Investment, Employment and Political Conflict in Northern Ireland

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Abstract

This paper combines panel data on employment and investment in different types of capital good in Northern Ireland with time-series data on the level of political conflict (measured in various ways) in order to estimate the extent to which conflict discourages employment and investment of different kinds. While all factors of production are affected by political conflict, the magnitude of the effect varies substantially from one to another.

Key Words: Investment, Employment, Northern Ireland

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1. Introduction

There has been violent political conflict in Northern Ireland for over 30 years (1969-2001), making the Troubles one of the longest-running low-intensity conflicts in the World. Over the last 30 years there has been substantial variation in the magnitude of the conflict, as measured by, for example, the total number of politically related deaths and injuries in the Province. Since the 1998 Good Friday Agreement there has been some reduction in the intensity of the conflict, prompting speculation about the potential size of a Northern Irish "peace dividend".

Given the length of the conflict, and the relative abundance of economic data for Northern Ireland, there have been surprisingly few quantitative studies on the impact of political violence on economic activity, and (to our knowledge) no econometric work of any kind. Existing estimates of the size of the peace dividend are therefore highly speculative. In this paper we will plug a gap in the literature by directly estimating elasticities of manufacturing investment and employment with respect to the intensity of the conflict. Although this is not by itself enough to estimate the potential economic consequences of the peace (which depend also on activity in the substantial public and private service sectors), it is surely an essential component in the calculation.

Our results are also relevant to a second issue. Economic activity (including manufacturing activity) in Northern Ireland has received very generous investment and employment subsidies over the past three decades. A great deal of attention has been paid to this system, and to its reform (see for example Clulow and Teague, 1993; Hart, 1993; Hamilton, 1996). One important factor in determining an economically efficient set of subsidies will be the extent to which the conflict has led to reductions in different factor inputs. It will be important to know which types of input are the worst affected by the violence, and therefore the ones most deserving subsidies on economic grounds. Our paper will provide some evidence relevant to this issue by estimating the extent to which the impact of violence varies across different factors of production.

The next section provides an overview of the Northern Irish economy during the period of the conflict. This informs the econometric model presented in Section 3. Section 4 concludes.

2. Economic Performance in Northern Ireland

Summary statistics for the Northern Ireland economy present a mixed picture. On the one hand, the rate of growth of real GDP for recent years has outstripped the UK average. The average annual growth rate for Northern Ireland over 1985-94 was 3.4%, as compared with 2.4% for the UK as a whole. For the manufacturing sector the contrast is even greater, with figures of 7.5% and 1.3%.[1] However, the level of per capita GDP in Northern Ireland is still only 80% of the UK average (Birnie and Hitchens, 1999). Hitchens et al. (1993) argue that the rate of convergence implicit in such figures is lower than the average international convergence rates estimated in cross-country growth models. In other words, Northern Ireland is not catching up with Britain as quickly as one might expect. The under-performance of the Northern Ireland economy might be due to a variety of proximate causes:

1. Factor inputs. The Northern Ireland unemployment rate (13.0% in 1995) has been persistently higher than the UK average (8.8% in 1995). On the other hand several studies indicate that Northern Ireland manufacturing investment rates are no lower than the UK average (Harris, 1983; Henry, 1989; Hitchens et al., 1990; Hitchens and Birnie, 1993, 1994), and that they have at times been higher. This explains the fact that there has been some convergence, however limited. But the Northern Irish economy has become increasingly manufacturing intensive – as indicated by the growth rates above – while the British economy that has become less manufacturing intensive. So marginally higher manufacturing investment rates in the province do not represent better underlying economic performance.
2. Factor productivity. Historically, Northern Ireland productivity growth, at least in the manufacturing sector, has been lower than the UK average. Figures reported in Borooah and Lee (1991) and Borooah (1993) imply that average annual TFP growth in Northern Ireland over 1960-83 was 2.0%, compared with 2.1% for the whole UK. The disparity is even larger for factors of production considered individually. Average annual growth in Northern Ireland labour productivity was 2.9%, compared with 3.2% for the UK; for capital productivity the figures are –3.2% and 1.1%. These differentials have resulted in lower levels of productivity in the late 1980s and 1990s. Birnie and

[1] Figures are based on Bradley and McCartan (1998).

Hitchens (1999) estimate that Northern Ireland manufacturing labour productivity in 1987 was 77% that of the UK as a whole. In no sub-sector was productivity higher in the province than in Britain.

To summarise: employment performance and labour productivity in Northern Ireland are worse than in Britain; investment is not much higher, and capital productivity is lower. Per capita GDP in the province is lower than the UK average, and is not converging on this average very quickly. These stylised facts suggest that Northern Ireland faces an aggregate production function (and hence labour and capital demand curves) that lies below Britain's.

To what extent can this be explained by the Troubles? Rowthorn (1981) suggests that the conflict might reduce factor productivity, and therefore employment and investment, by degradation of the capital stock in attacks on property. Perhaps more importantly, the violence could also reduce investment (and eventually employment) through increased uncertainty about the returns to investing in Northern Irish industry. As the intensity of conflict increases the perceived probability of a major escalation of violence, in which production is severely disrupted, might also increase. If it is impossible to insure against such risks fully, or if there is investment hysteresis (Dixit and Pindyck, 1994), then firms will be more cautious in their investment decisions.

The size of this effect could have been exacerbated by the fact that a large number of plants in Northern Ireland in the 1970s were part of firms based outside the province (mostly in Britain). Hamilton (1993) points out that the number of British-owned plants in Northern Ireland fell from 290 in 1973 to 121 in 1990. The fall in employment corresponding to the net reduction in the number of such plants was 41,186. A further 5,290 jobs were lost as the result of the closure of plants owned by firms based outside the UK. Fothergill and Guy (1990) argue that British firms in recession are likely to close Northern Irish plants before they close British ones, and that the explanation for this does not lie in the peripheral location of the former. One explanation for the difference is that locating plant in Northern Ireland is regarded as a relatively high-risk venture that a firm in recession can ill afford.

Several studies have sought to quantify the magnitude of such effects on manufacturing employment. These include Rowthorn (1981), Canning et al. (1987) and Rowthorn and Wayne (1988). The estimates of manufacturing job losses due to the Troubles range from about 25,000 to about 45,000. However, a great deal of caution should be attached to these figures, which are based not on econometric analysis but on a comparison of current employment growth in Northern Ireland with past growth and/or growth in Britain, controlling for changes in industrial composition and public employment policy. This accounting method involves calculating the conflict effect as a residual. The size of the residual could be attributable to a number of factors – such as changes in or regional variations in unit labour costs – that are not directly related to the conflict.

Although the explanations for a link between the Troubles and manufacturing employment also imply a link between the Troubles and manufacturing investment (unless the production function is very peculiar), there are no studies that attempt to quantify the investment effect. Nevertheless, there are several international cross-country studies that find a link between the degree of political instability (variously measured) and investment performance. For example, Alesina and Perotti (1993) explain cross-country investment variations by using a "sociopolitical instability index" constructed by principal components analysis. The important factors in the index are indicators of the absence of democracy and the incidence of political violence. Both Kormendi and Meguire (1985) and de Haan and Siermann (1996) discover similar results. Fedderke and Liu (1999) and Fielding (1999) apply different techniques to South African time series data to estimate the size of the link between investment and indicators of political instability.

An additional issue, discussed by Collier (1999), is that political instability and the threat of civil war may affect not only aggregate investment but also the composition of investment. In risky environments the demand for nontraded capital goods (buildings and other construction works) may be particularly low, because these are not geographically mobile and cannot be shipped out to another area if there is a major breakdown in civil society. Some traded capital goods (machinery and equipment) are more mobile, and therefore less of a risk. So an increase in political instability (an increase in the threat of civil war) may reduce construction investment more than machinery and equipment investment.

Most of these results on investment and political instability are based on cross-country analysis, and all include countries that have experienced greater instability than Northern Ireland. Nevertheless, the underlying rationale for the results – that instability shifts productivity and hence factor demand downwards – ought also to be manifested in a time-series, when the magnitude of instability varies over time. In the next section we will pursue this idea by constructing an econometric model that incorporates such shifts, distinguishing between traded capital, non-traded capital, and employment.

3. Modelling Investment and Employment

3.1 Investment, employment and political conflict data for Northern Ireland

In order to estimate the impact of political conflict on manufacturing investment and employment, we will make use of sectoral panel data on investment and employment that can be constructed from figures reported in the Northern Ireland Annual Abstract of Statistics. Data for total employment (N), measured in thousands, can be constructed for 1965-95 for four sectors: food and beverage processing, engineering, transport equipment production and textile production. A fifth category aggregates employment in other manufacturing activities. The same can be done for construction investment (I_B) and machinery and equipment investment (I_M), measured in thousands of pounds and deflated by the appropriate deflators in Economic Trends.[2] The separation of investment into "traded" and "nontraded" components will allow us to test the hypothesis that violent conflict can alter the composition of the capital stock. A finer sectoral disaggregation is not possible because of the reclassification of industrial sectors during the sample period. Figure 1 illustrates the investment and employment series. In some of the sectors the series exhibit a marked deterministic trend, but in all of them there is substantial variation over the sample period.

[Figure 1 here]

Our aim is to quantify the extent to which this variation is due to the Troubles by estimating the sensitivity of investment and employment to time-varying indicators of political conflict, conditional on time-varying economic factors. The structure of the underlying economic model is outlined in section 3.3 below and discussed in detail in Appendix 1. The economic time-series used are the average Northern Ireland manufacturing wage rate from the Northern Ireland Annual Abstract of Statistics (w), the construction investment and machinery and equipment investment deflators from Economic Trends (v_B and v_M),[3] and the fuel price index for manufacturing sectors from

[2] The Northern Ireland Annual Abstract of Statistics and Economic Trends are both HMSO publications.

[3] Province-specific capital goods prices are not recorded.

Economic Trends (p_F). All four of these are expressed relative to the manufacturing output deflator from Economic Trends. A fifth economic time series used is the real interest rate (h), measured using as the UK treasury bill yield rate.

In addition to the economic variables we will make use of two indicators of the intensity of political conflict in Northern Ireland. The first is the total number of fatalities each year as a result of politically motivated activity (F) as reported in the Sutton Index of Deaths (http://cain.ulst.ac.uk/sutton/index.html). This figure includes civilian deaths, security force deaths and paramilitary deaths. We assume that investors' perception of the intensity of the conflict does not depend on the identity of those killed.[4] The second is the number of deaths per year as a fraction of the number of violent incidents (G). The number of incidents is reported in the Northern Ireland Annual Abstract of Statistics. This ratio indicates whether the fatalities in a given year were the result of many small incidents or a few large ones. It is possible that a few large fatal incidents (for example, bombs that kill dozens of people) have more impact of the perceived magnitude of the conflict than many small ones, which might not be viewed that differently from other violent deaths (for example, ones resulting from apolitical criminal activity).

The two series are illustrated in Figure 2. Both the total number of fatalities and the number per violent incident are taken to equal zero before 1969 (when they are first reported). From 1969 onwards the values of both are positive. There is nevertheless a great deal of variation in the indicators over the period 1969–95, reflecting increases and decreases in the intensity of conflict. We anticipate that this range of variation, including the period immediately before the start of the Troubles, will facilitate estimates of the extent to which increase in the intensity of conflict lead to reductions in investment and employment.

[Figure 2 here]

3.2 Time-series properties of the data

Before proceeding to estimation of the investment-employment model, we need to ascertain the order of integration of each time-series listed in Table 1 below. Unit root tests are reported in Table 2. Sample sizes for the test are noted in the table. They differ

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[4] Regressions using disaggregated fatality data did not yield statistically significant, interpretable figures.

Table 1: The Variables and Sectors Appearing in the Model

Variables	Production Sectors
I_M: log machinery and equipment investment	F: food and beverages
I_B: log construction investment	E: engineering
N: log employment	T: transp. equipment
w: log real manufacturing labour cost	X: textiles
h: log real interest rate	O: other
v_M: log real price of machinery and equipment	
v_B: log real price of construction	
p_F: log real price of fuel	
F: log total political fatalities + 1	
G: log total violent political incidents + 1	

Table 2: Unit Root Tests

2A: Panel Unit Root Tests (1965-95 for I_M and I_B; 1960-95 for E)

variable	t-bar statistic	lags	5% c.v.
(I_M)	-3.50	0	-2.79
(I_B)	-3.32	1	-2.79
(N)	-2.73	1	-2.78

2B: Univariate Unit Root Tests for Economic Variables (1960-95)

variable	p value	lags	trend
(w)	0.045	3	X
(h)	0.004	0	
(p_F)	0.081	1	

2C: Univariate Unit Root Tests for Economic Variables (1965-95)

variable	p value	lags	trend
(v_B)	0.019	1	
(v_M)	0.045	3	X

2D: Univariate Unit Root Tests for Political Variables (1969-1998)

variable	p value	lags	trend
(F)	0.006	0	X
(F-G)	0.000	0	X

from one variable to another due to differences in data availability. We have sector-specific observations for the three dependent variables in our model, so we employ the t-bar panel unit root test of Im et al. (1998), which allows for sectoral heterogeneity. The null that the investment series are I(1) can be rejected against the alternative that they are I(0) around sector-specific linear trends at the 1% level. The t-statistic for employment lies almost exactly on the 5% confidence interval. We will treat the series as trend-stationary.

For the other variables (which do not vary across sectors) we employ the standard ADF test. Because in such a small sample ADF critical values are sensitive to the DGP assumed under the null, we simulate our own critical values. The p-values reported are tests of the hypothesis that $r = 0$ in the regression:

$$Dy_t = a_0 + a_1 \cdot t + \Sigma_{i=1}^{i=T} b_i \cdot Dy_{t-i} - r \cdot y_{t-1} + u_t \qquad (1)$$

where y_t represents each of the variables in Table 2 and the lag order T is determined by the Schwartz Criterion. The distributions on which the p-values are based are constructed on 10,000 replications under the null DGP:

$$Dy_t = a_0 + a_1 \cdot t + \Sigma_{i=1}^{i=T} b_i \cdot Dy_{t-i} + u_t \qquad (1a)$$

The null can be rejected at the 5% level in all cases except that of p_f, where the significance level is about 8%. We will treat all the variables as trend-stationary, though the t-values associated with p_f, in Section 3.3 ought to be treated with some caution.

3.3 The estimated model[5]

Using the data discussed above, we have observations for five sectors and (after taking lags) 29 years; so we have 145 observations on sector s in year t. The model estimated is a panel VAR for machinery and equipment investment (I_M), construction investment (I_B) and employment (N), conditional on (i) economic cost variables (vector $\underline{Z}$) and (ii) the political conflict variables (vector $\underline{P}$) discussed in section 3.1

[5] All the results reported in this section were produced using TSP 4.4.

and listed in Table 1 above.[6] Lags up to order 2 are included in the model:

$$\underline{X}_t^s = a(L)\underline{X}_{t-1}^s + b(L)\underline{Z}_{t-1} + g(L)\underline{P}_t + \underline{u}_t^s \qquad (2)$$

$$\underline{X}_t^s = [I_{Mt}^s, I_{Bt}^s, N_t^s]'; \underline{Z}_t = [w_t, h_t, v_{Mt}, v_{Bt}, p_{Ft}]'; \underline{P}_t = [F_t, (F-G)_t]'$$

$$s = [F, E, T, X, O]; t = [1967, \ldots, 1995]$$

$$a(L) = \sum_{i=0}^{i=1} a_i L^i; b(L) = \sum_{i=0}^{i=1} b_i L^i; g(L) = \sum_{i=0}^{i=2} g_i L^i$$

Appendix 1 shows how this representation is consistent with an aggregate model based on a profit-maximising representative firm. Each parameter in the model is to be interpreted as an average elasticity across the five sectors. Any cross-sector heterogeneity in the slope parameters in the model could potentially induce autocorrelation in the residuals $\underline{u}_t^s$, biasing the estimates of these averages. In such a case some correction would be required (Pesaran and Smith, 1995; Zhao and Pesaran, 1998). We proceed on the assumption of no autocorrelation; this assumption will be tested in due course. $a(L)$, $b(L)$ and $g(L)$ are lag operators. The theoretical model indicates that elements of $a(L)$ should be positive and elements of $b(L)$ (or at least the corresponding long-run coefficients) should be negative. We anticipate that elements of $g(L)$ will also be negative: an increase in the total number of politically related fatalities will reduce investment demand and possibly also employment; so too will the number of fatalities per violent incident.

All variables in the model have been de-trended. Each dependent variable in the $\underline{X}$ vector has been de-trended using sector-specific intercepts and trends, so we have in effect a within-groups estimator.[7] Note that contemporaneous values of the economic cost variables are excluded from the model, because no appropriate instruments are available.

$\underline{u}_t^s$ is a (3 X 1) vector of residuals for each sector s in each year t. There is no a priori restriction on the covariance matrix for the 15 residual time series (three factors of production, five sectors). The system represented by equation (2) is estimated as a Seemingly Unrelated Regression with 15 equations and parameter equality restrictions

[6] Neither (i) nor (ii) vary across sectors.

[7] The DPD estimator is not defined for our sample, since n + 1 < T. Even with a larger n DPD estimates would be likely to lead to substantial over-fitting with a T as large as ours. See Alvarez and Arellano (1998).

across the five sectors. We do however assume that there is no autocorrelation in the residual time series; tests of this hypothesis are reported below.

Table A1 in Appendix 2 reports the estimates and standard errors of all 66 parameters in the model (22 for each of the three dependent variables in the $\underline{X}$ vector). Because there is a substantial amount of autocorrelation in some of the explanatory variables, t-ratios on many individual lags are quite small, so the individual coefficients are difficult to interpret. For this reason Table 3 in the main text reports just the estimated long-run elasiticities on each explanatory variable. Two types of long-run elasticity are reported. For each element of $\underline{X}$ and each element of $\underline{Z}$ or $\underline{P}$, the "coefficient 1" column lists the direct long-run elasticity, i.e., the long-run effect of the right-hand-side variable, excluding the feedback between the different elements of $\underline{X}$. The "coefficient 2" column lists the long-run elasticities when these feedback effects are included.[8] I.e., the "coefficient 2" column shows the elements of the vectors $(I-\alpha(1))^{-1}\beta(1)$ and $(I-\alpha(1))^{-1}\gamma(1)$.

Table 4 lists some descriptive and diagnostic statistics for the system. For each of the 15 equations the table indicates the standard deviation of the dependent variable alongside the standard error and R^2 of the corresponding equation. The model explains a large part of the sample variation of each dependent variable, with the single exception of I_B^F (construction investment in food and beverages). Table 4 also reports LM tests for heteroskedasticity. In no case can the null of homoskedasticity be rejected at the 5% level. There are also two LR tests for residual autocorrelation. The first tests for the significance of the three elements of the vector θ in the regression:

$$\underline{u}_t^s = \eta(L)\underline{X}_{t-1}^s + \phi(L)\underline{Z}_{t-1} + \psi(L)\underline{P}_t + \theta\underline{u}_{t-1}^s + \underline{v}_t^s \qquad (3)$$

This test assumes that any residual autocorrelation is common across sectors. The second does not make this assumption, and tests for the significance of the 15 elements of θ^s in the regression:

$$\underline{u}_t^s = \eta(L)\underline{X}_{t-1}^s + \phi(L)\underline{Z}_{t-1} + \psi(L)\underline{P}_t + \theta^s\underline{u}_{t-1}^s + \underline{v}_t^s \qquad (4)$$

[8] Interactions between the three factors of production that are insignificant at the 10% level are suppressed in calculating "coefficient 2". I.e., insignificant off-diagonal elements of the $[\Sigma_i \alpha_i]$ matrix are set to zero. The suppressed effects are N on I_M, N on I_B, and I_M on N.

Table 3: Estimated Long-run Elasticities (See Table 1 for Variable Definitions)

variable	coeff. 1	std. err.	t ratio	p value	coeff. 2	std. err.	t ratio	p value
I_M elasticities								
(w)	-3.08787	1.19142	-2.59176	0.010	-3.42656	1.45606	-2.35331	0.019
(h)	0.07992	0.34204	0.23364	0.815	0.10798	0.41658	0.25921	0.795
(v_N)	1.10845	1.20385	0.92076	0.357	1.25329	1.42857	0.87730	0.380
(v_M)	1.68937	1.35376	1.24791	0.212	2.13102	1.60705	1.32605	0.185
(p_F)	-1.48473	0.41688	-3.56156	0.000	-1.89229	0.53006	-3.56995	0.000
(F)	-0.57880	0.13908	-4.16155	0.000	-0.66771	0.16264	-4.10533	0.000
(F-G)	-1.14686	0.27130	-4.22724	0.000	-1.29765	0.31582	-4.10886	0.000
I_B elasticities								
(w)	-1.43310	2.56541	-0.55863	0.576	-2.53123	3.07197	-0.82398	0.410
(h)	0.21886	0.67352	0.32495	0.745	0.25792	0.79717	0.32354	0.746
(v_B)	0.73344	2.05094	0.35761	0.721	1.14046	2.44103	0.46720	0.640
(v_M)	3.19840	2.29824	1.39167	0.164	3.94050	2.81412	1.40026	0.161
(p_F)	-2.99368	1.16858	-2.56181	0.010	-3.65659	1.36469	-2.67942	0.007
(F)	-0.50802	0.19975	-2.54326	0.011	-0.72787	0.25532	-2.85087	0.004
(F-G)	-0.76766	0.35585	-2.15722	0.031	-1.18929	0.47388	-2.50967	0.012
N elasticities								
(w)	-0.96319	0.25990	-3.70599	0.000	-0.99487	0.30531	-3.25857	0.001
(h)	-0.15340	0.06426	-2.38717	0.017	-0.14251	0.07552	-1.88699	0.059
(v_B)	0.25136	0.20962	1.19909	0.230	0.27244	0.23082	1.18028	0.238
(v_M)	0.13952	0.27917	0.49978	0.617	0.25074	0.30745	0.81556	0.415
(p_F)	-0.61236	0.09279	-6.59953	0.000	-0.70675	0.11760	-6.00981	0.000
(F)	-0.07318	0.02866	-2.55380	0.011	-0.08982	0.02854	-3.14745	0.002
(F-G)	-0.22296	0.05335	-4.17938	0.000	-0.24584	0.05178	-4.74775	0.000

Table 4: Regression Descriptive Statistics
(See Table 1 for Variable Definitions)

equation	std. dev.	std. err.	R^2	heteroske-dasticity*
(I_M^F)	0.263126	0.208297	0.356151	0.771
(I_M^E)	0.258415	0.235957	0.230917	0.119
(I_M^T)	0.668007	0.553077	0.303610	0.127
(I_M^X)	0.524700	0.404973	0.418934	0.488
(I_M^O)	0.258745	0.204206	0.384757	0.812
(I_B^F)	0.353896	0.412525	0.000398	0.241
(I_B^E)	0.675393	0.577586	0.252214	0.267
(I_B^T)	1.283010	1.041940	0.351954	0.145
(I_B^X)	0.841283	0.628581	0.427303	0.274
(I_B^O)	0.347083	0.340438	0.189943	0.152
(N^F)	0.047922	0.035819	0.448328	0.883
(N^E)	0.109848	0.057200	0.721875	0.602
(N^T)	0.090274	0.066372	0.461784	0.058
(N^X)	0.127943	0.047916	0.868951	0.922
(N^O)	0.099214	0.055032	0.717054	0.621

* p-value for an LM test of residual heteroskedasticity

LR Residual Autocorrelation Test 1: F(15,199) = 0.29085 0.9958
LR Residual Autocorrelation Test 2: F(03,211) = 1.67130 0.1742

Table 5: Impulse Responses of Dependent Variables to Shocks to Elements of the P Vector (See Table 1 for Variable Definitions)

(i) standard deviation impulse to F

period	(I_M)	(I_B)	(N)
t = 0	-0.388	-0.244	-0.025
t = 1	-0.351	-0.449	-0.065
t = 2	-0.131	-0.293	-0.030

(ii) standard deviation impulse to F-G

period	(I_M)	(I_B)	(N)
t = 0	-0.390	-0.273	-0.047
t = 1	-0.060	-0.046	-0.040
t = 2	-0.321	-0.505	-0.046

Neither test statistic is significant at the 10% level.[9]

3.4 Results of Estimation

The statistically significant coefficients in Table 3 are consistent with economic theory and with our priors about the impact of political conflict on economic activity:

(i) Higher real labour costs reduce both employment and investment; in fact, the estimated equilibrium impact of an increase in the wage (coefficient 2) is greater for investment than it is for employment. A 1% increase in the wage is estimated to reduce investment in machinery and equipment by about 3.4%, construction investment by about 2.5% and employment by about 1%.

(ii) Higher fuel prices also reduce employment and investment. A 1% increase in fuel prices is estimated to reduce investment in machinery and equipment by about 1.9%, construction investment by about 3.7% and employment by about 0.7%.

(iii) Higher real interest rates reduce employment, a 1% increase in interest rates leading to a 0.1% reduction. However, the estimated effect of real interest changes on investment is insignificantly different from zero. (In fact point estimates are positive, but several times smaller than the associated standard error.)

(iv) Capital goods prices are not found to have a statistically significant impact on either investment or employment.

Conditional on these economic variables, the effect of changes in the intensity of political conflict on both investment and employment are large and significant:

(i) An increase in the total number of fatalities resulting from the conflict reduces investment in both types of capital and employment. A 1% increase in fatalities reduces both investment in machinery and equipment and construction investment by about 0.7%. The corresponding reduction in employment is about 0.1%.

(ii) A 1% increase in the number of fatalities per violent incident reduces investment in machinery and equipment by about 1.3%. The corresponding figure for construction investment is 1.2%. For employment it is 0.2%.

There is no evidence that the intensity of conflict has a differential impact on investment in different types of capital. There are no significant differences in either the direct effects (coefficient 1) or the equilibrium effects (coefficient 2). There is no

[9] There is a caveat to these statistics. The reported F-tests are based on OLS regressions of the systems represented by equations (3) and (4). The value of the F-statistics does vary with the estimator used.

support from the Northern Ireland data for the hypothesis that construction investment is especially sensitive to measure of the intensity of conflict. However, the estimated effects on investment are several times greater than those on employment. Basing our calculations on the coefficient 2 column, a 1% increase in total fatalities reduces the capital-labour ratio by about 0.6%; a 1% increase in the number of fatalities per violent incident reduces the capital-labour ratio by about 1%. As a consequence, labour productivity and wages are likely to fall. With more frequently reported data on wages it might be possible to estimate the magnitude of this effect.

The sample period we are using contains very few years in which the number of fatalities is anywhere near zero, so it would be inappropriate to use the results here to hypothesize about the equilibrium impact of a complete cessation of violence. The model could well be non-linear at very small values of F. Moreover, a substantial part of the in-sample difference between high- and low-violence years could be due to the delaying of investment during periods of high violence and correspondingly greater investment during lulls; this would certainly be the case in a Dixit-Pindyck interpretation of the results.

However, we can say something about the size the political violence effects by calculating impulse response profiles for each of the factors of production. Impulse responses are reported in Table 5. The figures indicate the percentage change in each factor of production in response to a one-period shock to either (i) total fatalities (F) or (ii) fatalities per violent incident (F-G). The size of the shocks is one sample standard deviation (1.443 for F; 0.727 for F-G). The short-term reductions in investment in response to these shocks are well over 25%; the employment effects are smaller, at around 5%. A striking feature of Table 5 (at least for employment, N, and equipment investment, I_M) is that the responses to increases in the political violence indicators are immediate, in the sense that the peak of response profile is at t = 0 or t = 1. The full effect of an increase or reduction in violence is apparent within a year. It comes as no surprise that this is not true of construction investment, (I_B) which has a longer gestation period. For I_B the profile peaks at t = 1 for F and at t = 2 for F-G.

The estimates in Tables 3 and 5 also indicate why there is no obvious similarity between the time-profiles of investment and employment (Figure 1) and the time-profile of total fatalities (Figure 2). There is a substantial fall in the fatality figures after 1975: the average annual number of fatalities for 1970-75 is 246; the average number for 1976-95 is 53. There is no corresponding rise in investment and employment after this period. One reason for this is that the benefits of lower total fatalities are offset by an increase in fatalities per violent incident, also illustrated in Figure 2. The average value of F-G rose from –2.75 over 1970–75 to –2.17 over 1976–95. Although in terms of total deaths the intensity of the Troubles subsided after 1975, the seriousness of individual violent incidents continued to increase.

4. Summary and Conclusion

Panel data estimates of the determinants of investment and employment in the Northern Ireland manufacturing sector indicate that variations in the intensity of the political conflict have a large and significant impact on economic activity. The impact on investment is greater than the impact on employment, as one would expect if the sunk-cost element of investment decisions is greater than that of employment decisions. However, there is no significant difference between the impact on construction investment and that on equipment investment.

Investment and employment in any given year are affected both by the total number of casualties in the conflict and by the average size of violent incidents in that year. In other words, a few large incidents have more impact than many small ones. From an economic point of view, a single incident like Bloody Sunday or the Omagh bombing causes more damage than many small violent incidents leading to the same number of fatalities. Changes in conflict intensity from one year to the next have an immediate effect on investment and employment. Our results indicate that the increase in manufacturing activity resulting from a permanent cessation of all violence is likely to be substantial and to happen very quickly. For reasons discussed above, however, it would be imprudent to use our estimates to calculate a categorical figure for the peace dividend.

To the extent that the reductions in investment and employment are a response to uninsurable risks associated with upturns in the intensity of political conflict, the results here indicate an economic rationale for the substantial subsidies enjoyed by Northern Irish industry. The fact that investment is far more greatly affected than employment suggests that investment subsidies have a much more robust economic justification than employment subsidies.

Appendix 1

In this appendix we derive the model used in Section 3.3; this is an extension of the model described by Rama (1993). There are two types of capital investment in the model: non-residential construction (B) and machinery / equipment (M). The optimal level for each type of capital is that which maximises the growth in the value of the representative firm, *P*. *P* is given by:

$$P = [P_t Q_t - W_t N_t - P_t^F Y_t] + \{P_{t+1} Q_{t+1} - E[W_{t+1}] N_{t+1} - E[P_{t+1}^F] Y_{t+1}\}/[1 + r_t] \qquad (A1)$$
$$- S_i V_t^i I_t^i + S_i \{E[V_{t+1}^i] k_{t+1}^i/[1 + r_t] - V_t^i k_t^i\} + \{V_t^i k_t^i - V_{t-1}^i k_{t-1}^i/[1 + r_{t-1}]\}$$

where Q_t is the firm's output at t, P_t the price of this output, W_t wages, N_t employment, P_t^F fuel prices, Y_t use of fuel, r_t the nominal interest rate, k_t^i the stock of the i^{th} type of capital, I_t^i gross investment in this type of capital (planned one period ahead), V_t^i the price of this type of capital good and E[ ] an expectations operator. The firm chooses k_{t+1}^i, N_{t+1}, Y_{t+1} and Q_{t+1}. The first two bracketed terms represent the present discounted value of present and future operating profits. The third term represents the cost of acquiring new capital goods. The final two terms represent discounted capital gains from changes in the value of the firm's capital stock over the two periods.

Neither the first nor the last term in equation (A1) is dependent on current investment, and will not affect the maximisation problem. Defining these terms as z_t, we can write:

$$P = z_t + \{P_{t+1} Q_{t+1} - E[W_{t+1}] N_{t+1} - E[P_{t+1}^F] Y_{t+1}\}/[1 + r_t] - S_i V_t^i I_t^i \qquad (A2)$$
$$+ S_i \{E[V_{t+1}^i] k_{t+1}^i/[1 + r_t] - V_t^i k_t^i\}$$

The stock of the i^{th} type of capital is related to gross investment by the following law of motion:

$$k_{t+1}^i = [k_t^i + I_t^i]/[1 + d] \qquad (A3)$$

d is the rate of capital depreciation. Substituting equation (A3) into equation (A2):

$$\Pi = z_t + \{P_{t+1}\cdot Q_{t+1} - \Sigma_i E[C^i_{t+1}]\cdot k^i_{t+1} - E[W_{t+1}]\cdot N_{t+1} - E[P_{t+1}{}^F]\cdot M_{t+1}\}/[1 + r_t] \qquad (A4)$$

where C^i_t is the user cost of capital net of a capital gains term:

$$C^i_t = [r_t + \delta + r_t\cdot\delta]\cdot V^i_t - [V^i_{t+1} - V^i_t] \qquad (A5)$$

In order to derive a tractable solution for the optimal capital stock, we will assume that output is a log-linear function of employment and the firm's stock of each type of capital. We introduce adjustment costs by allowing output to depend negatively on the rate of growth of capital (productivity is lower when new capital is being installed). It is possible that the same type of costs could also apply to labour, so that workers are less productive during a period of expansion of the workforce, and output is lower during the expansion:

$$Q_t = \theta\cdot {k^B_t}^{\alpha}\cdot {k^M_t}^{\gamma}\cdot N_t^{\beta}\cdot Y_t^{\zeta}\cdot (k^B_t/k^B_{t-1})^{-\phi}\cdot (N_t/N_{t-1})^{-\omega}\cdot (k^M_t/k^M_{t-1})^{-\psi} \qquad (A6)$$

$1 > \alpha > \phi > 0, 1 > \beta > \omega > 0, 1 > \gamma > \psi > 0, 1 > \zeta > 0, \theta > 0,$

$\alpha + \beta + \gamma + \zeta - \phi - \psi - \omega \leq 1$

The parameter restrictions embody neoclassical assumptions. We will also allow demand for the firm's output to depend negatively on its relative price. Substituting equation (A6) into equation (A4) we have:

$$\Pi = z_t + \{P_{t+1}\cdot\theta\cdot {k^B_{t+1}}^{\alpha-\phi}\cdot {k^M_{t+1}}^{\gamma-\psi}\cdot N_{t+1}^{\beta-\omega}\cdot Y_{t+1}^{\zeta}\cdot {k^B_t}^{\phi}\cdot N_t^{\omega}\cdot {k^M_t}^{\psi} \qquad (A7)$$
$$- \Sigma_i E[C^i_{t+1}]\cdot k^i_{t+1} - E[W_{t+1}]\cdot N_{t+1} - E[P_{t+1}{}^F]\cdot M_{t+1}\}/[1 + r_t]$$

Maximising Π with respect to k^B_{t+1}, k^M_{t+1}, N_{t+1} and Y_{t+1} yields the following solutions for k^i_{t+1}, expressed in logarithms:

$$\ln(k^B_{t+1}) = \ln(\alpha - \phi) - \ln(E[c^B_{t+1}]) + \{[\theta + \phi\cdot\ln(k^B_t) + \omega\cdot\ln(N_t) + \psi\cdot\ln(k^B_t)]\cdot\sigma \qquad (A8)$$
$$- \ln(E[w_{t+1}])\cdot[\beta - \omega] - \ln(E[c^M_{t+1}])\cdot[\gamma - \psi] - \ln(E[p_{t+1}{}^F])\cdot\zeta\}/[1 - \sigma]$$

$$\ln(k^M_{t+1}) = \ln(\gamma - \psi) - \ln(E[c^M_{t+1}]) + \{[\theta + \phi\cdot\ln(k^B_t) + \omega\cdot\ln(N_t) + \psi\cdot\ln(k^B_t)]\cdot\sigma \qquad (A9)$$
$$- \ln(E[w_{t+1}])\cdot[\beta - \omega] - \ln(E[c^B_{t+1}])\cdot[\alpha - \phi] - \ln(E[p_{t+1}{}^F])\cdot\zeta\}/[1 - \sigma]$$

where $s = [a + b + g + z - f - w - y]$, and lower case letters represent real factor costs: $w_t = W_t/P_t$, $p_t^F = P_t^F/P_t$ and $c_t^i = C_t^i/P_t$. Assuming that employment decisions are planned one period in advance, actual employment in period t+1 will be equal to that planned in period t:

$$\ln(N_{t+1}) = \ln(b-w) - \ln(E[w_{t+1}]) + \{[q + f\cdot\ln(k^B_t) + w\cdot\ln(N_t) + y\cdot\ln(k^B_t)]\cdot s \quad \text{(A10)}$$
$$-\ln(E[c^B_{t+1}])\cdot[a - f] - \ln(E[c^M_{t+1}])\cdot[g - y] - \ln(E[p_{t+1}^F])\cdot z\}/[1 - s]$$

In other words, the optimal capital stock and employment levels are log-linear functions of the real user cost of each type of capital, the real wage rate, the real fuel price, the existing stock of each type of capital and the existing level of employment. Equations (A8-A10) are of the general form:

$$\ln(k^B_{t+1}) = a_1 - \ln(E[c^B_{t+1}]) + a_4\cdot\ln(k^B_t) + a_5\cdot\ln(N_t) + a_6\cdot\ln(k^M_t) \quad \text{(A8a)}$$
$$-a_8 ?\ln(E[w_{t+1}]) - a_9 ?\ln(E[c^M_{t+1}]) - a_{10} ?\ln(E[p_{t+1}^F])$$

$$\ln(k^M_{t+1}) = a_2 - \ln(E[c^M_{t+1}]) + a_4\cdot\ln(k^B_t) + a_5\cdot\ln(N_t) + a_6\cdot\ln(k^M_t) \quad \text{(A9a)}$$
$$-a_7 ?\ln(E[c^B_{t+1}]) - a_8 ?\ln(E[w_{t+1}]) - a_{10} ?\ln(E[p_{t+1}^F])$$

$$\ln(N_{t+1}) = a_3 - \ln(E[w_{t+1}]) + a_4\cdot\ln(k^B_t) + a_5\cdot\ln(N_t) + a_6\cdot\ln(k^M_t) \quad \text{(A10a)}$$
$$-a_7 ?\ln(E[c^B_{t+1}]) - a_9 ?\ln(E[c^M_{t+1}]) - a_{10} ?\ln(E[p_{t+1}^F])$$

We have data only on gross investment, not the net capital stock. The two are related by the equation:

$$k_t^i = \sum_{t=1}^{t=\infty} (1-d)^t \cdot I_{t-t}^i \quad \text{(A11)}$$

and hence:

$$I_t^i = k_{t+1}^i - \sum_{t=1}^{t=\infty} (1-d)^t \cdot I_{t-t}^i \quad \text{(A12)}$$

We will assume that this equation has a logarithmic approximation of the form:

$$\ln(I_t^i) = p \cdot \ln(k_t^i) + (1-p) \cdot \sum_{t=1}^{t=\infty} l_t \cdot \ln(I_{t-t}^i) \quad \text{(A13)}$$

and hence:

$$\ln(I^B_t) = p\cdot[a_1 - \ln(E[c^B_t]) - a_8\cdot\ln(E[w_t]) - a_9\cdot\ln(E[c^M_t]) - a_{10}\cdot\ln(E[p^F_t])] \tag{A14}$$
$$+ [(1-p)\cdot l_1 + a_4]\cdot\ln(I^B_{t-1}) + a_6\cdot\ln(I^M_{t-1}) + \pi\cdot a_5\cdot\ln(N_{t-1})$$
$$+ (1-p)\cdot[\Sigma_{t=2}^{t=\infty} (l_t + a_4\cdot l_{t-1})\cdot\ln(I^B_{t-t}) + a_6\cdot l_{t-1}\cdot\ln(I^M_{t-t})]$$

$$\ln(I^M_t) = p\cdot[a_2 - \ln(E[c^M_t]) - a_7\cdot\ln(E[c^B_t]) - a_8\cdot\ln(E[w_t]) - a_{10}\cdot\ln(E[p^F_t])] \tag{A15}$$
$$+ [(1-p)\cdot l_1 + a_6]\cdot\ln(I^M_{t-1}) + a_4\cdot\ln(I^B_{t-1}) + \pi\cdot a_5\cdot\ln(N_{t-1})$$
$$+ (1-p)\cdot[\Sigma_{t=2}^{t=\infty} (l_t + a_6\cdot l_{t-1})\cdot\ln(I^M_{t-t}) + a_4\cdot l_{t-1}\cdot\ln(I^B_{t-t})]$$

$$\ln(N_t) = p\cdot[a_3 - \ln(E[w_t]) - a_7\cdot\ln(E[c^B_t]) - a_9\cdot\ln(E[c^M_t]) - a_{10}\cdot\ln(E[p^F_t])] \tag{A16}$$
$$+ a_5\cdot\ln(N_{t-1}) + [a_4/p]\cdot[\ln(I^B_{t-1}) - (1-p)\cdot\Sigma_{t=2}^{t=\infty} l_t\cdot\ln(I^B_{t-t})]$$
$$+ [a_6/p]\cdot[\ln(I^M_{t-1}) - (1-p)\cdot\Sigma_{t=2}^{t=\infty} l_t\cdot\ln(I^M_{t-t})]$$

With Rational Expectations, the differences between $E[x_t]$ and x_t will be entirely random, so we can write:

$$\ln(I^B_t) = p\cdot[a_1 - \ln(c^B_t) - a_8\cdot\ln(w_t) - a_9\cdot\ln(c^M_t) - a_{10}\cdot\ln(p^F_t)] \tag{A14a}$$
$$+ [(1-p)\cdot l_1 + a_4]\cdot\ln(I^B_{t-1}) + a_6\cdot\ln(I^M_{t-1}) + \pi\cdot a_5\cdot\ln(N_{t-1})$$
$$+ (1-p)\cdot[\Sigma_{t=2}^{t=\infty} (l_t + a_4\cdot l_{t-1})\cdot\ln(I^B_{t-t}) + a_6\cdot l_{t-1}\cdot\ln(I^M_{t-t})] + u^B_t$$

$$\ln(I^M_t) = p\cdot[a_2 - \ln(c^M_t) - a_7\cdot\ln(c^B_t) - a_8\cdot\ln(w_t) - a_{10}\cdot\ln(p^F_t)] \tag{A15a}$$
$$+ [(1-p)\cdot l_1 + a_6]\cdot\ln(I^M_{t-1}) + a_4\cdot\ln(I^B_{t-1}) + \pi\cdot a_5\cdot\ln(N_{t-1})$$
$$+ (1-p)\cdot[\Sigma_{t=2}^{t=\infty} (l_t + a_6\cdot l_{t-1})\cdot\ln(I^M_{t-t}) + a_4\cdot l_{t-1}\cdot\ln(I^B_{t-t})] + u^M_t$$

$$\ln(N_t) = p\cdot[a_3 - \ln(w_t) - a_7\cdot\ln(c^B_t) - a_9\cdot\ln(c^M_t) - a_{10}\cdot\ln(p^F_t)] \tag{A16a}$$
$$+ a_5\cdot\ln(N_{t-1}) + [a_4/p]\cdot[\ln(I^B_{t-1}) - (1-p)\cdot\Sigma_{t=2}^{t=\infty} l_t\cdot\ln(I^B_{t-t})]$$
$$+ [a_6/p]\cdot[\ln(I^M_{t-1}) - (1-p)\cdot\Sigma_{t=2}^{t=\infty} l_t\cdot\ln(I^M_{t-t})] + u^N_t$$

where the u^i_t are random variables. With Adaptive Expectations, however, lags of the factor price terms will also appear in the system. Note that $\ln(c^i_t)$ has two linearly separable components: a real interest rate term (adjusted for capital depreciation) and a real capital goods price term:

$$\ln(c^{i}_{t}) = \ln(v^{i}_{t}) + \ln(h_{t}) \qquad \text{(A17)}$$

where $\ln(v^{i}_{t}) = \ln(V^{i}_{t}/P_{t})$ and $\ln(h_{t}) = \ln(r_{t-1} + d + r_{t-1}\square d - [v^{i}_{t} - v^{i}_{t-1}]/v^{i}_{t-1})$

Since $\ln(w_{t})$, $\ln(c^{B}_{t})$, $\ln(c^{M}_{t})$ and $\ln(p^{F}_{t})$ are potentially endogenous to factor demand, it will not be possible (in the absence of appropriate instruments) to include them in an econometric model of factor demand. If we were to assume Rational Expectations, then lags of factor prices could be used as instruments. This assumption may be too restrictive, so we instead adopt a reduced-form version of the system that is agnostic about expectations formation. Contemporaneous values of the factor prices are replaced by lags up to order T, and the two components of $\ln(c^{i}_{t})$ may have different coefficients:

$$\ln(I^{B}_{t}) = p\square a_{1} - p\square\,[\Sigma_{t=1}^{t=T} b_{1t}\square\ln(v^{B}_{t-t}) - b_{2t}?\ln(w_{t-t}) - b_{3t}?\ln(v^{M}_{t-t}) - b_{4t}?\ln(p_{t-t}^{F}) - b_{5t}?\ln(h_{t-t})] \qquad \text{(A14b)}$$
$$+ [(1-p)\square l_{1} + a_{4}]\square\ln(I^{B}_{t-1}) + a_{6}\square\ln(I^{M}_{t-1}) + \pi\cdot a_{5}\cdot\ln(N_{t-1})$$
$$+ (1-p)\square[\Sigma_{t=2}^{t=\infty} (l_{t} + a_{4}\square l_{t-1})\square\ln(I^{B}_{t-t}) + a_{6}\square l_{t-1}\square\ln(I^{M}_{t-t})] + u^{B}_{t}$$

$$\ln(I^{M}_{t}) = p\square a_{2} - p\square[\Sigma_{t=1}^{t=T} f_{1t}\square\ln(v^{B}_{t-t}) - f_{2t}?\ln(w_{t-t}) - f_{3t}?\ln(v^{M}_{t-t}) - f_{4t}?\ln(p_{t-t}^{F}) - f_{5t}?\ln(h_{t-t})] \qquad \text{(A15b)}$$
$$+ [(1-p)\square l_{1} + a_{6}]\square\ln(I^{M}_{t-1}) + a_{4}\square\ln(I^{B}_{t-1}) + \pi\cdot a_{5}\cdot\ln(N_{t-1})$$
$$+ (1-p)\square[\Sigma_{t=2}^{t=\infty} (l_{t} + a_{6}\square l_{t-1})\square\ln(I^{M}_{t-t}) + a_{4}\square l_{t-1}\square\ln(I^{B}_{t-t})] + u^{M}_{t}$$

$$\ln(N_{t}) = p\square a_{3} - p\square[\Sigma_{t=1}^{t=T} z_{1t}\square\ln(v^{B}_{t-t}) - z_{2t}?\ln(w_{t-t}) - z_{3t}?\ln(v^{M}_{t-t}) - z_{4t}?\ln(p_{t-t}^{F}) - z_{5t}?\ln(h_{t-t})] \qquad \text{(A16b)}$$
$$+ a_{5}\square\ln(N_{t-1}) + [a_{4}/p\square][\ln(I^{B}_{t-1}) - (1-p)\square\Sigma_{t=2}^{t=\infty} l_{t}\square\ln(I^{B}_{t-t})]$$
$$+ [a_{6}/p\square][\ln(I^{M}_{t-1}) - (1-p)\square\Sigma_{t=2}^{t=\infty} l_{t}\square\ln(I^{M}_{t-t})] + u^{N}_{t}$$

If the lag order on all right-hand-side variables is restricted to two, then the system can be represented by equation (2) in Section 3.3. That the estimated u^{i}_{t} are not autocorrelated suggests that this restriction represents a reasonable approximation of equations (A14b–A16b).

Appendix 2: Table A1: SUR Estimates of the Regression Coefficients (with White Corrected Standard Errors)

variable	$\ln(I_M)$ co.	std. err.	t ratio	$\ln(I_B)$ co.	std. err.	t ratio	$\ln(E^s)$ co.	std. err.	t ratio
$(I_M)_{-1}$	0.252422	0.071830	3.514150	0.410715	0.112779	3.641780	-0.003310	0.010197	-0.32428
$(I_M)_{-2}$	0.009020	0.076936	0.117232	0.015720	0.118231	0.132956	-0.016178	0.011408	-1.41806
$(I_B)_{-1}$	0.069025	0.037647	1.833460	0.141794	0.075450	1.879300	0.006600	0.005650	1.16855
$(I_B)_{-2}$	0.062584	0.036856	1.698060	0.108589	0.073342	1.480590	0.019628	0.005760	3.40838
$(N)_{-1}$	-0.343494	0.350983	-0.978664	-0.506409	0.511462	-0.990120	0.820944	0.067865	12.09670
$(N)_{-2}$	-0.261180	0.338528	-0.771518	0.082688	0.506292	0.163321	-0.225996	0.061319	-3.68557
$(w)_{-1}$	1.206460	0.851008	1.417690	3.771700	1.705780	2.211130	-0.052446	0.110840	-0.47317
$(w)_{-2}$	-3.487040	0.847383	-4.115070	-4.845980	1.720880	-2.815990	-0.337695	0.108609	-3.10927
$(h)_{-1}$	0.077916	0.170721	0.456392	0.103461	0.349541	0.295992	-0.010176	0.021262	-0.47860
$(h)_{-2}$	-0.018894	0.187546	-0.100743	0.060599	0.379573	0.159650	-0.051961	0.024052	-2.16035
$(v_B)_{-1}$	-0.164746	0.747143	-0.220501	-1.726360	1.524560	-1.132360	-0.111657	0.094346	-1.18349
$(v_B)_{-2}$	0.983404	0.506540	1.941410	2.276160	1.029820	2.210250	0.213469	0.066077	3.23063
$(v_M)_{-1}$	-0.452309	1.159660	-0.390037	1.702990	2.313370	0.736152	0.312127	0.148072	2.10794
$(v_M)_{-2}$	1.700000	1.169770	1.453290	0.694580	2.400560	0.289340	-0.255613	0.147111	-1.73755
$(p_F)_{-1}$	-2.103910	0.452987	-4.644540	-3.765520	0.921514	-4.086240	-0.387375	0.056324	-6.87764
$(p_F)_{-2}$	1.007350	0.492435	2.045660	1.521410	1.000560	1.520560	0.139338	0.063761	2.18531
(F)	-0.268731	0.060848	-4.416440	-0.169173	0.122648	-1.379340	-0.017381	7.87E-03	-2.20906
$(F)_{-1}$	-0.164030	0.062521	-2.623600	-0.175540	0.128401	-1.367130	-0.030227	8.04E-03	-3.75797
$(F)_{-2}$	0.005280	0.041275	0.127972	-0.036108	0.082706	-0.436584	0.017967	5.38E-03	3.34209
$(F-G)$	-0.536356	0.122876	-4.365020	-0.374912	0.251361	-1.491530	-0.063670	0.015384	-4.13866
$(F-G)_{-1}$	0.077676	0.078422	0.990482	0.211249	0.160316	1.317700	-2.86E-03	0.010128	-0.28223
$(F-G)_{-2}$	-0.388347	0.091616	-4.238850	-0.411784	0.184504	-2.231850	-0.023782	0.011644	-2.04252

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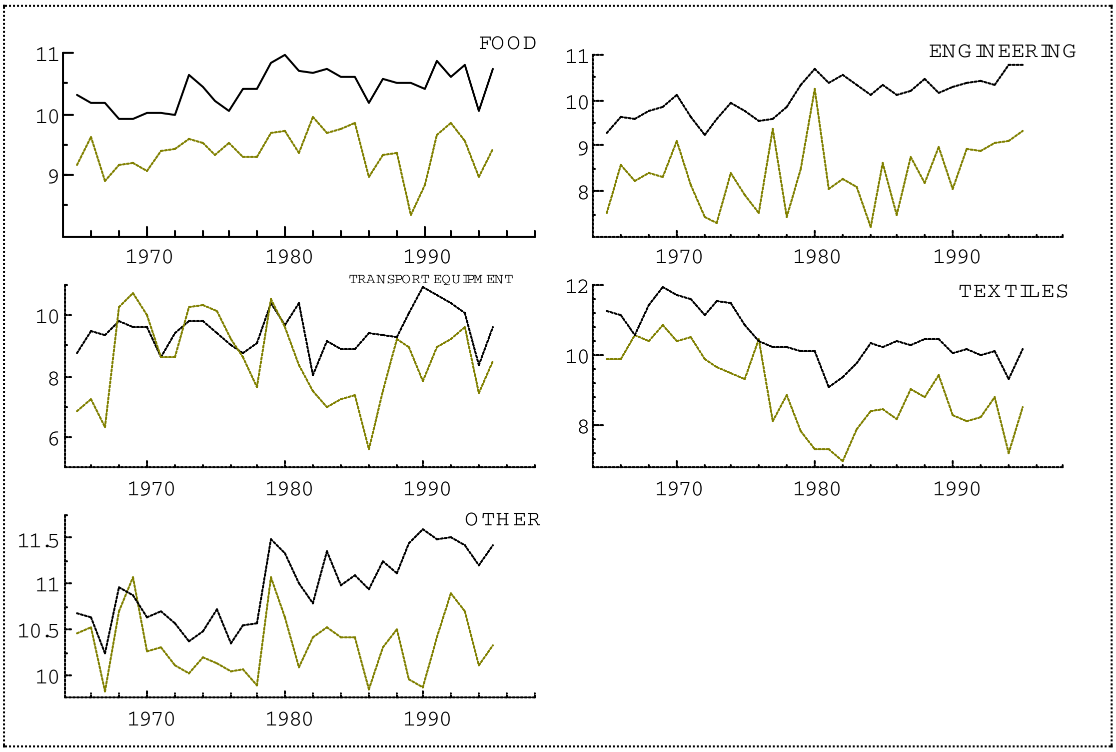

Figure 1 (a): Real Manufacturing Investment (in Logarithms)

Solid Lines: Machinery and Equipment; Dashed Lines: Construction

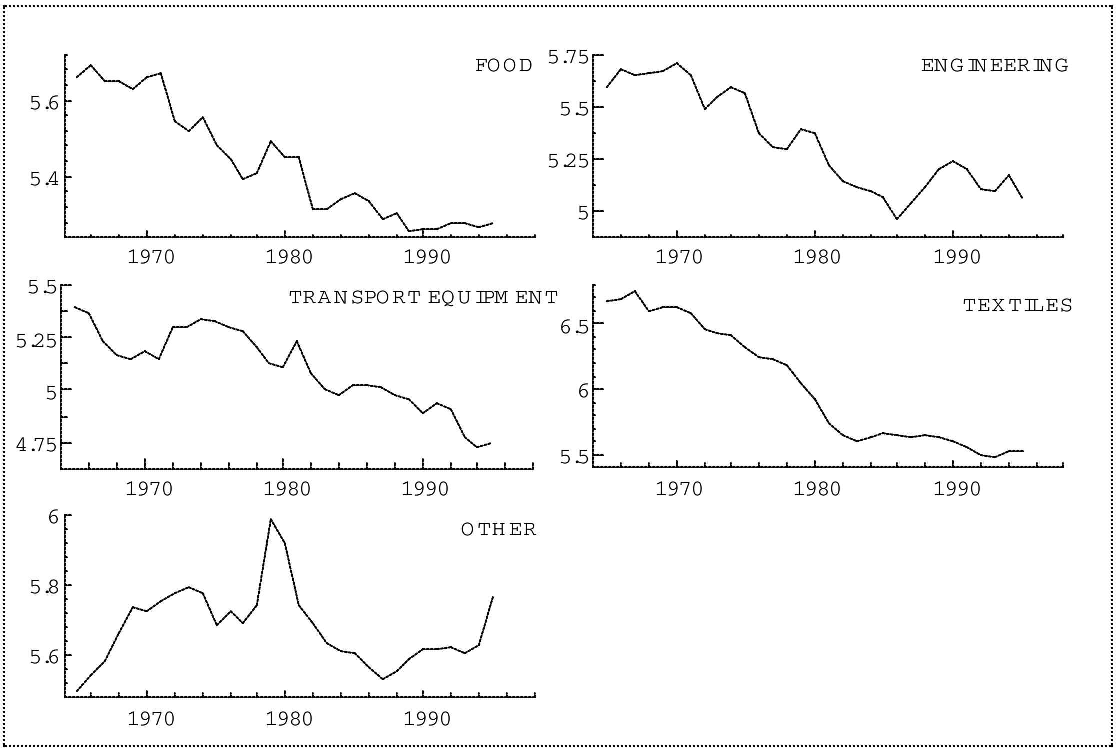

Figure 1 (b): Employment (in Logarithms)

Figure 2(a): log (1 + Total Fatalities in Violent Incidents), F

Figure 2(b): log(1 + Total Fatalities in Violent Incidents) − log(1 + Violent Incidents), F-G