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The Determinants of New Orders of Non-Defence Capital Goods and Its Relationship to Business Fixed Investment Expenditures: 1992 to 2010

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Abstract:
The determinant of nonfarm nonfinancial corporation orders of nondefense capital goods (as generated by the Census Bureau) is modelled during the period of 1992 to 2010. Statistically significant relationship between investment orders and the cyclical variations in output, the interest rate spread, net cash flows, the net increase in financial liabilities, the net increase in financial assets, and the value of (nondefense) manufacturing shipments is found. During the period 1992 to 2001, the wage share is inversely related to new orders. New orders are used to explain, subject to a lag, nonfarm nonfinancial corporations fixed investment expenditures, as generated by the BEA. A statistically significant relationship is found between investment expenditures and new orders, subject to modifications by changes contemporaneous economic conditions (largely reflected in cyclical changes in output, and, to a lesser extent, changes in the interest rate spread).

Key Words: *New Orders of Investment Goods, Investment Expenditures, Interest Rate Spread, Cash Flow, Sales Accelerator*

JEL Classification: *E12, E22, E32, E43*

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1. Introduction

Downward (2003) identifies a tension in Post Keynesian economics between philosophical pronouncement and practice over the role of econometrics. Critical realists, for example, Lawson, maintain that there will be a plurality of partial regularities and processes underlying events that are not predictable or are not universal event-regularities, thereby rendering econometric inference inherently problematic. This view is shared by Davidson who argues that Post Keynesians embrace a non-ergodic and transmutable-reality view of the world in which probabilities, and thus econometric inference, are not reliable guides to the future. Only Dow's 'Babylonian' approach allows for the possibility of some limited econometric testing. Herein lies the rub for Post Keynesian economics, how to reconcile its philosophical rejection of 'empirical realism' with a practical need for empirical analysis.

Kalecki (1965), too, was aware of the tension between the philosophical foundations of Post Keynesian/Marxist economics (historical materialism) and econometrics. Econometric models are based on functional relationships over time between econometric variables which are assumed to be given and not subject to change. Historical materialism considers the development of society as the interaction between the spheres of productive forces and productive relations (the base), and the spheres of natural resources and of government, culture, science and technology (the superstructure). The base and the superstructure interact with each other. Econometric modeling can only be properly applied in the sphere of productive forces if the relationships between the economic variables remain stable. But Kalecki recognised that the complexity of the relationships between the base, natural resources and the superstructure as these impact on the economic variables in the sphere of productive forces raises doubts over the legitimacy of econometric modeling.

Kalecki's historical materialist vision of the development of society would, therefore, appear to have lead him to the same negative conclusion on the role of econometrics as Lawson and Davidson. But he goes on to argue that ...'the two approaches [historical materialism and econometrics] do not seem to be irreconcilable' (ibid:233). He emphasises (ibid: 236) that the basic postulate of historical materialism is that autonomous changes in the superstructure are of lesser importance as compared with the effect upon it of productive forces and changes in productive relations.

An econometric model of productive forces can only be justified under two conditions (ibid:236):

- there are no autonomous changes in the spheres other than strictly economic conditions or if they do not affect significantly the pattern of economic development; and
- there is no significant feedback effect involved in the impact of economic development upon the other spheres of the system.

He defines a function f which stands for the aggregate of the relationships between and within the base and the superstructure. He assumes f to be invariable, an assumption he recognises as 'rather far-reaching' (ibid:234), but is justifiable as a useful tool of analysis if its limitations are kept in mind. Kalecki (ibid: 236) accepts that the basic assumption of the econometric model that the function f which stands for all the relationships between the economic variables past and present is not subject to change cannot be maintained, but concludes nevertheless (ibid:237):
It may be therefore concluded that f is normally a function of such a type that small changes in its shape do not lead to major changes in the economic variables (authors' emphasis).

For Kalecki, therefore, the impact of the superstructure on the spheres of production forces and productive relations is an empirical issue. However, there is one critical aspect of econometric modelling that he insists must be inviolate (ibid:234) What is, however, totally inadmissible is to construct an econometric model of future economic development postulating tacitly non-existent productive relations.

In the study we report below of the determinants of new orders for non-defence capital goods in the USA, we justify our use of econometrics by following Kalecki's two 'golden rules'.

- We assume that the changes that may have taken place in the superstructure over the period of our study have not been of such a magnitude as to have had a significant impact on the behaviour of the economic variables in the sphere of productive activity. This is not the same as assuming 'ceteris paribus'. We pay close attention to the residuals in our reported equations for evidence which may suggest the influence of changes in the superstructure.
- We explicitly include the wage share as a variable to capture the influence of the sphere of productive relations on the relationships between the variables in the sphere of productive forces.

Following the publication of Keynes' General Theory (1936), understanding the determinants of business fixed investment expenditures has been an important focus in understanding cyclical volatility and long-period economic growth. Kalecki (1954) contemporaneously developed an alternative theory of investment that links, profits, risk, and income distribution to determination of decisions to place new orders of investment goods. In short, Kalecki's analysis linked the macroeconomic

and microeconomic foundations of investment in explaining short-period fluctuations in investment, and longer-period trends in production and employment. Courvsisanos (1996) *has* refined and extended Kalecki's theory of investment (see Laramie, Mair and Miller (2007)) by combining Kalecki's "objective" and Keynes' (and others') "subjective" determinants of investment. The synthesis of these elements result***s*** in what Courvisano terms the susceptibility cycle. The susceptibility cycle seeks to explain the fragility of fixed investment decisions. Fragility is the results of tensions that investment decisions create concerning the firm's future profitability and viability. These tensions are a function of exposure to risk and uncertainty over time and lead to the emergence of a ***cycle***. It is this susceptibility cycle of investment orders that drives the investment (expenditure) cycle and plays a significant role in the shape and intensity of the business (or trade) cycle.[5]

By identifying these tensions, or behavioral elements, Courvisanos provides a link between Kalecki's (1971a/1968) rather mechanical theory of the business cycle and Keynes's views on the role of conventions or rules of thumb (event-regularities) in the investment decision process. The tangible (quantifiable) behavioral elements of this Kalecki-Courvisanos (K-C) susceptibility cycle are reflected in profits, the gearing (debt to equity) ratio and in the level of capacity utilization.

Recognition of the latent behaviorist foundations of Kalecki's investment theory is a major step in confirming his contemporary relevance in a global economy that has changed significantly since he wrote about it between the 1930s and the 1960s (Courvisanos, 2004). Essentially, Kalecki was a child of the second industrial revolution based on the widespread use of electrical power and the application of 'Fordist' mass production techniques. Since his death, a major revolution has occurred resulting in the emergence of what is generally described as The New Economy based on the widespread use of micro-electronics and computer-based networks. Information and communication technologies (ICT) have resulted in knowledge becoming the key engine of economic growth. For Kalecki to remain relevant to 21st century economics, he must be understood and applied from a new perspective. This can be achieved if the latent behaviorist foundations of his original writings are brought into the open. Interpreting Kalecki from a behaviorist perspective allows his basic insights to be linked with recent research in evolutionary economics.

If Kalecki is to be re-interpreted as a behavioural economist then it has to be demonstrated that the K-C susceptibility cycle model is capable of being measured empirically. This is not our first attempt at estimating the K-C susceptibility cycle. In *Empirical Post Keynesian Economics* (Holt and Pressman, 2007), we report the

5 We thank Jerry Courvisanos for this clarification.

results of our attempt at estimating the K-C susceptibility cycle for the United Kingdom over the period 1980Q1 to 1996Q4 (Laramie et al. 2007). From that study, we conclude that such tangible Kaleckian manifestations of business susceptibility as profitability, risk and capacity utilization have played a significant role in explaining investment behavior in the UK through the 1980s and early 1990s.

However, time has moved on since our UK study and the transition to The New Economy has proceeded apace. Accordingly, we have decided it is appropriate to have another attempt at estimating the K-C susceptibility cycle, this time with an up-dated version of the model, for a different economy (the USA), for a more recent time period (1992Q3 – 2010Q4) and using a different econometric approach. To do so, we consider the determinants of new orders of non-defence capital goods of non-financial corporations during the last two decades.[6]

New orders of capital goods lead investment expenditures over the business cycle and can be used to predict business fixed investment expenditures. Kalecki (1954, 1971/1968) explained new orders as being dependent upon entrepreneurial savings, the change in business profits and the change in the capital stock. Given these determinants, new orders lead investment expenditures subject to a construction time lag. Likewise, Zarnowitz (1973, p. 413) states: "Investment decisions are necessarily the antecedent and be treated as the proximate "cause" of investment spending." Zarnowitz (1973, pp. 442 - 463) estimates investment expenditures as a distributive lag depending on past levels of investment orders. In order to develop his susceptibility cycle, Courvisanos (1996) builds on the work of Kalecki and Zarnowitz by blending in the work of Keynes (1936), Minsky (1982), Loasby (1967) and Shackle (1970). And, by so doing, considers the psychological tensions that build up over a cumulative investment process. These psychological factors manifest themselves in new orders of investment goods, and reflect semi-autonomous factors, like cash flows, capacity utilization, and debt-to-equity (or gearing) ratios, and exogenous factors, like innovations and political instability (the superstructure) inter alia (see Courvisanos 1996, pp. 164 - 189). Laramie, Mair and Miller (2004 and 2007) provide evidence of the susceptibility cycle using U.K. data.

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6 Non-financial corporations new orders of non-defense capital goods series is provided by the U. S. Census Bureau. This series includes new orders of: small arms and ordnance; farm machinery and equipment; construction machinery; mining, oil, and gas field machinery; industrial machinery; vending, laundry, and other machinery; photographic equipment; metalworking machinery; turbines and generators; other power transmission equipment; pumps and compressors; material handling equipment; all other machinery; electronic computers; computer storage devices; other computer peripheral equipment; communications equipment; search and navigation equipment; electromedical, measuring, and control instruments; electrical equipment; other electrical equipment, appliances, and components; heavy duty trucks; aircraft; railroad rolling stock; ships and boats; office and institutional furniture; and medical equipment and supplies
(http://www.census.gov/manufacturing/m3/adv/pdf/table1a.pdf).

Laramie and Mair (2010) looked for further evidence of the susceptibility cycle in the U.S. and made comparisons to the findings for the U.K.

This paper refines the econometrics of Laramie, Mair and Miller (2004 and 2007). We use new empirical definitions of the dependent and explanatory variables, and include the interest rate spread (between the Ten Year Treasury Note and the Federal Funds Rate) as an additional measure of risk and cash commitments. We explicitly follow Kalecki's 'golden rule' by testing for the effects of the "wage share" and military spending (the superstructure) on investment orders, and we relate investment orders to capital expenditures, subject to the production lag and modifications.

The major conclusions of the paper are as follows. First, new orders of non-defence capital goods is largely explained by four factors: 1) Cyclical variations in real GDP; 2) The interest rate spread between the Ten Year Treasury Note Rate and Federal Funds Rate; 3) Net Cash Flows, as modified by net increases in financial liabilities and the net acquisition of financial assets; and 4) The value of shipments of manufactured goods. Second, the net increase in financial liabilities appears to be funding, in part, new investment orders, whereas the net acquisition of financial assets seems to be crowding out, substituting for, new orders. Other financial variables, for reasons discussed below, such as the debt-to-equity ratio, had no statistically significant effect on new orders. Third, the wage share, during the period of 1992 to 2001, is statistically significant and inversely related to new orders. This suggests to us that Kalecki was indeed correct to insist that an econometric model of investment behaviour that does not explicitly include productive relations (wage share) is miss-specified. During the period 2001 to 2010, no statistically significant relationship between new orders and the wage share is found. Fourth, we test for the direct effects of military spending on new orders during the period of 2001 to 2010. No statistically significant relationship was found. Finally, we show, using two-stage least squares, that the fitted-values of new orders influence investment expenditures and the impact of new orders on investment expenditures is altered by changes in contemporaneous economic conditions as reflected in cyclical changes in output and changes in the interest rate spread.

This paper is structured as follows. First, the capital goods new orders model is developed. Then, the empirical categories are defined. Next, various statistical tests are presented and discussed. Finally, the conclusions are summarized.

The Model: New Orders of Non-Defence Capital Goods

Following Courvisanos's basic specification, investment orders, D_t, depend on P_t = the level of profits; $\Delta P = P_t - P_{t-1}$, an actual increment in profit levels; g_t = the gearing ratio; c_t = the capacity utilization rate; i.e.:

$$(1) \qquad D_t = f(P_t, \Delta P_t, g_t, c_t).^{7}$$

We [adopt an eclectic approach and] modify the investment equation to include an interest rate spread, s, a sales accelerator, as, the wage share, w, [to reflect profit squeeze,] to satisfy Kalecki's golden rule, a defence spending variable, d, to capture the superstructure and we drop the change in profits term (as we expect that capacity utilization rate variable and the sales accelerator to pick up this effect). That is:

$$(1') \qquad D_t = f(P_t, s_t, sa_t, g_t, c_t, w, d).^{8}$$

Furthermore, we try a variety of different empirical definitions for our financial variables, as discussed below. Now we briefly consider the relationship between the right-hand-side variables and the level of investment orders.

Profits: The profits coefficient is expected to be positive. In the various versions of his investment theory, Kalecki included a profits variable to capture the effects of 'entrepreneurial' savings on investment and changes in profitability as affecting the prerequisites for re-investment of 'entrepreneurial' savings. Zarnowitz (1973), Fazzari and Mott (1986-1987), have used net internal cash flows as a proxy for profits in explaining investment expenditures. We modify their approach by also considering the effects of increasing liabilities or acquiring additional financial assets on investment orders. Businesses can acquire financial liabilities to place orders to purchase capital goods, and business can use internal funds or the funds raised through the increase in liabilities to acquire financial assets instead of placing orders to purchase capital goods.[9]

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7 Courvisanos (1996, p. 161) lags the right-hand-side variables by one period. Kalecki (1954, p. 98) has investment orders and the right-hand-side variables as contemporaneously determined. We adopt Kalecki's approach here.

8 Kalecki (1954, p. 98) and Zarnowitz (1973, p. 412) indicate that investment orders lead investment expenditures. Given this lead, investment orders and the right-hand-side variables are not simultaneously determined.

9 As described below, our data on cash flows, the net increase in liabilities and the acquisition of financial assets are derived from U.S. flow of Funds Accounts. In these accounts, Capital Expenditures = Total Internal Funds (plus the Inventory Valuation Adjustment) plus the Net Increase in Liabilities minus the Net Acquisition of Financial Assets plus the Statistical Discrepancy. Again, we don't expect problems of simultaneity as investment orders lead investment expenditures.

Gearing ratio: According to Kalecki's principle of increasing risk, a rising gearing ratio (an increase in debt relative to equity) generates higher risk of failure, if expected profits from investment plans are not realized. The gearing ratio and new orders are expected to be inversely related.

The interest rate spread: Minsky (1975) modified the effects of the gearing ratio on investment by explicitly considering the effects of cash commitments, like interest payments. In our approach, we use the interest rate spread to proxy for the effects of cash commitments on investment. Moreover, Gertler, *et al.* (1991) use an interest rate spread as a proxy to measure the agency costs associated external finance. A rising interest rate spread increases cash commitments and risk, and reduces new orders.

Capacity utilization: The coefficient on capacity utilization, *c*, is expected to be positive as rising capacity utilization is expected to encourage future investment orders. If businesses maintain excess capacity over the business cycle as Kalecki (1971) has asserted (see White 1999), then the capacity utilization effects are expected to be weak. As discussed below, we utilized a couple of different measures of capacity utilization, and find that the best measure, for our purposes, is a measure of the cyclical variation in output.

Sales Accelerator: A number of capital stock adjustment models link changes in the capital stock, and, therefore, new orders to changes in sales see (Zarnowitz 1973, p. 468). Since we are using Census of Manufacturing data, we use manufacturing sales, as reflected in changes in the value of shipments of manufactured non-defence goods.[10]

Wage Share: The wage share variable is used to [test for profit squeeze effects on new orders (see Zarnowitz, 1973, p.414)] satisfy Kalecki's golden rule**.** [As is well known,] The rate of profits can be written as the profits share times the output to capital ratio. A rise in the wage share, a fall in the profits share, given the output to capital ratio, lowers the profit rate and discourages investment orders. Business leaders might expect, therefore, lower future profits as a consequence of a rising wage share, therefore we expect an inverse relationship between the wage share and investment orders.

Defence Spending: Courvisanos (1996) considers defence or military spending (the superstructure) as an exogenous factor influencing investment orders, and he considers the possibility that defence spending can crowd in, that is encourage, non-defence orders of capital goods. The effects of military spending on non-defence

[10] Sawyer (1986, pp. 51 - 52) explains the analogous relationship between sales and profits in the investment equation.

new orders of capital goods can be indirect, effected through changes in the other determinants of new orders, or indirect, effected through changes in military spending. Here we simply test for direct effects.

2. Empirical Definitions

Our data are derived from four main sources: 1) The U. S. Census of Manufacturers (*Manufacturer's Shipments, Inventories, and Orders: Historic Timeseries Accounts (NAICS Based*); 2) The Federal Reserve's *Flow of Funds Accounts*; 3) *The National Income and Product Accounts of the U.S*; and 4) The Federal Reserve Economic Data (FRED database) provided by the St. Louis Federal Reserve Bank.

Investment orders (D): For the dependent variable, investment orders of non-defence new capital goods, as published by the Census Bureau, was used. The Census Bureau provides monthly data. The monthly data were converted into quarterly data by summing up the three months of data and by dividing that sum by 3. We used the NAICS time series. This series is available from 1992, second quarter to date.

Profits (P): For the profit variable, total internal funds plus the inventory valuation adjustment of non-farm non-financial corporations (which excluded dividends) is used. In addition to the profits variable, we consider the affects of the net increase in liabilities (*nil*) and the net acquisition of financial assets (*naf*) on new orders. The net acquisition of financial assets minus the net increase in financial liabilities equals net lending, if positive, or net borrowing, if negative. These series of data are provided by the Federal Reserve in the Flow of Funds Accounts of the United States.

Gearing (or leverage) ratio (g): Two measures of the gearing ratio were considered: 1) Debt to Net Worth; and 2) Debt to Equity. Both series are provided in Table B.102, lines 36 and 37. These series did not generate statistically significant results, and the series is excluded from estimates below.[11]

Capacity utilization (c): We considered three empirical definitions of the capacity utilization rate: 1) Total Industrial Capacity Utilization provided by FRED; 2) Manufacturing Capacity Utilization, also provided by FRED; and 3) The cyclical variation in output. The cyclical variation in output was computed as the difference between current real GDP and 'potential' real GDP as a percent of real 'potential'

[11] The *Flow of Funds Accounts* provides a much higher level of aggregation than does the Census Bureau's NAICS measure of New Orders of Non-Defence Capital Goods. We suspect that this high level of aggregation accounts for the statistically insignificant results.

GDP.[12] Total Industrial Capacity Utilization and the cyclical variation in output variables were highly correlated. The cyclical output variable generated slightly better estimates (see below) and was used as our capacity utilization measure.

The interest rate spread (s). The interest rate spread is calculated as the difference between the yield on the 10 Year (constant) maturity Treasury bond and the Federal Funds Rate as provided by FRED.

The Sales Accelerator (sa). The sales accelerator is the change in seasonally adjusted manufacturing value of shipments (excluding) defence as provided by the Census of Manufacturing. Shipments, instead of orders, were used, because our dependent variable includes a subset of manufacturing orders.

The wage share (w). The wage share is calculated as non-financial corporation's compensation to employees divided by the respective value added and this series is provided in Table 1.14 in the National Income and Product Accounts.

Defence Spending (d). The defence spending variable is measured as the ratio of National Defence and Consumption Expenditures and Gross Investment (Table 3.11.5 of the NIPA) to Nominal GDP.

The nominal levels of new orders, internal funds, the net increase in liabilities, the net acquisition of financial assets, the value of manufacture shipments were converted into constant dollars using the non-residential fixed investment price index provided in the National Income and Product Accounts, Table 1.1.4, line 9. These constant dollar levels were divided by real 'potential' GDP to reflect cyclical variations in variables and to ensure that the variables have similar units of measurement.

Stationarity tests were performed on all the variables. The data were first differenced to satisfy the stationarity conditions. In cases where the stationarity test provided evidence of a trend, the first differenced data were detrended. The stationarity tests are available upon request.

The summary statistics of the variables levels, first differenced levels are provided in Appendix 1.

[12] The measure of potential real GDP used is generated by the Congressional Budget Office and provided by FRED.

3. Statistical Results: New Orders of Non-Defence Investment Goods

A number of variants of the model were tested. We summarize a sample of our results. The estimates were generated using STATA's Prais-Winsten auto-correlation correction technique.

Table 1 shows that all the variables, with the exception of the constant, are statistically significant, and have the expected sign. A ten percent increase in internal funds relative to potential output, P, increases new orders of investment goods relative to potential output by about by about one-quarter of one percent. A ten percent rise in the cyclical variation in output, c, and increases new orders relative to potential output by about .15 of one percent. An increase in the interest rate spread by one percentage point reduces investment orders relative to potential output by .002 percentage points.

A rise in the net increase in liabilities increases new orders relative to potential output, and an increase in the net acquisition of financial assets reduces new orders relative to potential output. A ten-percent increase in the increase of net liabilities relative to potential output increase new orders relative to potential GDP by about 0.07 percentage points, and a ten-percent increase in the net acquisition of financial assets relative to potential output reduces new orders relative to potential GDP by about 0.06 percentage points.

The sales accelerator shows the strongest effect of the independent variables. If the shipment of manufactured goods increases by ten percent relative to potential output, new orders relative to potential output increase by 0.8% .

Inclusion of the wage share and defence variables, either separately or together, diminishes the equation's goodness of fit, [or is excluded from this report, but is available upon request.] We interpret this as indicating that the spheres of productive relations and the superstructure have not had a significant effect on the sphere of productive activity over this time period.

Table 1. New Orders of Non Defence Investment Goods: 1992Q3 to 2010Q4.

Prais-Winsten AR(1) regression -- iterated estimates

```
      Source |       SS       df       MS       Number of obs=74
-------------+------------------------------    F(6,67) =   30.88
       Model |  6.2702e-06     6  1.0450e-06   Prob > F =  0.0000
    Residual |  2.2673e-06    67  3.3840e-08   R-squared  =  0.7344
-------------+------------------------------   Adj R-squared=0.7107
       Total |  8.5375e-06    73  1.1695e-07    Root MSE =  .00018

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```

```
 Δ.D|      Coef.   StΔ. Err.      t    P>|t|      [95%Conf.Interval]
-------------+----------------------------------------------------------
ΔP. |   .0242326   .0061643     3.93   0.000     .0119285    .0365367
            |
Δc. |   .0148843   .0036852     4.04   0.000     .0075287    .0222399
            |
Δs. |  -.0002189   .0000361    -6.06   0.000     -.000291   -.0001468
Δnil. | .0069532    .001958     3.55   0.001      .003045   .0108613
            |
Δnafa. |  -.0058505  .0015649    -3.74   0.000  -.008974    .002727
            |
Δ2sa. |   .0831117   .0290444     2.86   0.006     .0251389 .1410845
            |
cons |  -8.14e-06    .000015    -0.54   0.589    -.0000381  .0000218
-------------+----------------------------------------------------------
 rho |  -.4978453
------------------------------------------------------------------------
Durbin-Watson statistic (original)    2.833243
Durbin-Watson statistic (transformed) 2.004609
```

We also test the model for two sub-sample periods: 1) 1992Q3 to 2001Q3; and 2) 2001Q 4 to 2010Q4.[13] These results are summarized in Tables 2 and 3.

In estimating the model for the first time period, we find that the first differenced values of new orders and the wage share have a statistically significant trend. We de-trend these variables, and estimate the equation using these de-trended variables. Our estimates show that the coefficients on sales accelerator, the net increase in liabilities and the net acquisition of financial asset variables are all statistically insignificant. Moreover, we find, during this period, that the internal funds and wage share variables are inversely correlated with each other. The inclusion of both variables in the model causes the internal funds coefficient to be statistically insignificant whereas the wage share variable is statistically significant at the 90% confidence level. As a result, we re-estimated the equation without the internal funds variable, but with the wage share variable. This specification yielded the best goodness of fit. See Table 2. The cyclical output and spread variables retain their statistical significance. The wage share variable is statistically significant at the 98% confidence level, and it is inversely related to new orders. The wage share's coefficient shows that a 1 percentage point decrease in the wage share increases investment orders to potential output by about 0.02%. From 1992 to 1997, the wage share declines from around 66% to around 63.5%, but, from 1997 to 2001, the wage share recovers to around 67%. This inverse relationship between the new orders and the wage share is suggestive of Zarnowitz's (1973) speculation that wage increases

[13] These two periods basically cover the last two business cycles as defined by NBER Business Cycle Dating Committee.

potentially squeeze out new orders, or Kalecki's (1943) conclusion that business leaders become boom weary.

Table 2. New Orders of Non Defense Investment Goods: 1992Q3 to 2001Q3

Prais-Winsten AR(1) regression -- iterated estimates

```
Source |       SS       df                  MS  Number of obs=    37
-------------+------------------------------ F(  3,    33) =    5.58
Model |  5.7138e-07     3  1.9046e-07        Prob > F      =  0.0033
Residual |  1.1270e-06    33  3.4152e-08      R-squared     =  0.3364
-------------+------------------------------  Adj R-squared =  0.2761
Total |  1.6984e-06    36  4.7178e-08         Root MSE      =  .00018

------------------------------------------------------------------------
ΔD. |   Coef.   Std. Err.    t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------
----
Δc. | .0122314  .0057986    2.11   0.043     .000434    .0240288

Δs. | -.0002106 .0000674   -3.12   0.004    -.0003478   -.0000734

Δw.  | -.0201522  .0094967  -2.12   0.041   -.0394733   -.0008311

cons  |-.000017 .0000313    -0.54   0.592    -.0000807    .0000468
-------------+----------------------------------------------------------
rho |   .0166846
------------------------------------------------------------------------
----
Durbin-Watson statistic (original)    1.886439
Durbin-Watson statistic (transformed) 1.917635
```

For the second time period, we are unable to find any statistically significant relationship between new orders and wage share or new orders and defence spending. In Table 3, we exclude these variables. Our results in Table 3 are qualitatively similar to that reported in Table 1. Perhaps a significant difference in our findings here is that the net increase in liabilities coefficient has decreased. This result suggests liabilities are being used less to finance new orders. In addition, we see a slight increase in the acquisition of financial assets coefficient, suggesting that financial assets are increasingly substituting for new investment orders.

Table 3. New Orders of Non-Defence Investment Goods: 2001Q4 to 2010Q4

Prais-Winsten AR(1) regression -- iterated estimates

```
Source |       SS       df       MS              Number of obs =      37
-------------+------------------------------     F(  6,    30) =   34.24
Model |  6.0242e-06     6  1.0040e-06           Prob > F      =  0.0000
Residual |  8.7965e-07    30  2.9322e-08        R-squared     =  0.8726
-------------+------------------------------    Adj R-squared =  0.8471
Total |  6.9038e-06    36  1.9177e-07           Root MSE      =  .00017
```

```
------------------------------------------------------------------------------
 ΔD |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------+-----------------------------------------------------------------
ΔP. |   .0262867   .0059852     4.39   0.000     .0140632    .0385102
           |
Δc. |   .0173595   .0042107     4.12   0.000     .0087601    .0259589
           |
Δs.|  -.0002119   .0000465    -4.56   0.000    -.0003069   -.0001169
           |
Δnil. |   .0045066   .0020558     2.19   0.036     .0003081    .0087052
           |
Δnafa.|  -.0062847   .0015682    -4.01   0.000    -.0094874    -.003082
           |
Δ2sa. |    .106197   .0289697     3.67   0.001     .0470329    .1653611
           |
cons |   3.91e-06    .000019     0.21   0.838    -.0000348    .0000426
------------+-----------------------------------------------------------------
rho |   -.734896
------------------------------------------------------------------------------
-
Durbin-Watson statistic (original)    3.204465
Durbin-Watson statistic (transformed) 2.133271
```

4. Statistical Results: Non-Farm-Non-Financial Corporate Fixed Investment

In this section, we attempt to explain the relationship between non-farm-non-financial corporate fixed investment expenditures and new orders of investment goods. The new orders data series is provided by the Census Bureau, as described above, and represents a relatively small subset of the investment expenditures provided by the BEA, and made available in the Federal Reserve's Flow of Funds Accounts. Fixed investment expenditures consist of equipment, software and structures, and investment orders consists of various types of equipment orders (see footnote 1).

To begin, like Kalecki (1971) and Zarnowitz (1973), investment expenditures are a lagged function of investment orders; i. e.:

(2) $I_{t+\tau} = f(D_t)$.

Like Courvisanos (1996), we consider the possibility that new orders can be cancelled, or otherwise modified, in the lag between orders and deliveries. As a result, we modify the investment equation as:

(3) $I_{t+\tau} = f(D_t, \text{Modifiers}_t)$;

where we select as our modifiers: the current period's cyclical output and the interest rate spread.

To illustrate this model, we develop two-stage least squares estimates of equation 3. In the first stage, we regress investment orders on the same set of variables given in Table 1. In the second, stage, investment expenditures is regressed on the fitted values of new orders. In our study, we considered two cases: 1) where we estimate equation 3 without any modifiers, and 2) where we estimate the same equation with modifiers.

Table 4 illustrates our estimates without the modifiers. To economize on space only the final-stage regression results are presented. Like above, all constant dollar levels were expressed as a percent of potential output, and first differenced to satisfy the stationarity conditions.

Table 4 illustrates that the Census Bureau's new order series predicts the BEA's investment series pretty well. In Table 4, we estimate investment expenditures as depending upon new orders, lagged over the eight previous quarters. The coefficients on the first three lagged variables are positive and statistically different from zero. The Sargan and Basmann identification tests suggest that the instruments are uncorrelated with the error terms.

Table 4. Investment Expenditures and New Orders: 1994Q1 to 2010Q4: No Modifiers

Instrumental variables (2SLS) regression

Number of obs= 66
Wald chi2(8)=101.76
Prob > chi2 = 0.0000
R-squared = 0.5906
Root MSE = .00129

ΔI_t	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ΔD_{t-1}.	3.439208	.6267326	5.49	0.000	2.210835	4.667582
ΔD_{t-2}.	2.085614	.6548519	3.18	0.001	.8021274	3.3691
ΔD_{t-3}.	2.33767	.6749982	3.46	0.001	1.014698	3.660642
ΔD_{t-4}.	.5706905	.6400995	0.89	0.373	-.6838814	1.825262
ΔD_{t-5}.	-.2901951	.6628541	-0.44	0.662	-1.589365	1.008975
ΔD_{t-6}.	-.4947178	.6697885	-0.74	0.460	-1.807479	.8180435
ΔD_{t-7}.	1.104547	.6556019	1.68	0.092	-.1804091	2.389503
ΔD_{t-8}.	.4723432	.7142281	0.66	0.508	-.9275181	1.872205

```
cons |   .0001951   .0001593     1.22   0.221  -.0001172    .0005074
------------------------------------------------------------------------------
Instrumented: ΔD_t-i, i = 1 - 8

Instruments:    ΔP_t-i, i = 1 - 8
                Δc_t-i, i = 1 - 8
                Δs_t-i, i = 1 - 8
                Δnil_t-i, i = 1 - 8
                Δnafa_t-i, i = 1 - 8
                Δsa_t-i, i = 1 - 8

Tests of overidentifying restrictions:

  Sargan (score) chi2(40)=  44.2672  (p = 0.2963)
  Basmann chi2(40)       =   34.627  (p = 0.7104)
```

Table 5 shows our estimates with the modifiers included. Our modifiers are the current period's cyclical variation in output and the interest rate spread. These modifiers are expected to be simultaneously determined with investment expenditures. Like before, we used two-stage least squares to estimate equation 3, where in the first stage, new investment orders, the cyclical variation in output, and the interest rate spread depend of the variables depicted in Table 1. In the second stage, investment expenditures depend on the fitted values of investment orders, the cyclical variation in output, and the interest rate spread. The results are similar to those in Table 4--where the lagged values of new orders retain their statistical significance with the expected signs. However, the inclusion of the modifiers improves the goodness of fit while allowing us to accept the null hypothesis that instruments are uncorrelated with the error term. The cyclical variation in output coefficient is statistically different from zero, and is positively related to investment expenditures. The interest rate spread coefficient has the expected sign, and it is statistically different from zero at the 90% level. These results suggest that the interest rate spread does affect the relationship between new orders and investment expenditures.

Table 5. Investment Expenditures and New Orders: 1994Q1 to 2010Q4: With Modifiers

```
Instrumental variables (2SLS) regression     Number of obs = 66
                                             Wald chi2(10) = 204.70
                                             Prob > chi2   =0.0000
                                             R-squared =  0.7608
                                             Root MSE  =  .00098

------------------------------------------------------------------------------
ΔI_t |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ΔD_t-1. |   1.627684 .5986736     2.72   0.007   .4543051    2.801063
ΔD_t-2. |   1.395098   .5169306   2.70   0.007 .3819325    2.408263
```

ΔD_{t-3}.	1.997984	.521553	3.83	0.000	.9757592	3.020209
ΔD_{t-4}.	.7066289	.4911141	1.44	0.150	-.255937	1.669195
ΔD_{t-5}.	.0690834	.5151413	0.13	0.893	-.9405751	1.078742
ΔD_{t-6}.	-.2621003	.5236337	-0.50	0.617	-1.288403	.7642029
ΔD_{t-7}.	.7731969	.507639	1.52	0.128	-.2217572	1.768151
ΔD_{t-8}.	.1144444	.5536809	0.21	0.836	-.9707501	1.199639
Δc_t.	.136787	.0253796	5.39	0.000	.0870439	.18653
Δs_t.	-.0005583	.0003044	-1.83	0.067	-.0011549	.0000384
cons	.0002969	.0001234	2.41	0.016	.0000552	.0005387

Instrumented: ΔD_{t-i}, i = 1 - 8; Δc_t; Δs_t

Instruments: ΔP_{t-i}, i = 1 - 8
Δc_{t-i}, i = 1 - 8
Δs_{t-i}, i = 1 - 8
Δnil_{t-i}, i = 1 - 8
$\Delta nafa_{t-i}$, i = 1 - 8
Δsa_{t-i}, i = 1 - 8

Tests of overidentifying restrictions:

Sargan (score) chi2(38)= 45.2115 (p = 0.1962)
Basmann chi2(38) = 36.9722 (p = 0.5168)

We also examined equation 3, with and without modifiers for our two sub sample periods. For the first sample period, 1992 to 2001, the lagged orders coefficients were statistically different from zero, but the equation's goodness of fit left much room for improvement. When the modifiers were included, the new order's coefficients lost their statistical significance, and the cyclical variation in output coefficient was statistically significant. The interest rate spread coefficient was not statistically different from zero. These results are available upon request.

For the second sample period, 2001Q4 to 2010Q4, we present our results in Table 6. In this illustration, we lag new orders over four quarters. The coefficients on the first, second and fourth lag are statistically different from zero at the 90% confidence level whereas the coefficient on the second lag is statistically different from zero at the 95% confidence level or higher. The coefficient on the second lagged variable is not statistically different from zero. Like in Table 5, the cyclical variation in output appears to modify investment expenditure, but, in contrast to Table 5, the interest rate spread does not.

Table 6. Investment Expenditures and New Orders: 2001Q4 to 2010Q4: With Modifiers

```
Instrumental variables (2SLS) regression    Number of obs =      37
                                            Wald chi2(6)  =  221.23
                                            Prob > chi2   =  0.0000
                                            R-squared     =  0.8473
                                            Root MSE      =  .00088

------------------------------------------------------------------------------
ΔIt |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ΔDt-1. |   1.480338 .7014244     2.11   0.035   .1055711    2.855104
ΔDt-2. |   .8460939   .5416572   1.56   0.118   -.2155347   1.907722
ΔDt-3. |    1.93845   .5087059   3.81   0.000   .9414043   2.935495
ΔDt-4. |   1.007792    .495108   2.04   0.042   .0373985   1.978186
Δct.   |   .2210133   .0339548   6.51   0.000  .1544632    .2875634
Δst.   |   .0000588   .0004472   0.13   0.895    -.0008177 .0009353
cons |   .0002919    .000159   1.84   0.066    -.0000198    .0006035
------------------------------------------------------------------------------
Instrumented: ΔDt-i, i = 1 - 4; Δct; Δst

Instruments:    ΔPt-i, i = 1 - 4
                Δct-i, i = 1 - 4
                Δst-i, i = 1 - 4
                Δnilt-i, i = 1 - 4
                Δnafat-i, i = 1 - 4
                Δsat-i, i = 1 - 4

Tests of overidentifying restrictions:

  Sargan (score) chi2(18)=  14.1958  (p = 0.7162)
  Basmann chi2(18)       =  7.47008  (p = 0.9855)
```

5. Conclusion

As Post Keynesians we are conscious of the need to exercise caution in the use of econometrics to explain business investment behaviour. We think that it is counter-productive for Post Keynesian to retreat into empirical nihilism. We have explicitly adopted a Kaleckian approach in this paper as this appears to us to offer a course by which Post Keynesians may plot a hazardous voyage between the Scylla of theoretical integrity and the Charybdis of empirical testing. In this paper, we have attempted to examine the determinants on non farm non financial investment orders, as reported by the U.S. Census Bureau in NAICS, and we then attempted to explain how these investment orders related to non farm non financial corporate investment expenditures.

New orders of capital non-defence goods are largely explained by four variables: 1) Cyclical variations in real GDP; 2) The interest rate spread between the Ten Year Treasury Note Rate and Federal Funds Rate; 3) Net Cash Flow as modified by the net increase in financial liabilities and net acquisition of financial assets; and 4) The value of shipments of manufactured goods. The net increase in financial liabilities appears to be funding, in part, new investment orders, and the net acquisition of financial assets seems to be crowding out or substituting for new orders. Other financial variables, such as the debt-to-equity ratio, had no statistically significant effect on new orders. We attribute the lack of significance to the disparate levels of aggregation (the gearing ratio used was for a much larger sample of businesses than was used to generate investment orders). The wage share, during the period of 1992 to 2001, is statistically significant and inversely related to new orders, and is better than the cash flow variable in explaining new orders. During the period 2001 to 2010, no statistically significant relationship between new orders and the wage share is found. The test for the effects of military spending on new orders during the period of 2001 to 2010 revealed no statistically significant relationship. We show, using two-stage least squares, that the fitted values of new orders influence investment expenditures, and the impact of new orders on investment expenditures is altered by changes in contemporaneous economic conditions, as reflected in changes in the cyclical variations in output. The evidence suggest that contemporaneous changes in the interest rate spread has mild effects on the relationship between new orders and investment expenditures.

The results that we report in this paper when taken in conjunction with the earlier results for the UK (Laramie, Mair and Miller, 2004) lead us to conclude that, on a behaviorist interpretation, Kalecki's investment theory provides a relevant 21st century explanation of investment volatility. To the best of our knowledge, ours are the only two studies that have recognized the importance of studying investment behavior *ex ante* incorporating the behavioral and institutional influences that impact on business investment decision-making.

Appendix 1: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
I	76	.0680108	.0097155	.0475594	.085256
D	75	.0052239	.0008139	.0032192	.006756
P	76	.0723269	.0096786	.0520345	.0943206
c	76	-.0101991	.0263477	-.0809878	.0360491
s	76	.0161342	.0139979	-.009	.037
nil	76	.0420372	.0366392	-.0534217	.132459
nafa	76	.0426508	.0367002	-.0633431	.1330258
s	76	.0295416	.0022712	.0233804	.0330549
w	76	.6471342	.0174358	.6137	.68
d	76	.0467411	.0064668	.03692	.06011

Variable	Obs	Mean	Std. Dev.	Min	Max
ΔI.	75	.0002214	.0019291	-.0071994	.0030642
ΔD	74	-3.25e-06	.0002828	-.0008782	.0007263
ΔP	75	.0005316	.0035921	-.014004	.0106274
Δc	75	-.0004657	.0064084	-.0275054	.0104977
Δs	75	-.00008	.0051159	-.0108	.015
Δnil	75	-.0002867	.022125	-.0709683	.0526559
Δnafa	75	-.0001224	.0258837	-.1047796	.0602505
Δ2sa	74	-7.39e-06	.0007946	-.0036087	.0021967
Δw	75	-.0005707	.0052293	-.0146	.0104
Δc	75	-.0000569	.0012038	-.00322	.00322

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