How well does the Aggregate Demand - Aggregate Supply framework explain unemployment fluctuations?

A France - United States comparison.

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Abstract

This paper reviews the ability of the traditional Aggregate demand-Aggregate supply framework to explain the unemployment fluctuations of the last three decades. A structural VAR model for the growth rates of labor productivity, inflation and unemployment is estimated on American and French data. By using long-run identifying restrictions, unemployment fluctuations are associated with conventional aggregate demand and aggregate supply shocks and with a supplementary residual innovation. One key finding is that the residual shock is far more significant in France than in the United States. The traditional macroeconomic synthesis proves then to be well suited for the American labor market while it leaves unexplained a large part of the French unemployment drift. This result questions the conventional prior that the heterogeneity in unemployment experiences lies in the magnitude of aggregate shocks or in their propagation mechanisms and calls for alternative explanations.

Keywords : Unemployment, Labor market rigidities, Hysteresis, Structural VAR.

JEL Classification : C32, E32.

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I Introduction

Explaining the upward trend in the French unemployment rate while the American unemployment rate has remained partially trendless over the last three decades is an ongoing challenge for macroeconomic theory. In particular this development has cast doubt about the ability of the traditional Aggregate Demand - Aggregate Supply (AD-AS) framework to be a common benchmark for explaining unemployment fluctuations.

According to this macroeconomic synthesis of conventional Classical and Keynesian arguments, unemployment fluctuations are mainly driven by aggregate demand and aggregate supply shocks in combination with some inertia in the adjustment process. While demand perturbations may have real effects in the context of nominal rigidities such as Taylor (1978) fixed-length wage contracts, supply shocks are likely to affect the unemployment rate as long as real wages do not adjust to clear the labor market. Actually such an interpretation seems well suited for explaining the initial rise in American and French unemployment rates during the 1970's and the early 1980's. Both countries suffered a protracted period of rising unemployment (from 2 percent to 8 percent) while they were successively hit by large adverse supply and demand shocks such as a total factor productivity slowdown and a stringent tightening of the monetary policy. However such aggregate perturbations are expected to have only short-run effects on unemployment. Once nominal wages and real wages adjust to the new inflation rate or to the lower underlying level of labor productivity, the effects of aggregate shocks should vanish. This is precisely what occurred in the United-States where the unemployment rate started decreasing by the mid-1985. So why has the French unemployment rate kept increasing since then?

This puzzle has fostered two classes of theories. The first one keeps the AD-AS framework as a benchmark reference. But one holds that the effects of aggregate shocks are longer in France because of more sluggish adjustments in the labor market. This argument refers to the hysteresis theory of Blanchard-Summers (1986) who claim that aggregate shocks are more persistent in European countries than in the United-States because of insiders-outsiders effects. Moreover France may have been affected by supplementary aggregate shocks from which the United States have been preserved such as the sharp increase in the interest rates in the late 1980's (Fitoussi and Phelps (1988)).

An alternative class of explanations leaves the reference to aggregate perturbations and focuses on more specific labor market shocks. In particular a recent macrodynamic framework based on job-search models (Pissarides (1990)) and wage setting - price setting models (WS-PS) gives micro-foundations to unemployment fluctuations. Job-search

models relate unemployment to imperfections in the employment setting process due to transaction costs and potential mismatch. This theory seems well fitted to account for the contribution of unskilled workers to the persistence of a high structural unemployment in Europe. WS-PS models rather focus on microeconomic imperfections in the wage setting process. Wages are set as a mark-up over the reservation wage and depend on key parameters such as the replacement rate of unemployment benefits, the minimum wage or the union bargaining power. In that context changes in the institutional setting of employment and wages lead to a permanent drift in the unemployment rate. In that perspective, Nickell (1997) claims that the labor market characteristics of European countries have undergone major reforms during the last three decades while they remained quite stable in the United States.

This article provides an econometric contribution to this debate by evaluating the quantitative share of unemployment fluctuations left unexplained by adverse aggregate shocks. The purpose is to weight the contribution of the long list of alternative explanations rather than giving them precise economic interpretation. To this end, I follow a structural VAR (SVAR henceforth) approach based on the seminal work of Blanchard-Quah (1989) who used long-run restrictions to identify reduced form innovations as structural shocks. But while the two authors only focused on the contribution of aggregate demand and aggregate supply shocks to unemployment fluctuations, I introduce a residual orthogonal explanation by enlarging the size of the VAR. I take the unemployment growth rate and two key variables which are the most likely to capture the main supply and demand perturbations of the period, namely the growth rate of labor productivity and the growth rate of inflation. In order to identify the three structural shocks, I use the following set of long-run restrictions. Aggregate supply shocks are considered as innovations which may affect all three variables in the long-run. Aggregate nominal demand shocks may have permanent effects on the inflation rate and on the unemployment rate but do not affect the level of labor productivity in the long-run. The residual orthogonal shock captures innovations which may only have long-lasting effects on unemployment. Furthermore, by allowing both technological and nominal demand shocks to have permanent effects on the unemployment rate, I can test the empirical relevance of the hysteresis hypothesis.

Several studies have already extended the number of potential unemployment perturbations by enlarging the original size of the Blanchard-Quah (1989) system. But they generally keep the Aggregate Demand - Aggregate Supply framework as their theoretical benchmark. For instance Blanchard (1989) and Dalido and Jimeno (1997) decomposed demand shocks into price push and wage push while Gamber and Joutz (1993) disentangle

aggregate supply perturbations into labor-demand shocks and labor-supply shocks. Furthermore they choose a set of variables and restrictions generally grounded on traditional theories of the wage setting process such as Fisher-Taylor wage contracts or insiders-outsiders wage bargaining *à la* Blanchard-Summers (1986).

The modelling strategy of this article generalizes the previous works in several ways. First the residual orthogonal shock not only captures specific labor demand-labor supply shocks but also institutional perturbations which have never been analyzed in the context of a SVAR model. Second the identifying strategy is consistent with a broader class of wage-setting process. It may encompass traditional wage contracts as well as more recent wage curves in the lines of Blanchflower-Oswald (1993) or Layard, Nickell and Jackman (1991). To that regard, the modelling strategy of this article is much more pragmatic. The propagation mechanisms are let free to decide which theory of labor market fluctuations is best suited for each country rather than imposing them a common benchmark.

Applying the previous SVAR approach to American and French data for the period 1970-1998, I find that the residual shock does not explain much of the American unemployment fluctuations while it accounts for the main part of the French ones. This result questions the traditional prior that the divergence in unemployment experiences lies in the magnitude of aggregate shocks or in their propagation mechanisms. The heterogeneity is rather linked to differences in labor market characteristics since the two unemployment rates do not react to the same kind of perturbations. In particular aggregate nominal shocks have little effects on the French unemployment rate, suggesting that the wage setting process is closer to a wage curve in this country. In that context technological shocks or nominal demand perturbations play a minor role in unemployment fluctuations. By contrast, the large contribution of nominal shocks to the American unemployment variations is consistent with numerous econometrics studies stressing the existence of a Phillips curve in this country. More generally these findings question the ability of the AD-AS framework to account for French unemployment fluctuations. I then suggest alternative explanations of the French unemployment drift by analyzing the contribution of the residual shock to unemployment history. I find that the evolutions of mismatch imperfections and unemployment benefits display the most significant correlations with this residual component of French unemployment history.

The rest of the paper is organized as follows. In section 2, I provide a brief overview of the main salient features of American and French labor markets in order to motivate the modelling strategy. Section 3 is devoted to the presentation of the structural VAR approach and to the identifying restrictions of shocks. In section 4, I estimate the SVAR model and I quantify the effects of each shock through impulse-response analysis and

forecast error-variance decomposition. Section 5 suggests economic interpretations of the residual shock based on an historical decomposition of unemployment fluctuations. Finally, section 6 concludes.

II Basic facts

This section provides a brief overview of the main aggregate demand and aggregate supply shocks which have affected the American economy and the French economy over the last three decades. Particular attention is given to the evolution of labor productivity and inflation since these two variables enter the SVAR model. It will then be possible to discuss wether the magnitude of such aggregate shocks differ across countries or if supplementary explanations are required.

II.1 The evolution of unemployment

The sharp difference between the evolution of the American and the French unemployment rates dates back to the mid-1980's (see Figure 1). During the 1970's, both countries suffered a steady increase in unemployment rate which reached 8 percent by 1984. But while the French unemployment rate has kept growing since then, its American counterpart continuously decreased returning to its 1970's initial level. In the first quarter of 1998, the unemployment rate stands at 12.2 percent in France versus 4.4 percent in the United States. Is this divergence due to hysteresis effects or to the occurrence of supplementary shocks during the 1990's in France?

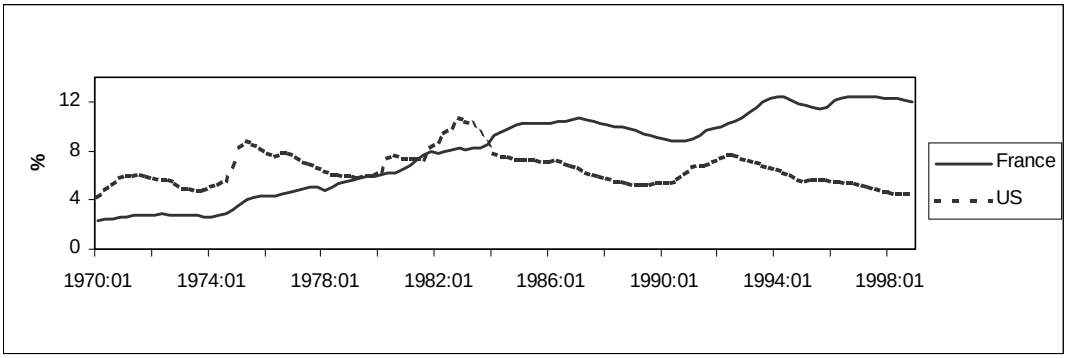


Figure 1 : Unemployment Rates

Before tackling this issue, one may check that this heterogeneity does not simply hide divergent exogenous trends in the evolution of employment rates or participation rates across countries. Actually Figure 2 shows some evidence of such a divergence. But it is the American participation rate which displays an upward trend while the current French

participant rate is nearly identical to its 1970 value (around 68 percent). Thus the rise in the French unemployment rate cannot be explained by exogenous labor supply shifts. Further explanations have to be provided.

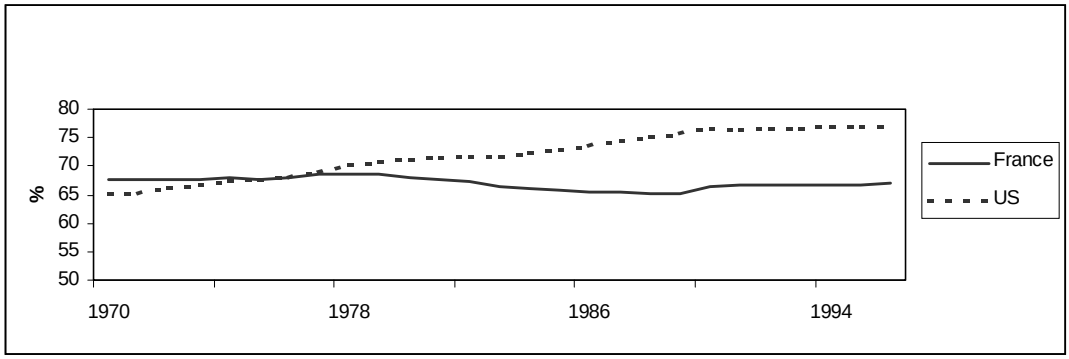


Figure 2 : Participation Rates

II.2 Empirical evidence of aggregate demand and aggregate supply shocks

Supply shocks :

There are many plausible candidates for adverse aggregate supply shocks over the last three decades. As unemployment started rising in the 1970's, the focus was primary on the consequences of large oil price increases on the unemployment rate (Bruno and Sachs (1985)). As unemployment kept rising, attention turned to another explanation based on the slowdown in the Total Factor Productivity (TFP) growth rate. While this rate was close to 4 percent in the late 1960's, it plunged down to 2 percent in the second half of the 1970's in the two countries. Last but not least, one may add the large increase in the real interest rates during the 1980's and the 1990's. This evolution is much more striking in France as this country decided to match the steady rise in German interest rates following the reunification. The French real interest rates rose from 0,2% in the early 1980's to 5% in the late 1990's.

Are such changes likely to affect the equilibrium unemployment rate? Concerning the rise in real interest rates, it is likely to be responsible for the dampening of capital accumulation during the last two decades. This evolution may have contributed, for a given ratio of employment to capital, to lower labor demand. As regards the TFP growth slowdown, it is likely to affect the unemployment rate as long as real wages do not adjust to the new lower underlying rate. In this case, firms offset the excess in wage growth by lowering their labor demand. But this effect should vanish once expectations have adjusted.

Figure 3 shows the evolution of the growth rate of labor productivity (HP filtered trend component with $\lambda = 1600$) in both countries from 1970:1 to 1998:4. Some divergence appears in the early 1980's. In each country, the seventies were characterized by a large decline in the growth rate of labor productivity. But while the French growth rate has kept decreasing from 9 percent to 4 percent throughout the whole period, the American one started to recover by 1980 and is back to its initial value of nearly 4 percent in 1998.

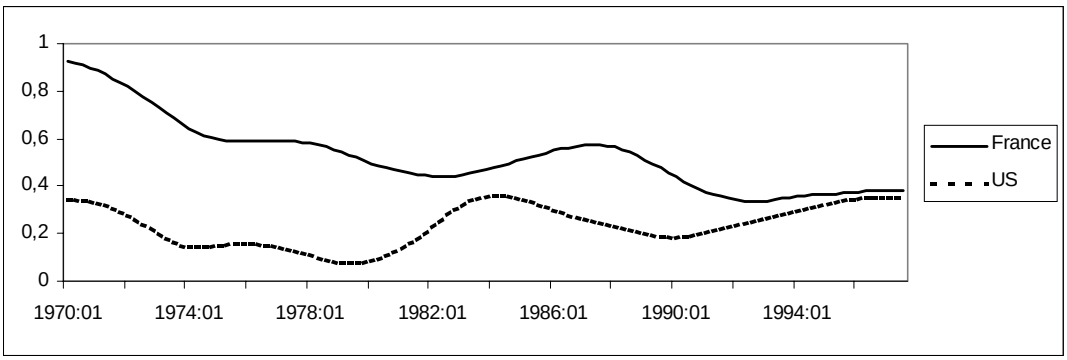


Figure 3 : Labour Productivity growth rates (HP filtred).

Is this divergence responsible for the persistence in French unemployment rate? To answer this question, the evolution of labor productivity should be compared with the growth rate of real wages. Figure 4 depicts the path of the labor share in France. This variable consists of the ratio of average compensation per worker to average value-added per worker. After climbing from 68 percent to 72 percent during the seventies, it has steadily fallen in France reaching 60 percent in the late nineties. This evolution highlights the stringent wage moderation policy implemented since the mid-1980's in France. Thus the slowdown in the growth rate of labor productivity is unlikely to be responsible for the steady increase in the French unemployment rate during the past two decades.

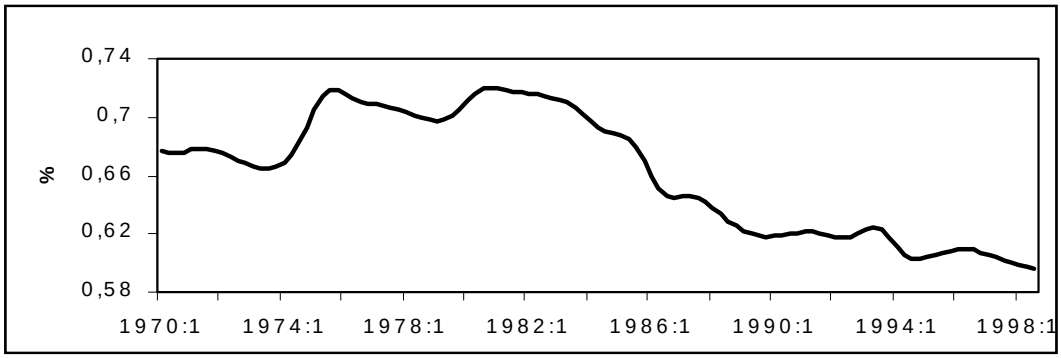


Figure 4 : Labor share in France

Demand shocks :

There is little doubt that France and the United States have been affected by large adverse demand shocks, especially since the early 1980's. Two main sources of perturbations seem to have played a key role in unemployment fluctuations. The first one is more specific to France and consists of a major fiscal contraction engaged by this country in view of European monetary unification. The second one is linked to the sharp monetary contraction implemented in both countries during the eighties. Figure 5 provides evidence of such a contraction by showing the evolution of inflation rates (using the Consumer Price Index) in France and the United States from 1970:1 to 1998:4. The United States had a leading role by tightening the monetary policy in the late 1970's. But in the aftermath of Mauroy's government (1981-1984) priority was given to the reduction of inflation in France too. This country has to a large extent matched the tight American monetary policy since then. Thus as long as inflation is concerned, France and the United States seem to have experienced the same nominal demand shocks.

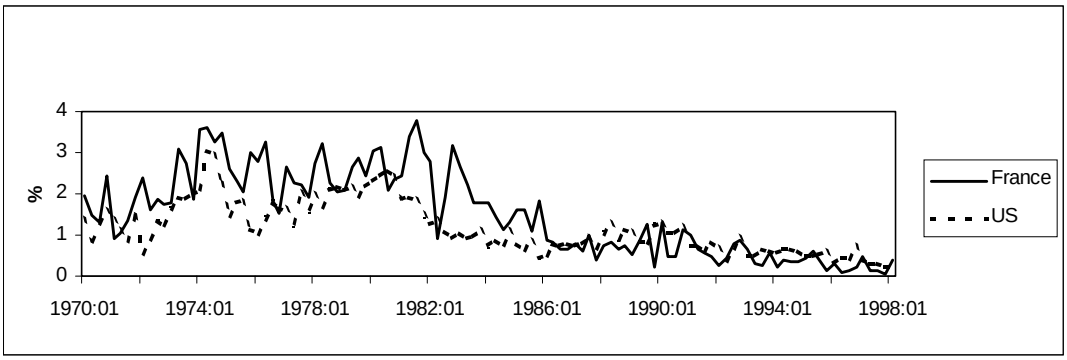


Figure 5 : Inflation Rates

Yet the unemployment responses to this aggregate demand perturbation differ markedly across countries. Figures 6 and 7 show that desinflation is associated with a progressive decline in the American unemployment rate while it coincides with an upward trend in the French unemployment rate.

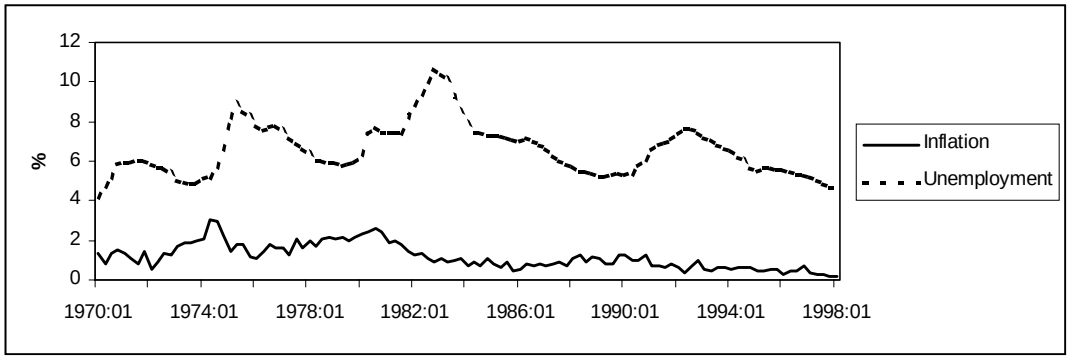


Figure 6 : Unemployment Rate Versus Inflation Rate in US

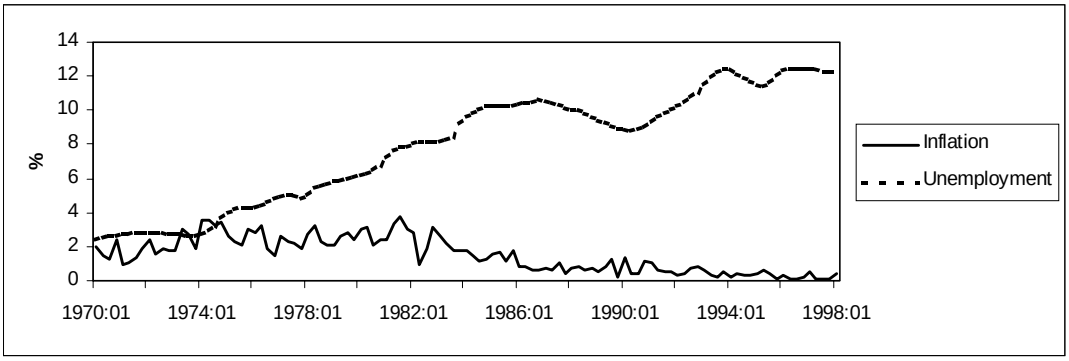


Figure 7 : Unemployment Rate Versus Inflation Rate in France

This evolution is rather puzzling since aggregate demand shocks are not expected to affect the equilibrium unemployment rate. In particular, nominal rigidities such as Taylor (1978) fixed-length contracts are unlikely to be large enough to account for such a persistence in the French unemployment rate. One explanation for this paradox is provided by Blanchard and Wolfers (1999) who stress the fact that the loose monetary policy of the 1970's postponed the adverse effects of the TFP slowdown. Then the tightening of the macroeconomic policy implemented in the 1980's contributed to higher unemployment throughout this decade. Another potential explanation lies in the potential presence of hysteresis effects. According to Blanchard and Summers (1996), temporary demand shocks can have permanent effects on the unemployment rate in contexts where wages are bargained with the objective to save insiders's job. Then by lowering the number of insiders, adverse shocks that lead to increased unemployment are likely to rise the equilibrium wage rate and thereby to have more persistent effects.

This brief overview shows the difficulty to trace back the heterogeneity in unemployment evolution due to differences in the magnitude of aggregate shocks. Potential divergences may then lie in the propagation mechanisms of aggregate perturbations or in the occurrence of other types of shocks. In order to tackle this issue, a SVAR model appears as the best suited approach.

III Identification of shocks

III.1 The Structural VAR approach

In order to identify the two aggregate demand - aggregate supply shocks and the residual orthogonal perturbation, I use the well-known Blanchard and Quah (1989) long-run restrictions. I first estimate the following VAR model (constants and dummies have been

omitted for simplicity) :

$$A(L)\,\Delta X_t = \varepsilon_t$$

where X_t is a (3 x 1) vector including the logarithm of labor productivity yn, the logarithm of the inflation rate π , and the unemployment rate u. $A(L)$ is a k-th order matrix of polynomials in the lag operator L with all its roots outside the unit circle, and ε_t is a vector of zero means identically distributed innovations such that $E(\varepsilon_t \varepsilon_t') = \Sigma$.

The Wold moving average representation of the VAR model is given by :

$$\Delta X_t = D(L)\,\varepsilon_t$$

where $D(L) = A(L)^{-1}$ and $D(0) = I_k$. Since the innovations entering the vector ε_t can be contemporaneously correlated, this vector cannot be considered as a vector of structural shocks. Yet it can be expressed as a linear combination of a vector of structural shocks η_t such as $E(\eta_t \eta_t') = I_3$ (after normalization) :

$$\varepsilon_t = S\eta_t$$

By identifying the (3x3) S matrix, it is then possible to estimate the alternative structural moving average representation :

$$\Delta X_t = C(L)\,\eta_t$$

where $C(L) = D(L)\,S$ and $C(0) = S$. To choose such a unique S, two kinds of relations are used. From $E(\eta_t \eta_t') = I_3$ it follows that $SS' = \Sigma$ and this equation already gives 6 restrictions. The 3 remaining relations derive from the long-run relation $C(1) = D(1)\,S$ and by exploiting the absence of permanent effect of shocks on some variables. Thus three long-run identifying restrictions are to be provided.

III.2 The identifying restrictions

The identification of aggregate supply and aggregate demand shocks are rather standard. The supply shock η_t^S is the only innovation which may have long-lasting effects on the level of all three variables including labor productivity. It typically consists of a technological shock. The demand shock η_t^D may have permanent effects on the level of inflation and unemployment but does not affect the level of labor productivity in the long-run, which already provides one restriction. The two remaining restrictions derive from the residual orthogonal shock η_t^R which has only long-lasting effects on the unemployment rate. This set of identifying restrictions proves to be consistent with a broad class of macroeconomic models.

The supply side of the economy encompasses various growth models adopting a constant-returns-to-scale technology. In such a case, the residual shock may have permanent effects on the unemployment rate and thereby on employment. But it does not affect labor productivity since the output is expected to adjust to the new level of employment in the long run. Besides, demand shocks may have permanent effects on the level of employment and thus on output as in endogenous growth models with variable saving rates. But they do not affect the output-labor ratio which remains constant in the steady state. To that regard, the choice of labor productivity as the variable of interest entering the VAR model instead of output allows me to enlarge the Solow growth model generally used in that context (see Blanchard-Quah (1989) or Gamber-Joutz (1993)).

The demand side of the economy may be represented by the quantity of real money in circulation and typically derives from an IS-LM equilibrium where government spending are ignored. In this framework, the inflation rate can be affected in the long run either by supply shocks (such as a technological or an oil price perturbation) or by innovations to the quantity of money supply. By contrast, unemployment innovations cannot affect the inflation rate in the long run. This restriction follows from the traditional assumption that an accomodating monetary policy is not sustainable in the long-run.

As regards the residual orthogonal shock which captures the fluctuations left unexplained by the two aggregate shocks, it is consistent with a large variety of alternative explanations for unemployment fluctuations. It captures specific labor supply shock or reallocation innovations already analyzed in the VAR context by Dalido-Jimeno (1997) and Jacques-Langot (1993) respectively. But it also accounts for changes in institutional parameters entering the employment and the wage setting process which have permanent effects on unemployment according to the new literature. Surprisingly, that kind of perturbations has never been quantified using a structural VAR approach.

The identifying restrictions finally lead to the following long run VMA matrix :

$$\begin{pmatrix} \Delta yn \\ \Delta\pi \\ \Delta u \end{pmatrix} = \begin{pmatrix} C_{11}(1) & 0 & 0 \\ C_{21}(1) & C_{22}(1) & 0 \\ C_{31}(1) & C_{32}(1) & C_{33}(1) \end{pmatrix} \begin{pmatrix} \eta_t^S \\ \eta_t^D \\ \eta_t^R \end{pmatrix}$$

Note that all three structural shocks are likely to have permanent effects on the unemployment rate. This assumption allows me to test the empirical relevance of hysteresis effects against residual orthogonal explanations.

IV Empirical results

IV.1 Data and VAR estimations

All the data are taken from the OECD base. They are quarterly seasonally adjusted and cover the period 1970:1-1998:4. For both countries the variables used are the level of GDP in 1990 prices (Y), the total employment (N), the consumer price index (P) and the unemployment rate (u). The logarithm of labor productivity is constructed as ln(Y/N)=yn$_t$ and the inflation rate π_t corresponds to ln(P$_t$)-ln(P$_{t-1}$).

The empirical model described below assumes that all variables entering the VAR model are stationary. Thus the estimation strategy of the paper critically depends on the correct differencing of each time series. To this end, I run the traditional battery of ADF and KPSS tests which are reported in table 1 and table 2. Note that in the case of ADF test, the null hypothesis describes a non-stationary process while it corresponds to the assumption of stationarity under the KPSS test.

Table 1 : Unit Root Tests for U.S

Series	Lags	ADF $\tau_{\mu 5\%} = -2.89$	ADF $\tau_{\tau 5\%} = -3.45$	$KPSS$ $\tau_{\mu 5\%} = 0.46$	$KPSS$ $\tau_{t5\%} = 0.14$
u	2	-2.44	-3.06	0.53	0.42
π	1	-2.51	-2.49	2.80	0.36
yn	1	-1.29	-1.18	3.83	0.43

Table 2 : Unit Root Tests for France

Series	Lags	ADF $\tau_{\mu 5\%} = -2.89$	ADF $\tau_{\tau 5\%} = -3.45$	$KPSS$ $\tau_{\mu 5\%} = 0.46$	$KPSS$ $\tau_{t5\%} = 0.14$
u	2	-1.16	-2.03	2.17	0.29
π	1	-0.46	-3.30	1.73	0.27
yn	1	-1.73	-2.60	3.75	0.60

These preliminary ADF and KPSS tests provide convergent conclusion and imply that labor productivity, inflation and unemployment are all integrated of degree 1. It is however well known that linear unit roots tests never provide sharp discrimination between the hypothesis of stationarity and non-stationarity. In particular, the ADF test has been criticized by P. Perron (1990) who argues that it cannot distinguish a stationary process around a broken trend from a differenced stationary process.

This consideration is particularly acute in the case of inflation since a sharp change in the monetary policy occurred during the early 1980's. It is then necessary to check that the

inflation rate is not over-differenced, leading eventually to an underestimation of nominal demand shocks. To this end, I use the Zyvot-Andrews (1992) test which endogenously calculates the breakpoint in the trend function. The null hypothesis of the test is that of non-stationary series against a stationary process with a break in the deterministic trend. The procedure calculates the breakpoint which gives the most weight to the trend-stationary alternative hypothesis by maximizing the t-statistics. Tables 3 reports the results of the tests at the 5% level with the estimated breakpoints. In each country the null hypothesis of a unit root process cannot be rejected.

Table 3 : Zyvot-Andrews test for a break-trend in inflation rates

Countries	Lags	C (-5.02)	$C+T$ (-5.08)
France	1	-3.83 (1983:3)	-3.29 (1983:3)
United States	1	-3.52 (1976:2)	-4.28 (1981:1)

A supplementary key issue is raised by the times series properties of the American unemployment rate. The assumption that it follows a stationary process has been supported by various articles such as Blanchard-Quah (1989) and Evans (1989). But generally the sample period goes back to 1950 and does not integrate the important unemployment variations of the nineties. Besides, the evidence of the presence of a unit root in the American unemployment rate is consistent with Hénin and Jobert results (1993) and more recently with Caner and Hansen (1998) findings.

To summarize, I estimate for each country a system in $(\Delta yn, \Delta\pi, \Delta u)$ which contains constants and price control dummies. The optimal VAR lag-length is derived using the AIC and BIC criteria leading to a choice of three lags and four lags in the American case and the French case respectively. By using the Johansen's procedure (1988), I finally check that there is no cointegrating relations between the variables.

IV.2 Impulse-responses analysis

The dynamic effects of aggregate demand shocks, aggregate supply shocks and residual innovations are reported through Figure 8 to Figure 10. They describe the impulse response functions (IRF) of productivity, inflation and unemployment to an innovation in each shock equivalent to a 1% point rise. The vertical axe denotes deviations from the initial values while the horizontal axe denotes time in quarters. Solid lines represent point estimates of variables response. Dotted lines depict approximate 90 percent confidence intervals computing 1000 bootstrap replications (using Runkle procedure (1987)).

A bootstrap simulation is preferred to a Monte Carlo procedure since some residuals are not normal.

(*i*) The dynamic effects of a one-unit *aggregate supply shock* in each country are characterized in Figure 8. As expected supply disturbances have a positive impact on the level of labor productivity which reaches a peak after one year. Thereafter this effect vanishes progressively, the level of labor productivity stabilizing eventually at a 1 percent higher level. The technological shock leads to a decrease in the growth rate of prices which is not really significant (the responses of prices in level are likely to be stronger).

To a qualitative point of view, the response patterns of unemployment are similar across countries and are mirror image of labor productivity responses. The unemployment rates steadily decrease during roughly six quarters and eventually stabilize at a new lower steady state level. The negative impact of supply perturbations on unemployment is suggestive of the existence of real rigidities. Real wages do not immediately adjust to changes in the productivity growth rate, triggering an increase in labor demand and in employment. The fact that unemployment rates do not recover their initial steady states provides further evidence of the existence of hysteresis effects as suggested by the "insiders-outsiders" model of Blanchard-Summers (1986).

However the quantitative impact of aggregate supply shocks on unemployment much differs across countries. First the interval confidence shows that the French unemployment response is not really significant in the short run. Second the initial response and the long run impact are twice as important in the United States as in France. The decrease in unemployment is of 0.7 percent in the USA and of 0.3 percent in France. Thus explanations of unemployment fluctuations based on supply factors appear much more relevant in the American case.

(*ii*) The dynamic effects of *aggregate nominal demand shocks* are characterized in Figure 9. The most striking divergence across countries comes from the unemployment response to nominal innovations. In both countries unemployment initially decreases as predicted by the AD-AS theoretical framework. But the interval confidence lines clearly indicate that the effects of nominal shocks on the French unemployment rate are not significant at all. By contrast, positive demand innovations sharply decrease unemployment in the United States and have cumulative effects over time. The American unemployment rate plunges down and reaches a minimum of minus 1.25 percent after one year. In the long run, the American unemployment rate decreases by 1 percent.

This sharp difference reveals the existence of nominal rigidities in the United States as opposed to the French case. The main plausible explanation for the low impact of nominal

shocks in France is that wages immediately adjust to the new inflation rate in this country (within a quarter) whereas wage adjustments are more sluggish in the United States. This result is consistent with various econometric studies such as Bruno-Sachs (1985) or Cahuc-Zylberberg (2000) who estimate the lagged inflation values in a standard Phillips curve. This result is traditionally explained by the fact that wage contracts last three years in the United States while they are renegotiated every year in France.

Concerning the inflation rate, it rapidly decreases after the initial perturbation but reaches a new steady state which stands above the previous one. Thus demand shocks have long run effects on the growth rate of prices. This result is consistent with the previous identification of inflation as a variable integrated of degree 1.

(*iii*) The response patterns of each variable to the *residual orthogonal shock* are reported in Figure 10. This shock has sharp effects on unemployment which steadily rises in each country. Thus the residual shock is likely to capture all residual innovations which have contributed to the rise in unemployment during the last three decades. Yet if the qualitative impact of the residual shock on unemployment is similar across countries, the magnitude of unemployment responses is much more important in France than in the United States. At the peak response (after one year) the unemployment coefficient is 3 in France whereas it merely approaches 2 in the United States. Thereafter, the French unemployment rate stands at a 2.8 percent higher steady state level compared with 2 percent in the United States. Thus the residual shock has much stronger cumulative effects in France than in the United States. And the French unemployment rate quantitatively reacts much more to this residual perturbation than to aggregate demand and aggregate supply shocks. Thus traditional aggregate shocks poorly explain the rise in French unemployment compared with the alternative orthogonal perturbation.

Finally, one may remark that inflation rates react positively to the rise in unemployment rates. This evolution is very consistent with the prolonged expansionary monetary policy implemented by both countries during the 1970's in order to cope with the initial rise in unemployment.

Figure 8 : Response functions to an Aggregate Supply Shock

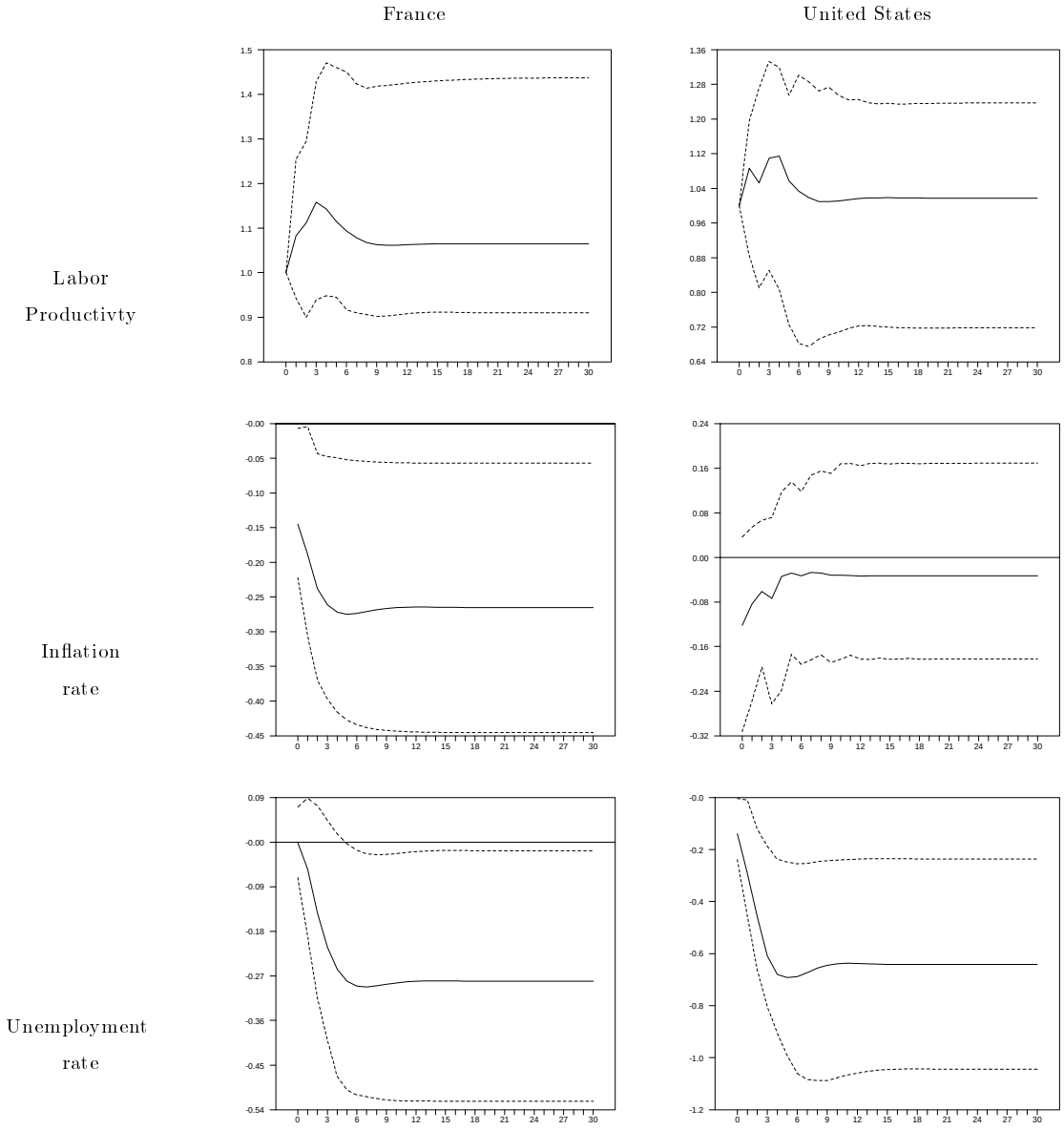


Figure 9 : Response functions to an Aggregate Demand Shock

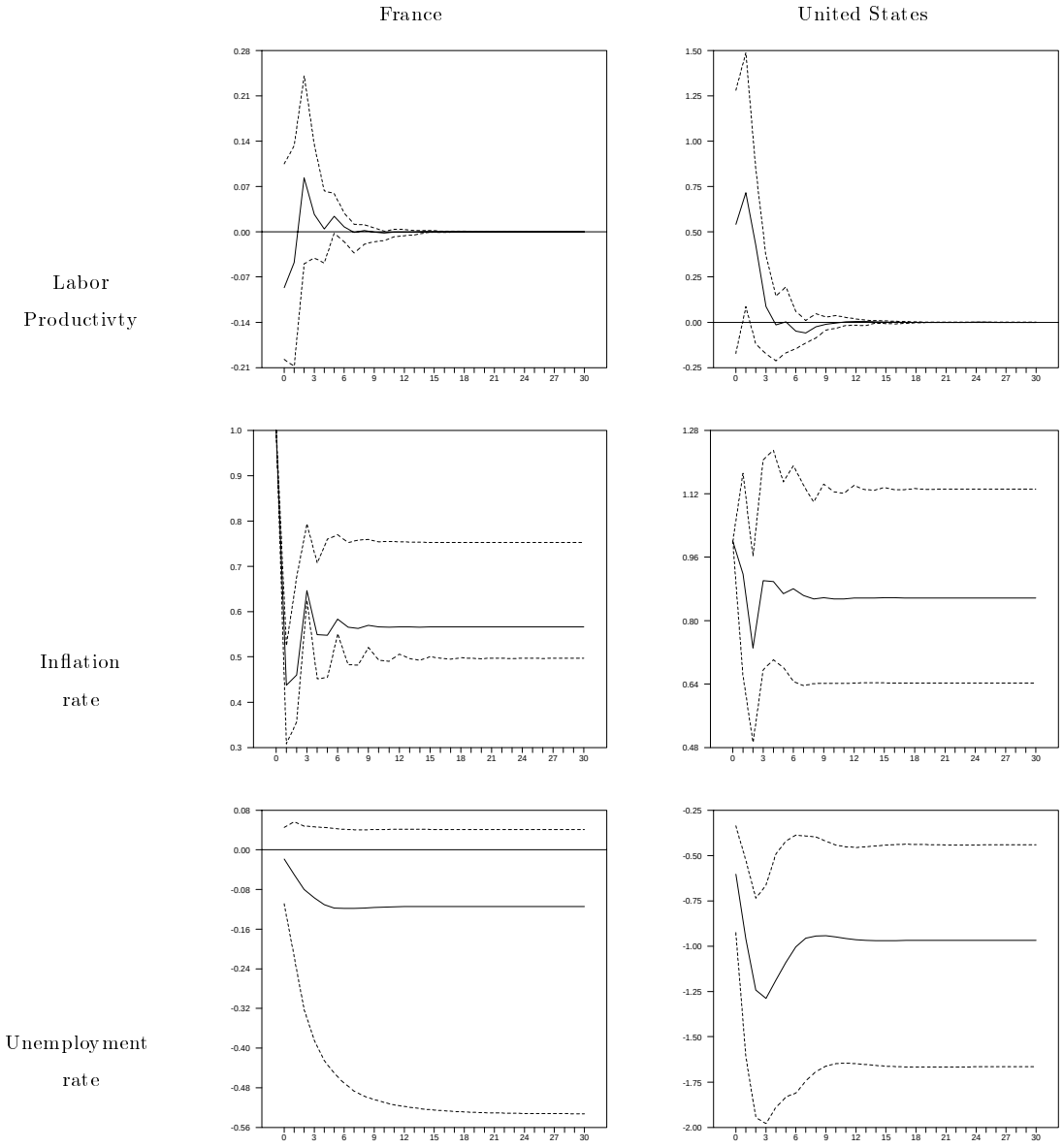
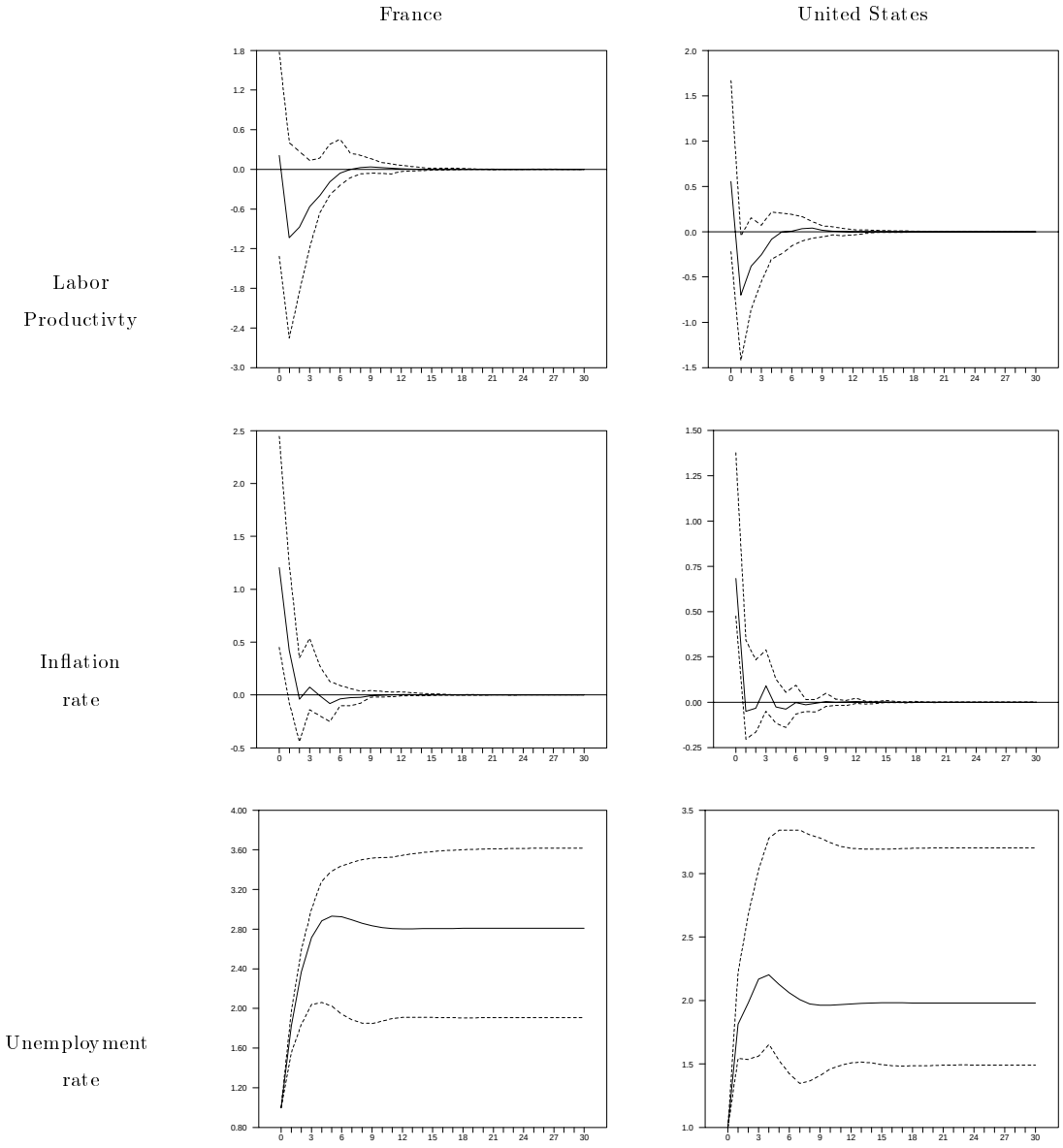


Figure 10 : Response functions to the Residual Shock



IV.3 Variance decomposition

I now turn to the analysis of the contribution of each structural shock to the variance of the k-quarter ahead forecast error for each endogenous variable. Tables 4-6 give the forecast error variance decomposition (FEVD) for the level of labor productivity, inflation rate and unemployment respectively.

Table 4 : FEVD Labor productivity

Periods ahead	Supply Shock		Demand Shock		Residual Shock	
	USA	France	USA	France	USA	France
1	80.5	83.8	9.9	5.4	9.6	10.8
4	85.2	88.1	6.3	2.1	8.5	9.8
8	90.7	92.9	3.3	0.7	6.0	6.4
∞	98.4	99.0	0.6	0.1	1.0	0.9

As regards labor productivity, supply shocks account for 80 % of its variance in the short-run and near 100% in the long-run. Demand shocks and residual perturbations have a slight contribution in the short run but they lose any importance in the long-run, in agreement with the identifying restrictions.

Table 5 : FEVD Inflation

Periods ahead	Supply Shock		Demand Shock		Residual Shock	
	USA	France	USA	France	USA	France
1	8	8.9	73.9	81.1	18.1	10
4	6.4	10.5	82.7	80.6	10.9	8.9
8	5.5	13.5	88.1	80.3	6.4	6.2
∞	4.7	17.4	93.2	80.6	2.1	2.0

Concerning the inflation rate, demand shocks account for most of its variations in the long-run in both countries. But in the short run, the relative contribution of shocks differs

across the United States and France. In the former country the residual shock accounts for almost 18 percent of inflation variations during the first quarter while this contribution amounts to 10 percent in the latter country. Thus in the short run, the Phillips trade-off between inflation and unemployment appears much more relevant in the United-States than in France.

Table 6 : FEVD Unemployment

Periods ahead	Supply Shock		Demand Shock		Residual Shock	
	USA	France	USA	France	USA	France
1	20.7	14.3	48.1	14.2	31.2	71.5
4	35.0	18.2	41.6	11.7	23.4	70. 1
8	41.5	24.6	39.2	8.4	19.3	67.0
∞	47.4	28.5	35.1	5.3	17.5	66.2

The most contrasted results are related to the unemployment variance decomposition. While the main unemployment fluctuations are driven by adverse aggregate shocks in the United States, they are overwhelmingly dominated by the residual perturbation at all horizons in France.

In the United States, short-run unemployment fluctuations are mainly due to innovations to aggregate demand. Within a quarter demand shocks account for half of the variance of American unemployment. Their share progressively decreases but they still account for 35 percent of unemployment variance in the long run. Similarly the residual innovation contributes to nearly 31 percent for the one-quarter ahead variance of unemployment. But this proportion sharply decreases to 17.5 percent in the long-run. By contrast, the contribution of aggregate supply innovations to the forecast error variance for American unemployment steadily increases over time. Within a quarter, they only account for 20 percent of the unemployment variance. But eight quarters ahead, aggregate supply innovations account for the main part of unemployment variance (41 percent). In the long run half of the unemployment fluctuations are driven by technological shocks which is consistent with the traditional AD-AS prior.

The contrast with the French unemployment decomposition is quite striking. The residual orthogonal shock dominates unemployment fluctuations at all horizons. This is true for the one-quarter ahead variance where such innovations account for 71.5 percent of unemployment fluctuations. This is still true in the medium-run and the long-run since

the proportion of unemployment variance due to the residual shock stands at 66 percent. The contribution of supply innovations to unemployment fluctuations steadily increases over time from 14.3 percent to 28.5. The more surprising stylized fact is the very low contribution of aggregate demand innovations to French unemployment variations. Their share on the forecast error variance decomposition for unemployment never goes beyond 15 percent and nearly amounts to 5 percent in the long-run.

These findings deserve several comments. The results concerning the American unemployment fluctuations are consistent with a large set of previous studies. In particular, they are close to Blanchard and Quah (1989) findings. In the United States, aggregate demand perturbations have a major impact on short-run and medium-run unemployment fluctuations while supply shocks dominate in the long-run. Thus the present variance decomposition gives further support to the assumption that the American labor market is characterized by large nominal rigidities and the existence of a Phillips curve. Finally, the fact that the residual orthogonal shock contributes to the lower part of unemployment fluctuations implies that the Aggregate Demand - Aggregate Supply theoretical framework is well suited for the American labor market.

However, this article gives empirical evidence that the traditional AD-AS framework does not satisfactorily match the French labor market. Furthermore it points out that nominal demand shocks do not matter everywhere. By combining the contribution of supply and demand innovations, I find that they jointly account for no more than one third of unemployment variance in the long-run. The remaining two third percent of French unemployment variations is captured by the residual orthogonal shock. Thus France and the United States neither differ in the magnitude of aggregate shocks nor in the propagation mechanism of such perturbations. But the French unemployment rate seems to be more sensitive to specific labor market structural shocks. The last section suggests potential interpretation for these residual perturbations.

V Economic interpretation of the residual shock

This section aims at giving economic interpretations for the residual shock. To this end I decompose the historical evolution of unemployment into its three structural components[1]. The contribution H_u^R of the residual shock to unemployment history is isolated. I then calculate the correlation of this residual component with variables which are likely

[1] Formaly, the growth rate of unemployment can be decomposed into :

$$\Delta u_t = \mu + C_{31}(L)\,\eta_t^S + C_{32}(L)\,\eta_t^D + C_{33}(L)\,\eta_t^R$$

to capture the main alternative explantations of unemployment fluctuations[2]. Among the non-exhaustive list of orthogonal perturbations, one may point out the contribution of specific employment innovations such as labor supply or reallocation shocks and the responsibility of institutional changes in the wage-setting process such as a rise in the replacement rate.

Figures 11a and 11b plot the historical contribution of each shock in France and in the United States. The whole visual impression suggests that the supply component largely dominates the rise in American unemployment rate while the residual component is the main culprit for high unemployment in France during the 1980's.

In both countries, supply shocks contribute positively to unemployment fluctuations over the whole period as the two economies were successively hit by the oil price crisis, the TFP growth slowdown and the rise in interest rates. The positive supply contribution to American unemployment variations is close to Blanchard-Quah (1989) historical decomposition. In France, the only period where supply shocks largely dominate the rise in unemployment corresponds to the increase in interest rates in the late 1980's. This evolution gives support to Fitoussi and Phelps (1988) analysis on the positive impact of interest rates on the French unemployment rate.

The demand component negatively contributed to unemployment variations during the 1970's as a loose monetary policy was implemented in France and the United States. As advocated by Blanchard and Wolfers (1999) this macroeconomic policy is likely to have delayed the negative supply effects of that period. In France, nominal perturbations started to contribute positively to unemployment variations in the aftermath of Mauroy's government and with the implementation of the *franc fort* policy .

Concerning the residual component of unemployment fluctuations, it largely contributed to the rise in the French unemployment rate while its effects are approximately mean-zero along the period in the United States. In France, this high contribution takes place in the 1980's at a time of buoyant labor market reforms under left-hand governments (1981-1986). Thus the high share of the residual component helps explaining the upward trend in French unemployment rate during the eighties while the American unemployment rate started to recover by this time. Eventually, H_U^R started to decrease in the late

The historical contribution of the structural shock i to the evolution of unemployment u_t is thus :

$$H_{ut}^i = \sum_{j=1972:1}^{t} C_{3i,t-j}\eta_{t-j}^i \qquad i = S, D, R$$

[2]I do not directly calculate the correlation with the residual orthogonal shock since it behaves as a withe-noise and is unlikely to be correlated with key labor market variables.

1980's with the progressive deregulation of the French labor market. This evolution seems then consistent with the path of institutional labor market reforms in France. Yet the residual component is likely to catch various effects and it is an uneasy task to give it a visual interpretation. I then provide some explanations based on correlations between the residual component and key labor market variables. This analysis is provided for the French case only because of the lack of institutional data concerning the American labor market[3].

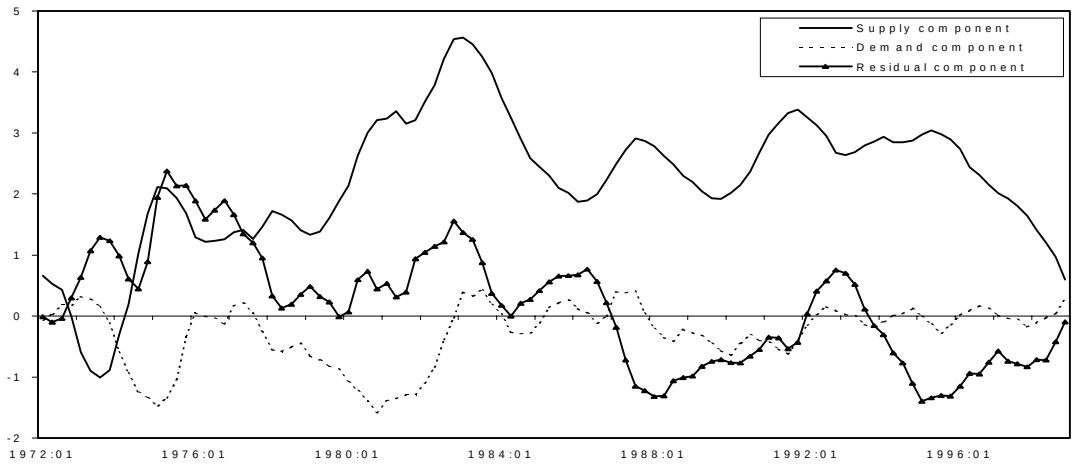


Figure 11a : Historical contribution of structural shocks to American unemployment variations (in %).

Figure 11b : Historical contribution of structural shocks to French unemployment variations (in %)

I first calculate the correlation between the residual component H_U^R and the participation rate lf which captures labor supply innovations. Results are reported in Table

[3]The correlations are calculated from 1972:1 to 1996:4.

7. The correlation is pretty weak since the participation rate has remained constant over the whole period (see Figure 2).

Alternative explanations based on mismatch perturbation is taken into account. This concern is linked to the large consensus about the contribution of unskilled workers to the high structural unemployment in France. I calculate the correlation between the residual component H_U^R and a mismatch indicator (see Appendix) [4]. Table 7 displays a significant correlation, giving an econometric support to explanations based on mismatch imperfections. In that perspective, the methodological approach of this paper has a value added compared to previous SVAR models. In order to quantify the weight of reallocation shocks compared to aggregate perturbations, Blanchard-Diamond (1989) and Jacques-Langot (1993) estimated a system in job vacancies and unemployment on American and French data respectively. The share of reallocation perturbations proves to be weak in their model. But this result is certainly linked to the fact that they do not take into account the heterogeneity between skilled and unskilled workers.

Finally I turn to the correlation between the residual component H_U^R and the variable which plays the main role in new unemployment theories : the replacement rate of unemployment benefits z[5]. In the WS-PS framework, a rise in the replacement rate pushes up wages and thereby unemployment by increasing outside opportunities in the wage bargaining process. This theoretical analysis has been comforted by empirical studies on the importance of real rigidities in European labor markets compared to the United States. In particular, Nickell (1997) put the emphasis on the great stability of the American institutional setting while French labor market characteristics have undergone major changes during the last three decades. To that regard, the replacement rate of unemployment benefits is a textbook example. According to OECD (1999), the American replacement rate has always been stable around 12 percent during the whole period. By contrast the French one remained stable around 25 percent during the 1970's before steadily increasing by 30 percent from 1980 to 1990 and by 15 percent from 1990 to 1998.

However previous econometric studies have difficulties in quantifying the impact of such a real rigidity on unemployment. Two approaches are traditionally used. Either small quasi-structural econometric models composed of price-setting and wage-setting equations are estimated. But Manning (1993) stressed the identifying problems attached to this method. Or cointegration relations are estimated in the context of a VECM model between the unemployment rate and the replacement rate. This method is followed by

[4] This indicator calculates the half variance of unemployment rates by skills. It is based on Jackman, Layard and Savouri (1991) methodology and is constructed by L'Horty and Rault (1998) on French data.

[5] A large number of other institutional variables are likely to play a role in the residual component of unemployment history. But either they are not avaible or their correlations are not significant.

L'Horty and Rault (1999) who found no evidence of the existence of such a relation in France. However this result is likely to be linked to the methodological approach since finding a long-run stable relation between the unemployment rate and the replacement rate seems too strong a hypothesis.

By contrast, this paper gives an original approach for quantifying the impact of the replacement rate on unemployment fluctuations. Its correlation with the historical residual component appears rather significant. Furthermore the replacement rate better explains the evolution of H_U^R than others institutional parameters often blamed for high unemployment such as the growth rate of the minimum wage $\Delta \bar{w}$[6]. Yet this analysis of the residual component of unemployment history leaves room for further investigations[7].

Table 7 : Correlations with the residual component of unemployment history H_U^R in France

Corr (H_U^R, *replacement rate*)	0.44
Corr (H_U^R, *mismatch*)	0.41
Corr (H_U^R, $\Delta \bar{w}$)	0.07
Corr (H_U^R, *labor force*)	-0.05

VI Conclusion

This paper has reconsidered the relative contribution of aggregate demand shocks and aggregate supply shocks to unemployment fluctuations. To this end a structural VAR containing the growth rates of labor productivity, inflation and unemployment has been estimated on American and French data over the sample 1970:1 - 1998:4. By using long-run identifying restrictions, the unemployment rate has been allowed to be permanently affected by a supplementary residual shock which captures the unemployment fluctuations left unexplained by the standard Aggregate Demand-Aggregate Supply framework.

The main results of the paper can be summarized as follows. I find that while the residual shock is not significant in the United States, it drives the main part of the French unemployment fluctuations at all horizons. This result suggests that the Aggregate demand-Aggregate supply framework is well fitted for the United-Sates but poorly

[6] I use the growth rate of the minimum wage in order to avoid potential spurious correlations since this variable is not stationary in level.

[7] A issue of interest is the correlation between the residual contribution of unemployment history and the OECD job protection index. Unfortunatly, this index is provided only in annual form.

explains the French labor market. Besides it reveals that the trend in the French unemployment is not brought about by more persistent effects of supply and demand shocks in this country. This finding is opposed to the Blanchard-Summers (1986) seminal prior that European labor markets display more hysteresis features than the United States. More generally it challenges the conventional wisdom that the heterogeneity in unemployment experiences lies in the magnitude of the aggregate shocks or in difference in their propagation mechanisms. Second the paper reveals the difference in the employment setting and the wage setting process across countries by stressing the very low impact of nominal demand shocks in France compared to the United States. This result provides further support to the existence of a Phillips curve in the United States while the wage-setting process seems better matched by a wage curve in France. Finally this article shows that the main contribution of the residual shock to French unemployment history takes place at a time of buoyant labor market reforms during the eighties. These findings call for future research focusing on direct shocks to labor market characteristics.

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VII Appendix

1. The replacement rate (in Percentage).

   The series is provided by the French Social Security UNEDIC and gives the ratio between total employees compensation and the total level of unemployment benefits.

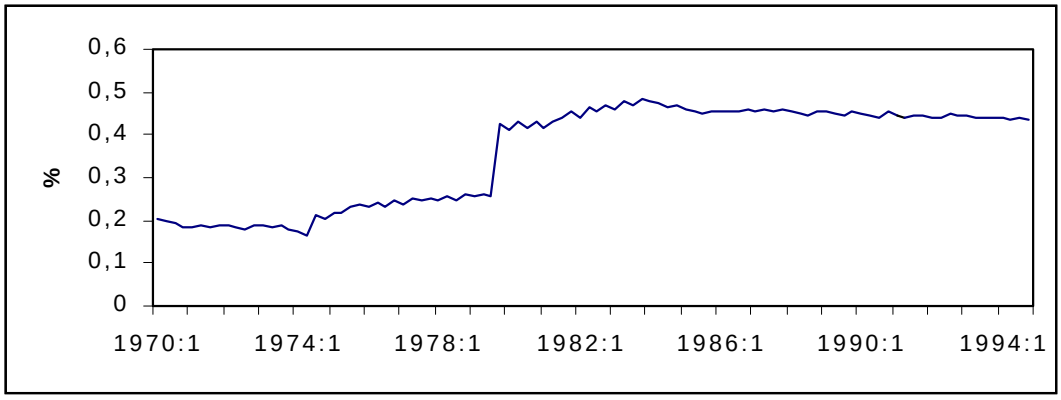

Figure 11 : Replacement rate

2. Growth rate of minimum wage (in Percentage).

   This variable can be considered as a proxy of the union bargaining power. It corresponds to the growth rate of the minimum wage deflated by the consumer price index.

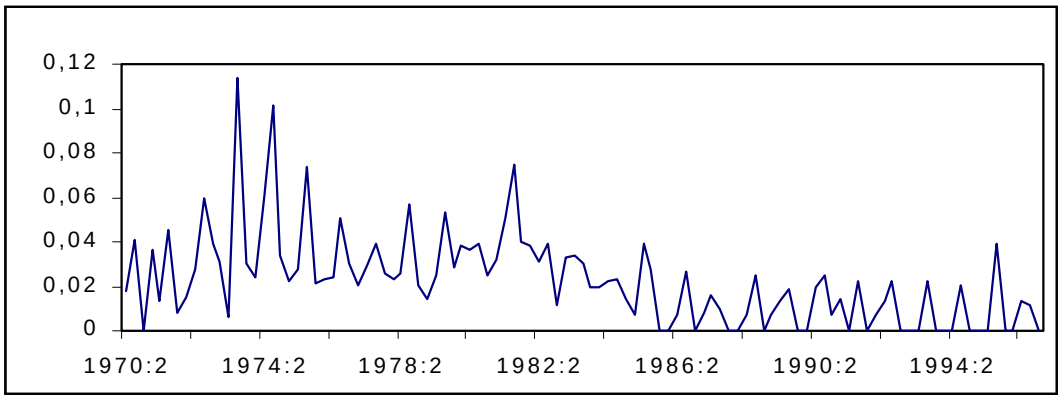

Figure 12 : Growth rate of the minimum wage

3. Mismatch indicator (in Percentage).

   This variable is an indicator of the half variance of unemployment rates by skills. It is based on Jackman, Layard and Savouri (1991) methodology. It is constructed by L'Horty and Rault (1994) on French data.

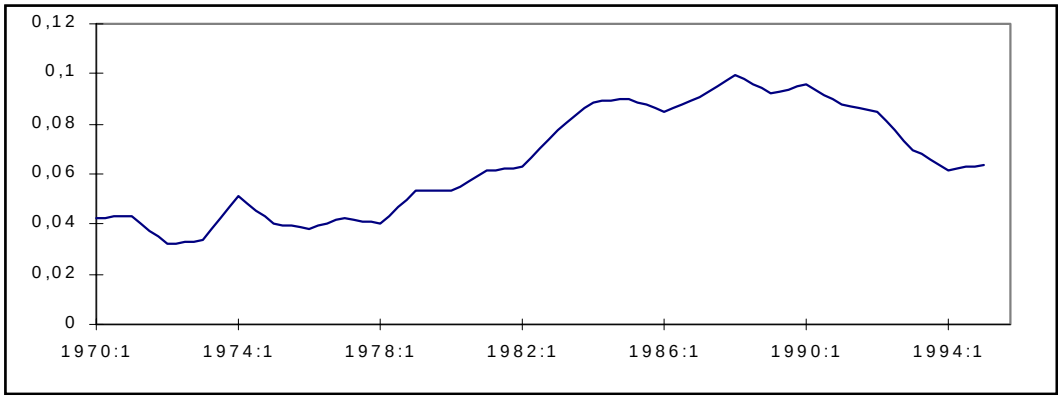

Figure 13 : Mismatch Indicator