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The French Depression in the 1930s[1]

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This paper shows that, first, in contradiction with the conventional view regarding the French depression, there are more similarities than differences between the French and U.S. episodes in the 1930s, which suggests the need for an explanation with a similar cause; second, technological change (regression or stagnation) is neither sufficient nor necessary to account for the French depression; and third, institutional and market regulation changes provide an explanation that is quantitatively plausible, but the causes of those changes are still to be explained. *Journal of Economic Literature* Classification Numbers: E30, N14, N44. © 2002 Elsevier Science
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1. INTRODUCTION

In studying the French depression of the 1930s, our objective is to help build a better general understanding of the depression era. In particular, our approach is to compare the French episode with that of the U.S. Great Depression and to use the modern tools of macroeconomics to analyze the French experience. In doing so, we help extend the number of depression

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episodes studied using a methodology similar to that pioneered in the work of Cole and Ohanian (1999a, b) and Prescott (1999).

This paper arrives at three conclusions. First, in contradiction with the conventional view regarding the French depression, there are more similarities than differences between the French and U.S. episode in the 1930s, which suggests the need for a common explanation of these episodes. Second, 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. Third, institutional change and market regulation may be key to understanding the depression. In particular, we show that such an explanation is quantitatively relevant, but the causes of those changes are still to be explained.

2. OVERVIEW OF FRENCH INTERWAR HISTORY

This section describes the main lines of French political and economic history of the interwar period that bear on the data. Our sources are Asselain (1995), Beltran and Griset (1994), Flamant (1989), Hautcoeur (1997), and Villa (1993).

2.1. *Broad Overview*

Figure 1 presents an evaluation of French GDP in 1938 francs. The broad overview shows rapid growth in the 1920s, a sharp decline from 1930 to 1932, then a mild decline from 1932 to 1936, and slow recovery toward the eve of World War II. This picture is the one that most economists and historians of the period have in mind.

2.2. *Post-World War I 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 to be "victorious but ruined." War damages were estimated to be 113% of 1913 GDP; 60% of those damages were represented by the destruction of productive capital, housing capital, and land. French public debt reached 170% of GDP in 1919, compared to 66% in 1913. Prices tripled during the war. The French franc depreciated between 1919 and 1920: there were 25 francs in a pound sterling in 1913, 42 in December 1919, and 60 in December 1920.

French growth was rapid in the 1920s, despite a short worldwide recession in 1921. This growth was 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

FIG. 1. French GDP, billions of 1938 French francs.

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, and tax and tariff increases. After a final devaluation in June 1928, the French franc stabilized at a level of one-fifth of its 1913 gold value.

2.3. *Great Depression* (1931–1936)

The French depression is considered to have been relatively mild (Hautcoeur, 1997). At its maximum, unemployment did not exceed one 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 in France was not accompanied by a banking crisis, as only one major bank failed. Starting in 1931, many countries decided to devaluate their currency. The pound sterling was devalued in 1931 and the U.S. dollar in 1933. As stressed by Asselain (1995), for political reasons French governments rejected the options of devaluation and capital controls. 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 devalue. Furthermore, the government led by Pierre Laval decided in 1935–1936 to implement a strict deflationary policy. A 1935 act reduced by 10% all public expenditures, including civil servant compensation. 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 regulations imposed by the *Front Populaire* provoked a large increase in the cost of labor. First, the government imposed collective bargaining on wage contracts between employers and trade unions. Second, the workweek was reduced from 48 to 40 hours, keeping the weekly or monthly wage constant. Third, workers were granted two weeks of paid holidays, again keeping the weekly or monthly wage constant. Fourth, the civil servant wage cut was suspended. At the same time, a nationwide strike movement led to the *Accords de Matignon*, where wages were increased on average by 12%. It seems that these strikes and their effect on wages were not anticipated by the government. All in all, labor cost increased by 29%: 12% because of the *Accords de Matignon*, 4% because of paid holidays, and 10.8% because of the 40-hour workweek. At the same time, the French franc was devalued by 30%. In 1937, the first public budget of the *Front Populaire* increased tax progressiveness but decreased average taxes, from 17.4 to 15.8% of GDP.

2.4. *Eve of the War* (1937–1939)

Following the implementation of the 40-hour workweek and a drop in investment, the economy weakly recovered. By 1938, the economy entered a prewar regime. Public expenditures increased by 122%. The work week increased by 1 hour in November 1938, and the workweek increased to 60 hours for "strategic industries."

2.5. *Summary*

Four basic points should be kept in mind. First, the depression started 1 year later in France than in the United States. Second, there was no major banking crisis in France. Third, there was no deflationary policy before 1934. Fourth, at the trough of the recession in 1936, a major program of reforms was implemented, which mirrors the 1933 U.S. New Deal.

3. INSPECTING THE DATA

In this study, we use Villa's (1993) data, which are generally seen as the best economic data for the interwar period. The data for 1939 should

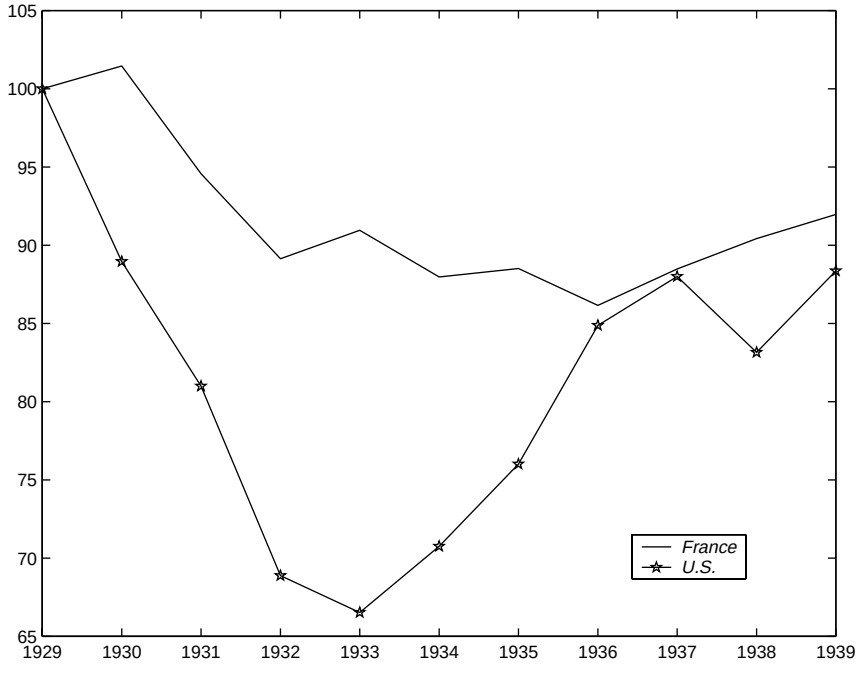

FIG. 2. Undetrended levels of French and U.S. real GDP, 1929 = 100.

be interpreted with caution, as war was declared on September 1939 and preparations for the war had occurred earlier that year.

Figure 2 presents the comparison of real GDP in France and in the United States, both normalized to 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*

The depth of the depression should be evaluated in relation to the "normal" growth rate of the economy. How do we calculate this "normal" rate? For the United States, Cole and Ohanian (1999a) use the average growth rate of per capita GNP over the sample 1919–1997 excluding the Great Depression and World War II (1930–1946). They find a value of 1.90% per year. The choice of the growth rate will greatly influence the evaluation of the depth and persistence of the depression.

Table I presents average growth rates of French per capita GDP for different subperiods. We use total population to compute the per capita series.

Following Cole and Ohanian, we use the entire available sample except for depression years to compute the average growth rate of output. This

TABLE I
Average Yearly Growth Rate of per Capita GDP
(1914–1918 and 1939–1945 Are Always Excluded)

By sub periods	
1896–1913	1.25%
1919–1929	3.53%
1930–1939	−0.3%
1946–1994	3.46%
Average	
All sample (1896–1994)	2.54%
Excluding 1930–1939	2.98%
Excluding 1930–1939 and pre-Wrold War I	3.47%
Pre-Great Depression (1896–1929)	2.15%

growth rate is 2.98%. Note that this is a conservative value compared to what economic agents would have thought in 1929 if they extrapolated the 1919–1929 trend (3.53%).

Figure 3 compares U.S. GNP taken from Cole and Ohanian (1999a) and French detrended GDP per capita. The pattern of the French Great

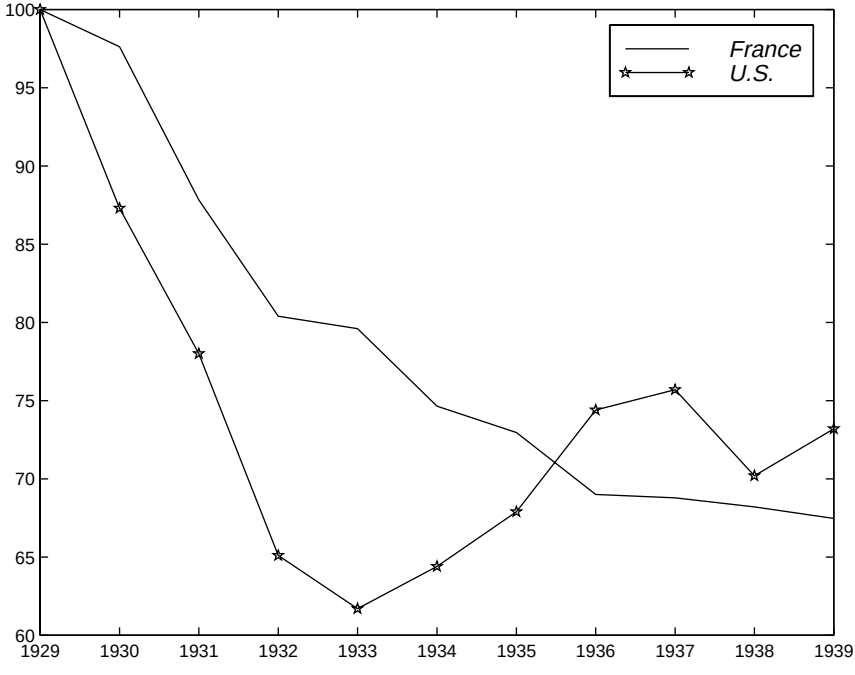

FIG. 3. Detrended levels of French and U.S. real GDP per capita, using different trends for the two countries, 1929 = 100.

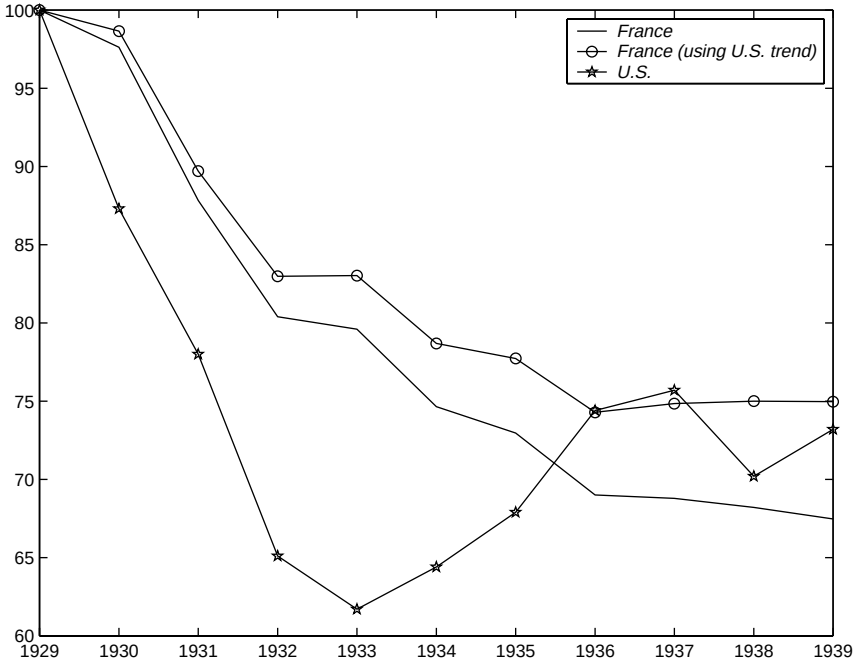

FIG. 4. Detrended levels of French and U.S. real GDP per capita, using the U.S. trend for the two countries, 1929 = 100.

Depression is now very different and is more in line with the U.S. depression. The U.S. depression is temporarily deeper (in the trough of 1933), but at the end of the period (say after 1936), detrended levels are roughly the same, about 30% below trend, France being in a slightly worse position than the United States. In both countries in 1939, detrended output has about the same value as in 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 dynamic patterns of the two countries is not an artifact of our choice for the long-run trend, and it can be seen in Fig. 4 that the qualitative picture is the same when the same trend as that for the United States (1.9%) is also chosen for France.

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

TABLE II
International Comparison
(per Capita, Undetrended, 1929 = 100)

Year	United States	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 Components*

Let us first inspect levels of output per capita and its components (Table III). In the following we use the expenditure-based data for GDP. Series are all normalized to 100 in 1929.

The undetrended measures presented in Table III show the collapse of exports and imports, the relative mildness of the depression from 1930 to 1932 and the long period of output stagnation from 1932 to 1935, the trough in 1936, and then the recovery at the steady growth rate. Table IV presents detrended measures of output components. One can observe the large decline in investment, the level of which from 1935 to 1938 is about 55% below trend. Also, note 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 V shows that the share of imports in output stayed constant over the period, while the share of exports declined. Excluding 1939, the consumption share increased while the investment share decreased. Compared to 1929, it seems that the economy

TABLE III
Undetrended per Capita Levels of Output and Their 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

TABLE IV
Detrended per Capita Levels of Output and Their 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

had reached a new balanced growth path with a lower capital–output ratio and a larger consumption–output ratio in the late 1930s.

Table VI shows that housing investment was the most affected component of investment and that the increase in government expenditures can be mainly attributed to consumption, not investment. Table VII shows that consumption decline started in 1929 except for manufactured goods.

3.3. *Input Measures*

Table VIII shows the effect of the 1936 accords on the workweek length and the drop in hours worked. Note that employment did not vary significantly after 1932. Again, it seems that in 1936–1939 the economy is on a

TABLE V
Shares of Output (in Percent)

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 VI
Detrended per Capita Levels of Investment and Public Consumption

Year	Households inv.	Firms inv.	Govt. inv.	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

new steady growth path where hours are about 25% lower than before the depression. Capacity utilization collapsed in 1930 and 1931 and then stayed relatively constant.

3.4. *Money and Prices*

In Table IX one does not observe any strong contractionary monetary policy, except for Laval's deflation in 1935 and early 1936. Nevertheless, the GDP deflator decreased from 1931 to 1936. As usual, deflation was sharper for the producer price index (PPI). Note that price deflation stopped after 1935 and that 1936–1939 were years of high inflation (Table X).

TABLE VII
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 VIII
Input Measures (per Capita, 1929 = 100)

Year	Employment	Working week length	Hours worked	Capacity utilization (%)[a]
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

[a]In Level.

3.5. *Real Wage*

In Table XI, one can observe a continuous increase in the real wage paid by firms (the nominal wage divided by a producer price index) up to 1936, which 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 (CPI), did not increase that much in 1936, as the

TABLE IX
Nominal and Real Monetary Variables (per Capita)

Year	M2	GDP deflator	Money market rate	M2/P[a]
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

[a]Detrended.

TABLE X
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

devaluation contributed to a larger increase of CPI (40% increase in 1936 versus 24% for PPI).

The striking feature of Table XI is that the real wage was above trend during the entire depression. The real wage relative to the PPI increased more than 5% above trend in 1930, stayed roughly flat until 1936, and then temporarily increased.

TABLE XI
Real Wages

Year	GDP	Real wage (using CPI)	Real wage (using PPI)	Real wage (using CPI)[a]	Real wage (using PPI)[a]
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

[a]Undetrended.

3.6. *Similarity to the U.S. Depression*

To summarize, once the output data of both economies are deflated by their own trends, we find strong similarities between the French and U.S. depressions. In 1938–1939, hours were constant in both countries at approximately 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 are not observed in France. Taking into account the fact that France lags the United States by 1 year in slipping into the depression and that the banking crisis of 1931–1933 was not observed in France, the picture is surprisingly similar. Finally, in both countries, the investment to output ratio seems to be permanently lower after the depression (see Cole and Ohanian, 1999a, Table 3 for the United States).

These results cast 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, the French depression is not milder when considered as deviation from a steady growth path. To put it differently, things went very badly compared to what would have been expected in 1930.

The second main feature of this conventional wisdom is the importance attributed to exchange rate fluctuations. The 1926 Poincaré stabilization of the French franc at an undervalued level is conventionally seen as an important reason for the relative high growth in France and for its insulation from the Great Depression in 1929 and 1930. The depression of 1931–1936 is mainly attributed to the United Kingdom and United States devaluations of 1931 and 1933. The story goes like this: France was insulated from the Depression in 1929 and 1930, because of the undervaluation of the French franc. The devaluation of the pound sterling in 1931 and the U.S. dollar in 1933 are seen as the two shocks that triggered the recession. Laval's deflation of 1935–1936 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, the depression started in 1930 and not in 1931, as can be seen from the detrended data, even though the drop in output is smaller than that in the United States. 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, in the absence of financial intermediation shocks, the conduct of monetary policy was accommodating (see Table IX) until 1935—real money, as measured by M2/P stayed almost constant from 1929 to 1935—and fell only with Laval's deflationary policy.

It seems that the idiosyncrasies attributed to the French depression do not stand up to a close look at the data and that we should look for a common, or at least similar, cause for both episodes. Are technological factors the likely explanation? This is what we look at in the next section.

4. ROLE OF TECHNOLOGY SHOCKS

4.1. *Growth Accounting*

We first compute total factor productivity (TFP) using Cobb–Douglas production functions $Y_t = A_t(X_tH_t)^{\alpha}K_t^{1-\alpha}$ and $Y_t = A_t(X_tH_t)^{\alpha}(z_tK_t)^{1-\alpha}$,

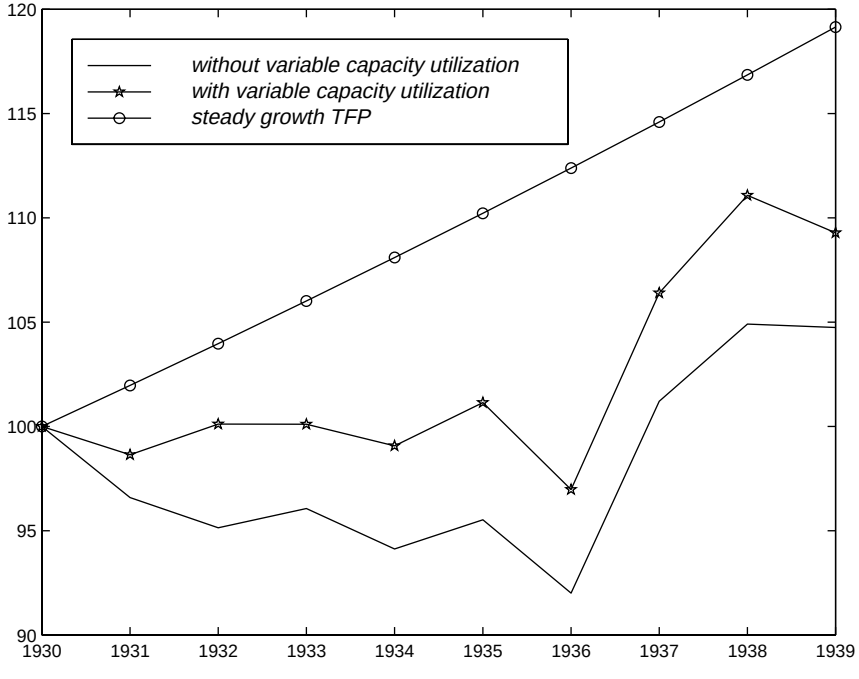

FIG. 5. TFP measures, 1930 = 100.

where z is a measure of capacity utilization and $\alpha = 0.66$. See the 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 is the deviation from the trend. The resulting series are depicted in Fig. 5.

As expected, the series computed without variable capacity utilization decreases more than the one with variable capacity utilization. In the following, we give attention to the latter measure of TFP. We observe a stop in TFP growth from 1930 to 1935, then a drop in 1936, and a strong rebound in the next 2 years. Is this evolution sufficient for understanding output growth? Is it necessary? We answer no to both these questions in two stages, first within a structural model and then by doing some more growth accounting.

4.2. *Technological Stagnation*

A Simple Model. We consider a growth model with labor supply and capital depreciation in use. Time is discrete and the time unit is 1 year. We assume that the economy is composed of a representative household and a representative firm. All variables are per capita.

Household preferences are represented by the intertemporal utility function V,

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

where C is consumption and H is hours worked. 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 (with growth rate γ) and A_t is a stationary component of total factor productivity,

$$X_t = X_0 \exp(\gamma t)$$

$$\log A_t = \rho \log A_{t-1} + \varepsilon_t,$$

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

Capital accumulates according to the law of motion

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

As in Greenwood, *et al.* (1988), it is assumed 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 social planner's problem

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

The first-order conditions of this problem are given by

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

plus a transversality condition.

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

Calibration. The following parameters need to be calibrated in this laboratory economy: the output elasticity to capital α, the labor disutility parameters η and θ, the discount factor (already divided by population growth factor) β, the growth rate of TFP γ, depreciation parameters δ_1 and δ_2, and the persistence of the technology shock ρ. Using the aggregate wage bill and assuming that the share of output that goes to labor is the same in firms and for self-employed persons, we find for the interwar period a labor share of 66%. Note that without the correction for self-employed workers, we would have found a labour share of 47%. We therefore set $\alpha = 0.66$. 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 and the other with low ones. In the high elasticity economy, δ_2 is close to one, while δ_2 is large in the low elasticity economy. We set the discount factor to $\beta = 0.96$, as in Cole and Ohanian (1999a). In the high elasticity economy, the 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 one-third of total available time. We estimated an AR(1) process on deviations of total factor productivity from trend on the period 1919–1939, and ρ was estimated to be 0.98. $\gamma = 0.0293$, so that steady growth rate of output is 2.98%. This calibration is summarized in Table XII.

TABLE XII
Calibration

Output elasticity to labor α	0.66
Discount factor β	0.96
Growth rate of TFP γ	0.0293
Depreciation rate δ	0.1
Depreciation elasticity parameter δ_2	
High elasticity case	0.1
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	0.98

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

Predictions of the Model. We assume that TFP behaves qualitatively as observed: growth at the steady growth rate before 1930 and after 1936 with 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? The depression in output is not fully reproduced. Even though the investment drop is matched before 1936, hours do not drop as they did in the data. On top of that, the slow (or absent) recovery after 1936 is missed by the model. Hence, we can conclude that TFP stagnation does not appear to be sufficient to account for the French episode, which is a conclusion similar to that found for the United States by Cole and Ohanian (1999a). In the next section, we go one step further and argue that technological stagnation may not even be a necessary condition for understanding the French depression.

4.3. *More on Growth Accounting*

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

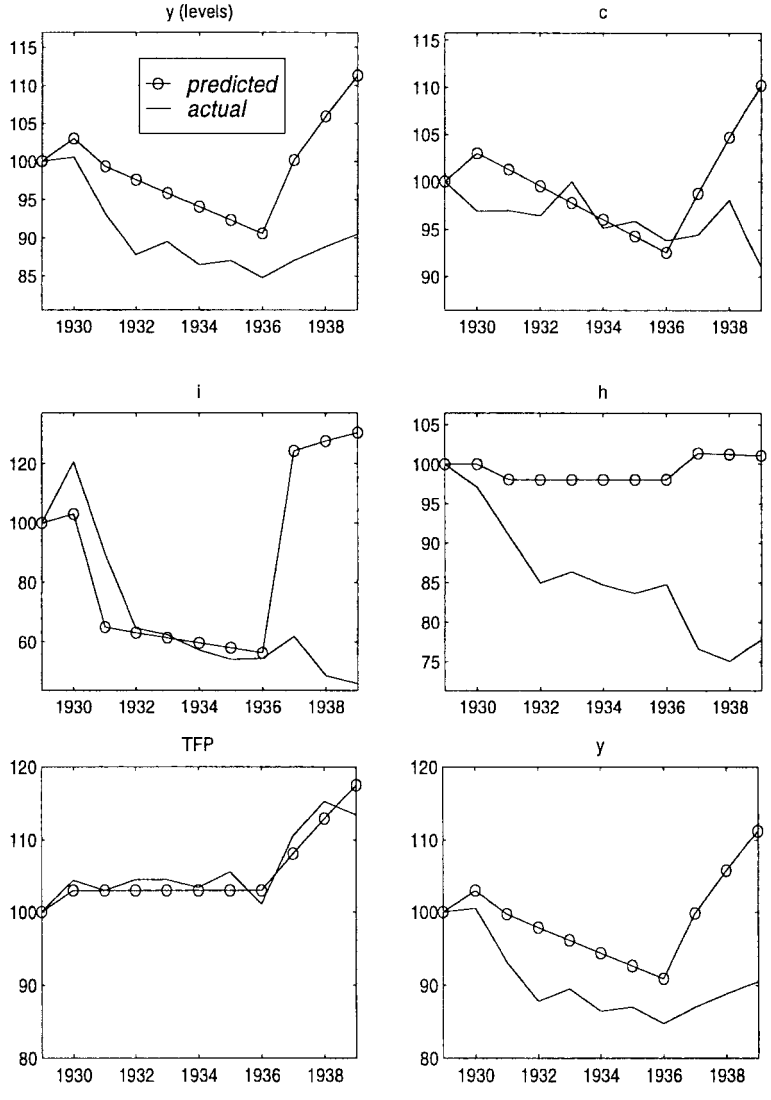

FIG. 6. Unexpected TFP stagnation from 1929 to 1936, high elasticity.

Let us take as given the observation of the stagnation in measured TFP from 1930 to 1936 and ask why we observed such a stagnation, knowing that technology improved in France throughout the century. A natural candidate to explain this observation, which does not rely on technological stagnation, is technological embodiment. In effect, the 1930s were a period of depressed investment. In a world with embodied technological progress,

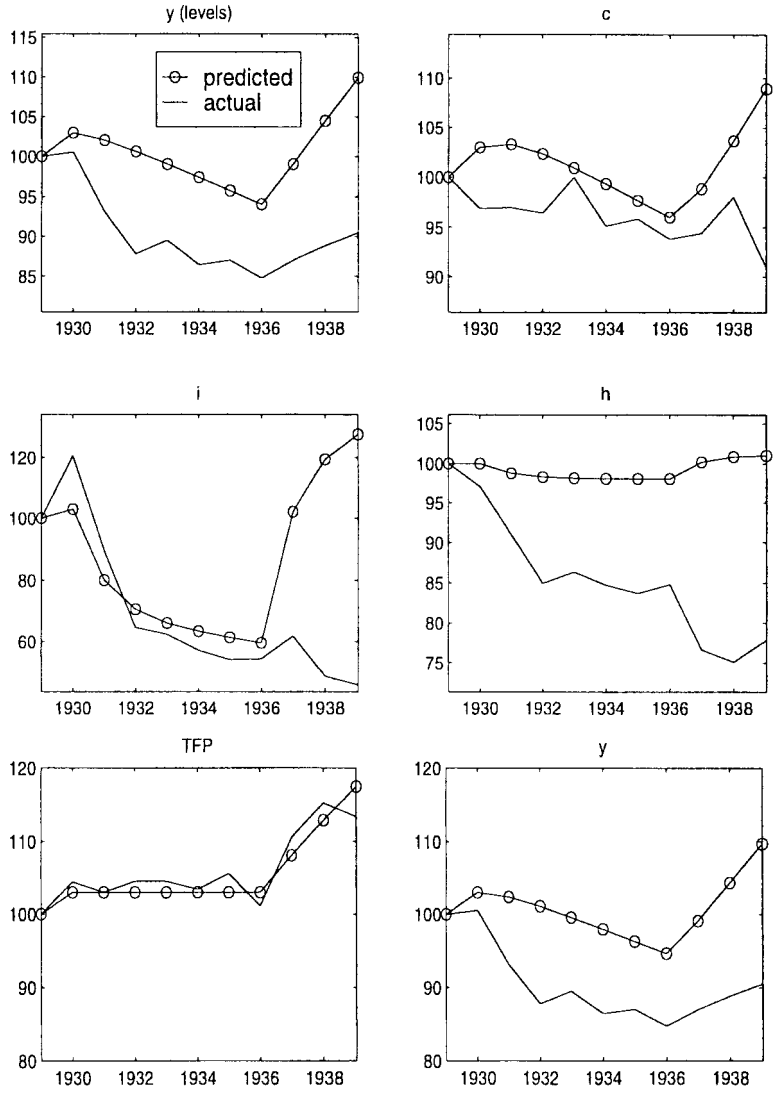

FIG. 7. Unexpected TFP stagnation from 1929 to 1936, low elasticity.

technological progress does not occur 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, if one follows this line of reasoning, one still needs to explain why investment was so low. For now, however, we just examine

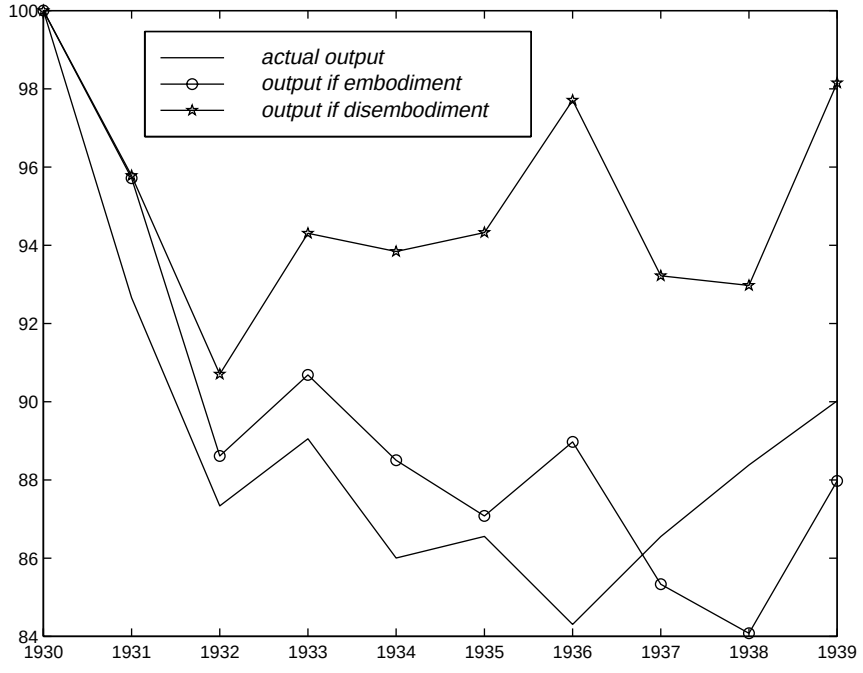

FIG. 8. Accounted movements in output.

whether we can explain movements in measured TFP by doing a growth accounting exercise under the assumption that technology is embodied in capital. To keep things simple, we assume in the following that *all* technical progress is embodied in capital.[2]

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 is a technological factor that grows at rate γ_X. From these 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

[2]An evaluation of the strength of embodied technological progress is given by the price of investment relative to the price of output. Over 1919 to 1939, the relative price of equipment declined at an annual rate of -1.63%, which is an indicator of vintage capital.

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 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 sum of past investments, the deflator taking into 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 $\delta_J = 0.14$ and $\gamma_I = 0.0298$, one gets the series with circles in Fig. 8. This simulated output tracks well the actual one, and no stop nor regression in technological progress is needed (but, of course, leaving unexplained movements in investment and hours).

To sum up, independent of the nature of technological progress, embodied or 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 that new technology is disembodied. Furthermore, if technological change is embodied in capital, then technological stagnation is not necessary to explain output movements as long as the investment drop can be explained by nontechnological factors. On top of that, in the model with embodied technological progress, one can use the simulated output to compute a series of measured TFP. Analytically, this series is given by

$$\Delta \log \mathrm{TFP}_t = (1 - \alpha)(\Delta \log J_t - \Delta \log K_t).$$

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

4.4. *Summary*

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

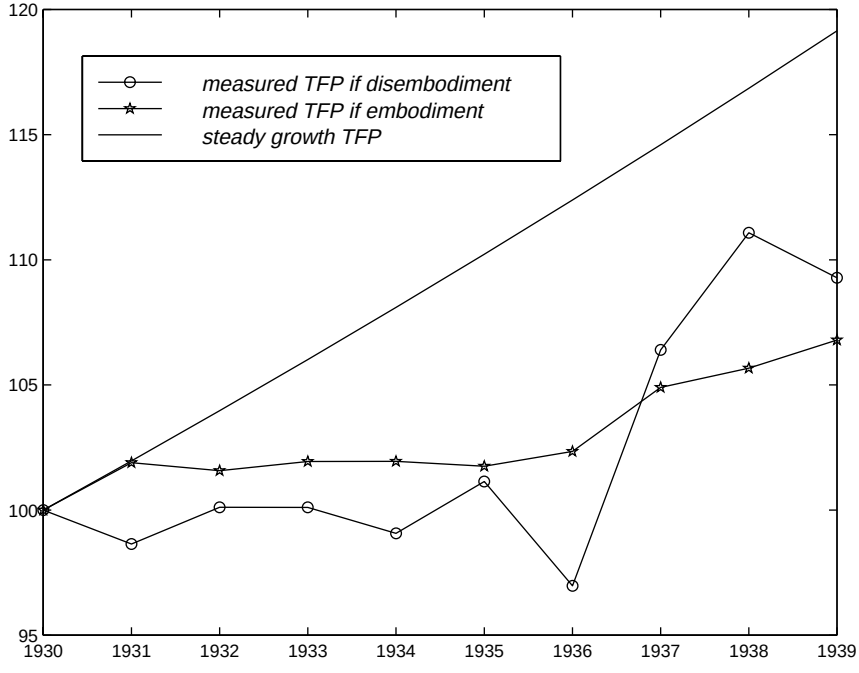

FIG. 9. TFP measurement.

depression within a standard real business cycle model and that it is not even necessary if one is willing to assume that technological progress is embodied in capital. In this latter case, however, it is necessary to have an alternative explanation for movements in inputs. We explore this issue in the next section.

5. INSTITUTIONAL CHANGE AS POSSIBLE EXPLANATION

5.1. *Change in Steady States*

As we have shown 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 was 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, modeled, for example, by increasing the bargaining power of labor suppliers, should lead to a reduction in the same proportion

of output (relative to trend) and hours. This is almost what we observe: output being around 30% below trend over the same subperiod. Strikingly, the same observation holds for the United States: 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 is about 8% lower at the end of the episode compared to the pre-depression level (see Table V for France and Cole and Ohanian, 1999a, Table 3 for the United States).

Cole and Ohanian (1999b) explore the implications of the institutional change associated with the New Deal for the slow recovery of the U.S. economy after 1933. Given the similarities between the French and U.S. cases, we want to explore the possibility of a change in market regulation accounting not only for the slow recovery, but also for the entire French episode, and therefore perhaps for the U.S. depression. Again, some simple growth accounting shows that this is quantitatively plausible.

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

$$\Delta \log Y_t = \alpha \Delta \log H_t + (1-\alpha)\Delta \log K_t.$$

One can also decompose the variation of K/Y into

$$\Delta \log\left(\frac{K_t}{Y_t}\right) = \Delta \log Y_t - \Delta \log K_t.$$

Putting those two equations together, one gets

$$\Delta \log Y_t = \Delta \log H_t + \frac{1-\alpha}{\alpha}\Delta \log\left(\frac{K_t}{Y_t}\right).$$

Along a balanced growth path, this is also

$$\Delta \log Y_t = \Delta \log H_t + \frac{1-\alpha}{\alpha}\Delta \log\left(\frac{I_t}{Y_t}\right).$$

In the French and U.S. cases, one has roughly $\alpha = 2/3$, $\Delta \log H_t = 0.025$, and $\Delta \log(I_t/Y_t) = 0.08$, and therefore

$$\Delta \log Y_t \cong 0.30,$$

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

Two questions now arise: why did such changes occur in hours and in the capital–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 fundamental reasons why hours and the capital to output ratio changed, we explore the second question within the confines of a simple model.

5.2. *Depression as Transitional Dynamics*

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

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

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 a constant deterministic rate

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

Two first-order conditions of a social planner's problem hold,

$$\mu_t / C_t = \theta(1-H_t)^{-\eta}(1-\alpha) Y_t / H_t$$

$$\frac{1}{C_t} = \chi_t E_t \left[\frac{\beta}{C_{t+1}} ((1-\alpha) A_{t+1} K_{t+1}^{-\alpha} (X_{t+1} H_{t+1})^{\alpha} + 1 - \delta) \right],$$

where μ_t and χ_t are two exogenous variables that allow us 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–output ratio. Interestingly, a positive shock on μ and a negative shock of χ corresponds to Cole and Ohanian's (1999b) modeling of the New Deal (increase in real wages and cartelization).

Given the high degree of abstraction in this model, we cannot expect it to match the data exactly. Let us simply assume that both χ and μ are equal to one before 1930 and are expected to stay constant. Then an unexpected and permanent shock on μ and χ occurs in 1930, with $\Delta \log \mu = 0.20$ and $\Delta \log \chi = -0.08$. A positive shock 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 in Fig. 10.

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

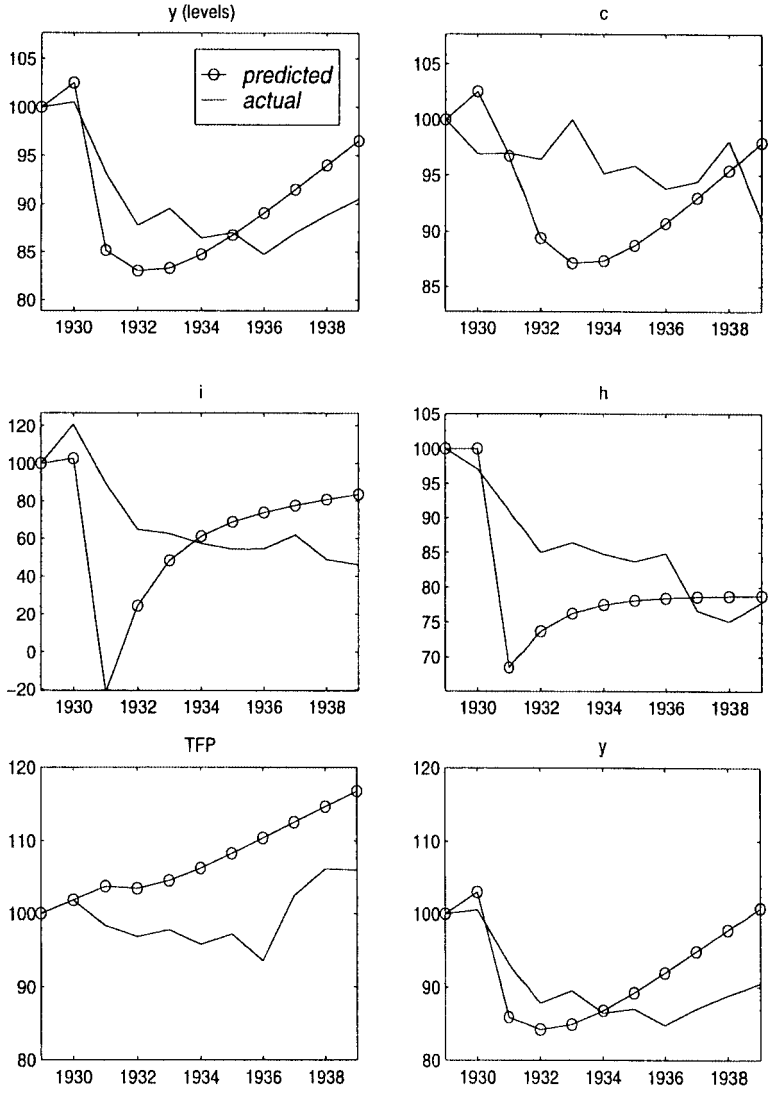

FIG. 10. Unexpected institutional change in 1930 in model with embodied technological change.

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

6. CONCLUSION

We have shown that the French depression of the 1930s had more similarities to than differences from the U.S. depression and that movements in inputs were sufficient to account for the movement in output, without having to invoke technological regression or stagnation, if a vintage capital model was used. We also show that it is possible to understand the French depression 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 1930s. Although we have not provided a fully specified model, we think it is a interesting avenue that we would like to pursue in the next future.

DATA APPENDIX

As mentioned earlier, the data we use in this study have been collected and/or constructed and put together by Villa (1993). He proposes a very detailed description of sources and methods of construction of the database, including National Income and Product Accounts for the 20th 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, and TFP growth rate), we use a production approach evaluation of GDP that is homogeneous for the entire sample.

The employment series used come from two different sources: first, census data for the years 1921, 1926, 1931, and 1936, at the two-digit level; and 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, it 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 survey information from the Ministry of Labor from 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 to the economy wide average.

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

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