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THE REAL WAGE GAP AND ITS DEVELOPMENT OVER TIME: THE IRISH EXPERIENCE 1960-1987

by

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THE "REAL WAGE GAP" AND ITS DEVELOPMENT OVERTIME: THE IRISH EXPERIENCE (1960-87)

INTRODUCTION

The high inflation and high unemployment occurring throughout the OECD in recent years have resulted from a complex interaction of contractionary supply and demand factors as outlined by M Bruno and J Sachs "The Economics of World-wide Stagflation" Blackwell (1985).

Their empirical work showed the "real wage gap" to be a very important supply factor in determining inflation and unemployment since the late 1960's. We seek to measure the "real wage gap" for Ireland, explain its development overtime and compare results with the OECD experience.

THEORY

The "Real Wage Gap" is defined as the percentage deviation of the actual real wage prevailing in the economy from the warranted real wage that gives full employment.

Assume a well behaved production function in terms of value added

$$(1:1) \quad V = F(L,K)$$

Under output market clearing and competitive firms assumptions the real product wage equals the marginal product of labour.

$$MP_L = (W/P_v) = F_L(L,K)$$

The warranted real wage that gives full employment is the marginal product of labour at full employment.

$$MP^F_L = (W/P_v)^F = F_L(L^F,K)$$

The "Real Wage Gap" in log-linear approximation

$$(1:2) \quad W^* = (W-P_v) - (W-P_v)^F$$

There are three major contributing factors that determine the size of the real wage gap.

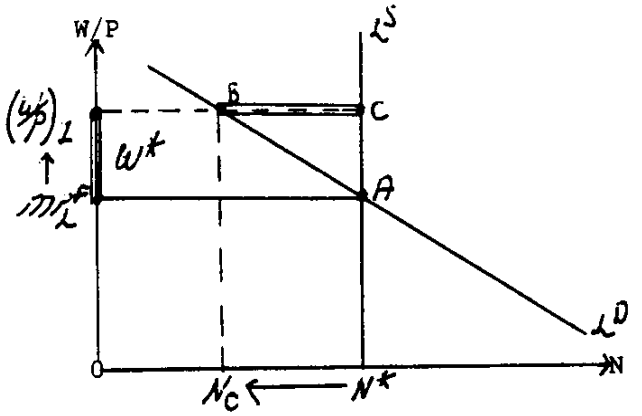
(1) Excessive real wage demands above marginal product of labour at full employment.

(2) A Terms of Trade Shock.

(3) A "Low Growth Trap".

(1) EXCESSIVE REAL WAGE DEMANDS.

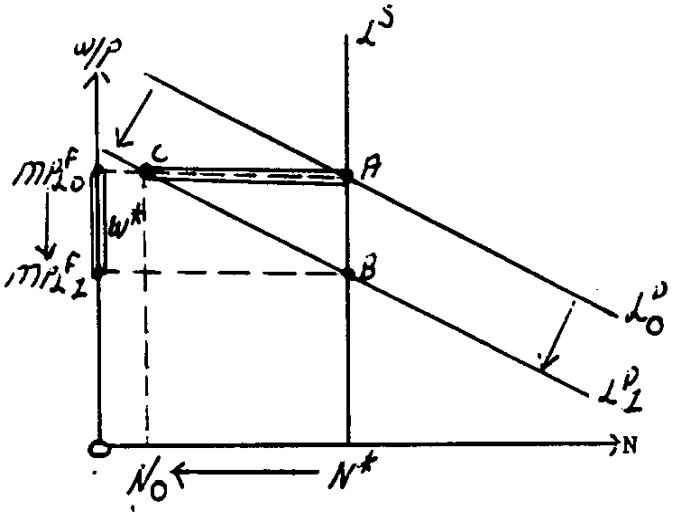
Figure 1



A period of high employment and tight labour markets can raise real wage aspirations and shift power to labour in wage bargaining. Excessive real wage demands ie $(W/P)^1$ above MP_L^F can lead to a wage gap and classical unemployment β-c in Figure 1.

(2) TERMS OF TRADE SHOCKS

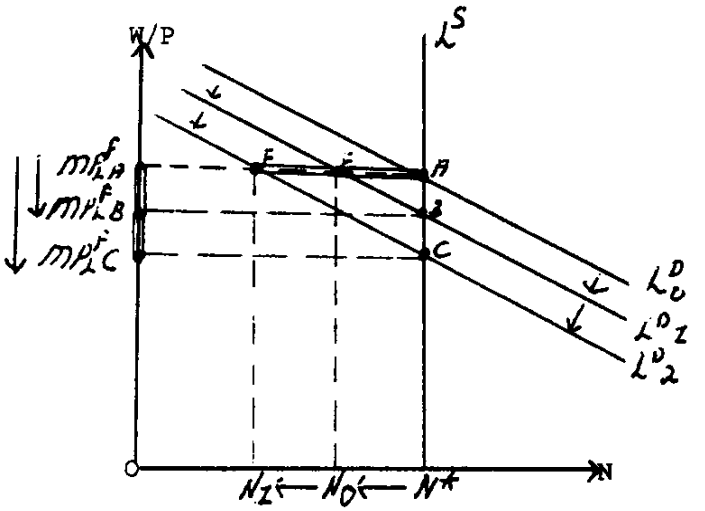
Figure 2



In the run up to the first major supply shock in 1973, most inflation was due to demand pull inflation. Workers in wage bargaining sought to keep their real wage constant.
In the face of demand pull inflation this would maintain the economy at full employment. During the seventies we had two major supply shocks which led to supply push inflation which had the same effects on the economy as a technical regress. It was not widely understood by Unions that external terms of trade shocks caused a downward shift in the labour demand schedule (L^D0-L^D1) in Figure 2. Labour in the face of growing inflation would have to adjust real wages downward so the economy could maintain itself at full employment (N^*). Failure to do so was the failure to recognise the origin and nature of the inflation ie workers would suffer from "inflation illusion". Labour by keeping the real wage constant in the face of a Terms of Trade Shock generate a W^* and classical unemployment (N^*-N_0) in Figure 2.

(3) A "LOW GROWTH TRAP"

Figure 3



If there is not an instantaneous adjustment of real wages in the face of a Terms of Trade Shock a W^* can generate a bigger W^* via the "low growth trap" which will cause real wages to have to adjust down even further to reach the warranted level that gives full employment as illustrated in Figure 3.

"Low Growth Trap" W^* → reduces profitability of firms → reduces the growth of investment → reduces the growth of capital accumulation → reduces the growth of the capital stock → reduces labour's productivity growth ie a productivity slowdown.

Real wages will be required to fall even further to the warranted level that gives full employmentent ie $MP_L{}^F{}_c$. If real wages do not adjust down this feeds into a cycle of lower investment and capital accumulation once again ie an explosion in the size of the W^*.

METHODOLOGY

(1) MEASUREMENT OF THE REAL WAGE GAP

In Log - Linear approximation the real wage gap is defined as

$$(1:2)\quad W^* = (W-P_v) - (W-P_v)^F$$

The easiest case for calculating the W^* is the Cobb-Douglas technology assuming capital grows at some constant exponential rate and the elasticity of substitution is unitary.

$$(1:3)\quad V_t = A L_t^{\gamma} e^{\lambda t}$$

since $$MP_L = \frac{\partial V_t}{\partial L_t} = \gamma \cdot \frac{V_t}{L_t}$$

then $$MP_L{}^F = \frac{\partial V_t{}^F}{\partial L_t{}^F} = \gamma \cdot \frac{V_t{}^F}{L_t{}^F}$$

and $$(1:4)\quad W^* = (W - P_v) - (V_t{}^F - l_t{}^F) - \text{Log}\,\gamma$$

The problem of estimating the marginal of labour at full employment comes down to calculating the average productivity of labour at full employment when we use the Cobb-Douglas technology (as the MP's and AP's are proportional to each other).

We follow the same methodology as Bruno "Aggregate Supply and Demand Factors in OECD unemployment: an update" Economica 1986. Bruno takes the benchmark for the real wage gap to be zero on average during a low inflation - high employment period for 12 OECD countries (1965-1969). He takes the average growth rates of (V_t-l_t) during 1960-73 and 1973-85 to represent the respective full employment trend $(V_t^F-l_t^F)$. He assumes $(V_t^F-l_t^F)$ grows at a constant exponential rate between 1960-73 and a different constant rate between 1973-1985 ie between cyclical peaks (1960, 73, 85). These procedures yielded an index for $(V_t^F-l_t^F)$.

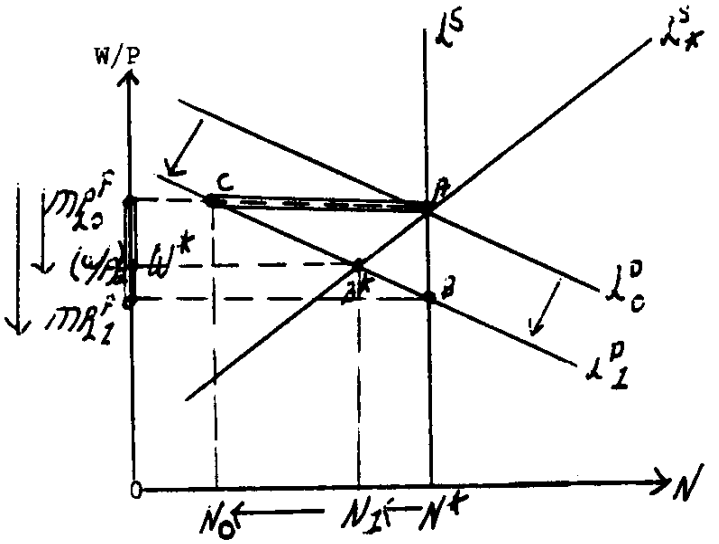
We follow the same pragmatic approach. The cyclical peaks taken in Ireland were in 1960, 1969, 1978 and 1987. We take the average growth rates of (V_t-l_t) during 1960-69, 1969-78 and 1978-87 to represent the respective full employment trend $(V_t^F-l_t^F)$. We normalise the resulting real wage gap to be zero on average during 1964-67. This procedure yielded our index for $(V_t^F-l_t^F)$.

In estimating the Cobb-Douglas our regression results gave us a statistically significant labour share in value added of .56791 = α. Having an index for $(V_t^F-l_t^F)$ and α, this can be subtracted from an index of actual real wages to give us a real wage gap index ie (1:4).

Bruno and Sachs and OECD wage gaps are measured using the above methodology. Yet there are three major shortcomings in using the above methodology

(1) There is an implicit assumption that the labour supply curve is perfectly inelastic. If the labour supply curve is not perfectly inelastic the wage gap will be **"overstated"**.

Figure 4



A Terms of Trade Shock shifts the labour demand schedule down by the fall in the marginal productivity of labour. If the Labour Supply

curve is perfectly inelastic the real wage must fall by exactly the same amount as the marginal product of labour to maintain full employment at N^*. ($MP_L{}^F0$-$MP_L{}^F1$) in Figure 4. If the labour supply curve is not perfectly inelastic the warranted fall in the real wage to maintain full employment is less than the fall in the marginal product of labour ($MP_L{}^F0$-$(W/P)_2$) in Figure 4. If in response to a Terms of Trade shock the real wage remains a constant a wage gap will result. A smaller wage gap will result the more elastic the labour supply curve as illustrated in Figure 4.

The implicit assumption that the labour supply curve is perfectly inelastic may overstate the wage gap.

(2) The measurement of the wage gap is probably **"understated"** as it overstates (V^F-l^F).

We assume at cyclical peaks $(V-l) = (V^F-l^F)$. The problem here is that while 1978 was a cyclical peak it was far from a full employment year with $l_{78}<l^F_{78}$, $V_{78}-l_{78}$ would probably be higher than $V^F_{78}-l^F_{78}$. During periods of unemployment observed productivity would tend to exceed full employment productivity. Intuitively excessive real wage demands will drive the least profitable domestic industries out of business and create unemployment. Least efficient labour intensive enterprises are driven out thus raising measured productivity of labour above the full employment level.

$$(1:3)\quad V_t = AL_t^{\gamma}e^{\lambda t}$$

$$(1:4)\quad v_t = a + \lambda t + \gamma l_t$$

$$(1:5)\quad v_t - l_t = a + \lambda t - (1-\gamma)l_t$$

$$(1:6)\quad v^F_t - l^F_t = a + \lambda t - (1-\gamma)l^F_t$$

$$(1:7)\quad (v_t-l_t) = (v^Ft-l^Ft) - (1-\gamma)(l_t-l^F_t)$$

Thus if $l_t < l^F_t$ then $(v_t-l_t) > (v^F_t-l^F_t)$ at cyclical peaks. The methodology will overstate $(v^F_t-l^F_t)$ which will understate the real wage gap. Bruno estimated $(v^F_t-l^F_t)$ which corrected the above problem and found the previous general trend of the wage gap remained intact.

(3) The assumption of unitary elasticity of substitution would tend to **"overstate"** the wage gap if the elasticity of substitution is less than one.

If the elasticity of substitution is less than one a rise in real wages will also result in a rising labour share in value added, for a given degree of capital deepening. Bruno recalculated (v^F-l^F) under two alternative assumptions $\sigma = 0.5$ and $\sigma = 0.7$ which required knowledge of the capital stock. The smaller σ the larger the reduction in the real wage gap. Again, the assumption of $\sigma = 1$ may over state the wage gap but Bruno proves that the general trend in the real wage gap remains the same.

CONCLUSION:
We have two implicit assumptions that may overstate the wage gap and one assumption that may understate the size of the real wage gap. The nett outcome of using the above methodology is ambiguous. Yet whether the above methodology understates or overstates the size of the wage gap the general trend that emerges will be accurate.

(2) DYNAMICS OF THE REAL WAGE GAP

Having the trend in the wage gap, the Cobb-Douglas allows to decompose the real wage gap into its contributing factors.

$$(1:4)\quad W^* = (W-P_v) - (v^F{}_t - l^F{}_t) - \text{Log}\,\gamma$$

Let $$(W-P_v) = (W-P_c) + (P_c-P_v)$$

Where
P_v = a value added price index
P_c = a consumer price index

$$(1.5)\quad W^* = W_c + (P_c-P_v) - (v^F{}_t - l^F{}_t) - \text{Log}\,\gamma$$

Taking first differences

$$(1.6)\quad \dot{W}^* = \dot{W}_c + (\dot{P}_c-\dot{P}_v) - (\dot{v}^F{}_t - \dot{l}^F{}_t)$$

(i) $\dot{W}_c$ is a negative function of the unemployment rate.

(ii) $(\dot{P}_c-\dot{P}_v)$ is a positive function of terms of trade shocks.

(iii) $(\dot{v}^F{}_t - \dot{l}^F{}_t)$ is a positive function among other things of the rate of capital accumulation, which in turn depends on profitability.

THE TREND IN THE IRISH WAGE GAP AND ITS DECOMPOSITION

The trend in the Irish Real Wage Gap:

(1) The wage gap was on a downward trend in the early and mid 60's declining sharply between 1964-67.

(2) Between 1966 and the first oil shock in 1973 the wage gap was on a sharply upward trend.

(3) The first oil shock was followed by a fall in the wage gap which continued up until 1976, after which the wage gap began to rise again leading up to the second oil shock.

(4) Immediately following the second oil shock the wage gap fell but began rising again after 1979. Since then its behaviour has been mixed but overall has been on an upward trend.

The wage gap reached its peak in 1972 at 6.4% but reached 6.1% in 1985 and the lowest point it reached was - 2.3 in 1966.

The Decomposition of the Wage Gap

The decomposition of the wage gap allows us to examine the movements in the wage gap more carefully and provide a clearer understanding of why those movements take place. (See table 2)

(1960-1973) This was a period of fundamental change in the Irish economy with the launch of the first programme for National recovery in the early sixties. Ireland began emerging from its protectionist stance which had major repercussions for the structure of Irish industry. Up until then industry was dominated by small scale relatively inefficient and labour intensive enterprises.

The gradual dismantling of protectionism, the subsidisation of foreign capital intensive industry and the steady decline of agricultural employment led to steady strong growth in productivity over the period of the study.

This was the main contributing factor to the sharp decline in the wage gap in the mid 60's. The terms of trade also moderated the wage gap reflecting the ending of protectionism and strong agricultural prices but this was not the major factor and real consumption wage growth remained modest until 1967.

The wage gap began exploding in the late sixties. While productivity growth and the terms of trade followed the trend of previous years real consumption wages took off. This was a reflection of rapidly rising employment industrialisation and unionisation and this upward trend continued up until the first oil shock.
The upward trend in employment in the face of a real wage boom has been attributed to the expansionary fiscal policies followed in the period.(See Kennedy & Dowling)

An interesting feature of the wage gap graph is the decline which took place immediately preceding the the first oil shock despite the large increases in real consumption wages. During this period the terms of trade grew rapidly due to an international commodity price boom (See Figure 2) and this exerted downward pressure on the wage gap increasing producer prices relative to consumer prices.

(1973-1979) Ireland's reaction to the first oil shock was very different from other countries and the wage gap actually fell up to 1976. There is strong evidence of an element of short run nominal wage stickiness in response to terms of trade shocks in Ireland. Real consumption wages fell immediately following both oil shocks. These were the only two years in the entire sample that they did fall. The fact that real consumption wages continued on a strong upward path the following year also suggests that the fall was not part of any deliberate adjustment.

Productivity growth remained strong with a new round of rationalisation in Irish industry in the wake of EEC entry and the continued subsidisation of capital intensive foreign firms. The late 70's saw the beginning of an international recovery which was added to by a major fiscal expansion. This significantly reduced unemployment and launched a major investment programme leading to a tightening of labour markets and a rise in real consumption wages which was the cause of the rise in the wage gap coming into the second oil shock.

It is worth noting also that the subsidisation of private investment as well as the acceleration of public sector investment during this period makes the low growth trap analysis less relevant for Ireland. The reduction of international interest rates following the first oil shock enabled countries like Ireland to borrow cheaply abroad and cushion themselves against the impact of the shock. We see from Figure 3 that the rate of growth of investment fell sharply immediately after the first shock but from 1974-79 was on a sharply rising trend.

(1979-87) The second oil shock saw a significant change in Irish economic performance. Productivity growth while still strong was on a lower trend.

Real consumption wages fell slightly following the shock. Again this is an indication of short run nominal wage stickiness although the size of the adjustment indicates that it was not as important a factor after the second oil shock. Clearly real wage growth has been on a lower trend since. There is evidence that wages were more responsive to unemployment which rose from 5.5% of the labour force in 1971 to 17.7% in 1987. Trends in the labour force which show services shares rising steadily over the period and the decline of industries share may be part of the reason for this due to the more casual and less unionised nature of many of the service sectors that are expanding.

Composition of Labour Force

% of total

	1971	1980	1987
Industry	30.0	32.0	27.8
Services	43.5	49.8	57.0
Agriculture	25.9	18.0	15.2
Unemployment	5.5	7.3	17.7

The wage gap increased in the eighties despite the fall in real consumption wages due to the lower trend of productivity growth and the mixed pattern of the terms of trade.

In contrast to the period following the first oil shock international interest rates rose sharply following the second. Ireland had built up a significant foreign debt over the 70's. Clearly the rise in interest rates had a negative impact on Irish income but also with a rising wage gap and high cost of investment the low growth trap analysis becomes more relevant here. We look to the graph showing the downward trend in the rate of growth of investment as further evidence of this.

Comparison between Irish and OECD Experience

As seen seen above, breaking the changes in the wage gap (W^*) down into the changes attributable to changes in the real consumption wage W_c changes in the relative consumption to product prices ($P_c - P_v$) and changes in the assumed productivity trend at full employment ($v^F_t - l^F_t$) provides an explanation of the changes in the measured wage gap.

Table 3 shows this decomposition for major sub-periods for the UK and the US, two countries with contrasting labour market characteristics and for the OECD as a whole as estimated by Bruno (1986) and for Ireland as

estimated by us.

1964-70
In this period, the Irish experience is in line with the average OECD trend: rising wage demands are counteracted by strongly growing productivity to give low real wage gap growth. Ireland's productivity growth, however, was less than in the OECD on average, but an improvement in our terms of trade due to the opening of the economy kept real wage gap growth in check.
In the US, the wage gap actually fell due to modest wage demands.
The UK experienced higher than average wage growth, which together with below average productivity growth caused the wage gap to grow above average.

1970-74
High rates of consumption wage growth, inherited from the previous period did not slow down sufficiently in the face of the first oil shock but continued to grow along their trend paths. A slow down in productivity growth and the terms of trade shock, as expressed by (P_c-P_v) caused the wage gap to accelerate in the OECD countries. Wages in the UK grew particularly fast and, together with a lower rate of productivity growth, resulted in a wage gap growing at a faster rate than the OECD average.
As seen before, Ireland was sheltered from this onslaught by a number of factors, in particular by very favourable terms of trade and lower than average wage growth, and thus experienced very small increases in the wage gap.

1974-78
In the period between the first and second oil shock, the real wage gap actually fell in many countries, as wage demands moderated in the face of a productivity decline. However, adjustment was incomplete and for the OECD as a whole, the wage gap had not yet returned to its pre-shock growth rate. The real wage gap also fell for Ireland due to exceptional productivity growth which counteracted the high real consumption wage growth.

1978-1980
In response to the second shock, wage demands in the UK accelerated dramatically, causing its wage gap to surge ahead.
In the US, by contrast, wage demands decelerated but a severe terms of trade worsening made the wage gap rise more than on average in the OECD, albeit by much less than in the UK.
Wage moderation in the OECD as a whole helped to keep wage gap growth at bay. Productivity growth was still slow in that period for the OECD and grew more slowly for Ireland than in any period discussed in this table. Ireland's wage gap fell in this period where wages grew at a very modest level.

1980-1983
The slowing down of relative import prices is a main factor in the

deceleration of the wage gap in the 1980's.

In particular, the real appreciation of the US Dollar in the early nineteen eighties sharply improved the American terms of trade and had a major impact on the relative import price developments in the US as compared to Europe. Productivity growth in the OECD as a whole and in the US and the UK still had not reached pre-shock 1 levels, but was seen to pick up again in Ireland.

1983-1987

Bruno (1986) calculated these contributing factors to measured changes in the real wage gap for OECD countries up to 1983. The OECD, in a forthcoming labour market study (Economies in Transition) shows that overall, the "real labour cost gap" was reduced in most OECD countries during the period 1975-1987.
Ireland, on the other hand, experienced an increase in wage gap growth between 1983 and 1987, fuelled by faster wage growth and the fact that productivity growth was still lower.

Conclusion

The trend in the Irish real wage gap has been different to the OECD experience. The three main reasons for this are:

(i) Nominal short run wage stickiness in response to terms of Trade Shocks.

(ii) Exceptionally good productivity growth in the inter oil shock period.

(iii) Favourable terms of trade due to the dropping of protectionism and in the wake of EEC entry.

Compared to the general OECD experience growth in the Irish real wage gap has been moderate yet Ireland experienced very high unemployment. Therefore, further research is warranted to see how much unemployment the real wage gap can actually explain. It is likely that the real wage gap cannot account for total unemployment in Ireland over the period analysed. World aggregate demand could be another important contribution factor, the inclusion of which, however, would break the assumption of perfect competition.

TABLE 1: REAL WAGE GAP IRELAND 1960-1987	
1960	3.9
1961	3.5
1962	3.1
1963	3.4
1964	3.3
1965	0.6
1966	-2.3
1967	-1.6
1968	2.1
1969	3.9
1970	4.1
1971	3.6
1972	6.4
1973	6.0
1974	5.4
1975	4.7
1976	2.0
1977	3.9
1978	3.9
1979	2.0
1980	2.1
1981	3.4
1982	3.5
1983	2.6
1984	5.9
1985	6.1
1986	2.4
1987	3.9

TABLE 2

DECOMPOSITION OF CHANGES IN THE IRISH WAGE GAP

	$\dot{W}^*$	$\dot{W}c$	$(\dot{P}c-\dot{P}v)$	$-(\dot{V}f-\dot{L}f)$
1960-61	-0.4	2.9	0.3	-3.6
1961-62	-0.4	3.3	0.0	-3.7
1962-63	-0.3	4.6	-0.4	-3.8
1963-64	-0.1	6.0	-2.2	-3.9
1964-65	-2.7	1.0	0.3	-4.0
1965-66	-2.9	2.1	-1.0	-4.0
1966-67	-0.7	5.6	-0.7	-4.2
1967-68	3.6	7.8	0.1	-4.3
1968-69	1.8	7.5	-1.3	-4.4
1969-70	0.2	4.4	-0.7	-3.5
1970-71	-0.5	4.4	-1.3	-3.6
1971-72	2.8	10.6	-4.0	-3.7
1972-73	-0.5	6.9	-3.6	-3.7
1973-74	-0.5	-6.1	9.4	-3.8
1974-75	-0.6	4.6	-1.3	-3.9
1975-76	-2.7	3.9	-2.6	-4.0
1976-77	1.8	5.5	0.4	-4.1
1977-78	0.1	6.9	-2.6	-4.2
1978-79	-1.9	1.0	-0.4	-2.6
1979-80	0.1	-0.3	3.0	-2.6
1980-81	1.3	1.4	2.5	-2.6
1981-82	0.1	1.2	1.6	-2.7
1982-83	-0.9	2.0	-0.2	-2.7
1983-84	3.3	4.6	1.4	-2.7
1984-85	0.2	2.7	0.3	-2.8
1985-86	-3.7	0.8	-1.7	-2.8
1986-87	1.5	3.7	0.6	-2.8

TABLE 3
DECOMPOSITION OF CHANGES IN THE WAGE GAP
ANNUAL PERCENTAGE RATES OF CHANGE

	$\dot{W}^*$	$\dot{W}c$	$(\dot{P}c - \dot{P}v)$	$-(\dot{V}f - \dot{L}f)$
1964-70				
U.K.	0.6	3.8	1.0	-4.3
U.S.	-0.8	1.5	1.2	-3.5
OECD AV.	0.1	4.9	1.0	-6.0
IRELAND	**0.1**	**4.9**	**-0.8**	**-4.0**
1970-74				
U.K.	2.2	5.0	1.0	-3.8
U.S.	0.9	1.1	2.9	-3.1
OECD AV.	1.8	5.5	1.8	-5.4
IRELAND	**0.3**	**4.0**	**0.1**	**-3.7**
1974-78				
U.K.	-2.2	2.3	-1.9	-2.6
U.S.	-0.1	2.0	-0.1	-1.9
OECD AV.	0.3	3.1	0.9	-3.7
IRELAND	**-0.4**	**5.2**	**-1.6**	**-4.0**
1978-80				
U.K.	4.2	5.0	1.9	-2.6
U.S.	1.7	-1.5	5.3	-1.9
OECD AV.	1.0	1.1	3.6	-3.7
IRELAND	**-0.9**	**0.4**	**1.3**	**-2.6**
1980-83				
U.K.	1.4	2.7	1.3	-2.6
U.S.	-0.2	0.6	1.1	-1.9
OECD AV.	-1.1	1.4	1.1	-3.7
IRELAND	**0.1**	**1.5**	**1.3**	**-2.7**
1983-87				
IRELAND	**0.3**	**3.0**	**0.1**	**-2.8**

FIGURE ONE

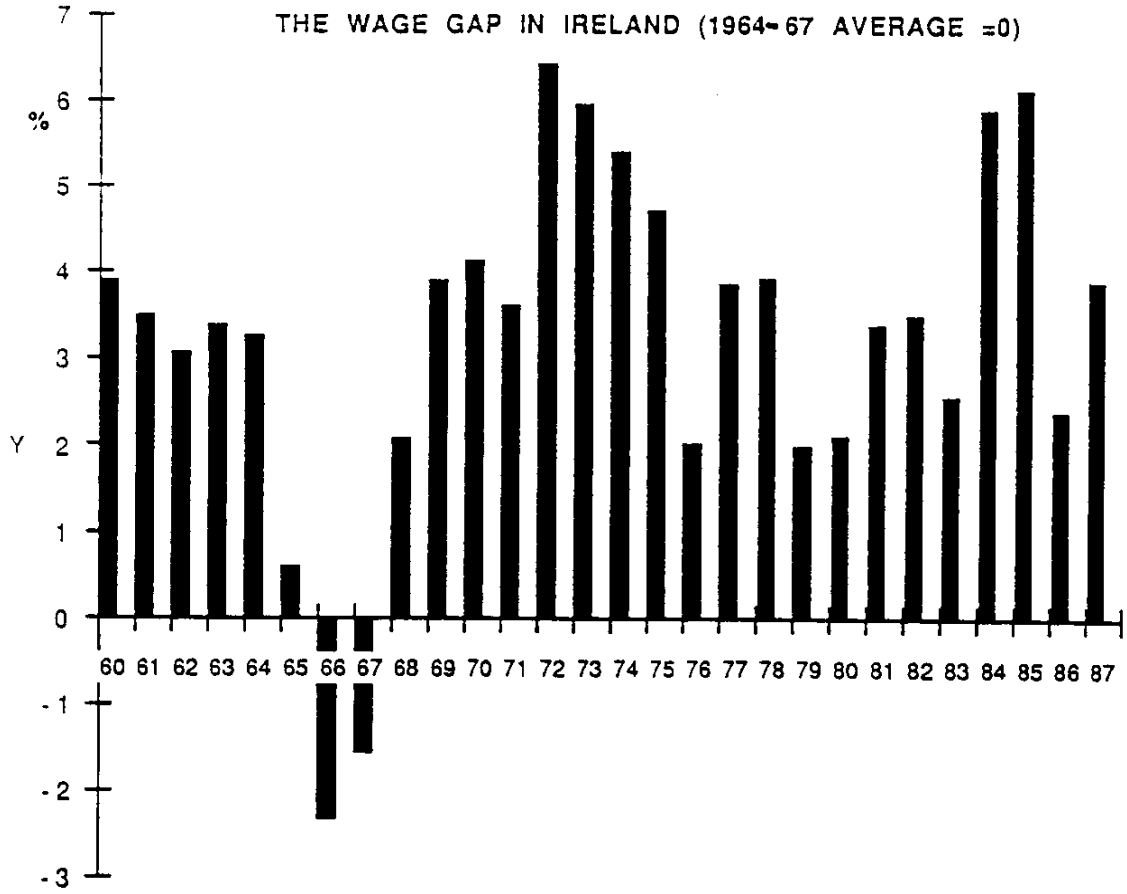


FIGURE TWO

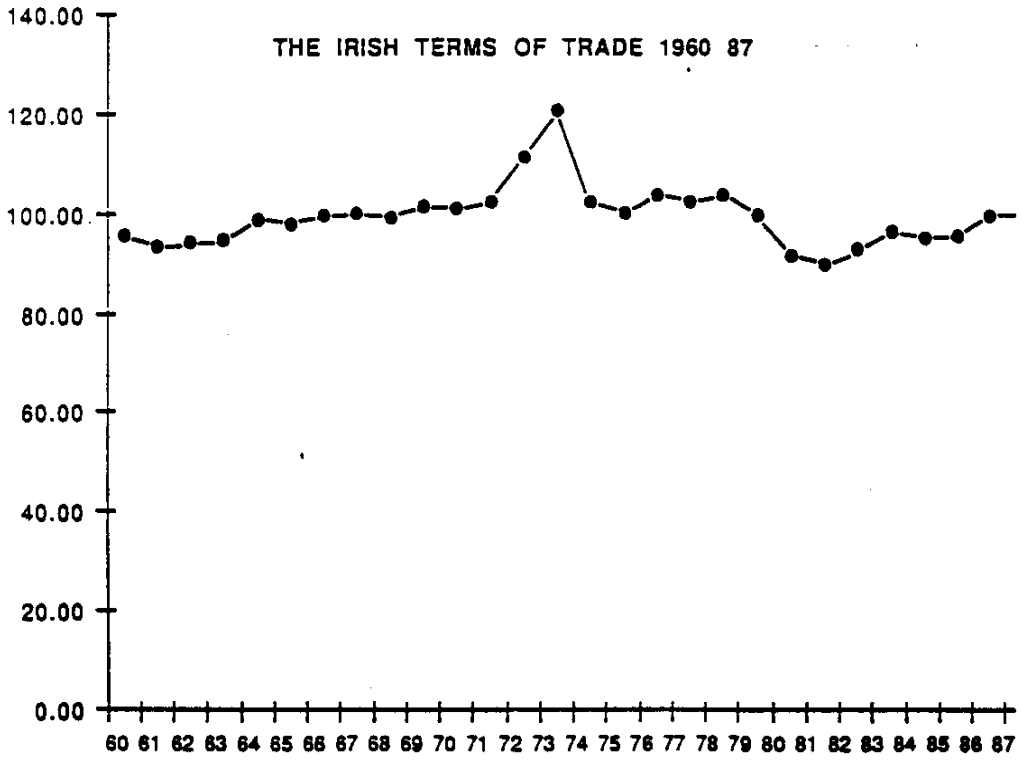
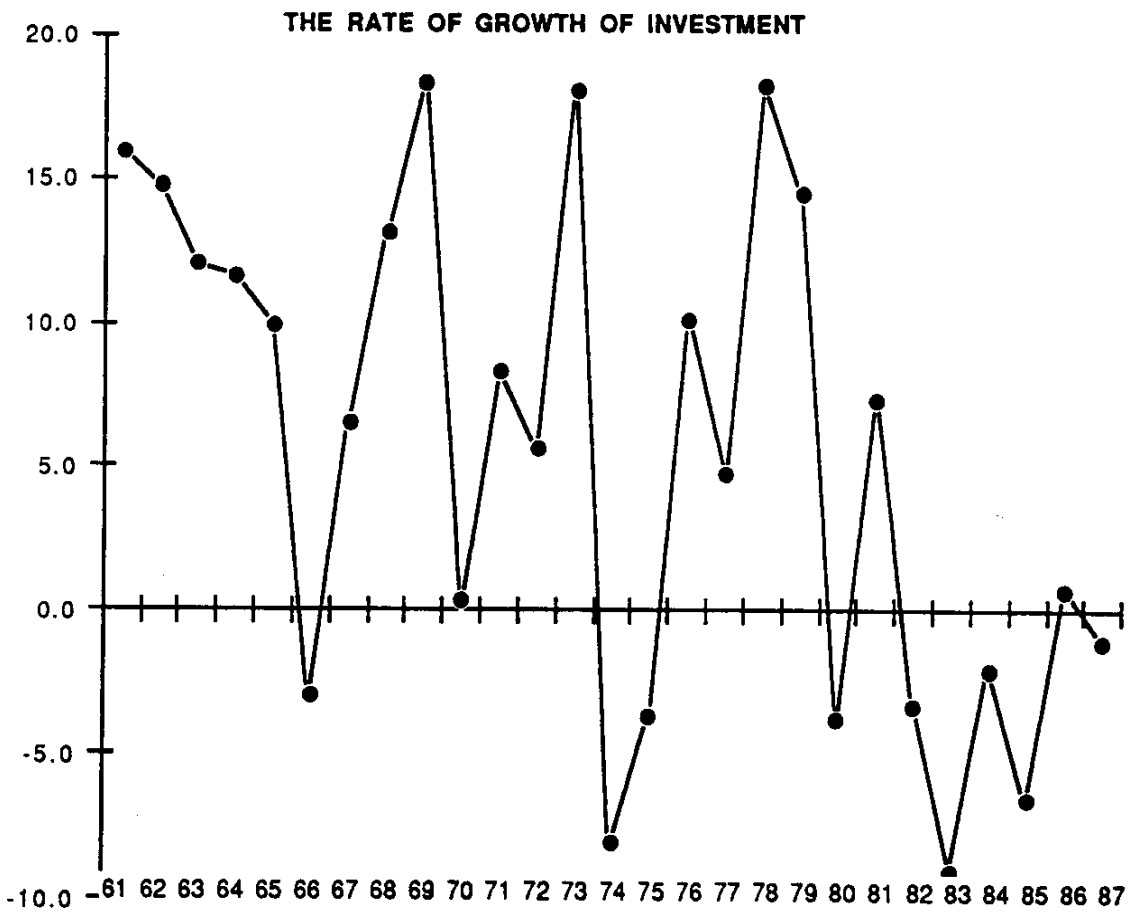


FIGURE THREE



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