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## Effective demand in the recent evolution of the US economy

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## Working Paper No. 673

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### Effective Demand in the Recent Evolution of the US Economy<sup>1</sup>

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## **ABSTRACT**

We present strong empirical evidence favoring the role of effective demand in the US economy, in the spirit of Keynes and Kalecki. Our inference comes from a statistically well-specified VAR model constructed on a quarterly basis from 1980 to 2008. US output is our variable of interest, and it depends (in our specification) on (1) the wage share, (2) OECD GDP, (3) taxes on corporate income, (4) other budget revenues, (5) credit, and the (6) interest rate. The first variable was included in order to know whether the economy under study is wage led or profit led. The second represents demand from abroad. The third and fourth make up total government expenditure and our arguments regarding these are based on Kalecki's analysis of fiscal policy. The last two variables are analyzed in the context of Keynes's monetary economics. Our results indicate that expansionary monetary, fiscal, and income policies favor higher aggregate demand in the United States.

**Keywords:** Effective Demand; Wage Shares; Monetary Policy; Fiscal Policy; Model Evaluation

**JEL Classifications:** C52, E12, E25, E52, E63

## INTRODUCTION

The recent crisis brought back to a central stage the teachings of Keynes, and the critical role of effective demand as a determinant of the evolution of capitalist economies. To mitigate the dire consequences of the crisis, economic authorities all around the world were compelled to sustain demand with expansionary policies, including deficit spending. Besides, mainstream academic economists were forced to temporarily put into a shelf almost everything they had been teaching during the last thirty-odd years. In this new situation, the overall view of Michal Kalecki, as well as the post Keynesian school inspired on the two founding fathers of the principle of effective demand, also regained some public prominence.

In this paper, we use the principle of effective demand to study empirically the evolution of the US economy before the eruption of the crisis, using modern econometric procedures. Our general objective is to show that its evolution can be fully explained by the behavior of demand-side variables. We also test some specific hypotheses about the role of fiscal and monetary policies and of income distribution in shaping output and employment. Thus, in our study we hope to answer with an alternative vision and with solid evidence to today's dominant view, which attempts to explain the evolution of capitalist economies on the basis of so-called Dynamic Stochastic General Equilibrium models.

Understanding the significance of the monetary situation and policies is obviously important in any study about the recent US development, where financial sophistication has developed at a phenomenal speed. A crucial point here is whether monetary policy can have a lasting influence on the level of output and employment, against the claim from mainstream economists who refute this possibility. Keynes maintained that, except during particular circumstances, availability of credit and low rates of interest would stimulate the pace of investment and expand effective demand, and conversely. In contrast, Kalecki did not give much importance to monetary conditions and policy. The significance of money and of the interest rate, as well as the difference of opinions between Keynes and Kalecki over this issue, is something that can be put to test, and which we put to test in this paper.

Fiscal policy is another type of intervention the forebears as well as supporters of the principle of effective demand strongly recommend. On the contrary mainstream economists

reject it even more vocally than any other type of government involvement. Keynes and Kalecki had rather similar views on this issue, except for one particular point, about the effect of taxation of profits, where they disagreed. In this paper we put to test the role of fiscal policy, as well as the difference of opinions between these two great thinkers.

Finally, Keynes and Kalecki viewed income distribution as an important determinant of effective demand and output. In the **General Theory**, the former claimed: “To suppose that a flexible wage policy is a right and proper adjunct of a system which on the whole is one of **laissez faire**, is the opposite of the truth” (Keynes 1964 269). However, he thought, at least in this book, that upon an increase in employment, real wages would have to drop<sup>1</sup>. Kalecki, on the other hand, claimed that a higher real wage and higher wage share does expand demand, and with it output and employment.

The above-mentioned are the hypotheses we want to explore in the present work. It is beyond our objectives to develop an overall study of the US economy. However, since output is our main variable of interest, we specify a general model to explain this variable. Besides, readers will probably recognize the points we study have been at the center of the economic debate for several decades. As said, different schools of thought give different, and even contradictory, answers to the issues under consideration. An additional investigation of these questions, underlining the empirical side of the matter and using modern econometric techniques, may not therefore be redundant.

### **Some Words on Method and Brief Review of the Literature**

Before continuing with our analysis, we shall say a few words about the econometric method we follow in this paper. This is important for evaluating the robustness of the empirical results of our econometric work. Afterwards, and considering this methodological discussion, we consider a brief sample of previous studies on the issues we deal with in the present paper.

There is an important controversy among econometricians about the most satisfactory procedure for empirical modeling. In a recent survey, Colander (2009), contrasts two alternative perspectives in empirical macroeconomics. He distinguishes on the one hand what he calls the

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<sup>1</sup> This hypothesis was based on Keynes’s acceptance of the principle of decreasing marginal returns in the short run. Afterwards, and in the light of empirical evidence, he recanted from his previous opinion, and recognized that higher employment could be accompanied by an increase in the real wages (Keynes 1939).

“European perspective”, based on “the general-to-specific Cointegrated Vector AutoRegressive (CVAR)” approach; and on the other the currently dominant “Dynamic Stochastic General Equilibrium (DSGE) models”. However, as Spanos (2009) has pointed out, the latter one can be “... better described as a Pre-Eminence of Theory standpoint, where the data are assigned a subordinate role broadly described as quantifying theories presumed adequate. In contrast, the European general-to-specific CVAR perspective attempts to give data a more substantial role in the theory-data confrontation and is more accurately described as endeavoring to accomplish the goals accorded by sound practices of frequentist statistical methods in learning from data”<sup>2</sup>.

In our econometric work, we shall follow what the latter author calls “a probabilistic approach to econometrics” (Spanos, Ibid). This approach stresses the use of *statistically adequate* models as the basis of drawing reliable inferences. The term *statistically adequate* refers to the validity of the probability and the statistical assumptions underlying the estimated model. The foundation of this approach is a purely probabilistic construal of the notion of a statistical model. This is considered to be a set of internally consistent probabilistic assumptions aimed at capturing the statistical information in the data (chance regularity patterns). Economic theory suggests the potential theoretical relationships and the relevant data. However, the statistical model is specified by viewing the observed data as a realization of a generic vector stochastic process with a probabilistic structure that would render the observed data a truly typical realization thereof. Thus, we distinguish between the structural model, based on substantive subject matter information, and the statistical model, chosen to reflect the systematic statistical information contained in the particular data. The structural and the statistical models will coincide when we can give a satisfactory, and sufficient for the purpose, economic rationalization to the latter one. When this is not the case, we will need to reformulate (reparameterize/restrict) an estimated well-defined statistical model to arrive at a structural model.

The success of econometric modeling depends on how correct the postulated assumptions are in capturing the statistical information in the data. Thus, in this approach,

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<sup>2</sup> Readers interested in the confrontation between alternative approaches to econometrics, are referred to Juselius and Franchi (2007), who thoroughly test Ireland's (2004) canonical DSGE model. The authors find that most inferences from this work may be misleading. When confronted with the data at hand the probabilistic and statistic assumptions underlying the model should be rejected.

misspecification testing plays a fundamental role to ensure the statistical adequacy of the model and the reliability of the inferences based on such a model. This is because all statistical inferences will be misleading unless the probability and the statistical assumptions of the estimated model are valid.

Let us now review a small sample of applied works related to ours. We may disagree with theoretical arguments underpinning the works we discuss, or with the results the authors infer from their work. However, we have only cared about the statistical ‘validity’ of their deductions by critically assessing their claims.

To start with, Blanchard and Perotti (2002) study the dynamic effects of government spending and tax shocks on the US post-war economy. Their main conclusions are that 1) whenever public spending increases, output moves in the same direction (the opposite happens with net taxes) and 2) multiplier effects are close to unity. An increase in public spending increases personal consumption (crowding in), but it also reduces private investment (crowding out).

Laramie, Mair, Miller and Stratopoulos (1997) study the direct impact of taxes on profits and private investment in the US for the period 1980-1993 on a quarterly basis. Their aim was to prove Kalecki’s argument that taxes on corporate income do not necessarily depress private investment, with a reduced form investment function. Their main inferences were that 1) increases in taxes to corporate income, if paid through a decline of personal savings, may not have an impact on profits. Besides, if such increase is accompanied by purchases of government infrastructure or by transfers to the unemployed, it may increase after-tax profits, resulting in new investment. 2) It is possible to stimulate investment with a minimum impact on the budget deficit, satisfying at the same time income distribution goals.

All in all, we consider the results from Laramie et al. more reliable, because they test for the statistical and probabilistic assumptions of their estimates, which is not the case for the Blanchard and Perotti paper.

We discuss now a small sample of papers dealing with the effects of money and monetary policy.

The first paper we consider is by Fair (2005), who conducts a full macroeconomic model for the U.S. economy. One of the system’s equations is a two-stage least squares

regression for the three-month Treasury bill rate as dependent variable for the period 1954-2002 on a quarterly basis. This short-term interest rate is a function of price changes, unemployment, the change in money supply and a dummy for the early Volcker period (1979:4 to 1982:3). Fair infers: “The net effects of, say, a decrease in  $r$  [the interest rate; JL and LR] on the U.S. output and the price level are positive. Output increases because there is an increase in the demand for domestically produced U.S. goods, and the price level increases because of the increase in demand and the depreciation of the dollar”(p. 659). Of the interest rate’s determinants, only unemployment has a negative effect on it. The short-term interest rate equation is one of many interrelated macroeconomic variables of the system, and the influence of the interest rate on output is only seen, indirectly, through a stochastic simulation procedure. This procedure consists of a set of estimations of average ‘variances’ between actual against predicted values of four macroeconomic fundamentals (real GDP, the short-term interest rate, private non-farm deflator and inflation) under different scenarios (no rule, modified rules and with tax rule). Fair’s bottom line is: interest rate rules reduce output and price variability, thus monetary policy is effective.

In another paper, Lown and Morgan (2006) estimate a VAR model using real GDP, the federal funds rate, loans and standards. The last variable represents non-price lending terms, which they take from a survey (discontinued through 1984:1-1990:2). Their models run from 1968:1 to 2000:2 on a quarterly basis, omitting the period where the standards variable was discontinued. They estimate several combinations of periods and variables to control for robustness of the signs and sizes of the estimated coefficients. In particular, they found that real GDP is negatively affected by the interest rate (price lending terms) and standards (non-price lending terms), as well as positively affected by loans. Standards, they argue, seem to weigh more.

With a similar approach, Bayoumi and Melander (2008) estimate a model under the assumption that loan standards depend negatively on bank capital-asset ratio (CAR) and positively on lagged standards (all as percentages of GDP). Changes in credit in turn depend negatively on loan standards and on changes in the interest rate, and positively on changes in income. Spending (both on consumption and investment) depend positively on credit (and its lags), on income. Finally, CAR depends on one period-lagged GDP. Their single equations



contain MA terms or are estimated by 2SLS (spending equation) for inconsistent periods. As the authors themselves recognize, they do not model any economic policy response to a financial shock.

One of the previously-mentioned authors co-authored a more recent study (Bayoumi and Darius 2011). The authors broaden the scope of the analysis, to examine the role of credit markets in the transmission of U.S. macro-financial shocks, using a financial conditions index (FCI). They estimate a vector auto regression (VAR), using information from the Senior Loan Office Survey (SLOS). Their conclusion is worth quoting in length: “Our baseline specification confirms the importance of the SLOS in predicting output and the results are relatively independent of whether the credit variable is the small- and medium- sized firm survey rather than the large company... Examining the impulse responses of real GDP, economic activity is relatively sensitive to lending standards, particularly in the longer-term.... A one standard deviation shock is associated with a highly-significant 0.3 percent decline in output after one year, rising to 0.4 percent after 2 years. By contrast, the 3-month LIBOR rate has a much more temporary and only marginally significant impact on output. A one-standard deviation shock peaks at 0.15 percent after 3 quarters and has minimal impact after 2 years. Of the other asset prices, the investment grade spread, high-yield spread, and equity prices all build gradually over time, while the real effective exchange rate follows LIBOR in having only a temporary effect.... Variance decomposition finds that the SLOS survey is the main private sector financial indicator explaining changes in output and dominates all other variables over time” (Bayoumi and Darius 2011 p. 8).

All in all, these studies seemingly support the hypothesis of a real effect of monetary variables on output. Anyway, a problem common to the three of these papers is that the authors do not test for the probability and statistical assumptions of their estimated models.

Let us finally consider some works studying the association between output (or other macro variables), and income distribution. By the way, many contemporary authors, inspired by the work of Kalecki, nonetheless propose the idea that a wage fall may stimulate demand and employment. Thus they have coined the notions of profit-led and wage-led regimes. The former means a higher profit-share stimulates output and employment, and conversely for the latter.

The first paper we consider is by Stockhammer and Onaran (2004). They modeled the growth rate of the capital stock, the output gap, the profit share of the business sector, the national unemployment rate and productivity growth. The method is structural VARs for the US, the UK and France with semi-annual (OECD Economic Outlook) data for the periods 1970:1–1997:2 (UK), 1966:1–1997:2 (US) and 1972:1–1997:2 (France). They found that these economies are wage-led.

Naastepad and Storm (2007) estimated simple linear regressions of investment and exports functions for eight OECD economies for the period 1960–2000. They thus studied Japan, US, France, Germany, Italy, Netherlands, Spain and UK, with annual (OECD) data. Comparing signs and sizes of the estimated coefficients they infer that Japan and the US are profit-led, whereas the six European economies they study are wage-led.

A third study is by Hein and Vogel (2008). They estimate single equation error correction models for the period 1970–2005 on an annual basis. They found that growth in France, Germany, UK and US is wage-led, whereas growth in Austria and the Netherlands is profit-led.

Finally, Barbosa-Filho and Taylor (2006) analyzed the relationship between effective demand and income distribution for the US economy, using a VAR(2) model. This includes capacity utilization and the wage share; as well as private consumption, private investment, government expenditure and net exports (the last four variables expressed as a share of potential output). Their period under analysis is 1948–2002 on a quarterly basis. Their results show a negative association between the wage share and capacity utilization; and thus between the wage share and output.

As we can see, results differ among different authors about the effect of a rising wage share on effective demand and output (or accumulation). However, we cannot accept their inferences without qualification, because the authors do not always provide misspecification tests, which in the spirit of our work are indispensable to assess the statistical validity of their findings<sup>3</sup>.

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<sup>3</sup> There is another problem with the previously reviewed works. They all normalize the variable of interest by either capital or potential output. Now, this may have been the most appropriate procedure to study the dynamic stability conditions of the neo-Kaleckian Saving-Investment model originally proposed by Bhaduri and Marglin (1990) and Bowles and Boyer (1995). However, it seems much less adequate for econometric work, because

Anyway, taking stock of the previous discussion, we can now advance to the empirical part of our research.

### **The Model**

To adequately test the hypotheses we want to explore in this paper, we would need a detailed macroeconometric model. Since this is beyond our possibilities, we have estimated a Vector Auto Regression (VAR) specification. We chose this method because most variables are interrelated and because it would not be correct to assume a priori which of them are endogenous and which are exogenous. We also use system-based cointegration methods (Juselius, 2006). These methods allow us to deal with the non-stationary nature of economic time series. Taking as the basis a VAR model, we then estimate an error correction model (ECM) and a cointegrated Structural VAR model (SVAR), which we use to carry out Impulse-Response analysis. The use of different methodologies allows us to confirm the robustness of our empirical results and the validity of our theoretical hypotheses.

Our main variable of interest is US GDP. As said, we want to study only if and how, fiscal, monetary and distribution variables affect GDP. However, to guarantee substantive adequacy of our model, we must consider all the variables that are likely to affect GDP, as well as their interactions. Thus, we need a general specification, within which to nest the fiscal policy, monetary and factor share variables. Therefore, we start from the National Accounts identity slightly adjusted. Let  $Y$  stand for output,  $C$  private consumption,  $I$  private investment, and  $J$  the trade balance (i.e. net exports).  $G$  is government expenditure on goods and services.

$$Y = C + I + J + G \quad (1)$$

We now have to find out which are the most basic factors controlling the right-hand side variables. Unfortunately, however, we have a limited range of choice because we must save enough degrees of freedom to carry out the estimation and misspecification tests. Besides, lack

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measures of capital or potential output are difficult to come by, and are in general not too reliable, which affects all the resulting inferences.

of adequate information will force us to use variables that are only imperfect proxies for our theoretical variables of interest. We now explain how we deal with this situation<sup>4</sup>.

We shall assume the trade balance ( $J$ ) depends on domestic output, on external output ( $Y^*$ ), and on the wage share. This is because the exchange rate depends on (and moves in opposite direction than) the share of wages in value added for a given **nominal** exchange rate (López and Perrotini 2006).

We assume private consumption and private investment depend on income and on the share of wages in the value added. We also assume that both private consumption and investment depend on private credit outstanding ( $C$ ) and on the interest rate ( $R$ ). As we know, over the last years, and until the financial crisis imploded, a dramatic rise in private credit outstanding occurred, and we have to consider this important new factor<sup>5</sup>.

Finally, we break up government spending on goods and services according to the source from which it is financed. Thus  $H$  and  $O$  are taxes on corporate profits ( $H$ ) and Other Government Revenues ( $O$ ). It would have been preferable to separate the budget deficit from net taxes from persons. However, the actual budget deficit, for well-known reasons, is pro-cyclical, and we did not find a satisfactory variable measuring the discretionary budget deficit<sup>6</sup>.

Therefore, we can reduce (1) as follows:

$$Y = C(w, Y, C, R) + I(w, Y, C, R) + J(Y, Y^*, w) + H + O \quad (2)$$

where  $R$  is the 3-month Treasury bill rate<sup>7</sup>. Simplifying again, our model will be specified as:

$$Y = Y(w, Y^*, C, R, H, O) \quad (3)$$

where the right-hand side variables are also endogenous.

We begin the modeling exercise with a brief description of the data<sup>8</sup>. The sample is on a quarterly basis, and it runs from 1980 to 2008(3). All monetary variables have been brought to

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<sup>4</sup> Note, we tried many models, with different information sets. We finally selected the model we present below because it was the best one from the statistical point of view. That is, it was subjected to, and was not rejected by, a large battery of misspecification tests.

<sup>5</sup> By the way, we also tried to have variables reflecting private wealth into our specification, but we did not find a statistically valid model including this variable.

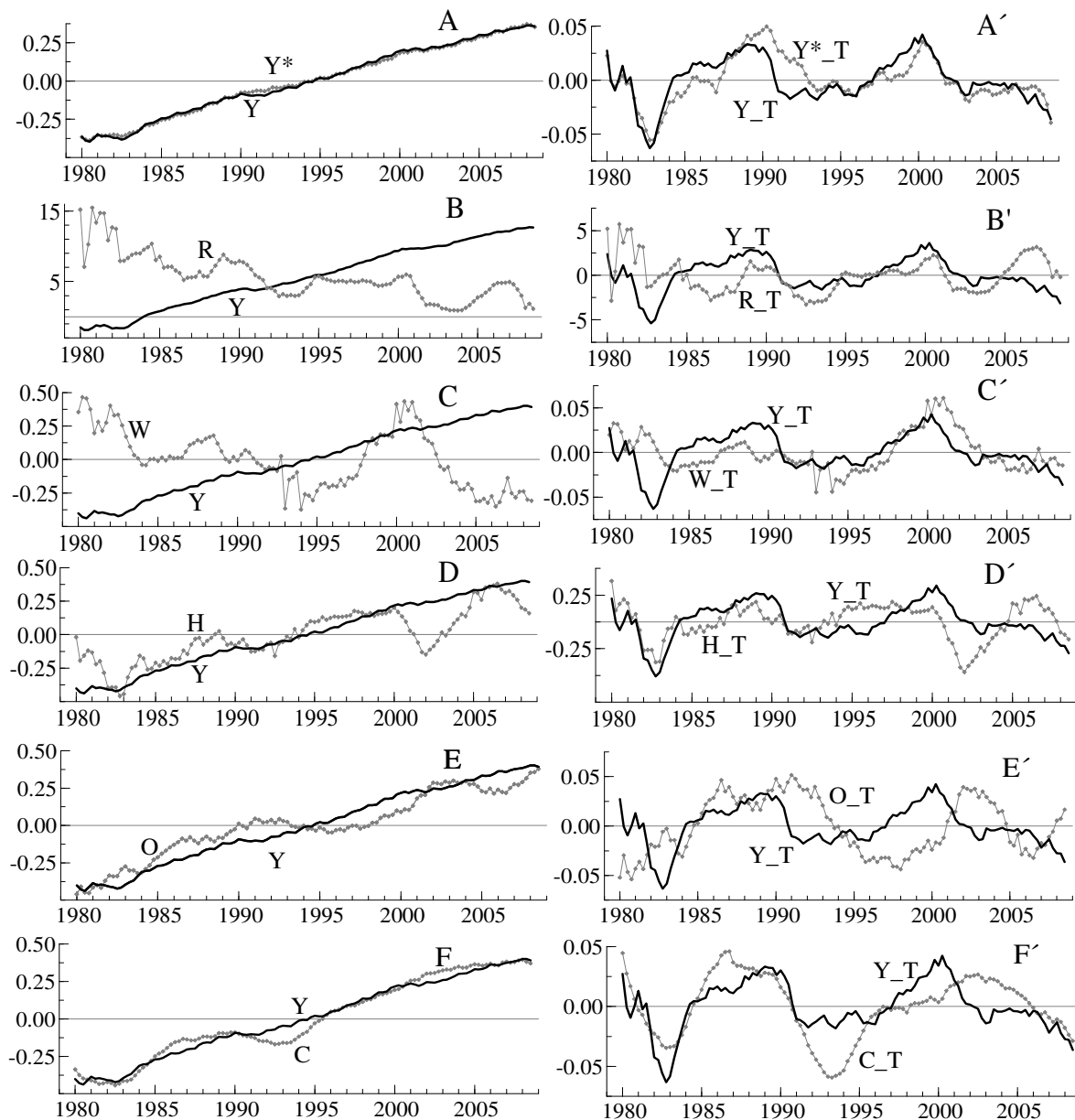
<sup>6</sup> We also estimated models where we split the (actual value of) budget deficit from net taxes from persons, but we confronted the problem of lack of degrees of freedom. Besides, the resulting estimates were not statistically valid.

<sup>7</sup> We tried different interest rates until we could identify one that resulted in a solid statistical specification.

<sup>8</sup> See the Appendix for the model data source.

2000 prices. In Figure 1 below we plot each variable and GDP. This will give us a first informal hint on how each one of the selected variables changed during the period, as well as how they may be connected. To simplify visual inspection of their possible association we show on the left-hand panel the seasonally adjusted variables, and the variables in deviation from their trend on the right-hand panel.

**Figure 1. GDP and Variables of the Model**



Source: See Appendix.

As we see in the figure from the output series, the aftermath of the crisis at the beginning of the eighties was hard to overcome. Only after the first half of the same decade output started growing steadily. The nineties started with a mild but lasting recession and a stock market boom fueled recovery, followed by another recession the next decade. OECD output displays a similar evolution as that of US output, except at the beginning of the nineties. The interest rate has gradually decreased since the beginning of the eighties, with drastic falls during recessions, increasing along most booms, with the important exception of the 1995-2000 stock market boom. The share of wages in GDP did not worsen for workers immediately and as deep as output during the 81-82 crisis, but from the beginning of the nineties on it has moved more pro-cyclically.

Taxes on corporate income have become gradually and pro-cyclically more responsive to fluctuations in GDP, whereas the budget deficit and taxes on workers (lumped together as other budget revenues) do not present a clear trend. It must be noticed, however, that taxes on workers represent a higher proportion on this series, thus that redistributive fiscal policy through taxes on workers has changed drastically. Finally, credit availability showed a clear sensitiveness to recuperation from the crisis of the early eighties, increasing more than output, but more so in the recession of the beginning of the nineties. Its fluctuations have been milder since then but following more or less the same pattern.

As shortly explained in the last two paragraphs, at first sight we can see a close positive association between  $Y$  and  $Y^*$  (panels A and A'); between  $Y$  and  $w$  (panel C'); between  $Y$  and  $H$  (D'); between  $Y$  and  $C$  (F'); and probably also between  $Y$  and  $O$  (E'). The nature of the association between  $Y$  and  $R$  is less clear. Anyway, **at first sight** the information suggested by the figures support the notion that demand-side variables strongly influence the economy. More

specifically, they appear to validate Keynes's conjecture about the importance of credit and the interest rate, of Kalecki's hypothesis regarding the expansionary role of the wage share, and of Keynes's and Kalecki's hypotheses about the relevance of government expenditure, on demand and output. But our econometric work will tell us whether this is actually the case.

From a statistical point of view, graphs of the variables suggest that all of them are non-stationary, i.e. they have a trending mean; also their underlying density function seems to be non-normal<sup>9</sup>. Unit root analysis of the series (not shown here) suggests that all series used in the model have the same order of integration (all are  $I(1)$ ). Provided we have a well-specified model, we can test for cointegration via the Johansen procedure.

We estimated a VAR with quarterly data for the period 1980-2008(3). We included the US GDP ( $Y$ ), OECD GDP ( $Y^*$ ), private credit outstanding ( $C$ ), profit-tax financed government expenditure ( $H$ ), other government revenues ( $O$ ), the wage share ( $w$ ), and the short-run interest rate ( $R$ ). All the variables, except the last two, are in logarithms. We found a statistically well-specified equation, in a model including an unrestricted constant, four lags and four *dummy* variables<sup>10</sup>. We included variable  $R$  as exogenous<sup>11</sup>.

After checking for misspecification and confirming that the model was not rejected by individual-equation and vector misspecification tests, we checked for a long-run association between our set of variables with Johansen's cointegration test. The test suggests that up to five

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<sup>9</sup> We checked this with normality tests, which rejected normality for all the variables. Non-normality may be due to the presence of outliers.

<sup>10</sup> These are for the following periods: 1982(1), 1987(1), 1993(1)-1994(1) and 2000(1). The first helped to correct normality problems for  $Y$  and  $Y^*$ , in the middle of the 1981-1982 crisis. The second was used to ameliorate a sudden change in  $C$  occurred at such point in time. The third dummy was useful in accounting for drastic declines in  $w$  in the first quarters of '93 and '94. The fourth one effectively eliminated normality problems in  $w$ , as well as in  $H$ .

<sup>11</sup> We were unable to find a statistically adequate model with  $R$  endogenous. We believe this is because the interest rate is in fact policy-determined, and is not exclusively associated with the variables included in our model.

cointegration vectors can exist<sup>12</sup>, and we take the first one as implying the long-run association between US GDP and its determinants<sup>13</sup>. This long-run vector is as follows:

$$y = 0.83 y^* + 2.17 W + 0.14 c + 0.15 o + 0.11 h - 0.012 R \quad (4)$$

where lower-case letters refer to the variable in logarithms. The vector misspecification test statistics are displayed in Table 2 below.

**Table 1. VAR Vector Misspecification Tests.**

Test	Statistics values
Vector AR 1-5 test : F(180,250)	0.99467 [0.5124]
Vector Normality test : Chi <sup>2</sup> (12)	20.663 [0.0555]
Vector Hetero test : F(1050,231)	0.24489 [0.990]

Source: See text.

In words, we find that **higher** output is associated with **higher** OECD GDP, with a **higher** share of wages in value added, and with **higher** government expenditure financed either via **higher** taxes on profits or via **higher** other government revenues. Finally, a higher interest rate is associated with lower output.

Since correlation does not imply causation, it is still necessary to study whether output is indeed determined by the right-hand side of (4). Therefore, we carried out Granger causality tests and found out that this is in fact the case. This is confirmed by the estimated Error-Correction Model, which describes the short-run association between US GDP and its determinants. Table 3 below shows the Error-Correction Model, where VC denotes the long-run cointegration vector. Note that, in a multi-variate context, Granger causality of variable X on variable  $\vartheta$  is obtained when X is contained among the regressors in the equation for  $\vartheta$ , or in the cointegration vector, or both.

<sup>12</sup> According to the corresponding test for stability of the vectors only two of them are stable.

<sup>13</sup> This was not an a priori distinction between endogenous and exogenous variables; we estimated a valid VECM model and then we tested the validity of the restriction of the existence of an output equation.



## Table 2. Estimated Error Correction Mechanism (ECM).

EQ( 4) Modelling DLYr by OLS

The dataset is: \\psf\Home\Documents\Datos de usuario de Microsoft\Datos adjuntos guardados\Modelo US.in7

The estimation sample is: 1981(2) - 2008(3)

	Coefficient	Std.Error	t-value	t-prob	Part.R^2
DLYr_2	0.154281	0.07638	2.02	0.0461	0.0396
DLyo_1	0.531254	0.1237	4.29	0.0000	0.1570
DLyo_3	-0.371270	0.1147	-3.24	0.0016	0.0957
DLTC	0.0547729	0.008761	6.25	0.0000	0.2831
DLTC_2	0.0213890	0.006702	3.19	0.0019	0.0933
DLGB	0.189058	0.04027	4.69	0.0000	0.1821
DLGB_4	-0.100629	0.02595	-3.88	0.0002	0.1319
Dws_1	0.169636	0.09954	1.70	0.0915	0.0285
DR3mnth_2	-0.00181283	0.0004541	-3.99	0.0001	0.1387
vc12_1	-0.00105845	0.0002611	-4.05	0.0001	0.1423
I:1982(1)+I:1981(4)	-0.0114360	0.003130	-3.65	0.0004	0.1188
sigma	0.00406008	RSS		0.00163193894	
log-likelihood	455.432	DW		1.98	
no. of observations	110	no. of parameters		11	
mean(DLYr)	0.0071957	var(DLYr)		4.1304e-005	

### Misspecification tests

AR 1-5 test:	F(5, 94)	=	0.26196	[0.9327]
ARCH 1-4 test:	F(4, 91)	=	0.23420	[0.9184]
Normality test:	Chi^2(2)	=	1.5403	[0.4630]
Hetero test:	F(21, 77)	=	0.78590	[0.7275]
Hetero-X test:	F(67, 31)	=	0.62616	[0.9442]
RESET test:	F(1, 98)	=	0.00046232	[0.9829]

D before a variable denotes its first difference. X<sub>q</sub> denotes that the X variable enters with a q lag. VC is the cointegration vector.

Finally, and to provide further evidence related to our previous findings, in this section we make use of the SVAR methodology, using the cointegrated VAR model from the previous section, and we conduct Impulse-Response Analysis.

We obtain the structuralized, contemporaneous effects, suggested by equation  $y = y(W, y^*, c, R, h, o)$  by imposing the appropriate restrictions in the matrices of the errors. We ensure the validity of the previously imposed restrictions by means of a LR test, and we reach the following estimates for the contemporaneous interactions<sup>14</sup>.

**Table 3.**

**Estimated Contemporaneous Effects. Estimates of SVAR Parameters**

STATISTICS ON AB MODEL PARAMETERS			
PARAMETER	COEFFICIENT	STD.ERROR	T-VALUE
Y-Y*	0.8071	0.0914	8.83
Y-H	0.0208	0.0055	3.78
Y-O	0.1063	0.0220	4.83
Y-C	0.0057	0.0422	0.14
Y-WS	-0.4031	0.1187	3.40
OVER-IDENTIFICATION LR TEST CHI-SQUARED( 10 )= 22.04824 SIGNIFICANCE LEVEL=			
0.01486			

Table 3 must be read as follows. The coefficients of each variable represent the short-run contemporaneous responses resulting from a shock in the conditioning variables. Specifically: the impact of government expenditure, foreign demand and the wage share are positive; and

<sup>14</sup> Note, the variable R does not appear in the contemporaneous effects and in the Impulse Response Graphs, because it is taken as exogenous in our estimated VAR.

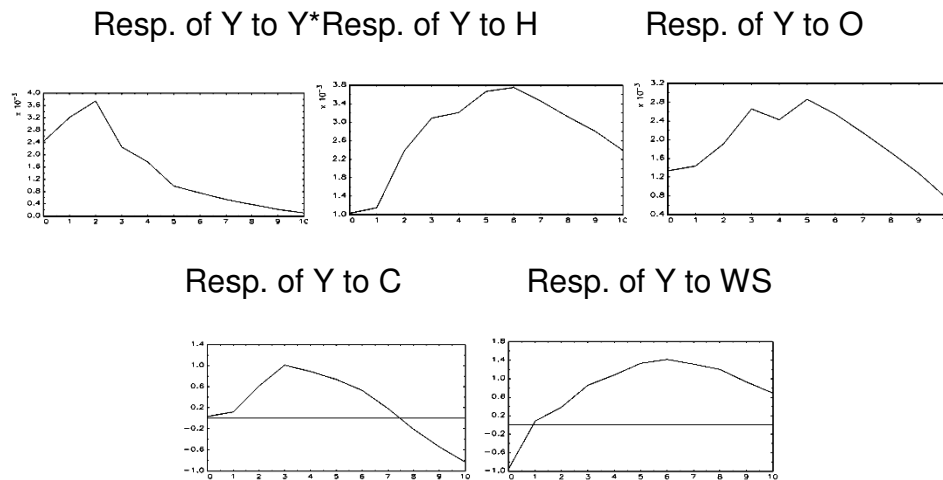
conversely, the interest rate has a negative impact. Note the contemporaneous impact of credit is statistically non-significant.

We can provide further evidence on the effects of macroeconomic variables on output by making use of the typical simulation techniques known as impulse response analysis (IRAs) based on the estimated VAR model and restricted to satisfy the cointegration rank constraint. IRA graphs are shown next:

**FIGURE 2**

**Impulse Response of the Structural Effects over Output**

**Impulse-Response to Shocks**



As we can see, shocks to the wage share, to government expenditure, to world output and to credit, have positive impacts on output and demand.

Let us now give an economic interpretation to our results, concentrating on the hypotheses that are the main object of our inquiry.

Firstly we notice that a higher share of wages stimulates demand and output in the short- and in the long-run. Note, the contemporaneous effect of the wage share rise on output is negative, but turns positive afterwards. From the second period onwards, the expansionary

effect of a higher wage share on domestic demand more than offsets any possible recessive impact on other demand items. This finding clearly supports Kalecki's idea.

Secondly, we have found that higher government expenditure, either financed with higher taxes on profits, or with other government revenues, stimulates demand and output. As anticipated by Kalecki, the size of the impact depends on how government expenditure is financed. To have an idea of the amounts involved, let us take into account that in 2007 US GDP amounted to about 11,552.6 billions of chained (2000) dollars. Taxes on Corporate Profits and Other Government Revenues were about 320.7 and 1,950 billion dollars, respectively. Now, let us assume that in 2007 government expenditure had been US \$100 (billions) higher than it was. If that rise had been entirely financed taxing corporate profits, then the latter item would have risen to US \$420.7; i.e. an increase of 31% on its original value. Since the long-run elasticity of GDP with respect to taxes on corporate profits is 0.11 (see eq. 4), that rise in government expenditure would have brought about a long-run increase in GDP amounting to 3.35% (31 times 0.11); namely, of US \$389 billion. On the other hand, if the US \$100 (billions) of extra government expenditure had been financed via other budget revenues, the latter would have risen 5.9%. In the long-run output would have been US \$104 billion higher. Thus, according to our estimate, a much larger impact would take place if government expenditure were financed taxing corporate profits than with other revenues.

Lastly, we have found that monetary conditions do affect demand and output, not only in the short but also in the long run. Thus, our result contradicts the conventional view that denies any long-run effect of monetary variables on the real economy. Contrariwise, it supports Keynes's hypotheses. Larger credit availability has a positive impact on demand, and a higher interest rate tends to depress demand.

## **FINAL REMARKS**

We may now summarize our findings. We have found full confirmation for the two Kalecki's hypotheses studied empirically in this paper. On the one hand, government expenditure financed via taxes on profits has a positive effect of on demand and output. On the other hand, a shift from profits to wages also expands demand. Let us delve a bit deeper into these two issues.

As a consequence of the depth of the current world financial crisis, public spending, even deficit financed, has regained a place of honor in the arsenal of acceptable economic policy instruments. This is hailed as a revival of Keynes and Keynesianism. Indeed, Keynes and writers identified with the so-called Post-Keynesian school, emphasize the beneficial effect of government expenditure, and of government deficit, when idle resources are abundant<sup>15</sup>.

There is much truth in the previous opinions. However, let us recall that Keynes was not alone in underlining the use of government expenditure as a tool to fight unemployment. Also Michal Kalecki, when he first put forward his version of the principle of effective demand, gave a prominent place to government spending as an extra source of demand. He also added a twist to that notion, claiming that even financing government expenditure with taxes on profits would have an expansionary effect.

In our study we have been able to corroborate that government expenditure would raise effective demand. We have also confirmed Kalecki's specific hypothesis about the impact of taxing profits to finance that expenditure.

Let us now discuss the second of Kalecki's hypotheses, which we may relate to the discussion that has taken place among Post-Keynesian economists on the so-called "wage-led" and "profit-led" regimes. Whether a wage-share fall will stimulate demand or not in the short run, depends on the balance between: a) its negative impact on workers' consumption, and b) its (supposed) positive effect on profits, investment and the trade balance. On the other hand, the long-run effects of such a fall depend on the weight of the different determinants of investment decisions. It also depends on how strongly investment impinges on the competitiveness of domestic producers. The wage fall may raise profits in an open economy in the short run, but may reduce demand and capacity utilization. The final result is ambiguous because profits and capacity utilization are two arguments that affect investment decisions.

Our empirical results for the US economy suggest that in this country the shift from wages to profits did indeed cause a short-term fall in effective demand. Besides, in the long run demand and output also appear to be discouraged by this shift.

We may suggest the evolution has gone more or less along the following lines. Let us consider a situation where a fall of the wage share improves the trade balance and profits in the

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<sup>15</sup> See especially Wray, 1998; and Arestis and Sawyer, 2003; as well as the bibliography cited therein.

short run, but depresses aggregate demand and output in the short run. Let us also assume a simple investment function, where investment depends positively on only two arguments: profits and capacity utilization. Let us finally assume the trade balance depends on the competitiveness of domestic producers, which in turn depends on past investment. Then, if the elasticity of investment with respect to profits is lower than its elasticity with respect to utilization, a wage-share fall will have a short-run negative effect on output and employment. Besides, that effect will persist because demand and supply factors come into play. On the one hand, investment will be growing at a lower rate, dragging with it internal demand, due to the demand (and capacity utilization) fall. On the other hand, the trade balance will not improve much, and may even worsen, due to the adverse effect on competitiveness of a lower rate of investment. This would be an example of what has been labeled in the previously cited literature as a “wage-led” regime. We may infer from our empirical results that this regime may be the one prevailing in the US economy.

Finally, let us say a few words about the monetary inferences arrived at from our estimated model. Irrelevance theorems (old and new) hold that any attempt of the monetary authorities to affect the aggregate demand and employment is doomed to failure. Worse, it can have perverse effects on other macroeconomic fundamentals, mainly on inflation. Contrariwise, Keynes’s main message was that monetary policy can be very powerful. He thought that open market operations should be the driving factor in monetary policy, with the interest rate playing a major role<sup>16</sup>. He also underlined the importance of banks, as the most important providers of loans to the private sector<sup>17</sup>. Monetary authorities carry out this type of operation by inducing private banks to substitute reserves for loans (expansionary policy), or to renew reserves (contractionary policy). This will hold as long as there is a well-diversified financial system for the portfolio adjustment (induced by open market operations) to be transmitted to the sector with the longest maturity and is not exhausted in a simple short-term asset substitution.

On the other hand, and despite some confusion about Keynes’s position on the ability or inability of the Central Bank to affect money supply in his writings, it is now clear that for him

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<sup>16</sup> In Keynes’s own words “The new post-war element of ‘management’ consists in the habitual employment of an ‘open-market’ policy (...). This method seems to me to be the ideal one” (Keynes 1930, Vol. II, pp. 206-207).

<sup>17</sup> “[I]n general, the banks hold the key position in the transition from a lower to a higher scale of activity” (CWJMK, vol. 14, 222)

money supply may be actually affected<sup>18</sup>. Reductions in the interest rate directly increase banks' reserves, and this in turn increases credit availability.

Needless to mention, today's US financial system is extremely sophisticated and well diversified, which implies that the importance of monetary policy is further reinforced in comparison with what was the case in Keynes's times. Our results suggest that the main channels through which Keynes thought monetary developments affect the macro economy, have indeed played a significant role in the recent evolution of the US economy. Low interest rates and ample loan availability provided by banks surely explain a lot of its growth prior to the crisis.

Other authors have argued that growing household indebtedness compensated for the negative effects resultant from the shift from wages to profits, thus contributing to sustain effective demand in the US economy<sup>19</sup>. We think our results confirm their opinions.

We now close. It is a fact of life that results arrived at in social sciences, and in sciences in general, are never definite. As time goes by new information becomes available and new and more powerful methods of analysis develop. Anyway, using the most complete set of information at our disposal, and what we think is a rigorous (and demanding) method of statistical analysis, we have reached what we believe are robust conclusions. In a nutshell, we hope to have shown the effective demand approach is useful to explain the recent evolution of the US economy. We have also proved, we hope, the main intuitions of their founding fathers, Keynes and Kalecki, were essentially correct. We do not claim, of course, that what we found for the US takes place in the same way in other advanced economies. The reaction of an economy to shocks and to economic policy measures depends on its structure and institutions. We would, nonetheless, suggest that the method we have used in this work might be useful to study other national cases.

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<sup>18</sup> For a thorough review of the controversy in the interpretation of Keynes' position regarding the ability of the Central Bank to affect money supply in *A Treatise on Money* and in *The General Theory* see Panico (2008).

<sup>19</sup> See Cynamon and Fazzari (2008), Barba and Pivetti, 2009; and Fitoussi and Saraceno (2010).

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## APPENDIX 1

All variables expressed in dollars were modeled as natural logarithms. World output is presented in dollars as well, brought to 2000 prices by OECD considerations. Taxes on corporate income, net taxes on workers and the budget deficit were deflated using the price index for government consumption expenditures (G\_CPI). R is the nominal short-run interest rate (3 months) and W is wage and salary disbursements divided by US GDP on a nominal basis. Table A1 shows all sources.

**Table A1. Model Data Sources**

Variable	Variable name at source	Source	Description
Y	Gross Domestic Product (at 2000 prices)	BEA	Table 1.1.6, item A191RX1
Y nom.	Gross Domestic Product	BEA	Table 1.1.5, item A191RC1
Priv. Cons.	Personal consumption expenditures	BEA	Table 1.1.5, item A002RC1
Priv. Inv.	Gross private domestic investment	BEA	Table 1.1.5, item A006RC1
Trade Balance	Net exports of goods and services	BEA	Table 1.1.5, item A019RC1
Gov. exp.	Government consumption expenditures and gross investment	BEA	Table 1.1.5, item A822RC1
Y*	OECD Gross Domestic Product (at 2000 prices)	OECD	OTF.VPVOBARSA.2000.S1____ GROSS DOMESTIC PRODUCT
W	Wage as share of GDP Wage and salary disbursements (W/Y nom.)	BEA	Table 2.1, item A576RC1 (W)
C	Total Credit Outstanding	FRB	
G_CPI	Price Index for Government consumption expenditures and gross investment (2000=100)	BEA	Table 3.9.4, item B822RG3
H	Taxes on corporate income	BEA	Table 3.1, item W025RC1
B	Budget deficit (total receipts minus total expenditures)	BEA	Table 3.1, item AD01RC1
S	Surplus of government revenue over government expenditure on compensations to employees and transfers	Own calculation	Variable calculated as: $S = \text{Gov. exp.} - (B + H)$
O	Other budget revenues	Own calculation	$O = \text{Gov. exp.} - H$
R	Short-run interest rate (3 months)	Federal Reserve	3-month Treasury bill secondary market rate discount basis