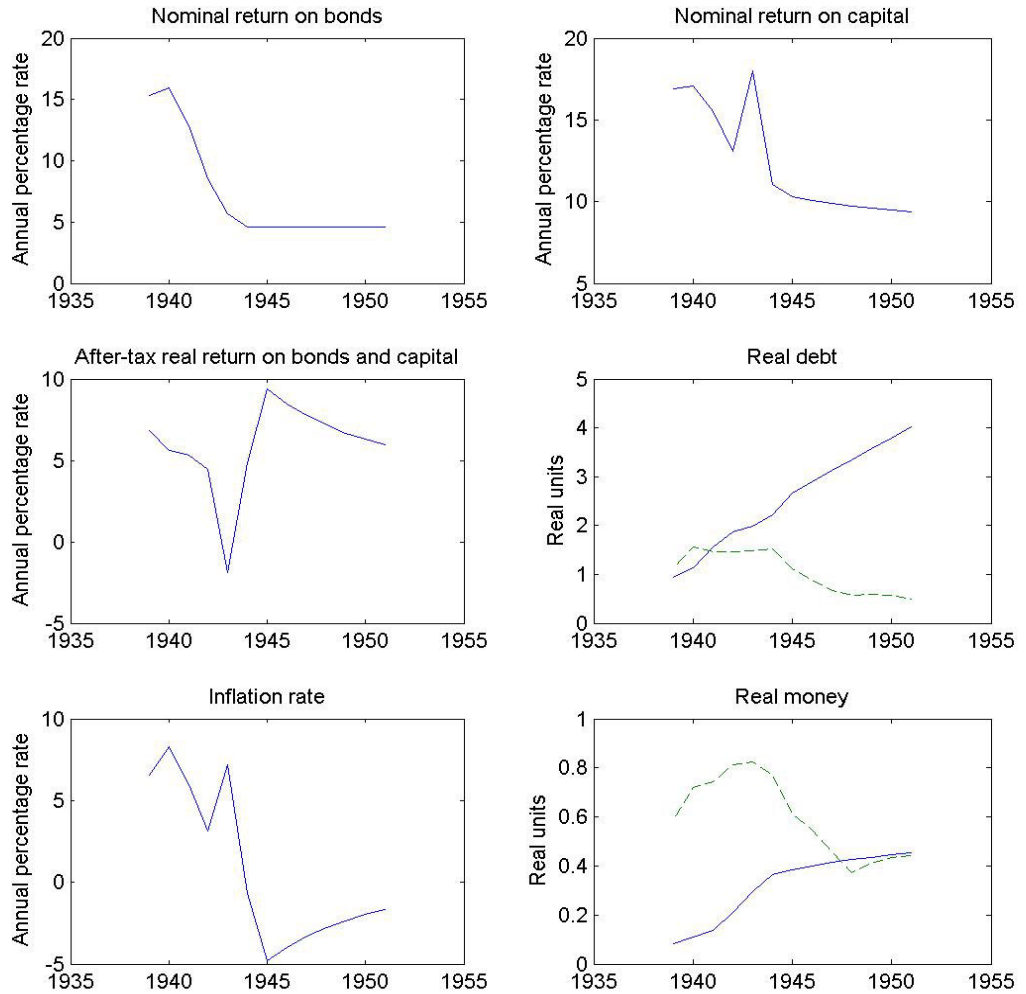


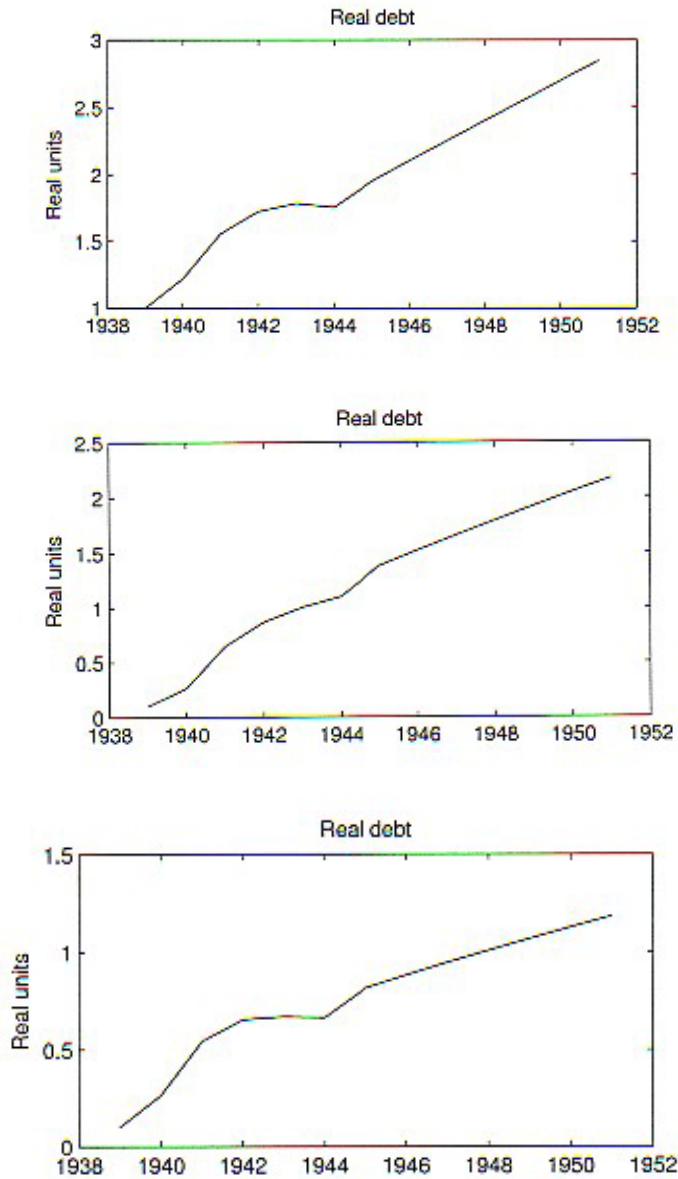
Figure 5b
Initial Real Debt Equals Actual Debt-to-GDP ratio



A prewar ratio of debt to GDP in excess of one was quite high by historical standards, and it reasonable to ask what drove the explosive growth of the debt. Was it the exactions imposed by the Nazis on the economy or was it the high initial level of the debt. To answer this question, we conducted a series of experiments whose results are seen in Figure 6. First, we substantially cut the Nazi occupation costs by reducing the ratio of government spending to steady state GDP by 10 percent for each year of the war, approximately halving the costs. Compared to the baseline model, debt growth is lower, with the ratio reaching approximately 2.5 instead of 3.5 in 1950 but the debt is still increasing explosively. Secondly, we reduced the initial debt ratio so that debt was one-

tenth of GDP. As seen below, real debt does not cease its upward climb, and by 1950 it is still at a ratio of two. Only if both the Nazi payments are reduced and the initial debt ratio is cut, does debt growth show signs of converging by 1950. These results indicate that even substantially lower payments to the Nazis would not have prevented the untenable debt position of postwar France.²³

Figure 6
Explosive Real Debt



²³ In some additional experiments we raised taxes and cut conventional spending, but debt still grew explosively.

How closely does our baseline model approximate the structure of Vichy war finance? Table 9 reports the shares of government revenue derived from taxes, bond revenue, and seigniorage for the two versions of the model depicted in Figure 5. The shares of taxes generated by the model are fairly close to the actual shares. However, the shares of debt are higher and money are lower for both. The real balances rise, but the tax rate, the inflation rate is low, yielding modest seigniorage. What we miss here are the extensive controls from price controls to financial repression that forced households to hold more money than desired in addition to the ordinary frictions that induce people to hold money in the face of inflation.

Table 9
Actual and Counterfactual Shares of Government Finance
(percent)

	Actual Policy Taxes	Actual Policy Debt	Actual Policy Money	Model 5a Taxes	Model 5a Debt	Model 5a Money	Model 5b Taxes	Model 5b Debt	Model 5b Money
1940	25	27	44	67	15	18	34	59	8
1941	30	34	34	33	58	9	23	72	5
1942	36	26	40	45	34	21	30	58	12
1943	30	35	37	52	17	29	50	43	19
1944	30	52	15	62	22	16	34	38	12

VI. Conclusion

The extraordinary extraction of resources from the French economy was successful, though ultimately unsustainable. Fearful of the inflationary potential of the payments demanded by the Nazi occupation, Vichy France's policy makers raised taxes and tried to induce the public and financial institutions to absorb the stream of new bond issues. In addition to wage and price controls imposed at the war's outset, the new regime soon added rationing and an intervention in the financial sector to redirect the flow of funds. While moderately successful in limiting inflation, the economy steadily contracted. If the war had not ended, the French economy would have continued to

shrink with consumption declining rapidly. Our estimates emphasize the costliness of these policies. For the fast approaching future, Vichy was adding to an already dangerously high debt ratio, which appears not to have been sustainable, even at the outset of the war. The real debt, rising from just under 100 percent of GDP to nearly one and a half times GDP, left postwar policy makers with an even more urgent day of reckoning.

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