The French Depression in the Thirties

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Revised

Abstract

This paper shows that *(i)* in contradiction with the conventional view according to which the French depression was mild, there are more similarities that differences between the French and U.S. episode in the Thirties, which is calling for a common or identical explanation of the depression; *(ii)* technological change (regression or stagnation) is neither sufficient nor necessary to account for the French depression; *(iii)* institutional and market regulation changes provide an explanation that is quantitatively plausible, but the causes of those changes are still to be explained.

1 Introduction

In studying the French Depression of the Thirties, our objective is to help the understanding of the French episode, of depressions in general, and of the U.S. Great Depression in particular, by increasing the number of episodes studied and investigating their similarities and differences. Our approach has

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been influenced by the work of Cole and Ohanian [1999a], Cole and Ohanian [1999b] and Prescott [1999].

The paper results are the following three points. One, and in contradiction with the conventional view according to which the French depression was mild, there are more similarities that differences between the French and U.S. episode in the Thirties, which is calling for a common or identical explanation of the depression. Two, technological change (regression or stagnation) is neither sufficient nor necessary to account for the French depression. This is shown in two ways, using a structural model and doing some growth accounting. Three, institutional change and market regulation seem to be the only remaining suspect for the depression. We show that the explanation is quantitatively plausible, but the causes of those changes are still to be explained.

We organize the paper as follows. In Section 2, we briefly review French political and economic history in the interwar period. In Section 3, we inspect the data, and conclude that there are extremely important similarities between the French and U.S. experience. In Section 4, we explore the role of technical change and conclude that a technological explanation of the depression is neither necessary nor sufficient. In Section 5, we crudely explore

the extent to which institutional change can explain the data, even though we are still ignorant on the causes of this institutional change.

2 A Quick Overview of the French Interwar Political and Economic History

This section reports the main lines of French political and economic history of the inter-war period. We think it is the minimum background that one should keep in mind to look at the data. It is directed inspired from our readings of Asselain [1995], Beltran and Griset [1994], Flamant [1989], Hautcoeur [1997] and Villa [1993].

2.1 Broad Picture

Figure 1 presents an evaluation of French GDP in 1938 Francs. The broad picture is the following: rapid growth in the 20's, sharp decline from 1930 to 1932, then mild decline from 1932 to 1936, and slow recovery towards the preparation of WWII. This picture is the one that most economists and historians of the period have in mind.

2.2 The post WWI period (1919-1930)

One observes in 1919 the traditional picture of a country after a war: large destruction of capital, high public debt and inflation. In 1919, France is said

Figure 1: French GDP, Bn of 1938 French Francs

"victorious but ruined". War damages are evaluated to 113% of 1913 GDP. 60% of those damages are represented by destructions of productive capital, housing capital and land. French public debt reached 170% of GDP in 1919, compared to 66% in 1913. Prices were multiplied by three during the war. The French Franc depreciated between 1919 and 1920: it was exchanged against 25 English Pounds in 1913, 42 in December 1919, 60 in December 1920.

French growth is rapid in the Twenties, despite a short worldwide recession in 1921. This growth is accompanied by a continuous depreciation of the French Franc. Depreciation accelerated with the "Cartel des Gauches"

government, a coalition of Socialists and "Radicaux" (center left party). The political cost of depreciation became too large, and in 1926 former President Raymond Poincaré was designated as the new Prime Minister ("Président du Conseil") of a right wing coalition. This government implemented a strict stabilization policy with public investment reductions, public consumption stabilization, taxes and tariffs increases. After a last devaluation in June 1928, the French Franc stabilized at a level of 1/5th of its 1913 gold value (65.5 mg of gold), and was not convertible below 215 000 FF (Gold Bullion Standard).

2.3 The Great Depression (1931-36)

The French depression is considered as relatively mild (Hautcoeur [1997]). At its maximum, unemployment did not exceed 1 million, less that 5% of the 1930 workforce. The fall in production was also relatively modest, and never reached 20% of the 1929 output in commerce and manufactures. The depression is not accompanied by a banking crisis, as only one major bank failed. Starting in 1931, many countries decided to devaluate their currency. The English Pound was devaluated in 1931 and the U.S. Dollar in 1933. As stressed by Asselain [1995], those years are characterized in France by a double refusal of devaluation and capital controls, for political reasons. Despite

the inflow of gold (one third of the world stock of gold was in France in 1933) and the relative price increase that followed, France did not devaluate and the government lead by Pierre Laval decided in 1935-36 to implement a strict deflationary policy. A 1935 act reduced by 10% all public expenditures, including civil servants compensations. Some controlled prices were cut (bread, housing rents) and taxes were increased.

In May 1936, a coalition of Socialists and Communists won the elections, and the Socialist leader Léon Blum became Président du Conseil in June. The new labor market regulation imposed by the Front Populaire provoked a large increase in the labor cost. First, the government imposed collective bargaining on wage contracts between employers and trade unions. Second, the working week was reduced from 48 to 40 hours, keeping the weekly or monthly wage constant. Third, workers were attributed two weeks of paid holidays, again keeping the weekly or monthly wage constant. Fourth, the civil servants wage cut were suspended. At the same time, a nation wide movement of strikes lead the "Accords de Matignon", where wages were on average increased by 12%. It seems that those strikes and their consequences on wages were not anticipated by the government. All in all, the labor cost increased by 29%: 12% because of the "Accords de Matignon", 4% because

of paid holidays, 10.8% because of the 40 hours. At the same time, a 30% devaluation of the French Franc was decided. In 1937, the first public budget of the Front Populaire was increasing tax progressiveness but decreasing average taxes, from 17.4% to 15.8% of GDP.

2.4 Preparation of the War (1937-39)

Following the implementation of the 40 hours and a new drop in investment, the economy weakly recovered. 1938 clearly shows that the economy is entering in a pre war regime. Public expenditures increased by 122%, the 41st hour became legal in November 38, and the working week increased to 60 hours for "strategic industries".

2.5 Summary

Four basic items should be kept in mind. One, the depression started one year later in France than in the U.S. Two, there was no major banking crisis in France. Three, there was no deflationary policy before 1934. Four, at the trough of the recession (1936), a major program of reforms was implemented, which echoes to the 1933 U.S. New Deal.

3 Inspecting the Data

The data we use in this study have been constructed and/or collected and made available by Pierre Villa. In his volume (Villa [1993]), Villa proposes an evaluation of quarterly NIPA for 1919-1939. Here, we limit ourselves to the use of yearly data. Note that 1939 figures should be interpreted with caution, as the war was declared in september 1939, and that the all economy was preparing the war the months before.

Figure 2: Undetrended levels of French and U.S. real GDPs, 1929=100

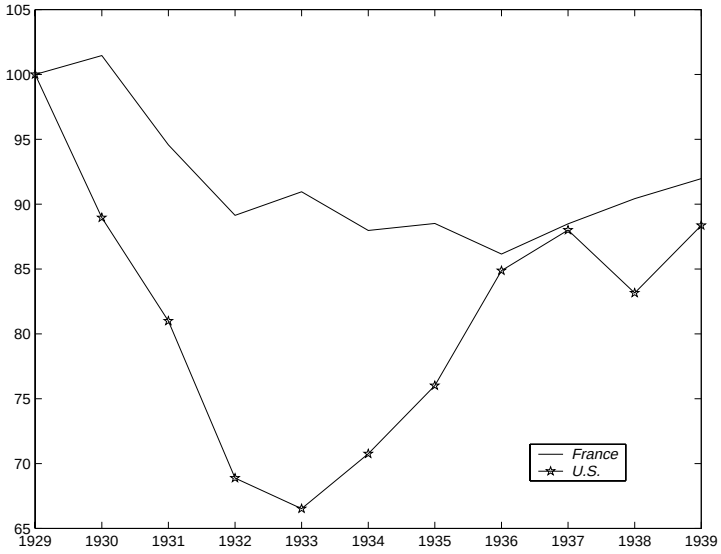


Figure 2 presents the comparison of real GDP in France and the in U.S., both being normalized to be 100 in 1929. It illustrates the conventional wisdom among economist and historians: the depression came later in France,

was less severe but lasted longer.

3.1 Detrending

It interesting to place the depression in comparison to the overall economy performance over the century, and the size of the depression should be evaluated in relation to the "normal" growth rate of the economy. How to evaluate this "normal" rate? For the U.S., Cole and Ohanian [1999a] use the average growth rate of per capita GNP over the sample 1919-1997 excluding the Great Depression and WWII (1930-1946). They found the value of 1.9% per year. Of course, the choice of the growth rate is very important given that it will condition greatly the evaluation of depth and persistence of the depression. Table 1 presents average per capita growth rates of French GDP for different subperiods. We use total population to compute per capita series.

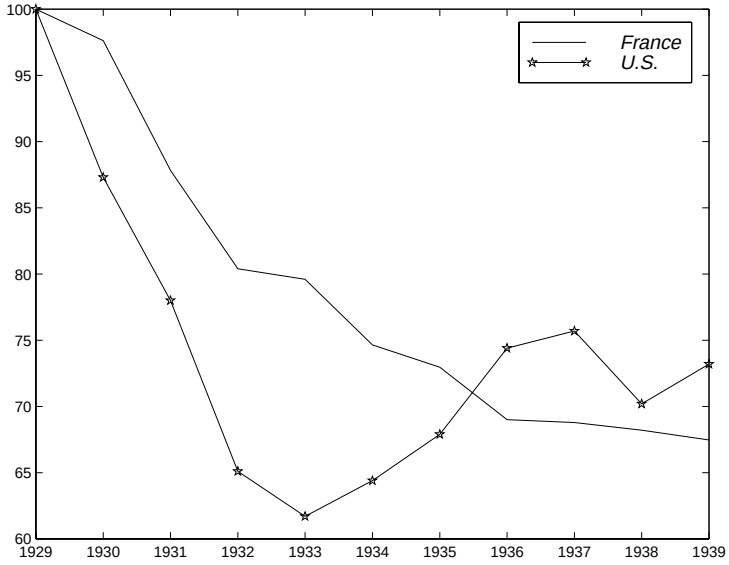
As Cole and Ohanian, we use the all sample except the depression years to compute the average growth rate of output, and have therefore chosen a growth rate of 2.98% along the steady growth path. Note that this is a conservative value with respect to what economic agents would have thought in 1929 while extrapolating the 1919-1929 trend (3.53%). We discuss in more details the choice of this deflator in the appendix.

Figure 3 compares U.S. GNP taken from Cole and Ohanian [1999a] and

Table 1: Average yearly growth rate of per capita GDP over various sub-periods (1914-1918 and 1939-1945 are always excluded)

by sub-periods	
1896-1913	1.25%
1919-1929	3.53%
1930-1939	-.3%
1946-1994	3.46%
average	
All sample (1896-1994)	2.54%
Excluding 1930-1939	2.98%
Excluding 1930-1939 and pre WWI	3.47%
Pre Great Depression (1896-1929)	2.15%

Figure 3: Per Capita Detrended levels of French and U.S. real GDPs, Using Different Trends for the Two Countries, 1929=100



French detrended per capital GDP levels. The pattern of the French Great Depression is now very different, and is more in line with the U.S. one. The U.S. depression is temporary deeper (in the trough of 1933) but at the end of the period (say after 1936), detrended levels are roughly constant, around 30% below the trend, France being in a slightly worse position that the U.S. In both countries, detrended output has in 1939 its level of 1936: growth is close to its long run value, while levels are permanently 30% below what would have been expected in 1929 had growth stayed constant.

This striking similarity between the two countries dynamic pattern is not an artefact of our choice for the long run trend, and it can be checked on figure 4 that the qualitative picture is the same when the U.S. value (1.9%) is also chosen for France

Table 2 compares undetrended per capita French GDP to undetrended measures for the U.S. and for an international average (Belgium, Britain, France, Germany, Italy, Japan and Sweden), as given in Cole and Ohanian [1999a]. Note that French depression, if milder than the U.S. one in 1933, is sharper and more persistent than the international average one.

Figure 4: Per Capita Detrended levels of French and U.S. real GDPs, Using U.S. Trend for the Two Countries, 1929=100

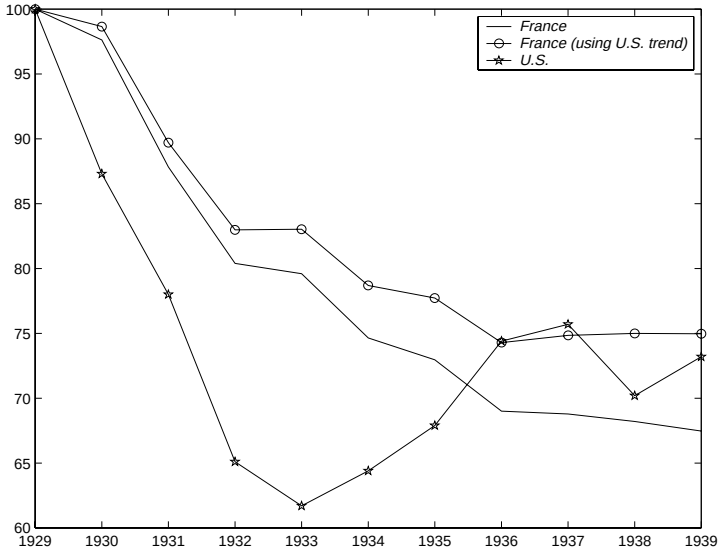


Table 2: International Comparison (per capita, undetrended, 1929=100)

Year	U.S.	International Average	France
1932	69.0	91.3	87.8
1933	66.7	94.5	89.5
1935	76.3	101.0	87.0
1938	83.6	112.4	88.8

3.2 Output and its components

Let us first inspect per capita levels of output and its components (table 3). In the following we use the expenditure based evaluation of GDP. Series are all normalized to 100 in 1929.

Table 3: Undetrended per Capita Levels of Output and Its Components

year	Output	Private Cons.	Private Inv.	Govt. Purch.	Exports	Imports
1929	100.0	100.0	100.0	100.0	100.0	100.0
1930	100.5	96.9	120.6	112.9	89.0	106.5
1931	93.1	97.0	89.4	137.9	75.0	104.4
1932	87.8	96.4	64.7	149.1	57.6	87.4
1933	89.5	100.0	62.5	146.3	58.9	91.0
1934	86.5	95.1	57.2	139.6	60.8	78.3
1935	87.0	95.9	54.2	170.1	54.8	76.1
1936	84.8	93.8	54.4	180.4	52.2	83.6
1937	87.0	94.4	61.8	183.7	56.2	88.7
1938	88.8	98.1	48.7	186.3	60.8	79.1
1939	90.5	91.0	46.0	371.6	58.9	69.5

The undetrended measures presented in table 3 show the collapse of exports and imports, the relative mildness of GDP depression from 1930 to 1932 and the long period of output stagnation from 1932 to 1935, the trough in 1936, then the recovery at the steady growth rate. Table 4 presents detrended measures of output components. One can observe the large decline in investment, whose level from 1935 to 1938 is about 55% below trend. Note also the

tremendous increase in public expenditures just before the war, with simultaneous reduction of other components of aggregate demand shares in 1938 and 1939. Table 7 shows that the share of imports in output stayed constant over the period, while exports share declined. Excluding 1939, consumption share increased while investment share decreased. Compare to 1929, it seems that the economy has reached in the late 30's a new balance growth path with lower capital-output ratio and a larger consumption-output one.

Table 4: Detrended per Capita Levels of Output and Its Components

year	Output	Private Cons.	Private Inv.	Govt. Purch.	Exports	Imports
1929	100.0	100.0	100.0	100.0	100.0	100.0
1930	97.6	94.1	117.1	109.7	86.4	103.5
1931	87.8	91.4	84.3	130.1	70.8	98.5
1932	80.4	88.3	59.2	136.5	52.8	80.0
1933	79.6	88.9	55.5	130.1	52.4	80.9
1934	74.7	82.1	49.4	120.5	52.5	67.6
1935	73.0	80.4	45.4	142.6	46.0	63.8
1936	69.0	76.4	44.3	146.9	42.5	68.1
1937	68.8	74.6	48.9	145.3	44.4	70.1
1938	68.2	75.3	37.4	143.0	46.7	60.7
1939	67.5	67.8	34.3	277.0	43.9	51.8

Table 5 shows that housing investment was the most affected part of investment, and that government expenditures increase can be mainly attributed to consumption, not investment. Table 6 shows that consumption

decline started in 1929 except for manufactured goods.

Table 5: Detrended per Capita Levels of Investment and Public Consumption

year	Households I.	Firms I.	Govt. I.	Govt. Cons.
1929	100.0	100.0	100.0	100.0
1930	134.4	110.2	100.1	114.9
1931	89.6	82.3	112.5	139.6
1932	74.3	53.2	111.6	150.0
1933	61.1	53.3	99.9	146.5
1934	60.3	45.1	88.0	138.1
1935	57.1	40.8	104.6	163.2
1936	41.1	45.6	94.8	175.1
1937	33.9	54.8	75.2	183.2
1938	30.2	40.2	70.2	182.5
1939	24.9	38.0	60.9	394.1

3.3 Input Measures

Table 8 shows the effect of 1936 on the working week length, and the drop in worked hours. It should be noticed that employment did not vary significatively after 1932. Again, it seems that in 1936-1939, the economy is on a new steady growth path where hours are about 25% lower that before the depression. Capacity utilization collapsed in 1930 and 1931, and then stayed relatively constant.

Table 6: Detrended per Capita Levels of Households Consumption Components

year	Agricultural Goods	Manufactured Goods	Services	Housing
1929	100.0	100.0	100.0	100.0
1930	83.9	109.0	96.1	97.3
1931	89.4	90.8	97.3	94.4
1932	86.8	88.2	91.0	92.0
1933	84.7	96.8	87.0	89.4
1934	85.5	74.7	83.1	86.8
1935	80.7	75.3	86.8	84.5
1936	71.7	75.8	89.3	82.0
1937	72.2	71.8	85.4	79.5
1938	74.1	74.2	80.1	76.9
1939	67.0	65.4	71.4	74.6

Table 7: Shares of Output (in %)

year	Private Cons.	Private Inv.	Govt. Purch.	Exports	Imports
1929	75	23	4	12	13
1930	73	27	4	10	14
1931	78	22	5	9	15
1932	83	17	6	8	13
1933	84	16	6	8	14
1934	83	15	6	8	12
1935	83	14	7	7	12
1936	83	14	8	7	13
1937	82	16	8	7	14
1938	83	12	7	8	12
1939	76	11	15	7	10

Table 8: Input Measures (per capita, 1929=100 except ($\star$) in level)

year	Employment	Working Week Length	Hours Worked	Capacity Utilization ($\star$)
1929	100.0	100.0	100.0	97.5%
1930	99.0	98.0	97.1	90.3%
1931	95.9	94.9	91.0	84.8%
1932	92.4	91.9	85.0	77.7%
1933	92.3	93.6	86.4	79.9%
1934	91.1	93.0	84.7	77.6%
1935	90.3	92.6	83.7	76.2%
1936	90.2	94.1	84.8	77.3%
1937	91.4	83.9	76.6	77.9%
1938	92.1	81.5	75.1	76.2%
1939	92.8	83.9	77.8	79.6%

3.4 Money and Prices

From table 9, one does not observe any strong contractionary monetary policy, except for the Laval's deflation in 1935 and early 1936. Nevertheless, GDP deflator decreased from 1931 to 1936. As usual, deflation was sharper for the WPI. Note that price deflation stopped after 1935, and that 1936-39 were years of high inflation.

3.5 Real Wage

From table 11, one can observe a continuous increase in the real wage bill paid by firms (nominal wage divided by a Production Price Index) up to

Table 9: Nominal and Real Monetary Variables (per capita and ($\star$) detrended)

year	M2	GDP Deflator	Money Market Rate	M2./P($\star$)
1929	100.0	100.0	3.5	100.0
1930	105.1	105.4	2.7	96.9
1931	110.5	104.2	2.1	100.0
1932	108.4	97.6	2.5	101.7
1933	102.9	93.7	2.5	97.6
1934	98.2	89.2	2.7	95.1
1935	95.5	82.5	3.4	97.1
1936	98.1	85.9	3.7	93.0
1937	106.9	107.7	3.8	78.5
1938	121.2	122.0	2.7	76.3
1939	161.4	129.0	2.0	93.3

Table 10: Prices

year	GDP Deflator	CPI	Wholesale Price Index	Production Price Index
1929	100.0	100.0	100.0	100.0
1930	105.4	103.5	87.1	99.8
1931	104.2	100.4	74.1	94.6
1932	97.6	93.6	65.3	88.1
1933	93.7	90.6	62.3	85.6
1934	89.2	86.4	58.8	83.4
1935	82.5	80.6	55.7	80.0
1936	85.9	84.0	64.9	80.1
1937	107.7	104.8	90.4	99.3
1938	122.0	118.4	102.5	115.6
1939	129.0	126.5	113.7	126.4

1936, and then stayed constant in deviations from trend (excluding 1939). Note in particular the large increase at the time of the "Front Populaire" in 1936, from 126 to 143 in levels (100 being the level in 1929). The purchasing power of the nominal wage, as defined by the nominal wage divided by a Consumer Price Index, did not increased that much in 1936, as the devaluation contributed to a larger increase of CPI (40% increase in 1936 versus 24% for PPI).

The striking feature of table 11 is the fact that the real wage bill was continuously above trend during the all depression. It increased up to 10% above trend in 1929 and 1930, then stayed flat until 1936, and only temporarily increased.

3.6 The French Depression is More Similar than Different from the U.S. One

To summarize, once both economy are deflated by their own trend, we find strong similarities between the French and U.S. economy. In 1938-39, hours were constant in both countries, about 25% below their 1929 level. Outputs were also about 30% below their respective trends in both countries, both growing roughly at their long run rate. Only the sharp U.S. drop of 1931-1933, and the subsequent recovery of 1933-1935 is not observed in France.

Table 11: Real Wages, ($\star$) = undetrended

year	GDP	Real Wage (using CPI)	Real Wage (using PPI)	Real Wage ($\star$) (using CPI)	Real Wage ($\star$) (using PPI)
1929	100.0	100.0	100.0	100.0	100.0
1930	97.6	101.3	105.0	104.3	108.1
1931	87.8	101.2	107.4	107.3	113.8
1932	80.4	100.5	106.8	109.7	116.6
1933	79.6	100.7	106.6	113.3	119.9
1934	74.7	101.1	104.8	117.1	121.3
1935	73.0	105.6	106.2	125.9	126.7
1936	69.0	111.4	116.8	136.8	143.4
1937	68.8	106.2	112.0	134.3	141.7
1938	68.2	107.4	110.0	139.9	143.2
1939	67.5	102.6	102.7	137.7	137.8

Once taken into account that France is lagging the U.S. of one year in the beginning of the Depression, at that the banking crisis of 1931-33 was not observed in France, the picture is pretty much similar. Finally, in both countries, the investment to output ratio seems to be permanently lower after than before the Depression (see Cole and Ohanian [1999a], table 3 for the U.S.).

Those results cast a doubt on the conventional wisdom about the French depression that is summarized by the following quotation:

> "The great Depression in France was unique: it began more slowly than in the other industrial countries, was less severe but lasted longer. The main reasons for these special features are the evolution of the exchange rate (under and later overvalued), policy errors, exposure to

> foreign competition, and dependence on foreign markets". (Hautcoeur [1997])

As we have shown it, the French depression is not milder once considered as deviation from a steady growth path. To put it differently, things were really going bad compared to what would have been expected in, say, 1930.

The second main feature of this conventional wisdom is the importance attributed to exchange rate fluctuations. The 1926 Poincaré's stabilization of the French Franc at an under-evaluated level is seen as an important reason for the relative high growth in France and for its insulation from the Great Depression in 1929 and 1930. Then, depression of 1931-1936 is mainly attributed to the English and American devaluations of 1931 and 1933. The story goes like this: France was insulated from the Depression in 1929 and 1930, because of the under-evaluation of the French Franc. Then the English Pound was devaluated in 1931 and the U.S. Dollar in 1933. These devaluations are seen as the two shocks that triggered the recession. The Laval's deflation of 1935-36 is interpreted as the wrong solution to the problem, the correct one being devaluation. Then, the Front Populaire devaluation of 1936 restored competitiveness and put the economy on a (mild) recovery path.

This story is hardly supported by the data. First of all, the depression

started in 1930 and not 1931, as it can be seen from the detrended data, even though the drop in output is smaller than the US one. Second, there is no acceleration of the depression in 1933. Third, international trade is a small share of output, and with reasonable substitutability between domestic and imported intermediate goods, could not account for a significant fraction of output drop.

Finally, absent of financial intermediation shocks, the conduct of monetary policy has been pretty much accommodative (see table 9) until 1935 (real money, as measured by $M2/P$ stayed merely constant from 1929 to 1935), and felt only with the Laval's deflationary policy).

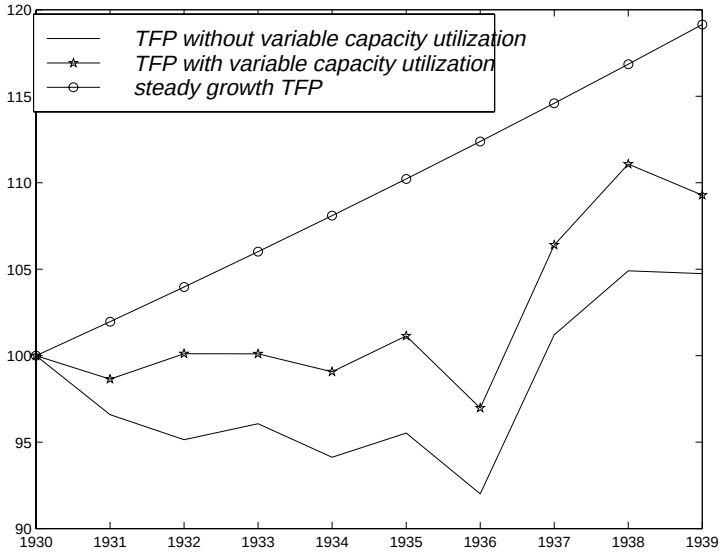
It seems that the idiosyncrasies attributed to the French depression do not really resist to a close look at the data, and that we should look for a common (or at least identical) cause for both episodes. Can technology be the explanation? This is what we aim at looking at in the next section.

4 Accounting for Output Fluctuations During the Depression: Technological Shocks are neither sufficient nor necessary

4.1 Growth Accounting

We first compute TFP using Cobb-Douglas production functions $Y_t = A_t(X_t H_t)^{\alpha} K_t^{1-\alpha}$ and $Y_t = A_t(X_t H_t)^{\alpha}(z_t K_t)^{1-\alpha}$ where z is a measure of capacity utilization, and with $\alpha = .6629$ (see next section for a description of the computation of α). TFP is given by $A_t X_t^{\alpha}$, where X is the deterministic trend of TFP and A deviations from the trend. The resulting series are depicted in figure 5.

Figure 5: TFP measures, 1930=100



As expected, the series computed without variable capacity utilization decreases more than the one with variable capacity utilization. In the follow-

ing, we put our attention on the later evaluation of TFP. We observe a stop in TFP growth from 1930 to 1935, then a drop in 1936 and a strong rebound the two next years. Is this evolution sufficient to understand output growth? Is it necessary? We answer no and no to those questions in two stages, first within a structural model, and then doing some more growth accounting.

4.2 TFP Stagnation in a simple Neoclassical Growth Model: A Technological Explanation is not Sufficient

A Simple Model

We consider the optimal growth model with labor supply and capital depreciation in use. Time is discrete and the time unit is one year. We assume that the economy is composed of a representative household and a representative firm. All variables are per capita.

The household preferences are represented by the following intertemporal utility function V, evaluated at period 0:

$$V(0) = E_0 \sum_{t=0}^{\infty} \beta^t \left(\log C_t + \frac{\theta}{1-\eta} \left((1-H_t)^{1-\eta} - 1 \right) \right)$$

where C is consumption and H worked hours. The representative firm produces according to

$$Y_t = A_t (X_t H_t)^{\alpha} (z_t K_t)^{1-\alpha}$$

where K stands for productive capital and z for capacity utilization. X_t is a labor augmenting deterministic trend (growth rate γ) and A_t a stationary component of total factor productivity.

$$\begin{aligned} X_t &= X_0 \exp(\gamma t) \\ \log A_t &= \rho \log A_{t-1} + \varepsilon_t \end{aligned}$$

where ρ is strictly between 0 and 1 and ε is a white noise.

Capital accumulates according to the following law of motion:

$$K_{t+1} = (1 - \delta_t)K_t + I_t$$

It is assumed as in Greenwood, Hercowitz, and Huffman [1988] that utilization increases depreciation of capital. The depreciation rate δ is endogenously given by

$$\delta_t = \delta_1 z_t^{\delta_2}$$

with $\delta_1 > 0$ and $\delta_2 > 0$. Such a specification allows for some endogeneity of TFP if the production function is misspecified by omitting variable utilization.

In this setting with complete markets and perfect competition, the equilibrium allocations can be recovered by solving the following social planner

problem:

$$\begin{array}{rl} \max & V(0) \\ \text{s.t.} & C_t + K_{t+1} = A_t(z_t K_t)^{\alpha}(X_t H_t)^{1-\alpha} + (1-\delta)K_t \end{array}$$

and the first order conditions of this problem are given by

$$\begin{aligned} 1/C_t &= \theta(1-H_t)^{-\eta} \times (1-\alpha)Y_t/H_t \\ \frac{1}{C_t} &= E_t\left[\frac{\beta}{C_{t+1}}\left((1-\alpha)A_{t+1}K_{t+1}^{-\alpha}(X_{t+1}H_{t+1})^{\alpha} + 1 - \delta\right)\right] \\ C_t &= A_t(X_t H_t)^{\alpha}K_t^{1-\alpha} + (1-\delta)K_t - K_{t+1} \end{aligned}$$

plus a transversality condition.

In such an economy, there exists a steady growth path , where growth is driven by TFP.

Parameters Calibration

The following parameters need to be calibrated in this laboratory economy: the output elasticity to capital α, labor disutility parameters η and θ, discount factor (already divided by population growth factor) β, growth rate of TFP γ, depreciation parameters δ_1 and δ_2, persistence of the technological sock ρ. Using aggregate wage bill and assuming that the share of output that goes to labor is the same in firms and for self-employed, we find for the interwar period a labor share of 66%. Note that without the correction

for self-employed, we would have found 47%. With perfect competition, this share is also equal to α. We therefore set $\alpha = .66$. δ_1 and δ_2 are chosen so that steady state capacity utilization matches the average value over 1919-1929 (83%) and steady state depreciation is 10%. We study two economies, one with high elasticities of utilization and labor supply, one with low ones. In the high elasticity economy, δ_2 is close to one while δ_2 is large in the low elasticity economy. The discount factor to $\beta = .96$, as in Cole and Ohanian [1999a]. In the high elasticity economy, intertemporal elasticity of labor supply is assumed to be infinite ($\eta = 0$, linear utility in leisure), while it is assumed to be one ($\eta = 1$, log utility in leisure) in the low elasticity economy. θ is then chosen such that H is on average 1/3 of total available time. We did estimate an AR(1) process on deviations of total factor productivity from trend on the period 1919-1939, and ρ was estimated to be .98. $\gamma = 3.47\%$, so that steady growth rate of output is 2.98%. This calibration is summarized in table 12.

Finally, we assume that capital was equal to its steady state value in 1929.

Table 12: Parameters Calibration

output elasticity to capital α :	.66
discount factor β :	.96
growth rate of TFP γ :	.0347
depreciation rate δ :	.1
depreciation elasticity parameter δ_2	
high elasticity case :	.1
low elasticity case :	10
Share of time allocated to work H	1/3
Inverse of the Intertemoral Elasticity of Substitution in Labor Supply η	
high elasticity case :	0
low elasticity case :	1
persistence of technology shock:	.98

Predictions of the Model

We assume that TFP behaves qualitatively as observed: growth at the steady growth rate before 1930 and after 1936, unexpected stagnation in between. Figures 6 and 7 present the dynamic response of the low and high elasticities economies.

What do we learn from this exercise? Output depression is not fully reproduced. Even though investment drop is matched before 1936, hours do not drop as they did in the data. On top of that, the slow (or absence of) recovery after 1936 is missed by the model.

TFP stagnation is not sufficient to account for the French episode, as it

Figure 6: Unexpected TFP Stagnation from 1929 to 1936, high elasticity

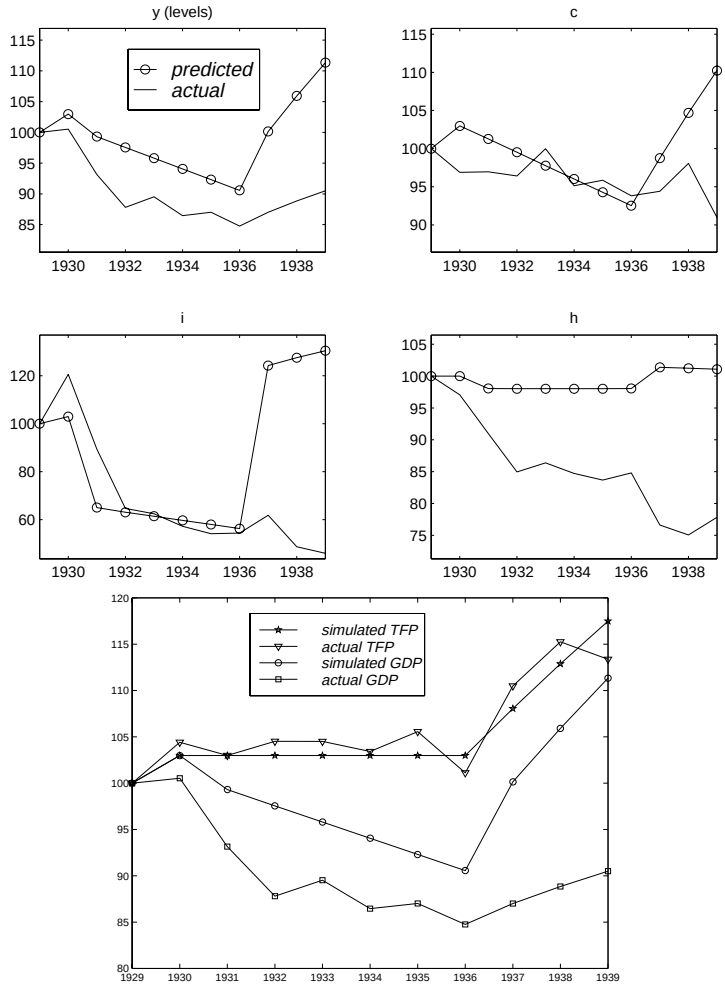
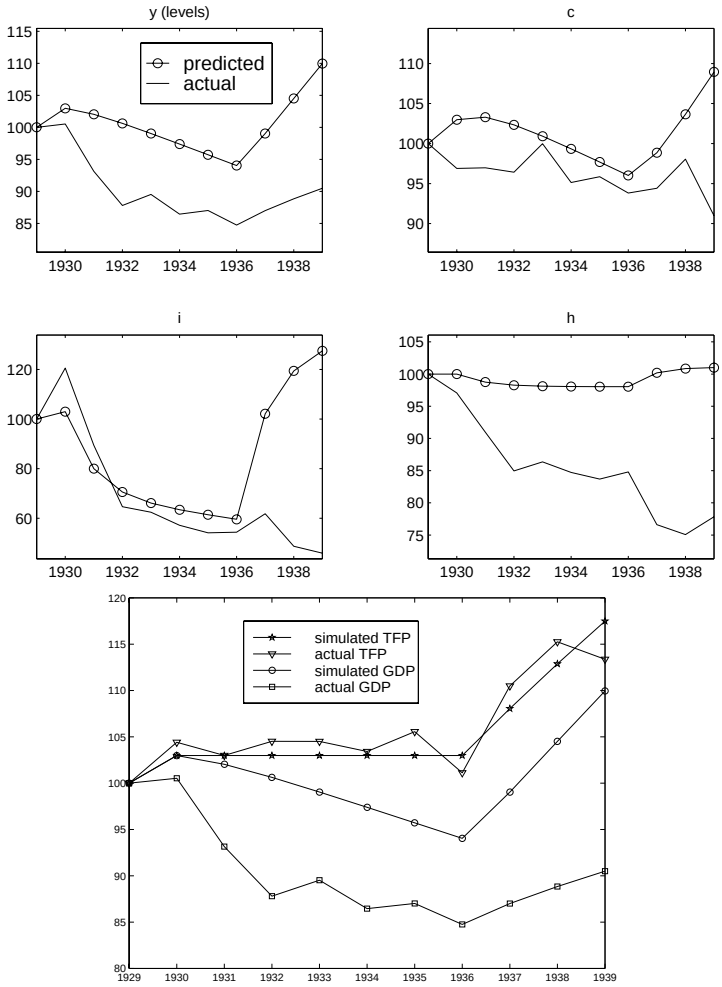


Figure 7: Unexpected TFP Stagnation from 1929 to 1936, low elasticity



was not to account for the U.S. one in Cole and Ohanian [1999a]. In the next subsection, we show that it is nor necessary.

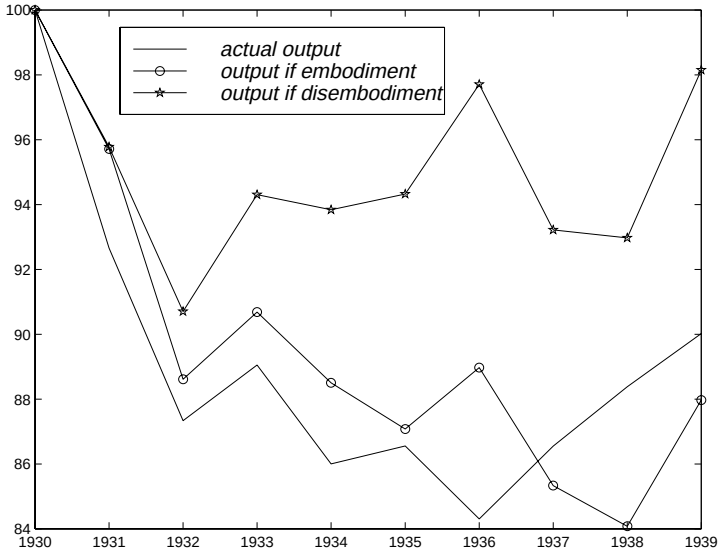
4.3 More on Growth Accounting: A Technological Explanation is not Necessary

We first start with some more growth accounting. Assume that, for the actual series of inputs, TFP has grown at its steady growth rate over the Thirties. What would then have been the path of output? We use the production function of the model economy, taking inputs variations as given. The path of output is the starred line on figure 8. About 70% of the 1930-32 drop is explained, without any need of TFP slowdown. 1932-36 is poorly reproduced, meaning that TFP slowdown is needed for this subperiod while, again, the match is pretty good for the cumulative growth between 1937 and 1939. If technological stagnation is needed for 1932-36, it seems not to be the main reason for 1930-32 and 1936-39 movements.

Let us accept for a while the idea of a stagnation in measured TFP from 1930 to 1936. TFP has been growing steadily in France over the all century. Why would this period be a period of stagnation? Do we have any convincing explanation for this apparent stagnation in measured TFP?

A natural candidate is technological embodiment. The Thirties have been

Figure 8: Accounted Movements in Output



a period of depressed investment. In a world with embodied technological progress, technological progress does not show up if the economy does not invest, as it is embodied with new vintages of capital. Even though the technological frontier still progresses, the economy does not make use of it as it does not implement technological progress in production, given the low level of investment. Clearly, why investment is so low has to be explained, but we just ask here for the plausibility of this theory of TFP by doing again a growth accounting exercise, now in a embodied technology world. To keep things simple, we assume in the following that *all* technical progress is incorporated in capital[1].

[1]A evaluation of the strength of embodied technological progress is given by the evolu-

Assume that technology is now given by

$$Y_t = AH_t^{\alpha}(z_t J_t)^{1-\alpha}$$

where J is the effective capital stock and A is now constant. According to the embodiment assumption, capital J accumulates according to

$$J_{t+1} = (1 - \delta_J)J_t + X_t I_t$$

where I_t is the National Accounting measure of investment and X a technological factor that grows at rate γ_X. From those two equations, it is easy to show that along a balanced growth path, the following relations hold: $\gamma_Y = \gamma_I = \frac{1-\alpha}{\alpha}\gamma_X$ and $\gamma_J = \frac{1}{\alpha}\gamma_X$. The problem with this model is that it is not the one used for national accounting, where capital is measured according to

$$K_{t+1} = (1 - \delta_K)K_t + I_t$$

How can we compute an evaluation of the true capital stock series J_t? Assuming that the economy has been on a steady growth path before 1930, with a growth rate γ_X for embodied technological progress, one can solve backward the accumulation equation for J to compute J_t as the deflated

tion of the price of investment relative to the price of output. Over 1919-1939, the relative price of equipment has been declining at a rate -1.63%, which is an indicator for vintage capital

sum of past investments, the deflator taking in to account both depreciation and technological progress:

$$J_{1930} = \frac{I_{1929}}{1 - \frac{1-\delta}{(1+\gamma_I)(1+\gamma_X)}}$$

Once J_{1930} is known, given the series of investment and assuming that X grows at constant rate, one can use the J accumulation equation to compute a series of J_t, from 1930 to 1939. Using this series and the series of hours, one can compute a simulated series of output with embodied technological progress. With $\delta_J = .14$ and $\gamma_I = .0298$, one gets the series with circles on figure 8. This simulated output tracks pretty well the actual one, while no stop nor regression in technological progress is needed (but of course leaving unexplained investment and hours movements).

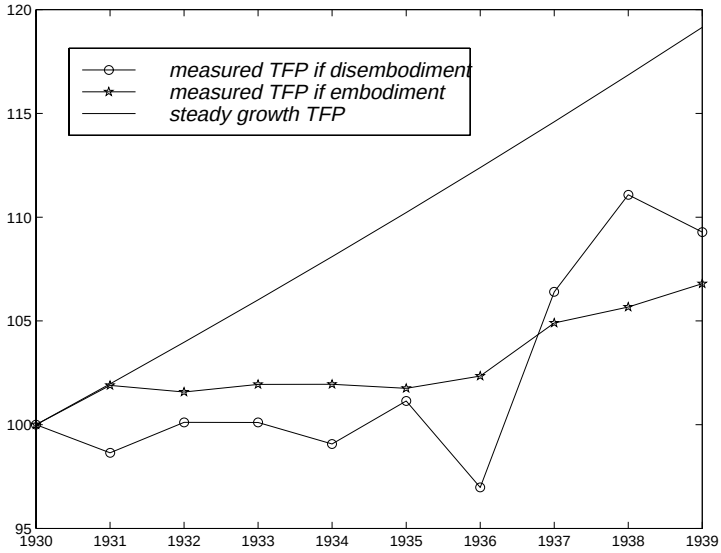
To sum up, independent of the nature of technological progress, embodied of disembodied, inputs movements are enough to account for most of output movements from 1930 to 1932, while TFP stagnation is needed for 1932-1936 if we assume disembodiment. An approach with embodiment clearly does not directly need any technological change, as far as investment drop can be explained by non technological factors. On top of that, if the true model is the embodied model with no stop in technological progress, one can use the simulated output to compute a series od measured TFP. Analytically,

this series is given by

$$\Delta \log TFP_t = (1-\alpha)\left(\Delta \log J_t - \Delta \log K_t\right)$$

This series is denoted "measured TFP if embodiment", and is represented with stars on figure 9, together with the standard evaluation of TFP. We basically reproduce TFP stagnation without assuming any stagnation of technological progress, again leaving unexplained movements in investment and hours.

Figure 9: TFP measurement



4.4 Summary

What we have shown in this section is that technological stagnation of the kind suggested by measured TFP was not enough to account for the depres-

sion within a standard RBC model, and that it was not even necessary once assumed that technological progress is embodied and provided than we have an alternative explanation for inputs movements. We explore this issue in the next section.

5 Institutional Change as a Possible Explanation

5.1 A change in steady states

As we have shown it in section 3, hours are roughly constant after 1937, 25% below their pre-depression level, while output is again growing at its normal growth rate. The French economy after 1936 behaves as if it was again a balanced growth path, but with a permanent decrease in hours of 25%. The *Front Populaire* of 1936 is the outcome of a decade of transformation of the French economy, with increasing unionization, strikes and changes in the working of the labor market. In a Neoclassical model, such an institutional change, modelled for example by increasing bargaining power of labor suppliers, should lead to a reduction in the same proportion of output (relative to trend) and hours. This almost what we observe, output being around 30% below trend over the same subperiod. Strikingly, the same observation holds or the U.S.: private hours are around 25 % below their 1929 level from 1936

to 1939, while output is between 25% and 30% below its trend (see Cole and Ohanian [1999a] Tables 2 and 5). A second striking observation is that in both countries, the investment to output ratio was around 8% lower at the end of the episode compared to the pre-depression level (see Table 7 for France and Cole and Ohanian [1999a], Table 3 for the U.S.

Cole and Ohanian [1999b] explore the implications of the institutional change associate to the New Deal to account for the slow recovery of the U.S. economy after 1933. Given the similarities between the French and U.S. case, we want to explore the possibility for a change in the markets regulation to account not only for the slow recovery, but for the all episode in France, and therefore perhaps in U.S. Again, some simple growth accounting shows that this quantitatively plausible.

Let us take the economy in deviations from its growth trend. With a Cobb-Douglas technology, the following relation holds

$$\Delta \log Y = \alpha \Delta \log H + (1-\alpha)\Delta \log K$$

One can also decompose the variation of K/Y into

$$\Delta \log \left(\frac{K}{Y}\right) = \Delta \log Y - \Delta \log K$$

Putting those two equations together, one gets

$$\Delta \log Y = \Delta \log H + \frac{1-\alpha}{\alpha} \Delta \log \left(\frac{K}{Y} \right)$$

Along a balanced growth path, this is also

$$\Delta \log Y = \Delta \log H + \frac{1-\alpha}{\alpha} \Delta \log \left(\frac{I}{Y} \right)$$

In the French and U.S. case, one has roughly $\alpha = 2/3$, $\Delta \log H = 25\%$ and $\Delta \log \left(\frac{I}{Y} \right) = 8\%$, and therefore

$$\Delta \log Y \approx 30\%$$

which is basically what we observe in both countries, in deviations from steady growth path.

Two questions now arise: why such changes in hours and capital to output ratio? Can those changes explain the dynamic response of the economy from one steady growth path to another. While we will not say anything about the first question, we propose a tentative exploration of the second in a simple model.

5.2 The Depression as a Transitional Dynamics

The model economy we use here is a simple model with embodied technological progress. Preferences are represented by

$$V(0) = E_0 \sum_{t=0}^{\infty} \beta^t \left(\log C_t + \frac{\theta}{1-\eta} \left((1-H)^{1-\eta} - 1 \right) \right)$$

Technology is Cobb-Douglas. For simplicity, we do not model variability of capital utilization, as it is not necessary for our purpose.

$$Y_t = A H_t^{\alpha} K_t^{1-\alpha}$$

Technological progress is embodied in newly installed capital

$$K_{t+1} = (1-\delta) K_t + X_t I_t$$

where X is growing at constant deterministic rate

$$X_t = \gamma X_{t-1}$$

The following two first order conditions of a Social Planner program hold:

$$\begin{aligned} \mu_t \times 1/C_t &= \theta (1-H_t)^{-\eta} \times (1-\alpha) Y_t / H_t \\ \frac{1}{C_t} = \chi_t \quad E_t & \left[\frac{\beta}{C_{t+1}} \left((1-\alpha) A_{t+1} K_{t+1}^{-\alpha} (X_{t+1} H_{t+1})^{\alpha} + 1 - \delta \right) \right] \end{aligned}$$

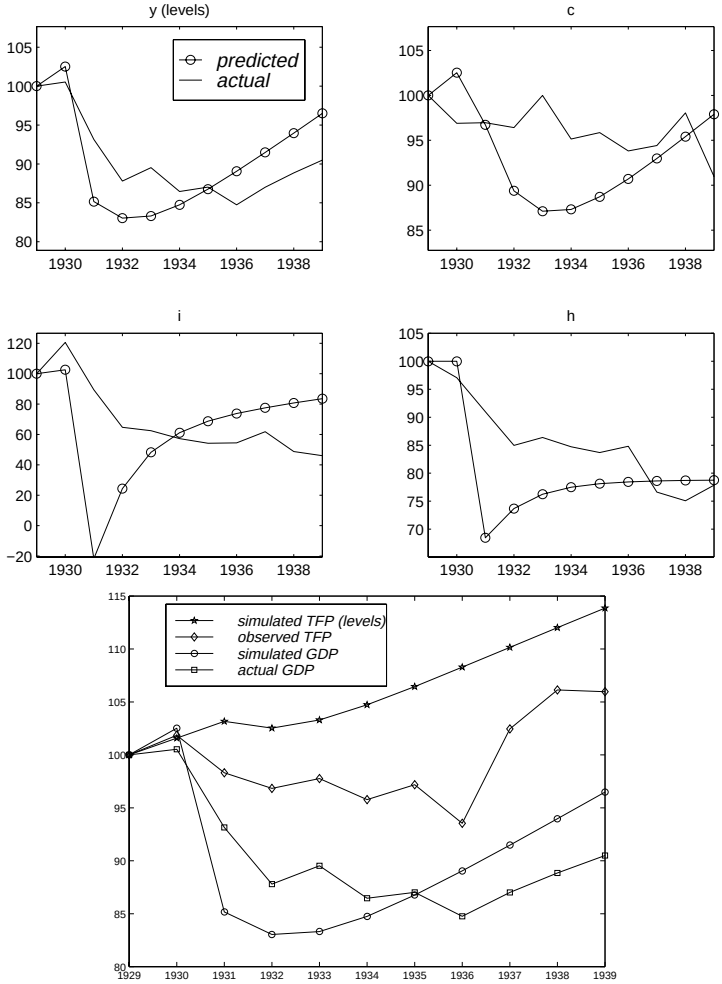
where μ_t and χ_t are two exogenous variables that allow to mimic the long run effect of institutional change. An increase in bargaining power of the workers will increase μ, while an increase in monopolistic power of firms will decrease χ. Both variables are needed to account for both a reduction of steady state worked hours and the capital to output ratio. Interestingly, a positive shock on μ and a negative shock of χ corresponds to Cole and Ohanian [1999b] modeling of the New Deal (increase in real wages and cartellization).

Given the high degree of stylization of this model, we do not want to push too far the exercise of matching the data. Let us simply assume that both χ and μ are equal to one before 1930, and expected to stay constant. Then an unexpected and permanent shock on μ and χ occurs in 1930, with $\Delta \log \mu = 20\%$ and $\Delta \log \chi = -8\%$. A positive chock to μ is interpreted as an increase (effective or expected in 1930) in workers bargaining power or markup), while a negative shock to χ relates to an increase in cartelization or degree of capital appropriability by workers.

We compute the dynamic response of the economy to these unexpected and permanent shocks in 1930. This response is displayed on Figure 10.

Note that without any slowdown or regression in technological change, the transitional dynamics is enough to account for 25% depression in levels

Figure 10: Unexpected Institutional Change in 1930 in a Model with Embodied Technological Change



of output. Because investment collapses after the shock (accordingly in a irrealistic way in this experiment), technological progress is not incorporated any more into production, and measured TFP stays flat. Accordingly, the experiment we conduct should be taken as illustrative, but gives direction for future research.

6 Conclusion

We have shown in this paper that the French depression of the Thirties have more similarities than differences with the U.S. one, and that movements in inputs were sufficient to account for movements in output, without having to invoke technological regress or stagnation, if a vintage capital model was chosen. We then show that is was possible to understand the French depression, and possibly the U.S. one, as a transitional dynamics between two steady-states, the final one being one with less worked hours and smaller investment to output ratio. A model of institutional change, on the labor market as well as on the capital market, that mimics the transition between those two steady states is qualitatively and quantitatively a candidate for explaining the economic path of the Thirties. Although we do not have provided a fully specified model, we think it is a interesting avenue that we would like to

pursue in the next future.

References

Asselain, J. (1995): *Histoire économique du XX^e siècle. La montée de l'Etat.* Presses de Sciences Po et Dalloz, Paris.

Beltran, A., and P. Griset (1994): *L'économie française, 1914-1945.* Armand Colin, Paris.

Cole, H., and L. Ohanian (1999a): "The great depression in the United States from a Neoclassical Prespective," *Federal Reserve Bank of Minneapolis Quarterly Review*, 23(1), 25–31.

——— (1999b): "New Deal Policies and the Persistence of the Great Depression: A General Equilibrium Analysis," Working Paper 597, Federal Reserve Bank of Minneapolis.

Flamant, M. (1989): *Dynamique économique de l'histoire.* Montchrestien, Paris.

Greenwood, J., Z. Hercowitz, and G. Huffman (1988): "Investment, Capacity Utilisation, and the Real Business Cycle," *American Economic Review*, 78, 402–417.

Hautcoeur, P. (1997): "The Great Depression in France (1929-1938)," in *Business Cycles and Depressions: an encyclopedia*, ed. by D. Glasner, pp. 39–42. Garland.

Prescott, E. (1999): "Some Observations on the Great Depression," *Federal Reserve Bank of Minneapolis Quarterly Review*, 23(1), 32–38.

Villa, P. (1993): *Une analyse macro-économique de la France au XXème siècle*. CNRS éditions, Paris.

Appendix

A Data

As mentioned earlier, the data we use in this study have been collected and/or constructed and put together by Pierre Villa. In his volume (Villa [1993]), Villa proposes a very detailed description of sources and methods of construction of the database, including National Income and Product Accounts for the all XXth century in France. Here, we briefly summarize some of Villa's work.

The GDP series that we use for 1919-1939 is constructed as the sum of final demands. When we compute century-wide statistics (GDP growth

rate, income share of labor, TFP growth rate), we use a production approach evaluation of GDP, that is homogenous for the all sample.

Employment series come from two different sources. First, census data for the year 1921, 1926, 1931, 1936, at the two-digit level. Second, quarterly surveys ("Enquêtes des Inspecteurs du Travail") from 1914 to 1939 for the private sector. Hours series are obtained by multiplying employment by the average workweek length. Information concerning workweek length comes first from a survey conducted in the manufacturing industry from 1931 to 1939 for more than 100 workers establishments. From this survey, in appears that the workweek length is close to the legal maximum. Information about the legal maximum is then used for the previous years, in addition with surveys information from the Ministry of Labor in the years 1920, 1924, 1929 and 1931. For services, information is not as good and data have been interpolated between the years 1920, 1924, 1929 and 1931. For civil servants, it has been assumed that the workweek length was equal to the legal maximum. As no information is available for the agricultural sector, the workweek length is assumed to be equal the economy wide average.

Capacity utilization ratio series is provided by Villa, and we have not been able to find how it was constructed.

B Choice of a Long Run Path Growth Rate

We have seen in section 3 that French growth rate was much higher than U.S. one in the twenties, and more generally over the all century. Here, we discuss this observation. Such a difference in average per capita growth rates can be explained by two different factors: *(i)* technical progress has been continuously faster in France; *(ii)* French economy has been twice partially destroyed by wars, and its more rapid growth indicates reconstruction and convergence towards U.S. per capita GPD level. While no evidence of a French technological leadership over the all century can be found to support explanation *(i)*, a possible catchup can be detected by comparing output and Total Factor Productivity (hereafter TFP) growth rates.

The values of TFP growth rates over various sub-samples are given in table 13.

Assuming no secular trend in worked hours ($\gamma_H = 0$) and balanced growth path ($\gamma_K = \gamma_Y$), the following relation should hold if the production function is Cobb-Douglas with elasticity α for hours:

$$\gamma_Y = \frac{1}{\alpha}\gamma_{TFP} \approxeq 1.5\ \gamma_{TFP}$$

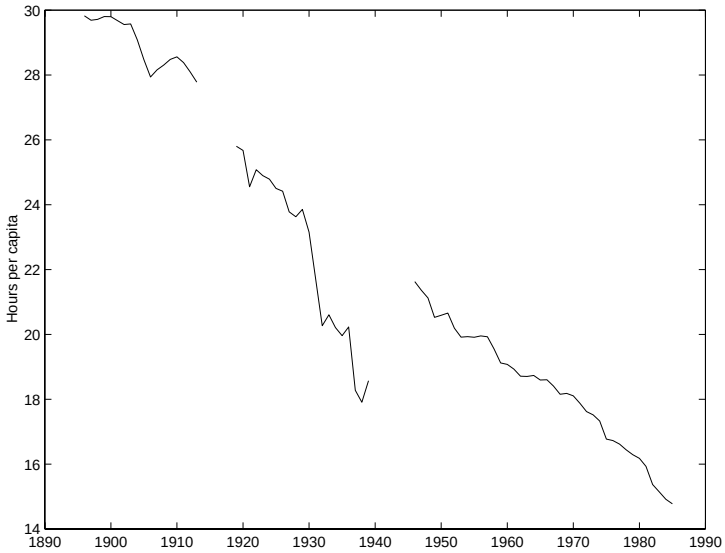
From tables 1 and 13, we notice that output growth is always much smaller

Table 13: Average yearly growth rate of TFP over various sub-periods (1914-1918 and 1939-1945 are always excluded)

by sub-periods	
1896-1913	1.39%
1919-1929	4.93%
1930-1939	.23%
1946-1985	3.14%
average	
All sample (1896-1985)	2.53%
Excluding 1930-1939	2.92%
Excluding 1930-1939 and pre WWI	3.45%
Pre Great Depression (1896-1929)	2.70%

that what should be expected from the preceding relation For example, if we consider the all sample, we should expect $\gamma_Y = 1.5 \times 2.53 = 3.79$ while it is only 2.54 in the data. This goes against the reconstruction explanation, which would imply output to grow faster than if only driven by TFP. Let us remark that part of the explanation for this result lies in the fact that H displays a -1% trend over the all sample, which explains 2/3 points of the difference. One explanation for this negative trend is that our measure of hours per capita has total population on the denominator, and not working age population, from 16 to 65 years old for example. Composition effect related to demographic changes (baby boom, aging) might be part of the story.

Figure 11: Secular Reduction in Hours per Capita in France



Another explanation is that the preferences of the representative French are such that utility of leisure is increasing with time, which is corroborated by the negative secular trend in hours per capita (see figure 11).

To conclude on this point, we think that our technological deflator choice for real variable should be considered as rather conservative, and that the French depression could be even seen as more dramatic as we have depicted it had TFP growth be chosen for deflator.