# Distribution and Growth in France (1982-2006): A Cointegrated VAR Approach

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# DISTRIBUTION AND GROWTH IN FRANCE (1982-2006): A COINTEGRATED VAR APPROACH[1]

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*Abstract: In this article, we propose a simple Post Keynesian model so as to test whether French economy is wage or profit-led i.e. whether a wage share increase has a negative or positive impact on economic growth. In that perspective, we estimate econometrically the three behaviour equations of our model (consumption, investment and net exports equations) by using a VECM. Once these equations estimated, we solve our model by using the estimated coefficients and can then conclude on the nature of the French economic regime. Our main conclusion is that French economy would be profit-led. However, although an increase of wage share would have a negative impact on economic growth, this negative impact is very weak, as a one point increase of profit share increases economic growth of only 0.1 %.*

*According to our econometric analysis, wage share increase has a positive impact on consumption and no significant direct effect on the balance of trade. Nevertheless, imports are very sensitive to any output increase, which implies a strong negative impact on the multiplier. Moreover, as the accelerator coefficient (in the investment equation) is not very important, the positive effect of a wage share increase on capital accumulation through consumption is not strong enough to outweigh the negative impact of a wage share increase on investment, consecutive to the decline of profitability. Finally, these two elements –weak accelerator and multiplier effects– well explain why any support of consumption through a wage increase would not have a positive and important impact on French economic growth nowadays. Symmetrically, no positive effect of a wage austerity policy on growth must be expected.*

## 1. Introduction

The question of the impact of a wage increase on output and growth is a very old one in the Keynesian tradition. Many Post-Keynesian authors (Rowthorn [1981], Dutt [1984], Bhaduri and Marglin [1990], Lavoie [1992]) have tried to show that the relation between level of activity and income distribution was not clear cut. Income distribution (between wages and profits) determines output through its respective effects on both investment and consumption behaviours. Let us suppose an increase of profit share in total value added: this is likely to raise investment by firms but, in the same time, it will have a negative impact on consumption

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by households. If the first effect is more important than the second one, the regime is exhilarationist. On the contrary, if the negative effect on consumption (we could also say: the positive effect on saving) outweighs the positive effect on investment, the regime is stagnationist. More generally, an economy in which a profit share increase improves economic growth is said profit-led. Otherwise, it is said wage-led.

Many empirical studies tried to asses if real economies were rather profit-led or wage-led (Bowles and Boyer [1995], and, more recently, Naastepad and Storm [2006], Ederer and Stockhammer [2007] or Hein and Vogel [2007]). The present paper belongs to this strand of analysis and focuses on French economy over the period 1983-2006. The contribution of this work is mainly methodological: at the econometric standpoint, we use a vector error correction model (VECM), which allows us:

- On the one hand, to estimate conjointly the macroeconomic behaviour equations of a simple Keynesian model (that we present in a first stage).
- On the other hand, to asses equations with variables in level and not in growth rate, which is expected to bring a stronger robustness to our results.

According to this analysis, French economy would have been profit-led over the period 1983-2006. However, although an increase of wage share would have a negative impact on economic growth, this negative impact remains very moderate. The growing openness of the French economy over the period does not seem to have a crucial impact on the nature of the economic regime, which is better explained by the low accelerator effect in the investment function of the model. At last, if we cover the period 1978-2006, results are less clear cut and more unstable, which could reveal the existence of a structural break around this period.

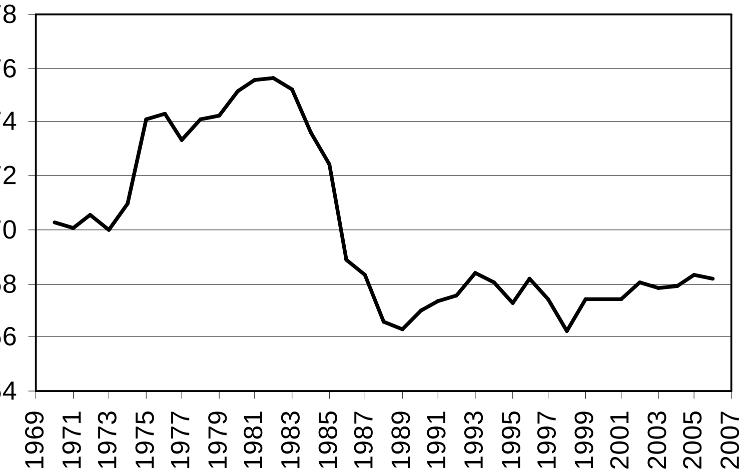
The article is built as follows. In the second section, we briefly present the economic situation of France since 1970. In the third section, we present a Keynesian model which includes equations for consumption, capital accumulation and net exports "behaviours" at macroeconomic level. This very simple theoretical frame constitutes the basis of the econometric analysis that we lead thereafter. In section 4, we present the data used in the econometric part. Section 5 presents the main stages of our VECM analysis. Results are reported in section 6. Section 7 is devoted to the issues raised by our VECM approach and its results. At last, we conclude.

## 2. Presentation of the economic situation of France since 1970

Since 1970, France experienced very important fluctuations of income distribution, as figure 1 (displaying wage share in total value added of non financial enterprises) highlights it.

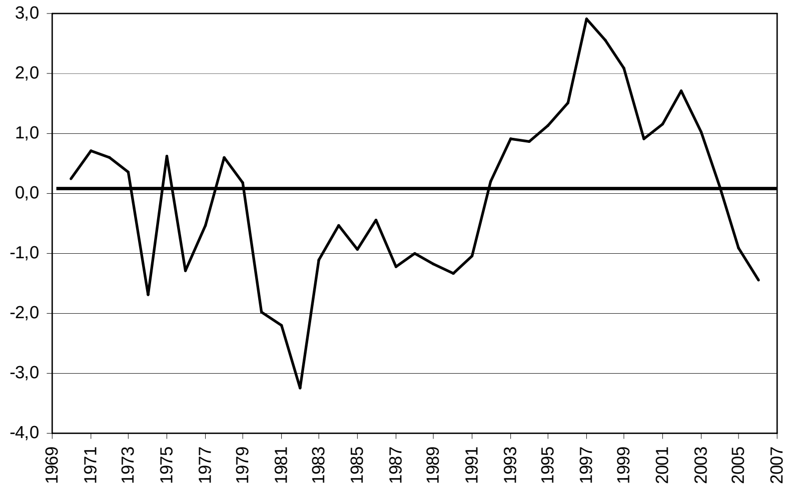
During the 1970s, the slowdown of labour productivity growth had not been taken into account during wage negotiations (Bruno and Sachs [1985]) so that wage share increased of almost 6 points of percentage between 1973 and 1982; in the same time, unemployment rate increased up to 6 %. After an unsuccessful Keynesian policy in 1981-1982, a policy of wage austerity had been implemented (*competitive disinflation* policy): the objective was to restore profitability and competitiveness of firms. Wage share did decrease during the 1980s and stabilised in the 1990s at around two points below its level of 1970.

**Figure 1. Wage share in value added (at factors price) of non financial enterprises (%). France, 1970-2006. Source: National Accounts, INSEE, Basis 2000.**




Wage austerity is likely to have had a positive effect on French balance of trade, at least until the beginning of the 2000s (figure 2).

**Figure 2. Balance of trade on (current) GDP (%). France, 1970-2006. Source: National Accounts, INSEE, Basis 2000.**




However, the large profit recovery did not come along with a durable (although expected) takeoff of capital accumulation: if we except the period 1987-1990, investment by firms has been remaining pretty weak for twenty years, as it is shown on figure 3. Finally, unemployment rate has never fallen below 8 % since 1985 in France (with two peaks at 12.5 %, in 1993 and 1997).

It seems obvious that income distribution is a key variable to understand economic dynamics that France has experienced for thirty years. This is the reason why it seemed to us crucial to study the relation between economic growth and income distribution, especially by analysing the impact of wage share (or, symmetrically, profit share) on consumption, investment and competitiveness respectively.

**Figure 3. Net capital accumulation rate of non financial companies (incl. unincorporated firms). France, 1970-2006. Source: National Accounts, INSEE, Bases 95 and 2000.**


The theoretical framework that we present in the next section should allow to answer these questions.

## 3. From the theoretical to the econometric model

In this model, all parameters are assumed positive.

We suppose an open economy with two kinds of agents, workers and capitalists, which are characterised by different incomes (respectively wages and profits) and different propensities to consume this income. Macroeconomic consumption behaviour is thus given by:

$$C = c_w W + c_p P \tag{1}$$

where W is the payroll, P, the total profits, $c_w$ and $c_p$, the propensities to consume of workers and capitalists respectively, with $c_w > c_p$. As $Y \equiv W + P$, equation (1) can be rewritten as:

$$C = c_w Y + (c_p - c_w)P \tag{2}$$

The capital accumulation function has two explicative variables: the profit rate $r = P/K$ (where $K$ is the capital stock in the economy) and the variable $z = Y/K$ (Taylor [2004]) which captures a demand effect. If we suppose a Leontief production function as $Y = \min[L/\phi; K/\sigma]$, $z$ is the utilisation rate of capacity utilisation. We thus have:

$$\frac{I}{K} = \gamma_0 + \gamma_1 z + \gamma_2 r \tag{3}$$

Concerning the profit rate *r,* note immediately that:

$$r = \frac{P}{Y}\frac{Y}{K} = \pi z \tag{4}$$

where $\pi$ is the profit share in national income.

We suppose that exports are positively related to the foreign output ($Y^f$) and negatively related to the real exchange rate $e$ (an appreciation of real exchange rate increases $e$). Symmetrically, imports (M) positively depend on both domestic income $Y$ and real exchange rate. We also suppose that imports and exports may be affected by the income distribution, even though the sign of this effect is not clear cut: on the one hand, as suggested by Bowles and Boyer [1995], a higher profit share can induce higher R&D, higher innovation and eventually better competitiveness (positive correlation). Nevertheless, according to Blecker [1998], international competition may compel firms to reduce the mark-up that they set on their relative unit labour cost, so as to improve their international competitiveness (negative correlation). In that second perspective, a smaller profit share involves a depreciation of the real exchange rate (as long as the unit labour costs remain unchanged): thus income distribution may also affect balance of trade through its impact on the real exchange rate (Hein and Vogel [2007]). This explains why we introduce both real exchange rate and profit rate in our balance of trade equation. Note at last that we retain neither the usual multiplicative functions for imports and exports nor the logarithmic additive formulation, for sake of consistency with equations (2) and (3). We retain eventually the following equation:

$$\frac{X-M}{K}=\delta_0-\delta_1 z+\delta_2 r-\delta_3 e+\delta_4\frac{Y^f}{K} \tag{5}$$

where the sign of $\delta_2$ is the only parameter of the model which could be negative.

At last, we suppose that government spending is exogenous:

$$G=\overline{G} \tag{8}$$

Finally, equations (2), (3), (4), (5), (6) give the following equations system:

$$\begin{cases}\dfrac{C}{K}=c_w z-\left(c_w-c_p\right)r & (9)\\[2mm] \dfrac{I}{K}=\gamma_0+\gamma_1 z+\gamma_2 r & (10)\\[2mm] \dfrac{X-M}{K}=\delta_0-\delta_1 z+\delta_2 r-\delta_3 e+\delta_4\dfrac{Y^f}{K} & (11)\\[2mm] \dfrac{G}{K}=\dfrac{\overline{G}}{K} & (12)\end{cases}$$

As the profit rate in equation (4) is the product of $z$, an endogenous variable of the model, and $\pi$, which is assumed exogenous, the reduced variables of this model do not depend on $r$, but on $\pi$. We assume that $\pi$ is related to the mark-up set by firms over their unit labour cost. This mark-up actually depends on the one hand on the degree on imperfect competition on the goods market, on the other hand, on the bargaining power of unions during wage negotiations (Blanchard and Giavazzi [2003]).

From the goods market equilibrium $Y/K\equiv C/K+I/K+G/K+\left(X-M\right)/K$ , we can easily determine $z^*$ as a function of exogenous variables of our model:

$$z^*=\frac{\gamma_0+\delta_0-\delta_3 e+\delta_4 y^f+\overline{g}}{\left(1-c_w-\gamma_1+\delta_1\right)+\left(c_w-c_p-\gamma_2-\delta_2\right)\pi} \tag{12}$$

where $y^f=Y^f/K$ and $\overline{g}=\overline{G}/K$ . The denominator of (12) is actually the Keynesian multiplier of the model.

According to Bhaduri and Marglin (1990), the economy is exhilarationist if $\partial z^* / \partial \pi > 0$ and stagnationist otherwise. Thus, in our model, the economy is exhilarationist if:

$$\frac{\partial z^*}{\partial \pi} = \frac{-\left(c_w - c_p - \gamma_2 - \delta_2\right)}{\left(1 - c_w - \gamma_1 + \delta_1\right) + \left(c_w - c_p - \gamma_2 - \delta_2\right)\pi} z^* > 0 \tag{13}$$

From (11), it is easy to show that the regime is exhilarationist if[4]:

$$\left(c_p - c_w\right) + \gamma_2 + \delta_2 > 0 \tag{14}$$

So the nature of the economic regime relies only on the sensitivity of consumption, investment and net exports on profit rate *r*.

An economy is said profit-led if $\partial \hat{Y} / \partial \pi > 0$. At the equilibrium, as $Y=z^*K$, we can easily show that:

$$\frac{\partial \hat{Y}}{\partial \pi} = \frac{\gamma_2\left(1 - c_w - \gamma_1 + \delta_1\right) - \gamma_1\left(c_w - c_p - \gamma_2 - \delta_2\right)}{\left(1 - c_w - \gamma_1 + \delta_1\right) + \left(c_w - c_p - \gamma_2 - \delta_2\right)\pi} z^* \tag{15}$$

At the equilibrium, the output growth rate equals the capital accumulation rate *I/K*, which itself depends on $z^*$ and $\pi$. An increase of $\pi$ has thus two effects on capital accumulation and economic growth: one direct and positive effect and one indirect effect through $z^*$: if the economy is exhilarationist, an increase in $\pi$ boosts $z^*$ which in turns supports investment (accelerator effect). In that case, the two effects are positive and the economy is necessarily profit-led. On the other hand, if the economy is stagnationist, the two effects have opposite signs, so that the economy may be either wage or profit-led.

In this paper, we try to assess whether French economy has been profit or wage-led for the last twenty five years, i.e. we try to know if economic growth, which has been very sluggish over this period, could have been boosted by decreasing or decreasing profit share in total income.

In that perspective, we proceed in two stages:

- In the first one, we estimate equations (8), (9) and (10). As our three explained variables (*C*/*K*, *I*/*K* and (*X*–*M*)/*K*) depend only on four explicative variables: *r*, *z*, *e* and $y^f$ (with *r* and *z* included in the three equations), a vector error correction model (VECM) seems to be a very appropriate econometric method for our estimations. Note immediately that, as we consider that government spending is exogenous (at least we assume that it does not directly depend on variables such as profit share or real exchange rate), the equation (11) is not included in our VECM.
- In the second stage, we just report the values of parameters estimated in the first stage in equations (12), (13) and (14) so as to determine the nature of French economic regime over the period covered by our estimations. The VECM allows us to estimate equations related to macroeconomic behaviours (especially consumption and accumulation behaviours) in which economic variables are kept in level (and not in growth rate) although the corresponding time series are not stationary.

[4] Indeed, we suppose, which will be strongly confirmed by our empirical analysis, that the numerator of $z^*$ is positive.

## 4. Data

For most of our variables, we use data from quarterly national accounts released by INSEE (but also by OECD) for the period 1978 to 2006. The time series of real exchange rate and foreign demand that we have selected come from OECD Economic Outlook database.

It would have been possible to collect data from 1970 to 1978, but these data would have come from an old database (the Basis 80), which exhibits important discrepancies with more recent databases (95 or 2000). Moreover, to our knowledge, no capital data are available for the 1970s period. This is the reason why we gave up the project to lead our econometrics over the period 1970-2006.

To calculate our explained variables, we needed data of net capital. Unfortunately, these data are available only in annual national accounts. Nevertheless, as we disposed of quarterly data for gross fixed capital formation (investment), we managed to build a quarterly capital time series (the only assumption that we needed to add is that annual capital depreciation (fixed capital consumption time series) was equally spread over the four quarters). Our capital time series refers to the volume of net capital of non financial enterprises (but including unincorporated enterprises): the real estate of households is then excluded of our capital time series.

We build $z$ by dividing national GDP (at constant prices) by our capital time series (indeed, we keep the national value added as we think that both investment and consumption behaviours are more related to national income than on corporate enterprises value-added only).

The profit rate is calculated as the product of profit share in non financial enterprises (excluding unincorporated enterprises, for which it is very difficult to distinguish capital from labour remuneration in mixed income) by $z$.

Our consumption time series is households' consumption (at constant prices). Capital accumulation displays investment (at constant prices) in physical capital by non financial enterprises.

As already noted in the previous section, the variable $z = Y/K$ is not equal (in our econometrics) to the sum of our variables $C/K$, $I/K$ and $(X–M)/K$, because we want to focus only on these three main components of demand and consider the others as exogenous. Note that the difference between these two time series includes various elements such as investment by financial companies, consumption or investment by general government or investment of households in real estate.

From a technical standpoint, note that if we had decided to include this "residual" time series in our econometric analysis, we would have had one relation of (perfect) multicolinearity between our variables $Y/K$, $C/K$, $I/K$ and $(X–M)/K$, which would have prevented us to use the VECM methodology.

At last, the results that we present in the next sections cover the period 1982:4 to 2006:4 and not our complete available dataset (from 1978:4 to 2006:4). Indeed, it has been very difficult to get satisfying and stable results over the full period, which could be explained by the fact that the period 1978-1982 was very unstable in France (from an economic standpoint): very high wage-share, very strong trade deficit after the Keynesian policy in 1981, and so on.

## 5. The estimation procedure

Everybody knows that standard techniques, such as ordinary least squares (OLS), entail spurious regression if time series are non-stationary variables. To solve this problem, one possibility is to apply OLS to first-difference series (which are likely to be stationary, i.e. I(0)). But this is not totally satisfying since theoretical models usually rest on variables in level, not in difference.

An alternative solution has been proposed by the Engle-Granger two-stages method [1987]. In the first stage, an OLS regression has to be made on the equation of the variables in levels, and the stationarity of residuals must be tested. If the stationarity hypothesis is not rejected, variables are said "cointegrated" and this equation gives the long-run relationship between these variables. In the second stage, residuals are included as an error correction term in the OLS estimation of the equation in first differences to obtain a short-run relationship. But the Engle-Granger method encounters two important limits. Firstly, it rests on the identification of one cointegration relation, whereas the number of cointegration relations may be greater. Secondly, it applies to a single equation while the objective is often to estimate a system of equations, as it is the case in this article.

For these reasons, we decided to use the Johansen method [1988, 1991] to estimate a VECM. We assume a vector $Z_t$ of $k$ non-stationary I(1) variables that can be represented by a VAR of order $p$:

$$Z_{\mathbf{t}} = A_1\, Z_{t-1} + A_2\, Z_{t-2} + \ldots + A_k\, Z_{t-p} + \Psi\, D_t + \varepsilon_t \qquad (16)$$

where $D_t$ is a vector of non-stochastic variables (intercept, trends, *etc.*) and $\varepsilon_t$ a white noise of dimension $(k \times 1)$. Because the variables forming $Z_t$ are I(1), the system may be reformulated in its error correction form (VECM):

$$\Delta Z_{\mathbf{t}} = \Gamma_1\, \Delta Z_{t-1} + \Gamma_2\, \Delta Z_{t-2} + \ldots + \Gamma_{p-1}\, \Delta Z_{t-p+1} + \Pi\, Z_{t-1} + \Psi\, D_t + \varepsilon_t \qquad (17)$$

Each stochastic component of this new system is I(0), except $Z_{t-1}$ which is I(1). The aim of the Johansen procedure is to find a decomposition of the $\Pi$ matrix, i.e. $\Pi = \alpha\beta'$ such as $\beta' Z_{t-1}$ is stationary. The number of cointegration relations is given by the $\Pi$ matrix rank. The coefficients of $\beta'$ are associated to the long-run relationship and the coefficients of $\alpha$ give the magnitude of the error correction terms around the long-run targets.

The steps to carry out the estimation of a VECM are the following:

1. Unit root tests on the time-series in level and in first differences: in this article, we refer to the Augmented Dickey-Fuller (ADF) and to the Phillips-Perron (PP) tests.
2. Determination of $p$, the order of the VAR.
3. Determination of the cointegration rank, which crucially depends on the deterministic trend specification (i.e. the presence or the absence of constant and trend in the cointegration relations and/or in the short-run model).
4. Identification of the VECM by imposing the restrictions which are consistent with the theoretical model.

The model includes seven time series, $C/K$, $I/K$, $(X-M)/K$, $Y/K$, $r$, $e$, $Y^f/K$, and covers the period between 1982:4 and 2006:4.

### 5.1. Unit root tests.

It is well known that the results of unit root tests often diverge. Therefore, by performing ADF and PP tests, our objective is not to favour one test or one result against one another. Anyway, it is pretty rare to get a convergent diagnosis for each time series. On the contrary, we refer to two kinds of tests to get hints for the later specification of the model.

| | First difference | | | Level | | |
|---|---|---|---|---|---|---|
| | $p$ | ADF | PP | $p$ | ADF | PP |
| $C/K$ | 4 | I(0) | I(0) | 2 | I(1) | I(1) |
| $I/K$ | 3 | I(0) | I(0) | 4 | I(0)+C | I(1) |
| $(X–M)/K$ | 2 | I(0) | I(0) | 2 | I(1) | I(1) |
| $Y/K$ | 2 | I(0) | I(0) | 2 | I(1) | I(1) |
| $r$ (profit rate) | 2 | I(0) | I(0) | 0 | I(1)+C | I(1)+C |
| $e$ (real exchange rate) | 2 | I(0) | I(0) | 1 | I(1) | I(1) |
| $Y^f/K$ | 3 | I(0) | I(0) | 1 | I(1) | I(1) |
| $G_{calc}/K$ [(a)] | 3 | I(0) | I(0) | 1 | I(1) | I(1)+C |

[(a)] Recall that the model is based on an accounting identity. We thus have to check the properties of the "removed" or "residual" variable $G_{calc}/Y = z – C/K – I/K – (X–M)/K$.

On the one hand, both ADF and PP tests indicate that all series are stationary in first difference. This ensures that the short-run estimation will not be spurious. On the other hand, most of the variables in level are I(1) except $I/K$, which could be either (I(0) + C) or I(1), and the profit rate $r$, which is I(1) + C (non-stationary with a constant).

If the rate of accumulation is actually stationary around a constant (I(0) + C, according to the ADF test), that means that $I/K$ might constitute a cointegration relation by itself. This hypothesis is of course rejected if we refer to the PP test.

The fact that $r$ is not I(1) but I(1) + C is a very important result because it forces us to introduce a trend in the cointegrating space.

At last, the time series $G_{calc}/K$ is non-stationary. If this had not been the case, the linear combination $z – C/K – I/K – (X–M)/K$ would have been a cointegrating relation of our VECM.

### 5.2. The VAR order determination

The VAR order determination is crucial because it influences the issue of the cointegration test: the number of cointegration relations will be overestimated if the lags number is too high, and conversely if the number of lags is too weak. As our model rests on ratios (consumption normalised by capital, and so forth) we do not expect a lot of lags. The same conclusion arises when looking at the number of lags introduced in the ADF unit roots test. In other words, we do not expect a VAR order exceeding 4 lags.

To determine the VAR order, we estimate the unrestricted VAR (equation (16)) then we compute the usual lag length criteria by imposing a maximum of 4 lags. The results (not shown) are conflicting because the SC and HQ criteria select only 1 lag while the LR and AIC criteria indicate to take 4 lags (these criteria are bound by our 4 lags constraint). This latter solution quickly appeared unsatisfying because, by imposing 4 lags, the cointegration test concludes in favour of 6 cointegrating relations, which is clearly overestimated. We then recalculated the lag length criteria by imposing a maximum of 3 lags. We present below the output given by E-views for this procedure:

VAR Lag Order Selection Criteria
Endogenous variables: $C/K$, $I/K$, $(X-M)/K$, $Y/K$, $r$, $e$, $Y^f/K$
Exogenous variables: C
Sample: 1982:4 2006:4
Included observations: 97

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | 3082.445 | NA | 6.82E-37 | -63.41125 | -63.22544 | -63.33612 |
| 1 | 3859.742 | 1426.379 | 2.06E-43 | -78.42767 | -76.94124* | -77.82663* |
| 2 | 3923.337 | 107.5213* | 1.54E-43* | -78.72860* | -75.94154 | -77.60165 |
| 3 | 3966.171 | 66.23750 | 1.82E-43 | -78.60145 | -74.51377 | -76.94859 |

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level) – FPE: Final prediction error – AIC: Akaike information criterion – SC: Schwarz information criterion – HQ: Hannan-Quinn information criterion

The results indicate that we can choose 1 or 2 lags. We computed the two alternatives and finally retained the second ($p = 2$), which led to more satisfying results[5].

### 5.3. *Deterministic components and rank of cointegration*

The rank of cointegration depends on the VAR order. It depends on the specification of the deterministic components too. The choice of the "good" specification is mainly based on theoretical aspects. From the unit root tests on variables that we led previously, trends have been introduced in the cointegration space as the profit rate is I(1) + C.

Sample: 1982:4 2006:4
Included observations: 97
Trend assumption: Linear deterministic trend (restricted)
Series: $C/K$, $I/K$, $(X-M)/K$, $Y/K$, $r$, $e$, $Y^f/K$
Lags interval (in first differences): 1 to 2

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 5 Percent Critical Value | 1 Percent Critical Value |
|---|---|---|---|---|
| None ** | 0.459696 | 204.2733 | 146.76 | 158.49 |
| At most 1 ** | 0.399688 | 144.5578 | 114.90 | 124.75 |
| At most 2 * | 0.268344 | 95.05810 | 87.31 | 96.58 |
| At most 3 * | 0.251794 | 64.75093 | 62.99 | 70.05 |
| At most 4 | 0.179163 | 36.61341 | 42.44 | 48.45 |

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Trace test indicates 4 cointegrating equation(s) at the 5% level
Trace test indicates 3 cointegrating equation(s) at the 1% level

| Hypothesized No. of CE(s) | Eigenvalue | Max-Eigen Statistic | 5 Percent Critical Value | 1 Percent Critical Value |
|---|---|---|---|---|
| None ** | 0.459696 | 59.71545 | 49.42 | 54.71 |
| At most 1 * | 0.399688 | 49.49971 | 43.97 | 49.51 |
| At most 2 | 0.268344 | 30.30717 | 37.52 | 42.36 |

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Max-eigenvalue test indicates 2 cointegrating equation(s) at both 5% and 1% levels

[5] Nevertheless, the normality test of Jarque-Bera rather suggests to take p = 1.

Under this specification, the trace test indicates 4 cointegrating equations at the 5% level and 3 at the 1% level while the max-eigenvalue test indicates 2 cointegrating equations at both 5% and 1% levels. We retained the former, which makes possible the identification of the three theoretical long-run relationships of our theoretical frame.

### *5.4.* *Identification and hypothesis testing*

Given the number of cointegrating relations, the Johansen procedure gives the maximum likelihood estimates of the unrestricting cointegrating relations β'Zt. Because they are unrestricted, these relations are not meaningful from an economic point of view. Firstly, one has to normalize each relation (i.e. to restrict one coefficient to unity). But it is not enough to identify all cointegrating vectors. Secondly, more restrictions must be imposed to obtain a binding system: as a rough rule, with three (respectively $n$) cointegrating relations, two (respectively $n-1$) coefficients can be restricted to zero in each vector.

In other words, every linear combination of the three unrestricted cointegrating vectors constitutes a cointegrating vector. To choose among this infinity of cointegrating vectors, some over-identifying restrictions must be imposed. As soon as the model becomes over-identified, a $\chi^2$ test is performed to check the significance of the restrictions.

All the results are displayed in the following table:

Vector Error Correction Estimates — Sample: 1982:4-2006:4
Included observations: 97
t-statistics in [ ]
$\chi^2(15) = 17.49$ — Probability = 0.290

| Cointegrating equations ($\beta$ matrix) | $C/K$ CointEq1 | $I/K$ CointEq2 | $(X–M)/K$ CointEq1 |
|---|---|---|---|
| $z$ | 1.11 [17.89] | 0.21 [8.24] | – 0.90 [– 10.07] |
| $r$ | – 0.30 [– 11.34] | 0.27 [11.65] | |
| $e$ | 0.08 [8.67] | | – 0.09 [– 9.47] |
| $Y^f/K$ | | | 1.13 [3.38] |
| *Trend* | 0.00015 [8.23] | – 0.00002 [– 2.08] | – 0.00023 [– 10.46] |
| *Constant* | – 0.21 | – 0.07 | 0.26 |

*(...)*

| (…) | | | |
|---|---|---|---|
| Error Correction ($\alpha$ matrix) | CointEq1 | CointEq2 | CointEq3 |
| $\Delta(C/K)$ | – 0.08 [– 2.06] | | |
| $\Delta(I/K)$ | – 0.13 [– 2.20] | – 0.28 [– 5.08] | – 0.12 [– 2.37] |
| $\Delta[(X–M)/K]$ | – 0.44 [– 4.15] | | – 0.43 [– 4.76] |
| $\Delta(Y/K)$ | | | |
| $\Delta(r)$ | – 0.54 [– 3.57] | | – 0.63 [– 4.85] |
| $\Delta(e)$ | 3.66 [ 5.08] | | |
| $\Delta(Y^f/K)$ | | 0.08 [ 3.11] | |

The choice of the over-identifying restrictions in the $\beta$ matrix is made so that our estimated equations match, as much as possible, the behaviours equations of our theoretical model. In that perspective, it quickly appeared that the exchange rate coefficient could not be restricted to zero in the consumption function. On the other hand, the profit rate in the balance of trade equation was unsignificant: this is why is has been removed of this equation (although this coefficient was assumed non null in our model). It is also worth noting that the trend coefficients are significant in the three cointegrating relations (and even very significant for both consumption and balance trade equations).

In the $\alpha$ matrix, the non-significant coefficients were restricted to zero. The main adjustment parameters are at once negative and significant: this parameter is higher for $(X–M)/K$ dynamics (43 %) than it is for $I/K$ (28 %) or $C/K$ (8 %). Let us still underline that $Y/K$ is weakly exogenous in the sense that its short-run dynamics does not depends on the error-correction terms.

## 6. Results

From the table above, we can write the equations (9), (10) and (11) of our theoretical model:

$$\begin{cases} \dfrac{C}{K} = 1.11z - 0.30r + 0.08e + 0.00015t - 0.21 \\ \dfrac{I}{K} = 0.21z + 0.27r - 0.00002t - 0.07 \\ \dfrac{X-M}{K} = -0.90z - 0.09e + 1.13\dfrac{Y^f}{K} - 0.00023t + 0.26 \end{cases}$$

It is important to note that:

- All the significant coefficients have the expected sign.

- Our estimation suggest that $c_w$ is (near but) bigger than 1 ($c_w = 1.1$) and that $c_p = 0.8$.
- As already mentioned, the coefficient in front of real exchange rate in consumption equation is significant. Nevertheless its sign is satisfying: as exchange rate appreciates, imported goods are cheaper and may support consumption.
- If we focus on the balance of trade equation, one important result is that the profit rate has no significant effect on the balance of trade, which could suggest that the opposite effects of *r* on *(X–M)/K* (that we have presented in the theoretical section) offset each other. However, the globalization may have a very important effect on the economy through the very high value of the coefficient in front of *z*. According to this result, a one point increase of *Y/K* brings about a 0.9 point decrease of *(X–M)/K*. through the positive impact on imports. Globalisation has actually a strong negative effect on the value of the Keynesian multiplier (with the coefficient of –0.9 in front of *z* in the balance of trade equation, the multiplier equals around 1,7; with a coefficient of –0,7, it rises to 2.5); . Note that, symmetrically, the effect of European Union Output on French exports is also very large (superior to one).

From that equation system, we can determine $z^*$ and deduce, on the one hand, the nature, stagnationist of exhilarationist, of the economic regime. As $(c_p - c_w) + \gamma_2 + \delta_2 = -0.03$, the economy is stagnationist. Furthermore, we can determine whether the economy is wage or profit-led. In theory, as $\partial\hat{Y}/\partial\pi$ depends on $\pi$, the nature of the regime may change as profit share fluctuates. At the empirical level, this is not the case at all: whatever the value of $\pi$ between 1983 and 2006, our estimations clearly conclude that the French economy was profit-led all over the period. Nevertheless, this crucial conclusion must immediately be softened because of the very weak magnitude of the impact of profit share on growth: if we focus on the period 1990-2006 during which profit share has remained quite stable, we conclude that $d\hat{Y} = 0.08 d\pi$ (the coefficient is a bit higher for the period 1982-1990). Thus, a one point increase of profit share (from 0.34 to 0.35, for example) would increase growth rate of less than 0.1 point of percentage! Our main conclusion is finally that income distribution fluctuations would have very limited impact on French economic growth currently. Such a result would also attribute a supplement from 0.5 to 1 point of growth, consecutively to the large decrease of wage share between 1982 and 1990 (– 6 points) and thus explains a part of sustained growth between 1987 and 1990.

Such a result is a bit disappointing, because the combination of historically high profit share with low level of capital accumulation for fifteen years better corresponds to a wage-led economy: profitability is high but does not sustain investment, which remains sluggish because of insufficient demand. We can bring two explanations to this pretty surprising result:

- As already mentioned, profitability does not have any effect on balance of trade; nevertheless, according to our results, any increase of wage share boosts consumption and… imports! The Mauroy Government already experienced such a dynamics… fifty five years ago.
- Our results show that the accelerator effect (the coefficient in front of *z*) in the capital accumulation equation is pretty weak. Indeed, from simulations that we have led, it appears that the nature –wage or profit-led– of the economy crucially depends on the magnitude of this acceleration effect.

## 7. Further comments

### 7.1. The propensity to consume and the income "elasticities" of foreign exchange

As it has been already mentioned in previous section, our estimates of $c_w$ as well as $c_p$ appear to be too high to be quite realistic. We encounter the same problem with the sensitivity of net exports to foreign demand.

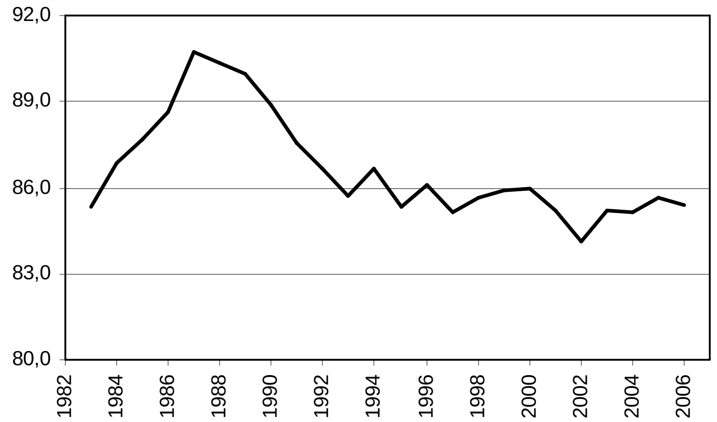
Concerning more specifically $c_w$, we have added a constraint to our system and checked that this coefficient could be set to 1: the important conclusion is that this restriction is not rejected and the results are very weakly modified as $c_w$.= 1 (it is quite different if the coefficient is constrained to 0.9). More fundamentally, this odd result may be explained by the very important fluctuations of the propensity to consume income (by households). As highlighted on figure 1, the large fluctuations between 1980 and 1994 contradict the constant hypothesis of $c_w$, usually assumed in Post-Keynesian models and may be at the origin of this issue.

To briefly present the consequence of $c_w$ variations, equation (2) (*cf.* section 3) is rewritten as:

$$\frac{C}{Y} = (c_w - c_p)(1-\pi) + c_p \tag{18}$$

Suppose that an exogenous shock durably decreases $c_w$, ($c_p$ remaining constant) during the period that we study. From an econometric standpoint, the estimation of $c_w$ will be between the values of $c_w$ before and after the shock. However, if our sample is so that wage share is more often "high" before the shock, and more often "low" after, then it can be shown that the estimation of $c_w$ is biased and may be higher than its value before the shock. This explanation has to be checked more precisely, but it seems quite possible that the overestimation of $c_w$ in our VECM would be the consequence of such a break in consumption behaviour.

**Figure 4. Ratio of consumption on disposable income of households (%). France, 1973-2006, 2000 Basis**




### 7.2. The positive sign of some error correction terms

Surprisingly, some error correction terms in the VECM are positive, quite significant, and it is impossible to constrain them to zero. At this stage of our work, we found no convincing explanation to this problem.

### 7.3. *The remaining trend in the cointegrating equations*

One of the oddest results is the presence of a visible remaining trend in the first and third cointegrating equation (*cf.* the cointegration graphs in appendix). It is worth saying that these are partly due to the sign of the trend coefficient in each equation (negative in the first one, positive in the third one). Thus, we tried to add a trend in the VAR system, although this is in principle not allowed by the times series properties[6]. We then observe that this "misspecification" has the advantage to remove the trends in all the cointegrating equations, without sensitive changes in the coefficients of $\alpha$ and $\beta$ (*cf.* appendix).

### 7.4. *Structural breaks*

As previously mentioned, we have restrained the period of our analysis from 1982 to 2006, because our results cover the whole period 1978-2006 were quite less realistic. Indeed, the beginning of the 1980s has been a very unstable economic period in France. More fundamentally, this instability in our econometrics could also come from a structural change, which would have occurred in France during the 1980: France might have change of economic regime, switching for example from an exhilarationist to a stagnationist regime. As it has been suggested by Marglin and Bhaduri [1990] and more explicitly exposed by Taylor [1991], some parameters of the model might have quite different values, depending on the values of some endogenous variables, especially the profit share (the case, previously analysed, of the propensity to consume wages wage might fit this hypothesis). Such a hypothesis would require more technical econometrics, introducing thresholds effects in equations to be estimated. This could constitute the next step of our work.

## 8. Conclusion

In this article, we propose a simple Keynesian model so as to test whether French economy is wage or profit-led. In that perspective, we estimate econometrically the three behaviour equations of our model by using a VECM. Once these equations estimated, we solve our model by using the estimated coefficients of the VECM and can then conclude on the nature of the French economic regime. Our main conclusion is that French economy would be profit-led. However, although an increase of wage share would have a negative impact on economic growth, this negative impact is very weak, as a one point increase of profit share increases economic growth of only 0.1 %. Such a result allows nevertheless to explain the sustained growth that France experienced between 1987 and 1990 as a direct consequence of wage share decline between 1982 and 1990 (– 6 points).

This result (French economy is, even weakly, profit-led) appears to us pretty counterintuitive, because the combination of a high profit share with a low capital accumulation rate during the 1990s would better match a wage-led regime. It is usually stated that the growing openness of a country would raise its likelihood to be profit-led (Bowles and Boyer [1995]). According to our econometric analysis, income distribution has no significant effect on the balance of trade. Nevertheless, imports are very sensitive to any output increase, which implies a strong negative impact on the multiplier of our model. Another important conclusion is that the accelerator effect in the investment function is one key variable determining the nature –wage profit-led– of the economy. According to our estimations, this accelerator effect is rather low for France: this could be the main reason for which France would be currently profit-led. Finally, these two elements –weak accelerator effect, and weak

[6] We should have had a time series I(0)+T in first difference to justify the presence of a trend in the short-run VAR.

multiplier effect, consecutive to high sensitivity of imports to output– well explain why any support of consumption through a wage increase would not have a positive and important impact on French economic growth nowadays.

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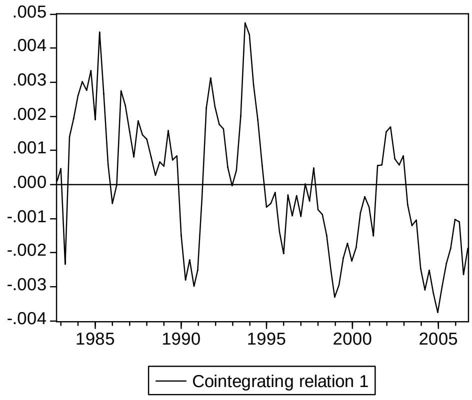
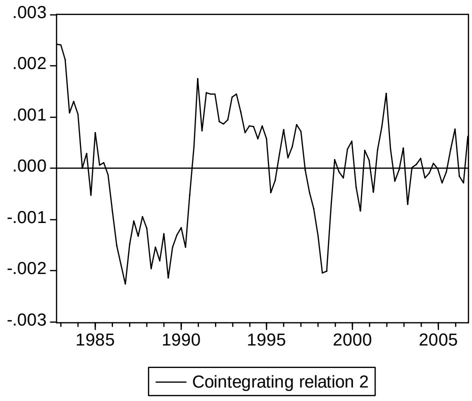
## Appendix

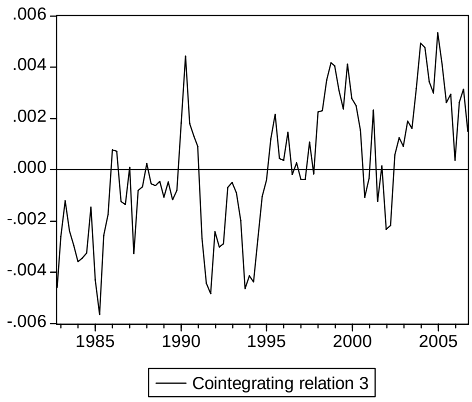
The next table displays the $\beta$ matrix when trends are introduced in the short-run VAR. Note that the trend coefficients are weak but significant in the *C*/*K* and (*X*–*M*)/*K* dynamics ($7.64\times10^{-6}$ and $-6.62\times10^{-6}$ respectively).

| Vector Error Correction Estimates | | | Sample: 1982:4-2006:4 |
|---|---|---|---|
| Included observations: 97 | | | |
| t-statistics in [ ] | | | |
| $\chi^2(11) = 16.41$ | | Probability = 0.127 | |
| Cointegrating equations ($\beta$ matrix) | *C*/*K* CointEq1 | *I*/*K* CointEq2 | (*X*–*M*)/*K* CointEq1 |
| *z* | 1.11 [15.58] | 0.20 [6.83] | – 0.88 [– 10.33] |
| *r* | – 0.31 [– 10.27] | 0.28 [11.09] | |
| *e* | 0.08 [8.32] | | – 0.10 [– 9.49] |
| $Y^f/K$ | | | 0.80 [2.90] |
| *Trend* | 0.00011 | – 0.00002 | – 0.00017 |
| *Constant* | – 0.21 | – 0.07 | 0.26 |

Cointegration graphs when trends are not introduced in the short-run VAR.




Cointegration graphs when trends are introduced in the short-run VAR.