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Oil Prices, Profits, and Recessions: An Inquiry Using Terrorism as an Instrumental Variable*

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Abstract

Nearly all post-war recessions have been preceded by oil-price shocks, but is this because spikes in the price of petroleum cause economic downturns? Most research has ignored an identification problem: oil prices and the state of the world economy are endogenously determined. This paper uses terrorist incidents as an instrumental variable. In an international panel of industries, we show that after correction for simultaneity bias – though not before – the price of oil has large negative effects upon profitability. Our results seem to lend support to the claim that oil-price spikes can be a source of recessions.

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1 Introduction

This paper is a contribution to the long-standing debate about whether spikes in the price of oil lead to recessions. We build upon two ideas. The first is that it is necessary to address a central identification problem: the petroleum price and the health of the world economy are endogenously determined. The second is that terrorist attacks provide economists with a potentially useful instrumental variable.

Instrumenting in this way, we argue, leads to improved inference and helps to unravel the role of oil shocks in the economy. Our analysis has a cross-national flavor and combines theory with disaggregated evidence. It studies a panel of seventeen industries across twelve nations between 1981 and 2003. These data cover both manufacturing and services. Throughout the analysis we make the same simplifying assumption as in the literature, namely, that the price of oil can be thought of as a proxy for the price of energy more generally. We draw upon concepts proposed by Rotemberg and Woodford (1991, 1996), and present estimates of the long run real oil-price elasticity of profits. We control for country and industry fixed-effects.

A number of economists have argued that oil spikes – abrupt movements in the price of petroleum – have significant macroeconomic effects. The post-war era offers informal and econometric support for this view. Hamilton (1983) provided one of the most persuasive accounts of the thesis. He demonstrated that until the late 1970s almost all modern recessions had been preceded by a marked increase in the price of oil. Subsequent observation – the severe downturn of the early 1980s in particular – appeared to line up on James Hamilton's side.[1] Formal support also emerged. Carruth et al (1998), for example, uncovered evidence of a connection between movements in United States unemployment and movements in real oil prices approximately 1-2 years before, and showed that changes in oil prices Granger-cause unemployment fluctuations. Using micro data from the early 1970s to the late 1980s, Davis and Haltiwanger (2001) provided other evidence. They documented a direct link between the oil price and the labor market. The authors concluded that oil shocks account for almost 25% of the

[1] "Nine out of ten of the US postwar recessions since WWII were preceded by a spike up in the price of oil..." (Hamilton 2005).

variability in employment growth in US manufacturing – twice as much as monetary shocks. Papers containing other supporting evidence are summarized in the review article by Hamilton (2005).

Neoclassical theory suggests that expensive energy is likely to reduce profitability and therefore be inimical to economic booms. At the time of writing, however, a general issue remains controversial (Zarnowitz 1999, Barsky et al 2002, Barsky and Kilian 2004): whether oil shocks can be quantitatively important enough to be causal in economic slowdowns. Was the world recession of the early 1980s prompted by the rise in real petroleum prices that occurred in 1979-80, and how much did the spike in the oil price in 1990 contribute to the 8% US unemployment rate of 1992? Such questions are still debated.

The paper explores this with international inter-industry data. Unlike most previous analyses, whether macroeconomic or microeconomic, we focus on profitability rather than on employment or output. Our analysis is complementary to that of Keane and Prasad (1996), who also take a disaggregated approach and study the level of employment rather than profitability, and to Lee and Ni (2002), who examine whether oil prices have their effect predominantly upon industries' demand or supply functions. Later results provide empirical evidence relevant to the theoretical work of Kim and Loungani (1992) and Leduc and Sill (2004), and to cross-industry work by Bohi (1991) that suggests only modest output responses to oil shocks.

Our paper's principal point is a simple one. It is about identification. Oil prices and the state of the world economy are endogenously determined. Yet it has been presumed in previous writings that oil shocks are sufficiently exogenous that the potential problem of simultaneity bias can be ignored. By contrast, we lay out evidence, including Wu-Hausman tests, that suggests such a view may be mistaken. As shown below, once a correction is made for the endogeneity of oil prices, the case for Hamilton's ideas seems to become stronger. Later results are consistent with the view that oil spikes play an influential role in the economy.

2 Oil and Profitability: An Analytical Framework

Changes in energy prices alter firms' costs. There is, however, no generally accepted way to model the effects of the petroleum price upon economic activity.

In the spirit of Rotemberg and Woodford (1991, 1996), we work with a conceptual framework in which there is a continuum of firms within each sector of the economy. Each produces a differentiated good. There can be imperfect competition in the product market. Taking the prices of all other firms as given, each firm chooses its factor demands and its price. In the spirit of a Phelps-Winter framework, we consider a customer market model in which demand also has a dynamic pattern. This is the idea that the firm has a stock of customers that erodes or increases only sluggishly. A firm that lowers its current price sells more to current customers, but also increases its stock of customers, and at any given price this increased stock leads to greater sales in the future.

To model this, assume that firm i faces a demand for its product given by

$$y_t^i = \left(\frac{p_t^i}{p_t}\right)^{-\theta} y_t \; m_t^i \tag{1}$$

where y^i is the output of a particular firm and p^i the price it sets. Variables y and p are aggregate output and the price level, respectively, and θ is a parameter which is increasing as the degree of imperfect competition falls.

The stock of customers is m_t^i which evolves according to the difference equation

$$m_{t+1}^i = \left(\frac{p_t^i}{p_t}\right)^{-\varepsilon} m_t^i \tag{2}$$

where ε measures the elasticity of the stock of customers to the firm's relative price.

Firms face a production function

$$y_t = k_t^{\alpha} \; n_t^{\beta} \; e_t^{1-\alpha-\beta}$$

where k is capital, n labor and e energy, and a cost function

$$c_t = r_t \; k_t + w_t \; n_t + p_t^e \; e_t$$

where w, r, p^e are the real prices of the three factors respectively.

Solving the cost minimisation problem gives an expression for marginal cost

$$\lambda = \left(\frac{r}{\alpha}\right)^{\alpha} \left(\frac{w}{\beta}\right)^{\beta} \left(\frac{p^e}{1-\alpha-\beta}\right)^{1-\alpha-\beta}$$

and firms take this marginal cost as given and choose their price, and hence their markup, to maximise the expected discounted value of real profits. Firm i's real profit in period t is then given by

$$\Pi_t^i = \left(\frac{\mu_t^i - 1}{\mu_t} \right) y_t^i \tag{3}$$

where μ_t^i is the markup of firm i and μ_t the aggregate markup. Using (1) and (2) we can write the maximand as

$$E_t \sum_{j=0}^{\infty} \beta_{t,t+j} \left(\frac{\mu_{t+j}^i - 1}{\mu_{t+j}} \right) \left(\frac{\mu_{t+j}^i}{\mu_{t+j}} \right)^{-\theta} y_{t+j} \prod_{k=0}^{j-1} \left(\frac{\mu_{t+k}^i}{\mu_{t+k}} \right)^{-\varepsilon}$$

where $\beta_{t,t+j}$ is the stochastic discount factor between period t and $t+j$. The first order condition for a maximum, in a symmetric equilibrium in which all firms within a single sector set the same markup $\mu_t^i = \mu_t$ and have a market share equal to unity, leads to the optimum markup

$$\mu_t = \frac{\theta}{\theta - 1 + \tau \frac{x_t}{y_t}} \tag{4}$$

where x is the present value of future profits

$$x_t = E_t \sum_{j=1}^{\infty} \beta_{t,t+j} \left(\frac{\mu_{t+j}^i - 1}{\mu_{t+j}} \right) y_{t+j}.$$

Note that if $\varepsilon = 0$, i.e. the market share is constant, then the markup is constant and equal to $\frac{\theta}{\theta-1}$ as in the standard Dixit-Stiglitz case.

Markups and profits can vary across sectors. With non-zero ε, the markup is decreasing in the ratio of future profits to current output.

A *temporary* increase in oil prices means that future profits are unchanged, and current output falls, so that $\frac{x_t}{y_t}$ increases and the markup declines.

The full expression for profits takes a relatively complicated form because, from Equation (4), the current markup depends on all future values of the markup and output. Nevertheless, if we assume that the three factor prices follow first-order autoregressive processes – or any equivalent higher-order ARMA processes – a useful simplified form emerges. Write equation (4) as

$$\mu_t = \mu_t \left(r_t, w_t, p_t^e, \Psi \right)$$

where Ψ is a vector of parameters. Then it is straightforward to show that

$$\frac{\partial \mu_t}{\partial r_t} < 0; \frac{\partial \mu_t}{\partial w_t} < 0; \frac{\partial \mu_t}{\partial p_t^e} < 0$$

and current profit is a function

$$\Pi_t = \Pi_t\left(r_t, w_t, p_t^e, \Psi\right)$$

with partial derivatives:

$$\frac{\partial \Pi_t}{\partial r_t} < 0; \frac{\partial \Pi_t}{\partial w_t} < 0; \frac{\partial \Pi_t}{\partial p_t^e} < 0.$$

This analysis implies that the effect of an increase in a factor price will differ in ways that depend on whether the increase is temporary or permanent. Equation (4) means that a permanent increase in a factor price can have no long run effect on the markup but will permanently depress output and, via (3), the level of profitability. In the long run, profits are depressed by permanently higher costs of energy.

It is necessary in empirical work to have a measure of energy prices. Following convention, we focus in this paper on the price of petroleum. We also create variables for wages, w, and interest rates, r.

Perhaps surprisingly, there seems to have been little empirical work on how oil shocks alter profitability. It would be possible to study this relationship with aggregate data. Our paper's approach, however, attempts to exploit the greater level of disaggregation offered by sectoral data. Estimates of the short run effects of oil prices are provided in the paper, but the emphasis later is upon the long run consequences of a higher price of petroleum, and in particular upon whether these are large enough to be consistent with the oil-macroeconomy relationship suggested in the work of James Hamilton and others.

3 The Empirical Approach

We exploit a dataset on the manufacturing and service sectors across a range of industrialized nations (mostly from the European Union). The paper uses these to assess the impact of oil price shocks upon two measures of profitability: price-to-cost margins and profits.

Our data cover twelve countries. These are Austria; Belgium; Denmark; Finland; France; Germany; Italy; Japan; Netherlands; Portugal; Spain; Sweden. Within the different nations, the data set provides information on ten manufacturing sectors and seven services sectors. The data cover the period 1981-2003. This provides an unbalanced industry panel (it is unbalanced also with respect to time).

The source for the data is the Bank for the Accounts of Companies Harmonized (BACH) database. This contains account statistics of non-financial enterprises in eleven European countries, Japan, and the US.[2] Accounts are harmonized through a common layout for balance sheets, profit-and-loss accounts, statements of investments, and statements of depreciation. The data are disaggregated at the BACH level of industries, are available annually and are broken down by major sector and firm size. The theory has predictions on the effects of oil prices upon markups; but to measure those empirically, and compute them across sectors, countries and years, it would be necessary to have information on prices and marginal costs. Therefore we ignore markups and focus on profitability.

We have to decide empirically on an appropriate measure of sectoral profitability. As an aid to robustness, we use two. They are defined in the following way.

(i) The price-to-cost margin variable

Following Domowitz et al (1986), we compute this as a price-to-cost margin, denoted by $\pi_{ik,t}$ for country i, sector k and year t:

$$\pi_{ik,t} = \frac{(\text{Value-Added} \ - \ \text{Staff Costs})_{ik,t}}{(\text{Value Added} + \text{Costs of Materials})_{ik,t}}$$

(ii) The profits variable

This alternative measure is for total profitability, denoted by $\Pi_{ik,t}$. The series sometimes takes negative values – in other words, financial losses occur in certain sectors in certain years – and this prevents us using the logarithm of the variable.

[2]The data are available at http://europa.eu.int/comm/economy_finance/indicators.htm.

A way around this problem is to re-scale the series in order to get only positive values. In the later estimations, this will affect only the value of the intercept. In order to control for changes between losses and profits, as a robustness check we also included a dummy for the existence of losses (unreported in later tables but available upon request).

The annual price of oil comes from the source *International Financial Statistics*. It is given as the number of US dollars per barrel of petroleum (UK Brent). This is then converted to a common currency (Euros) using end of period (annual) nominal exchange rates with the US dollar, and is deflated to real values using the GDP deflators of each country (the base year is the year 2000, and nominal exchange rates and GDP deflators are from the European Commission's AMECO database).[3] Nominal short term interest rates – from the AMECO database as well – are deflated using the GDP deflator for each country. The average wage, which is defined as Wages and Salaries over Total Employment (from the OECD Economic Outlook, and converted to a common currency, i.e. Euros), is deflated using national GDP deflators; it is measured at the country level, so does not vary across sectors. This is perhaps most naturally viewed as an assumption of a mobile competitive labor market where, within any country, workers of given quality earn the same in each sector.

In the empirical analysis we also explore what happens when the price of oil is deflated with sectoral price indices. This is to allow for the possibility that different parts of the economy might be affected differently by changes in real oil prices. Sectoral price indices are available from Eurostat's New Cronos database, and are disaggregated at the 2-digit NACE revision 1 level. Sectoral price indices are not available, unfortunately, at the BACH level of sectors. Because there exists a correspondence between the two sectoral classifications (BACH and NACE, where BACH sectors are composed of several NACE sectors), we calculate the sectoral price indices at the BACH level as a weighted average of the corresponding sectors at the NACE revision 1 level. Value-added shares are used as weights.

The aim here is to understand the causal role of oil prices. As mentioned by

[3] The AMECO database is available online at http://ec.europa.eu/economy_finance/indicators/annual_macro_economic_database/ameco_en.htm

Barsky and Kilian (2004), the price of petroleum may be endogenously[4] determined alongside the state of the world economy. Previous empirical research has noted this possibility but largely ignored it. It has been implicitly or explicitly assumed that oil shocks arrive in an extraneous way, and some authors have used data on lagged oil prices to bolster a causal case. Our paper experiments with an instrumental variable.

We propose that terrorist acts might serve as a suitable shifter in an oil-price equation while satisfying a natural exclusion restriction in equations for profitability. Because terrorist attacks are often politically motivated, such an approach seems a potentially fruitful one. Moreover, Ali (2007) has recently shown that, as might be expected, there is a statistically significant reduced-form correlation between oil prices and terrorist incidents.

Data on known terrorist incidents are available online from the MIPT Terrorism Knowledge Database.[5] This website provides information on the number of attacks in each month of the year, as well as the region where the incidents took place, the targets of the attacks, the identity of the organizations that carried out the attacks, and whether the incidents were suicide related or not. Unsurprisingly, some of the terrorism variables are highly correlated; for instance, attacks in the Middle-East move almost one-for-one with the number of incidents that are suicide related. Hence we decided to use information only on the total number of attacks and on the nature of the attacks (Middle-East, suicide, etc – and we exclude attacks on businesses as this might not be exogenous to margins and profitability). As the estimation uses annual data on oil prices and profitability, monthly information on terrorist incidents was aggregated into an annual frequency.

Table 1 reports descriptive statistics. These include the mean, minimum and maximum values for the countries and sectors. The data reveal that on average margins are lowest in Sweden and Germany, and highest in Finland. Profits (as a percentage of total turnover) range between -25 percent and 65 percent, and are lowest in Metalliferous Ores and highest in Chemicals. Losses are most severe in Spain while profits are highest in Sweden.

[4] This reverse-causality problem is not solved merely by our use of disaggregated data, because of a likely economy-wide component in profits that may be correlated with oil prices.

[5] This is available at http://www.tkb.org.

We have in mind a three-factor model. Profits then depend on the costs of oil, capital, and labor. In order to distinguish between the short and the long run effects of oil price shocks upon margins and profitability, we estimate the following two kinds of equations. They are for margins $\pi_{ik,t}$

$$\begin{aligned}\Delta \ln \pi_{ik,t} = \alpha_k + \xi_i + \beta_0 \Delta \ln \pi_{ik,t-1} + \beta_1 \ln \pi_{ik,t-1} + \beta_2 \Delta \ln p_{i,t}^{oil} \\ + \beta_3 \ln p_{i,t-1}^{oil} + \beta_4 \Delta \ln r_{i,t} + \beta_5 \ln r_{i,t-1} + \beta_6 \Delta \ln w_{i,t} \\ + \beta_7 \ln w_{i,t-1} + \varepsilon_{ik,t} \end{aligned} \tag{5}$$

and for profits $\Pi_{ik,t}$

$$\begin{aligned}\Delta \ln \Pi_{ik,t} &= \alpha_k + \xi_i + \varphi_0 \Delta \ln \Pi_{ik,t-1} + \varphi_1 \ln \Pi_{ik,t-1} + \varphi_2 \Delta \ln p_{i,t}^{oil} \\ &+ \varphi_3 \ln p_{i,t-1}^{oil} + \varphi_4 \Delta \ln r_{i,t} + \varphi_5 \ln r_{i,t-1} + \varphi_6 \Delta \ln w_{i,t} \\ &+ \varphi_7 \ln w_{i,t-1} + \epsilon_{ik,t} \end{aligned} \tag{6}$$

where $p_{i,t}^{oil}$ is the real price of oil for country i in a common currency, $r_{i,t}$ is the short run real interest rate, $w_{i,t}$ is the average wage for country i, and Δ is the first-difference operator. Sector α_k and country ξ_i fixed-effects are included in each specification.

The short run elasticities of margins and profits with respect to oil prices, real interest rates, and wages are given by the estimated coefficients on the variables in first-differences, while the long run elasticities can be calculated using the coefficients on the lagged levels of the variables (or error correction terms). In order to discriminate between the short and the long run effects of oil prices upon profitability, we require the variables in levels to be non-stationary. Table A1 in the Appendix attends to this. It provides a set of panel unit root tests to investigate for the existence of unit roots in margins, profits, interest rates, average wages and the price of oil (we test for unit roots in the price of oil only across countries as the variable does not change across sectors). The Im, Pesaran and Shin (2003) and ADF-Fisher Chi Square statistics test the null of individual root processes, the Levin, Lin and Chu (2002) statistic the null of a common unit root, and the Hadri (2000) statistic the null of no common unit root process. We allow for the inclusion or not of deterministic trends. In almost all cases, it is not possible to reject the null hypothesis of a unit root in the variables for margins, profits, interest rates, the price of oil and, in the majority of cases, the wage variable. In Table A2 we test for the existence of a cointegrating relationship between margins and profits, on the one hand, and the price of oil, on the other hand. Among the seven tests proposed by Pedroni (1999), six allow us to reject the hypothesis of no cointegration among the variables concerned. These results support error-correction specifications for the estimated equations.

4 Results

Table 2 reports elementary regression equations in which the dependent variables are, respectively, margins and profits. These columns provide results for our panel of industries. They cover the years 1981-2003.

The upper panel of Table 2 contains nine OLS regression equations explaining margins. We first pool the manufacturing and services sectors together. In Column (1) of Table 2, the simplest full-sample specification is presented. As a benchmark case, the equation contains solely the change in the price of oil as its explanatory variable. The variable enters with a negative effect on margins in the short run (under non-stationarity, the results are consistent but not efficient).

By adding lagged levels of the oil price $p_{i,t}^{oil}$ and the margin, Column (2) of Table 2 distinguishes between short run and long run effects. As would be expected theoretically, an increase in the real price of oil has in the steady state a downward impact on margins across countries and sectors. Yet the long run elasticity (denoted *LR elast.* in this and later tables) is small, in Column (2) of the upper half of Table 2, at an estimated value of -0.011. This effect is well-determined, with a t-statistic of 3.08. Here a doubling of the price of petroleum (a 100% move up in $p_{i,t}^{oil}$) is associated, in the steady state, with an eventual decline in industry profit margins of 1%.

Without additional controls in the equation, the immediate conclusion from OLS estimation appears to be that oil shocks have small consequences for the economy.

To allow us to assess more carefully the difference between large and small effects, the empirical backdrop is the following. Profits rise and fall sharply over the business cycle. Marcuss (2004) estimates that profitability in the US economy declines by approximately one third from the top of a boom to the trough of a recession. Similar numbers are found by Small (1998) for the UK economy: he shows that profit margins declined almost 40% before the bottom of the severe 1980s recession was reached. Hodge (2006) concludes that the size of profit variability over the cycle can be as much as 50%. Those who support the Hamilton oil-macroeconomy thesis, therefore, have to provide evidence that oil shocks can generate fluctuations of a size close to these kinds of magnitudes.

In Columns (3), (4) and (5) of Table 2, extra regressors are included. Following the theoretical framework, these are, respectively, the real interest rate, a wage variable, and both of these simultaneously. The effects of the oil price and the average wage are as predicted by the framework, but the variable for the real interest rate, although it enters with the expected negative sign, has a coefficient that is mostly insignificantly different from zero at conventional confidence levels, both in the short and the long runs. The estimated long run oil price elasticity varies only a little from one specification to another. In Column (6) we further add dynamics to the model by adding a lagged dependent variable, but the results remain unchanged.[6] Columns (7) and (8) of Table 2 present some results on sub-samples. For clarity, to emphasise that these are to be compared to the full sample, the numbers in these columns are written in italics. The major distinction here is between manufacturing and services. Although in Columns (7) and (8) the magnitude of the long run oil elasticity is similar across the sectors (at -0.020 and -0.014, respectively), oil prices enter Column 7 of the upper half of Table 2 with a better-defined coefficient than in Column (8). In the latter case, the null of zero cannot be rejected. Again, these elasticities are small.

Different industrial sectors might, in principle, react differently to changes in (real) oil prices. To try to allow for this, in Column (9) of Table 2 we deflate the price of oil using sectoral price indices (instead of GDP deflators). Due to data unavailability, only manufacturing sectors can be included. The resulting long run elasticity with respect to the price of petroleum remains statistically significantly different from zero. In Column (9), of the upper half of Table 2,

[6] When adding a lagged dependent variable, the total number of observations used in each regression does not alter. This is because data on real interest rates are missing for the first year 1981, while data for profits and margins are available for that year.

the elasticity estimate is -0.015.

The lower panel of Table 2 takes instead a measure of total profits as its dependent variable. Perhaps paradoxically, the short run elasticity of profitability with respect to oil prices in the lower half of Table 2 in Column (1) is now positive (but insignificantly different from zero). The results for profits in the following regressions are largely consistent with those reported in the upper panel of Table 2 for margins, i.e. oil price shocks have a significant and negative steady-state effect on profits across countries and sectors. In this paper, we are particularly interested in long run consequences. In Column (2) in the lower half of Table 2, the long run elasticity of total profits with respect to oil prices is -0.031. This alters only slightly as extra regressors are added, namely, as we go through Column (1) to Column (6). The oil-price elasticity of profits is highest in Column (5) in the lower half of Table 2; it is -0.048, with a t-statistic of 3.25. Real interest rates typically have estimated coefficients that are significantly different from zero, and a larger wage leads to lower profits in the long run. The estimate of -0.048 implies that a doubling of real oil prices is associated in the long run with a decline in profits of approximately 5%. This effect is a non-negligible one, but, as before, does not appear to be of sufficient size to support the idea that oil spikes are central causes of recessions.

It seems useful to evaluate the robustness of the OLS findings across time. In this spirit, Table A3 in the appendix provides simple checks on the stability of Table 2's coefficients; it explores whether the effect of oil has changed over the period. Given that our sample covers 1981 to 2003, we decided to divide the data into three sub-periods: for 1981-1991, for 1992-1997, and for 1998-2003. That split is chosen in an effort to keep the sample size approximately the same in each of the three sub-samples. It is inevitable, given the numbers of observations, that our point estimates will vary by sub-period, but this procedure has the advantage that it offers a simple, and perhaps usefully tough, way to scrutinize the reliability of the framework. Here we report the specification with all controls, as in Column (6) in Table 2. For both margins and profits, four sets of regressions are provided in Table A3. The first pools manufacturing and services sectors together; the second and third consider these two sectors separately; and the last includes the price of oil deflated by sectoral price indices. Column (1) of Table A3 again regresses margins in manufacturing and services on the price of oil, the real interest rate, and the wage. It is possible to reject the hypothesis that the OLS effect of oil price shocks is the same across sub-periods, the magnitude of the effect being somewhat stronger in the latter period. Partly because of large standard errors, the effects of the real interest rate and of the average wage do not significantly alter. In Column (3) of Table A3, we cannot reject the null hypothesis that the effects of the three explanatory variables have remained the same over time. Columns (5) to (8) of Table A3 repeat the same specifications but with profits as a dependent variable.

It has been argued in the literature – for instance in Carruth et al (1998) – that it is legitimate to treat the price of oil, $p_{i,t}^{oil}$, as exogenous to changes in margins and profits across countries and sectors. Nevertheless, it seems interesting to try to assess possible concerns about simultaneity. Hence we now compare our OLS results to those obtained after instrumenting the price of oil. Our analysis relies on data on terrorist attacks. A terrorist-incident variable is potentially a useful instrument, because it seems likely to be driven by political forces that do not directly shape the level of profitability.

Using the total number of terrorist attacks as an instrument for the price of oil, Table 3 provides our first Instrumental Variables estimates. These are again equations in which the dependent variables are margins and profits. The specifications are for manufacturing and services combined into a full sample; for each of the two sectors separately; and for the oil price deflated by sectoral price indices. At the foot of the table, Wu-Hausman and Durbin-Wu-Hausman test p-values are reported. They provide a check on whether Instrumental Variables estimation is required. In all full-sample cases, the exogeneity of oil prices is, on such tests, rejected (though not for Services in the margins equation).

When the price of oil is instrumented, there is an immediate effect upon the paper's key parameter. The long run petroleum-price elasticity of profitability – measured in each of two ways – goes up. This is what would be expected if OLS estimation is biased by the tendency for oil prices to be driven higher in world booms. In the equations of Table 3, $p_{i,t}^{oil}$ continues to have statistically significant negative effects upon margins and profits, and, after instrumenting the price of petroleum, the long run elasticity has typically more than doubled. In some cases, the estimated oil-price elasticities are many times larger than in equivalent previous OLS equations. Table 3's two estimates of the long run oil-price elasticity of profitability in the full sample are, in Columns (1) and (5) respectively, -0.044 and -0.164. The standard errors on these allow the null hypothesis of zero to be comfortably rejected. It seems that there is an inverse relationship between the price of petroleum and firms' prosperity, and, when compared to an analysis that does not control for simultaneity, there is some reason to believe that this relationship is causal. Other influences upon profitability, from the rate of interest and the price of labor, continue to operate.

The simple average of these two long run oil-price elasticity estimates – aggregating across the numbers in Columns (1) and (5) of Table 3 – is approximately -0.1. In contrast, the average value for the OLS estimates of Table 2 was -0.03. By this (crude) measuring rod, instrumenting oil prices with a terrorist-attacks variable has roughly tripled the estimated size of oil's effect upon the economy. In Table 3's Columns (2) and (3), and again in (6) and (7), the oil-price elasticity is larger in manufacturing than services. Deflating by sectoral prices, in the final columns, changes the elasticity estimates slightly, but does not alter the fundamental conclusions.

These findings seem interesting but might be a product of the particular methods or span of time. As a check, Table 4 breaks the sample into separate time periods. They are again for 1981-1991, for 1992-1997, and for 1998-2003. As would be anticipated, the estimates of the long run elasticity with respect to oil move around from one sub-sample to another (the effective sizes are not large). However, each is negative. For the equations explaining profit margins, the three sub-sample oil-price elasticities in the left-hand half of Table 4 are, respectively, -0.113, -0.241 and -0.047. Table 4's long run profit elasticities with respect to the price of oil are, respectively, -0.037, -0.352, and -0.237. The majority of the coefficients are well-determined at the 5% significance level.

This cutting of the data set into short sub-samples is a harsh test of the quantitative framework. Although the outcome from the procedure is not perfect, the broad qualitative similarity of the resulting patterns – as in the lower panel of Table 4 – seems somewhat supportive of the empirical structure.

Table A4 reports further explorations in robustness. These alter the exact choice of instrument. For both margins and profits, and for the full sample that combines manufacturing and services, we report Instrumental Variables regressions with alternative terrorist attacks: suicide and non-suicide, and attacks in the Middle-East, respectively. For the sake of easy comparison, Columns (1) and (5) of Table A4 replicate the results from Table 3 using the total number of terrorist attacks as the instrument. Whatever the instrument, the long run elasticity with respect to the oil price is larger than in standard OLS regressions, and the Wu-Hausman and Durbin-Wu-Hausman tests reject the hypothesis of exogeneity of the oil price.[7]

For completeness, Table A5 sets out the form of first-stage regression equations implicit in our instrumented equations. These are representative of the oil-price equation structure that lies behind the profitability equations in the paper. More precisely, the dependent variable is the change in the price of oil. Country dummies are included. The four terrorist-attack variables – denoted in the equations by *Total*, *Suicide*, *NonSuicide* and *MiddleEast* – measure respectively the number of incidents in total, incidents of a suicide kind, incidents of a non-suicide kind, and incidents in the Middle East.

In this paper we have concentrated upon a total terrorist-attack variable in the instrumenting equation, but it can be seen from Table 5 that other terrorist variables could be chosen. The correct signs in the delta-price equations are debatable in the short run, and it seems that the dynamics are complex. Nevertheless, the long run elasticity – a measure of the consequences of terrorism for the later price of petroleum – is in each case positive, and varies between 0.001 and 0.014. Perhaps encouragingly, the R-squared values suggest that these terrorist incidents, when combined with a lagged level of oil prices, can explain approximately one quarter of the variation in the price of petroleum.

5 Conclusions

Oil shocks have been a prominent feature of the post-war era. Given the volatility of world politics, it seems prudent to expect sharp oil-price movements to occur again. Drawing on observation and econometric research, some macroeconomists, including James Hamilton, have argued that rises in the price of

[7] We do not include all types of terrorist attacks simultaneously in a single instrumental regression because they tend to be correlated with each other.

petroleum act as key triggers of world recessions. This is an important claim. Currently, it remains controversial.

The first contribution of this paper is methodological. We have emphasized, and attempted to confront, an identification problem that has been largely ignored in previous writing on the topic of oil and recession. We have proposed the use of terrorist incidents as an instrument for the price of petroleum. We view these attacks as politically motivated events that can be thought of as exogenous to the economics of the business cycle.

Using an international inter-industry panel, the paper begins by showing that, even in simple regression equations, the price of petroleum matters. However, the OLS results do not favor the view that oil shocks lead to major downturns in firms' profitability. Without instrumenting, the oil-price coefficients are too small. Our analysis estimates the long run OLS oil-price elasticity of profits to be of the order of -0.03. While this is more than trivial, its effect is not large enough to be important in the genesis of recessions. It is known that a deep downturn in the business cycle cuts the level of profits in the economy by around one third.

The paper's second contribution is substantive. Once the price of petroleum is instrumented, by using a terrorism variable of the sort described in the paper, we find that the empirical picture painted by our data is different from that in our OLS equations. The long run oil-price elasticity of profitability rises approximately three-fold. Looking across specifications, it is estimated at numbers of approximately -0.1 or higher. Historically, it is known that the price of petroleum can double, and occasionally quadruple. The paper's elasticities therefore are large enough to be consistent with the belief that oil shocks play an influential role in shaping business downturns. This effect operates independently of our attempts to control for the cost of borrowing and labor. As checks on the model's robustness, we have also found evidence in each of three sub-periods – as in Table 4 in the paper – that high oil prices significantly depress long run profitability.

Whatever their merits, our findings should be treated cautiously. One justifiable criticism of the analysis is that the microeconomic mechanisms linking oil to recessions remain unclear. This is also true of the published literature. Detailed micro data may hold the key to the next step in the unravelling of the oil-macroeconomy relationship.

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Table 1: **Descriptive Statistics (17 sectors, 12 countries, 1981-2003)**

	Price-To-Cost Margins π			**Profits Π (% of turnover)**		
	Mean	Min	Max	Mean	Min	Max
Countries						
Austria	0.11	-0.01	0.30	3.2	-5.3	21.0
Belgium	0.09	0.02	0.18	2.5	-5.9	24.3
Denmark	0.12	-0.01	0.27	4.2	-7.7	28.2
Finland	0.13	0.01	0.30	4.8	-8.6	38.2
France	0.10	0.03	0.20	2.1	-7.7	9.5
Germany	0.08	-0.04	0.18	1.5	-6.3	6.7
Italy	0.09	0.01	0.18	1.0	-7.9	6.4
Japan	0.09	0.02	0.20	1.0	-2.7	3.6
Netherlands	0.10	0.02	0.21	4.8	-6.7	34.5
Portugal	0.12	0.04	0.26	2.7	-9.8	43.1
Spain	0.11	-0.05	0.36	2.2	-25.0	13.6
Sweden	0.08	-0.12	0.21	5.5	-6.5	65.1
Manufacturing industries						
Metalliferous ores	0.10	-0.05	0.21	1.2	-25.0	12.2
Non-metallic mineral products	0.16	0.07	0.26	4.8	-6.2	13.6
Chemicals	0.14	0.06	0.27	6.7	-5.0	65.1
Metal articles	0.10	0.03	0.16	2.5	-9.0	10.0
Electronic equipment	0.10	-0.12	0.25	2.9	-6.5	38.3
Transport equipment	0.07	-0.01	0.14	1.0	-10.1	20.8
Food, drink and tobacco	0.09	0.04	0.13	3.3	-0.3	14.6
Textiles, leather, clothing	0.09	0.01	0.15	2.0	-4.0	9.3
Timber and paper	0.12	0.07	0.23	3.7	-6.3	17.8
Rubber products, furniture	0.11	0.02	0.18	3.1	-7.7	31.6
Services						
Building and civil engineering	0.07	-0.04	0.14	1.7	-7.9	12.4
Wholesale trade	0.04	0.02	0.07	1.3	-2.2	4.6
Sale of motor vehicles	0.04	0.02	0.12	1.1	-3.5	4.7
Retail trade	0.05	0.03	0.08	1.9	-0.8	8.4
Hotels and restaurants	0.13	0.07	0.30	1.8	-3.1	15.8
Transport and communication	0.19	0.08	0.36	1.6	-8.6	11.8
Other services	0.13	0.06	0.26	5.4	-9.8	43.1

Source: BACH database.

Table 2: Regression Equations for Margins and Profits, Ordinary Least Squares (17 sectors, 12 countries, 1981-2003)

Margins $\Delta\pi_{ik,t}$	(1)	(2)	(3)	(4)	(5)	(6)	*(7)*	*(8)*	*(9)*
$\pi_{ik,t-1}$	–	−0.258	−0.259	−0.258	−0.259	−0.208	-0.234	-0.207	-0.288
		(−7.941)	(−7.979)	(−7.971)	(−8.010)	(−9.595)	(-9.166)	(-5.650)	(-8.112)
$\Delta\pi_{ik,t-1}$	–	–	–	–	–	−0.190	-0.082	-0.287	-0.071
						(−3.884)	(-1.842)	(-3.397)	(-1.282)
$\Delta p^{oil}_{i,t}$	−0.003	−0.003	−0.003	−0.003	−0.003	−0.003	-0.002	-0.006	-0.002
	(−2.207)	(−2.396)	(−2.299)	(−2.221)	(−2.092)	(−2.415)	(-1.135)	(-2.294)	(-0.836)
$p^{oil}_{i,t-1}$	–	−0.003	−0.003	−0.004	−0.004	−0.004	-0.005	-0.003	-0.004
		(−3.048)	(−3.003)	(−3.375)	(−3.686)	(−4.057)	(-3.701)	(-1.732)	(-3.806)
$\Delta r_{i,t}$	–	–	0.000	–	0.000	0.000	-0.001	0.000	-0.001
			(−0.750)		(−1.111)	(−1.009)	(-2.068)	(0.750)	(-2.429)
$r_{i,t-1}$	–	–	0.000	–	0.000	0.000	-0.001	0.000	-0.001
			(−0.898)		(−1.399)	(−1.529)	(-1.910)	(-0.081)	(-3.711)
$\Delta w_{i,t}$	–	–	–	−0.013	−0.014	−0.020	-0.026	-0.002	-0.080
				(−0.781)	(−0.893)	(−1.492)	(-2.071)	(-0.093)	(-1.849)
$w_{i,t-1}$	–	–	–	−0.006	−0.008	−0.010	-0.012	-0.003	-0.058
				(−2.036)	(−2.973)	(−3.651)	(-3.713)	(-0.788)	(-4.202)
LR elast. p^{oil}_i	–	−0.011	−0.011	−0.014	−0.015	−0.020	-0.020	-0.014	-0.015
		(−3.08)	(−3.01)	(−3.39)	(−3.65)	(−4.06)	(-3.64)	(-1.76)	(-3.61)
LR elast. r_i	–	–	−0.001	–	−0.001	−0.002	-0.002	-0.001	-0.005
			(−0.89)		(−1.38)	(−1.52)	(-1.93)	(-0.08)	(-3.49)
LR elast. w_i	–	–	–	−0.022	−0.030	−0.047	-0.053	-0.016	-0.201
				(−2.01)	(−2.86)	(−3.54)	(-3.49)	(-0.79)	(-3.38)
Sample	Full	Full	Full	Full	Full	Full	*Manuf.*	*Serv.*	*Sector Pr.*
N	2626	2626	2626	2626	2626	2626	*1733*	*893*	*1126*
R^2	0.008	0.16	0.16	0.161	0.162	0.2	*0.155*	*0.317*	*0.2*

Profits $\Delta\Pi_{ik,t}$	(1)	(2)	(3)	(4)	(5)	(6)	*(7)*	*(8)*	*(9)*
$\Pi_{ik,t-1}$	–	−0.166	−0.172	−0.164	−0.172	−0.195	-0.144	-0.298	-0.292
		(−3.379)	(−3.456)	(−3.354)	(−3.466)	(−3.334)	(-4.012)	(-2.367)	(-5.662)
$\Delta\Pi_{ik,t-1}$	–	–	–	–	–	0.107	0.038	0.208	0.117
						(0.786)	(0.281)	(0.860)	(0.712)
$\Delta p^{oil}_{i,t}$	0.004	0.003	0.003	0.004	0.003	0.003	0.004	0.002	0.000
	(1.567)	(1.187)	(0.867)	(1.408)	(0.973)	(1.098)	(1.142)	(0.415)	(-0.019)
$p^{oil}_{i,t-1}$	–	−0.005	−0.005	−0.007	−0.008	−0.008	-0.005	-0.013	-0.006
		(−2.646)	(−2.606)	(−3.134)	(−3.620)	(−3.664)	(-2.201)	(-3.444)	(-2.280)
$\Delta r_{i,t}$	–	–	−0.001	–	−0.001	−0.001	-0.001	-0.002	-0.001
			(−1.757)		(−2.323)	(−2.434)	(-2.016)	(-1.439)	(-1.973)
$r_{i,t-1}$	–	–	−0.001	–	−0.002	−0.002	-0.002	-0.002	-0.002
			(−2.507)		(−3.343)	(−3.229)	(-2.756)	(-1.752)	(-2.747)
$\Delta w_{i,t}$	–	–	–	−0.036	−0.041	−0.038	-0.037	-0.041	-0.098
				(−5.031)	(−5.308)	(−4.979)	(-3.999)	(-2.921)	(-3.528)
$w_{i,t-1}$	–	–	–	−0.016	−0.026	−0.024	-0.022	-0.028	-0.076
				(−3.939)	(−5.901)	(−5.880)	(-4.673)	(-3.850)	(-3.276)
LR elast. p^{oil}_i	–	−0.031	−0.030	−0.043	−0.048	−0.041	-0.036	-0.044	-0.021
		(−2.63)	(−2.64)	(−2.85)	(−3.25)	(−3.13)	(-1.84)	(-2.58)	(-2.34)
LR elast. r_i	–	–	−0.007	–	−0.010	−0.008	-0.011	-0.007	-0.008
			(−2.36)		(−2.90)	(−2.50)	(-2.19)	(-1.64)	(-2.66)
LR elast. w_i	–	–	–	−0.098	−0.151	−0.123	-0.152	-0.095	-0.260
				(−2.74)	(−3.48)	(−3.03)	(-2.84)	(-2.16)	(-2.85)
Sample	Full	Full	Full	Full	Full	Full	*Manuf.*	*Serv.*	*Sector Pr.*
N	2626	2626	2626	2626	2626	2626	*1733*	*893*	*1126*
R^2	0.006	0.066	0.07	0.069	0.075	0.082	*0.058*	*0.138*	*0.113*

Notes: t-values in parenthesis. Full sample is Manufacturing and Services; Manuf. is Manufacturing; Serv. is Services; and Sector Pr. indicates the oil price is deflated using sectoral price indices (Manufacturing only). Sector and country fixed effects are included. Robust standard errors.

Table 3: Regression Equations for Margins and Profits, Instrumental Variables (17 sectors, 12 countries, 1981-2003)

Margins $\Delta\pi_{ik,t}$	(1)	*(2)*	*(3)*	*(4)*	**Profits** $\Delta\Pi_{ik,t}$	(5)	*(6)*	*(7)*	*(8)*
$\pi_{ik,t-1}$	−0.213	-0.243	-0.208	-0.299	$\Pi_{ik,t-1}$	−0.200	-0.150	-0.304	-0.302
	(−9.787)	(-9.450)	(-5.671)	(-8.178)		(−3.482)	(-4.196)	(-2.472)	(-5.795)
$\Delta\pi_{ik,t-1}$	−0.192	-0.086	-0.287	-0.082	$\Delta\Pi_{ik,t-1}$	0.102	0.039	0.193	0.110
	(−3.945)	(-1.950)	(-3.402)	(-1.506)		(0.761)	(0.293)	(0.808)	(0.668)
$\Delta p^{oil}_{i,t}$	−0.001	0.002	-0.005	-0.002	$\Delta p^{oil}_{i,t}$	0.004	0.003	0.004	-0.008
	(−0.311)	(0.877)	(-0.897)	(-0.789)		(0.471)	(0.403)	(0.239)	(-1.187)
$p^{oil}_{i,t-1}$	−0.009	-0.012	-0.003	-0.013	$p^{oil}_{i,t-1}$	−0.033	-0.027	-0.044	-0.024
	(−3.745)	(-3.795)	(-0.656)	(-3.499)		(−4.874)	(-3.788)	(-3.058)	(-3.075)
$\Delta r_{i,t}$	0.000	-0.001	0.000	-0.001	$\Delta r_{i,t}$	−0.002	-0.001	-0.002	-0.002
	(−1.502)	(-2.589)	(0.641)	(-3.011)		(−3.163)	(-2.500)	(-1.935)	(-2.529)
$r_{i,t-1}$	0.000	-0.001	0.000	-0.002	$r_{i,t-1}$	−0.002	-0.002	-0.003	-0.003
	(−1.665)	(-2.034)	(-0.034)	(-4.181)		(−4.512)	(-3.572)	(-2.608)	(-4.500)
$\Delta w_{i,t}$	−0.032	-0.043	-0.004	-0.107	$\Delta w_{i,t}$	−0.082	-0.074	-0.095	-0.145
	(−2.394)	(-3.262)	(-0.148)	(-2.522)		(−5.722)	(-4.593)	(-3.419)	(-4.387)
$w_{i,t-1}$	−0.019	-0.025	-0.004	-0.087	$w_{i,t-1}$	−0.059	-0.052	-0.070	-0.124
	(−4.056)	(-4.330)	(-0.516)	(-5.393)		(−6.257)	(-4.979)	(-3.802)	(-4.218)
LR elast. p^{oil}_i	−0.044	-0.049	-0.014	-0.043	LR elast. p^{oil}_i	−0.164	-0.177	-0.143	-0.081
	(−3.68)	(-3.74)	(-0.66)	(-3.37)		(−2.85)	(-2.84)	(-1.88)	(-2.83)
LR elast. r_i	−0.002	-0.002	-0.000	-0.006	LR elast. r_i	−0.011	-0.013	-0.008	-0.011
	(−1.66)	(-2.07)	(-0.03)	(-3.96)		(−2.86)	(-2.59)	(-2.03)	(-3.82)
LR elast. w_i	−0.087	-0.103	-0.019	-0.291	LR elast. w_i	−0.295	-0.346	-0.230	-0.410
	(−3.92)	(-4.15)	(-0.52)	(-4.35)		(−3.03)	(-3.21)	(-2.03)	(-3.42)
Sample	Full	*Manuf.*	*Serv.*	*Sector Pr.*	Sample	Full	*Manuf.*	*Serv.*	*Sector Pr.*
N	2626	1733	893	1126	N	2626	1733	893	1126
R^2	0.186	0.123	0.317	0.166	R^2	0.034	0.013	0.087	0.076
Wu-Hausman	0.01	0.00	0.94	0.02	Wu-Hausman	0.00	0.00	0.01	0.03
Durbin-Wu-Hausman	0.01	0.00	0.93	0.02	Durbin-Wu-Hausman	0.00	0.00	0.00	0.03

Notes: t-values in parenthesis. Full sample is Manufacturing and Services; Manuf. is Manufacturing; Serv. is Services. Instruments are total terrorist attacks. Sector and country fixed effects are included. Robust standard errors. The Wu-Hausman and Durbin-Wu-Hausman tests report the p-values of the hypothesis that the oil price is exogenous.

Table 4: Regression Equations for Margins and Profits, Instrumental Variables in Three Sub-Periods (17 sectors, 12 countries, 1981-2003)

Margins $\Delta\pi_{ik,t}$	(1)	*(2)*	*(3)*	*(4)*	**Profits $\Delta\Pi_{ik,t}$**	(5)	*(6)*	*(7)*	*(8)*
1981-1991					**1981-1991**				
$\pi_{ik,t-1}$	−0.191	*-0.262*	*-0.138*	*-0.236*	$\Pi_{ik,t-1}$	−0.192	*-0.134*	*-0.284*	*-0.299*
	(−7.395)	*(-7.383)*	*(-4.015)*	*(-3.267)*		(−3.162)	*(-3.674)*	*(-2.258)*	*(-4.183)*
$\Delta\pi_{ik,t-1}$	−0.053	*-0.023*	*-0.108*	*0.193*	$\Delta\Pi_{ik,t-1}$	0.231	*0.373*	*-0.154*	*0.371*
	(−0.820)	*(-0.277)*	*(-1.692)*	*(1.650)*		(2.375)	*(3.490)*	*(-1.246)*	*(2.567)*
$\Delta p^{oil}_{i,t}$	−0.009	*-0.005*	*-0.019*	*0.005*	$\Delta p^{oil}_{i,t}$	−0.006	*-0.006*	*-0.001*	*0.012*
	(−1.410)	*(-0.599)*	*(-1.786)*	*(0.494)*		(−0.587)	*(-0.723)*	*(-0.021)*	*(1.260)*
$p^{oil}_{i,t-1}$	−0.022	*-0.023*	*-0.017*	*0.001*	$p^{oil}_{i,t-1}$	−0.007	*-0.006*	*0.000*	*0.014*
	(−2.705)	*(-2.602)*	*(-1.040)*	*(0.089)*		(−0.619)	*(-0.506)*	*(-0.003)*	*(0.687)*
$\Delta r_{i,t}$	−0.003	*-0.004*	*0.000*	*-0.002*	$\Delta r_{i,t}$	0.000	*-0.001*	*0.000*	*0.001*
	(−3.278)	*(-3.488)*	*(0.090)*	*(-1.288)*		(−0.462)	*(-0.461)*	*(0.051)*	*(0.873)*
$r_{i,t-1}$	−0.005	*-0.005*	*-0.002*	*-0.002*	$r_{i,t-1}$	−0.002	*-0.003*	*-0.001*	*0.001*
	(−5.245)	*(-4.717)*	*(-1.683)*	*(-1.426)*		(−2.524)	*(-2.613)*	*(-0.588)*	*(0.730)*
$\Delta w_{i,t}$	−0.019	*-0.031*	*0.010*	*-0.174*	$\Delta w_{i,t}$	−0.021	*-0.038*	*0.030*	*-0.105*
	(−0.967)	*(-1.189)*	*(0.294)*	*(-1.200)*		(−0.772)	*(-1.403)*	*(0.444)*	*(-0.451)*
$w_{i,t-1}$	−0.010	*-0.010*	*-0.011*	*-0.012*	$w_{i,t-1}$	−0.018	*-0.021*	*0.007*	*-0.053*
	(−0.863)	*(-0.708)*	*(-0.478)*	*(-0.188)*		(−0.982)	*(-1.246)*	*(0.121)*	*(-0.412)*
1992-1997					**1992-1997**				
$\pi_{ik,t-1}$	−0.229	*-0.251*	*-0.237*	*-0.318*	$\Pi_{ik,t-1}$	−0.174	*-0.107*	*-0.285*	*-0.257*
	(−7.564)	*(-5.993)*	*(-5.023)*	*(-5.921)*		(−2.775)	*(-2.877)*	*(-2.244)*	*(-3.748)*
$\Delta\pi_{ik,t-1}$	−0.283	*-0.151*	*-0.371*	*-0.137*	$\Delta\Pi_{ik,t-1}$	−0.033	*-0.121*	*0.141*	*-0.038*
	(−3.933)	*(-2.312)*	*(-3.150)*	*(-1.715)*		(−0.427)	*(-1.398)*	*(1.071)*	*(-0.378)*
$\Delta p^{oil}_{i,t}$	−0.041	*-0.048*	*-0.009*	*-0.061*	$\Delta p^{oil}_{i,t}$	0.001	*-0.013*	*0.021*	*-0.024*
	(−2.154)	*(-1.815)*	*(-0.374)*	*(-1.655)*		(0.055)	*(-0.609)*	*(0.640)*	*(-0.495)*
$p^{oil}_{i,t-1}$	−0.055	*-0.061*	*-0.016*	*-0.036*	$p^{oil}_{i,t-1}$	−0.061	*-0.108*	*0.021*	*-0.138*
	(−2.697)	*(-2.178)*	*(-0.648)*	*(-0.916)*		(−2.232)	*(-3.827)*	*(0.374)*	*(-2.427)*
$\Delta r_{i,t}$	0.000	*0.000*	*-0.001*	*-0.002*	$\Delta r_{i,t}$	−0.003	*-0.002*	*-0.006*	*-0.003*
	(−0.849)	*(-0.262)*	*(-1.170)*	*(-2.374)*		(−3.867)	*(-1.950)*	*(-3.488)*	*(-1.380)*
$r_{i,t-1}$	0.000	*0.000*	*0.000*	*-0.002*	$r_{i,t-1}$	−0.002	*0.000*	*-0.005*	*-0.001*
	(0.059)	*(0.080)*	*(-0.087)*	*(-2.252)*		(−1.811)	*(-0.255)*	*(-2.084)*	*(-0.598)*
$\Delta w_{i,t}$	−0.056	*-0.068*	*-0.005*	*-0.105*	$\Delta w_{i,t}$	−0.015	*-0.021*	*0.000*	*-0.050*
	(−2.305)	*(-2.564)*	*(-0.128)*	*(-1.628)*		(−1.132)	*(-1.258)*	*(0.015)*	*(-0.724)*
$w_{i,t-1}$	−0.037	*-0.039*	*-0.007*	*-0.052*	$w_{i,t-1}$	0.003	*-0.007*	*0.021*	*-0.036*
	(−2.197)	*(-1.819)*	*(-0.298)*	*(-1.009)*		(0.247)	*(-0.555)*	*(0.858)*	*(-0.346)*
1998-2003					**1998-2003**				
$\pi_{ik,t-1}$	−0.207	*-0.203*	*-0.217*	*-0.197*	$\Pi_{ik,t-1}$	−0.178	*-0.122*	*-0.269*	*-0.278*
	(−8.730)	*(-6.521)*	*(-5.718)*	*(-4.736)*		(−2.901)	*(-3.206)*	*(-2.140)*	*(-3.776)*
$\Delta\pi_{ik,t-1}$	−0.102	*-0.082*	*-0.096*	*-0.142*	$\Delta\Pi_{ik,t-1}$	0.093	*-0.012*	*0.196*	*0.073*
	(−1.540)	*(-0.795)*	*(-1.182)*	*(-1.315)*		(0.475)	*(-0.053)*	*(0.681)*	*(0.213)*
$\Delta p^{oil}_{i,t}$	−0.003	*-0.001*	*-0.006*	*-0.006*	$\Delta p^{oil}_{i,t}$	0.000	*0.002*	*-0.006*	*-0.010*
	(−1.052)	*(-0.272)*	*(-1.126)*	*(-1.234)*		(−0.030)	*(0.217)*	*(-0.387)*	*(-0.753)*
$p^{oil}_{i,t-1}$	−0.010	*-0.012*	*-0.003*	*-0.014*	$p^{oil}_{i,t-1}$	−0.042	*-0.030*	*-0.065*	*-0.041*
	(−3.081)	*(-2.842)*	*(-0.620)*	*(-1.580)*		(−3.390)	*(-2.341)*	*(-2.514)*	*(-1.703)*
$\Delta r_{i,t}$	−0.001	*-0.002*	*0.002*	*-0.002*	$\Delta r_{i,t}$	0.001	*-0.002*	*0.005*	*0.000*
	(−1.384)	*(-1.858)*	*(1.325)*	*(-0.918)*		(0.439)	*(-0.624)*	*(1.007)*	*(0.079)*
$r_{i,t-1}$	−0.002	*-0.003*	*0.001*	*-0.003*	$r_{i,t-1}$	0.000	*0.000*	*0.001*	*-0.001*
	(−1.560)	*(-1.783)*	*(0.860)*	*(-1.048)*		(0.170)	*(0.023)*	*(0.131)*	*(-0.122)*
$\Delta w_{i,t}$	0.000	*0.002*	*0.001*	*0.045*	$\Delta w_{i,t}$	−0.106	*-0.063*	*-0.184*	*-0.192*
	(0.015)	*(0.111)*	*(0.073)*	*(0.438)*		(−3.818)	*(-2.412)*	*(-2.845)*	*(-2.582)*
$w_{i,t-1}$	0.009	*0.011*	*0.006*	*-0.026*	$w_{i,t-1}$	0.005	*0.006*	*0.002*	*-0.028*
	(1.929)	*(1.749)*	*(0.887)*	*(-0.535)*		(0.408)	*(0.441)*	*(0.067)*	*(-0.252)*

(Continued on the next page)

Table 4 (continued)

Margins $\Delta\pi_{ik,t}$	(1)	*(2)*	*(3)*	*(4)*	**Profits** $\Delta\Pi_{ik,t}$	(5)	*(6)*	*(7)*	*(8)*
1981-1991					**1981-1991**				
LR elast. p_i^{oil}	−0.113	*-0.089*	*-0.123*	*0.004*	LR elast. p_i^{oil}	−0.037	*-0.044*	*-0.000*	*0.046*
	(−2.97)	*(-2.82)*	*(-1.14)*	*(0.09)*		(−0.63)	*(-0.52)*	*(-0.00)*	*(0.62)*
LR elast. r_i	−0.023	*-0.020*	*-0.017*	*-0.009*	LR elast. r_i	−0.013	*-0.023*	*-0.004*	*0.004*
	(−4.67)	*(-4.30)*	*(-1.65)*	*(-1.21)*		(−1.76)	*(-2.19)*	*(-0.51)*	*(0.72)*
LR elast. w_i	−0.054	*-0.039*	*-0.082*	*-0.052*	LR elast. w_i	−0.094	*-0.154*	*0.025*	*-0.178*
	(−0.90)	*(-0.73)*	*(-0.50)*	*(-0.19)*		(−0.99)	*(-1.28)*	*(0.12)*	*(-0.44)*
1992-1997					**1992-1997**				
LR elast. p_i^{oil}	−0.241	*-0.244*	*-0.066*	*-0.112*	LR elast. p_i^{oil}	−0.352	*-1.011*	*0.073*	*-0.538*
	(−2.43)	*(-1.80)*	*(-0.64)*	*(-0.86)*		(−1.46)	*(-2.14)*	*(0.39)*	*(-2.09)*
LR elast. r_i	0.000	*0.000*	*-0.000*	*-0.007*	LR elast. r_i	−0.011	*-0.002*	*-0.016*	*-0.005*
	(0.06)	*(0.08)*	*(-0.09)*	*(-2.47)*		(−1.99)	*(-0.26)*	*(-1.84)*	*(-0.60)*
LR elast. w_i	−0.161	*-0.153*	*-0.031*	*-0.163*	LR elast. w_i	0.016	*-0.061*	*0.073*	*-0.142*
	(−2.07)	*(-1.59)*	*(-0.30)*	*(-1.03)*		(0.25)	*(-0.55)*	*(0.89)*	*(-0.36)*
1998-2003					**1998-2003**				
LR elast. p_i^{oil}	−0.047	*-0.061*	*-0.015*	*-0.073*	LR elast. p_i^{oil}	−0.237	*-0.247*	*-0.240*	*-0.147*
	(−2.84)	*(-2.59)*	*(-0.60)*	*(-1.37)*		(−2.08)	*(-1.60)*	*(-1.59)*	*(-1.31)*
LR elast. r_i	−0.009	*-0.015*	*0.005*	*-0.016*	LR elast. r_i	0.002	*0.000*	*0.003*	*-0.002*
	(−1.55)	*(-1.75)*	*(0.86)*	*(-0.95)*		(0.17)	*(0.02)*	*(0.13)*	*(-0.12)*
LR elast. w_i	0.041	*0.054*	*0.027*	*-0.130*	LR elast. w_i	0.030	*0.052*	*0.006*	*-0.099*
	(1.88)	*(1.65)*	*(0.89)*	*(-0.54)*		(0.39)	*(0.43)*	*(0.07)*	*(-0.26)*
*LR elast. p_i^{oil}	0.18	*0.24*	*0.65*	*0.44*	*LR elast. p_i^{oil}	0.18	*0.05*	*0.60*	*0.05*
*LR elast. r_i	0.00	*0.00*	*0.12*	*0.85*	*LR elast. r_i	0.79	*0.13*	*0.20*	*0.31*
*LR elast. w_i	0.26	*0.32*	*0.74*	*0.55*	*LR elast. w_i	0.16	*0.45*	*0.80*	*0.63*
**LR elast. p_i^{oil}	0.04	*0.14*	*0.63*	*0.68*	**LR elast. p_i^{oil}	0.59	*0.07*	*0.22*	*0.13*
**LR elast. r_i	0.17	*0.13*	*0.41*	*0.63*	**LR elast. r_i	0.41	*0.89*	*0.47*	*0.85*
**LR elast. w_i	0.02	*0.07*	*0.58*	*0.83*	**LR elast. w_i	0.80	*0.23*	*0.29*	*0.36*
Sample	Full	*Manuf.*	*Serv.*	*Sector Pr.*	Sample	Full	*Manuf.*	*Serv.*	*Sector Pr.*
N	2626	*1733*	*893*	*1126*	N	2626	*1733*	*893*	*1126*
R^2	0.144	*0.058*	*0.352*	*0.186*	R^2	0.087	*0.067*	*0.151*	*0.09*

Notes: t-values in parenthesis. * (**) is the p-value of the null that the two effects remain the same between 1981-1991 and 1992-1997 (1992-1997 and 1998-2003). Full sample is Manufacturing and Services; Manuf. is Manufacturing; Serv. is Services; and Sector Pr. indicates that the oil price is deflated using sectoral price indices (Manuf. only). Instruments are total terrorist attacks. Sector and country fixed effects are included. Robust standard errors.

Appendix

Table A1: Panel Unit Root Tests (17 sectors, 12 countries, 1981-2003)

	Margins	Profits	Int. Rate	Av. Wage	Oil price
Im-Pesaran-Shin					
Intercept	-1.87 (0.03)	-2.84 (0.00)	4.83* (1.00)	42.89* (1.00)	3.74* (0.99)
Intercept + Trend	-1.13* (0.13)	-0.72* (0.23)	-1.57 (0.06)	-1.81 (0.03)	12.65* (1.00)
ADF-Fisher Chi-square					
Intercept	273.71* (0.13)	258.13* (0.18)	120.09* (1.00)	221.31* (0.89)	105.57* (1.00)
Intercept + Trend	185.15* (0.66)	156.37* (0.93)	149.20* (0.99)	170.56* (0.89)	3.79* (1.00)
Levin-Lin-Chu					
Intercept	5.25* (1.00)	-45.49 (0.00)	7.53* (1.00)	200.63* (1.00)	24.03* (1.00)
Intercept + Trend	6.02* (1.00)	17.51* (1.00)	9.84* (1.00)	4.13* (1.00)	18.46* (1.00)
Hadri					
Intercept	15.80* (0.00)	14.85* (0.00)	21.63* (0.00)	38.00* (0.00)	12.10* (0.00)
Intercept + Trend	21.83* (0.00)	20.11* (0.00)	25.78* (0.00)	27.94* (0.00)	34.38* (0.00)

Notes: Test-values and p-values in brackets. Im-Pesaran-Shin and ADF-Fisher Chi square test the null hypothesis of an individual unit root process. Levin-Lin-Chu report the Breitung t-statistic corresponding to the null hypothesis that there is a common unit root process. The Hadri test reports the Z-statistic corresponding to the null hypothesis that there is no common unit root process. An * indicates that the series contains a unit root.

Table A2: Pedroni Panel Cointegration Tests - Each variable with Real Oil Price (17 sectors, 12 countries, 1981-2003)

	Panel cointegration tests				Group mean cointegration tests		
	v test	rho test	non param. t test	param. t test	rho test	non param. t test	param. t test
Margins	2.65*	-5.93*	-8.76*	-7.16*	0.45	-9.59*	-142.96*
Real Profits	3.53*	-8.16*	-11.61*	-10.51*	-1.42	-12.33*	-16.60*

Notes: Test-values are reported for each of the tests. An * indicates rejection of the null hypothesis of no cointegration at the 10% level.

Table A3: Regression Equations for Margins and Profits, Ordinary Least Squares in Three Sub-Periods (17 sectors, 12 countries, 1981-2003)

Margins $\Delta\pi_{ik,t}$	(1)	*(2)*	*(3)*	*(4)*	**Profits** $\Delta\Pi_{ik,t}$	(5)	*(6)*	*(7)*	*(8)*
1981-1991					**1981-1991**				
$\pi_{ik,t-1}$	−0.172	*-0.236*	*-0.128*	*-0.278*	$\Pi_{ik,t-1}$	−0.188	*-0.130*	*-0.284*	*-0.281*
	(−7.541)	*(-6.889)*	*(-4.343)*	*(-6.279)*		(−3.075)	*(-3.661)*	*(-2.177)*	*(-5.423)*
$\Delta\pi_{ik,t-1}$	−0.036	*-0.006*	*-0.083*	*0.187*	$\Delta\Pi_{ik,t-1}$	0.226	*0.368*	*-0.152*	*0.362*
	(−0.516)	*(-0.060)*	*(-1.256)*	*(1.755)*		(2.327)	*(3.414)*	*(-1.235)*	*(2.915)*
$\Delta p^{oil}_{i,t}$	−0.004	*-0.005*	*-0.005*	*-0.007*	$\Delta p^{oil}_{i,t}$	−0.003	*-0.005*	*-0.002*	*-0.003*
	(−1.978)	*(-1.643)*	*(-1.277)*	*(-3.350)*		(−1.355)	*(-1.995)*	*(-0.535)*	*(-1.151)*
$p^{oil}_{i,t-1}$	−0.005	*-0.007*	*-0.002*	*-0.005*	$p^{oil}_{i,t-1}$	−0.004	*-0.003*	*-0.007*	*-0.004*
	(−3.015)	*(-3.175)*	*(-0.831)*	*(-3.480)*		(−1.678)	*(-1.371)*	*(-1.454)*	*(-1.755)*
$\Delta r_{i,t}$	−0.001	*-0.002*	*0.000*	*-0.001*	$\Delta r_{i,t}$	0.000	*0.000*	*0.000*	*0.001*
	(−3.298)	*(-3.863)*	*(0.230)*	*(-0.984)*		(−0.813)	*(-0.727)*	*(-0.437)*	*(1.589)*
$r_{i,t-1}$	−0.003	*-0.003*	*-0.002*	*-0.001*	$r_{i,t-1}$	−0.002	*-0.003*	*-0.001*	*0.000*
	(−4.351)	*(-4.036)*	*(-1.620)*	*(-0.945)*		(−3.186)	*(-3.685)*	*(-0.887)*	*(0.162)*
$\Delta w_{i,t}$	−0.001	*-0.018*	*0.034*	*-0.207*	$\Delta w_{i,t}$	−0.024	*-0.038*	*-0.002*	*-0.263*
	(−0.129)	*(-1.404)*	*(1.914)*	*(-3.032)*		(−1.909)	*(-2.359)*	*(-0.066)*	*(-3.469)*
$w_{i,t-1}$	0.000	*-0.003*	*0.008*	*-0.068*	$w_{i,t-1}$	−0.016	*-0.017*	*-0.012*	*-0.097*
	(0.028)	*(-0.571)*	*(1.365)*	*(-2.570)*		(−2.051)	*(-2.129)*	*(-0.588)*	*(-2.524)*
1992-1997					**1992-1997**				
$\pi_{ik,t-1}$	−0.231	*-0.267*	*-0.235*	*-0.339*	$\Pi_{ik,t-1}$	−0.185	*-0.122*	*-0.289*	*-0.271*
	(−8.029)	*(-7.803)*	*(-5.015)*	*(-7.590)*		(−3.030)	*(-3.452)*	*(-2.282)*	*(-5.280)*
$\Delta\pi_{ik,t-1}$	−0.273	*-0.124*	*-0.372*	*-0.115*	$\Delta\Pi_{ik,t-1}$	−0.013	*-0.075*	*0.129*	*0.010*
	(−3.844)	*(-1.933)*	*(-3.150)*	*(-1.572)*		(−0.183)	*(-0.905)*	*(0.955)*	*(0.117)*
$\Delta p^{oil}_{i,t}$	−0.012	*-0.014*	*-0.012*	*-0.026*	$\Delta p^{oil}_{i,t}$	−0.015	*-0.030*	*0.008*	*-0.048*
	(−1.895)	*(-1.773)*	*(-1.165)*	*(-2.523)*		(−1.422)	*(-2.355)*	*(0.436)*	*(-3.186)*
$p^{oil}_{i,t-1}$	0.001	*0.001*	*0.001*	*0.005*	$p^{oil}_{i,t-1}$	−0.001	*-0.023*	*0.034*	*-0.011*
	(0.351)	*(0.322)*	*(0.126)*	*(1.020)*		(−0.043)	*(-1.694)*	*(1.445)*	*(-0.774)*
$\Delta r_{i,t}$	−0.001	*0.000*	*-0.001*	*-0.002*	$\Delta r_{i,t}$	−0.004	*-0.003*	*-0.006*	*-0.005*
	(−1.137)	*(-0.823)*	*(-1.182)*	*(-2.756)*		(−5.179)	*(-3.118)*	*(-4.185)*	*(-3.677)*
$r_{i,t-1}$	−0.001	*-0.001*	*0.000*	*-0.003*	$r_{i,t-1}$	−0.004	*-0.003*	*-0.005*	*-0.005*
	(−1.462)	*(-1.535)*	*(-0.505)*	*(-5.083)*		(−6.777)	*(-4.802)*	*(-4.870)*	*(-5.593)*
$\Delta w_{i,t}$	−0.033	*-0.045*	*0.004*	*-0.115*	$\Delta w_{i,t}$	−0.027	*-0.036*	*-0.012*	*-0.118*
	(−1.460)	*(-1.902)*	*(0.090)*	*(-2.169)*		(−2.256)	*(-2.382)*	*(-0.548)*	*(-3.276)*
$w_{i,t-1}$	0.009	*0.009*	*0.012*	*-0.062*	$w_{i,t-1}$	0.000	*-0.004*	*0.004*	*-0.069*
	(1.905)	*(1.519)*	*(1.416)*	*(-2.338)*		(0.029)	*(-0.369)*	*(0.212)*	*(-1.864)*
1998-2003					**1998-2003**				
$\pi_{ik,t-1}$	−0.188	*-0.172*	*-0.213*	*-0.211*	$\Pi_{ik,t-1}$	−0.181	*-0.122*	*-0.282*	*-0.270*
	(−8.449)	*(-5.828)*	*(-5.786)*	*(-5.732)*		(−2.928)	*(-3.370)*	*(-2.154)*	*(-5.243)*
$\Delta\pi_{ik,t-1}$	−0.115	*-0.116*	*-0.101*	*-0.110*	$\Delta\Pi_{ik,t-1}$	0.104	*-0.007*	*0.226*	*0.079*
	(−1.780)	*(-1.170)*	*(-1.256)*	*(-1.004)*		(0.527)	*(-0.030)*	*(0.783)*	*(0.233)*
$\Delta p^{oil}_{i,t}$	−0.003	*0.000*	*-0.008*	*0.003*	$\Delta p^{oil}_{i,t}$	0.006	*0.009*	*0.001*	*0.004*
	(−1.499)	*(0.193)*	*(-2.048)*	*(0.971)*		(0.896)	*(1.095)*	*(0.061)*	*(0.532)*
$p^{oil}_{i,t-1}$	−0.006	*-0.007*	*-0.005*	*-0.004*	$p^{oil}_{i,t-1}$	−0.023	*-0.019*	*-0.027*	*-0.017*
	(−3.729)	*(-3.302)*	*(-1.777)*	*(-1.210)*		(−3.045)	*(-2.130)*	*(-2.131)*	*(-1.398)*
$\Delta r_{i,t}$	0.001	*0.000*	*0.002*	*-0.001*	$\Delta r_{i,t}$	0.002	*-0.001*	*0.008*	*0.001*
	(1.065)	*(-0.138)*	*(1.834)*	*(-0.543)*		(0.872)	*(-0.540)*	*(1.534)*	*(0.413)*
$r_{i,t-1}$	0.001	*0.000*	*0.002*	*0.000*	$r_{i,t-1}$	0.002	*0.001*	*0.003*	*0.003*
	(1.128)	*(0.402)*	*(1.203)*	*(0.109)*		(0.586)	*(0.314)*	*(0.456)*	*(1.152)*
$\Delta w_{i,t}$	0.003	*0.004*	*0.003*	*0.016*	$\Delta w_{i,t}$	−0.076	*-0.053*	*-0.119*	*-0.165*
	(0.236)	*(0.238)*	*(0.191)*	*(0.179)*		(−3.552)	*(-2.207)*	*(-2.747)*	*(-2.460)*
$w_{i,t-1}$	0.004	*0.005*	*0.007*	*-0.064*	$w_{i,t-1}$	−0.003	*0.004*	*-0.021*	*-0.067*
	(1.096)	*(0.992)*	*(1.233)*	*(-2.559)*		(−0.283)	*(0.274)*	*(-1.170)*	*(-1.562)*

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Table A3 (continued)

Margins $\Delta\pi_{ik,t}$	(1)	*(2)*	*(3)*	*(4)*	**Profits** $\Delta\Pi_{ik,t}$	(5)	*(6)*	*(7)*	*(8)*
1981-1991					**1981-1991**				
LR elast. p_i^{oil}	−0.031 (−3.17)	*-0.028 (-3.66)*	*-0.019 (-0.81)*	*-0.020 (-3.44)*	LR elast. p_i^{oil}	−0.023 (−2.15)	*-0.025 (-1.37)*	*-0.026 (-2.31)*	*-0.014 (-1.85)*
LR elast. r_i	−0.17 (−3.84)	*-0.014 (-3.77)*	*-0.014 (-1.44)*	*-0.003 (-0.91)*	LR elast. r_i	−0.012 (−1.85)	*-0.022 (-2.43)*	*-0.004 (-0.69)*	*0.000 (0.16)*
LR elast. w_i	0.000 (0.03)	*-0.011 (-0.57)*	*0.063 (1.26)*	*-0.245 (-2.31)*	LR elast. w_i	−0.086 (−2.18)	*-0.128 (-1.86)*	*-0.043 (-0.69)*	*-0.344 (-2.35)*
1992-1997					**1992-1997**				
LR elast. p_i^{oil}	0.005 (0.35)	*0.006 (0.33)*	*0.003 (0.13)*	*0.016 (1.04)*	LR elast. p_i^{oil}	−0.003 (−0.04)	*-0.185 (-1.48)*	*0.116 (1.16)*	*-0.040 (-0.77)*
LR elast. r_i	−0.003 (−1.48)	*-0.003 (-1.60)*	*-0.001 (-0.51)*	*-0.009 (-4.71)*	LR elast. r_i	−0.021 (−3.18)	*-0.024 (-3.01)*	*-0.019 (-2.11)*	*-0.019 (-4.32)*
LR elast. w_i	0.038 (1.85)	*0.032 (1.50)*	*0.051 (1.33)*	*-0.183 (-2.20)*	LR elast. w_i	0.001 (0.03)	*-0.030 (-0.36)*	*0.013 (0.21)*	*-0.255 (-1.76)*
1998-2003					**1998-2003**				
LR elast. p_i^{oil}	−0.032 (−3.32)	*-0.039 (-2.66)*	*-0.022 (-1.72)*	*-0.017 (-1.21)*	LR elast. p_i^{oil}	−0.124 (−1.94)	*-0.153 (-1.58)*	*-0.096 (-1.36)*	*-0.062 (-1.31)*
LR elast. r_i	0.004 (1.13)	*0.002 (0.41)*	*0.007 (1.20)*	*0.000 (0.11)*	LR elast. r_i	0.009 (0.55)	*0.006 (0.32)*	*0.011 (0.42)*	*0.012 (1.13)*
LR elast. w_i	0.020 (1.09)	*0.026 (0.97)*	*0.035 (1.24)*	*-0.304 (-2.13)*	LR elast. w_i	−0.017 (−0.29)	*0.030 (0.27)*	*-0.075 (-1.40)*	*-0.248 (-1.52)*
*LR elast. p_i^{oil}	0.04	*0.06*	*0.52*	*0.03*	*LR elast. p_i^{oil}	0.76	*0.19*	*0.15*	*0.61*
*LR elast. r_i	0.01	*0.01*	*0.21*	*0.15*	*LR elast. r_i	0.03	*0.78*	*0.01*	*0.00*
*LR elast. w_i	0.05	*0.02*	*0.78*	*0.15*	*LR elast. w_i	0.10	*0.30*	*0.43*	*0.08*
**LR elast. p_i^{oil}	0.02	*0.02*	*0.34*	*0.05*	**LR elast. p_i^{oil}	0.17	*0.81*	*0.15*	*0.77*
**LR elast. r_i	0.09	*0.33*	*0.19*	*0.05*	**LR elast. r_i	0.11	*0.13*	*0.32*	*0.01*
**LR elast. w_i	0.26	*0.76*	*0.56*	*0.09*	**LR elast. w_i	0.68	*0.43*	*0.12*	*0.82*
Sample	Full	*Manuf.*	*Serv.*	*Sector Pr.*	Sample	Full	*Manuf.*	*Serv.*	*Sector Pr.*
N	2626	*1733*	*893*	*1126*	N	2626	*1733*	*893*	*1126*
R^2	0.236	*0.192*	*0.375*	*0.264*	R^2	0.103	*0.094*	*0.168*	*0.155*

Notes: t-values in parenthesis. * (**) is the p-value of the null that the two effects remain the same between 1981-1991 and 1992-1997 (1992-1997 and 1998-2003). Full sample is Manufacturing and Services; Manuf. is Manufacturing; Serv. is Services; and Sector Pr. indicates that the oil price is deflated using sectoral price indices (Manuf. only). Instruments are total terrorist attacks. Sector and country fixed effects are included. Robust standard errors.

Table A4: Regression Equations for Margins and Profits, Experiments with Alternative Instruments (17 sectors, 12 countries, 1981-2003)

Margins $\Delta\pi_{ik,t}$	(1)	(2)	(3)	(4)	**Profits** $\Delta\Pi_{ik,t}$	(5)	(6)	(7)	(8)
$\pi_{ik,t-1}$	−0.213	−0.213	−0.213	−0.218	$\Pi_{ik,t-1}$	−0.200	−0.206	−0.200	−0.206
	(−9.787)	(−9.793)	(−9.787)	(−9.838)		(−3.482)	(−3.606)	(−3.482)	(−3.628)
$\Delta\pi_{ik,t-1}$	−0.192	−0.188	−0.192	−0.189	$\Delta\Pi_{ik,t-1}$	0.102	0.108	0.102	0.106
	(−3.945)	(−3.828)	(−3.947)	(−3.892)		(0.761)	(0.810)	(0.760)	(0.794)
$\Delta p^{oil}_{i,t}$	−0.001	0.010	−0.001	0.013	$\Delta p^{oil}_{i,t}$	0.004	0.031	0.003	0.027
	(−0.311)	(1.112)	(−0.342)	(2.545)		(0.471)	(1.163)	(0.445)	(1.976)
$p^{oil}_{i,t-1}$	−0.009	−0.005	−0.010	−0.010	$p^{oil}_{i,t-1}$	−0.033	−0.024	−0.033	−0.030
	(−3.745)	(−1.784)	(−3.735)	(−4.265)		(−4.874)	(−2.528)	(−4.878)	(−5.137)
$\Delta r_{i,t}$	0.000	−0.001	0.000	−0.001	$\Delta r_{i,t}$	−0.002	−0.002	−0.002	−0.002
	(−1.502)	(−1.775)	(−1.499)	(−2.483)		(−3.163)	(−2.774)	(−3.158)	(−3.506)
$r_{i,t-1}$	0.000	0.000	0.000	0.000	$r_{i,t-1}$	−0.002	−0.002	−0.002	−0.002
	(−1.665)	(−0.756)	(−1.672)	(−1.067)		(−4.512)	(−2.767)	(−4.523)	(−3.697)
$\Delta w_{i,t}$	−0.032	−0.036	−0.032	−0.048	$\Delta w_{i,t}$	−0.082	−0.096	−0.082	−0.102
	(−2.394)	(−2.423)	(−2.400)	(−3.345)		(−5.722)	(−4.256)	(−5.694)	(−4.902)
$w_{i,t-1}$	−0.019	−0.018	−0.019	−0.026	$w_{i,t-1}$	−0.059	−0.060	−0.059	−0.067
	(−4.056)	(−4.112)	(−4.037)	(−4.621)		(−6.257)	(−5.897)	(−6.228)	(−5.784)
LR elast. p^{oil}_i	−0.044	−0.024	−0.045	−0.045	LR elast. p^{oil}_i	−0.164	−0.115	−0.165	−0.145
	(−3.68)	(−1.81)	(−3.67)	(−4.15)		(−2.85)	(−2.09)	(−2.85)	(−2.96)
LR elast. r_i	−0.002	−0.001	−0.002	−0.001	LR elast. r_i	−0.011	−0.008	−0.011	−0.009
	(−1.66)	(−0.76)	(−1.67)	(−1.07)		(−2.86)	(−2.26)	(−2.86)	(−2.70)
LR elast. w_i	−0.087	−0.085	−0.087	−0.120	LR elast. w_i	−0.295	−0.294	−0.296	−0.324
	(−3.92)	(−3.90)	(−3.90)	(−4.41)		(−3.03)	(−3.17)	(−3.03)	(−3.02)
Sample	Full	Full	Full	Full	Sample	Full	Full	Full	Full
N	2626	2626	2626	2626	N	2626	2626	2626	2626
R^2	0.186	0.16	0.186	0.113	R^2	0.034	0.003	0.033	0.030
Instrument	*Total*	*Suicide*	*NonSuicide*	*MiddleEast*	Instrument	*Total*	*Suicide*	*NonSuicide*	*MiddleEast*
Wu-Hausman	0.01	0.01	0.01	0.00	Wu-Hausman	0.00	0.00	0.00	0.00
Durbin-Wu-Hausman	0.01	0.01	0.01	0.00	Durbin-Wu-Hausman	0.00	0.00	0.00	0.00

Notes: t-values in parenthesis. Sector and country fixed effects are included. Robust standard errors. The Wu-Hausman and Durbin-Wu-Hausman tests report the p-values of the hypothesis that the oil price is exogenous.

Table A5: Regression Equations for Oil Price, Ordinary Least Squares (12 countries, 1981-2003)

Oil Price $\Delta p_{i,t}^{oil}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$p_{i,t-1}^{oil}$	−0.279 (−4.461)	−0.320 (−4.792)	−0.279 (−4.491)	−0.324 (−4.960)	−0.338 (−4.589)	−0.381 (−4.891)	−0.338 (−4.614)	−0.383 (−4.989)
$\Delta p_{i,t-1}^{oil}$	–	–	–	–	0.116 (2.268)	0.103 (1.479)	0.114 (2.225)	0.050 (1.018)
$\Delta Total_t$	0.000 (−5.069)	–	–	–	0.000 (−5.120)	–	–	–
$Total_{t-1}$	0.000 (4.627)	–	–	–	0.000 (4.832)	–	–	–
$\Delta Suicide_t$	–	−0.002 (−0.777)	–	–	–	−0.002 (−0.854)	–	–
$Suicide_{t-1}$	–	0.005 (2.998)	–	–	–	0.005 (3.261)	–	–
$\Delta NonSuicide_t$	–	–	0.000 (−5.166)	–	–	–	0.000 (−5.205)	–
$NonSuicide_{t-1}$	–	–	0.000 (4.681)	–	–	–	0.000 (4.891)	–
$\Delta MiddleEast_t$	–	–	–	−0.001 (−2.016)	–	–	–	−0.001 (−2.086)
$MiddleEast_{t-1}$	–	–	–	0.001 (4.660)	–	–	–	0.001 (5.089)
LR elast. $Total$	0.001 (3.19)	–	–	–	0.001 (3.40)	–	–	–
LR elast. $Suicide$	–	0.014 (2.33)	–	–	–	0.013 (2.67)	–	–
LR elast. $NonSuicide$	–	–	0.001 (3.24)	–	–	–	0.001 (3.45)	–
LR elast. $MiddleEast$	–	–	–	0.002 (3.78)	–	–	–	0.002 (4.21)
N	201	201	201	201	192	192	192	192
R^2	0.414	0.251	0.415	0.321	0.454	0.289	0.454	0.364

Notes: t-values in parenthesis. Sample only varies across countries and time. Country fixed effects are included. Robust standard errors. (1) to (4) exclude lagged dependent variables while (5) to (8) include them.