KEYNES RE-INTERPRETED – AN ECONOMETRIC INVESTIGATION OF KEYNES' CONSUMPTION FUNCTION THEORY IN POST-WAR AMERICA

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Using econometrics, this essay examines John Maynard Keynes' consumption function hypothesis and its applicability to the US economy over the last half-century. Employing income and interest rates as explanatory variables, Michael Curran seeks to examine their effects on consumption expenditure, encountering non-stationarity, autocorrelation and non-normality along the way.

Introduction

> *"The fundamental psychological law … is that men are disposed … to increase their consumption as their income increases, but not by as much as the increase in their income."[1]*

Although recent emphasis has focused on the marginal propensity to consume (MPC) of permanent income and of wealth, e.g. Modigliani and Brumberg (1955), Friedman (1957), Kimball (1990), Carroll (2000, 2001a, 2001b), in this paper I will investigate Keynes' consumption function hypothesis. I will examine the effects of real income per person employed, and nominal interest rates on real consumption expenditure per person employed concentrating on consumers in the USA between the first quarter of 1949 and the third quarter of 2006.
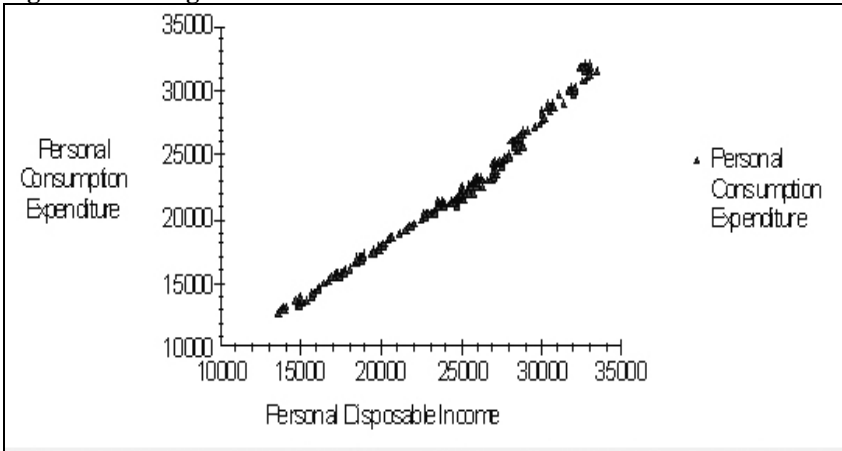
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[1] Keynes 1936, p.96

Figure 1. PCE against PDI

Figure 1 illustrates a rising trend and close relationship between the two variables, personal consumption expenditure (PCE) and personal disposable income (PDI). It is harder to identify any clear relationship in Figure 2 between PCE and bank prime loan rate (PRIME). As most of the observations for *quarterly changes* in PDI and *quarterly changes* in PRIME are scattered around the origin (Figure 3), it appears that there is no multicollinearity between these two explanatory variables.

Figure 2. PCE against PRIME
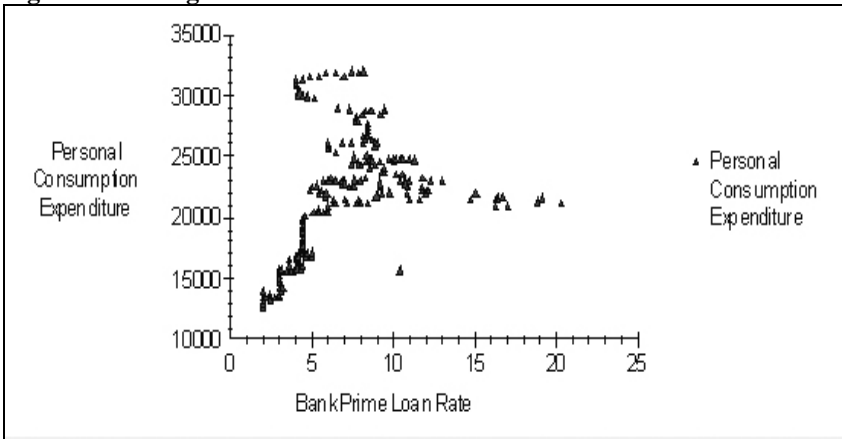
Figure 3. Changes in PDI against Changes in PRIME
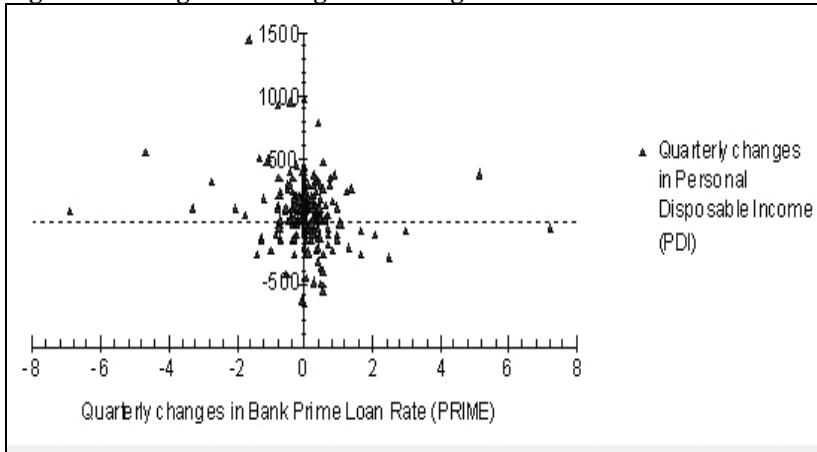
Keynes' General Theory

Keynes approximated the discount rate using the interest rate, which he hypothesised led to short period changes, only if there were unusually large variations in this rate; else it was part of a separate determinant of consumption, *viz.* windfall changes of capital values: 'consumption of wealth owning classes may be extremely susceptible to unforeseen changes in the money-value of its wealth' (Keynes, 1936:92-3) He concluded that real income is 'the principal variable upon which the consumption-constituent of the aggregate demand function will depend' (ibid.:96).

I could have chosen the real rate of interest and transformed my second explanatory from PRIME (nominal) to the real value:

$$\frac{1 + \text{PRIME}}{1 + (P_{t+1} - P_t)/P_t} - 1$$

However, the *nominal* interest rate is more appropriate to my investigation – Keynes refers to the nominal interest rate, which will have greater impact on my variables.

Econometric Models & Estimation

The following graphs illustrate that the time series variables – PCE, PDI and PRIME are non-stationary[2]; in Figures 4 and 5, the means of PCE and PDI, respectively rise over time. First differencing produces stationary time series', removing stochastic trends. Figure 6 shows that the variability of PRIME changed over time. Again first differencing induces stationarity.

Figure 4. PCE over Time
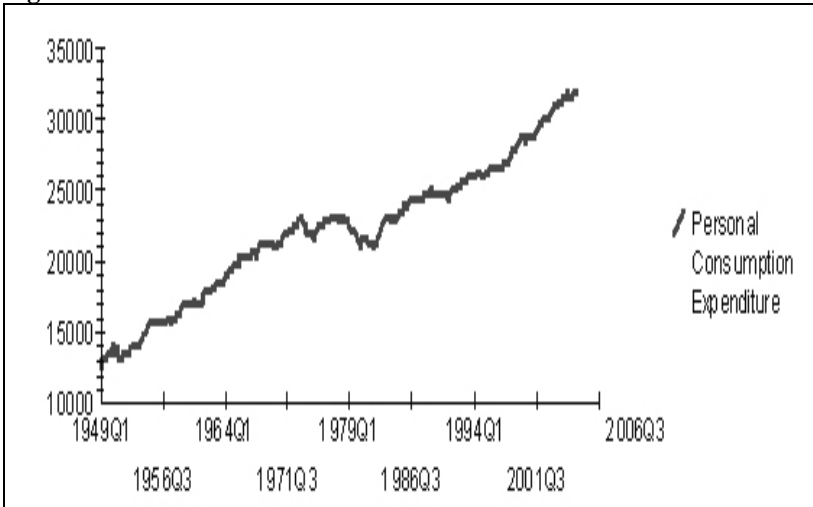
Figure 5. PDI over Time
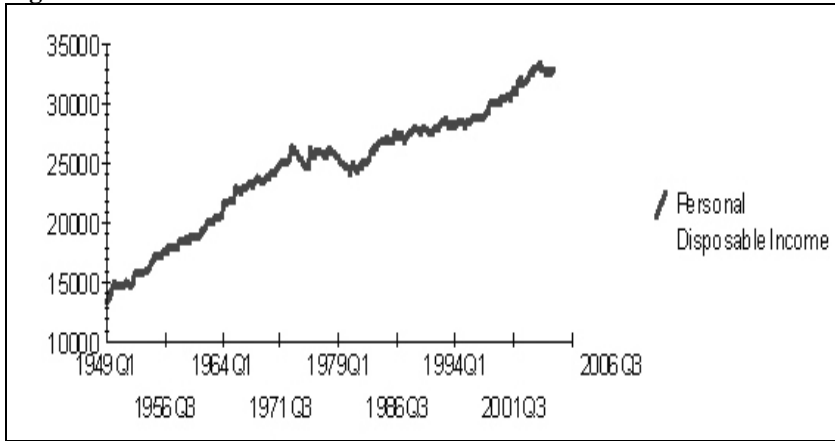
Figure 6. PRIME over Time
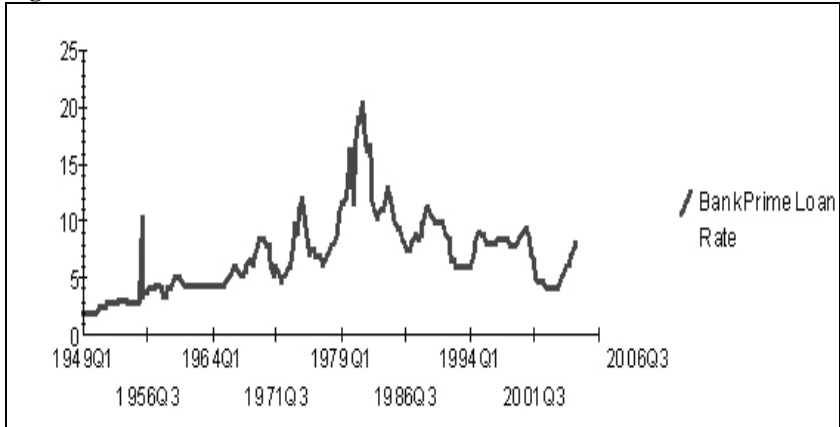
A lower Durbin Watson (DW) statistic (.24511) than R^2 (.98818) would suggest that the estimation method of OLS provides spurious[3] results (Granger and Newbold, 1974) – we should not take the results of the regression too seriously. The DW statistic produced under first differencing is 2.3422, which is greater than R^2 = .30257; we fail to reject the hypothesis of non-spurious regression.

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[3] Even when sample size is large, spurious correlation can persist in nonstationary time series (Yule, 1926).

The above discussion advocates a revised model: *quarterly changes in (real) PCE (per person employed) depends linearly on quarterly changes in (real) PDI (per person employed) and quarterly changes in nominal interest rates*. Hence, I shall estimate the following equation[4]:

$$\Delta PCE_t = \beta_0 + \beta_1\,\Delta PDI_t + \beta_t\,\Delta PRIME_t + u_t{}^5$$

where

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ΔPCE	= quarterly change in real personal consumption expenditure per person employed.
ΔPDI	= quarterly change in real personal disposable income per person employed.
$\Delta PRIME$	= quarterly change in bank prime loan rate.
u	= residual.

PCE and PDI are level variables and PRIME is a nominal, percentage variable. I chose *real* PCE *per person employed* to be a proxy of consumption expenditure, as PCE is an aggregate figure that could rise due to an increase in employment levels and/or with inflation. The reasoning behind my selection of real PDI per person employed as a proxy for real income was similar to that for real PCE per person employed; 'other objective attendant circumstances' determining consumption include changes in fiscal policy, which affect disposable income, so I chose income net of taxes (Keynes, 1936:91). As a proxy for the interest rate, I chose the Bank Prime Loan Rate, which is a short term reference/base rate that US domestic commercial banks use to set the interest rates on many of their commercial bank loans and loans to consumers. Unlike deposit rates, it is usually uniform across all banks and is similar to an upper-bound on interest rates. Figure 10[6] shows that the prime rate very closely follows the federal funds rate – the interest rate that banks charge each other on overnight loans.

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[4] Retrospection on introducing a trend term revealed a similar adaptation by Smithies (1945).
[5] $\beta_0 \equiv$ Constant
[6] See http://www.frbsf.org/education/activities/drecon/2005/0506.html

Figure 7. Bank Prime Loan Rate and Federal Funds Rate
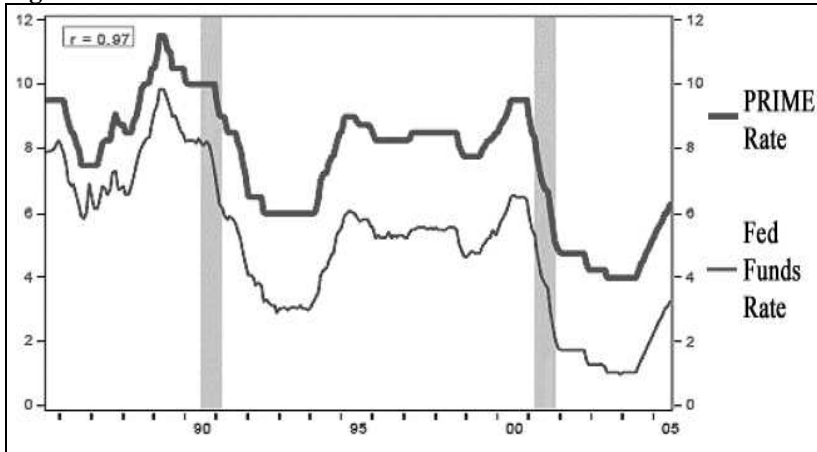
My model is linear in form (in the parameters and variables). I postulate an increase in PCE, when ΔPDI and ΔPRIME are simultaneously zero and a 'positive and less than unity' β_1 (partial regression coefficient[7] of ΔPDI) – a slight variation to Keynes' model (Keynes, 1936:96). The partial coefficient of ΔPRIME measures the change in the mean value of ΔPCE, per unit change in ΔPRIME holding ΔPDI constant; I anticipate an inverse [8] relationship between ΔPRIME and ΔPCE.

Data

231[9] quarterly observations were taken for PCE and PDI from the first quarter of 1949 to the third quarter of 2006. The data for PRIME was transformed from a frequency of monthly to that of quarterly. I adjusted PCE and PDI from nominal, aggregate level variables in billions of US dollars to

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[7] My substitute for Keynes' MPC measures the change in the mean value of ΔPCE, per unit change in ΔPDI, holding the value of ΔPRIME constant. Ceteris paribus, I envision that similar to the MPC (although in terms of changes), variations in ΔPDI will lead to less than proportional variations in ΔPCE, albeit in the same direction.

[8] Fixing ΔPDI, an increase in growth of PRIME slows down the growth of PCE, or if PCE is constant, it should start to fall.

[9] 230 observations are used for first difference estimation: sample size minus first observation.

real[10], per person employed[11] variables in US dollars. All data has been taken from the website of the St. Louis Federal Reserve Bank.

Table 1. Summary Statistics for Level Variables for Sample Period

Variable	PCE (US$)	PDI (US$)	PRIME (%)
Maximum	31,895.80	33,483.40	20.3233
Minimum	12,654.10	13,619.20	2
Mean	22,166.20	24,551.40	7.1076
Std. Deviation	4,904.80	5,101.00	3.4355
Avg. Growth[12]	0.004079	0.003881	0.015892

Table 1 shows summary statistics for the three *level* variables. The maximum value of PRIME was in the third quarter of 1981 – the chairman of the Federal Reserve at this time was Paul Volcker, an 'inflation hawk' (Bernanke, 2004).

Results

Table 2. Regression Results

Regressor	Coefficient	Standard Error	T-Ratio	[Prob]
CONSTANT	52.9116	11.7046	4.5206	[.000]
ΔPDI	0.38058	0.043485	8.7521	[.000]
ΔPRIME	-34.5743	10.8581	3.1842	[.002]

Table 3. Relevant Statistics

Statistic	Value
R-Squared	0.30257
R-Bar-Squared	0.29643
F-Statistic F(2,227):	49.2406 [.000]
DW-statistic	2.3422

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[10] Dividing nominal variables by the Consumer Price Index (CPI) divided by 100 (since the base period CPI had a value of 100). The base period index was 1982-84. I averaged CPI data for each quarter.

[11] Actually, per civilian employed – a proxy for total employment. I assumed (hoped for) inter-temporally an approximately constant ratio of civilian to military employment, of purchasing power of civilian employees to military employees and of consumer expenditure of civilian employees to military employees in order to justify my choice of surrogate for employment. I averaged this data for each quarter.

[12] Average *quarterly* growth expressed in percentages.

Multiple Coefficient of Determination (R^2)

The R^2 value of .30257 is statistically significantly different from zero since the F statistic (49.2406 for 2 numerator and 227 denominator degrees of freedom) has a p-value of less than .001: the true population parameters are not identically zero. This R^2 value means that over 30% of the variation in ΔPCE is explained by ΔPDI and ΔPRIME. The fitted line and the actual line in Figure 8 depart from each other to some extent, but there is sufficient visual evidence of closeness of fit.

Figure 8. Plot of Actual and Fitted Values of Regression
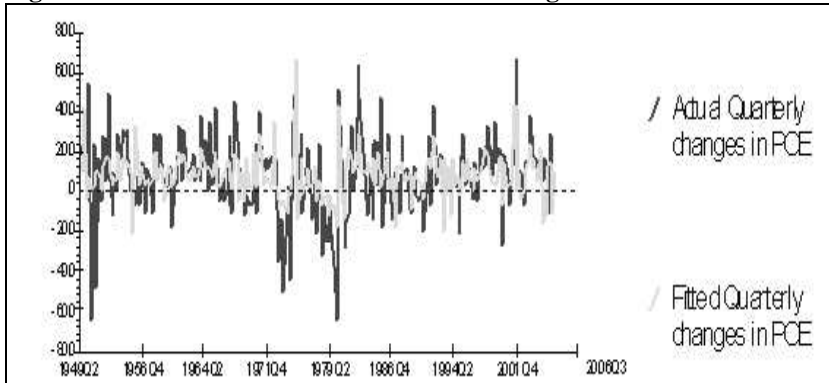
T-tests

All partial regression coefficients, β_0, β_1 and β_2 are statistically significantly different from zero as the accompanying p-values to their estimated t-values are sufficiently small. Their signs are in accordance with prior considerations. When PDI and PRIME are constant, on average, PCE is increasing quarterly by just over US$52.91. Fixing ΔPRIME, a 10% increase in ΔPDI will lead to a $3.8 rise in ΔPCE. Holding ΔPDI constant, raising ΔPRIME by 1% will lead to a decline in ΔPCE of almost $34.6.

Table 3: Diagnostics Results

Diagnostic Tests	CHSQ	T-Statistic	P-Value
Serial Correlation	4	11.9365	[.018]
Functional Form	1	0.55487	[.456]
Jarque-Bera Test	2	47.6336	[.000]
Heteroscedasticity	1	0.028538	[.866]

A histogram of residuals (Figure 9) shows that the residuals from the regression may not be symmetrically distributed. The Jarque-Bera (*JB*) statistic is about 47.6336 with a *p*-value of less than 0.1%. The sample size should be large enough for us to be reasonably confident that we are not making a Type I error – we reject the hypothesis that residuals are normally distributed.

Figure 9. Histogram of Residuals
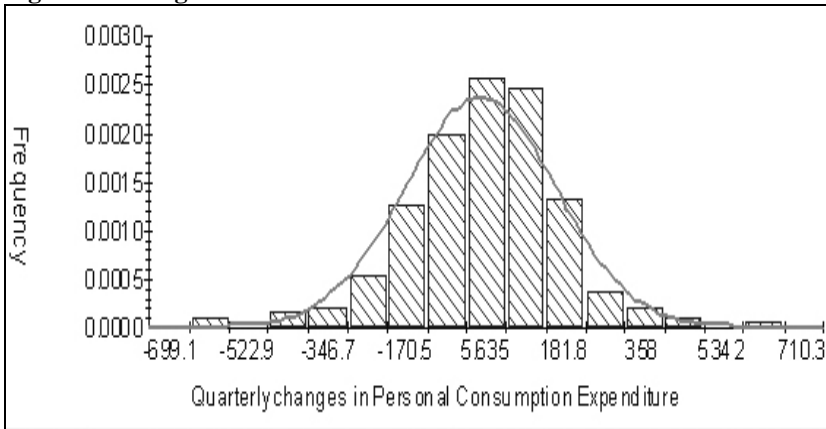
The value of 0.55487 with a *p*-value of .456 from the Ramsey RESET test of functional form results in a failure to reject the null hypothesis that the model is correctly specified. This test is validated because of the relatively large sample size.

For a 1% significance level, 230 observations and two explanatory variables, $d_u \approx 1.693$ and $d_l \approx 1.653$. A Durbin-Watson statistic for autocorrelation between residuals of 2.3422 displays evidence of negative autocorrelation[13]. Unlike the *DW* test, the Breusch-Godfrey serial correlation test relies on large sample sizes. The *p*-value accompanying the *BG* statistic is about 0.018 – we conclude that serial correlation is present in our model.

The Koenker-Bassett test for heteroscedasticity is valid even if the residual term in the model is not normally distributed; Microfit produces 0.028538 with a *p*-value of .866 – we fail to reject the null hypothesis that the residuals exhibit the same conditional variances. The graph (Figure 10) of residuals on the fitted values of ΔPCE confirms the roughly equal spread.

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[13] Since the regressors are stochastic, the DW or d test will be valid in neither small samples, nor in large samples (Davidson, 2000).

Figure 10. Estimates for Changes in PCE and Residuals
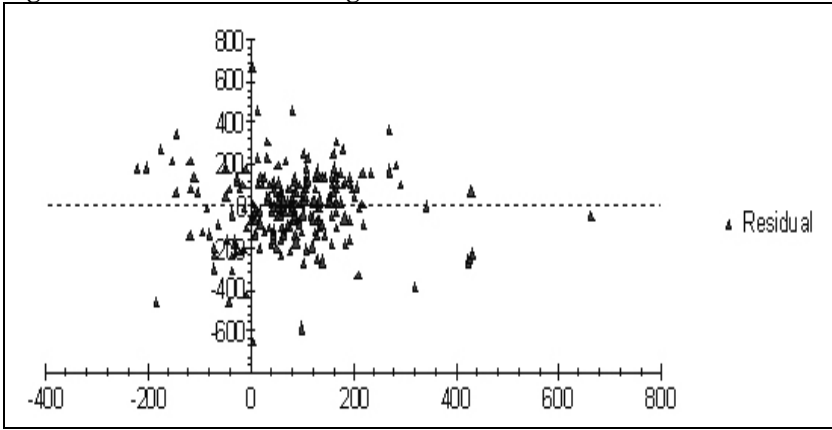
Confidence Interval for β_1

A confidence interval for β_1 will take the form:
$$\beta_1 \pm (t_{\alpha/2}{}^{\upsilon=n-3})(SE(\beta_1))$$

For a 95% confidence level, $\alpha = 0.05$, t-tables show $t_{0.025}{}^{227} \approx 1.96$; thus we get:
$$.38058 \pm (1.96)(0.043485)$$

This yields a confidence interval of:
$$[0.2953494, 0.4658106]$$

Therefore if this test was carried out an infinite number of times, the true value of β_1 would lie between 0.2953494 and 0.4658106 ninety-five percent of the time.

Forecast

Forecasting tests the model's accuracy. Running the regression, without the last 43 quarters (i.e. from the first quarter of 1949 to the last quarter of 1995) resulted in a graph (Figure 11) of the observed ΔPCE and the forecasted values. The forecast seems to follow the general trend and the Chow predictive failure F-test returns a value of 0.92562 with a p-value of 0.606 –

we fail to reject the null hypothesis of accurate forecasting properties of the model.

Figure 11. Plot of Actual and Forecasted Values
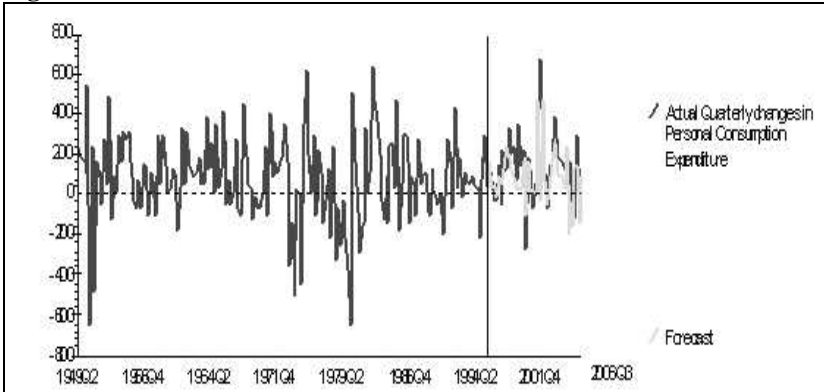
Conclusion

The problem of non-stationarity means that first differencing is necessary. On inspection of the correlogram for PRIME we see it cuts off at lag j = 52, so further research may propose using a MA(52) model. The correlograms for PCE and PDI do not cut off, so one could look at the Partial Autocorrelation Function of each variable to determine whether we should assume an AR or an ARMA model.

Data on total employment may be explored. As mentioned in footnote 11, I have looked at civilian employment in this investigation, i.e., per civilian (not per person) employed.

The presence of autocorrelation suggests the use of a Feasible Least Squares estimation such as the Cochrane-Orcutt method. The adoption of this process (also the addition of a trend variable) delivers improved results.[14]

Non-normality is a worrying consequence as the *F* and the *t* tests both assume normal distribution of variables. However, the model appeals due to an equal spread of errors (homoscedasticity), correct functional form, and good forecasting ability, in addition to meeting prior considerations discussed earlier. On the assumption that Keynes would agree to my reinterpretation, he would be proud of the results!

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[14] Space considerations do not permit the inclusion of these findings.

Data Sources

Federal Reserve Bank of St. Louis:

PCE:	http://research.stlouisfed.org/fred2/series/PCEC/downloaddata?&cid=110
PDI:	http://research.stlouisfed.org/fred2/series/DPI/downloaddata?&cid=110
CPI:	http://research.stlouisfed.org/fred2/series/CPIAUCSL/downloaddata?&cid=9
PRIME:	http://research.stlouisfed.org/fred2/series/MPRIME/downloaddata?&cid=117
Figure 7:	http://www.frbsf.org/education/activities/drecon/2005/0506.html
Emp.:	https://alfred.stlouisfed.org/fred2/series/CE16OV/downloaddata?&cid=10

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AN INVESTIGATION INTO THE CONSTITUENTS OF IRISH INVESTORS' EQUITY DEMAND FUNCTIONS

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While the determinants of demand for a stock are complex, financial economics seeks to find the elements of demand that are common to all economic agents. Colm Friel's analysis strives to improve our understanding of investor reactions to the stock market and consequently the movement of stock prices. He uses interest rates, oil prices, the dollar-euro exchange rate, the pound-euro exchange rate and daily volatility in an effort to explain some of the movements in Irish stock prices.

Introduction

What moves stock prices?[1]

The ostensibly enigmatic nature of stock price movements has been the subject of a multitude of studies by renowned financial economists for the last few decades. Stock prices are the result of the asset demands of a vast number of economic agents interacting across time. Their demand functions are complex and often contain as-yet-unquantifiable factors. However, in as much as every agent's demand function is different, it seems plausible several elements exist that are common to a majority. Financial economists aim to answer the above question by finding these elements. This paper takes a highly quantitative approach to ascertain the contribution of several recently formed daily series to the movement of stock prices in Ireland. Rather than trying to predict stock prices, the objective is to increase understanding of the nature and reactions of the aggregate investor, and, hence, contribute to the debate about why stock prices move as they do.

The General Linear Regression Model

The linear regression model in matrix-vector form is given by

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[1] The title of a paper by Cutler, Poterba and Summers (1988)

$$\mathbf{y} = \mathbf{X}\boldsymbol{\beta} + \mathbf{u}$$

$$\begin{bmatrix} y_1 \\ \vdots \\ \vdots \\ \vdots \\ \vdots \\ y_T \end{bmatrix} = \begin{bmatrix} x_{11} & x_{12} & x_{13} & x_{14} & x_{15} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ x_{T1} & x_{T2} & x_{T3} & x_{T4} & x_{T5} \end{bmatrix} \begin{bmatrix} \beta_1 \\ \beta_2 \\ \beta_3 \\ \beta_4 \\ \beta_5 \end{bmatrix} + \begin{bmatrix} u_1 \\ \vdots \\ \vdots \\ \vdots \\ \vdots \\ u_T \end{bmatrix}$$

The parameter vector, $\boldsymbol{\beta}$, describes the nature of the relationship between $\mathbf{X}$ and $\mathbf{y}$. It will be estimated using Ordinary Least Squares (hereafter OLS).

The Data

The column vector $\mathbf{y}$ comprises the daily price change of the ISEQ overall index since the introduction of the euro. The choice of this starting point is not arbitrary since three out of the four explanatory variables did not exist before this date. Figure 1 shows the daily price and return on the ISEQ.

Figure 1. ISEQ Overall Index Daily Price and Change Thereof[2]
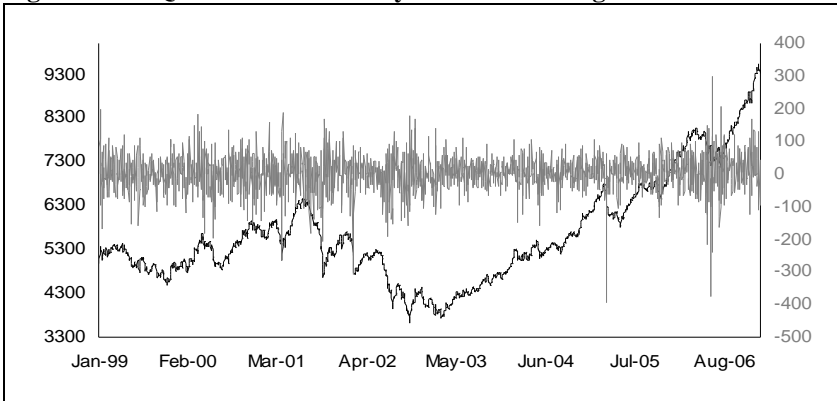
The $\mathbf{X}$ matrix contains the independent variables related to each contemporaneous observation of daily return on the ISEQ. The constant is

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[2] Axes in Figures 1 to 5 measure levels of the original series on the left and first differences of the series on the right

suppressed for theoretical reasons. However, if it were included a column of 1s would appear in the matrix.

x_{12} is the daily change in the Euro Interbank Offered Rate (EURIBOR). This is the eurozone's equivalent to Britain's LIBOR[3] and represents an interest rate which moves freely and frequently to equate the supply and demand of liquidity. The daily change, rather than the original series, is used for reasons that will be revealed below. If this essentially risk-free rate increases, one would expect stock market returns to increase to maintain a constant risk premium. Figure 2 shows the daily interest rate and the daily change related to the EURIBOR.

Figure 2. EURIBOR Daily Price and Change Thereof
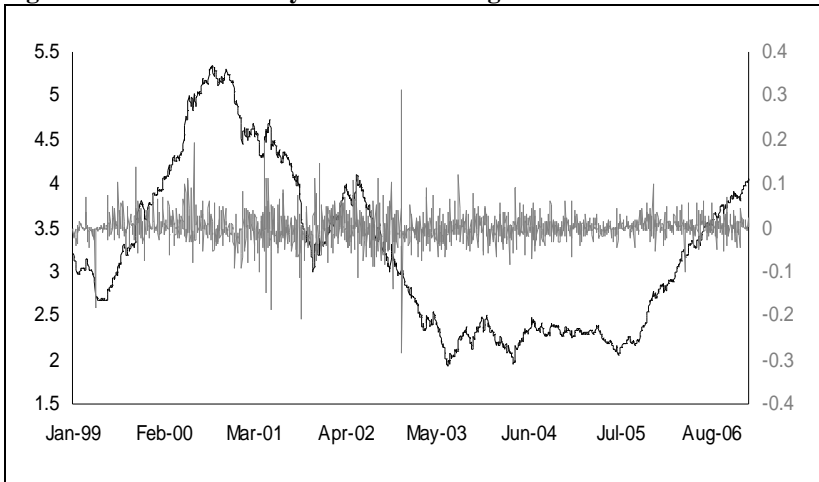
x_{13} is the daily change of the Pound-Euro sterling exchange rate. x_{14} is the daily change of the Dollar-Euro exchange rate. If either variable increases it makes Irish exports more expensive in two significant markets for export-oriented companies and should, *ceteris paribus*, reduce the value of the stocks of these companies, hence of the market as a whole. Figures 3 and 4 present the daily change in price of one Euro in terms of Pounds Sterling and US Dollars respectively.

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[3] London Inter-bank Offered Rate

Figure 3. Price of €1 in Terms of £ and Daily Change Thereof
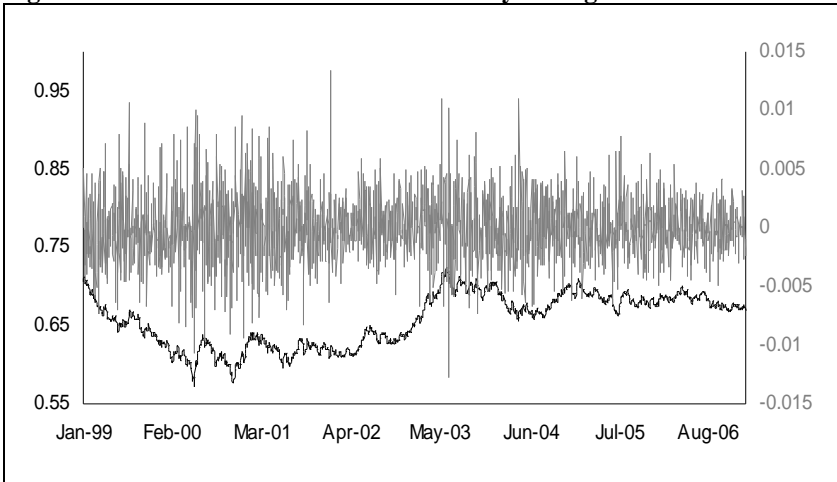
Figure 4. Price of €1 in Terms of $ and Daily Change Thereof
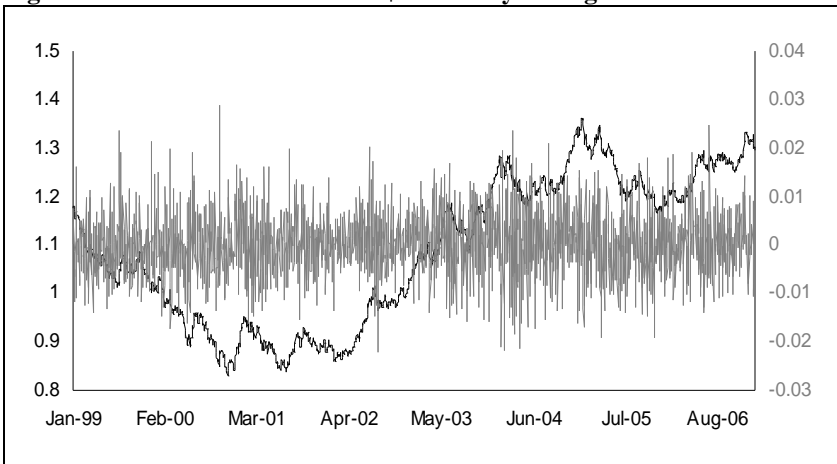
x_{15} is the daily change of the price of crude oil. There are contrasting sensitivities to oil prices. Firms that use oil face higher costs as the price increases so investors may expect lower profits thus lowering share prices. Conversely, companies involved in the energy sector may become more profitable and observe a share price increase. There may be additional effects of changing oil prices. The regression results below will indicate whether the net effect is positive, insignificant or negative.

Figure 5. Price of Crude Oil and Daily Change Thereof
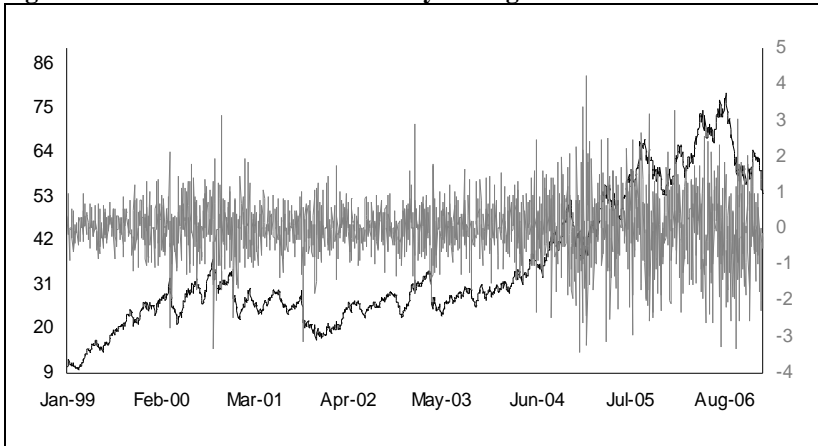
x_{16} is a vector of estimated conditional standard deviations of returns. This variable captures the risk associated with stock returns. For a higher level of risk an investor will require a higher level of return so one expects a significant relationship between the two variables. Figure 6 shows the conditional standard deviation and the daily price of the ISEQ index.

Figure 6. Price and Daily Conditional S.D. of Returns on ISEQ
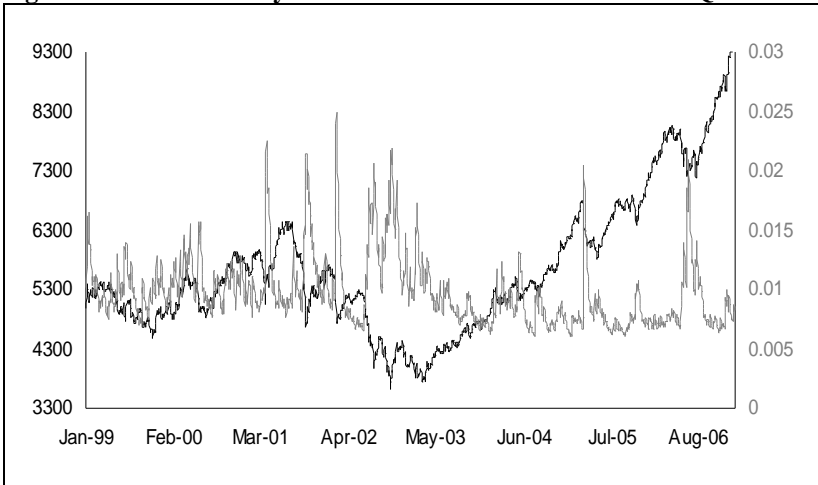
The following section outlines the procedure for calculating this variable.

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Estimation of Conditional Standard Deviation

Engle (1982) proposed ARCH[4] as a solution to the problem of non-constant variance in time series. It models conditional variance as a function of past errors. Bollerslev (1986) extended the model to include past conditional variances. GARCH[5] (p,q) is given by the equation below; if the last term is omitted it gives ARCH(p).

$$\sigma_t^2 = \varpi + \sum_{j=1}^{p} \alpha_j \varepsilon_{t-j}^2 + \sum_{j=1}^{q} \beta_j \sigma_{t-j}^2$$

Through the process of Maximum Likelihood[6] (hereafter ML) this formula can be used to give variance estimates for each time period, t, conditional on p past errors and q past variances. Specifically, the Berndt-Hall-Hall-Hausman (1974) recursive algorithm estimates parameters that maximise the log-likelihood of the function. First, the orders of p and q are determined. Then, the parameters ω, α and β, are estimated.

Three specifications of the GARCH model were tested. Table 1 shows the results of running the ML procedure on each one.

Table 1. Results of three specifications of GARCH model

	GARCH(1,1)	GARCH(1,2)	GARCH(2,1)
ω	3.67×10^{-6}	3.02×10^{-6}	3.95×10^{-6}
S.E.	4.82×10^{-7}	7.37×10^{-7}	5.08×10^{-7}
P-value	0	0	0
α_1	0.0959333	0.0787445	0.0745398
S.E.	0.010181	0.0171913	0.0172947
P-value	0	0	0
α_2	-	-	0.028673
S.E.	-	-	0.0203786
P-value	-	-	0.159
β_1	0.8705045	1.103471	0.8608325
S.E.	0.0121088	0.1939901	0.0135046
P-value	0	0	0
β_2	-	-0.2096994	-

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[4] Autoregressive Conditional Heteroscedasticity
[5] Generalised Autoregressive Conditional Heteroscedasticity
[6] ML is preferred to OLS on efficiency grounds since the errors are not independently distributed

S.E.	-	0.1727931	-
P-value	-	0.225	-

The p-values on the second lags of both the ARCH and GARCH components are not significant at the 5 per cent level. Thus, the GARCH(1,1) model is chosen as the best specification with which to estimate conditional standard deviation.

Testing for Unit Roots

With the exception of the conditional standard deviation of returns, each variable is the first difference of its underlying series. The reason for this lies with the fact that the original variables are non-stationary and the risk of spurious regression would be high if they weren't transformed. Table 2 shows the computed Dickey-Fuller test statistics for the original series and the first difference of the series. If the computed value exceeds the critical value in absolute terms the hypothesis of a unit root and hence non-stationarity can be rejected. The critical value is -2.8634.

Table 2. Computed Dickey-Fuller Statistics

Variable	Level	First Difference
ISEQ	1.1509	-43.39
EURIBOR	-0.52126	-44.3539
Brent[7]	-1.3996	-48.074
Pound-Euro	-2.2663	-44.4737
Dollar-Euro	-0.60439	-45.4719
Con S.D.	-6.608	n/a

Thus, the use of first differences is justified. It must be noted that all variables, with the exception of the conditional standard deviation, are integrated of order one and hence it is possible that a cointegrating relationship exists. This is a matter for ensuing investigative study.

Regression Results

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[7] Used to measure the daily change in the price of oil, as described by the price of Brent crude oil; oil sourced from the North Sea.

The regression was run as set out above. Tables 3 and 4 below summarise the main results. This section will present and interpret these results.

The estimated contents of the β vector are given below.

$$\begin{bmatrix} \beta_1 \\ \beta_2 \\ \beta_3 \\ \beta_4 \\ \beta_5 \end{bmatrix} = \begin{bmatrix} 213.11 \\ 3.43 \\ -587.03 \\ -1038.8 \\ 165.49 \end{bmatrix}$$

Table 3. Regression Results[8]

Regressor	Coefficient	Standard Error
FDEURIBOR	213.1131	38.1634
FDBRENT	3.4346	1.4522
FDUKEUR	-587.0341	501.3067
FDUSEUR	-1038.8	218.9947
CONSD	165.499	115.3733

Table 4. Relevant Statistics

Statistic	Value
R-Squared	0.039868
R-Bar-Squared	0.038029
F-Stat	21.6752
DW-statistic	1.8824
AIC[9]	-11321.5

The results indicate the following:

- Increasing interest rates by 1 percentage point will cause the price of the ISEQ index to rise by 213. This value is significant at both the 5% and 1% level. Intuitively, this seems plausible since a rise in the EURIBOR is akin to a rise in the risk-free rate and, according to asset pricing models, this should raise the return on risky assets such as stocks.

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[8] Use Where FD implies the variables have been first differenced.
[9] Akiake Information Criterion

- A one euro increase in the price of oil causes the price of the ISEQ to rise by 3.4. This value is significant at the 5% level. Thus, the net effect of the conflicting theories outlined above is a positive one.

- The exchange rate coefficients are less straight-forward to interpret. If either exchange rate increases it is analogous to a terms-of-trade deterioration for Ireland relative to the United Kingdom or United States. The coefficient quoted for FDUKEUR, in a strict sense, means that if the exchange rate increases by 1 unit, the price of the ISEQ declines by 587 units. This interpretation is disjointed from any realistic situation. A more plausible interpretation is the following: If the exchange rate increases by .01, one would expect the ISEQ index to decline by 5.87 units. In the case of the FDUSEUR, an increase in the exchange rate of .01, will reduce the ISEQ index by 10.38 units. However, the coefficient on FDUKEUR is not significant at the 5% level. FDUSEUR, on the other hand, is significant at both the 5% and 1% levels.

- A one unit increase in the conditional standard deviation of returns should increase the price of the ISEQ by 165. This finding is consistent with the hypothesis that increased risk requires higher return. However, the coefficient is not significant at the 5% level so any inference based on this may be erroneous.

Table 3 above presents some relevant summary statistics. The R-squared value suggests that 96% of the movement in the price of the ISEQ has gone unexplained. This is not a cause for concern. In the introduction, the multitude of factors that enter investors' demand functions was alluded to; if a high R-squared value was obtained, the finding would be inconsistent with previous studies and perhaps point to a spurious regression (or, maybe, very narrow and simple minded investors).

Figure 7 graphs actual and fitted values of FDISEQ. The relatively small size of the fitted values when compared with realised values is testament to the low R-squared obtained in the regression.

Figure 7. Plot of Fitted and Actual Values
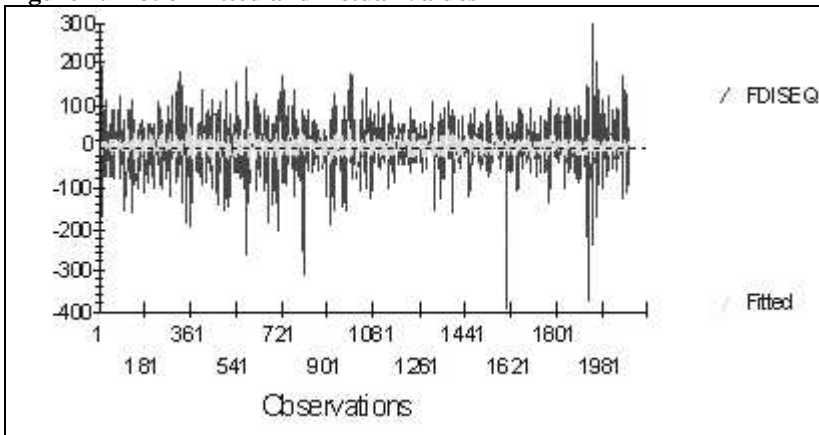
The F-statistic, with a P-value of 0.000, rejects the hypothesis that the **β** vector is zero.

Misspecification Testing

Parameter instability can be detected by plotting the residuals from the regression equation against time. The cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) are plotted in figures 8 and 9 respectively. Under the null hypothesis of parameter stability, the statistics follow a beta distribution which gives rise to the boundary lines used in the graphs. If the plots of residuals fail to cross these lines, one does not reject the hypothesis of parameter stability. The diagrams suggest that no structural breaks have occurred and that the parameters in the regression have remained stable over time. Brown et al. (1975:155) warn that this procedure is not strictly a formal test of significance but rather it acts as a "yardstick".

Figure 8: Plot of Cumulative Sum of Recursive Residuals

The straight lines represent critical bounds at 5% significance level
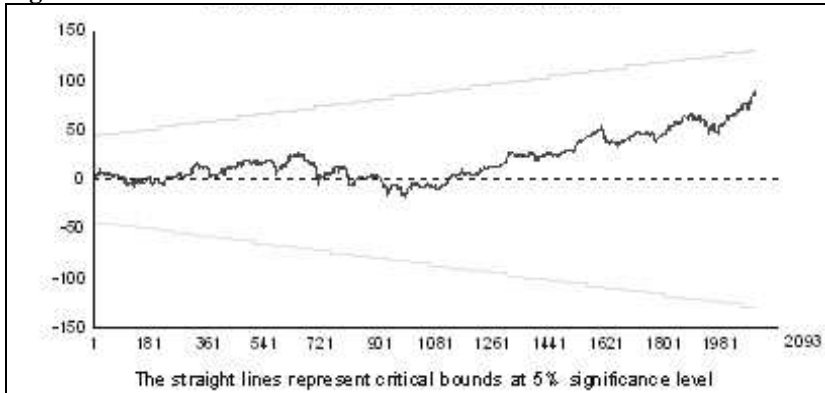
Figure 9: Plot of Cumulative Sum of Squares of Recursive Residuals

The straight lines represent critical bounds at 5% significance level
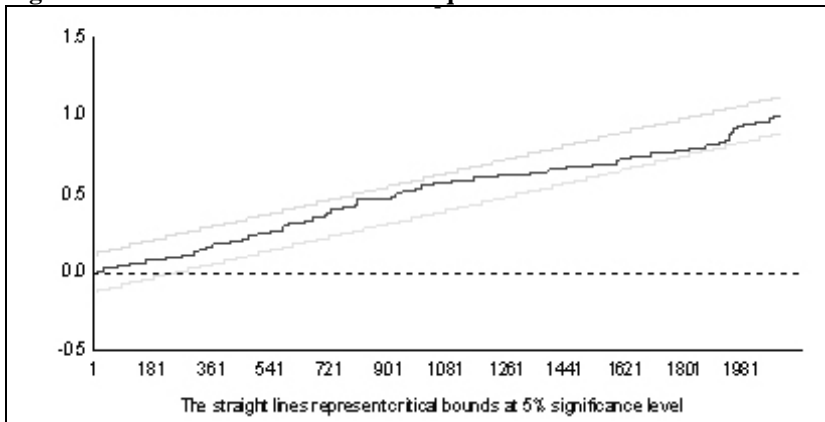
The Durbin-Watson (1951) test is principally a test for a serially or auto correlated error term but has applicability to other areas of misspecification such as incorrect functional form. The D-W test requires that an intercept be included in the model since the standard critical values are not strictly applicable otherwise. The D-W statistic in the regression with a constant, differed from the one reported above by .0035 (1.8859-1.8824). The critical d-statistics provide upper, d_U, and lower, d_L, bounds of 1.93049 and 1.92246, respectively[10]. The computed value lies marginally below the lower bound

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[10] These figures correspond to a sample size of 2000 rather than 2094 but would differ only in the 4th decimal place. In large samples, the DW statistic converges to the normal distribution.

thus we reject the null hypothesis of no positive autocorrelation. The correlation coefficient, ρ, is estimated to be approximately .06. The D-W test is strictly only valid under normality, which is evidently absent in this model.

A further test for autocorrelation of the error terms gives a chi-squared statistic of 6.99 with a corresponding p-value of .008. Thus, one rejects the null hypothesis of no serial correlation. Coupled with the D-W results, there is evidence of autocorrelation in the model. The implications of this are that the estimated $\boldsymbol{\beta}$ vector may be inefficient and its t-statistics may not be valid. Further discussion of this is issue will take place below.

Figure 10 compares a histogram of the regression residuals with a normal density function. At a glance, the residuals appear to be non-normal. The Jarque-Bera test is a more formal procedure for testing the normality of errors. The computed value is 1812.7 with a corresponding p-value of approximately zero. Thus, one fails to accept the null hypothesis of normality and the intuition from the graph is confirmed. Non-normality implies that t-tests and f-tests may be misleading. However, given the large sample size under consideration these statistics may have asymptotic validity.

Figure 10: Histogram of Residuals
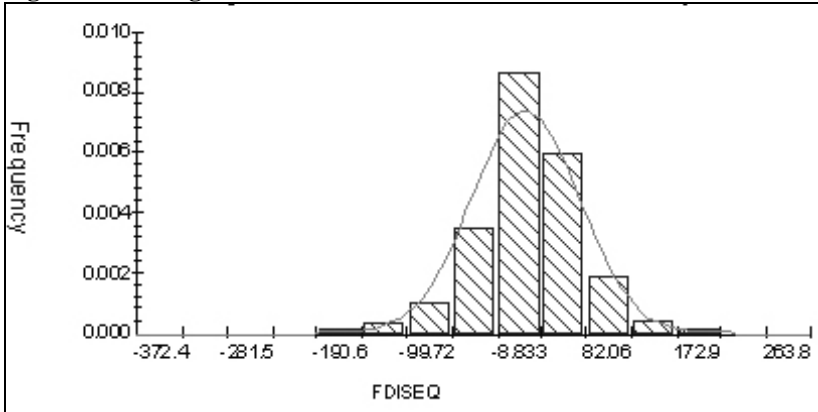
Ramsey's (1969) RESET test for incorrect functional form computes a statistic of 1.5436 with a p-value of .214. Thus, one fails to reject the null hypothesis of correct functional form. The linear relationship imposed, it seems, is valid. Furthermore, the test for heteroscedasticity gives a statistic of 2.003 and a p-value of .157. Thus, one fails to reject the null hypothesis of homoscedasticity at the 5 percent significance level.

Cochrane and Orcutt Test Accounting for Autocorrelated Errors

Given the above finding of autocorrelation in the error terms, a generalised least squares approach is taken. The results of this regression are given in Table 4 below. The coefficients are not significantly different from those in the standard regression which is corroboration of the marginal rejection of non autocorrelated errors in the D-W test above. The model is specified with one autoregressive lag component since higher lags were not significant.

Table 5. Regression Results Accounting for Autocorrelated Errors

Regressor	Coefficient	Standard Error	T-Ratio	P-Value
FDEURIBOR	206.3051	38.0879	5.4166	0
FDBRENT	3.6075	1.4429	2.5002	0.012
FDUKEUR	-547.8212	501.0964	-1.0932	0.274
FDUSEUR	-1091.5	218.6797	-4.9912	0
CONSD	167.4418	122.3388	1.3687	0.171

These coefficients may be more reliable than those reported above. This procedure estimates the autocorrelation parameter to be .058, which is very close to the estimate derived from the D-W statistic above of .06. Furthermore, the R-squared statistic is marginally higher at 4.3 per cent.

Wald Test of Linear Restrictions

The Wald test for linear restrictions on variables is carried out. The null hypothesis that the coefficient on FDUSEUR is equal to .6 times that of FDUSEUR is tested. The restriction represents the average exchange rate between the US Dollar and UK Pound over the sample period. The Wald test returns a statistic of .0038680 with a p-value of .950. Thus, the null hypothesis is not rejected. This is merely an interesting aside but gives an added degree of intuitive credibility to the main test.

Conclusion

This investigation succeeded in explaining some of the movements of the ISEQ index using a general linear model. Each variable had theoretical justification but two were found not to be statistically significant. Interest rates and oil prices have a positive effect on the ISEQ index while the

Dollar-Euro exchange rate has a negative effect. The effect of Pound-Euro exchange rate and daily volatility are insignificantly negative and positive respectively. The results of the regression indicated marginally autocorrelated errors and severe non-normality. The Cochrane-Orcutt GLS regression was applied to account for the autocorrelation while the large sample size provides asymptotic validity to the results. Nevertheless, exactly what causes the entirety of movements in stock prices remains, as ever, an inscrutable phenomenon.

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THE SCIENTIFIC STATUS OF ECONOMICS AND ECONOMETRIC METHODOLOGY

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Junior Sophister

Can economics be classified as a science? While many economists consider their approach to be scientific in nature, in this paper Iain Nash disagrees. He explores this enduring question by defining the nature of science and the properties that allow a subject to be labelled as such. He concludes that while particular events may be forecast using econometrics, this is limited by the application of certain assumptions and therefore scientific status cannot be justified.

Introduction

The scientific status of economics is a question that has provoked much controversy since the inception of the subject. However, before the status of economics can be discussed, one must first define 'science', or, more precisely, what values and criterion a subject must possess in order to be 'scientific'.

Science and scientific knowledge is often portrayed in a classical view in which it is totally demarcated from that which it studies. In reality this is not the case, as is shown by the constant revolutions which frequently occur, debunking theories and thus causing a rebase in the subject and its disciplines. Ritchie (1923) comments on how the only constant in science is the scientific method itself and while scientific theories are in a constant state of flux, the process used to create these theories has remained static. Thus, if economics and econometrics are to be classified as scientific, then surely they must use and apply the scientific method in their applications, regardless of any other difference in methodology from the natural sciences.

Another criterion for a subject to be scientific is falsifiabilty. Popper (1959:41) states that "it must be possible for an empirical scientific system to be refuted by experience" meaning that a theory must be capable of being *disproved* through empirical tests in order for them to be considered scientific. Logically then, theories must also be *examinable* in order for them to be proven scientific, otherwise they fall into the realm of idle speculation.

The Scientific Status of Economics

This leads us to the question of whether economics and econometric methodology should be considered a science. Economics, taken independently of econometrics (i.e. classical economics), cannot be considered a science in any real sense of the word. While it may offer interesting and intriguing theories about the nature of the man and the process of exchange, and although these are sometimes correct, classical economic theory fails the scientific method almost entirely; it is not based on empirical data, the hypotheses are not tested and no experiments are carried out. From this, it can be seen that there is little interaction between data and theory as there is no data available to interact with the theory, nor are the limits to economics domain such as the *ceteris paribus* assumption discussed.

Elementary Scientific Method

- Hypothesis Formulation
- Hypothesis Testing
- Deductive and Inductive Logic
- Controlled Experiments
- Repeatability and Replication
- Interaction between Data and theory
- Limits to Science's Domain

Source: Gauch, 2003

An example of this failure is the theory of 'Pareto Efficiency' as discussed by Kenneth Boulding. The theory describes the optimal outcome as one where no further allocations may be reached that makes any one individual better off without making another worse off. He mentions how "from this simple principle a wide range of applications have emerged" (Boulding, 1970:126). However, a simple analysis of the theory shows how it fails the scientific method on a variety of levels. The theory neglects to represent human nature; factors such as malevolence, benevolence, greed and selfishness are ignored. Boulding claims that "anything less descriptive of the human condition can not be imagined" (ibid). This theory is not testable in the scientific sense and hence is not falsifiable, yet it is one of the keystones of modern economics.

Another global assumption in economics is that of *ceteris paribus*. Ceteris paribus means 'all other things being equal' and is widely used in economic methodology as a means of simplifying complex situations in order to permit examination. It allows the economist to study the individual effects of a change in a variable on the overall system and thus draw relevant conclusions. While this initially implies a furthering of scientific method, this is incorrect. C*eteris paribus* has evolved from being a simple analytical tool to a fundamental economic assumption. Economists now use this assumption liberally in the application of theories, ignoring its limitations. For instance, in economics, different variables often interact and cause changes in each other. Thus, economic theories that assume *ceteris paribus* cannot be deemed scientific as they are no longer representative of reality but have become rough approximations of an assumed and simplified reality. For example, in comparative statics, one studies a change in price by holding demand constant. However, we know that price influences demand while simultaneously demand influences price (Brown, 1981). Furthermore, Friedman states that the *ceteris paribus* assumption is invalidated by the passage of time as "the points on a demand curve are alternative possibilities, not temporally ordered combinations" (Friedman, 1966:49).

The value of *ceteris paribus*, however, must not be overlooked as the modern economy is simply too complicated to be studied as a single entity. Eric Beinhocker states that "markets win over command and control, not because of their efficiency at resource allocation in equilibrium, but because of their effectiveness at innovation in disequilibrium" (Wolf, 2007). This demonstrates how economists are forced to introduce simplifications such as *ceteris paribus* in order to return market components to more linear and understandable models. However, economists must recognize that while these 'approximated theories' are quite valid as a study, they are not scientific.

The Scientific Status of Econometric Methodology

This leads us to the question of econometrics as a science and the status of neo-classical (or 'modern') economics. Econometrics was defined as "the advancement of economic theory in its relation to statistics and mathematics" (Econometrica, 1933:1). It should be noted here that the word 'advancement' is not 'replacement'. Econometrics is a tool used to *test* economic theory and not one to develop it. As a result of this, any flaw in the theory will invalidate an econometric analysis even though it may be technically perfect. Hendry generalises this definition when he states that "econometrics commences an analysis of the relationships between

economic variables (such as quantities and prices, incomes and expenditures, etc.) by abstracting the main phenomena of interest and stating theories thereof in mathematical form" (Hendry, 2000:13). From the outset econometrics appears to confer the scientific method onto economics as now, apparently, hypotheses can be tested empirically and also falsified which satisfies the scientific method. In order to validate this argument, a study of econometric methodology and its relation to economic theory must be carried out. Taking the four steps which Koutsoyiannis describes as present in all econometric research, we can immediately see how this method is more scientific in nature than the method of classical economics, as the model is capable of sustaining rigorous testing.

Econometric Methodology

- Formulation of maintained hypothesis
- Testing of maintained hypothesis
- Evaluation of estimates
- Evaluation of model's forecasting validity

Source: Koutsoyiannis, 1973

However, it would still be false to claim that this methodology is inherently scientific in nature. Even with the introduction of econometrics, it is still impossible to carry out controlled, repeatable experiments without introducing assumptions, such as *ceteris paribus*. As shown above, such assumptions nullify the scientific status of the experiment by invalidating the scientific status of the underlying theory.

Leaving aside technical arguments such as the effects of serial correlation, multicollinearity, heteroscedascity, simultaneity and so forth (Gilbert, 1986), which present an array of problems for the modern econometrician but are inherently statistical in nature, more fundamental flaws in the methodology of econometrics exist. For instance Brown states that many economic theories may not be testable with econometrics (Brown, 1981). This indicates a failing in both the economic theory and econometric methodology that prohibits them from being scientific as *all* scientific theories must be examinable and falsifiable.

Conclusion

It can clearly be seen that economics and econometric methodology cannot be classified as 'scientific' as they do not adhere to the scientific method. Although, this is not to say that econometrics is not a useful skill set and that economics will never become a science. Econometrics has shown that, by testing theories using advanced mathematical and statistical techniques, certain events may be forecast. However, these theories are only valid given an array of assumptions and depend on the presence of a number of unique conditions which may never be fully known and thus prevent repeatability. These stochastic errors, combined with the fact that outcomes are only probable to a given level of confidence, places econometrics and hence economics, into a realm which is too imprecise to be deemed 'science' but which is still a valid study. One should also consider that as alchemy led the way for modern chemistry, economics and econometrics do provide an 'approximate' scientific method which could lead to the development of a more rigorous, accurate and overall *scientific* methodology for the study of economics.

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AN ECONOMETRIC INVESTIGATION OF THE RELATIONSHIP BETWEEN IRISH HOUSE PRICES AND THEIR ESTIMATED FUNDAMENTAL VALUE

DEIRDRE REILLY

Senior Sophister

The issue of Irish house price inflation has been a contentious one in recent years. Many have speculated that dramatic price increases are the result of a bubble that has meant houses are now valued in excess of their fundamental value. In an effort to explore this issue, Deirdre Reilly examines the roles of income, interest rates, population and expected capital gain.

Introduction

Between 1995 and 2005, second-hand house prices in Ireland increased by 345%.[1] This is far in excess of the 38% increase in the consumer price index.[2] The economic significance of such large price movements cannot be understated considering the huge proportion of household wealth that is held in this asset. Kenny (1998) notes that consumer behaviour can be significantly affected by such disproportionate changes in house prices relative to other goods and services. However, to conclude on the basis of observation, as many people have done in recent years, that houses prices are far in excess of their fundamental value, would be to overlook the strong economic performance of the economy and the significant demographic shifts in the population. In this paper I propose to investigate whether a speculative bubble exists. I will first review the literature on the subject and then set out my methodology. Following that, I will discuss the econometric process. Finally, I will present my findings and suggest some direction for further research.

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[1] Department of the Environment
[2] EcoWin Pro

Literature Review

There have been a number of studies investigating the relationship between Irish residential house prices and their estimated fundamental value. Stevenson (2005) analyses this relationship under a number of methodological approaches, in general finding the existence of a speculative premium. Kenny (1998) examines the causes of the house price movements in Ireland between 1975 and 1997. After modelling housing demand and supply, he found that severe supply-side constraints explain the large increase in house prices.

Methodology

There are alternative approaches to modelling the fundamental price of houses (P), such as inverted demand models, error correction models (ECMs), and asset based pricing models. Inverted demand models are quite simple but their results raise serious diagnostic concerns, are highly unstable and their variables are often non-stationary. ECMs are much more desirable as they allow for short-run dynamics and deviations from long-run equilibrium. I would like to use such a framework, however ECMs use many variables; given the lack of data on the Irish housing market it is likely that that I would run into over-parameterisation difficulties. Instead I will use a variation of the asset based pricing model developed by Levin and Wright (1997). This model is based on the assumption that due to the supply constraints that housing operates under, changes in prices are mainly determined by demand shocks and that changes in demand conditions will determine expectations regarding future price appreciation. The motivation for choosing Levin and Wright's model is the lack of reliable rental data, which underpins many of the other asset-based models, such as that used by Olaf Weeken (2004) in measuring fundamental house prices for the Bank of England. Levin and Wright believe that the fundamental price of a house can be defined by the sum of the price (based on owner-occupation and zero capital gain) and the present value of the expected capital gain. The expected capital gain at time t is assumed to be determined by the capital gain in the previous period (g_{t-1}), where

$$g_{t-1} = (P_{t-1} - P_{t-2})/P_{t-2}$$

I defined the present value of the expected capital gain as E_t, and it is calculated as $[g_{t-1}/(1 + I_t)]$. The authors assume that fundamental value based on zero capital gain is related to the income (Y) and the one-period interest rate (I). However, I believe that the population aged 25-44 (POP) is also a significant factor in determining the fundamental value. This age category should best capture the demographic influences on house prices as it is the main house buying age group (Duffy and Quail, 2005), detects the key demographic trends, and since this is the age category of most migrants, it should also pick up the migration effects (Stevenson, 2005). Therefore, the specification of the model I will use for determining fundamental value of house prices is as follows:

$$P_t = \alpha + \beta_1 Y_t + \beta_2 I_t + \beta_3 POP_t + \beta_4 E_t + \varepsilon$$

Annual data from 1975 to 2005 was used to estimate the model. 1975 was chosen as the start year as it is the first year that the mortgage rate is available.

Regression

To begin, following the Dolado procedure, each variable was tested for a unit root. When a Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) test was conducted on P. Looking at the model with a constant and a trend, the DF version was preferred under the Schwarz Bayesian Criterion (SBC), Akaike Information Criterion (AIC) and Hannan-Quinn Criterion (HQC). The Log-Likelihood (LL) criterion would have selected ADF with 5 lags (=5). Since the sample size is small relative to the number of variables the DF version was chosen so as to reduce the risk of over-parameterisation. However, the choice of the order is subject to an important degree of uncertainty. Choosing ρ too small results in a test that will over-reject the null, but choosing ρ too big reduces the power of the test.

The DF had a test statistic of 2.198, and considering the critical value was –3.60, the null hypothesis that P had a unit root could not be rejected. In this case the version chosen would not have made a difference to the outcome, as none tests of could have rejected the null.

Following the Dolado procedure, I estimated the regression under the null, i.e. omitting Y_{t-1}, and tested the significance of the time trend (T). The probability that the coefficient on the time trend equalled zero was 0%, making the variable very statistically significant. Therefore, the test statistic is distributed asymptotically standard normal, yet it is still not possible to

reject the null of unit root because the test statistic is greater than the 5% standard normal critical value of –1.96. This implies that P does have a unit root. Similarly for Y and E, the null hypothesis of a unit root could not be rejected, even using the standard normal critical values, after showing that a time trend was significant. For both POP and I, all the information criteria preferred ADF(5). With test statistics of –3.649 and –3.633 respectfully and both with a critical value of –3.603, the null hypothesis of a unit root could be rejected in both cases.

As P, Y and E appeared to be integrated of order one, the next step was to check if any of the variables were co-integrating. Theoretically it seemed unlikely that there would be a stable long run relationship between P and Y or Y and E but perhaps one may exist between P and E. To test for co-integration between P and Y, P was regressed on a constant and Y, and checked the residuals for a unit root. With a 95% critical value of –3.591, neither the DF nor any of the ADF test statistics were significant. Therefore the null hypothesis that residuals have a unit root could not be rejected, signalling that P and Y are not co-integrating. Analysing the pairs (P, Y), (P, E), and (Y, E), and the set of variables (P, Y and E) in the same manner revealed that they were not co-integrating either.

However, the original regression model is not balanced; the variables P, Y and E are integrated of order one while variables I and POP are integrated of order zero. The unit root variables cause major problems as the series are not stationary and standard asymptotic distributions are no longer appropriate. First-differencing the variables with unit roots, produces the differenced variables DP, DY and DE. A time trend was inserted as this was suggested to be appropriate by the DF and ADF tests.

Next, DP was regressed on C, T, I, POP, DY and DE. A unit root test of the residuals was conducted to check if these variables were stationary. There was disagreement among the information criterion as to the stationarity of the model. The LL, AIC and HQC preferred the ADF(5), which had a test statistic of –3.377. When compared to the critical value of –5.542, the null hypothesis of unit roots in the residuals could not be rejected. If there is a unit root in the residuals, then the regression is spurious rendering the reported t- and F- statistics invalid. However, the SBC preferred the more parsimonious ADF(2), which had a test statistic of –6.173, allowing the null to be rejected, thus implying stationarity. Considering there was very little difference in the preferences of the models ADF(2) and ADF(5), and bearing in mind the reduction in the number of observations available to test the ADF(5), which would diminish the power of the test, to reject the null hypothesis, it was decided to cautiously reject the null hypothesis of unit root. Also, as the autocorrelogram of residuals (below) falls off quickly, this indicates that the model is stationary.

Figure 1. Correlogram
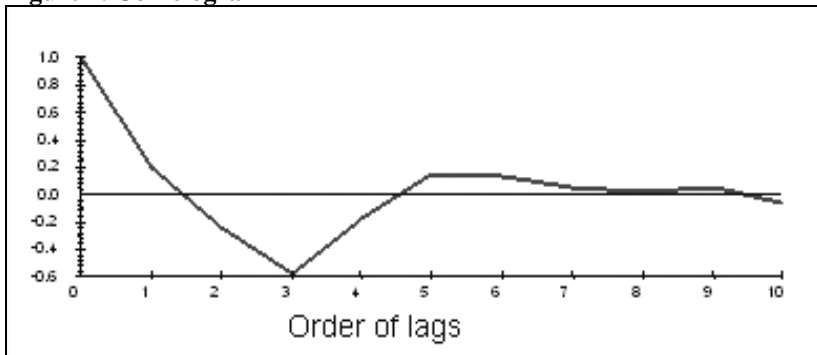
The DW statistic for the model of 1.581 lay in between the upper (1.850) and lower (1.028) bound for the 5% critical value, indicating that the test for serial autocorrelation was inconclusive. Considering the diagnostic test for serial correlation of the errors, indicates that the null cannot be rejected. To investigate further a test for serial correlation of the errors was carried out. This showed that correlation of order 1 and 2 was insignificant but that the correlation of order 3 was very significant. A correction was made for the potential problem by estimating the equation using the Cochrane-Orcuttt (C-O) iterative procedure. The second order scheme was chosen as it produced the best diagnostic results. The C-O summary regression results and the OLS diagnostic results are presented below.

Table 1. Regression Results

Regressor	Coefficient	Standard Error	t-Ratio	Probability
C	-39553.1	42168.5	-0.938	0.358
T	-1030.7	781.847	-1.318	0.201
I	-500.26	1222.4	-0.409	0.686
POP	28.98	22.957	1.262	0.22
DY	4.229	0.783	5.404	0
DE	1065688	1814768	0.587	0.563

Table 2. Relevant Statistics

Statistic	Value
R-squared	0.906
R-bar-squared	0.869
F-Stat F(7,18)	24.715 [0.000]
DW-Statistic	2.388

Table 3. Diagnostic Results

Test Statistic	LM Version	Probability	F Version	Probability
Serial Correlation	1.700	0.192	1.357	0.257
Functional Form	0.071	0.791	0.053	0.820
Normality	0.750	0.687	-	-
Heteroscedasticity	9.205	0.002	12.734	0.001

The C-O regression had a DW statistic of 2.388, indicating autocorrelation is no longer a problem. The insignificant statistic for the Ramsey RESET test, suggests that the functional form is correct. The Chi-squared test for normality of the OLS residuals is insignificant, supporting the null hypothesis of zero skewness and normal kurtosis. Considering the histogram of C-O residuals also suggests normality of the residuals.

Figure 2. Histogram of Residuals
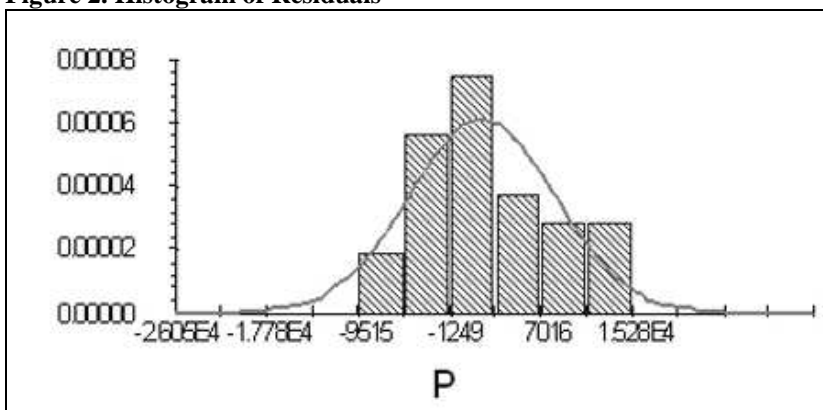
The test for hetroscedasticity indicates that the model displays significant homoscedasticity. Considering the scattergram of C-O estimated residuals

and the fitted P values, there appears to be little systematic pattern. This implies that the transformed data is relatively hetroscedastically distributed.

Figure 3: Scattergram of Estimated Squared Residuals Against Fitted Prices
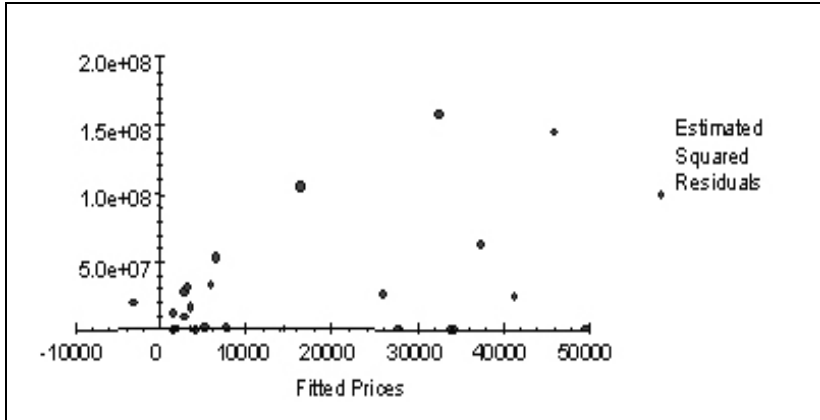
The coefficient of determination (R^2) is a measure that indicates how well the sample regression line fits the data. The R^2 for this model is 0.906, indicating that over 90% of the variation in P is explained by the variation in the regressors. The plot (below) of the actual and estimated values of P indicates that a close relationship exists between them.

Figure 4: Plot of Fitted and Actual Values
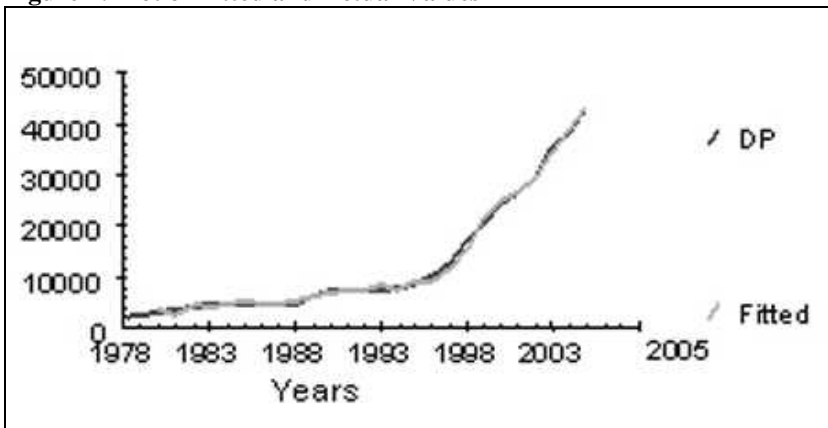
The R-bar-squared statistic takes into account that adding another variable to the model has the negative effect of reducing the model's degrees of freedom. At 87%, it is also an encouraging statistic. However, it must be stressed that the aim of the paper is not to maximise the fit of the model but rather to estimate fundamental house prices.

The F-statistic calculates the overall significance of the fitted regression line, that is, it tests the null hypothesis that the coefficients of all the variables are zero. This model has a highly significant F-statistic and a correspondingly negligible p-value, thus allowing the null hypothesis to be rejected.

For this model the only statistically significant variable is DY. The null hypothesis that the coefficient of DY is zero can in fact be rejected at the 0.001% significance level. The coefficient has the correct theoretical sign, that is, an increase in the expected capital gain would lead to an increase in the price. The variables C, T, I, POP and DE are statistically insignificant. The coefficients on I, POP and DE have the theoretically correct sign; indicating that an increase in interest rates leads to a fall in prices, an increase in the population leads to an increase in prices and an increase in the expected capital gain leads to an increase in prices.

Given the high F-statistic and theoretically correct signs of the variables, yet their small t-statistics suggests a problem of multicollinearity. Correlation among the variables could make them independently insignificant. To investigate this further, the pair-wise correlation between the explanatory variables was estimated. The pairs (DY, POP), (I, DY) and (POP, I) were highly correlated, having a correlation co-efficient of 0.87, -0.84 and -0.91 respectfully. The remaining pairs (I, DE), (DE, P) and (DY, DE) were not as highly correlated; having a correlation co-efficient of –0.25, 0.25 and 0.36 respectfully.

Considering as the pair (POP, I) was highly correlated and both variables were individually insignificant, I did a variable deletion test on the pair. Jointly they were still insignificant; the null hypothesis that their coefficients are both zero could not be rejected by the Lagrange Multiplier (LM), Likelihood Ratio (LR) or F-test. Extending the test to include the deletion of the variable POP also resulted in an insignificant outcome under each test. Despite the low degree of multicollinearity between the pairs (POP, DE) and (DE, I) a variable deletion test was carried out for each, both of which were insignificant. Therefore, although multicollinearity is a problem in the model, some of the variables probably play a very limited or insignificant role in explaining house prices.

Speculative Bubble?

The fitted values from the above regression are the implied fundamental values. As can be seen from the plot of actual and fitted house prices, they follow each other very closely throughout the period examined. According to this model, the largest premium to fundamental value was in 1981, when actual prices were 45.6% above their fitted value. It is difficult to find any explanation for this exceptionally large premium. Between 1980 and 1987 actual house prices fluctuated above and below their fundamental value. From 1987 through to the early 1990s the market was generally at a discount to its fundamental value. From 1996 to 1998, house prices were overvalued by an average of 8.3%. This was the longest sustained premium observed over the period studied. Since 1999 house prices have been at a small discount to their fundamental value, apart from 2003 and 2005, which had a premium of 2.5% and 0.2% respectfully.

From this analysis it appears that there was a speculative component present in the market in 1981 and between 1996 and 1998. Excluding this, there has for no sustained time horizon been a premium or discount to fair value maintained, indicating that house prices have otherwise been at their fundamental value. Stevenson (2005) believes that the premium in the late 1990s may be due to the market being driven by expectations. The strong consumer confidence and general confidence in the economy could account for the premium to fundamental value. Considering the very robust growth of the Irish economy since the mid-nineties and the strong population growth over the period, it may be the case that the dramatic increase in house prices can be justified in an economic fundamental sense.

However, this does not preclude the affordability difficulties experienced by many people attempting the access the market. Poterba (1991) argued that prices in the housing market are largely determined by uninformed investors and therefore their expectations cannot be expressed as rational. They are inclined to over rely on past price movements to the extent that, particularly during periods of bubble-like price growth, such movements play the role of an expectations operator, as opposed to a measure of fundamental value. This argument brings into question the very model used to estimate fundamental value. Furthermore, the results of this econometric analysis must be interpreted with extreme caution as there is the possibility of a unit root in the data generating process, which if present would make the regression spurious and the findings invalid.

Further Research

It would be very interesting to do another study addressing the same issue but using an error-correction framework. To overcome the over-parameterisation difficulties discussed previously it may be possible to use quarterly data as opposed to annual data. Additionally, it would be enlightening to do a separate analysis of house prices within different areas of Ireland. Many experts argue that a speculative bubble exists in a number of sub-markets, notably those of Dublin, Cork and Galway, but that for the country as a whole, houses are fairly priced. It would be also be very desirable to investigate and perhaps account for the autocorrelation that appears in the third lag of this model.

Data

The following data was used in the analysis:

P   House prices, as measured by the second-hand house prices, published by the Department of the Environment. Viewed at, http://www.environ.ie/ accessed on 15/02/2007.

Y   Disposable income, as measured by the Gross National Disposable Income at current market prices, published by the CSO between 1975 and 1994 and published by EcoWin Pro between 1996 and 2005, the figure for 1995 is an average of the figure from both sources. Viewed at http://www.cso.ie accessed on 15/02/2007] and EcoWin Pro, 'Ireland, Income Approach, Disposable Income, National, Gross, Total, Current Prices'.

I   Interest rates, as measured by the building society mortgage interest rate, published by the CSO. Viewed at, http://www.cso.ie accessed on 15/02/2007.

POP   Population aged 25-44, published by the CSO. Viewed at, http://www.cso.ie accessed on 15/02/2007.

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WILLIAM PETTY: AN UNLIKELY INFLUENCE ON KARL MARX

MARK MCGOVERN

Senior Sophister

As a leading economist of his time, William Petty's contribution was, and continues to be, widely recognized. Mark McGovern gives a short biography of this renowned economist with specific reference to his theories on value and surplus. Subsequently, he examines the relationship between Petty's concept of value and the views of other famous economists, such as John Locke, Adam Smith, David Ricardo and Karl Marx. In particular, Petty's influence on the work of Marx is expounded.

Introduction

William Petty (1623-1687) is often cited as being one of the foremost innovators in the history of economic thought, and is without doubt one of the most extraordinary figures of the 17th century. Although he has been praised by many significant economists, Karl Marx was particularly vocal. He referred to him as "one of the most gifted and original of economic investigators" (Roll, 1992:98). It is the aim of this essay to examine why Marx held this view, with reference to Petty's role in developing a labour theory of value.

Born into relatively humble beginnings Petty went to sea at the young age of 13. After breaking his leg he was put ashore in Normandy, France, where he attended university. In Caen he revealed himself to be an exceptionally bright student, paying his way by tutoring and trading jewellery. He later spent a year acting as secretary to the influential Thomas Hobbes[1] in Paris, before proceeding to Oxford. He was appointed professor of medicine in 1650, where he was most famous for resurrecting a supposed corpse during one of his lectures. He rose rapidly through the ranks at Oxford and was involved with the leading scientific minds of the time. He was cofounder of the Royal Society of London for the Improvement of Natural Knowledge (along with Samuel Hartlib and Robert Boyle). Indeed one of his greatest achievements was to introduce rigorous quantitative methodology (more commonplace in Boyle's discipline of physics) into

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[1] Thomas Hobbes 1588-1679, philosopher and author of *Leviathan*.

economics. Along with his work in the field of economics, he is particularly noted for the role he played in founding the discipline of statistics (along with his friend John Gaunt). He later joined the armed forces as chief physician to Cromwell's army in Ireland and made his fortune after he was appointed to undertake the Down Survey; a formidable task which he completed with distinction[2]. As a result of these efforts he was rewarded with substantial amounts of land, including a large estate in Kenmare, county Kerry.

Many of his writings were aimed at those in power and were often undertaken to address matters of personal concern, particularly the protection of the wealth which he had amassed, hence his works on the issue of taxation. However, his abilities were not confined to academia. Among his more practical projects were the creation of an iron factory on his Kenmare estate and the construction of a boat with a new type of double hull (which sadly ended at the bottom of the Irish Sea). Recent evidence (Aspromourgos, 2005) suggests he was conducting experiments in new types of agricultural machinery. He is also accredited with the invention of the w.c.[3] Readers can judge for themselves the relative importance of his contributions!

While Petty wrote his works during the mercantilist period of economic thought, it is clear that his views were far more advanced than many of his contemporaries. Unlike them, he was not so concerned with trade balances or hoarding of specie. His acknowledgement of the existence of other forms of value (labour in particular) is the main topic of this essay. It is my contention that Petty casts a long shadow; that his theories can clearly be recognised as the underlying influence behind the value theories of Smith, Cantillon, Ricardo and Marx. As a corollary of his investigations into value, Petty was the first to explore the notion of surplus. This will also be examined (in the light of some new information concerning Petty's involvement in agriculture) in an attempt to answer why Marx regarded Petty as one of his most important predecessors, and the "founder of modern political economy" (Marx, 1951:15)

Petty on Value

The nature of value has occupied philosophers for millennia, and has been a preoccupation of many schools of economic thought. The philosophers of ancient Greece were taken by issues such as the water/diamond paradox.

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[2] See Hutchison (1988)
[3] Erroneously, according to Spiegel (1991)

Aristotle was able to provide an explanation using relative scarcity and abundance. He held that value was expressed in the proportion that goods were exchanged (Sewall, 1901). Plato also pondered the paradoxes of value (Bowley, 1973).

Petty's aim in examining value as a concept was entirely different from that of the philosophers or schoolmen of the middle ages. He wrote his famous work *A Treatise on Taxes and Contributions* in 1662 to examine the contemporary tax system. He held that there must be some method of valuation other than money (which he recognised can fluctuate in accordance with relative abundance and scarcity of specie, setting himself apart from other mercantilists).[4] Petty regarded the "Wealth, Stock or Provision of the Nation" as "being the effect of…past labour" (Dooley, 2002:1). He establishes a measure of value in terms of labour and land and states, "labour is the Father and active principle of Wealth, as Lands are the Mother" (ibid).

Petty's analysis of value is not contained in the one work; rather it is spread throughout his publications. This makes summarising his views more difficult. Nevertheless it is clear that his theory is still cogent and innovative (Roll, 1992; Hutchinson, 1988). Although not all of his analysis was entirely new, he turned the analysis of the origins of value into one of the fundamental paradigms for the classical school of economics. However, just as with the suggestion that Smith held a labour theory of value, Petty's contribution on this front has also been questioned. Bowley states, "it is not in Petty's measure of value that the labour theory of value sometimes attributed to him is to be found, for his measure is based on inputs of both land and labour" (Bowley, 1973:85).

Indeed, his statement above suggests he also believed in land as a source of value. Slutsky agrees with this criticism. He believed that "Marx conscientiously selected practically all of the most vital parts of Petty's work but explained them in an excessively one-sided manner" (Slutsky, 2005:4). Like Blaug (1979) he points out that Petty's statement on land being the mother is given as a quote (or more specifically a saying) in the original publication. Petty was obviously concerned with this inconsistency however, as he believed that it was necessary "to find out a natural Par between Land and Labour, so as we might express the value by either of them alone as well or better than by both, and reduce one into the other as easily as we reduce pence into pounds" (1667:25).

Indeed Richard Cantillon criticised Petty for not considering this further when writing on his own theories. However Roll (1992:106-7)

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[4] Also noteworthy is his attempt to distinguish between real and nominal variables, something which has occupied economics ever since.

believes Petty did intend to put forward a labour theory of value and believes that the above inconsistency is evidence of a confusion Petty had between exchange value and use value. Roll states that "where he is concerned with the latter, he speaks of land and labour, and where he is dealing with exchange value (at any rate implicitly) he speaks of labour alone". Overall he gives "ample evidence for his fundamental belief in a labour theory of value".

Petty had a well known tendency to digress, and the fact that his views on the subject are not all contained in one context makes analysis difficult. Petty may have been confused himself; Slutsky (2005) also points that Petty sometimes refers to wealth or a method of exchange rather than value. At the time of writing the concepts may have appeared interchangeable. However, whatever Petty intended is to some extent unimportant. The fact is that Petty has often been credited with developing a labour theory of value, notably by Marx himself.

Petty as the Inventor of Surplus

Another hugely influential theory developed by Petty, as a consequence of his analysis of value and rents, was the concept of surplus and subsistence. In his *Political Anatomy of Ireland* (1667:65) he states, "the day's food of an adult man, at a Medium, and not the day's labour, is the common measure of Value". This is precisely what Marx came to call 'labour surplus'. Indeed Marx singles out Petty's views in his *Treatise* as the origin of his surplus value theory; "the law that appoints such wages… should allow the labourer but just wherewithal to live; for if you allow double; then he works but half so much as he could have done, and otherwise would; which is a loss to the public of the fruit of so much labour" (Marx, 1662:87).

It is interesting to consider what may have prompted Petty's investigation of surplus. In a recent article, Aspromourgos (2005) puts forward the view that Petty developed this concept from his involvement with Samuel Hartlib (c.1600-1662) and agricultural circles. This is particularly suggested by his use of corn in his *Treatise* of as a proxy for the basic necessity in society. It seems that Petty was taken with agricultural innovation. Hartlib received several letters from a Cheny Culpepper concerning certain 'corn engines' that Petty was developing. Despite apparent success of the invention (he evidently would have made a better farmer than seafarer!), pecuniary difficulties arose and Culpepper stated that his dealings "hathe bred . . . a resolution, not to trouble my . . . thoughts any farther with these kind of people" (Culpepper, as cited in Aspromourgos 2005:10). Aspromourgos believes that Petty's insight (that there could be an

economic surplus on a societal level analogous to surplus in the corn industry)[5] had its origins in his agrarian explorations.

Locke, Smith and Ricardo on Value

William Petty's theories on value had wide ranging influence, and not only on his immediate successors. There is a clear line of thought stretching from Petty to Marx, which Marx himself acknowledged on several occasions.

John Locke (1632-1704), writing in his *Second Treatise of Civil Government*, presented a theory which was similar to Petty's, also considering land, but reckoning it of little importance. He also refers to other goods embodied in the production process, citing Petty's 'past labour' concept. He states that all of this "would be almost impossible, at least too long, to reckon up" (Locke, 1681:44). Dooley (2002) regards this as the Achilles heel of any empirical labour theory of value, and Smith, Ricardo and Marx all came face to face with this problem.

Smith begins the *Wealth of Nations* with the bold statement that the entire nation's wealth comes from labour. However when he turned his analysis to the civil society which he occupied, his labour theory of value dissipates, leaving a cost of production theory of value. Interestingly, Bowley believes that Smith is not really interested in a labour theory of value at all and that the exposition above is intended to show that such theories only hold under special assumptions. She uses the lack of such a theory from his lectures as evidence for countering the "very common view that Adam Smith's theory of natural price was, as it were, a second string in his analysis introduced because he found himself unable to develop a labour-input theory for an advanced society" (Bowley, 1973:110). Roll again provides an opposing point of view, but agrees that "it is not easy to give a summary account of Adam Smith's ambiguous and confused theory of value…not even adherents of the same school can agree on their interpretation of Smith's theory" (Roll, 1992:139-140).

Following on from Adam Smith, David Ricardo sought to apply a labour theory of value to a more advanced society with profit, rent and capital. Again he encountered the problem of Petty's 'past labour' assertion.

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[5] Net output per worker exceeds consumption per worker

Marx

The line of thought discussed above (originating in William Petty) was used by Karl Marx to establish his theories of exploitation of labour. Marx's concept of a labour theory of value was tied up with the idea of surplus (essentially the difference between the value of what a labourer could produce and what it cost to keep a labourer alive), which he believed capitalists generated by exploiting labour. Marx believed that in capitalist society, goods had exchange value which was determined by the socially necessary labour time involved in their production, being defined as "the labour time necessary to produce any use value with the given normal conditions of social production and the social average degree of skill and intensity of labour" (Roll, 1992:63).

Marx also recognised that land played a part in the production process, and that any machinery used in production was also the product of 'past labour'. He distinguished between the exchange value and use value of labour, defining the exchange value of labour as the subsistence of the labourer. But the use value employed by the capitalist exceeds this exchange value. If the subsistence level of the labourer is 4 hours, and the labourer is generally employed for the whole day (12 hours), then the surplus the capitalist enjoys is the value of 8 hours labour. As Dooley (2002:21) notes, "the whole working day is, in this way, divided into two parts: one to produce the necessary subsistence for the labourer, the other to produce the surplus value for the capitalist".

We have already seen how Petty recognised the difference between production necessary for subsistence and production which resulted in a surplus. Marx defined the rate of surplus as the ratio of labour time spent producing a surplus for the capitalist, to labour time required to cover subsistence. This was the degree of exploitation of labour by the producer.

However, as with all proponents of a labour theory of value, Marx shied away from it in the end, as did Ricardo and Smith before him. As Dooley states:

> Even though Marx sought to explain the prices of production by the labour embodied in production, he ended up with a cost-plus-profit theory of value like Adam Smith and David Ricardo. Marx's transformation turns profits into a necessary cost of production, because any industry that did not receive the 'average profit' would see its capital diverted to other industries. (Dooley, 2002:24-25)

Conclusion

Petty's contribution to the evolution of a labour theory of value was instrumental, and even if this line of argument was to be discredited (partly due to his own assertion that capital goods were 'past labour'), it preoccupied many leading economists for centuries. Marx's own exultation of Petty as the founder of modern political economics is surely enough evidence of his influence. In particular, Petty's development of the surplus concept anticipates the crux of Marx's theories.[6]

It is interesting to conclude by considering how Petty would have fitted into Marx's world of post-industrial revolution Europe and how Marx would have viewed him, if they had had the opportunity to meet. Without doubt Petty was a capitalist, an entrepreneur in the tradition that Richard Cantillon describes so well. Although this essay has necessarily concentrated on a narrow section of his work, his contributions in other areas should not be ignored, such as in terms of the circulation of money. As the evidence suggests, he was constantly seeking out innovation, take for example his agricultural digressions. Although he made a significant contribution to Marx's theories, as a wealthy landowner he would most certainly have viewed communist theories with scepticism (or, more likely, horror, given his interest in protecting his own wealth and property).

Let us return to Petty's discussion on wages. While Marx argues that it is unjust for the labourer to be paid at subsistence level, Petty is arguing the exact opposite, taking the point of view of the 'capitalist'. While it is unfair to suggest that Petty only wrote to further his own interests, most of his works do so.

The fact that Marx singles out Petty for praise is certainly worthy of note. Slutsky (2005) believes Marx was very selective in his quotation of Petty's writings, however the origins of many of his theories can be found therein. Indeed Petty's views on unemployment have a distinctly socialist flavour[7]. That is not to say that he was a communist! But nor could he be classified as a classicist or mercantilist. He was surely unique.

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[6] By 200 years

[7] Petty sounds remarkably like Keynes in some passages, even arguing for the relocation of Stonehenge to boost employment. Hutchison (1988) has an interesting discussion on whether Petty was in fact a prescient Keynesian.

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ADVERSE SELECTION

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Senior Sophister

In economics it is often too readily assumed that full information is available uniformly throughout a market. David O'Cinneide examines a more realistic scenario – that of asymmetric information. He refers to the classic work of Akerlof, Spence and Stiglitz to determine the nature of this market failure and subsequently outlines two ways in which the information gap may be bridged, namely 'signalling' and 'self-selection'.

Introduction

In theory, economics provides a reliable framework for analysis. A perfectly competitive market maximises the gains from trade to both producers and consumers, thus society is better off. The conditions that describe this perfect market (buyer and seller atomicity, product homogeneity, free entry and exit for firms), ensure that goods sell for the lowest price and are produced efficiently, to be enjoyed by the perfectly informed consumer who values it most. However, the assumptions intrinsic to the perfectly competitive market do not always apply in the real world. In particular, full information is not always available to *all* agents in the market. To account for this, economists have relaxed the unrealistic assumption of perfect information and uncovered new ways of looking at market failure and also new ways to counter it.

The theory of markets with asymmetric information was formally recognised as a cornerstone of modern economic thought when, in 2001, George Akerlof, Michael Spence and Joseph Stiglitz were awarded the Nobel Prize for Economic Sciences. The ground-breaking work of these academics brought economic theory closer to economic reality. Akerlof's classic paper, *The Market for Lemons: Quality Uncertainty and the Market Mechanism*,[1] has been described as "the single most important contribution to the literature on economics of information," (Nobel press release, 2001:2).

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[1] While Akerlof's ideas are now recognised as groundbreaking, his lemons paper was rejected by two major journals before being published in the Quarterly Journal of Economics in 1970. (Riley, 2001)

This work was first to identify the concept of adverse selection, or the so-called 'lemons problem'. This phenomenon exists when an information imbalance characterises a market and can stop the gains from honest trade being realised. In order to maximise social welfare, this information imbalance must be remedied. The work of Spence and Stiglitz recognized how this might be accomplished. Spence's research focused on how the informed economic agent can send credible signals to the uninformed agent in a way that can be trusted, therefore ensuring mutually beneficial trade. Stiglitz's 'solution' approaches the problem of adverse selection from the other side of the transaction; the uninformed party screens the informed party to obtain the deals which are advantageous to both, i.e. the uninformed does not adversely select an unfavourable transaction. In this paper, I shall explore the work of these three economists and discuss the wisdom they have imparted on the economics of information.

Information & When Markets 'Go Bad'

As is often the case in market transactions, one agent has an information advantage over the other. The seller of a used car is well aware if his car is a cherry, plum, peach or lemon.[2] The entrepreneur seeking capital in the form of a bank loan is in a better position to judge his level of risk. This uncertainty can cause the market mechanism to fail.

Consider a certain E. Knievel endeavouring to obtain motorcycle insurance. Mr. K knows if his actions are fraught with risk[3] (i.e. whether or not he has a high probability of having an accident) as compared to his insurance company, who can only judge the observable characteristics of Mr. K, i.e. age, gender, type of vehicle. These observable characteristics are the basis on which the insurance company sets the premium rate for Mr. K's cohort. Those with low risk will find this average rate too expensive to cover their expected loss and thus find it more attractive to seek insurance elsewhere or even self insure. Those with high risk, through the weighting of the group rate, force those of low risk out of the market. This exodus of low risk individuals causes an increase in the average risk of the entire group. In order to counteract the losses incurred due to the unexpected large number of claims (which in itself is due to the initial adverse selection of bad risks) the

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[2] These fruity colloquialisms describe the quality of the car. Cherries, plums and peaches are high-quality cars, lemons are inferior cars.

[3] A distinction here must be made between the two classic problems of markets with asymmetric information. Adverse selection occurs when information concerning product quality is denied an agent, forcing a bad economic decision. Moral hazard is when the agents' actions affecting the quality of the product are unobserved by the other side of the transaction.

insurance company must raise premiums further, pushing more individuals out of the market. The proportion of good risks changes adversely as the premium is raised[4]. In his paper, Akerlof (1970) compares adverse selection to a kind of 'generalised' Gresham's law, the good trades in the market driven out by the bad.

The following is a basic illustration of adverse selection. Consider a good available in two qualities, high and low. The high-quality good represents a proportion μ of all goods to be traded. To the buyer, a high quality good is valued at v^H and the low quality good v^L, $v^L < v^H$. To the seller, a high quality good is worth w^H and the low quality good w^L, $w^L < w^H$. In a market characterised by perfect information, i.e. the buyers and sellers both know the quality of the good, then there exist two markets, one for each quality type. The low quality good sells for v^L, and high quality goods for v^H, thus assuring societal welfare is maximised. However, if there exists imperfect information, as is often the case in the real world, the buyer only offers the expected value of the good:

$$\omega = \mu \cdot v^H + (1\text{-}\mu) \cdot v^L$$

If $w^H > \omega$, then only sellers of low quality goods would find trade beneficial. Sellers of high quality goods would find it more attractive to hold onto their products and leave the market, leaving only the low quality goods for sale – adverse selection occurs!

Sending the Right Signals

As shown above, markets with asymmetric information fail through the inability of both sides of the market to communicate information that they can trust. How can this information gap be bridged? Any cunning businessman can claim to own a high-quality product, but as the adage goes: talk is cheap. Another adage could aid us here: actions speak louder than words. Actions communicate. It was through the use of actions as a signal that Michael Spence approached the adverse selection problem.

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[4] The father of modern economics, Adam Smith touched on the concept of adverse selection in his great work The Wealth of Nations (1776): "If the legal rate …was fixed so high… the greater part of the money which was to be lent, would be lent to prodigals…who alone would be willing to give this higher interest. Sober people, who will give for the use of money no more than a part of what they are likely to make by the use of it, would not venture into the competition." (Smith 1776, as cited in Stiglitz , 2001: 4).

For example, when you buy a pair of Campers, these hard-wearing shoes come with a two year warranty. This implies that the company has confidence in the quality of their product. On the other hand, if you buy flip-flops from someone carrying their wares in a blanket, there is no guarantee that they will last an hour on your feet. The warranty from Camper sends a signal to the consumer concerning the quality of the product. The very fact that the shoes will be replaced, no questions asked, leaves the impression that replacement won't in fact be necessary! Similarly, a used car salesman will undertake long-term investments such as large elaborate car showrooms to demonstrate their dedication to the business. By showing they are not 'flightly', in the parlance of the economist, they are playing the 'lemons' game repeatedly, thus building a reputation for selling quality cars. Signalling is costly and different 'senders' have different signalling costs. Sellers of poor quality shoes would not be able to bear the cost of a two year warranty, as they'd be replacing shoes far more than selling them!

In his paper *Job Market Signalling*, Spence explores education as a signal in the labour market.[5] Uncertainty arises because of the lack of information the employer (as the buyer of labour), has on the productivity of the seller (the job applicant). Education however, may be a signal as to whether this productivity is high or low. Spence assumes that employers believe applicants with an education level e^h, have a high productivity and are therefore paid a wage, w^h, all other education levels being paid w^l. An indifference curve framework illustrates the preferences of the applicants.

Figure 1. Indifference Curve Analysis of Education & Wages
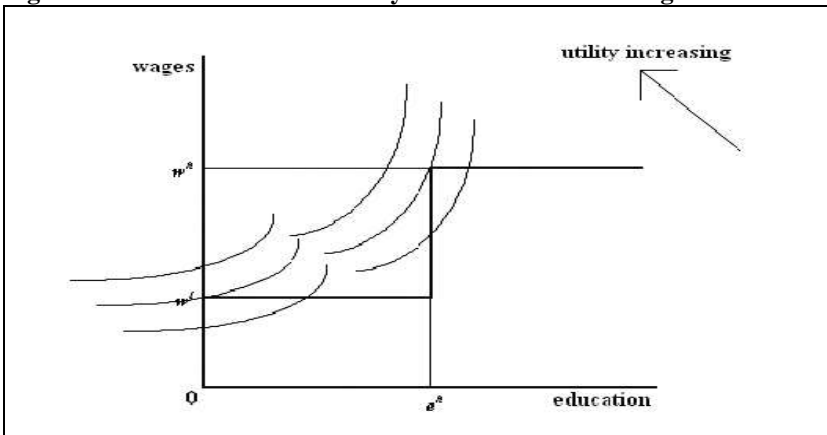
[5] Isn't this the real reason behind university: To signal to a prospective employer how clever we are?

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Moving in the northwest direction corresponds to higher utility levels, as higher wages are 'good' but costly education is 'bad'. [6] The flatter indifference curves represent the low-productivity individuals who find education more costly to obtain. The high productivity job applicants are satisfied with a wage-education combination (w^h, e^h), reflecting the preference that the costly education is worth the higher wages. Those to whom education is more costly, prefer the lower wage and no education, that is a "higher wage does not compensate for their high cost of education" (Nobel press release, 2001:6). Employers therefore know (under rigid but plausible assumptions) that in general, more productive workers will have higher educational attainment. Thus instead of the low productivity workers being adversely selected by employers, high productivity workers signal their abilities and participate in the labour market. Society is better off, thanks to information being indubitably transferred.[7]

Standing Out From The Crowd

If the informed party can reliably signal to the uninformed party, then adverse selection can be overcome. Is there another way the uninformed party can manage trade with the informed side of the market to ensure that selection makes maximal benefits accrue? Stiglitz, using the insurance market as his main emphasis, tried to see how the ignorant insurance company (i.e. without full information) could "force customers to make market decisions in such a way that they both reveal their characteristics and make the choices they would have wanted them to had their characteristics been publicly known" (Stiglitz, 1976). "If those who are more able, less risk prone, more credit worthy acted in some observable way, then it might be possible to design a set of choices which would result in those with different characteristics in effect identifying themselves through their self selection" (Stiglitz, 2001). This 'self-selection' mechanism is the focus of Stiglitz and Rothschild's influential paper *Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Information*.

In order to induce this 'self-selection', the uninformed party has to get the economic incentives right. Equilibrium must be *separating*, i.e. different types of customer select different types of contracts, rather than

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[6] Purely from an economic cost minimisation perspective, of course!

[7] Although sometimes there is in fact no information transfer at all, except for the fact that the signal was extremely expensive to make. This is how some economists explain advertising (Hartford, 2006).

p*ooling*, when differing types choose the same contract. This is accomplished by the deductible.

In the Stiglitz and Rothschild model, an insurance contract is represented by the vector *(p, c)*, where *p* is the premium and *c* is the compensation paid in case of income loss *L*. When *c=L*, we say there is full coverage. If *c<L*, then the difference, *d=c-L,* is said to be the deductible, that is, the amount of the loss that the insured must pay from his own pocket before reimbursement from the insurance company begins. By pairing the high premiums with the low deductibles, the insurance company ensures that the policy buyers purchase the correct contracts that the company wants them to.

The high risk customers, those who are highly prone to accidents, while tempted by the lower premiums, do not relish the prospect of paying the high deductible that accompanies it. They would prefer to accept the high premium in return for no deductible. Conversely, the low risk group, those who 'take care', gladly pay the lower premium with the larger deductible because, if you accept that the probability of an accident is extremely low, then so is the probability of paying it. Thus, through offering different contracts, insurers 'screen' their customers and motivate them to choose policies which confirm their riskiness and so bad risks are not adversely selected.

On the other side of the coin, instead of the bad risk being chosen adversely, Hemenway (1990) proposes a source for *favourable* selection in markets with asymmetric information he calls 'propitious selection'. In particular, again using insurance markets, different customers have different attitudes towards risk. Those who are 'risk avoiding' might both buy insurance and drive carefully, while those who are 'risk seeking' may be disinclined to buy insurance, drive carefully, or even wear their seatbelts.

Conclusion

By thoroughly understanding why adverse selection can cause markets to breakdown, economists can better understand ways to correct the problem Economic agents can be seen to be using the ideas of these Nobel Laureates in their everyday interactions; how many questions must be answered and tests passed before an insurance company will offer a quote? How many graduates wear their finest suits and push their best exam result to the top of their CVs in job interviews? In market transactions, information can benefit society as a whole as a perfectly competitive market with perfect information maximises social welfare. Understanding how economic agents

use that information is crucial for real world markets to approach this theoretical ivory tower.

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DECODING J. M. KEYNES' WORKS: AN ANALYSIS OF THE INTERPRETATIONS OF KEYNESIAN ECONOMICS

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The publication of John Maynard Keynes' ground-breaking General Theory *in 1936 sparked debate among economists, resulting in varied interpretations of his work. In this essay Melinda Simonffy concentrates on Fundamentalist Keynesianism, Hydraulic Keynesianism and Reconstituted Reductionism, comparing and contrasting these three different approaches. In conclusion she notes that it is the ever dynamic economic climate that results in the development of different perspectives on any economic theory.*

Introduction

In the history of monetary thought, opinions about the role of money have often swung like a pendulum from one extreme to another (Hahn, 1947). Ever since John Maynard Keynes' attack on the body of theory that he designated as "Classical" in his famous *The General Theory of Employment, Interest and Money* (1936), academics and policymakers alike have debated the validity and the significance of the revolutionary ideas that were put forward in these writings (Coddington, 1983).

Keynes' suggestions, which he so presumptuously yet accurately believed "will largely revolutionize… the way the world thinks about economic problems" (Keynes as cited in Minsky, 1975:3), created a major shift in economic thought, but also much debate, confusion and controversy (Robinson, 1975). At the heart of this controversy lies a key question: What do Keynes' theories really mean? In order to find an answer to this question, a variety of researchers have attempted to provide appropriate explanations for Keynes' ideas. Three major interpretations of Keynesianism have emerged as a result; Fundamentalist Keynesianism, Hydraulic Keynesianism and Reconstituted Reductionism (Coddington, 1983). The objective of this paper is primarily to shed light on the aforementioned three interpretations with a particular focus on the *General Theory*, showing some of the shortcomings of each school of thought. To conclude, the Keynesian debate

will be re-examined, demonstrating its value to monetary thought.

The Interpretations of Keynes

The *General Theory* is considered disappointing when compared to his other works, renowned for their clarity and elegance in expression (Leijonhufvud, 1968). Thoroughly confusing, leaving "many gaping holes in his theory" (Gerrard, 1991:277), this work of genius (Samuelson, 1946) has been widely criticized as being vague, underdeveloped and "a very clumsy statement" (Minsky, 1975:12). In this context, it is not surprising that a variety of interpretations have sprung up as a response to disentangle this Keynesian "doctrinal fog" in order to discover the true essence of Keynesianism (Gerrard, 1991:276). Prior to this, the 'un-interpreted' theories of Keynes' *General Theory* will be presented.

The "Economics of Keynes"[1]

The aim of the *General Theory* is to lay out "what determines at any time the national income of a given system and…the amount of its employment" (Keynes, 1936:247). He concluded that "national income depends on the volume of employment" and that the macroeconomic equilibrium is consistent with involuntary unemployment (Snowdon & Vane, 2005:58). It is said that Keynes did not consider it necessary to repeat his views on banking and money; since these were developed at great length in his *Treatise on Money* (1930), which is deemed a better guide on the latter two subjects (Leijonhufvud, 1968). The main innovation of the *General Theory* is the concept of effective demand, the principle whereby consumption can be stimulated through increasing the money supply, that is, "spending our way out of depression" through fiscal incentives (Garrison, 1996:166). A further uniqueness in his theory is the stress on quantity rather than price adjustments and the balancing role of output as opposed to prices (Snowdon & Vane, 2005).

In the *General Theory* Keynes redefined the fundamental propositions of the Quantity Theory of Money which holds that in equilibrium, money is neutral, where output, relative prices and incomes do not depend on the quantity of money. This position is in stark contrast to his previous works where he still maintained that, the Quantity Theory was valid although somewhat vague particularly in the short-run when disequilibrium

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[1] Leijonhufvud (1968: 6)

occurs (Minsky, 1975). Keynes rejected the belief that a decentralized market system is inherently stable (ibid) since the intrinsic uncertainty of the future was spurred by investors' "animal spirits" (Keynes, 1936:161), making a centralized decision-making process more desirable than a decentralized one prevalent in market economies (Garrison, 1996).

Keynes expressed support for the "comprehensive socialization of investment" (Keynes, 1936:378) in order to achieve full employment. The interest rate that "rewards no genuine sacrifice" (Garrison, 1996:166) must in Keynes' view be kept low (or even driven to 0%) to hinder the short supply of capital and so create a more equitable economy (Minsky, 1975). Keynes thought that once the problem of scarcity had been tackled, future generations could abandon questions about economics in order to focus on a life full of aesthetic pleasures (Garrison, 1996). However, Keynes' predictions never materialized. Despite his philosophy, speculations about his writings on economics have never ceased. To gain further insight into these Keynesian movements, the three main interpretations outlined by Coddington (1983) will be discussed in greater detail.

Fundamentalist Keynesianism

Fundamentalist Keynesianism refers to a "frontal assault on the whole reductionist program"[2] (Coddington, 1983:217). The central tenet of the fundamentalist approach places an emphasis on Keynes' *The General Theory of Employment* (1937), which served as a response to criticisms on his *General Theory* and attempted to clarify some elements of the latter (Minsky, 1975).

Fundamentalist Keynesians include Hugh Townsend who was one of the earlier adopters of this position; G.L.S. Shackle who focused his studies on the unpredictability of human preferences; and Joan Robinson who maintained a "Neo-Ricardian" stance, which in Coddington's (1983:218) words reflected a "hybrid of Keynesianism with those aspects of Ricardo's work that were appropriated by Marx: Ricardo minus Say's law and the quantity theory of money."

The *General Theory of Employment* (1937), which serves as the main source of insights for the fundamentalist movement, is primarily an assault on the choice theory; one of the basic principles of the reductionist program. The paper discusses points such as the issue of uncertainty and the

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[2] Reductionism is what Coddington (1983: 216) referred to as market theory where the "central idea is the reduction of market phenomena to (stylized) individual choices". See Coddington (1983) for further details.

intrinsic tendency for people to hoard and accumulate wealth due to "our distrust of our own calculations and conventions concerning the future" (ibid:216). This desire to hoard is ultimately determined by the level of interest. Keynes also elaborated on the notion of effective demand, which in his view includes two concepts; "investment-expenditure" and "consumption expenditure", which depended on the level of income, people's propensity to spend and expectations about the future as well as the interest rate (ibid:219). An increase in aggregate income has a positive effect on consumption expenditure; whereby the "amount that is consumed depends on the amount of income made up" by entrepreneurs that require investment for further generation of income (ibid:220).

The *General Theory of Employment* (1937:221) concludes with the notion that his theory can be summed by "saying that, given the psychology of the public, the level of output and employment as a whole depends on the amount of investment". However, factors which affect aggregate output (such as propensity to hoard, monetary policy, future expectations about the yield of capital assets, propensity to spend and other social issues influencing the money-wage) are "those which determine the rate of investment which are the most unreliable, since it is they which are influenced by our views of the future about which we know so little" (ibid). This supports Keynes' position on why output and employment are liable to fluctuation and why he rejects the orthodox assumption about existing information about the future.

Littleboy (1997:238) outlined some key points that characterize fundamentalist Keynesianism; the rejection of the Walrasian equilibrium; the fact that unstable expectations and flimsy conventions prevail; the pervasiveness of crowd behaviour that can "lose confidence and stampede or just huddle together for security"; the anti-mechanistic standpoint and the dismissal of what Robinson declared as "Bastard Keynesians" (1975:127); the focus on chronic instability; the uncertainty of the future and the belief that macro-instability is partly psychological and partly institutional.

Fundamentalists are also "accused of nihilism" which has been exemplified by both Robinson, who has revealed that "if the idea of equilibrium is pursued relentlessly, then as the concept becomes all-embracing it becomes paralyzed by its own logic: the equilibrium becomes a state of affairs that is, strictly, unapproachable; unless it already exists, there is no way of attaining it" (Coddington, 1983:219). Shackle supported a similar view, concluding that the use of comparative equilibriums to examine consequences of changing events is inadequate. Fundamentalists view the concept of the equilibrium as a distraction, for which the Keynesian model offers a refreshing alternative.

However, fundamentalist beliefs are not without flaws. In the final chapter of the *General Theory* it is outlined how classical theory holds if full employment is attained through the creation of the necessary aggregate volume of output to maintain this, contradicting fundamental Keynesian beliefs. Keynes (1936:378) stated that "there is no objection to be raised against the classical analysis of the manner in which private self-interest will determine what in particular is produced, in what proportions the factors of production will be combined to produce it, and how the value of the final produce will be distributed between them." Robinson (1935:581), however, maintains that "laissez-faire fails to maximise total utility, by failing to provide the ideal selection of commodities" and commented that "Keynes himself began the reconstruction of the orthodox scheme that he had shattered" (Robinson as cited in Coddington, 1983:221).

A further inconsistency in fundamentalist Keynesian thought is exemplified in the *General Theory of Employment* (1937). Here Keynes specifically expresses no objection to Hicks's formation of the IS/LM framework (or the income-expenditure model), clearly refuting fundamentalist principles (Coddington, 1983). In addition, the fundamentalist position does not offer a suitable alternative for the reductionist program; and is characterized by the conviction about the deep ambivalence of the functioning of the economy. Fundamentalist Keynesians, however, do agree on the proposition that "no model of this situation can be fully specified" (Coddington, 1983:222).

Hydraulic Keynesianism

The hydraulic interpretation of Keynesianism originates in Hicks' (1937) famous paper *Mr Keynes and the Classics – A Suggested Interpretation* (Cardim De Carvalho, 1992). Among the hydraulic interpreters of Keynesian economics are Modigliani (1944), who supported the view that the essence of Keynesianism was the "economics of wage and price rigidities", Samuelson (1946) who developed the 45° Keynesian cross diagram, Klein (1947) and Hansen (1953) (Snowdon & Vane, 2005).

Hydraulic Keynesianism holds the idea that the economy at the aggregate level contains "disembodied and homogenous flows" which rely on stable relationships between these (Coddington, 1983:224). Recurring themes of the hydraulic approach evolve around a focus on fiscalism which is characterized by a steep IS curve and a flat LM curve; fixed prices and rigid wages as represented by a flat AS curve; the importance of the liquidity trap and the "discretionary fine-tuning by technocrats"; a view of lethargic

capitalism which lacks "animal spirits" and the support for state intervention in a mixed economy yet avoiding dogmas such as Marxism and fascism (Littleboy, 1997:326).

The backbone of the hydraulic theory is the IS/LM framework (Snowdon & Vane, 2005), which has become "the conventional wisdom in modern macroeconomics" (Cardim De Carvalho, 1992:5). Hicks defined three models in his interpretation; (i) the Classic, (ii) the special Keynesian and, (iii) the Keynesian:

Table 1: Hicks' Keynesian Models

Classic	Special Keynesian	Keynesian
I = S (I, Y)	I = S (Y)	I =S(Y)
I = I (i)	I = I (i)	I = I(i)
M = k Y	M = L I	M = L (i, Y)

where

I	= investment
S	= saving
Y	= income
i	= the interest rate
M	= money.

Models (i) and (ii) construct the IS curve, and the third identifies the LM curve. The two endogenous variables are i and Y. The distinction between the first two models lies in the savings function and in the demand for money (Cardim De Carvalho, 1992). In Hicks' approach, the demand for money is stressed and the importance of the savings function mitigated, thereby juxtaposing the Cambridge Quantity Equation to Keynes' Liquidity preference. However:

> …even this difference is not as important as it may seem at first sight, because even though Keynes emphasizes the role of interest rates in the determination of the demand for money (through the speculative motive to demand money), when one considers Keynes' transactions demand for money the model to be used is not model II but model III, which represents, according to Hicks, 'a big step back to Marshallian orthodoxy', making 'his theory… hard to distinguish from the revised and qualified Marshallian theories…'(Hicks as cited in Cardim De Carvalho, 1992:5).

The validity of the IS/LM model as a reflection of the *General Theory* is greatly debated on a number of grounds. Hicks himself cautioned against using his "skeleton apparatus" without the use of a critical eye since his methodology "remains terribly rough and ready sort of affair" (Hicks as cited in Leijonhufvud, 1968:4). Cardim De Carvalho (1992) points out that the IS/LM model fails to attain its objective to satisfactorily compare Classic theory with Keynesianism. Also, Hicks's approach establishes simplistic rationalizations as a matter of econometric convenience which has no theoretical significance, ignoring variables held constant in the equations. Coddington (1983) stated that since the paper was published, 30 years of experience in demand management policies have highlighted the intellectual problem of scope, which led to Hicks' reappraisal of his own theories on Keynesian economics. The reconstituted reductionist school of thought also attempted to address this question of scope, as will be elaborated in the following section.

Reconstituted Reductionism

The reconstituted reductionist school of thought was first developed by Patinkin (1956), who proposed that the essence of Keynesianism is the "economics of unemployment disequilibrium and that involuntary unemployment should be viewed as a problem of dynamic disequilibrium (Snowdon & Vane, 2005:71). Patinkin focused on analysing the existence of involuntary unemployment in perfect competition with flexible prices and wages, which he concluded may occur in this situation. In Patinkin's evaluation, particular attention is paid to the pace with which markets can correct and absorb shocks. This diverted the focal point of his analysis from the degree of wage and price flexibility to the issue of coordination.

The main characteristics of this school of thought have been described as the following: the belief that the mechanism out of equilibrium behaves irrationally when left to its own devices; the proposition that agents must fend for themselves yet the "members of the crowd push each other further away from full employment"; that the auctioneer is fictional; that in disequilibrium false prices, signals and trades occur; the issue of co-ordination breakdown; that "dynamics depend on effective (money-backed or credit-backed) demand not (Walrasian) notional demand"; how exchanges are affected by money; the deviation-amplification due to the multiplier and how long-run recovery is problematic (Littleboy, 1997:334).

Two economists associated with the reconstituted reductionism proposition, R.W. Clower and A. Leijonhufvud, followed a similar approach

to Patinkin, creating a "modified general equilibrium" model along Walrasian lines as a response to overcome the aforementioned coordination problem (Snowdon & Vane, 2005). However, Clower and Leijonhufvud differed in their interpretation of Keynes' work, which materialized in a 'family quarrel' about 'the expandability of the concept of equilibrium (Coddington, 1983:226). Clower on one hand came up with the so-called 'dual decision hypothesis' which relies on the principle that current income affects consumer spending. He believed that Keynes had the concept of dual-decision hypothesis and the household behaviour theory "at the back of his mind when he wrote the *General Theory*" otherwise "most of the General Theory is theoretical nonsense" (Clower as cited in Coddington, 1983:226). The assumption that Clower presented here was that Keynes had a variety of ideas that he did not include in the writing of the *General Theory*, raising speculation regarding what these omitted ideas were. However, Coddington points out that this "is a problem of reading not so much between the lines as off the edge of the page"; indicating that Clower's assumptions may have been at times ambiguous in their nature (ibid).

Leijonhufvud, in his famous *On Keynesian Economics and the Economics of Keynes* (1968) tried to prove that Keynes' theory is quite distinct from the Keynesian income-expenditure theory and tried to provide a fresh perspective from which the income-expenditure theory may be reconsidered. He attempted this by undertaking a thorough analysis of Keynes' ideas such as the role of money, the role of the interest rate, the relationship between the *Treatise* and the *General Theory*; relative prices; the importance of money and by looking at the Keynesian revolution. Leijonhufvud's exposition has been praised for its great detail in presenting logical requirements of the Keynesian system; patiently disentangling the misunderstanding in the neo-classical scheme and shedding light on some controversies such as the Pigou effect (Robinson, 1969).

Leijonhufvud built upon Clower's theme providing a neo-Walrasian interpretation that stresses the importance of processes and implications of disequilibrium trading and coordination failure (Snowdon & Vane, 2005). He outlines how the concept of 'involuntary unemployment' arises from this disequilibrium and offers an explanation on how a competitive market economy behaves in the short-run to aggregate demand shocks when "wage and price adjustments are less than perfectly flexible", criticising the neoclassical synthesis (Snowdon & Vane, 2005:73).

However, Leijonhufvud's work is not immune to criticism. Coddington (1983:228) commented that in Leijonhufvud's attempts to hunt for authenticity in the *General Theory* he falls back into "the realms of mind-reading", and "fails to distinguish between the past and the future, and treats rentiers, workers and entrepreneurs all alike as 'transactors' and 'asset

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holders'" in his juxtaposition with the neo-classical model that eliminates money prices (Robinson, 1969:582). Furthermore, Leijonhufvud's theories have been criticized as "unfaithful to Keynes' writings" that "misrepresents Keynes on a number of issues" such as on the questions of "the theory of unemployment, the causes and consequences of wage rigidity, the liquidity trap, and the behaviour of commodity prices" (Jackman, 1983:31-43).

In their search for innovative approaches, both Clower and Leijonhufvud tried to set themselves the task of "constructing a framework that would provide room or scope for Keynesian ideas" (Coddington, 1983:228), which led them to the conclusion that in order to accommodate these ideas, the process of disequilibrium trading must be embraced and the concept of equilibrium theorizing deserted. In Clower and Leijonhufvud's reconstituted reductionism, it is evident that they were attempting to explain the problem of attaining equilibrium rather than the state of it, yet it does not provide any practical solutions such as the hydraulic Keynesians did (Coddington, 1983). Accordingly, Leijonhufvud's book is "not so much about the economics of Keynes as about the scope of the economics of Keynes" leaving many questions unanswered (ibid:231).

Conclusion

In this discussion, some interpretations of Keynes' *General Theory* have been considered. The fundamentalist approach advocates the rejection of the choice theory; the 'old-fashioned' hydraulic view shuns formal choice theory foundations while the reductionist Keynesians try to "make room for Keynesian ideas… by refocusing the market theory on disequilibrium states whilst retaining the standard choice-theoretic foundations" (Coddington, 1983:231).

In the field of economics, particularly macroeconomics, it is only natural that with changes in experience and within the economic climate, debates surrounding economic theories alter dynamically with time and will continue to do so in future. The era in which the *General Theory* was written was a completely different world from the current one; creating a further divide between what Keynes tried to express and the point of view and methodologies that economists living in the 21st century apply when reading those 'Classic' works. This leads to the development of a continual stream of new perspectives. Multiple interpretations of the "Economics of Keynes" provide a great platform for discussion, foster progress and diversify macroeconomic thinking, much to the benefit of the field; for there is

nothing more stimulating to the mind than insights gained from intellectually challenging debates.

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FRANKFURT OR LONDON? COMPARISON OF THE MONETARY POLICY OF THE ECB WITH THAT OF THE BANK OF ENGLAND

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Despite the fact that central banks have similar objectives in mind, it does not necessarily imply that the manner in which these are achieved is identical. To demonstrate this, Michal Kolesar compares and contrasts the monetary policy of the ECB with that of the Bank of England. Common goals and targets are identified, as are important differences in the practices and tactics employed. He concludes that inflation expectations are easier formed using the British model due to its recent history of low inflation and clear communication methods.

Introduction

Economic models are like trends in fashion – they come and go, compete with each other, disappear and reappear again in a slightly modified form, only to be replaced yet again due to a new trend in economic thought. Central banking, due to its reliance on economic models, is no different. Rules versus discretion, fine-tuning versus laissez-faire, money growth versus inflation targeting, employment versus price-stability as a policy criterion, role of transparency and credibility, or shapes of Phillips curves have all been (and many of them still are) topics widely discussed among monetary policy-makers, often without reaching a clear consensus. The fashion today seems to be focus on inflation targeting and price stability, clear and careful communication, operational independence, and credibility. By examining these recent fashion trends, concentrating on the Bank of England (BOE) and the European Central Bank (ECB), this essay will try to show that even though central banks may have common objectives and similar ideas on how best to achieve them, it does not mean that their conduct of monetary policy is necessarily similar in practice. In other words, shooting at the same target using similar weaponry does not imply that the shooting technique is the same.

Choosing the Target

Few people dispute the view that price stability should be one of the primary concerns of central banks. It is the main objective of many central banks today, including BOE and the ECB. However, what exactly we mean by price stability is not a clear-cut issue. The Governing Council of the ECB defines price stability as inflation below 2%, measured by the Harmonised Index of Consumer Prices (HICP). In England, price stability definitions have been changed often. At first, inflation was measured by the RPIX (Retail Prices Index) minus mortgage interest payments, and the target was initially (in the period 1992-97) 1–4%. In 1997, this was narrowed to 2.5±1%. In 2003, the chancellor redefined price stability as 2% inflation as measured by the Consumer Price Index (CPI), which is equivalent to HICP. The target is symmetric, which effectively means that the BOE tries to keep inflation between 1% and 3%. The reason for the change was that the RPIX is an arithmetic measure, while CPI is logarithmic. Thus, CPI attaches less weight to stores where prices have been rising the fastest. Since most people switch their consumption away from products in such stores, the new formula is claimed to be superior (King, 2004). As a side effect of the new measure, inflation figures are lower, hence the reason for lowering the target by 0.5% (Lomax, 2004).

The question of whether or not price stability should be the only concern of Central Banks is more controversial. While the Federal Reserve Board of the US gives its priority equal to employment maximisation and maintenance of moderate long-term interest rates, the ECB states clearly that "price stability is top priority" (ECB, 2006:20). Although it does also say that "the ECB should avoid generating excessive fluctuations in output and employment" (ECB, 2004:44), the ECB stresses that it will only do so "if it lies in line with the pursuit of its primary objective". (ibid) In this respect, the ECB seems to be very monetarist. Indeed, its publication *The Monetary Policy of the ECB* is full of expressions like "what monetary policy can and cannot do" (ibid:41), "monetary policy can only ultimately influence the price level in the economy" (ibid:43), or "inflation is ultimately a monetary phenomenon" (ibid:42). These phrases seem to be taken straight out of Milton Friedman's famous paper *The Role of Monetary Policy* (Friedman, 1968).

The BOE's focus is similar. Although the Bank of England Act states that "the objectives of the Bank of England shall be to maintain price stability, and subject to that, to support the economic policy of Her Majesty's Government, including its objectives for growth and employment" (Bank of England, 1998:25), the Bank maintains that while it can 'rough tune' the economy, 'fine-tuning' variables other than inflation, such as

employment and output is impossible (Tucker, 2006:8). Firstly, we do not know enough about the underlying structure and properties of the economy and secondly, macroeconomic data are far from perfect and are often revised – we will be as successful as a jeweller repairing a watch with a sledgehammer. Thus, in practice, "the overriding goal is to secure low and stable rates of inflation over the long run" (Lambert, 2006:5).

Choosing the Arsenal

Two principal instruments to maintain price stability can be used. The first is monetary targeting, advocated by the Monetarists, whereby the Central Bank targets the rate of growth of money supply. Their argument was that if the demand for money function is stable, then the velocity of money V is also stable. By the quantity equation M V = P Y, through controlling the money supply M, we can control the price level P. However, in practice, "monetary targeting can hardly be considered a success – targets were often missed" (Eiffinger and de Haan, 2004). In EU countries, for the period 1975-98, the average success rate (the percentage of cases when the target was not missed) was only 31%. The reason for such a low success rate was that the claim made by Friedman and Schwarz (1963) that the stability of the money demand is "another example of stability of basic monetary relations" is too strong. Some authors (Bofinger, 2001) go as far as saying that money demand is "notoriously unstable in the short run". Thus, monetary targeting was replaced in some countries by inflation targeting, i.e. targeting price level growth directly.

The two-pillar approach of the ECB combines these two instruments. The first pillar comprises a 'weak' form of monetary targeting; it uses M3 as an indicator of medium-term risks (Bofinger, 2001). The ECB avoids the use of the word 'target', so more precisely; it compares the money growth to a 'reference value' of 4.5% (Eiffinger and de Haan, 2004). There are two reasons for including monetary targeting into ECB's framework. First is the strong influence of monetarist Bundesbank. Second, some studies have shown that money demand is relatively stable in the euro-zone, especially compared with the national demand (Browne et al., 1997). However, since there is still a lot of uncertainty regarding the issue of money demand stability, a second pillar, which comprises assessment of the outlook of price developments, is also included (Eiffinger and de Haan, 2004). Some economists dislike the two-pillar approach on the basis that it is not clear what to do when the two pillars give contradictory signals (Boffinger, 2001). However, since the rate of growth of M3 has constantly been overshooting its reference value since 1999 (apart from a brief period in 2000-01), it is

questionable how seriously ECB takes the first pillar – one might ask why the ECB does not get rid of it completely.

Bank of England uses a much simpler framework. After monetary targeting (1979-86), shadowing of the Deutschmark (1986-90), and the ERM (1990-92) failed to deliver low inflation and output stability, with the ERM dubbed 'Eternal Recession Mechanism' due to recession in the early 1990s, it adopted inflation targeting in 1992. Since there is a lag of up to two years between the change in interest rates and its effect on prices, "inflation forecast targeting" is probably a better name (Tucker, 2006:3). Consequently, the role of expectations is very important, as the Bank needs to know what inflation will be in one or two years' time, given today's interest rates. Inspired by the new classical school, it uses a "forward-looking rational expectations" (ibid:6) model to estimate it. A big advantage of this approach is that it is resistant to structural changes in the economy, as it focuses on the ultimate policy goal. A policy regime based around an intermediate target, such as monetary targeting would need to be modified whenever the structure of the economy changes (Bean, 2002).

Credibility

It is now widely believed that in order for monetary policy to be successful, a central bank needs to be credible. If people believe that, say, the Bank is committed to bringing inflation down, they will adjust their inflation expectations accordingly, and lower their nominal wage increase demands, which makes it much easier for the Bank to succeed. There are several ways to improve a Bank's credibility, hence the shooting technique and shooting efficiency: history of low inflation, transparency and clear communication, and independence. Let me examine each of them in turn.

A History of Low Inflation
A Bank of England study (Lombardelli and Salaheen, 2003) found that young people (who do not remember the high inflation period of the 1970s) expect, on average, lower inflation than their parents. Due to a good inflation record in the last decade, inflation expectations implied from bonds hardly budged in the UK after the oil price increases in 2004 (Bean, 2002), since it was believed that the Bank would contain price level increases – which it did, also thanks to low inflation expectations. This contrasts starkly with a similar scenario during the OPEC crisis in the 1970s. Thus, by succeeding to keep inflation at bay, the Bank's credibility was boosted, which in turn helps to maintain the inflation record (Lomax, 2004). On the other hand, since the

ECB is a relatively young institution, it cannot take advantage of its historical record.

Transparency and Clear Communication

It is easier for markets to form interest rate expectations if they know how the Bank determines them. Similarly, it is easier to adjust their inflation expectations if the Bank explains at length why it has (or hasn't) changed the interest rate. This explains the focus on transparency and accountability in the institutional design of BOE. The 9-member Monetary Policy Committee (MPC), which since 1997 has determined the interest rate, is technocratic, rather than representative, as is the case in Australia, for example. This helps to foster the belief that the members of the MPC know best how to maintain the inflation target. The minutes of the MPC meetings are published and contain information on the votes of individual members, who are publicly accountable for their decisions. In 1997, the 1–4% interval inflation target was changed to a symmetric point target of 2.5 ± 1% so as to make communication more straightforward (Tucker, 2006); if inflation is above 2.5%, but within the band, the Bank will probably try to reduce it; if it is outside the band, the Bank will certainly take measures to bring it back inside.

The ECB, on the other hand, does not score as well. Although its president, J.C. Trichet maintains that "a central bank should not only do what it says, but also explain what it is doing" (ECB, 2006:3), the unclear target of 'below 2% inflation', and failure to explain constant monetary target overshooting are not exactly examples of effective communication. It is also unclear why it has included the first pillar in its policy framework, after having seen it fail in many countries, most notably the UK in the 1970s and 1980s.

Independence

Another important aspect of the Bank's credibility is its independence from political influences. A politician cannot abuse monetary policy by, say, slashing the interest rates to boost the economy before an election, and thus jeopardising the Bank's low inflation commitment. Here the ECB cannot improve much. Since the Maastricht Treaty does not define what is meant by price stability, the governing council of the ECB formulates its monetary policy, which gives the ECB full goal independence (Eiffinger and de Haan, 2004). The executive board, in turn, has full responsibility in its implementation. Since neither the EU parliament, nor any other body can influence the board's decisions, "the ECB must not seek or take instructions (from anybody)" (ECB, 2006:14), it also has full operational independence. This makes it the world's most independent central bank (Salvatore, 2002).

The Bank of England also gained operational independence in 1997, when the Chancellor ceased to have the power to influence the Bank's interest rate decisions. The Bank of England Act (1998) still retains a clause that, under special circumstances, the government has the power to give instruction on interest rates to the Bank for a limited period, although it is questionable how this power can be used in practice. However, BOE does not have goal independence – it is up to the Chancellor to define what is meant by price stability.

Summary

We have seen that, in broad terms, both the objectives and the instruments of the ECB and the BOE are similar; price stability is the primary objective, defined as HICP of about 2%, achieved primarily by inflation targeting. However, there are some technical differences. While the BOE has a symmetric point target, it is debatable what exactly the ECB means by less than 2% inflation. 1.9%? Or perhaps 1.7%? Secondly, it is also unclear why the ECB retains its first pillar when the targets are constantly overshot.

These communication problems become more acute, however, if we look at them from the credibility and communication perspective. It is certainly easier for businesses to form rational inflation expectations about the British rather than the eurozone economy. As the BOE's inflation record since 1997 shows, it is then much easier to control inflation if the public's inflation expectations mirror the Bank's.

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THE IMF'S TRANSITION FROM KEYNESIANSIM TO MONETARISM AND ITS CONSEQUENCES

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In this essay, Ross Reynolds examines the progression of the International Monetary Fund from its Keynesian beginnings to the Monetarist nature it employs today. He considers how effective the organisation has been in fulfilling its original aims and the resulting consequences for the world economy, in particular developing countries. He concludes that acting in a more advisory role, with less emphasis on US interests and international intervention, could lead to a more effective organisation.

Introduction

The world was a different place in the summer of 1944 when John Maynard Keynes and Henry Dexter White first met at Bretton Woods to discuss the beginnings of what is now known as the International Monetary Fund (IMF). The world was at war. The great depression had occurred only ten years previously. Economics had only recently been shaken by the publication of Keynes' classic *General Theory* in 1936. There was no talk of globalisation, or the environment and the world had not been engulfed in the storm that is information technology.

These men met to create an organisation that would help the world to grow. This organisation would be given key responsibilities; promoting international monetary cooperation, facilitating international trade, lending to those with short-term balance of payment difficulties, encouraging economic stability, promoting exchange rate stability and the establishment of a multilateral system of payments.

The main question this essay will seek to answer is - how successful has the IMF been in achieving these goals set out over sixty years ago? Has the Keynesian doctrine that heralded the beginning of its existence been changed? If this is the case, do new policies give the IMF a legitimate chance of reaching the goals it set out in its Articles of Agreement?

The Beginning to the Washington Consensus

Keynes arrived at Bretton Woods with a radical plan for an IMF equal to half the world's imports, a world central bank with its own reserve currency and the ability to create sufficient international reserves where needed (Power, 1995). Balance of payment deficits would be financed by taxes on surpluses in other nations meaning a reduction in debt problems. It would act as a countervailing balance to US economic power.

In fact Keynes' plans were diluted by White's own formula for the IMF and further still by US support for White, i.e. the IMF would promote trade in a way to preserve the central role of the US in international finance (Boughton, 1998:4). However crucially, the IMF was set up to deal with problems using Keynesian economic ideas. Keynes' central beliefs were that macroeconomic equilibrium is consistent with involuntary unemployment and that national income depends on the volume of employment. He hypothesised that markets alone are insufficient and the state should have a prominent role in guiding output and employment to their optimum levels. (Snowdon and Vane, 2005:58) Consequently, the government should be encouraged to use counter-cyclical fiscal policies, i.e. deficit spending in recession and limiting of inflation in boom times. All this was given a short-term focus, as Keynes famously believed that "in the long run we are all dead" (Keynes, 1971:65). Thus the institution was set up to pressure countries into striving for full employment and to provide liquidity to countries facing downturn. The IMF was an institution set up to deal with *market failure*.

So what of today, has the IMF changed its philosophy and policies? It would seem so. Many refer back to the early 1980s when Margaret Thatcher and Ronald Reagan took power in the UK and US and preached a free market mantra (Palast, 2002:149). The result for the IMF was the implementation of the now much-derided 'Washington Consensus'.

The encompassed ideas changed the nature of the IMF from an organisation attempting to correct market failure, to one preaching the values of free markets. Despite the Washington Consensus being based on an implausible model of a market economy that assumes perfect information, perfect competition and perfect risk markets (Stiglitz 2006:28), this set of guidelines was quite literally taken as fact by the IMF. The Washington Consensus consisted of a few main policies that countries who borrowed from the IMF had to implement as part of 'Structural Adjustment Programmes' (SAPs), or more recently 'Poverty Reduction Growth Facility' (PRGPs).

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Under the Washington Consensus countries are required to:
- Privatise state companies
- Liberalise capital markets
- Employ a market pricing system
- Deregulate trade
- Cut balance of payment deficits (Hanhel, 1999:52)

The IMF and Monetarism

These policies are clearly opposed to the fundamental values Keynes espoused in 1936. Keynes believed in concentrating on the short run; spending in order to stimulate an economy in recession and for the government to have a large role in aiding economy to reach full output and employment. New Keynesians also add real-world imperfections into the mix, for example imperfect information. (Snowdon and Vane, 2005:360) The policies engaged in by the IMF can arguably be traced more to Monetarism then to Keynesianism. Monetarism is built upon the notion that the market is stable in the absence of unexpected changes in the money supply, meaning no government intervention is required. Monetarists see the supply and demand for money as the primary means by which the economy is regulated and that economies should focus on *price stability* as the main objective. (Snowdon and Vane, 2005:173). The IMF seems to have subscribed to this view of price stability, as it pressures countries to raise interest rates in order to reduce inflation. (Stiglitz, 2002:96)

Monetarists argue that restraint of government spending is the most important target to restrict excessive monetary expansion, which invariably results in inflation. Here we can see a huge convergence with IMF policy that has made reducing government spending and cutting balance of payment deficits a cornerstone of its programmes. Cutting government spending has often resulted in increased poverty and suffering for the poorest people in developing countries. In the case of Malawi in 2002, the IMF forced the country to sell its surplus grain supplies for foreign exchange just before famine struck. Out of necessity, the government imported food from abroad. However this move out the country off-track in cutting its balance of payment deficit, and so the IMF suspended aid to the country. (Petifor, 2002)

This has led some economists to tar the IMF with same brush as monetarists, criticising "the disciples of Milton Friedman and of radical market reforms, who paid little attention to the social and distributional consequences of policy." (Stiglitz, 2002:167)

IMF Policy- Success or Failure?

> Many of the policies that the IMF pushed…have contributed to
> global instability. (Stiglitz, 2002:15)

Many academics are of the opinion that the IMF's new policies have done
more harm then good, particularly in the last 20 years as the IMF has made
lending to help solve balance of payment problems its main focus. So why is
this?

The IMF and Politics

An organisation such as the IMF, which was born to concentrate on global
monetary matters to benefit all, should not be used in any way as a political
tool; in fact, this is not the case. During the formation of the IMF in 1944,
the US received 17% of voting rights. As an 85% minimum was required for
major voting decisions, the US was effectively given a veto. US dominance
does not end there; there are many examples of blatant policymaking in US
interest:

1. In Russia in 1995 the IMF insisted on instant privatisation despite
   the certainty of such a move resulting in corruption and money
   being smuggled from the country. Added to this was a large loan
   just before elections were held. This did not act in the interests of
   the Russian people, yet it helped get the White House-approved
   Boris Yeltsin re-elected, by postponing the onset of huge amounts
   of inflation and the subsequent economic collapse. (Stiglitz,
   2002:242)
2. On many occasions the IMF has been accused of 'bailing out'
   Western banks when debtors appear unable to pay. For example in
   Argentina in 2001 a $20 billion bailout package was given to the
   country. However as Argentina owed $128 billion, between the
   interest owed and the 16% risk premium charged, the amount due
   was $27 billion. The money never left Washington and went
   directly to the Westernbanks. (Palast 2002:160)

With this in mind, how can the IMF profess to be trying to achieve the goal
of international monetary cooperation? If it does not function as a
multilateral institution but rather as one acting in the monetary interests of
the US, then this is simply an unreachable target.

Conditionality

This refers to the stipulations forced upon countries in order to qualify for an IMF loan, i.e. SAPs (or PRGPs as they were renamed) due to the Washington Consensus. The IMF has been criticised for blindly applying the same criteria to all countries and crises. There is overwhelming evidence to back up this claim (Mussa and Savastano, 1999).

It seems that "any country capable of meeting such stringent requirements is already a developed country themselves" (Naím, 2000:92). In other words a developing country does not have the monetary and banking structure or quality of institutions to succeed in implementation, meaning IMF reforms often perpetuate poverty and inequality (Welch, 2000). One wonders how Less Developed Countries (LCDs), many of which depend on agriculture and natural resources for income, benefit by allowing competition against highly subsidized US and EU food markets for example? The type of trade is crucial to LDCs. They need to end their dependency on the primary goods that some have relied on for the past thirty years. This critical point is not addressed by the IMF (Lockwood, 2005). In no way is this the 'balanced growth' set out as a target by the IMF; balanced growth is gradual and, as history shows, begins in the domestic market. When new competition from abroad and reduced government spending are taken into account, the likelihood of growth is limited.

The most successful developing countries, such as China, began by building their economies behind protectionist policies before slowly and cautiously opening their doors to the world. This is the exact opposite of what is preached by the IMF and echoes a return to Keynes' concept of intervention.

The Never-ending Cycle

The integral problem is that, despite IMF programs actually reducing growth rates (Dreher and Veubel, 2004), countries have no choice but to accede to IMF demands. Once indebted, it is impossible to raise funds anywhere else without accepting IMF conditions; the alternative is being frozen form the world economy. There is in fact a positive correlation between the number of conditions per program and the prior use of credit (ibid:26). These countries are stick in a vicious cycle; the longer they borrow from the IMF the less chance they have of overcoming debt problems, increasing the power of the IMF over these countries.

The only policy to negate this is to build up reserves to avoid the use of the IMF. This can be seen in East Asia where countries are wary after the policies that exacerbated the crisis in the late 1990s. Other countries such as Brazil and Argentina are fully repaying their loans ahead of time in order to be free of the IMF (Bello, 2006). This represents a crisis of legitimacy for

the IMF. Its returns from loan repayments and interest will be lower in years to come, meaning funding will have to be found elsewhere. Thus one of its main functions, lending to countries with balance of payment difficulties, will be worth less.

The Future of the IMF- Back to Keynes?

Ideology

So what now for the IMF? Is there still a positive role it can play or should it quite simply be abolished? The opinion that it would be "…unwise for the fund to disengage…unless there are fairly compelling reasons to believe that the fund's role could be better played by other agencies" (Bird, 2005:40) is the most sensible one. The IMF should narrow the scope of its operations to surveillance and lender of last resort activities (Caballero, 2003:32). It has placed itself on an ideological podium, pronouncing a monetarist free market perspective to be the one and only way forward. The way each decision should be made is to take into consideration that "a healthy, well-fed, literate population…is the most intelligent economic choice a country can make." (George, 1990:235)

Even countries in crisis with their own economically sound alternative plans, such as Ecuador and Bolivia in the 1990s, are not allowed to implement them (Stiglitz, 2006:146). Could it not be possible that those closest to the problem have the best solution for it? Offering governments greater discretion, while still monitoring performance and offering technical and procedural advice, would seem to be the way forward. Structural conditionality would be more fully self-designed (Bird, 2005:44). In simple terms, the IMF should move from being an organisation simply promoting one economic idea, that of the free market, and take into account alternative economic strategies. It should be a facilitator, not a director of operations.

SDRs – A Multilateral System?

One of Keynes' original ideas was for the IMF to have its own reserve currency, which he called 'Bancor'. This was proposed to be fiat money, meaning it would only exist in bookkeeping entries in funds' banks. His contemporaries originally scorned the idea. However, a limited version of this idea was implemented some decades after his death with the creation of Special Drawing Rights (SDRs). The problem is that SDRs today are worth only 3% of the world's liquidity and are limited to the world's wealthiest countries.

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There is an argument for the creation of a global reserve system to replace the two-currency reserve system we seem to be moving towards (Stiglitz, 2006:260). The IMF could provide this fiat money to act as reserves, which countries could exchange for currency in times of crisis. This system would alleviate the growing problem of a global system reliant on the increasing debt of the United States. One of the greatest contradictions in the world's financial system may also be rectified. The IMF is an organisation largely controlled by the US, yet the stringent IMF policy of limiting balance of payment deficits is not being followed by the US itself. Its trade deficit and overall balance of payment deficit shows no sign of abating. A global reserve system would go a long way to helping to solve this.

Conclusion

The IMF needs to take a few steps back and rediscover the role of being the "ballast that stabilized the global economy" (Power, 1995). Although Keynes believed in intervention, his was a belief in government intervention rather then by an international organisation more or less controlled by the US. The IMF should assist governments in running their economies, not force them into certain policies that lack proof of success. Keynes' ideas are being taken on board more so by developed countries if anything, despite the monetarist nature of the European Central Bank and the likes of Alan Greenspan. For example consider the actions of both Bill Clinton and George Bush; spending to try to stimulate the economy and campaigning on a platform of trying to reach full employment. Recall Clinton's motto of simply 'Jobs, Jobs, Jobs'. (Stiglitz, 2002)

The question over what would have transpired if the IMF had let countries in difficulty use Keynesian counter-cyclical expansionary policies to emerge from a recession rather then tightening the noose on spending, will remain. Would Argentina have crashed in 2001? Would the East Asian crisis in 1997 have been so severe? These are questions we can but guess the answer to. Our objective should be to look to the future and ensure the people of the world, particularly those less fortunate then us, are not restrained in any way by corporate or foreign interests. The world must avoid the mistakes of the past to ensure its future.

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WHY MIGHT SHARE PRICES FOLLOW A RANDOM WALK?

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Senior Sophister

The Efficient Markets Hypothesis no longer holds the impervious position in finance it once did, Consequently the assumption that share prices follow a random walk is now uncertain. Samuel Dupernex defines and discusses the random walk model, outlining its relationship to the efficiency of markets. Empirical evidence is used to investigate the arguments for and against the model.

Introduction

As recent as 30 years ago, the efficient market hypothesis (EMH) was considered a central proposition in finance. By the mid-1970s there was such strong theoretical and empirical evidence supporting the EMH that it seemed untouchable. However, recently there has been an emergence of counter arguments refuting the EMH.

The EMH is the underpinning of the theory that share prices could follow a random walk. Currently there is no real answer to whether stock prices follow a random walk, although there is increasing evidence they do not.

In this paper a random walk will be defined and some of the literature on the topic will be discussed, including how the random walk model is associated with the idea of market efficiency. Then the arguments for and against the random walk model will be presented. It will be shown that, in some cases, there is empirical evidence on the same issue that could be used to support or challenge the theory.

Random Walks and the Efficient Market Hypothesis

As mentioned above, the idea of stock prices following a random walk is connected to that of the EMH. The premise is that investors react instantaneously to any informational advantages they have thereby eliminating profit opportunities. Thus, prices always fully reflect the

information available and no profit can be made from information based trading (Lo and MacKinley, 1999). This leads to a random walk where the more efficient the market, the more random the sequence of price changes.

However, it should be noted that the EMH and random walks do not amount to the same thing. A random walk of stock prices does not imply that the stock market is efficient with rational investors.

A random walk is defined by the fact that price changes are independent of each other (Brealey et al, 2005). For a more technical definition, Cuthbertson and Nitzsche (2004) define a random walk with a drift (δ) as an individual stochastic series X_t that behaves as:

$$X_t = \partial + X_{t-1} + \varepsilon_{t+1} \qquad \varepsilon_{t+1} \sim iid(0, \sigma_\varepsilon^2)$$

The drift is a simple idea. It is merely a weighted average of the probabilities of each price the stock price could possibly move to in the next period. For example, if we had €100 and this moved either 3.0% up or 2.5% down with P=0.5 for each case, then the drift would be 0.25%, calculated by (Brealey et al, 2005):

0.5(0.03) + 0.5(-0.025) = 0.0025 = 0.25%

However, even though it is useful, the model is quite restrictive as it assumes that there is no probabilistic independence between consecutive price increments. Due to this, a more flexible model called the 'martingale' was devised. This improved on the random walk model as it can "be generated within a reasonably broad class of optimizing models" (LeRoy, 1989:1588).

A martingale is a stochastic variable X_t which has the property that given the information set Ω_t, there is no way an investor can use Ω_t to profit beyond the level which is consistent with the risk inherent in the security (Elton et al, 2002).

The martingale is superior to the random walk because stock prices are known to go through periods of high and low turbulence. This behaviour could be represented by a model "in which successive conditional variances of stock prices (but not their successive levels) are positively autocorrelated" (LeRoy, 1989:1590). This could be done with a martingale, but not with a random walk.[1]

Fama (1970) stated that there are three versions of efficient markets:

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[1] Samuelson (1965) proved this result.

1. *Weak-form*: Ω comprises of historical prices only, meaning that it is not possible to earn superior risk adjusted profits which are based on past prices (Shleifer, 2000). This leads to the random walk hypothesis.

2. *Semi-strong form*: Ω includes historical prices and all publicly available information as well.

3. *Strong form*: "Ω is broadened still further to include even insider information" (LeRoy, 1989:1592).

Each of these forms has been tested and some of the results of these studies will be discussed later in the paper. As the strong form is considered somewhat extreme, analysis focuses on the weak and semi-strong forms.

Arguments against the Random Walk Model

There has been myriad of empirical research done into whether there is predictability in stock prices. Below, a summary of the main theories will be presented.

Short-Run and Long-Run Serial Correlations and Mean Reversion
Lo and MacKinley (1999) suggest that stock price short-run serial correlations are not zero. They also propose that in the short-run stock prices can gain momentum due to investors 'jumping on the bandwagon' as they see several consecutive periods of same direction price movement with a particular stock. Shiller (2000) believes it was this effect that led to the irrational exuberance of the dot-com boom.

However, in the long-run this does not continue and in fact we see evidence of negative autocorrelation. This has been dubbed 'mean reversion' and although some studies (e.g. Fama and French (1988)) found evidence of it, its existence is controversial as evidence has not been found in all research.

Chaudhuri and Wu (2003) used a Zivot-Andrews sequential test model to increase test power, thus decreasing the likelihood that previous results were a result of data-mining and obtained better results. To date, this method has not been widely adopted.

Market Over- and Under-reaction
Fama (1998) argues that investors initially over or under-react to the information and the serial correlation explained above is due to them fully

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reacting to the information over time. The phenomenon has also been attributed to the 'bandwagon effect'.

Hirshleifer discusses 'conservatism' and argues that "under appropriate circumstances individuals do not change their beliefs as much as would a rational Bayesian in the face of new evidence" (Hirschleifer, 2001:1533). He asserts that this could lead to over-reaction or under-reaction.

Seasonal Trends

Here, evidence is found of statistically significant differences in stock returns during particular months or days of the week. The 'January effect' is the most researched, but Bouman and Jacobsen (2002) also find evidence of lower market returns in the months between May and October compared with the rest of the year.

One problem with finding patterns in stock market movements is that once found, they soon disappear. This seems to have been the case with the January effect, as traders quickly eliminated any profitable opportunities present because of the effect.

Size

Fama and French (1993) found evidence of correlation between the size of a firm and its return. It appears that smaller, perhaps more liquid firms, garner a greater return than larger firms. Figure 1 shows the results:

Figure 1. Average monthly returns for portfolios formed on the basis of size (1963-1990)
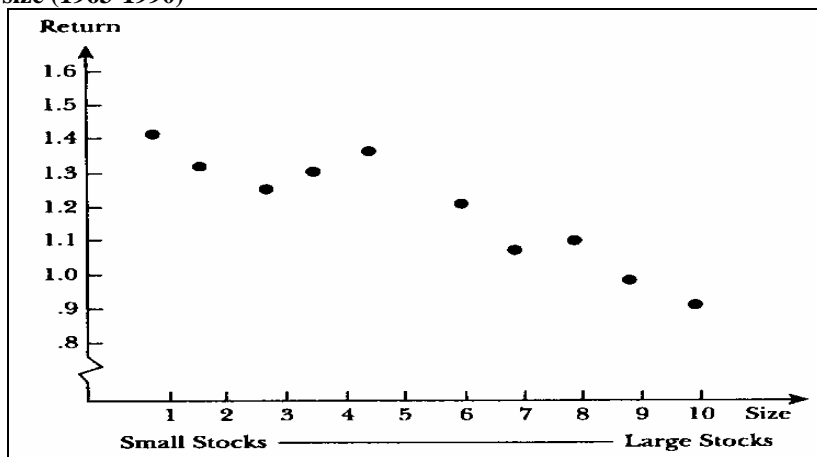
Source: Malkiel, 2003

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However, it should be noted that the results may not accurately reflect reality, as this size trend has not been seen from the mid 1980's onwards. In addition to this, the beta measure in the CAPM[2] may be incorrect, as Fama and French (1993) point out. The market line was in fact flatter than the beta of the CAPM would have you believe. An illustration of this can be seen in Figure 2 below, where the market line should follow a fit of points 1-10.

Figure 2. Average Premium Risk (1993-2002), %
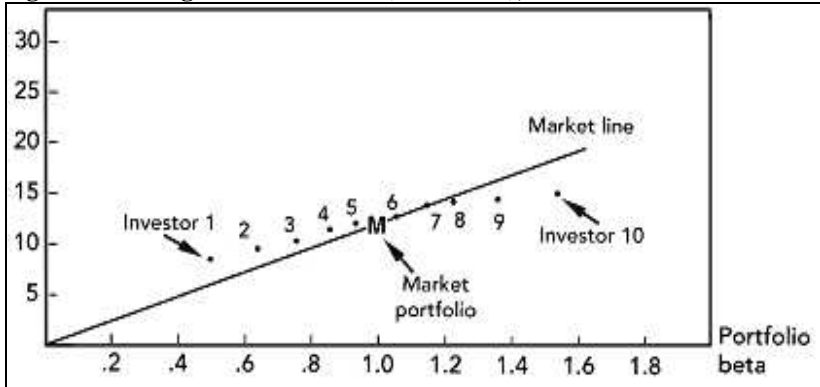
Dividend Yields
Some research has been done on the ability of initial dividend yields to forecast future returns. As can be seen from the Figure.3, generally a higher rate of return is seen when investors purchase a market basket of equities with a higher initial dividend yield. It should be noted that this trend does not work dependably with individual stocks.

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[2] Capital Asset Pricing Model

Figure 3. The Future 10-Year Rates of Return When Stocks are purchased at Alternative Initial Dividend Yields (D/P)
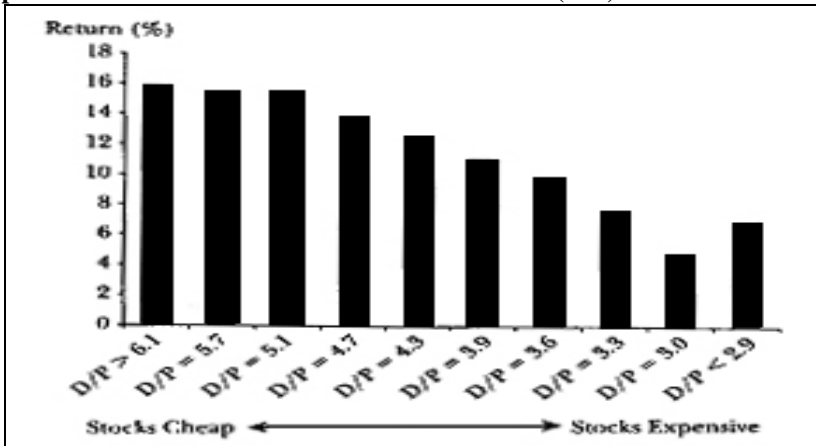
However, Malkiel (2003) notes that as dividend yields are intrinsically linked with interest rates, this pattern could be due more to the general economic condition rather than just dividend yields. Also, dividends are becoming replaced by things such as share repurchase schemes, so this indicator may no longer be useful.

Shiller looked at how dividend present value was related to stock prices. There seemed to be very little correlation. For example, during the bull market of the 1920s, the S&P Composite Index (in real terms) rose by 415.4%, while the dividend present value increased by only 16.4% (Shiller, 2000). The results are seen in Figure 4 below:

Figure 4. Stock Price and Dividend Present Value: 1871–2000.
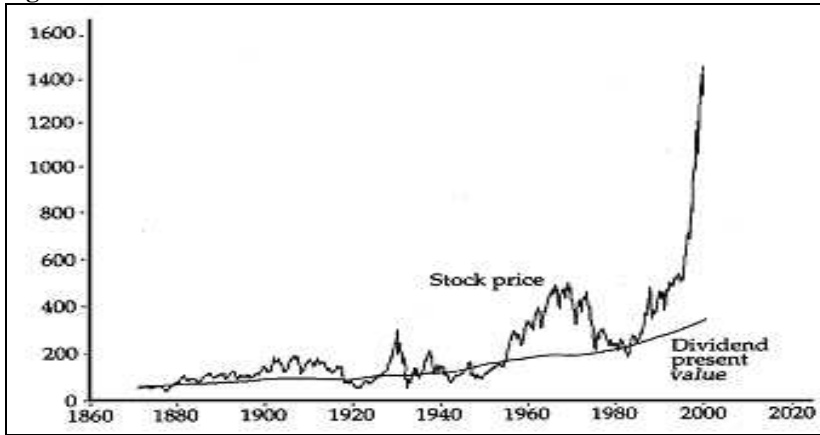
Value vs. Growth Firms

It has been noted by many[3] that in the long-term, value (low price to earnings (P/E) and price to book-value (P/BV) ratios) firms tend to generate larger returns than growth (high P/E and P/BV ratios) firms. In addition, Fama and French (1993) found there to be good explanatory power when the size and P/BV were used concurrently.

Fama and French (1995) then took this idea further and asserted that there are 3 main factors that affect a stock's return[4]:

1. The return on the market portfolio less the risk-free rate of interest.

2. The difference between the return on small and large firm stocks.

3. The difference between the return on stocks with high book-to-market ratios and stocks with low book-to-market ratios (Brealey and Myers, 2005)

These arguments are powerful and could lead people to doubt the EMH and random walks, assuming that the CAPM is correct. However, as Malkiel

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[3] Hirshleifer (2001), Malkiel (2003) and Fama and French (1993), among others

[4] This is part of the arbitrage pricing theory, which does not assume that markets are efficient. Instead it assumes that stocks returns are linearly related to a set of factors, and the sensitivity to each factor depends on the stock in question.

(2003) points out, it may be that the CAPM fails to take into account all the appropriate aspects of risk.

Arguments for the Random Walk Model

Shleifer (2000) identified three main arguments for EMH:

1. Investors are rational and hence value securities rationally.

2. Some investors are irrational but their trades are random and cancel each other out.

3. Some investors are irrational but rational arbitrageurs eliminate their influence on prices.

If all these exist, then both efficient markets and stock prices would be very unpredictable and thus would follow a random walk.

Brealy and Myers (2005) employed a statistical test to assess the EMH by looking for patterns in the return in successive weeks of several stock market indices.

Figure 5. Scatter diagrams showing the return in successive weeks on two stock market indices between May 1984 and May 2004
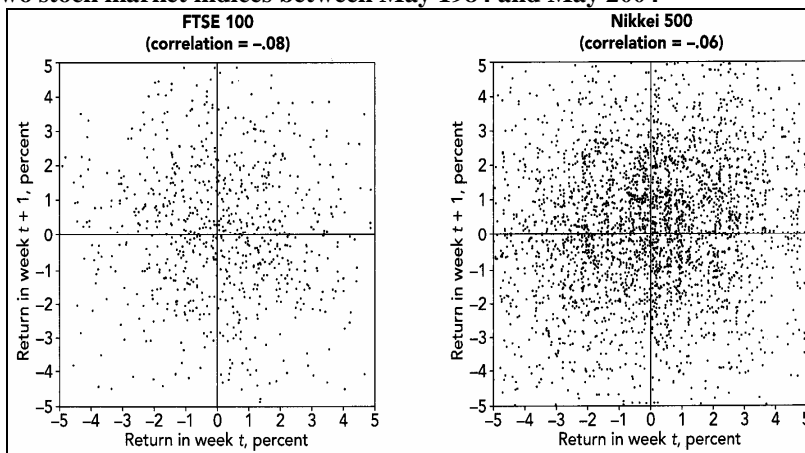
Source: Brealey, R. A., Myers, S. C. and Allen, F. (2006:338)

Some of the results appear in Figure 5 and show almost no correlation in the returns.

Event Studies

Event studies help test the semi-strong form of the EMH. One such study examined how the release of news regarding possible takeover attempts affected abnormal returns. The results, illustrated below in Figure 6, showed that:

- Share prices rose prior to announcement as information is leaked.
- Share prices jump on the day of announcement.
- Share prices steadied after the takeover, showing that news affects prices immediately.

Figure 6. Cumulative abnormal returns of shareholders of targets of takeover attempts around the announcement date
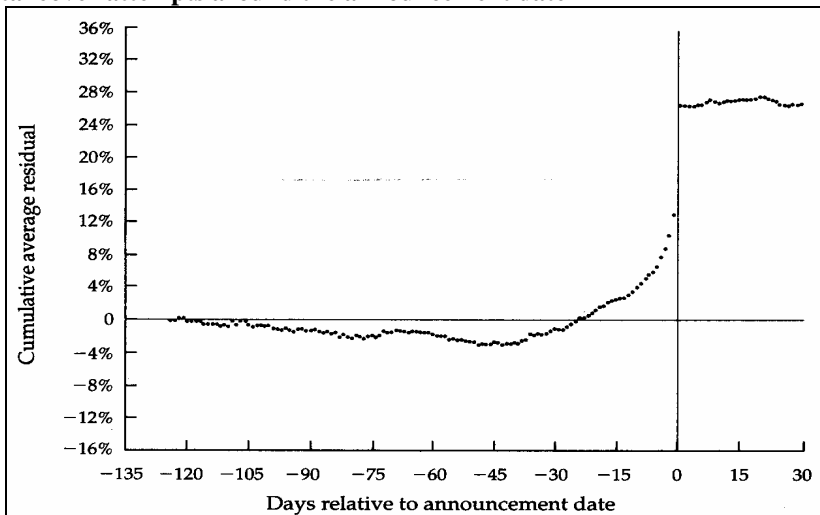
Source: Shleifer, A. (2000:8)

In another study, Scholes (1972) observed how prices reacted to non-information by seeing how share prices reacted to large share sales by large

investors. This study is important as it directly deals with the issue of the availability of close substitutes for individual securities[5].

Scholes finds they lead to small price changes and that this could be due to negative news regarding the share sale. Thus, the results support the random walk theory.

Predictability of Technical Trading Strategies

Fama (1965) found evidence that there was no long-term profitability to be found in technical trading strategies. Malikiel (2003) supports this view and provides us with evidence, such as Figure 7, that more often than not traders find it difficult to perform better than the benchmark indices. When they do, their success is often not repeated in the long-run.

Figure 7. Percentage of Various Actively Managed Funds Outperformed by Benchmark Index 10 Years to 12/31/01
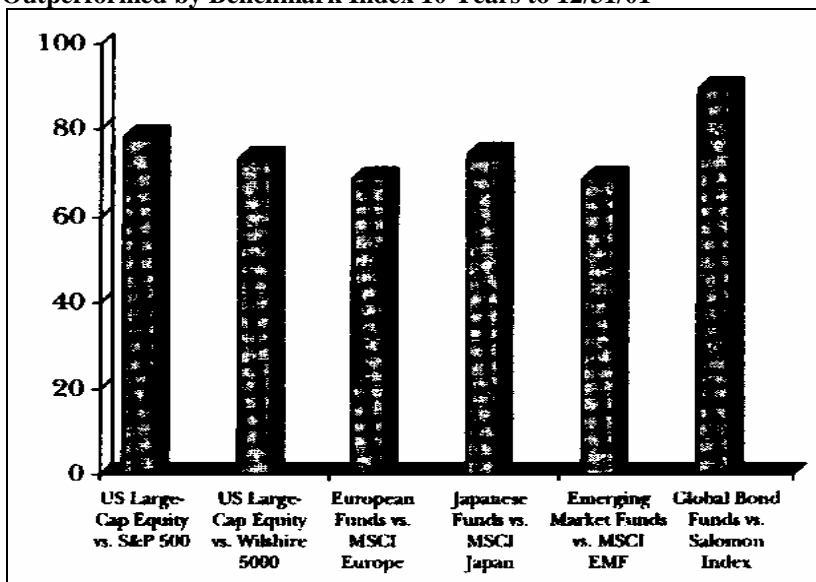
Source: Malkiel, B. G. (2003:79)

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[5] This is central to the arguments of arbitrage in the EMH, as the theory states that 'a security's price is determined by its value relative to that of its close substitutes and not on market supply' (Shleifer, 2000)

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On the other hand, why are there investors with sophisticated tools if their efforts are futile? This does seem to be the problem, as clearly rational investors would not invest if they could not 'beat the market'. Indeed there is evidence to support this point of view. Lo, Mamaysky and Wang (2000) found that "through the use of sophisticated nonparametric statistical techniques… [analysts] may have some modest predictive power" (Malkiel, 2003:61)

Mis-pricing

There are many theories that assume mis-pricing. Mis-pricing does not affect our belief in the EMH or random walks so long as the profitable opportunities are small or they are the result of public information being misunderstood or misused by everyone.

Conclusion

As many of the results have contradictory evidence, it is very difficult to come to a conclusion. Data mining is certainly a problem, as one can manipulate data to support their findings. Also, many of the results could be due to chance.

It has also been suggested by Conrad that the evidence on cross-sectional predictability could be due to "missing risk factors in a multifactor model … [and conclude that the] pricing errors are persuasive evidence against linear multifactor model and therefore for other types of models, or they are evidence of data-snooping biases, significant market frictions, or market inefficiencies" (Conrad, 2000:516).

However, evidence suggests that markets are to a certain extent predictable. This does not mean that there are opportunities for arbitrage though, because these would soon be exploited and then vanish. In the real world (with taxes, transaction costs etc.) you can have some predictability without there being profitable opportunities.

It seems that stocks do approximately follow a random walk, but there are other factors, such as those discussed by Fama and French (1995), which appear to affect stock prices as well.

Studies on random walks and the EMH are important, as they can give us some information on the relative efficiency of markets. The EMH can be used as a benchmark for measuring the efficiency of markets, and

from this we have at least a rough idea as to whether the stocks are likely to follow a random walk.

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A NEW ROLE FOR MONEY IN MONETARY POLICY? FINANCIAL IMBALANCES AND THE ECB'S TWO-PILLAR APPROACH

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Senior Sophister

The influence of money on monetary policy has waned in recent years. Andrew Maguire explores the potential revival of its status. Through his analysis of the BIS hypothesis and the resulting connotations, he investigates the future challenges for monetary policy. He suggests that the two-pillar approach employed by the ECB may be the ideal model required to remedy the failings of the BIS hypothesis.

Introduction

Inflation is always and everywhere a monetary phenomenon - Friedman's (1963) famous one-liner has exerted varying degrees of influence throughout the years. It is now broadly accepted that it holds only over the long run in accordance with the neutrality of money principle[1], as such money has since declined in its standing within monetary policy. This was clearly illustrated last year by the Federal Reserve Board when it stopped publishing figures for M3 growth, seeing it as a pointless task.

However, there is an increasingly coherent and respectable body of work that seeks to question the wisdom of this rejection of money. This is not just based on an innate unease of relying on moneyless models. It stems from concerns grounded in the possibility that the economy may once again be facing changing and evolving conditions which have the potential to test the limits of the prevailing conventional theory. The most consistent and articulate description of this 'new environment' hypothesis is presented by work emanating from the Bank of International Settlements (BIS). (Borio, 2006)

The BIS has been arguing that due to the interaction of a number of forces acting on the global economy, conventional Consumer Price Index (CPI) measurements are increasingly incapable of indicating pressures

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[1] Whereby changes in the money stock only affect nominal variables such as prices, wages and exchange rates, while leaving real variables, such as output and unemployment, unchanged.

stemming from imbalances and overheating or, at least, imbalances are instead first seen in the financial and asset markets while undetected by the CPI. This can have important consequences both for monetary policy and wider macroeconomic stability.

I will look at this hypothesis and consider its implications for monetary policy, in particular looking at the two most widely supported responses of monetary policy to the new challenges faced. These challenges are dealing with, or avoiding, the problems that stem from the build up and sudden reversal of imbalances such as equity, credit, and house price booms or 'bubbles'. Of the possible responses I see 'leaning against the wind' by central banks as potentially the most successful. I will then briefly turn to the European Central Bank's (ECB) two-pillar monetary policy and discuss how this might actually be a ready made solution to the problems identified by the BIS. This may be so in that the ECB approach leaves open the possibility of pre-emptive corrective action based on warning signals that can be found in the monetary analysis pillar of the ECB approach. Furthermore, it does so with relatively little risk. In this context the two-pillar approach, despite recent criticisms, may not be obsolete just yet.

BIS Hypothesis

The hypothesis presented by the BIS is essentially:

> …that changes in the financial, monetary and real economy regimes worldwide may have been subtly altering the dynamics of the economy and hence the challenges that monetary and prudential authorities face. (Borio, 2006:3)

This view rests on the effects of three main forces: financial liberalisation, the establishment of credible anti-inflation monetary policies and 'real-side' globalisation. It is not doubted that these forces are beneficial, however when taken together they may be affecting the global economy by challenging existing relationships and mechanisms. In this context, runaway inflation may no longer be the key structural risk for central banks to worry about, "rather it may be the damage caused by the unwinding of financial imbalances that can build up over the longer expansion phases of the economy" (Borio, 2006:2)[2]. Such imbalances have not been uncommon;

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[2] Of course what central banks really care about are specific objectives as defined in their mandate, although of relevance in this debate, I will leave aside discussion of how specific

stock and asset price booms, exchange rate crises, declining risk premiums, speculative capital flows, current account imbalances, excessive credit and liquidity growth and financial market instability are all well recognised conundrums of the modern 'new economy'[3]. In particular, such imbalances can build up undetected by conventional measures and in a climate where they are given too little attention by policymakers.

Financial liberalisation and innovation, particularly since the 1980's, has undoubtedly improved the allocation of resources and increased the efficiency of the market mechanism. Nonetheless, it has also greatly increased access to credit, transforming the economy from being income-led to driven by asset-backed wealth. Such an economy is inherently more susceptible to booms and busts, in fact such cycles can become somewhat self-reinforcing.

The subduing of inflation has followed a long drawn out battle to institutionalise price stabilising mechanisms in the form of independent central banks and the 'inflation targeting' approach. This has undoubtedly been a great success. However, financial imbalances can still build up in a low inflation environment as the experience of Japan has shown[4]. Moreover, there is the possibility that victory over inflation has led to a sort of 'victors curse' whereby inflation expectations are now so deeply anchored that prices and wages are 'sticky' to the extent of delaying inflationary pressures. Not only this, with no apparent need to tighten monetary policy central banks may unwittingly be accommodating a cumulative build up of imbalances via continually low interest rates. This has been termed the 'paradox of credibility' by Borio (2006).

'Real-side' or deeper integration of world product and labour markets have also played a role in lowering inflationary pressures. It is intuitive if globalisation is thought of as a series of positive supply-side shocks. Increasing competition in all markets has reduced the pricing power of firms while increasing competition in the labour markets has helped keep wage pressures and labour costs somewhat subdued[5]. Furthermore, the increasing pace of technological change and resulting productivity growth,

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objectives of central banks might condition or direct their thinking on the place of financial imbalances and monetary aggregates in monetary policy.

[3] The term 'new economy' has come to mean the relatively inflation proof, fast growing economy that some think has emerged as a direct consequence of globalisation, technological progress and other dynamic forces that began to take effect in the latter years of the 20th century.

[4] Japan suffered a bubble and subsequent collapse in both equity and real estate prices in the late 1980s during a period when CPI was relatively subdued.

[5] This competition stemming in large part from the increased incorporation into the global economy of previously closed off economics such as the former Soviet Bloc, China, India and other developing nations.

partly necessitated by the stronger competition brought on by globalisation, has also tended to mask inflationary pressures. So too has the impact of global supply chains in business. Indeed the positive supply-side shocks of increasing globalisation may reinforce central bank credibility via the lower inflationary pressures.

The net result has been an increase in what the BIS calls the 'elasticity' of the economic system - its ability to absorb and accumulate imbalances up to a point where this expansion snaps and gives way to crisis. This increase in 'elasticity' only means that when the snap does come the results could be more painful. The BIS presents five pieces of evidence that seem to support their hypothesis:

- ***The pattern of financial booms and busts since financial liberalisation*** is illustrated through the use of an aggregate asset price index which can be shown as correlated to credit developments as presented in Figure 1 of the appendix.

- ***The predictive content of financial imbalances*** is highlighted by use of ex-ante real time statistics to try and predict or indicate imbalances. The results are based on simple measurements of credit, asset price and foreign exchange rate divergences from trend values. The conclusion is that "a credit gap of around 4 percentage points and an asset price gap of 40 percent provide the best combined threshold values" (Borio and Lowe, 2002:15). These indicators are powerful enough to predict, over a three year horizon before the crisis, 55% of the crises while providing false signals only 6% of the time.

- ***The coexistence of financial imbalances and low inflation:*** Again Japan in the late 80s and early 90s is a key illustration. Even where crisis has not occurred, financial imbalances have still been observed alongside low inflation. For example China has even witnessed falling CPI while asset prices have soared, not to mention the recent stock market volatility there that has sent shockwaves throughout the world. Indeed soaring asset prices, particularly house prices, have not been uncommon across much of the industrialized world while inflation has remained subdued.

- ***The implications of globalisation for inflation:*** These point to evidence that increasingly domestic measures of inflation alone may not be enough. A scatter plot shows "that over a large set of

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industrial countries there is an economically and statistically significant impact of global slack measures on inflation" (Borio, 2006:12). The conclusion is that with increased integration of product and labour markets global slack may be supplanting domestic slack as a key indicator of inflationary pressures.

- *The signs of policy accommodation:* Here econometric analysis is carried out to show how policy may have been accommodative. It is suggested that policy has responded asymmetrically to imbalances as they unwind and not as they build up, thus contributing to excessive cumulative expansion in times of growth. They also suggest that rates have continually been at lower ends of 'reasonable' Taylor rule ranges, possibly out of a fear of deflation (even if it is of the 'good' supply-side kind).

Implications

The implications of the hypothesis, although not yet as well understood as the hypothesis itself, are nevertheless profound for both monetary policy and prudential (financial market) regulations. For the purpose of this paper, I will confine myself to looking at how monetary policy might better cope in this new environment and in particular assess two responses that have gained most support.

Conventional View - Do Nothing

The 'conventional view' holds that no extra action in monetary policy should be taken in response to financial imbalances and that monetary policy should only respond to imbalances or asset prices in so far as they affect future CPI through the regular transmission mechanism of the wealth effect[6]. Furthermore imbalances should be left to correct themselves, as the central bank is not the arbiter of the correct level of asset prices. It cannot assume to have more information or better-processed information than the market, which is what interference would imply.

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[6] Whereby changes in asset valuations will affect peoples real, or perceived, 'wealth'. As a consequence a positive wealth effect will induce increased consumption and hence may place upward pressure on CPI.

The moderate version of this view[7] accepts imbalances do arise but rejects that there is anything monetary policy can or should do about them. Perhaps the most visible proponent of this view is the US Federal Reserve, current governor Ben Bernanke feels regulatory powers should be used if imbalances arise and monetary policy only used to provide liquidity in the event of crisis (Bernanke, 2002). After all, asset price booms and busts are usually due to deeper structural problems and as such it is foolish to use monetary policy to try and resolve these problems. Moreover, responding to asset price rises that are out of line with fundamentals (the difficult calculation of which further supports the conventional view) in a climate of low inflation implies a monetary policy that is too tight in the sense that inflation targets may be undershot and disinflation, possibly even deflation may result. There is also huge informational requirements and uncertainty surrounding how monetary policy will be responded to. Posen (2006) points to the ineffectiveness that small interest rate increases would have on investors banking on returns of over 10% and higher as a bubble would imply. Not only this but central banks are no longer the only source of liquidity in town and as such their ability to even constrain bubbles is questionable.

This approach, as practiced by the Fed, has come to mean asymmetric responses to imbalances as the problems that arise when a bubble does eventually burst are seen as too great to avoid. Yet when such imbalances are building up, policy does not respond. Following the stock market crash of 2000, Federal Reserve chairman Alan Greenspan quickly intervened with excessive liquidity in order to 'mop-up' the problems brought about by the collapse[8]. Although successful in terms of avoiding complete financial sector collapse and deep economic recession, asymmetric responses can lead to excessive risk taking in the financial markets as participants feel they are 'hedged' on the downside by implicit guarantees of the central bank. Such distortions are part of the problem that leads to the creation of boom/bust cycles in the first place.

Often when proponents of this view talk of informational requirements, they talk in terms of exactly identifying 'bubbles' - undoubtedly a difficult task. However this sort of language is confusing and unhelpful. One need only look for signs of growing imbalances that may

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[7] There is an extreme version which corresponds to the Efficient Market Hypothesis (EMH) whereby through processes of arbitrage, imbalances cannot form, irrational behaviour does not pay and is aggregated out, thus there is by definition nothing for the central bank to respond to. Due to space limitations I will not discuss this somewhat unrealistic view, suffice to say it has been largely discredited.

[8] This ensured credit channels did not freeze up, confidence did not plummet and the wider financial sector was able to continue functioning relatively smoothly.

pose significant threats to future macroeconomic stability. As the work at the BIS has shown, such signs might not be as difficult to identify as some would have you think. Also the argument that sledgehammer-like interest rate rises would be needed to have any significant effect is not necessarily true. If made at an early stage, small changes could be useful in signalling to the market the likely future evolution of rates if the imbalances persist. Indeed in an environment of improved central bank credibility, it is the effect of current central bank decisions on expectations of future actions that are most powerful.

Lean against the Wind

The most popular view that is emerging in response to the moderate conventional view is that at times, it may be optimal for monetary authorities to take out a little 'insurance' against the dangers of a disruptive unwinding of imbalances. The premium on this insurance policy is a little less inflation today than would otherwise be desired. In this regard the central bank acts to 'lean against the wind' of inflating imbalances by raising interest rates a bit more than under the conventional strategy. This has the effect of signalling to the markets that the bank recognises the increasing imbalances and is willing to act against them.

As hinted at above, it may be that the current environment of increased central bank credibility is conveniently more suited to this approach. Increased credibility may cause more market participants to question the market trend and possibly even take contrary positions, thereby reducing herd behaviour and slowing, if not stopping, the growth of the bubble. Not only that, with interest rate smoothing now seen as the way central banks do business, such small but committed moves to lean against the wind will be interpreted as signalling further future moves. A slight interest rate rise today might not in itself have much effect on investors expecting large returns at the end of a given period. However the prospect of continuing interest rate rises will surely erode the investors' confidence that the desired returns can actually be realised over that period. This effect could be felt either by increasing the opportunity cost, in terms of a riskless return, of a position in the bubble and/or by increasing the probability that *others* will decide to get out of the bubble and bring on a collapse before the said period is up.

It is important to note that this is by far the least risky strategy in that the corrections can be made with the least threat to real economic activity and even if they are proven to fail, little is lost either in terms of current output or the central banks credibility to maintain price stability. Although the conventional 'mopping up' strategy safeguards current growth at the expense of risking a future bust, the excessive easing during the bust

period may simply replace one bubble with another. It has been suggested that Alan Greenspan's excessive liquidity after the stock market crash might have contributed to inflating the housing market (The Economist, 2004). This is an illustration of the moral hazard problems that can arise from the asymmetric response following the conventional approach. With 'leaning against the wind' this asymmetry is reduced and the central bank can respond to both rising and falling asset prices in a way that would surely temper participants' behaviour.

ECB's Two-Pillar Monetary Strategy

The ECB's monetary strategy rests on a two-pillar approach. The economic analysis pillar looks at a broad range of economic indicators and their implications for near term inflationary pressure. This analysis is then cross-checked with the monetary analysis pillar which is seen as providing important signals of medium to long-term inflationary pressures.

The initial decision to assign a role to the monetary analysis, especially at a time when inflation targeting was on the rise and proving effective, can be seen either as an attempt by the ECB to hedge its bets by having both inflation targeting and elements of monetarism in its policy, or as a way of transferring credibility from the Bundesbank by ensuring that a link with the past was maintained. As such, the ECB's two-pillar monetary policy strategy is unique in the world of central banking, stemming as it does from the unique situation in which the ECB was formed[9].

Lately the 'prominent role' assigned to monetary analysis has come under increasing criticism. This is not surprising since monetarism has been considered dead for some time now and the informational benefits of monetary analysis considered dubious since the changes the world economy has faced. The result has been unease in the markets surrounding the supposed ambiguous nature of the ECB's analytical framework. This has been compounded by the fact that the monetary pillar has seemingly played a trivial role in the actual decisions made[10], even though M3 growth has consistently surpassed its 'reference value' of 4.5% set by the ECB (see Figure 2 in appendix).

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[9] Although recently the Bank of Japan announced a 'second perspective' component to its monetary strategy broadly similar to the ECB's monetary pillar - perhaps this can be taken as further support for the argument made in this paper.

[10] Indeed it has been shown using analysis of statements from the ECB that "over time the relative amount of words devoted to the monetary analysis has decreased" and that "developments in the monetary sector…only played a minor role most of the time" (Berger et al., 2006:1)

My view, and one that is evolving within the ECB itself (Trichet, 2005), is that the two-pillar strategy is consistent with the ability to lean against the wind when imbalances are shown to exist via monetary analysis. In this context, broad analysis of credit and liquidity dynamics, portfolio shifts and other monetary aggregates can provide a sufficient and timely warning to the central bank that imbalances may be increasing and allow a coherent and relatively well defined motivation to lean against the wind if needs be. Hence, if one accepts the BIS hypothesis and considers leaning against the wind an appropriate option, then the ECB's approach may be the best readily available framework.

Conclusions

One wider question that can be said to underpin much of this debate concerns the objectives of monetary policy - is price stability all that matters? Benjamin M. Friedman considers what is at issue as "a form of disguised reaction against the increasingly narrow interpretation of what monetary policy is all about…. including in particular the increasingly widespread adoption of inflation targeting" (Friedman, 2005:296). In addition, an unwavering fear (perhaps warranted) of central bankers of being misinterpreted has so far had debilitating effects on the debate. Have we become too attached to the narrow notion of inflation targeting as the ultimate end of monetary policy? Perhaps, as is often the case, it may take a crisis for its dominant position to be properly questioned. However, this paper does not go that far and does not even seek to question inflation targeting, rather the intention behind this paper is whether and how this policy may be supplemented and improved upon, given the possibility that some of the fundamental relationships monetary policy has come to be based on may again be changing. This possibility should not be such a surprise as history has shown how theories and policies based on stable relationships evolve, degenerate and are replaced by progressive approaches that can better explain new observations.

Although the BIS hypothesis appears very powerful, its implications remain unclear and little understood. Nowhere is this more so than in terms of monetary policy, the conventional response is rejected based on the view that there is no such thing as doing nothing. In this regard it is suggested that the ECB's two-pillar approach could be the most suited and pragmatic way currently available to incorporate this possibility without too much disturbance. As such this might be a new justification for the continuing importance of money and monetary aggregates in monetary policy. Further research and experience is no doubt needed before any of the

views expressed above can be generally accepted or not, however at the very least they should serve to raise worthy and helpful questions surrounding the wisdom of any final dismissal of money and monetary aggregates from monetary policy just yet.

Appendix

Figure 1. Large medium-term swings in asset prices and credit
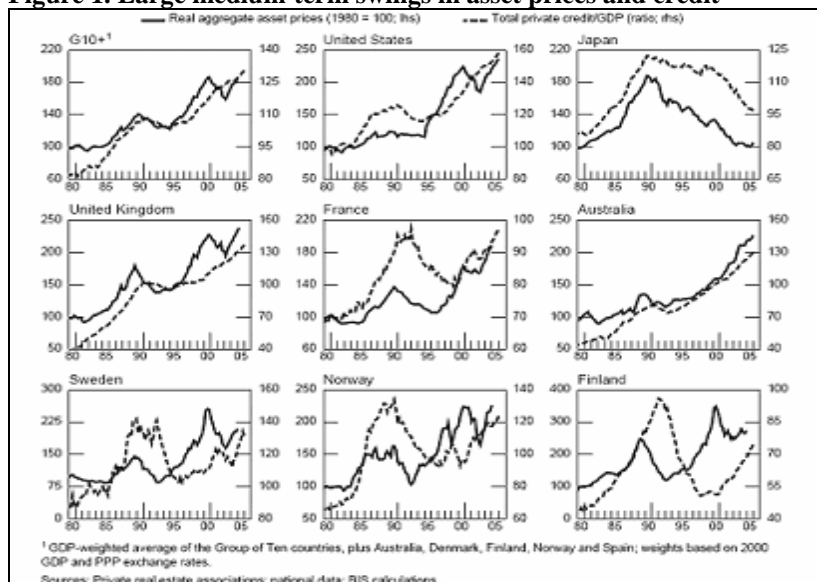
Source: Borio, C.E.V. 2006

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Figure 2. Monetary aggregate M3
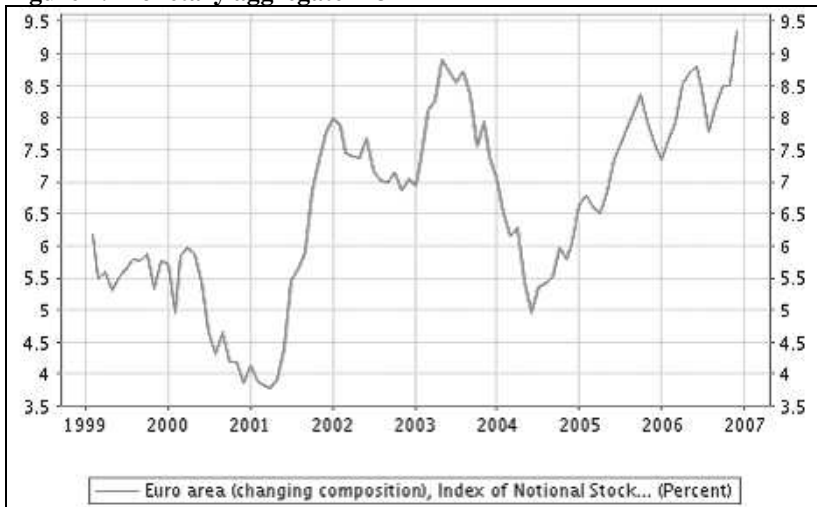
Source: ECB Statistical Data Warehouse http://sdw.ecb.int/home.do?chart=t1.2

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THE FUTURE OF BIOFUELS: POLICY IMPLICATIONS FOR EUROPE

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Are biofuels the solution to Europe's energy crisis? Supply concerns and renewability make them an attractive alternative to oil and natural gas. However, following a discussion of energy policy, Hugh Hennessy concludes that it may be difficult to efficiently produce these goods in European countries. Problems and environmental issues are discussed, as is the role of government policy. To conclude, it is noted that although there is undoubtedly a future for biofuels, it may not be an Irish one.

Introduction

Security of supply has become the dominant word in relation to energy policy. Issues like the Iraq War and Europe's over-reliance on a tenuous relationship with Russia have brought this issue to the fore. Promotion of biofuels is seen as a way of reducing security of supply concerns while simultaneously being of benefit to the environment (European Commission, 2007). Biofuels generally depend on agricultural production. How then, will policy overcome the switching costs associated with producing biofuels? The answer to this question is not straight forward, quite possibly involving the return to a CAP-like production distortionary scheme.

Biofuels have a medium- to long-term future in agricultural production. The level of economic rationale applied by regulators will determine the source of new fuel. This type of rationale provides the fundamental argument put forward throughout the essay. Initially, a brief outline will be given of the economics that drive energy policy. Next, we will turn attention to issues relating to ethanol, including its current economic viability. There will be an exploration of longer-term issues, including the discovery of cellulosic ethanol and subsequently a discussion of the problems and environmental considerations associated with biofuel production. In addition, oil (biofuel's major substitute good) will be considered, with special reference to how its price plays a major role in the economic viability of biofuels. Finally I revert back to the policy decisions

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facing Irish and European agriculture and what the long-term prognosis of these decisions might be.

Biofuel Production

Demand for energy is a derived demand, and thus as economic growth increases, so too does the demand for energy. Energy is an economic necessity, much like food, rendering demand unavoidable. It is generally accepted that there is a positive relationship between energy security and the promotion of renewable sources of energy. Fuel supply diversity is also crucial for establishing greater levels of energy security. This is part of the economic rationale for the promotion of biofuels, another form of renewable energy. An increase in the production of biofuels would reduce the dependence on foreign oil for transportation-energy needs (IEA, 2004)[1]. This would somewhat alleviate Europe's security of supply concerns and give a greater bargaining position with countries rich in natural resource, like Russia.

The fundamental facet of the cost of producing ethanol is its dependence on feedstock prices. This explains some reasons why ethanol production is cheaper in Brazil than in America and the EU. Feedstock prices are cheaper in Brazil, where lower labour costs and higher levels of average sunshine lead to larger yields. At present Brazil is able to produce 30% of its energy needs through biofuels (IEA, 2004). The price of ethanol is quite similar to the price of gasoline in Brazil and may actually become cheaper as efficiency gains from large-scale production are achieved. However, this does not seem to be the case in America or Europe where increased ethanol production will only serve to keep feedstock prices high.

Optional European directives have been placed upon member states with little regard for attainability or efficiency. In Europe and Ireland there is a legislative target to achieve a 5.75% share of energy consumption through biofuels by 2010 (European Commission, 2007). At the moment this is suspended around the 1% mark, effectively meaning the only way to achieve the objectives will be through high levels of biofuel importation. At present, there is still limited global trade in biofuels with many restrictions being placed on the trading of Brazilian ethanol.

What does this mean for the future of biofuels? The law of comparative advantage[2] would state that the production of biofuels should

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[1] Intrenational Energy Agency.
[2] This exists when a country produces a good or service at a lower opportunity cost than its trading partners.

remain pre-dominantly in Brazil [3] and other such developing countries. However, this may not be the case as 'security of supply' concerns may advocate American and European production; under-developed countries may be seen as politically unstable which would lead to supply concerns. This is the political rationale for the introduction of subsidy-driven biofuel production.

However, ethanol is not the only biofuel in production. Biodiesel, derived from rapeseed and vegetable oil, is currently more competitive in the EU than in the US (IEA, 2004). It also compares more favourably with the price of diesel than ethanol with the price of gasoline. Germany, with its large market share, is the leading producer of biodiesel.

Cellusoic Ethanol: A new hope?

Cellulosic ethanol is derived from cellulose, a major component of plants and can also be found in wood and straw. Global research is currently led by the United States, where large amounts of funding have been granted to continued technological research in this field. The reason behind this level of funding are the potential advantages that cellulosic ethanol has to offer. Rational analysis of ethanol production should quickly realise the displacement factor involved. What will be replaced to accommodate the land required for ethanol production? Land has the economic property of being fixed in supply, which raises issues over food supply. In theory, the production of cellulose does not compete with the production of food. In reality, the production of crops, which are rich in cellulose, can be undertaken on the poorest agricultural land thus lessening the impact of the substitution of food production (European Commission, 2006). Projections over the long-term economic viability of cellulosic ethanol are very encouraging. It is not dependent on feedstock prices, which should in the long-term give a cost advantage over conventional ethanol. The IEA projects that cellulosic ethanol could overtake ethanol in terms of cost effectiveness by the year 2012. This, along with most other biofuel estimates, seems rather optimistic, considering the technology has not yet being finalised. The EU has recently projected a more pessimistic outlook, where it forecasts large-scale lignocellulosic ethanol production to be viable around 2020 (ibid).

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[3] Brazil is also one of the most efficient sugar cane producers and transforming sugar cane into ethanol may bring down the costs of biofuels further.

Problems with Biofuels

Transportation accounts for 40% of total energy consumption. Conventional ethanol production is at a technologically advanced stage. As a result there are limited ways of achieving cost advantages. Economies of scale will reduce costs but not to the level where it is comparable to oil, at least not in Europe and America (IEA 2004). In order to produce the desired levels of biofuels a staggering amount of agricultural land will be required. In Ireland, it is estimated that to achieve a 2% substitution of biofuels for oil, 75,000ha of tillage land (20% of total tilled area) would be required. To achieve the target of 5.75% by 2010 would completely change Ireland's agricultural landscape. This highlights a major obstacle when considering reaching biofuel targets. A similar problem is apparent with biodiesel although the relationship here is more favourable due to the yields associated with rapeseed oil.

Cellulosic ethanol is not without its problems. The technology is still at an infant stage and the reliability of the cost estimates being put forward is questionable. Huge levels of government funding are being put into the further development of this technology, especially in America. This in itself creates a problem, as scientists exude rent-seeking behaviour in order to maximise the size of their research budget. This brings into question the validity of results put forward by various scientists about the medium-term viability of cellusoic ethanol (European Commission, 2006). However, the technological question still dominates the future of this type of biofuel production.

Environmental Issues

Evidence of climate change has given the environmental movement some impetus on the issue of controlling carbon emissions. These emissions are generally regarded as the direct cause of global warming[4] and fossil fuels contribute greatly to the levels of these pollutants. Conventional ethanol is estimated to reduce carbon emissions by between 20% and 50% (IEA, 2005). However, the environmental problem with conventional ethanol production is that large amounts of fossil fuel energy are required in the

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[4] This view has been contradicted by various scientists who claim that we are simply going through a 1500-year cycle of climate change. They argue that man has had little impact on climate change. This view has been published in a book by climate physicist Fred Singer and environmental economist Dennis Avery called 'Unstoppable Global Warming: Every 1,500 years'

production process. Some observers have estimated that this energy requirement could mean that the well-to-wheels emissions reduction could be as little as 18% of a normal gasoline car. Cellulosic ethanol production is environmentally friendly and may lead to a reduction in carbon emissions in the region of 70-90% (ibid). It is hoped that the remains of the plant, not used in cellulose production, can be used to power the ethanol plant. It has even been argued that the emissions could be greater than 100% as carbon dioxide may be absorbed in the plant growing process.

The Impact of Oil

Just as the price of biofuels depends on feedstock prices, its long-term viability depends on the price of fossil fuels, in particular oil. The significant upward trend in the price of oil has awakened policymakers to the importance of fuel supply diversity. Oil producers seek to keep the price of oil artificially high by limiting production. According to the IEA[5] there are currently 2.6 trillion barrels of oil resources available. Including an annual rise of 2% in demand, there is still enough oil to last for another century. A startling statistic about oil production is that only 3% of all drills between 1992 and 2004 were in the Middle East, a region considered to have about 70% of the earth's oil resources. By contrast, in Canada and the US, who account for about 2% of total supply, the number of drills represents around 70% of total drills (Keenan, 2007).

How does this affect the biofuels sector? The reason to include an analysis of oil production is to highlight the precarious nature of biofuel production. With increasing cost savings, biofuels will enjoy greater substitutability with oil, which is in line with consumer choice theory. The regulation issue will be addressed later, but the economic viability of biofuels depends to a certain degree on the oil price. With more extensive drilling in the Middle East, a substantial cut in the price of oil could seriously weaken the biofuel industry. Also the optimal time for oil producers to increase supply would be when biofuels become relatively efficient i.e. are seen as a genuine alternative to oil. However as mentioned above, this analysis ignores any form of regulation where environmental concerns over climate change are apparent.

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[5] International Energy Agency

Policy Issues: A subsidised future?

Government has the unique ability to stimulate demand through regulation and taxation. It has been proposed that a mandatory 10% biofuel composition be placed on fuels. This would compel fuel companies to seriously embrace the biofuel industry. The rationale for this would be environmental, as this should reduce the carbon emissions of cars. Forcing manufacturers to make more fuel efficient and lower carbon emitting cars requires strong government regulation. However, the reductions in emissions that such regulations will bring are much lower than the potential benefits from biofuels. This leads back to the question of how to encourage biofuel production.

Ethanol production in the United States is highly political. Various Farm Bills have led to the implementation of high levels of subsidy payments across the so-called 'corn-belt'. The Iowa caucus is decided on one issue; the continuation of ethanol production (The Economist, 2007). Biofuel production is not as political in the European Union but that may change in the near future. There are two main policy instruments available to the EU. As stated in an SEI[6] report in 2005, these policy measures are excise relief combined with subsidies for biofuel producers and obligation supported by a certificate system (SEI, 2005).

There are clear arguments against the subsidy route, which could lead to an excessive price regime, as was seen with CAP. At present, the only justification for any biofuel production is the subsidy system which makes production viable for farmers. Many crops that are suitable for biofuels do not yield an immediate harvest. Thus, agricultural producers incur sizeable switching-costs. The subsidy program is seen as a solution to this. However, these types of subsidy schemes are only short-term measures and will become unworkable in the long-term, such as in the case of CAP. This leads to the case for obligation of production, which has been introduced in Austria. It is also proposed in the Netherlands, the U.K, Slovenia and Spain.

The hope is that this type of policy will minimize the direct cost to the government and allow for the introduction of second-generation biofuels, giving producers a stronger guarantee for the long-term. This policy is designed to bring large fuel suppliers into the biofuel market (ibid). These producers will be obliged by regulation to place a certain fraction of biofuels on the Irish market. This process will be supported by the use of certificates. This policy should prove more sustainable in the future although issues over domestic supply of biofuels will persist.

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[6] Sustainable Energy Ireland

Ireland enjoys a comparative advantage in terms of wind and wave production and the government has proposed that 15% of our electricity needs will be served by these renewable sources of energy by 2015. However, this still does not address the energy requirement of transport. There is a strong argument that Ireland and many other European countries in the EU should not produce biofuels. However, the fact is, that the EU *are* producing biofuels and if a target of 5.75% is to be reached through domestic production, a substantial increase in production is needed. Inefficiencies with biofuel production does not equate to a cessation of biofuel production, as the Irish sugar industry[7] will testify to. Recent policy changes by prominent member states suggest that there is contemporary wisdom to the long-term burden a distortionary subsidy scheme may have. The future is not all bleak for biofuels, as Brazil has shown. Technological progress in cellusoic ethanol could mean a huge breakthrough in terms of a sustainable energy policy, both environmentally and economically. Climate change is becoming a huge issue and may get more political credence in the next election cycle across Europe. Conventional biofuel will still have a role to play in farming but perhaps only a complementary role with food and feed production. Biofuels certainly have a future; however their role in Ireland is at present uncertain.

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[7] The Irish Sugar Industry effectively ceased in 2006 when both sugar factories were closed down. Both France and Germany enjoyed higher sugar beet yields and were considered to be more efficient.

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THE MULTIFUNCTIONAL BENEFITS OF AGRICULTURAL PRODUCTION – CONTINUED JUSTIFICATION FOR SUPPORT OF FARMERS?

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Senior Sophister

Under the European Model of Agriculture, the issue of multifunctionality has led to the provision and justification of, high levels of subsidies for farmers. Jill Tully assesses the validity of Europe's emphasis on multifunctionality, contrasting EU and WTO agendas. She argues against the multifunctionality clause, based on the belief that it acts as a facade for protectionism and colonial exploitation.

Introduction

While the economic benefits of agriculture have always been recognised, it is only in the past two decades that a greater emphasis has been placed on the social benefits arising from agricultural production. The EU has become an advocator of the importance of these multifunctional benefits and has incorporated multifunctionality as a fundamental element of the European Model of Agriculture. It has even become a justification for the maintenance of high levels of subsidies and protection for the European Agricultural sector. In the early 1990s, multifunctionality became a widely debated issue in agricultural discussions, at both a European and international level. The World Trade Organisation (WTO) classifies multifunctionality in the 'Green Box', thereby stating that it does not distort trade. However, it is argued that the use of the multifunctionality clause by the EU in international trade negotiations is simply a euphemism for protectionism (Swinbank, 2001), and a step backwards in trade liberalisation.

In order to proceed with this analysis, it is necessary to first define the economic concept of multifunctionality and the contrasting views presented by the EU and the OECD. Various elements of multifunctionality and their relationship with agriculture will then be assessed. In order to determine if continued justification for public support to farmers is still valid, the contrasting views of the EU and the WTO agenda will also be examined. This will be aided by the OECD's analytical framework for multifunctionality. From this, I shall conclude by highlighting the argument

against the use of the multifunctionality clause in the European Model of Agriculture. This argument is based on the belief that multifunctionality is a camouflage for protectionism and is a modern "continuation of colonial exploitation through different means" (Wilkinson, 2000:24).

Multifunctionality

Multifunctionality was first recognised at an international level in the 1992 Rio declaration on sustainable development. The OECD defines multifunctionality as:

> …an economic activity [that] may have multiple outputs and, by virtue of this, may contribute to several societal objectives at once. Multifunctionality is thus an activity-oriented concept that refers to specific properties of the production process and its multiple outputs (OECD, 2001:26).

An example of multifunctionality is the benefits that agriculture provides to rural society through the preservation of customs and culture. I shall return to these benefits in greater detail later. The key elements that justify multifunctionality include:

- The ability to jointly produce commodity and non-commodity output through agricultural production.
- A proportion of the non-commodity goods display characteristics of public and private goods.
- In some instances the market is unable to supply the non-commodity goods and thus intervention may be required.

Before proceeding to the assessment of the issues associated with multifunctionality, it is necessary to select either a positive or normative perspective for this assessment. The positive approach focuses on multifunctionality as a characteristic of economic activity. The OECD highlights this perspective as not solely related to agriculture, but rather as a property of numerous economic activities, which can be positive or negative, intentional or accidental, reinforcing or offsetting, complementary or conflicting (OECD, 2001). Thus, the OECD has adopted this 'positive' concept of multifunctionality.

       The alternative option is the normative perspective. This approach views agriculture through its ability to satisfy particular functions in society

and highlights its multiple roles. From this perspective, multifunctionality is not simply an element in the production process of agriculture. It can assume a policy role of its own; for example, aiming to make goods more multifunctional. This is the case with the European Model of Agriculture, where multifunctionality has become an essential element in the European Agricultural policies (OECD, 1998).

Both perspectives view multifunctionality from different angles. In this analysis I shall adopt the positive approach as outlined by the OECD.

Jointness

Joint production refers to two or more commodities that are interlinked and produced simultaneously. If the production level of one increases or decreases, it affects the other(s) in a similar way. Jointness can occur for three distinct reasons as outlined by the OECD (2001):

- Technical interdependencies in the production process and its provision for 'economies of scope'. These can have negative outputs such as soil erosion, gas emission and water pollution. The positive effects include improved crop rotation or controlled pest management.
- Numerous outputs are produced from a single input. Generally, these are not produced in equal proportion and some can be also associated with technical interdependencies including beef and manure or mutton and wool.
- The allocable inputs that are fixed at firm level. An increase or decrease in the production of one output changes the amount of the factor available for the supply of the other. This can often occur in relation to output and worker requirements and could result in unemployment.

As can be seen from above, there exist both beneficial and damaging outcomes in association with jointness. When considering the term jointness it is necessary to ask oneself; to what extent are the production of commodity and non-commodity goods considered joint, and are they efficiently produced in a joint capacity or could they be produced more efficiently, separately?

Some non-commodity goods, such as environmental and essential amenity services, can be justified as jointly produced because they are directly tied to the land and therefore are dependent on the provision of

agricultural output and activity. The complexities of jointness arise with non-commodity provisions that are not directly tied to the land and have the potential to be provided separately. Also, in many cases these non-commodity goods can be maintained more efficiently and cheaply when provided separately. It is therefore necessary to question why these non-commodity goods that are not directly tied to the land or jointly produced are included in multifunctionality. Historical buildings, for example, can be maintained without the requirement of agricultural activity.

One of the fundamental arguments for multifunctionality is the provision of rural employment, which plays a significant role in local community. Many local areas are dependent on agricultural employment as a means of sustaining employment. However, the question does arise in relation to the relationship between agricultural output and rural employment. In developing countries a positive relationship exists between production and employment. An increase in agricultural output will result in a direct increase in the demand for primary labour. However, in developed countries this is not the case. As a result of technological advancements and the replacement of physical labour by machinery on farms, the relationship between agricultural produce and rural employment is negative. In developed countries, some towns have become desolated as a direct result of the need to emigrate from the town for employment. Therefore, to what extent should the multifunctional argument be used to ensure continuing support is provided to rural employment? It is evident that in the case of rural employment, the issue of jointness is not as clear-cut as initially assumed.

Food security is highlighted as one of the fundamental multifunctional benefits of agriculture. Food Security has been defined by the United Nations FAO (Food and Agricultural Organisation) as the "access for all people at all times to enough food for an active, healthy life" (OECD, 1998:3).

The provision of food supplies is of national concern. While trading internationally to ensure sufficient food security usually yields the greatest efficiencies, history has taught us that uncertainty in future international supplies, global changes and fluctuating demand and supply has forced nations to internalise their food security policies. In developed countries today the jointness of food security is not a serious issue. However, in developing countries the jointness of food security is important as it also relates to non-agricultural factors, which include distribution and transportation systems.

The above examples illustrate the complexities that exist in determining the degree of jointness between commodity and non-commodity outputs of agriculture. While many do fit the criteria for the 'green box' (as

outlined by the WTO), some are in breach of this, resulting in trade-distorting outcomes.

Public Goods and Market Failures

Market failures can occur in the provision of non-commodity goods due to positive externalities. Economists define an externality as "a harmful or beneficial side effect that occurs in the production, consumption or distribution of a particular good" (Bohman et al, 1999:11). In theory, this occurs because producers ignore the benefits supplied to society from the externality and as a result, they under-provide the good that generates it. In general, economic theory promotes the use of subsidies in these circumstances in order to correct the market failure and restore the optimal level of efficiency (OECD, 1998). In some instances, a reduction in the supply of positive externalities can be offset by a reduction in the negative externalities; they may both balance each other. An example of an agricultural externality is the amount of run-off produced from fertilizer that is used on crops, which may eventually reach the nearby river. This externality possesses both positive and negative outcomes.

While some non-commodity goods produce positive externalities that imply market failures, it does not always justify the need for government intervention. In determining the level of intervention required, it is essential to estimate to what extent output is classified as a public good - scaling from pure public goods (in which government intervention is essential for its provision) to club goods (which operate more efficiently without government intervention). Most non-commodity goods yielding from agriculture are pure goods. Pure goods can be classified as non-excludable and non-rival; governments usually supply these goods (OECD, 2001).

Agricultural examples include natural habitats and rural landscapes. As a result of the non-excludability and non-rivalry elements of pure goods, there is no existing market for these goods and thus government intervention is essential in order to provide for the provision of these goods.

Models of Agriculture

There is a general agreement among many of the WTO member states that there does exist an element of legitimacy to the importance of providing for the multifunctional elements of agriculture. However, the general consensus

on the measures used to determine the different degrees of non-commodity goods is strongly debated (Committee of Agriculture Organisations, 1999). Having examined both the supply and demand aspects of multifunctionality we can now determine how and when intervention is necessary. The OECD (2001) has formulated three essential questions, which if answered yes to all, justify intervention:

- Is the non-commodity output jointly produced with an agricultural commodity and if so, to what degree can its link with commodity production be changed, e.g. by changing farm practices or technology?
- Is there market failure?
- Have non-governmental options such as market creation or voluntary provisions been explored as the most efficient strategy?

Therefore, the most efficient and logical intervention will be determined by the degree of jointness and public good qualities of the non-commodity good (Cahill and Shobavashi, 2000). The European Union views agriculture as one of its defining features and therefore feels that it is justified for them to use measures to protect it. In 1998 the European Commission highlighted this when they stated that "for centuries Europe's agriculture has performed many functions in the economy and the environment and has played many roles in society and in caring for the land…" (Swinbank, 2001:4). Also, the EU maintains that the multifunctional benefits from agriculture provide a sustainable way for the EU to integrate all the inter-related objectives (production, territorial and social) of farmers and society (Committee of Agriculture Organisations, 1999). However, this provides neither an efficient nor logical reason for extensive subsidies provided to farms.

Many people argue that the EU uses the term multifunctionality as a means to continue justifying its high levels of agricultural support. The WTO separates agricultural policies into either green, blue or amber boxes depending on the degree of trade distortion that they accrue. The 'green box' addresses some non-trade concern such as food security and environmental programs, and as a result of this the EU has made substantial use of this policy in its justification for agricultural subsidies. In many cases the agricultural price support programs, which have been implemented by the EU to protect domestic price and agricultural production, have resulted in the distortion of international trade and prices. These policies have resulted in an increase in the level of production within its borders and consequently have increased the exportation and 'dumping' of agricultural products onto the international market, reducing world prices and having detrimental

effects on developing countries' agricultural markets. It has been argued that potentially up to $72 billion per annum is lost in real income by OECD countries as a result of these agricultural support programs (Winters, 1990).

The Uruguay Round of the WTO has emphasised the need to reduce support provided by nations to agricultural production and its additional non-commodity produce. Some members of the WTO have argued that most of the existing non-commodity goods that are a by-product of agriculture and could be produced separately and equally efficiently. However, while this is quite likely in a country that does not require large subsidies for its production of agricultural produce (e.g. Canada), it does not apply to countries that are highly dependent on subsidies to protect their farmers and their agricultural industries (e.g. EU). The cost of protecting and ensuring the continued existence of the non-commodity goods varies significantly from one country to another, depending on the cost levels and priorities that the agricultural sectors face.

Conclusion

Throughout this article I have highlighted the complexities that have arisen from the classification of commodity and non-commodity goods and their degree of jointness, as well as the classification of goods as pure public goods and club goods. Also I have noted the benefits of externalities and the degree to which government intervention is justified. Some economists argue that the multifunctional benefits of agricultural production justify continued public support to farmers. I find this justification highly questionable. The importance of food security, the preservation of historical landmarks, landscapes and rural communities is a fundamental issue for the EU and the preservation of these multifunctional benefits is essential to the general EU community. From this aspect, it is understandable why the EU wishes to maintain its existing subsidies and the important roles that these play. The aspect of the continued justification is subject to question in relation to the extent to which the EU is distorting world trade and also the extent to which it is suppressing developing countries' agricultural economies. How can the EU claim to continue trade liberalisation through WTO negotiations, if they are going to continue with acts of protectionism?

The point to highlight here is that developed nations (i.e. the EU) are in a sustainable position to protect society, territory and production and to trade efficiently on the international market without the requirement of subsidies that distort prices. However, developing countries are in a less competitive position being economically inferior. Therefore the question

arises as to the justification of the European Model of Agriculture and the use of multifunctional benefits as a cover for protectionism. In this case, the EU is abusing its position of power in order to protect its own benefits. The threatening element is that the EU's power reaches beyond the WTO's control. By simply rejecting the agreements drawn up and allowing for the WTO negotiation rounds to almost collapse (as was the case with the Uruguay Rounds in 1994, and is the case with the stalling of the Doha Rounds at present) the EU can ensure that it maintains its existing level of subsidies and protection for its members. In December 2000, the Comprehensive Negotiating Proposal noted that the EU is still vulnerable to the charges that it is using multifunctionality as a camouflage for protectionism. Finally, Alan Swinbank notes:

> …Protectionist intent…is liable to alienate its trading partners, and discredit the EU's negotiating stance. To be able to claim the moral high-ground in the negotiations, the EU should...focus on refining its suggestions for reform of the green box, whilst keeping in the fore the notion that the green box was originally designed to accommodate policies that have no, or at least minimal, trade impact (Swinbank, 2001:16).

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IRELAND'S PRIVATE HEALTH INSURANCE MARKET: THE INTRODUCTION OF RISK EQUALISATION AND THE CONSEQUENCES FOR COMPETITION

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The controversial Risk Equalisation scheme has sparked much debate of late within the Irish Private Health Insurance Market. Certainly it has significant consequences for competition. In this essay, Cian Ó Mórain discusses the nature of the scheme, outlining its advantages and disadvantages. He concludes that its implementation will be beneficial, subject to the inclusion of a number of essential reforms.

Introduction

The ongoing and controversial introduction of risk equalisation in the Irish private health insurance (PHI) market has been widely publicised in the Irish media. Opinion from within the market and from the media on the matter has been far from harmonious. In addition to this, having initially been commissioned to publish a report together, both the Health Insurance Authority (HIA) and the Competition Authority have recently published separate reports on the PHI market dealing in detail with the issue of risk equalisation. Owing to the unprecedented popular and official attention this issue has received, I intend in this essay to investigate the effects of risk equalisation on competition in the Irish PHI market. Some of the reforms necessary to promote competition in the market in the future will be recommended accordingly.

This essay will first outline a framework to address the effects of risk equalisation on competition. A definition will be given of the concept of risk equalisation and an explanation of why it is used in PHI markets. It will include a summary of the risk equalisation system being used in Ireland, highlighting its strengths and weaknesses, and then address the anti and pro-competitive effects of risk equalisation. Subsequently we reach a verdict on whether or not the scheme will have a positive effect on competition in the market. To conclude, I assess the main issues for competition in the Irish PHI, be they surrounding risk equalisation or otherwise.

Framework

Before addressing risk equalisation it is important to outline a framework for analysing the problem. To properly analyse the issue of risk equalization, it is necessary to address two issues. First, the relevant market within which we will analyse risk equalisation must be defined. Then a set of criteria will be outlined in order to decide whether or not risk equalisation is competitive. A relevant market can be defined as:

> …a set of products and geographic area, such that if all the production capacity in the set were owned by a single firm (a 'hypothetical monopolist'), that firm profitably could raise price by at least some percentage (for example, 5 percent or 10 percent) above the current (not necessarily competitive) level for a 'significant non-transitory' time period. (Salop, 1987:7)

Thus, to define the relevant market for Irish PHI, its 'set of products' and 'geographic area' must first be clarified. In a report recently published by the Competition Authority the PHI market is described as follows:

> For the purpose of this Report, the relevant market is open enrolment PHI policies that offer indemnity for in-patient hospital services with varying levels of hospital accommodation in Ireland. (The Competition Authority, 2007:34)

It is important to note what this definition omits from the market. The most notable products not considered, are restricted entry PHI schemes[1] and related health insurance plans.[2] Perhaps most significantly, the public health system is also omitted from the relevant market.[3]

In order to effectively analyse the effects of risk equalisation on competition in the PHI market, some criteria are required for analysing the problem. In this essay the following shall be considered:

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[1] The biggest of these schemes are those for ESB workers, Gardaí and Prison officers. These are omitted from the relevant market as the restrictive nature of their entry means they are not substitutes for PHI.

[2] These are health cash plans, serious illness insurance and income protection insurance plans. These are omitted from the relevant market as they are not comprehensive enough to act as substitutes for PHI (HIA, 2007).

[3] The public health system is not viewed as a substitute to PHI owing to the perceived superior quality of care available from PHI. Accordingly, they are viewed as complements (HIA, 2007).

1. The likely effect it will have on rivalry[4] within the market.

2. Will its introduction act as a barrier to entry for potential entrants?

3. The effect it will have on efficiencies in the market.

Finally, before proceeding, it is important to stress the high market concentration that exists in the Irish PHI market. There are only three players in the market: VHI, BUPA[5] and VIVAS. Their respective market shares are approximately 75%, 22% and 3% (HIA, 2007). Computing the HHI[6] gives us a very large result of 6118. In international terms the Irish PHI market is very highly concentrated (Barrett, 2005)

Risk Equalisation in Ireland

In the *White Paper on Health* (1999), risk equalisation is described as:

> …a process which aims to equitably neutralise differences in health insurers' costs that arise due to variations in risk profiles. This results in cash transfers from insurers with healthier than average risk profiles to those with less favourable risk profiles (White Paper, 1999:40)

In an unregulated PHI market, health insurance companies can charge customers different premiums according to their risk profiles and risk equalisation is not an issue. However Ireland, like many other countries, regulates the PHI market with social goals in mind. In pursuit of inter-generational solidarity, and also equality, the government have entrenched the following concepts into the Irish PHI market:

- Community Rating – "Under a health insurance contract for any specific level of benefit, a health insurer must charge the same premium in respect of all such contracts regardless of the age,

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[4] Rivalry being the extent to which there is competition between competitors in the market.
[5] BUPA have recently been taken over by the Quinn Group. For the purpose of this essay I will assume that the trading name BUPA will be retained.
[6] The HHI, or Hirschman-Herfindahl Index, is the method most commonly used to gauge market concentration. It is calculated by summing the squared values of the market shares of each competitor in the market. Merger regulations state that a merger which results in a HHI greater than 1800 are likely to cause competitive concerns (The Competition Authority, 2002)

gender, sexual orientation or current or prospective health status of insured persons." (ibid:33)

- Open Enrolment – "Under a system of open enrolment, all applicants are guaranteed acceptance for cover regardless of their risk profile" (McLeod and Parkin, 2001:vii)
- Lifetime Cover – "Lifetime cover regulations ensure that a health insurer cannot refuse to renew an insured person's health insurance cover…This gives protection for every insured person – so that as they get older, or as their health may deteriorate, or in the event of sustaining serious injury – their health insurance may not be terminated by the health insurer" (White Paper, 1999:54)
- Minimum Benefits – Under minimum benefit regulations "each health insurer must not provide benefits below a prescribed level"[7] (ibid).

As a result, companies in the Irish PHI market may not charge customers different premiums based on their risk profile. This regulation favours those companies that have customers with a lower risk profile and a risk equalisation scheme attempts to correct for this.

Risk equalisation schemes are used in many countries and although the concept behind them is broadly similar, there is considerable variation in the type of scheme used in different countries (McLeod & Parkin, 2001). It is therefore important to outline the scheme being used in Ireland.

The risk equalisation scheme being implemented in Ireland attempts to deduce whether the claims costs experienced by an insurer would have been greater or lower had the risk profile of their customers been equal to an average market risk profile. This is achieved by taking account of the age and gender profile of individual companies and comparing them to that of the market. A third mechanism for deducing risk profiles, that of health status, is not currently used in calculations, although there is a provision in the legislation to introduce such a mechanism if the HIA deemed it necessary (The Competition Authority, 2007). The so-called 'Health Status Weight' (HSW) adjusts for it[8]. The scheme also incorporates a 'Zero Sum Adjustment', which ensures that the scheme is self-financing. [9] Risk equalisation payments in Ireland are calculated in a retrospective manner.

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[7] Usually this is equal to basic public hospital accommodation.
[8] The health status weight measures risk profiles through utilisation of healthcare services. Under Irish legislation, this weight can be between 0 and 0.5. Currently it is at 0. (The Competition Authority, 2007)
[9] Were the zero sum adjustment not used, the amount payable into the risk equalisation scheme would not necessarily equal the amount payable out of the scheme. This is owing to the fact

Could a better scheme be implemented in Ireland? The question of whether or not health status, through the HSW, should be included in calculations is an important one. Without it there is still an incentive to seek out lower risk customers but its introduction would also decrease incentives to achieve lower costs through efficiencies (The Competition Authority, 2007). The issue of retrospective calculation also provides difficulties; risk equalisation payments are only calculated ex-post, so it is difficult for companies to factor these cost/revenues in. There may be scope for the introduction of a prospective scheme that is more predictable for companies.[10]

Anti-Competitive Effects of Risk Equalisation

There is no doubt that risk equalisation represents a barrier to entry in the Irish PHI market. Seven potential new entrants, who have considered entering the Irish PHI market, have listed the introduction of risk equalisation payments as a factor against their entering the market (York Health Economics Consortium, 2003). Indeed Mr. Justice Liam McKechnie, while presiding over BUPA's challenge of risk equalisation, also acknowledged that the scheme did make entry into the market less attractive (The Competition Authority, 2007).

The introduction of risk equalisation is also likely to have a detrimental effect on rivalry in the PHI market. Currently, both BUPA and VIVAS are able to charge lower premiums than VHI for similar products[11] owing to the lower risk profile of their customers (ibid). This factor is forcing VHI, with its far greater market share, to compete on price.[12] However, the introduction of risk equalisation will have the effect of harmonising prices among providers (ibid). As a result the ability of VIVAS and BUPA to price significantly below VHI will be greatly restricted. It will

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that the average claim of customers within age and gender profiles differs from one company to another. (The Competition Authority, 2007)

[10] Although the cost of such a system is far greater than that of a retrospective system (White Paper, 1999).

[11] As an example, VHI's most popular plan, plan B, costs €50.29 per month in comparison with BUPA's essential plus, which costs €43.74 (HIA, 2007).

[12] Surveys suggest that it is young (and therefore lower risk) customers who are most price sensitive in the PHI market (HIA, 2005a) and thus it is important for VHI to compete for these customers.

also have the effect of creating substantial market power for VHI[13], reducing the need for it to compete as regards price.

Finally, risk equalisation provides a certain disincentive for companies to seek to lower their claims costs through greater efficiency. The downside of 'Zero Sum Adjustment', which serves to make the scheme self-financing, is that it shares out a certain amount of savings made from such efficiencies. Notably, as mentioned above, this effect would increase health status, through the 'Health Status Weight', introduced.

Pro-Competitive Effects of Risk Equalisation

Although the introduction of risk equalisation will not have any positive effect on competition as regards barriers to entry or rivalry, the reasons for its introduction can be seen in the effect it will have on the efficiency of market operations. The community rated PHI market in operation in Ireland suffers from certain failures which cause the market to work inefficiently. One of these failures is the problem of risk selection, or 'cherry picking', which is the main driver behind the implementation of risk equalisation. The practice of risk selection occurs when insurers target lower risk groups specifically. If an insurer is able to attract customers with lower risk it can charge lower premiums while still earning high profits. In addition, as it is younger and consequently lower risk customers who are more likely to switch due to lower premiums (HIA, 2005a), the insurer can then attract more customers with low risk profiles. Thus, they further increase their profitability while maintaining a low risk profile.

Although community rating and open enrolment ensure that companies must accept customers of any risk profile into their schemes, it is possible to tailor and market them towards people with lower risk profiles (HIA, 2007). The result of this market failure in Ireland is that newer entrants, i.e. BUPA and VIVAS, have managed to attract a customer base with a lower risk profile than that of VHI. As both companies have been successful in doing so, two options have been left open to them. First, they can charge a substantially lower price than VHI and attract large amounts of customers away from it. Secondly, they can choose to follow the price of VHI, charging a price that is lower but that only attracts a small number of

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[13] The price convergence of risk equalisation, coupled with factors such as (i) its market share (ii) its solvency requirements (which will be alluded to later in the essay) and (iii) the strength of its brand mean that VHI's hypothetical market power would be turned into substantial market power. (The Competition Authority, 2007)

younger customers away from VHI. It is the second option which both companies have apparently chosen to operate.

Since their entry into the market a decade ago, BUPA have followed the premium increases of VHI, always maintaining their premium circa 10% below that of VHI (The Competition Authority, 2007). This practice has had serious implications for the market. VHI's risk profile has been increasing, pushing up costs and causing it to increase premiums to compensate. At the same time, BUPA and VIVAS, who are not experiencing the same large cost increases, are also increasing premiums, thus earning supernormal profits.

Risk equalisation corrects for this market failure. As the system equalises the risk of all customers, it makes the community rated PHI market more efficient by encouraging companies to compete for customers of all risk category. It also allows companies to concentrate on cost saving through efficiencies, rather than attracting less risky members.

Risk Equalisation: Pro or Anti-Competitive?

It is evident, from the above analysis, why the issue of risk equalisation is such a contentious one. On the one hand there are those arguing against its implementation who point to its anti-competitive effects. Risk equalisation does act as a barrier to entry, creates substantial market power for VHI and will dampen price competition. On the other hand, those in favour of the system point to the risk selection being practiced by BUPA and VIVAS without the scheme.

One might, at first glance, be tempted to claim that risk equalisation is not applicable to the Irish PHI market. It has a number of anti-competitive effects and while community rating and open enrolment are giving BUPA and VIVAS a substantial regulatory advantage, is this not merely forcing VHI, with its large market share, to compete on price? However, when one examines the situation a little closer and discovers how VHI are financing their relative price competition, the extent of the regulatory advantage being afforded to the newcomers becomes apparent. While BUPA must meet the solvency requirement of the UK's Financial Services Authority (FSA) and VIVAS those of the financial regulator, VHI is in fact exempt from solvency requirements. Without this mechanism VHI's current premium prices, which are already above those of their competitors, would be unsustainable and (without running its solvency down to nothing) not profitable. It is, in fact, the anti-competitive effect of risk selection without a risk equalised market that outweighs the anti-competitive effects of its implementation. While

BUPA and VIVAS will be able to adjust to risk equalisation and retain profitability, PHI is not profitable for VHI without risk equalisation.

Pressing Issues for Competition in the Irish PHI Market

The implementation of risk equalisation will be important for competition in the Irish PHI market as long as the government wishes to retain the idea of community rating as the cornerstone of PHI provision. There is however much scope for increasing competitiveness in the market. It is highly concentrated and the VHI does possess some amount of market power (especially after the implementation of risk equalisation). Indeed, there are a number of further reforms without which the benefits of risk equalisation will be undermined. The most important and pressing of these are:

1. VHI's Solvency Requirements
As stated above, VHI are currently not required to meet any solvency requirements. This is a significant regulatory advantage. While risk equalisation would harmonise the premium prices of competitors, the retention of this regulatory advantage would mean that the VHI would be able to artificially hold its prices at low levels for prolonged periods. As a result VHI would be able to match any lower premiums achieved by its competitors through efficiencies and price competition would be completely undermined. It would also act as an immense barrier to entry. Entry into a market with such a dominant player would not be viewed as a healthy prospect.

2. Uncertainty
In a consultation process with potential new entrants, conducted on behalf of the HIA in 2003, one of the main factors against entry stated was the uncertainty surrounding the market (HIA, 2007). Uncertainty surrounding the market is currently one of the largest barriers to entry for the Irish PHI market. This uncertainty stems from a number of areas. First, there is the uncertainty surrounding risk equalisation[14]. Secondly, there has been uncertainty since December 2006 when BUPA announced its intention to depart from the Irish PHI market. Although the Quinn Group are in the process of purchasing it, there is a great deal of uncertainty surrounding how BUPA will compete in the future.

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[14] Currently BUPA is appealing the High Court case they lost against risk equalisation. There is also still a great deal of uncertainty as regards the three year derogation from risk equalisation payments afforded to new entrants.

Thirdly, the more or less simultaneous publishing of reports on the market by both the Competition Authority and the HIA has stirred some uncertainty. Both bodies were initially instructed in December 2005 by the Minister for Health to compile a report together on the market (The Competition Authority, 2007) but rather than doing this they both published separate reports. The fact that both the bodies charged with overseeing competition in the market cannot find the consensus to publish a report together[15] will undoubtedly breed uncertainty about the future direction of the market. Which report will be followed when legislators attempt to reform the market? Given the amount of uncertainty it is unsurprising that potential entrants prefer to adopt a 'wait and see' policy rather than entering.

3. Reform of the Minimum Benefits

Under the minimum benefit regulations there is a certain minimum level of benefits that every PHI plan must provide. These regulations ensure that there is a minimum level of quality for every plan available. Minimum benefits unfortunately act as a constraint on competition between providers as regards quality of brand, as they restrict the amount one company can differentiate their product from those of a competitor. Although minimum benefits are not going to be removed from the PHI market, there is scope for reforming them. The minimum benefit regulations have not been reviewed for a long time and some of the benefits specified have become outdated and could be replaced by newer procedures (The Competition Authority, 2007). This would give insurance providers a little more room to differentiate their product further from those of their competitors.

4. Reducing Switching Costs

As a result of risk equalisation there will be more competition for customers with higher risk profiles. Currently in the market, there is a lot of inertia among customers as regards switching insurers (HIA, 2005a). Although open enrolment, community rating and lifetime cover ensure that switching is easy and almost costless, there is a perception that switching is difficult and costly (HIA, 2005a). If customers' risk profiles are equalised but older people are highly unlikely to switch insurer (even with substantial cost savings), VHI's market power would be greatly increased having a negative impact on competition. They

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[15] Although the basics of the reports are, to a great extent, identical they do contain a couple of major differences. For example, while the Competition Authority are in favour of both bundling/tying arrangements and buyer power in the market, the HIA are not.

would have an effective monopoly over a sizeable segment of PHI consumers. Thus, it is of utmost importance that the HIA address this issue.

Conclusion

The risk equalisation scheme which is in the process of being implemented in the Irish PHI market has both anti-competitive and competitive aspects to it. As a result there are compelling arguments for and against its implementation. On balance however, the benefits of correcting the instability in the market owing to risk selection outweighs the negative effects that risk equalisation will have on the market. In accordance with the fact that the implementation of risk equalisation is vital for the market, there are a number of other reforms that are vital for promoting competition in the market. Without these further reforms the benefits of risk equalisation are likely to be undermined.

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DUBLIN'S CHRONIC CONGESTION: WHAT WE HAVE DONE AND WHAT WE HAVE FAILED TO DO

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In this paper Siobhan Scallan considers the varied costs arising as a consequence of Dublin's road congestion problems and explores the measures that have been employed to date in an effort to alleviate the growing crisis. Considering the London model as a case study, 'congestion charging' is examined as a possible solution. It is argued that such a policy will only be beneficial in conjunction with increased investment and development in public transport.

Introduction

"Roads and rail are the arteries and veins of a modern economy. Clog them up and circulation starts to fail. Ignore the disease for too long and the patient's condition may take a serious turn"[1]

Traffic congestion is a rapidly growing concern in many contemporary cities and Dublin is no exception. Congestion can be defined as "waiting for other people to be served" (Thomson, 1974:72); it is the delay imposed by one vehicle on another. This is not an efficient system for a modern economy.

This paper considers the current congestion problem in Dublin. The costs associated with congestion are explored. Following from this, the merit of the government's response over the last forty years is questioned. Congestion pricing, a proposed policy solution, is discussed and its success in reducing congestion in London is examined. To conclude, this paper advocates an increase in the marginal cost of motoring in the city, relative to the fixed cost via the pricing mechanism.

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[1] The Economist, 2006

Gridlock Beckons[2]

Dublin's transport infrastructure was unprepared for the record period of economic growth in the 1990s. This brought about a phenomenal increase in the number of cars in the city, and generated an excess demand at peak hours for an inadequate public transport system. For instance, between 2003 and 2004 the number of cars licensed in Ireland grew by 6.9% (CS0, 2004). As expected, this rise in the level of car ownership coincided with an ever-increasing reliance on the private motor vehicle as the preferred mode of transport. The percentage of people driving to work in Dublin increased from 45.1% in 1996 to 50.3% in 2000 (Morgenroth, 2001). This flow of vehicles into the city meant the ratio of road space to vehicles diminished rapidly. Such an increase in the number of vehicles has significant implications for vehicular emissions and congestion in Dublin. This is largely due to the fact that the development in traffic management, public transport and "growth in road space has not kept pace" (Clinch and Kelly, 2001:4).

Car commuting is another major cause of traffic congestion. Dublin City Council has been monitoring inbound commuter car journey times during the morning peak period since 1994. Data on journey times and average speeds are summarised in Table 1. The average inbound journey times during the morning peak period on the 20 routes monitored increased by 44% between 1994 and 2002, while average speeds declined by 31%. It is evident that changes are needed.

Table 1: Private Car Commuter Journey Times/Speeds 1994, 1998 & 2002 (Average for 20 Routes)

Morning Peak	1994	1998	2002	% Change
Journey Time (mins.)	21.24	26.19	30.65	+44%
Average Speed (km/hr)	16.71	13.55	11.58	-31%

Source: Dublin City Council

The Costs of Urban Road Congestion

How much is congestion costing us? The distinguished economist Button, has shown congestion to imply a "dead-weight welfare loss and to reduce the economic efficiency of any transport system" (Button, 1993:118). Congestion represents a cost to those who are exogenous to a person's

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[2] Title from The Economist, 2002.

decision of undertaking a journey. Any side effects, whether positive or negative, of the decision are known as externalities. Housing policy during Ireland's economic boom was particularly inadequate. Consequently the spread of the Dublin commuter belt to comprise all of Leinster, and further afield, has resulted in many undesirable externalities. These include "further congestion, increased travel time to work, rising frustrations and stress, increased fuel use and associated greenhouse gas and pollution emissions" (Clinch & Kelly, 2001:4).

Clinch and Kelly describe how a recent report from Infras/IWW (2000) placed the "external costs of all transport in the EU at 8% of GDP, with private cars accounting for some 58% of this cost" (ibid:6). It is approximated by the Dublin Transportation Office that congestion costs in terms of lost time amount to £0.5 billion per annum while the "Small Firms Association are less specific, stating simply that it is costing the economy millions every year" (ibid:7).

Economist Johansson-Stenman in his report *Regulating Road Transport Externalities: Pricing Versus Command and Control*, outlines the principle externalities of traffic congestion as discussed below.

Environmental Costs

Of all the environmental pressures facing Ireland, congestion is the most highly correlated with GDP   growth, with car ownership growing at over 7% per annum (ibid). There are numerous negative environmental externalities resulting from road transport. These consist of noise, dirt, vibrations, toxic fumes, safety fears, loss of privacy, disruption and the need for relocation of people and industry (Button, 1993).

Increased numbers of vehicles contribute to the level of noise pollution in an area (Johansson-Stenman, 1999). According to an OECD EST report in 2000, high levels of transport noise can contribute to sleep loss, high blood pressure and cardiovascular disease. The report also notes that current EU limits on noise emission levels greatly exceed levels consistent with health and comfort.

Congested traffic results in repeated acceleration, deceleration and idle motors. "Emissions from cars can be found to be up to 250% higher under congested conditions than under free flowing traffic" (Clinch & Kelly, 2001:5). CO_2 emissions contribute considerably to global warming and are of particular concern in the Irish case given the requirements of the Kyoto target. Other pollutants include NO_x, VOCs, CO and particulate matter, the latter two being particularly damaging to human health (ibid). Convery (2001) affirms that the vast majority of air pollution in our cities, and the

related health and other dysfunctions, are a consequence of emissions from road-based transport.

Accident Costs

There is a significant correlation between the number of vehicles on the road and the probability of accidents. Congested traffic is undoubtedly more stressful than free flowing traffic. The frustration of being 'hemmed in' in traffic can lead to over acceleration when roads are clear (Johansson-Stenman, 1999). There are many components involved in the external costs of accidents including physical costs, mental costs and loss of output.

Road Wear and Tear

Road damage is primarily thought to relate to heavy vehicles and factors determined by the weather. Although heavy vehicles are responsible for most of the damage, the phenomenal increase in road usage has also contributed significantly to the wear and tear of urban roads. The cost of this damage is not simply the cost of road repairs, but "the cost of discomfort and damage to cyclists, other motorists and their vehicles from poor road surface integrity" (Clinch & Kelly, 2001:6).

Time Loss

The major cost imposed by traffic congestion is usually found to be time; "queuing up for the use of a transport facility and slowing down in its consumption take up the user's time" (Button, 1993:118). This is a large cost to the Irish economy. Congested traffic leads to delays and undoubtedly contributes to drivers' stress and anxiety (Johansson-Stenman, 1999). According to IBEC's Traffic Congestion Survey in 2006, some 89% of Irish businesses are affected by traffic congestion and this figure is higher, at 95% in Dublin.

What We Have Done?

'Engineering dominance' is distinctly evident in the Government's policy responses over the past few decades. Ireland is still in the investment phase; building roadways and railways. These activities generate substantial social costs at the expense of general traffic flow. The traditional outcome of "transportation planning exercises in Dublin has been a set of ambitious and expensive plans to expand capacity" (Keegan, 2003:105). The transportation strategy for 2001 to 2016, *A Platform for Change* is no different in this regard, being both predominantly ambitious and costly.

According to a progress report in the National Development Plan 2000 - 2006, the following positive developments to Dublin's transport network can be noted (National Development Plan, 2006). Significant upgrades continued to be made to Dublin's national roads in 2006 with an allocation of over €137 million, over €41 million was allocated for non-national roads throughout Dublin. The Dublin Port Tunnel was opened, improvements made to the Naas Road and the upgrading of the M50 is now under way. In 2006, Dublin Bus planned to purchase 100 replacement double-decker buses which cost €29 million, and by September over 80 of the buses were acquired. In the first six months of 2006, LUAS carried over 12 million passengers. There are now eleven Quality Bus Corridors (QBCs) constructed in the Greater Dublin Area and in 2006 €40 million was allocated to the Dublin Transport Office for the planned doubling of the QBC network. 5% of commuters in Dublin cycle (Dublin City Council, 2004). Dublin City Council's objective is to double that over the next seven years via the construction of 160 km of a strategic cycle network. In recent years, there has been a dramatic improvement in taxi services in Dublin from a customers' perspective as a consequence of market entry liberalisation. Towards the end of 2004, the city's taxi fleet consisted of 10,000 licensed carriers (ibid) as opposed to just 1,975 in 1995 (Keegan, 2003).

Recently, in November 2006, the Irish government celebrated the first anniversary of its investment plan Transport 21; a large transport investment plan for the years 2006 to 2015, costing the Irish taxpayer 34.4 billion euro. Dr. Sean Barrett of the Economics Department, Trinity College, Dublin states that Transport 21 is a "seriously flawed document" (ESRI, 2006). Barrett describes the plan as showing a "lack of any evaluation culture in the Department of Transport and its spending agencies" (ibid).

According to IBEC's Traffic Congestion Survey 2004, 45% of Dublin–based companies had a lack of confidence in the National Development Plan, compared to the 74% that lacked confidence in Transport 21 in 2006. IBEC Transport Director Reg McCabe notes that the "industry would like to see a number of urban congestion relief projects included in Transport 21" (O'Connor, 2006:32). Of course, the findings of a survey are not definitive.

The Irish Government has evidently invested heavily over the past decade to provide reliable and timesaving alternatives to private car commuting. Nonetheless, thousands of commuters and urban residents must endure chronic congestion in Dublin city each day. "Dublin buses operate in far worse traffic than any other European city, according to an EU-based public transport study" (Connolly, 2003). Is the government's response of continued and greater investment *ever* going to achieve an efficient transport network in Dublin? What the urban public now need is an incentive to

switch from the private motorcar to public transport, thus reducing congestion and benefiting society as a whole. Road pricing is a potential policy solution, having proven itself in both London and Singapore. It may well be Dublin's answer to congestion.

What We Have Failed To Do?

Economist Newbery (1990) describes road space as 'a valuable and scarce resource' that should be rationed by price. It has only recently been accepted that managerial measures such as "pricing are the correct solution to urban road-congestion" (Barrett, 2002). Road pricing is, it seems, the best method to internalise the undesirable costs related to congestion. Barrett comments that we have allowed the road pricing debate to be "dominated by negative critiques" (ibid), making the issue a tenuous one with policy makers.

Singapore provides a prime example of a successfully implemented road pricing scheme. The success of the scheme was largely due to the exemplary public transport system which includes a Metro. Dublin's lack of an integrated public transport system, gives substance to the argument that in the absence of adequate alternatives, road pricing in Dublin is politically unacceptable. However, under the government's National Development Plan 2000-2006 many alternatives have been provided as already discussed. Transport 21 also outlines vast investment in the public transport network, including the provision of a Metro line. IBEC strongly endorses the Dublin Metro project, "which can contribute massively to relieving congestion" (O'Connor, 2006:32).

Regarding equity considerations, Clinch argues that "higher tolls disproportionately affect poorer drivers" (Clinch and Kelly, 2001:16). This argument, however, ignores those who travel by public transport, as they cannot afford a car. Barrett argues that "road pricing does not harm low-income people because the bus will be the big gainer from creating a market for the first time in scarce urban road space of which it is an efficient user" (Barrett, 2002). Low-income people will benefit from less congested routes and faster journey times, thus enduring a lower journey cost overall.

Fears that road pricing will merely result in a transferral of the congestion problem to just outside the pricing zone, also causes opposition. Barrett refers to this problem as "The Ranalagh Problem". People will start to perform U-turns to avoid the charge and further congestion will result. However in the London case, fears of this kind were unfounded and the pricing zone was recently further enlarged. In London, "higher traffic levels did not materialize, at least partly as a result of improved traffic management

systems that adjust traffic lights to manage the flow of traffic on and approaching the ring road" (Leape, 2006:167).

Success of London's Policymakers

As early as the 1960s, the road congestion problem was underlined in the field of economics in the Smeed Report (1964). Around this time, Vickrey (1958, 1963) and Walters (1961) formalized Pigou's (1920) ideas on the application of marginal social cost pricing to the case of congested roads. The report recommended the introduction of road pricing in London. Road pricing is a system of charging drivers for travelling through certain urban areas. It was not until forty-three years later, innovator Ken Livingston introduced the economic concept of pricing away congestion into London, and proved the system to be a phenomenal success. The introduction of the London congestion charge is "a triumph of economics" (Leape, 2006:158). Leape describes it as representing a "high-profile public and political recognition of congestion as a distorting externality and of road pricing as an appropriate policy response" (ibid).

The charge has had a significant impact on congestion levels. One way to measure congestion is in terms of minutes of delay experienced compared to an un-congested travel rate. Using this measure, congestion has fallen an average 30% from the start of the charge in February 2003 to mid 2005 (Transport for London, 2005:14). "The drop in congestion levels, and increase in average speeds, reflects mainly a decrease in queuing time at junctions" (Leape, 2006:166).

Pricing had a favourable impact on public transport in London. The congestion charge sought to reallocate road space from private motor vehicles to public transportation. The higher price of rush hour car travel induces many to switch to public transport. This is the incentive Irish policy lacks to urge Dublin people to change their mode of transport. The switch to public transport reduced congestion and led to increased travel speeds for buses which in turn further encourage patronages while also reduced average costs per passenger to transport providers (Leape, 2006:166).

In the most recent detailed estimates drawn from Transport for London (2006:171), the total estimated social annual costs of the congestion charging scheme are £163 million, while the total annual benefits are £230 million. The case for congestion charging is clearly "overwhelming" (Wolf, 2007:15).

Despite London's phenomenal success in reducing congestion, the general public are still feeling the pain of paying for space that used to be

free. On February 15th 2007, 1.5 million people had signed the Downing Street petition that argues that "road pricing is already here with the high level of taxation on fuel" (ibid). Wolf questions, "can 1.5 million people be wrong? Yes, they can" (ibid). Wolf explains that the tax that drivers pay on fuel is an efficient way to encourage people to buy fuel-efficient vehicles and reduce emissions. It is not an efficient way to reduce congestion. "It is a principle of economics and common sense that one needs two stones to hit two birds" (ibid). If the objective is to cut emissions and congestion, one needs a fuel tax and road pricing.

Conclusion

The answer to Dublin's traffic congestion lies in pricing. This will reduce the traffic on the roads, while maintaining the flow of people. We should seek a shift in preference from the private motorcar to other more efficient available modes. Road pricing has the power to make public transport and other modes relatively more attractive to the private motorist.

The numerous costs of congestion to our society and environment have been discussed, the Government's current and past policy solutions have been explored and the results can be easily observed – widespread chronic congestion. There is an overwhelming case for pricing to solve this problem, provided it is part of an integrated approach to investment in roads and development of public transport. In London, it took the courage of Mr. Livingstone's convictions to initiate the policy solution. Does Ireland have such a politician? Only time will tell.

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ENNISKILLEN SOUTHERN BYPASS: A COST BENEFIT ANALYSIS

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Congestion is endemic in modern Ireland and the town of Enniskillen is no exception. In this essay Laura Gibson challenges the decision to exclude the proposed Enniskillen Southern Bypass from the Transport Plan 2015. The viability of the project is investigated using a comprehensive cost-benefit analysis. To add further depth to her analysis, two separate alternatives to the project are considered; imposition of a road toll and increased expenditure on public transport.

Introduction

Continued growth and development in the Enniskillen area has led to an increase in delays and congestion at some of the critical points in the transport network during periods of peak demand. Average daily traffic has increased from 10,870 vehicles in 2003 (FDC, 2004)[1] to 12,180 vehicles in 2004 (RSNI, 2004)[2] on the main A46 route to Belleek and Donegal. In a rural county, such as Fermanagh, the lack of adequate public transport, the dispersed population and distances to hospitals, places of work and schools all point to the need for an adequate road structure. The Enniskillen Southern Bypass was one of a number of schemes appraised for inclusion in the Forward Planning Schedule of the Regional Strategic Transport Network – Transport Plan 2015, a strategic plan dealing with the transport needs of the whole of Northern Ireland, proposing a total investment in transport of £2319.8 million from 2002-2015 (Department for Regional Development, 2005). However, the proposal for a Southern Bypass of Enniskillen was not included as the Roads Service claimed that it did not rank sufficiently high enough when assessed against other competing schemes, as "most of the traffic going into the town of Enniskillen stays in the town" (Divisional Planning Manager, 2005). However, with a geographical position that places the town in the centre of major transport corridors in the region, it is thought

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[1] Fermanagh District Council
[2] Roads Service of Northern Ireland

that the exclusion of the proposal from the Plan is significantly unjustified. Mr. Sam Foster, Fermanagh and South Tyrone representative of the Ulster Unionist Party, summed up the problem well when addressing the Northern Ireland Forum:

> Much to my disappointment, the proposal for a Southern Bypass for Enniskillen has been overlooked. I respect the interests, the dedication and the integrity of all the Committee members… but, as none of them comes from anywhere near the West or South-West of the province, all the thrust is towards the East... (Foster, 2003)

Economic Impact of Congestion

Additional costs to Fermanagh businesses due to weaknesses in the local road infrastructure have been estimated at £1.7 million per year based on the following; the effects of lost orders due to inability to provide fast and reliable deliveries, costs of accidents, damaged goods in transit and additional fleet maintenance and repairs due to poor road services (Fermanagh District Council, 2002). This is equivalent to approximately £30 per resident of the county. Applying this figure to the population of the surrounding cross-county road catchment area (ibid) provides an estimate of the annual economic cost of poor road infrastructure to be approximately £6.3 million. This is almost certainly an under-estimate. It does not account for business lost due perceived length and unpredictability of journey times in the region.

While the economic impact of congestion in Enniskillen and the surrounding area is of great concern, it also has great impact on local people, in terms of time constraints and other negative externalities. Examples including noise, dirt, vibrations, toxic fumes, safety fears, loss of privacy, disruption and the need for relocation of both people and industry (Button, 1982). All of these problems would be significantly relieved by the construction of a 2km length of single carriageway road from a point just to the north of the Killyhevlin Hotel, following the route of the old Sligo, Leitrim and Northern Counties Railway line to join the A509 Cavan/Dublin near its junction with the Sillees River.

Cost-Benefit Analysis

Cost-Benefit Analysis (CBA), as defined by E.J. Mishan (1998), sets out to answer whether a number of investment projects should be undertaken and if funds are limited, which one or more of these projects should be selected, all of which would otherwise qualify. CBA is suitable for the analysis of capital-intensive projects as a means of assigning expenditure to specific outcomes of the project, depending on the level of their relative performance. With projects such as the Bypass, unless a toll is charged it will not gain monetary benefits to pay-off against the initial costs of construction or the continuing maintenance costs; other benefits and positive externalities must be assigned a monetary value in order to justify the costs, both in terms of monetary expenditure and negative externalities resulting from the project. It is in the allocation of such costs and benefits that I believe the Roads Service has not been accurate or efficient, leading to a false impression in their assessment of the need for a Southern Bypass for Enniskillen.

Proposed Costs of Investment

Georgi (1973:18-19) has defined project costs as, "the value of goods and services that are required to establish, maintain and operate a project." Scott Wilson and Ferguson McIlveen, in their original economic assessment of the Southern Enniskillen Bypass, have estimated that the total cost of the scheme, including an allowance for risk and optimism bias, amounts to £10.7m,[3] (Fermanagh District Council, 2005a) composed of construction costs of £10.1m, land acquisition costs of £0.1m and preparation and supervision costs of £0.5m. This suggests the initial cost per kilometre to be £5.35m.

This figure, when compared to the relative total cost of the Cavan Bypass at £5.59m per kilometre[4] (Finfacts, 2007) and that of the Drogheda Bypass at £6.89m per kilometre,[5] (ibid) seems reasonable. However, these totals are based on the cost of building roads in Ireland, which doubled within a few years. This fuelled large cost over-runs - 92.4% cent on the Cavan Bypass and 117% on the Drogheda Bypass (ibid). In addition, the National Development Plan 2007-2013, launched on 23rd January 2007, states that land acquisition accounts for 23% of the cost of road projects in

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[3] Mid-2002 prices
[4] Total Cost = €33m, distance 3.9Km, (1 EUR = 0.660198 GBP)
[5] Total Cost = €244m, distance 21.5km, (1 EUR = 0.660198 GBP)

Ireland. While land prices in Northern Ireland cannot be directly compared with those in the Republic, an estimation of land acquisition costs to be only £0.1m in this case seems to be an underestimate. Finally, these estimations do not encompass continuing maintenance costs of the proposed Bypass.

Proposed Benefits of Investment

The benefits of a project, as defined by Georgi (1973:19) "comprise of all the positive effects, less the negative effects, resulting from the realisation of the project regardless of whom they fall to." Barrett and Mooney (1984) have characterised three main benefits which have been quantified in studies of highway investment, namely time savings, accident reduction and vehicle cost savings. Through the following analysis, the true Shadow Prices and the overall Net Present Value for the scheme, which have been computed in the original CBA prepared for Fermanagh District Council, shall be discussed in order to gain a true understanding of whether or not the appraised project should have gained acceptance into the Transport Plan 2015.

Journey Time Analysis

"Time savings allow further activities to be engaged in." (Barrett & Mooney, 1984:22) To understand the impact that the Bypass would have on people in and travelling through Enniskillen, an analysis of journey times between the two ends of the proposed Bypass was carried out at the request of Fermanagh District Council, using the existing road structure. An approved driving instructor was commissioned to undertake 20 journeys (10 each way) from the car park at the Killyhevlin Hotel to the 40 MPH speed limit on the A509, between the 19th of January and the 22nd of February 2005. The mean journey time was 19.9 minutes. However, this was affected by a number of fairly long journey times. The modal and median journey times were both 16 minutes. The most notable feature of the distribution presented, is that 6 of the journey times (30% of the total trips) were over 20 minutes in duration and 4 (20% of the total) were over 30 minutes. The longest recorded journey, during a peak time, was 38 minutes.

These figures can be used to illustrate the journey time savings which the Bypass would bring about. Compared to the average journey time of 19.9 minutes found in the survey, driving along the Bypass would take approximately 2 minutes (2km @ 40MPH or 60KPH). The journey time saving is therefore 17.9 minutes. 2,100 journeys per day would be predicted on the Bypass if it opens, growing to 2,700 per day in the longer term (Divisional Planning Manager, 2005). The calculation of annual journey time saving, on this basis, is shown in the following table:

Table 1. Annual Journey Time Saving along Enniskillen Southern Bypass

	2100 Journeys per day	2700 Journeys per day
Average Journey Time Saved	17.9	17.9
Total Daily Journey Time Saved in Hours	626.5	805.5
Total Annual Journey Time Saved in Hours	228,672.5	294,007.5
Total Annual Journey Time Saved in Days	9,528	12,225
Total Annual Journey Time Saved in Years	26.1	33.6

Source: Scott Wilson, Ferguson McIlveen (2005) *Enniskillen Bypass: Updated Economic Assessment*

Current guidance from the Transport Plan on the value of time saved in road journeys suggests an average value of £8.65/hour/vehicle.[6] Applying this value to the journey time savings suggests an annual economic benefit of £1,975,730 on the basis of 2,100 journeys per day and £2,540,225 on the basis of 2,700 journeys per annum.

Accident Cost Savings
Accident data prepared by Scott Wilson and Ferguson McIlveen (2005) via the COBA 11 Release 6 computer model presents accident cost savings of £2.893m. This implies that while Enniskillen has a relatively low accident record, 56 collisions in 2005/2006 (Fermanagh District Policing Partnership, 2006), compared to similar-sized towns in Northern Ireland (Omagh, for example, is reported as having 73 collisions in 2005) the number of accidents will be further reduced on the Bypass. This reduction in the accident rate will be largely due to, "the reduction in the number of junctions drivers will face on the Bypass, along with the presence of a central barrier along a portion of the 2km proposed carriageway." (Department of Regional Development, 2007)

Vehicle Cost Savings
The COBA model has presented a figure for vehicle cost savings of £0.214m per annum, encompassing fuel savings. This figure is smaller than expected and could be overly conservative, due to the fact that it does not capture the extra fuel consumed by increased moments of acceleration and deceleration

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[6] Regional Strategic Transport Network – Transport Plan 2015; this figure is recommended when more accurate vehicle type information is not available

during the current congested conditions in the town (Barrett & Mooney, 1984).

From these figures, combined with an updated figure for the cost of the scheme, including maintenance costs, the overall impact of the Bypass has been calculated.

Table 2. Overall Impact of the Enniskillen Southern Bypass[7]

Benefits	£ millions
Time Saving Benefits	2.54
Accident Cost Savings	2.893
Vehicle Cost Savings	0.214
Business Benefits	18.682
Consumer User Benefits	17.34
Present Value of Benefits	41.67
Costs (Government Funding)	
Present Value of Costs	13.051
Overall Impact	
Net Present Value	28.619
Benefit to Cost Ratio	3.193

Source: Scott Wilson, Ferguson McIlveen (2005) Enniskillen Bypass:
Updated Economic Assessment

Cost-Benefit Analysis Overall Results

It can be seen that the proposed Southern Bypass would generate an overall Net Present Value of £28.619m, with a corresponding Benefit-to-Cost Ratio of 3.193. In monetary terms this means that for an investment of £13.051m, the benefits are equal to a monetary value of £41.67m. By this analysis, the benefits far outweigh the costs. In addition, it must be noted that this analysis fails to include the majority of non-monetary externalities, both positive and negative. However, due to the fact that the proposed Bypass is

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[7] COBA 11 Release 6 analysis is based on default central traffic growth and default economic growth with costs in 2002 prices. The evaluation period is 60 years, with the first scheme year being 2008. The Discount Rate is 3.5% for 30 years, thereafter 3.0% for 46 years, thereafter 2.5%.

aligned to run along the old Sligo, Leitrim and Northern Counties Railway line, it is assumed that the additional non-monetary benefits would far outweigh the further possible costs. Examples of these costs include the environmental impact, as no buildings would have to be demolished and few buildings along the old railway line will be exposed to visual intrusion (Barrett & Mooney, 1984).

Although NPV data for the further proposed schemes that have been included in the Transport Plan 2015 are not presented, it can be seen that with an NPV of £28.619m and a Benefit-to-Cost ratio of 3.19, both almost certainly understated, it is hard to imagine why the Enniskillen Southern Bypass was not included. Further analysis shows that while the other schemes could perhaps have lower NPVs, they involve a much lower initial outlay of cash. For example, Stage 3 of the Omagh Bypass requires an outlay of only £5m and Stage 2 of Strabane Bypass requires only £4m (DRD, 2005)[8]. It is the high level of initial outlay which seems to be the deterrent of the Roads Service against the inclusion of a Bypass for Eniskillen.

Alternatives to the Bypass

When the original assessment of the proposal for a Southern Bypass for Enniskillen was undertaken, 2 alternatives were studied:

- Increased expenditure in the rural public transport network.
- A toll to reduce unnecessary traffic through the county town.

Increased expenditure in the existing bus network throughout the county was turned down on three counts. Firstly, due to the high dispersion of the rural population a great hike in the service, supported by huge infrastructural investment, would have to be considered to make any sort of obvious influence on the traffic coming into the town. Secondly, despite the fact that the bus is an efficient use of road space, as Barrett and Walsh (1983) point out, with such a dispersed population as that in Fermanagh, "in the absence of a market, [the bus service] is unable to derive a commercial advantage from this efficiency" (ibid:364). Finally, an increased bus service would not address the congestion caused by the heavy transportation vehicles travelling through the town along the regional transportation corridors.

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[8] Department for Regional Development

The adoption of a toll, in line with Newberry's (1990) rationale that as road space is a scarce and invaluable resource, it should be rationed by price, was suggested as a 'quick-fix' alternative to reduce unnecessary journeys through Enniskillen. It has been calculated that a toll of £9.24 would be required to reduce traffic numbers significantly and cause average or individual cost to rise to the marginal cost of a journey. This would equate the supply and demand of available trips with no capacity in excess. It is a huge price to pay for a trip into a county town. Indeed, the daily cost into London, originally put in place by Ken Livingston in February 2003, is currently £8 (Transport for London). Therefore, it could not be expected for people entering a county town to pay even more than this.

Proposed Solution and Conclusion

Following the analysis of the original CBA, additional traffic surveys and proposed alternatives, it can be seen that a Southern Bypass is the only truly viable solution to the congestion problem in Enniskillen. The major flaw in the Roads Service's analysis of the need for the Bypass is their failure to consider it as a circular route for journeys that currently have no option but to travel through the town. In that sense their analysis does not "measure the benefits and costs to *society as a whole*," Barrett (1985:48). The fact that the Bypass will act as a circular route to traffic, needs to be further stressed to the Roads Service and backed up by empirical evidence if the scheme is to be included in the Transport Plan 2015, or in any additional plan for that matter.

Therefore, it can be seen that the most valuable lessons for those involved in the case for the Bypass is to consider the vast improvements that can be made in the Cost Benefit Analysis. The scheme represents a sound transport initiative. However, more realistic evaluation of the cost elements and ways to reduce initial cash outlay should be given priority, in order to gain consideration by the powers that be and to remind them that in such initiatives we are, "aiming for [a] Pareto optimal improvement for society as a whole…" and in the case of the Enniskillen Southern Bypass the "gainers can (indeed) compensate the losers." (Barrett, 1982:51)

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MARITIME TRANSPORT IN IRELAND: HOW PORTS CAN ENCOURAGE ECONOMIC GROWTH

JESSICA FERGUSON

Senior Sophister

Ireland's economic development has placed unprecedented pressure on the country's infrastructure. Jessica Ferguson examines the importance of ports to Ireland's economy and points out that capacity constraints are now at crisis levels. Solutions to this problem are discussed, with the Bremore proposal emphasised as the most feasible option.

Introduction

"Whosoever commands the sea commands trade; whosoever commands the trade of the world commands the riches of the world, and consequently the world itself"[1]

The gains from trade, and consequently economic growth, are well documented, empirically evident, and desirable. Yet, as Kondratieff and other economists have discovered[2], with every boom comes a downturn in a cyclical fashion that is inevitable (McAleese, 2004). Ireland has experienced major economic, social and political change in recent years. 'Peaks' and 'troughs' are readily identifiable; the recession of the 1980s was dramatically replaced by the booming 1990s, migration patterns have reversed from a position of net emigration in the eighties to net immigration today, major unemployment in the eighties succumbed to almost full employment during the mid to late 1990s, the Irish population is at its highest figure in 130 years and the future of Northern Ireland looks bright. In 2007 it is evident that another economic fluctuation has occurred; the Celtic Tiger, characterised by extraordinary economic growth rates in Ireland from the mid to late nineties, has peaked and left major implications for transport in its aftermath. This essay will look at capacity issues at Irish seaports, an indirect consequence of the preceding economic boom. Particular attention

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[1] Sir Walter Raleigh, (Garrison and Levinson, 2006:206).
[2] Kuznets, Juglar and Kitchin

will be paid to Dublin Port and remedies required to encourage Ireland into the next stage of the economic cycle.

The Irish Economy: Exports and Ports

As a small open economy, Ireland is highly dependent on trade for economic prosperity and sustainability. Exports currently comprise over 80 per cent of Gross Domestic Product (McCall, 2006). In 2005, total Irish exports reportedly reached a value of €88 billion, an increase of 4.7 per cent on 2004, (Gurdgiev et al., 2005). During its most recent peak in the mid to late nineties, Ireland's economy was growing at an annual average rate of 8-10 per cent – a figure perfectly exemplifying the results achievable via openness to international trade. A good quality infrastructure system is also a crucial prerequisite[3] for such healthy economic performance. As an island located on the periphery of Europe's lucrative market, Ireland has a particular interest in maritime transport. McCall (2006) and the Department of Transport (2005) both believe that 99 per cent of Ireland's foreign trade uses *"the maritime supply chain"* (Department of Transport, 2005:10). Given Ireland's location, it is clear that ports, being the essential link between sea and land transport, play a vital role in Ireland's trade activities and hence its economic growth.

The Ports Defined: Role, Purpose and Performance

Ports, by definition, are *"bi-directional logistics systems"* (Paixão and Marlow, 2003:358), receiving goods from ships, transporting them to land, and vice versa. They are the central link in complex supply and logistics chains (Banister et al., 1995). The explicit role of a port is to provide berthage, pilotage, towage, stevedore services and terminal and handling facilities (Mangan and Hannigan, 2000), consequently enhancing competitiveness and facilitating business flexibility and adaptability (Paixão and Marlow, 2003). Transport has a limited intrinsic value but accommodates the performance of other activities (Barrett, 1982). While ports cannot guarantee an economy's prosperity, they do support its growth indirectly (Cole, 2005).

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[3] Other prerequisites may include FDI (Foreign Direct Investment), political and constitutional stability, labour market flexibility, a highly educated, quality workforce, technological innovation, favourable taxation schemes and more.

The Irish Maritime Development Office (IMDO) has praised both large and small Irish ports for their record performance and contribution to trade in recent years. They handled an astonishing 84 per cent of the total volume and 58 per cent of the total value of trade in 2004 and managed to improve on that in 2005. The Central Bank suggests 2006 and 2007 will produce figures mirroring this positive. These figures and predictions indicate that efficient handling and management of trade flows at Irish ports is a crucial contributor to Ireland's competitiveness and economic performance (Gurdgiev et al., 2005).

A Capacity Crisis

One important consideration arising from these optimistic outlooks for the future is capacity. Economic growth has been the norm rather than the exception in developed economies since the industrial revolution (McAleese, 2004). The positive, welfare enhancing results of the Celtic Tiger have led to externalities aplenty; congestion, bottlenecks and capacity problems are consequences that have the potential to damage the Irish economy's performance.

The Deterministic Model of Congestion

Capacity in a transport system can be illustrated by Figure 1. The 'deterministic model of congestion' (Vanags, 1977, as referenced in Brooks et al., 2002) treats the throughput of a port as if it were a flow and relates the output of the system to the cost of producing it[4].

The three variables of the model are:

q = rate of flow
T = average time spent in the system
D = average density of traffic in the system

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[4] The costs, in this case, are time costs

Figure 1. Vanags' Model
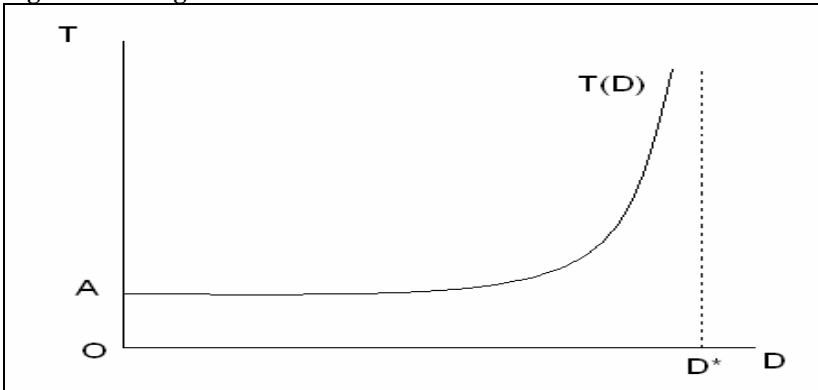
(Vanags, 1977, as referenced in Brooks et al., 2002).

OA is the time spent in the system under perfect conditions, i.e. when density is zero or very low. As density increases, T increases. D* is the system's maximum physical capacity, and as D tends towards D*, T increases without bound.

Ireland has approximately 30 ports, yet 80 per cent of trade flows through just four key ports, namely Dublin, Cork, Shannon and Rosslare (Mangan and Hannigan, 2000). In their Trade and Transport Study 2005/2006, the Irish Exporters Association warned that Ireland's ports are at risk of a capacity crisis as trade flourishes[5]. They believe port capacity, particularly at Dublin port, will literally run out sooner than expected[6]. Enda Connellan, chief executive of Dublin Port, has already been forced to turn customers away due to the capacity issues at the port (O'Brien, 2006). Both Irish Ferries and Stena Line predict growth rates of about 5 per cent for their freight service this year, a strong pace that will only intensify capacity dilemmas. IBEC's transport director, Reg McCabe, has also stressed the likelihood of "bottlenecks in the Republic's ports, which are struggling to handle record freight volumes" (McCall, 2006:24). This has been echoed by The Economist Intelligence Unit in their Country Profile (2006). Independent research conducted by Baxter Eadie Ltd. and ORM Consulting in 1998 and 2000 produced results reiterating this problem, specifying that key ports would experience major shortfalls (as referenced in Department of Communications, Marine and Natural Resources, 2005).

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[5] Total volume of international trade (imports and exports) is increasing by approximately 10 per cent
[6] i.e. capacity at Dublin Port is tending towards D*

The Future of Exports, Ports and Economic Performance

If Irish exports are to follow the global incremental trend, the capacity issue needs to be addressed immediately and resolved adequately, otherwise our international competitive position will be jeopardised. A capacity crisis will essentially increase the cost of doing business, thereby reducing productivity, efficiency and economic vitality. We are essentially victims of our own success, and the capacity problem is an urgent matter of concern if Ireland is to progress into the next economic era successfully.

> Hindsight may allow us to determine the future stance of congested ports. When tackling the capacity problems, reflecting on history and preceding trends is a valuable exercise as it can potentially steer us from errors in the future (Baker, 1999).

Transport Standards and Economic Performance

Higher living standards typically persuade heavy investment in transportation (Fromm, 1969). In Ireland, this was first witnessed in the 1950s as the country realised it had an under-developed transport system in conjunction with a developing economy. This led to the formation of the Industrial Development Agency (IDA) and other semi-state bodies that encouraged industrial growth. Ireland now experiences vibrant economic growth alongside insufficient investment in transport, resulting in congested facilities, bottlenecks and capacity problems around the country.

Some Additional Considerations

As Cole (2005) reminds us, a high quality transport system and more efficient and competitive ports, cannot in isolation guarantee future spells of economic growth[7]. In addition, the amplitude of economic fluctuations of recent times actually appears to have diminished in magnitude (McAleese, 2004).

Nevertheless, with globalisation, more countries are joining the World Trade Organisation, businesses are increasingly adopting 'just-in-

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[7] Ireland currently suffers from high inflation reflected in astronomical house prices and escalating household debt, social problems such as increasing crime rates and a widening gap between the rich and the poor, and an inadequate health service, all of which may also restrain economic progression.

time' practices (Gordon, 1991) and consumers are becoming wealthier. There is substantial and sustainable demand for port services, the nature of which inspires economic growth. In reality, recent rapid economic growth is putting severe pressure and strain on infrastructure. The actual effects a downturn, however subtle today, could still have detrimental consequences (McAleese, 2004; Baker, 1999).

Resolutions: Implemented and Proposed

Ports Policy Statement 2005

Given the importance of the ports to the economy, the Irish Government launched the 2005 Ports Policy Statement which acknowledges the capacity concerns and proposes to encourage the following:

1. Private sector investment and involvement in the state owned ports in an attempt to enact the desirable 'landlord' model.[8]

2. Healthy competition within and between ports.

3. Mergers where plausible.

4. A more integrated transport system to facilitate the ports in linking sea and land transport.

5. Increased consultation and negotiation between port stakeholders and the Department of Communications, Marine and Natural Resources and the Department of Transport.

However, the IEA has expressed scepticism towards the Government's 2005 statement due to long lead times that are to be expected with development programmes.

Alexandra Road Extension

The Dublin Port Company has tried to relieve its capacity problems by applying to develop a 21-hectare site, namely the Alexandra Road Extension. However, the project has been plagued by delays in issuing the necessary licence, effectively adding insult to injury (The Irish Exporters Association, 2005).

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[8] A mix of public and private ownership and operation (Department of Transport, 2005)

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Containerisation
In retrospect, containerisation has been one of the most influential advancements for the maritime industry. It has revolutionised the operation of ports by reducing transfer times, damage, theft, labour costs, administration and paperwork, and also increasing handling abilities and scale economies (Kraft et al., 1971).

Ro-Ro, Lo-Lo, Speed and Capacity
Ro-Ro (Roll-on, Roll-off) and Lo-Lo (Lift-on, Lift-off) technologies, as well as increases in ship capacity and shipping speed, are other innovations that have advantageously influenced the maritime industry.

Bremore
In order to overcome the capacity problems at the ports today, perhaps a more radical and dramatic step is required. The Progressive Democrats (PDs) have an ambitious solution – relocate Dublin Port to Bremore (Logue, 2006). The proposed project, titled *A New Heart for Dublin*, could generate many benefits for Dublin Port, Dublin city, its commuters and the economy as a whole. At its new Bremore site, Dublin Port would benefit from:

1. A site capable of significant expansion.

2. Deepwater port facilities.

Larger modern vessels require sufficiently dredged facilities to promptly manoeuvre in and out of ports. The optimal ship size is defined at the point where cost per ton, at sea and in port, is at a minimum (Jansson and Shneerson, 1982, as referenced in Brooks et al., 2002). Deciphering the optimal ship size is an important and rational economic task for ship owners and port operators alike. The Bremore Port claims to have the ability to accommodate these larger vessels.

Excellent transport links such as the M1 and the nearby Dublin-Belfast rail line and M50. These inland connections are crucial to the swift flow of traffic from sea to land and vice versa[9]. Landward infrastructure, in effect, extends and assists the services a busy port provides. Ports benefit greatly from multi-modal transport combinations. Meanwhile, the current

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[9] Ireland's largest ever infrastructure project developed from the importance of hinterland to a port. The Dublin Port Tunnel, which opened to traffic on the 20th of December 2006, was a Government initiative aiming to improve the commute from Dublin Port to the major motorways and surrounding hinterland, and vice versa, to reduce traffic congestion in Dublin's city centre. The Dublin Port Tunnel effectively acts as an ancillary service, enhancing Dublin Port's overall service provision.

site of Dublin Port would be transformed into a 'Manhattan-style skyline' (Logue, 2006:26) and would be redeveloped for valuable residential, commercial and recreational purposes.

The PDs' suggestion has received support from the Taoiseach (Logue, 2006), Dublin Transport Office, Irish Road Hauliers' Association, Chambers of Commerce of Ireland, Dublin Docklands Development Authority and Dublin City Centre Business Association.

A New Heart For Dublin also has its opponents, such as the Minister for Communications, Marine and Natural Resources, Pat 'The Cope' Gallagher, who has no intentions to relocate Dublin Port, and IBEC's transport director, Reg McCabe, who believes the move would be "an almighty risk" (Logue, 2006:26).

The Bremore proposal: Costs and Benefits

Any investment in transport should ideally be accompanied by and based on the results of a thorough cost benefit analysis. It is common to see infrastructure projects run over budget and over time, as was the case with the highly anticipated Dublin Port Tunnel for example. Given the significant role of Dublin Port in the economy, and its strategically attractive location at the hub of economic activity, deems the Bremore move the perfect candidate for extensive cost benefit analysis.

Costs
The costs of such a project would no doubt be immense. Notwithstanding that, the social costs must be considered via shadow prices which adjust the market by including factors such as:

1. Devaluation of residential property at Bremore, and the nearby Balbriggan, as a new port arrives on their doorstep.

2. A build-up of traffic at Bremore and surrounding areas. Dublin's road congestion problems, namely trucks clogging up the city centre streets due to business at Dublin Port, will be transferred to Bremore as a result of the port's relocation.

3. The Dublin Port Tunnel will become obsolete as its main focus. The trucks who commute to and from Dublin Port would now operate primarily out of Bremore.

4.   The immense inconveniences due to construction and diversions over the estimated 20 years it will take to complete the relocation.

5.   The possibility that the port at Bremore could face premature obsolescence if it does not thoroughly consider the future potential of ship size development and thus cannot accommodate an increase in the future.

Benefits

Despite these costs, both social and monetary, the benefits to be sought from this large deepwater port are very appealing and potentially revolutionary. In some respects, the move to Bremore is just what Dublin Port and the Irish economy require. As the IEA and many others have expressed, the lack of adequate capacity at key ports will be the biggest challenge for the export industry in the short to medium term. The Bremore proposal would, undeniably, be a huge scale project carrying a lot of risk and expense. Equally, it could prove to be Dublin Port's saviour and the perfect stepping stone towards economic prosperity and competitiveness.

Conclusion

The key ports around Ireland play a fundamental role in the conduct and accomplishments of the Irish economy. They handle a significant and increasing proportion of the volume of trade travelling by sea. Given their record performance in recent years alongside the Celtic Tiger economy, the ports have now realised a capacity crisis. Their amenities are being so intensively utilised today in response to a dynamic economy that they may struggle to perform in the future.

Kondratieff explored the notion of cycles and fluctuations in business and economics. Schumpeter [10] added to his discoveries with theories of innovation. In order to nurture and sustain the future of ports, especially the most congested, Dublin Port, radical innovation is required. Remedies such as the Ports Policy Statement 2005 and the Alexandra Road Extension are rife with typical planning delays and long lead times. Past inventions in the maritime sector such as containerisation, Ro-Ro and Lo-Lo, have been

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[10] Joseph Schumpeter, an Austrian economist. His famous theory of innovation and entrepreneurship can be found in his 1939 Business Cycles, in which he builds on Kondratieff's waves of economic growth by hinting that 'clusters' of innovations spark long term economic growth.

beneficial but new issues need to be addressed. I conclude that the PD's Bremore proposal has much appeal. In relation to Kondratieff and Schumpeter, it may prove to be the right innovative ingredient to see the ports and the Irish economy exist prosperously and successfully in the next stage of the economic cycle.

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THE CONGO WAR: ECONOMIC CAUSES AND CONSEQUENCES

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The causes and consequences of civil war are varied and complex. Using the modern Democratic Republic of Congo's recent war as a case study, Rob Quinn approaches this issue of modern civil conflict from an economic perspective. He examines the issues that create and influence such conflicts and employs the 'Collier model' to assess the ensuing economic consequences. He argues the case that there is a link between the causes of war and poverty and as such there is an economic facet to the prospect for peace in the DRC.

Introduction

"The Heart of Africa" is a title the Democratic Republic of Congo (DRC) should justifiably claim. Geographically huge, bordering nine other countries and drenched in mineral wealth the DRC has the potential to be a catalyst for prosperity across the continent. Sadly, this behemoth nation has come to embody everything that has gone wrong since Africa's wave of independence. Chronically mismanaged for decades, the DRC is one of the poorest places in the world. Its Gross Domestic Product (GDP) per capita of $100 (International Crisis Group, 2006) is a telling sign of the conditions in which its populace live. However it is an even grimmer reality that has defined Congolese lives this past decade. Between 1998 and 2003 the country fell victim to one of the bloodiest wars since World War II, which claimed 3.9 million lives, and continues to kill another thousand each day through the conditions it has created (Roberts, 2003). Regional, national and international armies clashed for five years, competing over security, political and ultimately economic interests. The country was brought to its knees. The gruesome acts of savagery committed by all sides harking back to an era when colonial brutality moved the novelist Joseph Conrad to describe the DRC as humanity's "Heart of Darkness" (Conrad, 1902).

The DRC war underlines a trend that has emerged in recent decades; the movement from international, high tech wars for ideals, to ones that take place in the confines of a single country with little to motivate those that fight them, other than a lack of alternative opportunities and riches from resource rents (Watkins et al., 2005). Lack of opportunity, or utility, suggests a link between poverty and war. As such, this essay seeks to qualitatively evaluate the

economic issues that create and influence modern civil conflicts, using the DRC's recent war as a case study. Part one gives a brief account of the events that lead up to the Congo war in 1998, describes the actors involved and their motives. Part two evaluates the effect that the war has had on the Congolese economy using the Collier (1999) model of the economic consequences of civil war. The final section discusses the core causes of violent conflict and further problems accumulated during war, applying them to the DRC.

The Emergence of Economic Agendas

The DRC's people have suffered from the richness of their resources for close to 150 years. Estimated to possess half of the world's coltan reserves, the DRC also holds significant diamond, copper, zinc and gold deposits. During the late nineteenth century through to 1963, when independence was gained, the Congolese were brutalised by their Belgian occupiers and used as slaves to mine the rich mineral seams that litter the country, especially in the east and south (Meredith, 2005). Post independence, the country was ruled by Joseph Desire Mobutu, the central source of power in the DRC (renamed Zaire) for over three decades. Mobutu's regime was characterised by patronage, corruption and economic mismanagement so acute that it weakened the DRC's institutions and economy to the point of collapse (Wrong, 2002). The Human Development Report 2005 characterises governance issues in resource-rich states that mirror the DRC's woes, post Mobutu. Owing to the huge windfalls accruing from natural resource rents, the Mobutu regime became completely unaccountable to the electorate with no incentive to diversify economic activity or establish a tax base. Gécamines, the copper producing parastatal, offers a perfect example; it brought the government 50%-80% of its revenue between 1960 and 1975 (Nest, 2006). Incentives for off budget activity also fester where resource rents are available (Watkins et al., 2005), as was the case in Zaire. The result: a weak and predatory state with little capacity or legitimacy to govern.

Mobutu was ousted in 1996 by a Rwandan orchestrated coup and replaced by the warlord Joseph Kabila. Kabila soon proved hostile to his allies, fostering former Hutu militia from the Rwandan genocide of 1994 in the forests of Eastern Congo, whilst arbitrarily distributing resource concessions that further disabled the economy. In August 1998, Rwanda simultaneously invaded with her own army whilst funding a newly formed pro Rwandan rebel movement, the RCD. [1] Uganda followed suit, allied with a northern rebel movement named the MLC [2], composed of disenfranchised Congolese

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1 Rassemblement Congolais pour la Démocratie.
2 Movement for the Liberation of Congo.

businessmen. The DRC government's plea for help was answered by Zimbabwe and Angola. Thrown into the mix were the Mai Mai; a nationalist, inter-ethnic, crudely-armed militia determined to expel any foreign force (International Crisis Group, 1998). Eighteen months and millions of civilian deaths later, a stalemate was reached, the DRC roughly divided between west (the government side) and east (the rebels). Starved of cash, all actors began to seek means of funding their military campaigns that would provide quick return for minimum effort. A series of economic agendas emerged that converted motives from military funding into private gain (Nest, 2006).

Each actor in the conflict raised funds using different means and patterns of leadership. Rwanda, in control of the coltan-rich Kivu regions, integrated a commercial wing into her army. Known as the Congo Desk it netted the government \$340 million between 1998 and 2000 (Ba- N'Daw, 2001). The RCD, complicit in Rwanda's activities, extorted from the local populace, through control of a number of trading routes which it taxed heavily. Uganda's operations further north came under the discretionary control of high-ranking army individuals. In co-operation with the MLC, the UPDF[3] organised security and logistics for a number of mining areas, exporting minerals through Uganda and controlling strategic border towns where any trade was taxed.

Kabila's administration benefited from international recognition that allowed it to fund raise by distributing mining concessions in the areas still under its control. Easily taxable items such as gasoline were heavily marked up while widespread state sponsored predation kept the government army in AK-47s and government ministers in pink champagne (ibid). In return for their military support, Zimbabwe and Angola were given rights to exploit resource-rich regions. Zimbabwe set up multiple operations in the diamond and copper rich Katanga province (Nest, 2006). Angola's economic and military agenda was limited. Most disorganised in their methods were the Mai Mai militia. Internally fractured and militarily unsophisticated, the Mai Mai operated by looting the population and fighting for control of taxable trading routes.

Since the deployment of a UN peacekeeping force (MONUC) and the formation of a transitional government in 2003 that included all rebel actors, the DRC has enjoyed relative peace, albeit with negative side effects (Grignon, 2006). The economic agendas that sprouted during the war remain as they entrench interests at odds with the building of a functioning state and economy. Added to this, the country is economically worse off than when the war started.

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[3] Uganda People's Defence Force.

Economic Dimensions of the Post Conflict Environment

Civil conflict results in the destruction of all forms of capital (Collier, 1999). Social capital unravels as businesses behave opportunistically to achieve short term gain. Human capital suffers as people are killed, maimed and displaced. Physical capital is destroyed as buildings are demolished, land planted with mines and equipment looted.

One way to judge the actual effect of capital destruction on GDP is to apply the Collier (1999) model of the consequences of civil war on capital efficiency and quantity. The model divides factor endowments into two types. Firstly stock levels are endogenous to war as they can easily be transferred abroad e.g. livestock, skilled labour, raw minerals; other forms are exogenous e.g. land, unskilled labour. The following Cobb Douglas function in equation 1 depicts an economy's output by endogenous (N) and exogenous (X) factors:

$$Q = a.X^b.N^{1-b}$$

The endogenous factor's rate of return is given in equation 2 by its marginal product minus the depreciation rate (d). The capital stock is in equilibrium where endogenous factors' rate of return equals its rate of return abroad (r):

$$(1-b).aX^b N^{-b} -d = r$$

In times of war, an economy's output will see a reduction for three reasons:

1. The multiplying power of the constant *a* falls as aspects of doing business such as transaction costs increase. During the DRC war, most trading routes came under the control of belligerents who exacted a toll, often arbitrarily. This fundraising tool, particularly used by the Mai Mai militia raised inhibited trade over long distances. For twelve months from September 1998 the Congo River, a crucial trading artery, was closed to commercial traffic and resulted in higher transport costs.

2. Depreciation increases owing to the destructive effects of war. The Katanga and Kivu regions of Eastern Congo are currently operating at 10% of the agricultural output they enjoyed before Mobutu's deposition (Nest, 2006). This resulted from the persistent looting of equipment and the scorched earth policies employed by many belligerents. A more subtle but compelling destructive effect has been a fall in primary school enrolment rates by over a third since the war began (Watkins et al., 2005) and a leap in numbers of "kadogos" or child soldiers (Tuquoi, 2007). More soldiers mean more immediate

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depreciation since resources to re-integrate them post war are diverted from more productive use.

3. Assets are more liquid in the developed world, given the strength of laws such as property rights. The uncertainty generated in a war zone places a premium on liquidity and capital flight will take place. The DRC's mining sector, in spite of being subject to much economic activity, has suffered as a result of this aspect of civil war (Ba- N'Daw, 2001). International and internal actors have repatriated vast quantities of raw minerals abroad where it can be easily sold for cash out of other countries not at war. As such the country's stock of mineral deposits and capacity to exploit them has diminished.

Given the estimate that violent conflict reduces an economy's growth rate by 2.2% annually (Collier, 2005) the DRC has suffered an exponential loss during the past decade. Its GDP shrank by 7% and inflation rose to 511% in 2000 (Kisangani, 2006). Since 2003, the IMF has introduced stabilisation policies that have brought about growth (7% in 2005) and halted inflation. However, this belies the government's dependence on aid and increased fiscal control of the formal sector rather than increases in production (International Crisis Group, 2006). The deterioration of the country's capital stock and reduced ability to use what is left due to the destructive and disruptive effects of war have accrued to a sizeable human development cost. The DRC's infant mortality rate is double the African average of 10% (Watkins et al., 2005). Its Human Development Index currently languishes around 167th, tenth from bottom (ibid, 2006). Whilst the challenge to achieve lasting economic growth that results in human development for its people is any impoverished economy's principal objective, the stakes are particularly high in Central Africa. Little guarantee of peace, let alone growth and development exists if the conditions that Congolese people live in do not improve. Increasingly the causes of war and poverty are linked, nowhere more so than in this region.

Core Causes and Continuing Risks

Studies of post conflict settings show that for up to five years after hostilities have ended, a nation has a 50% chance of reverting to war (ibid). The problems that brought about conflict in the first place may remain. Collier (2006) names some general causes of civil war in developing countries, three of which were present in the DRC in 1998. The first is economic underdevelopment; where poverty and inequality are rife it is easier to give idle hands guns to wield. Secondly, slowing economic growth results in unrest among the population and

provides ample ammunition for rebel groups to dispel faith in governing institutions' integrity and competence. Finally, as has been mentioned, easily captured resource rents make governments less accountable and effective whilst giving profiteers an incentive to fight. Being an economist, Collier presents economic reasons for the cause of civil war and it should be noted that situation specific security risks and ethnic tensions also contributed to the DRC's pre-conflict woes. However, the accentuated nature of each of these general economic issues (negative growth and 10th lowest HDI in 1998 added to huge mineral wealth) makes them priorities for peace in the DRC.

Just as the causes of war remain, the post conflict setting is further marred by negative factors acquired during hostilities; societal polarisation and lack of incentive to give up fighting (Collier, 2006). Understandably, bitter hatreds and grievances emerge in bloody parts of the world, and in this respect nowhere has matched the DRC since 1945 (Roberts, 2003). Furthermore, key actors that stand to lose their economic interests are unlikely to make peace, just as those that fight for them know little else as a way of life.

Since 2003, political progress in the DRC has dispelled some of the volatile bitterness so capable of provoking bloodshed. The country's first democratic elections in forty years, that took place in August 2006, were relatively peaceful and the government at present is reasonably inclusive of all sides previously involved in the fighting. However, inclusion comes at a cost. Lack of discussion about economic agendas during the peace process contributed towards legitimising the actions of rebel groups exploiting natural resources (Grignon, 2006). Proof of continued international interests and meddling is represented by neighbours' exports of resources they do not possess (but the DRC does). Uganda exported $58 million worth of gold in 2004 in spite of pre war annual exports of $50,000 (International Crisis Group, 2006). The DRC is also estimated to be losing up to 80% of its cross border taxes, currently the government's largest source of revenue owing to embezzlement and inefficiency in the collection system (Degeune, 2005). Though these practices emerged as a means of funding military campaigns, their continuation suggests motives for self-enrichment. The actors involved have been legitimised, wartime rebel and government leaders forming the transitional government and then becoming elected members of parliament. The illegal mining and cross border extortion they undertook in the past now falls into the category of institutional corruption. Given the government's desperate need for funds, such corruption leaches the fragile state's capacity and legitimacy to govern, potentially compromising the peace. Poorer than it was in 1998, still resource rich and hampered by entrenched interests, the DRC's core causes of conflict remain.

Conclusion

The Human Development Report 2005 finds that nine of the ten lowest ranked countries by HDI experienced violent conflict in the past decade (Watkins et al., 2005). This link is graphically illustrated by the DRC war, where economic agendas contributed to, and prolonged hostilities. The clear motives of all actors to acquire rents from resources and taxation, present both a cause of the war and a disrupting factor in the post-conflict environment. As such, the DRC's acute and worsening poverty levels since 1998, and the contribution of underdevelopment to violent conflict indicate the importance of economic policy and management toward achieving peace. Just as natural resources provoke war, they also present an opportunity. The DRC's abundant reserves of minerals and metals contain enough value to help the country's economy develop infrastructure, provide health and education, encourage private investment and create employment. It is the question of their distribution that hangs an entire population in the balance between war and peace.

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LESSONS FROM THE AMERICAN AUTOMOTIVE INDUSTRY

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As part of the largest manufacturing industry in the US, and one of the largest in the world, the global influence of American Automotive companies cannot be underestimated. In this essay, William Aherne describes the evolution of the industry from the 1900s with particular reference to the 'Big Three'. The potential profitability and cost structure employed by firms in the industry are outlined. Finally he examines the difficulties faced by American firms as a result of competition from imports and concludes that unfairly-priced imports are likely to reduce the U.S. share of the domestic market.

Introduction

The history of the indigenous companies in American automotive manufacturing reflects the growth and decline of one of the world's largest manufacturing oligopolies. It involves factors affecting many companies in other industries today; increased competition due to globalization, changing environmental regulations, legacy issues and new technologies.

The US automotive market has changed dramatically, with the indigenous 'Big Three', General Motors (GM), Ford and DaimlerChrysler (hereafter Chrysler), losing market share, mainly to Asian manufacturers. Until the 1970's, these companies (in particular GM) dominated world automotive trading. However along with other American manufacturers in the industry, they are now experiencing trading difficulties.

Background

1900 to the 1970's

Until the early 1970's, the history of the U.S. automotive industry followed the growth path of many large corporations in the U.S. To avail of the economies of scale, a process of continuous consolidation took place as the market moved away from Imperfect Competition where according to

AAMA[1], there were more than three thousand makes of cars and trucks built from fifteen hundred identifiable manufacturers, to the state of Oligopoly with 3 manufacturers in the 50's, 60's and 70's.

In the early phase of the industry, GM, Ford and Chrysler, quickly established overseas operations, principally in Europe, the other potential mass market. The development of the mass production assembly line by Ford in 1910 facilitated the establishment of offshore plants to service local markets. GM and Ford began the export of 'Completely Knocked Down' kits as part of a strategy to avoid protectionist tariffs. Ford established subsidiaries in Europe, while GM expanded through acquisitions (e.g. Vauxhall in England 1926, and Opel in Germany 1929). Over the following decades, the European operations of both companies went on to develop local supply chains, so that by the 1960's the European operations were largely autonomous (Moavenzadeh, 2006).

By 1955 the consolidation of the industry in the U.S. was attracting the attention of legislators. The Senate Committee on the Judiciary, Subcommittee on Antitrust and Monopoly, heard evidence on GM's antitrust activities. In 1957, the U. S. Supreme Court ruled that the 23% stock interest DuPont held in GM violated Antitrust Law and as a result DuPont, GM's largest shareholder, divested its stock in 1961. DuPont had held the stock since 1918 (GM, 2007).

The United Auto Workers (UAW) union was formed in 1935 and began organising unskilled workers, an innovative approach for its time. The union forced recognition from GM and Chrysler in 1937, and Ford in 1941. The combination of the post-war demand for cars, the oligopoly of employers, and the strong union, enabled the UAW to negotiate favourable pay and working conditions, including fully paid hospitalisation, sick leave benefits and pensions. The cost burden of those benefits are now legacy issues for the Big Three which they allege are making them uncompetitive against overseas manufacturers, including those who have built plants ('transplants') in the U.S. (Cooney and Ycobucci, 2005). Though most transplants are non-union operations, they provide an equivalent level of benefits but they do not face the burden of healthcare and other benefit costs for older workers (ibid). The Big Three have been locked into multi-year labour contracts with the UAW that require them to support laid off workers at 95% of salary, plus benefits (ibid).

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[1] The American Automobile Manufacturers Association was dissolved in 1998, when the merger of Daimler Benz and Chrysler rendered unviable its "American" exclusivity

1970's to date

The global automotive industry, prior to the 1970's oil shocks, was concentrated in the two large markets of America and Europe and the emerging market of Japan. There was little trade in vehicles between those regions. Following the oil shocks, the Japanese and European carmakers started to make an impression on the U.S. market, selling cars with greater fuel economy than U.S. models (Moavenzadeh, 2006:16).

By the mid-1970s, the Big Three were clearly high in cost and poor in product quality; the U.S. had in fact been a net importer since 1957. Nevertheless, foreign firms were slow to enter the U.S. market as it was costly to set up a national dealership network, while Americans favoured cars much larger than those driven by the Japanese or Europeans. Until the oil crises of 1973 and 1979 their sales never exceeded 10% of the market and were typically much less. However, the shift in demand toward subcompacts following the oil crises, led to a flood of imports (Smitka, 1999:5).

In the early 1980's the Big Three and the UAW pressured the U.S. government to protect the U.S. market from Japanese competition. In response, the Japanese Ministry of International Trade and Industry (MITI) announced a Voluntary Export Restraint (VER) that limited Japanese exports of vehicles to the U.S. The consequences were completely contrary to U.S. interest and unforeseen by the Big Three and the UAW. The VER had provided an incentive for overseas manufacturers to open plants in the U.S., since the restraints only applied to imports and not to vehicles built in the U.S. Furthermore, the VER provided an incentive to move upscale and develop luxury vehicles for the U.S. (e.g., bringing Acura, Lexus and Infiniti to the U.S.). The Japanese manufacturers also reaped profits estimated at $4-$7 billion per year for 1981 to 1985 on their high-demand, VER-limited-supply vehicles which were in effect a tax on American purchasers. (ibid:6)

The increase in the number of 'transplants', often located outside the traditional Mid Western automotive industry regions, was also driven by other factors; reduced currency risk where weakening of the dollar made foreign purchases very expensive for U.S. customers, transporting finished vehicles is more expensive than transporting components, and locating a plant in the U.S. offers political leverage because of the large direct employment and larger indirect employment levels (Moavenzadeh, 2006:33).

The 1990's also saw the transfer of vehicle production to Mexico and Canada after the North America Free Trade Association agreement came into force in 1994, although U.S. vehicle production still reached a historic record in 1999 and 2000. As of October 2006, the Big Three had 35 plants in the U.S., 7 in Mexico and 5 in Canada (ibid:21). Out of the total automotive

imports of \$124 billion in 2005, \$35 billion came from Canada and \$10.8 billion from Mexico (ibid:38).

The U.S. automobile market is still dominated by the Big Three, who currently make approximately 62% of units sold. Eight Asian suppliers account for approximately 33% of units sold, and three German manufacturers for approximately 5% of units sold. In the sub category of light trucks or SUV's the Big Three corporations have an even stronger position producing 74% of the vehicles sold.

Table 1. Percentage Market Shares for the Big Three

	Unit Sales 1979			Unit Sales 2003		
	Cars	Light Trucks	Total	Cars	Light Trucks	Total
GM	45.90%	41.00%	44.80%	25.70%	30.50%	28.30%
Ford	20.00%	34.40%	23.60%	15.40%	25.10%	20.70%
Chrysler	10.90%	11.20%	11.00%	6.00%	18.50%	12.80%
Big Three	76.70%	86.70%	79.40%	47.10%	74.20%	61.80%

Historically, Original Equipment Manufacturers (OEMs) and automotive suppliers have not considered the after-sale market as a reliable source of revenue. However, as the number of light vehicles on U.S. roads increased to over 213 million in 2000, and the average age of a passenger car increased to 9.0 years in 2000, up from 7.6 years in 1990, the importance of the after-sale market has increased. In addition, people are travelling further and more frequently; miles travelled and the numbers of vehicle trips are increasing. As the sale of after-sales service and parts has been estimated to amount to 20% - 24% of the value chain of the vehicle that is an important factor (McAlinden and Andrea, 2002). While large trucks have progressed toward a more open architecture and modular design, cars have a largely closed architecture because the integral design compels the use of non-modular components. This in turn supports the future demand for specific components for that vehicle (Moavenzadeh, 2006:9).

Prior to 1990, the practice was to manufacture all components within the OEM group but in the late 1990's GM and Ford, spun off the Delphi and Visteon parts divisions respectively, whereby the parts divisions obtained a stock exchange quotation and the shares were distributed to the shareholders in the parent company. Delphi filed for bankruptcy in 2005 after substantial losses (Schoen, 2005).

The provision of loans to customers to finance the purchase of vehicles is now an important source of profitability for the OEM, and

enabled Ford to earn a profit in 2005 despite making a loss on manufacturing.

In addition to changes in the value of different components in the value chain, the relationships between the OEMs and other participants in the market are also changing. The relationship between manufacturers in the industry has become complex and is rapidly changing with technology; product development agreements, shared platforms, minority equity holdings, controlling equity stakes, and mergers and acquisitions (Daimler Benz and Chrysler, Ford and Jaguar, Ford and Volvo). This leads to complex ownership and control structures.

The industry is also developing new relationships with many Tier 1 suppliers (i.e. supply directly to the OEM). Such suppliers are now undertaking sub-assembly contract manufacturing and engineering design work for the OEMs. This blurring of the lines between OEMs and suppliers is reflected in DaimlerChrysler's Supplier Park in Toledo, Ohio, where the 2007 Jeep Wrangler is manufactured by three suppliers with facilities located on site. The concept, called 'modularisation', allows the OEM to have much of the sub-assembly work done by less expensive labour and UAW has accepted that labour will be drawn from currently unemployed auto workers (Cooney and Yacobucci, 2005:42).

The industry became less concentrated between 1979 and 2003, with the Big Three taking a smaller percentage of the market in every category, other than DaimlerChrysler's slightly increased share of the Light Trucks market. The 17.6% market share lost by the 3 corporations was taken almost entirely by Japanese suppliers, Toyota, Honda and Nissan, between them up 13% in market share, from 11.1% in 1979.

No major automobile manufacturer has exited the industry in the U.S., although Chrysler got into financial difficulties in 1980 and had to be rescued by government intervention in the form of Federal Guarantees for its debts. Within three years, Chrysler had paid off its loans and the federal government sold at a substantial profit the warrants it had required on Chrysler stock as collateral (ibid:55).

New entrants to the market have entered by way of imports or the establishment of transplant operations. There are currently 17 transplants in the U.S., 14 Japanese, 1 Korean (Hyundai) and 2 German (Mercedes Benz and BMW), representing an investment of over $27 billion and employing 65,000 (ibid:16).

Profitability

Legacy Costs and Operating efficiencies

The ability of overseas manufacturers, particularly Japanese manufacturers, to earn a return on their investment in the U.S, has been reviewed by the Congressional Research Service, which identified two principal areas of interest, legacy costs and operating efficiency.

> [On legacy costs], an *Automotive News* article…stated that GM paid for the health care of 339,000 retirees, accounting for more than two-thirds of GM's $5.2 billion spending on health care (and not counting a $9 billion contribution to a trust fund for health care costs). Ford spent $2 billion on retiree health care in 2004, and the Chrysler Group spent $1.3 billion. By comparison, Toyota's employees in Japan are switched from the company health care plan to a national health care system within two years of retirement; the company is thus responsible currently for the retiree health care coverage of only 3,000 persons in Japan. (ibid:44)

The Big Three and the UAW challenge the view that Japanese operating systems such as kaizen and kanban are more efficient.

> But a study by the Harbor automotive consulting organization, which surveys plant efficiencies every year, reportedly found in June 2004 that manufacturing inefficiencies contributed to an average loss by Ford of $48 on every vehicle that it produced in North America, while Nissan, the industry leader, had a profit of $2,402 per vehicle, and Toyota followed with a profit of $1,742 (ibid:39).

Credit Incentives and Price Discounting

After a slump in cars sales, due in part to September 11th 2001, GM engaged in price discounting and provided credit incentives. Maintaining sales levels was particularly important for the Big Three because of the 95% salary support in their contracts with the UAW (ibid). GM's campaign turned out to be very successful. Ford and DaimlerChrysler pursued the same strategy. This change coincided with the opening of new highly efficient manufacturing plants in the U.S. by European, Japanese and South Korean automotive manufacturers. These two factors together resulted in a price war that was disproportionately felt by the American manufacturers, as the European luxury brands had more efficient production plants and were perceived by consumers as more stylish, allowing them to command a higher

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market price. The Japanese car was viewed as more reliable and of superior quality.

The Big Three continue to use incentives. "Heavy use of incentives, especially by GM and Ford, has promoted sales since 2001, but at the price of reducing current profits and future demand. If companies continue promoting sales through financial incentives, then higher interest rates, which are widely expected in financial markets, will raise the cost of incentives." (ibid:7). GM incentives per automobile in March 2005 averaged more than $4,000 per vehicle. Ford and Chrysler averaged more than $3,000, while Nissan averaged $2,000, and Toyota and Honda about $1,000 (ibid:8).

Cost Structure of the Industry

The pressures that have brought about change in the American automotive industry were economic and environmental. Underpinning the economic pressures on the profitability of the automotive industry is the fundamental issue of supply and demand. Growth rates in the established markets of the world such as the United States have been relatively low. In the U.S., the Big Three face legacy issues, not merely related to labour costs as described above, but their size and market dominance, which may have hindered their ability to respond to the Japanese challenge in the 1980's.

The cost differential per automobile between the Big Three and the transplants are attributable to three main factors; sales incentives, legacy costs (predominately labour) and dissimilar operating efficiencies. Sales incentive programs encourage purchases, creating a depression in sales when the incentive is withdrawn. This is expensive, estimated to cost $3,000 - $4,000 per automobile, according to Congressional Researchers. The cost of Japanese incentives has been much less at $1,000 - $2000 (ibid). The cost of the incentives plus the legacy labour costs, claimed by the Big Three to be at least $1,200 per automobile, combined with the efficiency bonus enjoyed by the more efficient Japanese transplants, present major problems for the Big Three. The cost differential between the best Japanese plant (Nissan) and Ford, was estimated by Harbor Consulting at nearly $2,500 per unit (ibid:39).

Conclusion: Future of the Industry?

Because of the open nature of the US market, increases in global overcapacity could bring accelerating rationalisation and industry closures,

with especially negative consequences for U.S. manufacturers, their employees and the economy. The U.S. China Economic and Security Review Commission (USCC) commented that:

> China's automobile production capacity already exceeds domestic demand by 10 percent to 20 percent. This overcapacity is projected to grow to 8 million vehicles by 2010 and it is very likely that China will begin exporting vehicles to the United States within the next five to ten years. …The U.S. auto industry will find it difficult to compete with unfairly priced imports and likely will lose an additional share of the domestic market. (USCC, 2006)

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ON IDENTIFYING CHANDLER INDUSTRIES THROUGH AN ANALYSIS OF CAPITAL/LABOUR RATIOS

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In this essay, Won Chai notes a possible relationship between those manufacturing sectors which are largely affected by transportation and technology improvements and their corresponding capital-labour ratios. This is investigated using through an analysis of the pig iron and woollen goods industries, in an effort to determine whether or not these ratios may be used to identify Chandler industries.

Introduction

In *Industrial Structure and the Emergence of the Modern Industrial Corporation*, Jeremy Atack argues that the manufacturing sectors most affected by improvements in transportation and technology had the lowest establishment-to-minimum establishment ratios in 1900. He notes that these "High-High" industries were Chandler industries, industries hypothesized to have undergone significant structural change due to continuous process production technologies and improvements in transportation (Atack, 1985).

Making selections based on data availability, I attempt to determine whether Atack's HH (High-Transportation/High-Technology) industries exhibited capital/labour (K/L) ratios that were significantly different from that of other industries. I begin my analysis with an examination of the pig iron (HH) and woollen manufacture (LL) industries from 1860 to 1900. Relying upon findings made in this introductory analysis, I then turn to analysis of K/L ratio trends for multiple industries, and attempt to see if the behaviour of a given industry's K/L ratio can indicate whether it was a Chandler industry or not.

Part I contains a description of data methodology. Part II analyses technological developments, transportation effects, and their relationship to consolidation in the pig iron and woollen goods industries. Part III examines K/L ratio trends from 1860 to 1900. Part IV concludes and summarizes preliminary findings.

Methodology and Data Sources

All data, unless otherwise noted, were obtained from U.S. Decennial Censuses from 1860 to 1920. Data for a given industry were often compromised by changes in industry classification. To maximize consistency, special manufacturing reports in the decennial censuses were used whenever possible to back-check older data. Data summations were also sometimes done to maintain consistency. Breakdowns for these summations are as follows:

Tobacco Manufacture: Tobacco used for chewing, smoking, snuff, cigars, and cigarettes.

Pig Iron: Pig Iron (Blast Furnaces). The term "blast furnaces" is often used as a synonym for "pig iron".

Wool Manufacture: Woollen goods, worsted goods, carpets, wool hats, hosiery and knit.

Brick and Tile: Brick, tile.

Except for the four industries listed above, all data for K/L ratio comparisons were obtained from decennial census tables for general manufacturing statistics of the United States.

All capital, wage, and value of product data, unless otherwise noted, are given in current dollars. Establishment and employment statistics are given in their natural numbers. Ratios of capital value-to-wage are used in order to avoid problems with deflation and to allow for labour skill changes. As an alternative, real capital value-to-employee ratios are also calculated. GDP was deflated[1] to obtain real dollar figures for 2004. I used the GDP deflator instead of the CPI because the quantities being deflated are producer-related, and the GDP deflator includes the prices of non-consumer capital goods (Bernanke and Abel, 2005).

The census included "hand and neighborhood industries" before 1904, but did not do so afterwards (O'Brien, 1988:644). Establishment number analysis after 1904 is avoided. Census capital stock data were always attended by warnings of inaccuracy and should be treated with caution.

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[1] Using the GDP deflator calculator at www.eh.net.

The Pig Iron Industry: High Impact of Transportation – High Impact of Technology

The pig iron industry underwent significant reorganisation in the latter half of the 19th century. According to Atack, the industry had an establishment-to-minimum establishment ratio of about 0.40 in 1900 (Atack, 1985). This decline in establishment number occurred when the market for pig iron was still growing. Although establishment numbers declined, both employees per establishment and real annual product increased. The industry therefore did not shrink, but became concentrated as it grew.

Figure 1: Pig Iron Establishments and Employees Per Establishment
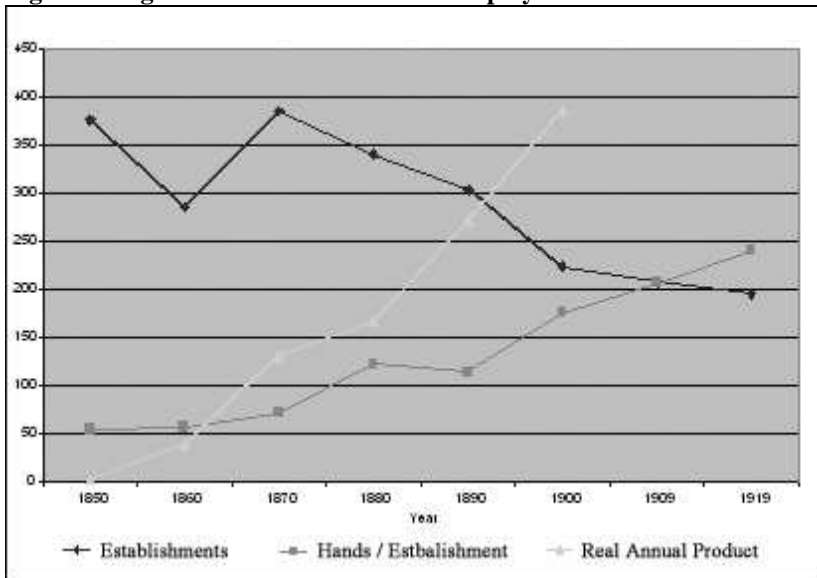
Much of the consolidation was probably fuelled by technical innovation. The technological discoveries in the pig iron industry were expensive, but critical. Firms that did not apply them could not remain competitive. The Bessemer process "vastly increased" a firm's ability "to provide steel at a given price," and the open-hearth furnace allowed for huge energy savings through the reuse of exhaust fumes for heating purposes (Termin, 1963:454). However, only those firms with sufficient resources could afford to invest in the necessary capital. The Bessemer process, which was discovered in 1855, and the open-hearth furnace, which was invented in 1865, required large investments in huge converters and furnaces. These investment requirements

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caused consolidation because small firms could not purchase the required capital by themselves, but needed to do so in order to remain competitive.

Blast furnaces use ore to make pig iron, and pig iron is used to make steel. Vertical integration in the pig iron industry was common in the 1880s and 1890s (Dennison, 1939). The exact causes of integration are under debate, but vertical consolidation was most likely spurred by a desire to ensure continuity and dependability in raw material supply (ibid). For vertical integration to be feasible, however, transportation had to be dependable. Pig iron production, especially integrated pig iron production, relied critically upon it. Mines and power stations were often located far apart from each other, and the fixed capital associated with pig iron production was for all intents and purposes impossible to move (Mancke, 1972). Bessemer converters were very large. The chance of key production units being located next to each other was small. In fact, pig iron producers who wanted to vertically integrate often hunted for specific locations where multiple inputs were located (ibid). Improved transportation, by making the hunt for special locations unnecessary, spurred integration. Improved technology, by lowering costs, made it appealing to have everything occur under a single managerial 'roof' (ibid).

Transportation and technology were mutually dependent in the reshaping of the pig iron industry. Technology spurred investment, but waves of consolidation required reliable connections between geographically separate areas in order to be profitable. Transportation allowed for the expansion of markets, but was not able to spur waves of consolidation by itself. Required investments played a key role by placing pressure upon small firms to integrate and remain competitive in the face of more powerful, more far-reaching, and lower-cost firms.

The Wool Industry: Low Impact of Transportation – Low Impact of Technology

Atack calculates that wool manufacture had a 2.48 establishment-to-minimum establishment ratio. This industry, unlike pig iron, had characteristics inimical to consolidation. A very significant portion of wool manufacture was carried out in small, dispersed firms, and these firms were often self-contained production entities (Weld, 1912). The exclusion of "hand and neighborhood industries" from the 1904 Census onwards reveals how numerically important these small firms were.

Table 1. Decennial Change in Number of Firms

	Establishments	Percent Change in Establishments
1870	3,456	N/A
1880	2,689	-22.19328704
1890	2,489	-7.437709186
1900	2,335	-6.187223785
1909	1,115	-52.248394
1919	1,016	-8.878923767

Besides the ubiquity of small, local-market firms, lack of a standardized product hampered consolidation in the woollen goods industry (Cole, 1923). A woollen product's quality, besides determining what market it will be sold in, directly determines the amount of labour that must be put into its creation. Mass production, and profitable homogeneity, was therefore limited by the varying styles and tastes of wool consumers (ibid). Moreover, wool manufacture cannot rely upon a limited natural resource to facilitate consolidation at a particular location. The wool industry also did not experience major technological change. Steam power revolutionized the industry, but was implemented very early in the 19th century.

Besides creating disincentives to consolidate, the above characteristics dampened the effects of transportation. Wool manufacturers were widespread. Transportation therefore provided little opportunity for market expansion. It also failed to facilitate integration, as it did in the pig iron industry, because vertical integration was already realized to some extent in the self-contained wool manufacturer, and there was no technological development that *had* to be invested in.

Examination of Capital/Labour Ratios

Any examination of capital labour ratio trends should keep in mind that such trends can change for a variety of reasons unrelated to investment in new technology. The real interest rate, aggregate savings, changes in the relative prices of capital and labour, and demography are a few of the factors that can have significant effects upon the K/L ratio (Field, 1987). Inflation is also a problem if employee numbers are used in the calculation. This last problem can be addressed in part by using wages, but such a solution introduces labour market factors which are bound to further complicate analysis.

The elasticity of substitution between capital and labour addresses some of the issues mentioned above. Most importantly, by explicitly factoring in the prices of capital and labour, it accounts for the idea of biased technical change,[2] which can lead to misleading movements in the K/L ratio unrelated to technological innovation (Cain and Paterson, 1986). Theorists generally agree that, if the capital share rises over a given period and if the elasticity of substitution between capital and labour was less than one during that period, some evidence has been found for the presence of a labour-saving bias to technological change (Field, 1987). Many scholars have argued that the elasticity of substitution was below one during the period I am examining, and I will rely upon their arguments in my analysis of capital share trends (ibid).

Figure 2 displays capital/wage lines for three industries from 1860 to 1919.[3] Surprisingly, the wool industry, an industry in which the rate of technological change was low and the effect of transportation was minimal, had a higher K/L ratio than tobacco manufacture, which was revolutionized by the invention of the Bonsack machine, and brick and tile production, which was electrified by the invention of the Vervalen bricking-making machine in 1852 and the steam shovel in 1874. Despite our data, it would be a mistake to conclude that the wool industry was more labour-saving than tobacco and brick manufacture. Besides K/L ratio interpretation problems, a variety of fixed characteristics in wool manufacture may have made that industry's K/L ratio significantly higher than that of industries which actually experienced more significant changes in technology and transportation.

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[2] Biased technical change occurs when relative price changes cause producers to change their mix of inputs.

[3] The pig iron industry's ratio was often more than double the value of any other industry's ratio, and its K/L trend was excluded to facilitate comparison.

Figure 2. Capital Value/Wages Ratio
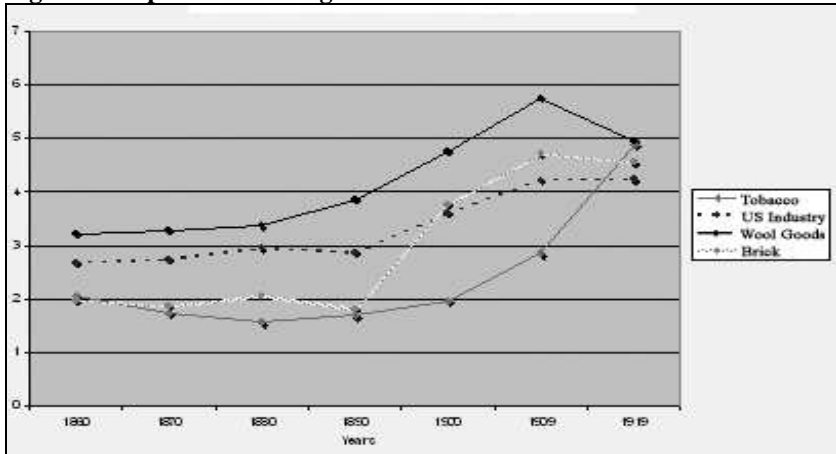
Although analysis of a particular industry's characteristics would involve detailed calculations and many assumptions, analysis of Figure 2 suggests an alternative to individual industry analysis. Figure 2 reveals that significant changes, presumably caused by technological innovation and transportation improvements, resulted in significant shifts in the K/L ratio in the 1890s. It also shows that K/L ratios remained fairly stable throughout previous decades. Given the above, an examination of the change in the K/L ratio from the middle to the late 19th century may reveal significant information. By calculating percentage changes, this method can also avoid the pitfall of misinterpreting K/L ratios for industries with significant fixed characteristic effects. However, the approach is not without fault. The proposed analysis must make the assumption that fixed effects for a particular industry do not influence its rate of K/L ratio growth. Ideally, only transportation and technology effects will have had this power. It must also be assumed that overall trends in capital deepening and demography did not overly affect specific industries' K/L ratios to the extent that simple size comparisons between industries become invalid.

Table 2 displays K/L ratio averages for different transportation/technology industries in 1900. Averages were calculated in order to mitigate the effect of outliers.[4]

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[4] The meat packing, sawmill, iron foundry, sheet metal, and farm machinery industries were left out of the calculation due to consistent data unavailability.

Table 2. Examination of K/L Ratios for 1900

1900	Real 2004 Cap. Value/Employee Number	Current Cap. Value/Wages	Real 2004 Cap. Value/Employee Number	Current Cap. Value/Wages
	High Technology		Low Technology	
High Trans	$116,797.57	11.03687	$27,317.90	3.389069
Low Trans	$55,434.19	6.1623774	$30,528.11	3.862841

Given my assumptions and arguments, the data above seem to indicate that high technology industries generally had K/L ratios significantly larger than that of low technology industries. Low technology industries averaged a K/L ratio only 43% of that of high technology industries.[5] Since we would expect an industry in which the effect of technology was significant to have a higher K/L ratio than one in which it wasn't, this finding both checks our method and suggests that the K/L ratio may be able to identify HH industries through ratio size. The HH category's K/L ratio average was 95% higher than that of the category whose K/L ratio average was second highest.

In order to determine whether our preliminary conclusions still hold when the effects of technology and transportation were not significant, the same calculations were performed with 1860 data. Table 3 reveals that HH industries already exhibited K/L ratios in 1860 that were much larger than that of non-Chandler industries. This result is surprising. The Bonsack machine was patented in 1880. The open hearth furnace was invented in 1865. Chilled porcelain and iron rollers for flour mills were developed in the 1860s and 70s. All the industries under examination should not have been consolidated in 1860 to levels outside of the 1870 ranges predicted by Atack (Atack, 1985).

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[5] The calculation is done as follows: [(HL/HH) + (LL/LH)] / 2, where LH stands for Low Transportation, High Technology. This calculation is done for both the dollar value K/L and the unit-less K/L, and the two numbers are averaged. All future calculations regarding percent comparisons of the K/L ratio are done in this way.

Table 3. Examination of K/L Ratios for 1860

1860	Real 2004 Cap. Value/Employee Number	Current Cap. Value/Wages	Real 2004 Cap. Value/Employee Number	Current Cap. Value/Wages
	High Technology		Low Technology	
High Trans	$39,362.80	6.77826	$11,545.17	2.330012
Low Trans	$13,801.91	2.691653	$11,562.34	2.33379

Although neither technological innovation nor consolidation had yet occurred, K/L ratios in 1860 still clearly differentiate HH industries. All of our previous conclusions still apply. To see if the growth rate, rather than the straight value, of the K/L ratio can also identify Chandler industries, I compute average growth rates from 1860 to 1900 for each of the four transportation/technology categories.

Although the absolute average value of the K/L ratio was greater for HH industries than for other industries, Table 4 suggests that the growth rate of the HH industry's K/L ratio was not exceptional. The growth rate of the LH industry, which was more than double that of other industries, dominates.

Table 4. Examination of the Growth Rate of K/L Ratios between 1860 and 1900

1900 – 1860	%ΔReal 2004 Cap. Value/Employee Number	%ΔCurrent Cap. Value/Wages	%ΔReal 2004 Cap. Value/Employee Number	%Δcurrent Cap. Value/Wages
	High Technology		Low Technology	
High Trans	196.70%	63%	136.60%	45.50%
Low Trans	301.60%	128.90%	164%	65.50%

One would expect high technology industries to have similar growth rates that are jointly larger than those of low technology industries. The interaction of transportation and technology may explain the seemingly counter-intuitive results in Table 4. It seems plausible that HH industries, although forced to make investments in new, industry-changing technology, experienced less pressure to directly increase capital holdings because they could ship inputs amongst each other and effectively consolidate and specialize across regions. In other words, transportation improvements may have mitigated HH firms' need to personally invest in capital and technology. They could avoid investment, to some extent, by consolidating and integrating.[6] The LH industry, due to its inability to benefit greatly from improvements in transportation, may have been forced to invest in capital more heavily than its more transportation-adept counterpart. The HH industries, due to fixed characteristics, may have had inherently higher K/L ratios than LH industries, but the effect of transportation may have slowed down HH industry K/L ratio growth, resulting in comparatively greater LH K/L ratio growth in the late 19th century.

Conclusion

The above analysis suggests that certain general trends in the K/L ratio may be correlated with identification as a Chandler industry. However, many assumptions regarding the elasticity of substitution, movement in the K/L ratio, and general economic conditions had to be made. At this point, to declare that K/L ratios have the power to identify Chandler industries would be a mistake. The discussion notably neglects treatment of economy wide shocks, which could have had different effects upon the industries examined. Generalisation from two observations also runs the risk of selection problems. Finally, non-physical production innovations and their effects upon physical capital and labour were not given any treatment. Technology in this paper was mechanical. A more thorough research effort should expand the scope of analysis and pay more attention to non-physical input factors.

Reservations aside, however, a preliminary look at K/L ratio statistics seems to indicate that there may be a relationship between these ratios and Chandler industries. As expected, high technology industries had K/L ratios much higher than that of low technology industries. As posited in the analyses of the pig iron and woollen manufacture industries, interaction

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[6] The pig iron industry, discussed above, was a model for this sort of consolidation. Aggregate capital stock growth rates hit a trough for the industry during the 1890s.

between transportation and technology was important. Large transportation effects did little to change the K/L ratio in low technology industries, but may have been responsible for LH industries' surprising K/L ratio growth. Chandler industries had inherently high K/L ratios, but significant transportation effects may have slowed K/L ratio growth in these industries by allowing them to adapt to technological change without going all out on investments in physical capital. LH industries may have had no other choice but to buy the new machines themselves.

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