Business Responses to the Introduction of the New Zealand Emissions Trading Scheme: Part1: Baseline

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Abstract:

This paper reports the intended responses of business to the Emissions Trading Scheme (ETS). It is part one of a two part study on the effect of economic instruments on business decision making and strategy. This first part involved the collection of survey data at the time of the introduction of emissions pricing for stationary energy, liquid transport fuels and industrial processes, 2010. This data is analysed statistically and econometrically to draw tentative conclusions about the degree to which the intended and observed responses align with expectations, particularly: the degree to which emissions pricing is being passed through to end consumers or resulting in actions to abate emissions; the degree to which a domestic market of "clean tech" is developing; and the relative importance of emissions pricing versus other drivers such as shareholder and customer expectations. Part two of this research project will be carried out during the course of 2011 to explore the effect of the emissions price one year on.

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1. Introduction

Debate about the application of environmental taxes (or permit systems) to address climate change has taken place both internationally, and within New Zealand, with limited comparable ex post evidence. Concerns about the potential macro-economic and business level impacts of raising energy input prices are pitted against the potential scale of climatic changes and their social, environmental and economic impacts. At both ends of the debate, projections based on models (general equilibrium and climate models) have formed a significant part of the evidence base.

On 1 July 2010 the New Zealand Emissions Trading Scheme (ETS) commenced for greenhouse gas emissions from electricity generation, transport fuels, and industrial chemical processes. There is now an opportunity to study the actual impacts of price incentives on businesses.

Monitoring the effects of any policy is an important government function. Collection of data over many time periods will be required before the ultimate effectiveness of the ETS can be assessed. Until then, however, monitoring the effects at points in time also has an important purpose – and that is to inform (any) refinement in the details of the policy to ensure governments objectives are met.

2. Monitoring the ETS in real time

Several factors need to be taken into account in monitoring the effects of the ETS on businesses, especially in the short run:

- First, the incentives created by the ETS play out over multiple time periods. Abatement in the short run will be incentivised where it is (statically) efficient (ie lower cost than the price of emissions with current equipment etc). Incentives will also be created to reduce future emissions cost exposure by making investments, such as in R&D.
- Second, there is a lag between the introduction of emissions pricing and the response by business due to a range of factors, for example: emissions prices might not be included in all input prices from 1 July 2010[2]; existing supply contracts need to be completed; and there may be legacy capital (eg existing capital for which upgrade investment can be lumpy). In addition, there is a lag between the introduction of emissions pricing and the measurement of emissions[3].
- Finally, other stimuli may be driving markets in a consistent direction. Care in required to avoid misattribution of all responses solely to the ETS. New Zealand has a market economy – government influences the business environment but does not direct outcomes.

The consequence is that the concept of efficient abatement is not a practical standard against which to assess responses. We must monitor more than emissions levels in exploring the effects of the ETS. To understand how the ETS is impacting in these early stages we need to study individual firms, the influence emission pricing has on them and the choices they make[4] - after all, ultimately it is these choices that will flow through to national emissions outcomes.

Insert Figure 1 about here

3. Business Response Framework

This paper uses a stimulus response framework to monitor the impact of the ETS on business decision making. This involves identifying the set of possible actions a firm could take and the variables that might influence the choice of a firm in taking that action. This framework underpins the variables of interest in this study and the hypotheses developed.

Insert Figure 2 about here

Variables of interest: categories of response

There are a number of actions that a firm might take in response to the incentive created by emissions pricing. At a general level, those choices largely fall into 'abate' or 'pay' (or a mix of both). This simplification disguises the many individual choices that businesses have.

Common features have been observed in the literature which suggests that firms can be classified in one of a small number of stylised categories of business response [see Hart (1995); Roome (1992), Kolk and Pinkse (2004, 2005) and

[2] Surrender of emissions units is not required until July 2011. Pass through industries such as fuel and electricity generation, however, have raised their prices to incorporate emissions costs at commencement.

[3] Responses are not instantaneous. There will be a lag between the introduction of the price and a measureable impact on economy wide emissions because of data collection lags, because in the short term there are more limited options available to firms, and because experience with the instrument and its effects on competitors and consumers will be thin. The ability to measure the effect of the ETS in terms of emissions reductions is delayed by the rigorous measurement and reporting processes that New Zealand is obligated to undertake under the Kyoto Protocol. These processes mean that the reporting of greenhouse gases is delayed by two years, so that in 2010, New Zealand reported on its emissions from 1990 to 2008 in its National Greenhouse Gas Inventory.

[4] The implication of this approach is that we measure the count of responses – not the aggregate emissions impact of the responses.

Okereke (2007)]. Based on a review of literature[5] we have specified a set of relevant business strategies in response the ETS (set out in figure 3).

Insert Figure 3 about here

Variables of interest: influencing factors
Both firm characteristics and industry (and market) characteristics are important for shaping actions by firms (Henderson & Mitchell, 1997).

The following categories of firm characteristics have been identified as influencing business response and the effectiveness of that response. They include moderating and magnifying factors that may influence the strength of the stimulus felt and response made.

- Emissions intensity/energy intensity
- Existing business strategies, resources and capabilities
- Capital investment horizon
- Internal organisational factors
- Economic and financial position
- Stakeholder attentiveness

The following categories of industry characteristics have been identified as important to the dominant response of firms in a given industry:

- Industry structure, market share/concentration, maturity, intensity of rivalry
- Proximity to final demand
- Consumer preferences
- Availability/threat of substitutes
- Internationalisation

The type of response a firm makes to the ETS is likely to be influenced by a mix of its exposure to emissions costs, firm characteristics and industry characteristics. Figure 4 sets out a stylised view of the potential characteristics of firms undertaking each of the specified strategies.

Insert Figure 4 about here

4. Method

Sample
Two samples were drawn for this study reflecting the two sided incentive effects of emissions pricing. The first sample was a purposive sample of general business. The second sample was a small targeted sample of 'solutions provider' businesses. The surveys were undertaken under contract by Andy Heinemann and his team at the National Research Bureau.

[5] "Business Responses to Emissions Pricing: General Literature Review", unpublished paper by Elisabeth Numan-Parsons, Ministry of Economic Development.

For the general business survey 63 ANZSIC[6] industry categories were selected across the primary sector, manufacturing, mining, electricity, construction, retailing, and business services. This mix was chosen to ensure diversity in the sample and responses to the ETS[7]. For each selected industry three groups were defined based on employee sizes ("Rolling Mean Employment" (RME) which is the12-month moving average of the employee count of the enterprise). The three groups are: 0-5 employees; 6-19 employees; and 20 plus employees. The design was pre stratified to draw an initial sample of 20 firms from each cell in a matrix of 63 industry category and 3 employment size groups[8].

Proportionally the sample included fewer firms in primary food production (eg farms) and in the construction industry but higher proportions in food and beverage, and equipment manufacture industries (amongst others). This approach was taken due to the large number of small businesses that dominate some industries (such as builders and plumbers in the construction industry) for whom climate change and the ETS are unlikely to be material concerns.

The sample was drawn from the New Zealand Business Frame (maintained by Statistics New Zealand). The Business Frame contains the full population of New Zealand firms that are determined as economically significant[9]. This

[6] Australia New Zealand Standard Industry Classification.

[7] While the industries selected are fairly representative, the industries selected account for only 32% (or 36% by 3 digit group estimation) of total enterprise count in New Zealand. This is because a large proportion of business count is in business services and enterprises of residential and non-residential property landlords (around 33% - of which 17% are property operators). These industries were not sampled as they are very unlikely to be sensitive to emissions prices. Others excluded include the domestic non-tradables sectors dominated by government administration (eg health, public administration, schools etc). While also subject to the ETS, for these industries procurement policy, for example, rather than market impacts are likely to have a stronger effect.

[8] Constraints on SNZ meant that if there were less than 5 firms in an industry category and employment size group, no firms were selected. Four groups fell into this category. If there were six to twenty firms in this industry category and employment size group, all firms were selected. If there were more than twenty firms in this industry category and employment size group, twenty firms had been selected.

[9] That is, they meet one or more of the following criteria: annual expenses or sales (subject to GST) of more than $30,000; 12 month rolling mean employee count of greater than three; or part of a group of enterprises;

enabled precision sampling of a specified number of firms from the selected industry groups on the basis of ANZSIC industry classification. The other advantage of sampling from the Business Frame is that it is a comprehensive and current database and as such reduces errors in the research associated with database accuracy from other sources. Statistics New Zealand provided business names, contact addresses, ANZSIC classification and employee size group information to National Research Bureau[10].

The second sample, the 'solutions providers', involved the selection of 32 firms from previous unpublished research undertaken by the Ministry of Economic Development on future competitive advantage. The selected firms were those for whom at least part of their business involved contribution to 'climate change solutions' – for example, manufacturing of energy saving devices.

Much attention has been paid to the effects of the ETS on cost exposed firms. But we know less about firms on the other side of the ledger – who stand to benefit. These firms, however, are often only in part focused on solutions production. Solutions focused activities fall across a variety of different industries – and it may be only part of their operations. This means that in the general population survey they are not likely to be discernable.

Survey Method and Hypotheses

Telephone survey questionnaires were undertaken for both samples. Data was collected to test the following hypotheses:

General business population	
	H0: The ETS is not a significant issue for most businesses
	H1: Most businesses intend to take no action (that is, pay rather than abate)
	H2: Firms who are intending to abate, are most likely to abate through a cost focus approach
	H3: Those taking abatement action are driven by other pressures (ie not just emissions price)
	H4: For those who intend to pay the relative costs of abatement are greater than other options (absorbing or passing the cost through to consumers)
Solutions providers	
	H6: The ETS has increased the domestic market for emissions solutions
	H7: The ETS has enhanced the competitive advantage of NZ solutions providers in overseas markets
	H8: Growth of solutions providers businesses is sensitive to the emissions price level

The information collected included both firm's own perceptions and other data to enable assessment of underlying drivers and factors (as suggested in the literature[11]).

The general business population survey was undertaken between March and July 2010. 1158 firms were interviewed and a response rate of 58.8% was achieved[12].

The sample was asked about energy use, scope to reduce energy use, likely response to emissions costs and business profile (such as whether they export and level of turnover and profit). Information on industry classification and employee count were obtained directly from Statistics New Zealand.

At the time, amendments had just passed to the Climate Change Response Act and the development of regulations for free allocations for emissions intensive activities had commenced. There were consultation and information seminars being held by the government around the country and in February the Government had announced emissions targets to 2020 – tabled internationally. As a consequence there was a lot of media coverage on climate change issues around the time of the survey. This in part probably contributed to the high response rate achieved. But it was also a time when business would have been uncertain about the ETS and its impacts on them.

registered for GST and involved in agriculture or forestry; over $40,000 of income recorded in the IR10 annual tax return.

[10] To get a mix of different industry characteristics we select industries to sample within. To get a mix of firm characteristics was more difficult to select. Firm name, employee size and firm address were the only descriptors that Statistics New Zealand was allowed, under the Statistics Act, to provide for survey research purposes. As a consequence the only firm specific parameter we could use is employee count. We weren't able to include emissions intensity (although we know that this varies by industry so we do have a mix in the sample); and internal factors (eg attitudes etc – instead we explore them in the survey)

[11] Note that data was collected to enable the calculation of energy intensities. These are used as a proxy in this analysis for emissions intensities (which we could not estimate accurately from the available data).

[12] A total of 2774 firms had been selected by SNZ. A total of 1970 of these were contacted before sufficient interviews were obtained. Of these 412 refused to be involved; 247 were not available; and a further 142 were unable to participate for a range of reasons. 11 firms only answered part of the questionnaire. This left 1158 respondents.

The solutions provider survey was conducted between November and December 2010. Of the 32 businesses selected, 24 completed interviews (3 companies were no longer operating and a further 5 could not be contacted). The response rate therefore was 83%.

This group was also asked about the nature of their activities in the so called low emissions sector, perceptions of changes in their domestic market (including in the five or so months since the commencement of the ETS) and in international markets, responses to their own emissions costs and business profile information.

The survey was undertaken later than the first survey and at a time when there was significant attention focused on Cancun discussions. This was also a time when early signs of recovery from the recession were being observed and market opportunities in less affected economies such as China, continued to grow.

Analysis

The two data sets were analysed separately. While there was overlap in the questions asked, the solutions provider sample was too small to undertake comparisons with the data from the general business population. In addition the time lag between the two means that the results are not strictly comparable.

The data collected through the general business survey was analysed both for simple associations and for correlations (econometrically) to establish the nature of responses and what is driving those responses.

As there are a small number of observations in the solutions provider survey, it was not possible to undertake statistical or econometric analysis of this data set. Analysis of the solutions provider survey involves presentation of the results in simple uni and bivariate format.

5. Results: General Population

Respondent profiles

In addition to information on industry classification and business size (which were sourced from Statistics New Zealand and provided a basis for the initial sampling) respondents were asked to provide further information for business statistic purposes. This data included energy expenditure, exports, ownership, turnover, and financial outcome status.

The characteristics of the respondents (on an unweighted basis) are as follows:

- The majority operate in the domestic market only (63% of the businesses surveyed)[13]. 89.5% were wholly New Zealand owned companies while 6.6% were wholly overseas owned.
- Energy costs made up 1-4% of turnover for 61% of respondents. Nearly 15% of respondents had energy intensities over 10% (and could therefore be considered energy intensive)[14].
- Small firms (0-5 FTE's) are just as likely to include energy intensive firms as larger firms (proportionally, a similar amount of firms in the 0-5 FTE group have energy intensities over 20% as firms with 20+ employees);
- Around 2% of firms claimed to have been advised that they would receive an allocation of emissions units free15. Interestingly, for those respondents for whom it was possible to calculate energy intensities for, 70% had intensities of 1-9%.
- 5% of respondents considered themselves to be points of obligation.
- Electricity was the dominate energy cost for 51% of respondents (driven by the manufacturing industry) with diesel being dominant for 26% of respondents (driven by a combination of industries – primary, oil and gas, construction and transport services, in addition to manufacturing.). Note this result flipped when weighted data was used so that diesel was the most dominant energy cost.
- Around 20% of respondents expect that emissions prices will get higher. By energy intensity group this result is relatively stable (ie doesn't really change with energy intensity).

These profiles are broadly consistent with expectations and suggest that the sample includes the desired diversity of firm and industry characteristics.

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[13] For respondents in the manufacturing industry only, 51.1% are exporters. This is largely driven by firms in the machine and transport equipment manufacturing sectors, that while being fairly evenly split between exporters and domestic, by number comprise over 50% of the sample of manufacturing firms. However, over 70% of firms surveyed in each of the following groups were exporters: seafood, wine, and metal.

[14] Nearly 57% of respondents had turnovers of greater than $1 million and 18% (the majority of these are in the manufacturing industry) have turnovers over $10 million (note, when weighted these drop to 22.3% and 1.6% respectively). 6.5% of respondents (nearly half of which are in the manufacturing industry) had average expenditure on all forms of energy of over $1 million; 26.2% had average expenditure on all forms of energy over $100,000 (both proportions drop by over a half when weighted – reflecting the lower energy intensity in primary production).

[15] Note, that in this study we consider only energy related emissions. Industrial process emissions are also priced and it is possible that respondents receiving allocations for the latter would also be included in this group.

Significance

The actual cost that most firms will face from the introduction of the ETS will amount in value to only a small proportion of turnover. Despite this, during the development of the ETS there was robust discussion amongst business groups and with government about its effects. This might suggest that the significance of the ETS to businesses was greater than indicated by the emissions intensity profile.

Other factors that might affect the significance of emissions pricing to business include the scale of the absolute emissions cost and the ability of the business to recoup costs from suppliers or customers (as indicated by price elasticity of demand). The last of these variables, in particular, can be difficult to estimate.

Another way to get an indication of the importance or the concern held by business about emissions pricing is to explore whether they have estimated how much it will cost them – that is, what proportion of respondents are really attuned to the introduction of the ETS as a business risk?

We asked respondents whether they had estimated how much emission costs would add to their business. Only 11% of firms have (or were in the process of) estimating the cost impacts[16]. This result was consistent across industries – with the exception of the oil and gas and electricity industries with 50% and 24% respectively who had (or were in the process of) estimating the costs.

We therefore accept the hypothesis: *H0: The ETS is not a significant issue for most businesses.*

The consequence of this finding is that at this time we are unlikely to observe the range of responses set out figure 3. We do, however, find that for those who have estimated the cost impacts the direction of the relationship with emissions intensity is as expected. In addition, respondents (unweighted) are more likely to have estimated the costs if they have overseas ownership and over 20 FTE's.

Insert Figure 5 about here

Response: abate or pay?

Respondents were asked how they intended to deal with emissions prices. Only 61 (5%) of the respondents stated that they intend to abate (such as by improving energy efficiency or fuel switching)[17]. In contrast, 757 (65%) of respondents were intending to pay emissions costs and either raise prices or simply absorb the costs[18]. 27 respondents were in both the abate and pay groups.

The pattern of intended response by industry group is remarkably consistent across industries with those intending to pay (absorb or raise prices) falling largely between 50-60% of respondents in most industries. This is with the exception of the electricity industry (D) and construction (E) (who, as expected have a higher proportion of firms intending to raise prices), and the commodity based industries (who, as expected had a smaller proportion of respondents intending to raise prices).

In addition to being asked to state their intended response, we asked respondents to rate the probability of their firm responding in a set of specified ways.

- 37% stated that it was highly probable that they would review their prices with a further 26% stating that it was probable that they would (with exception of the primary industry and arts and recreation which were relatively more unlikely to review prices). The significance of price reviews as a response indicates that the price of emissions is being passed through to end consumers.
- When analysed by industry group, for many industries reviewing prices was simultaneously both highly probable and unlikely – in similar proportions. This suggests that firm specific factors, rather than industry characteristics, are at play.
- 55% stated that they would be unlikely to undertake an energy audit to identify savings. However 58% of respondents in the electricity industry stated it was probable (somewhat or highly) that they would undertake an audit. Respondents in this industry also had the highest probability of using emissions management in their branding and marketing.
- For all industry groups the probability of changing behaviour was greater than the probability of changing to more efficient equipment (which most said it was unlikely). The passenger and freight transport industry indicated a proportionally higher probability that it would undertake behaviour change.

These results support the two hypotheses that:

H1: Most businesses intend to pay rather than abate; and

[16] Both weighted and unweighted data provided similar results.

[17] Four of these respondents intend to make more than one change. A further seven respondents intended to reduce their cost exposure by switching to cheaper power suppliers.

[18] 47 respondents intending to both raise prices and absorb some costs.

H2: Firms who are intending to abate, are most likely to abate through a cost focus approach.

Reasons for response

In this section we explore what the reasons/drivers might be for the intended responses of business to the ETS. There are a number of possible influences on the response taken – including firm and industry characteristics. There are also potential moderating and magnifying factors such as other stimuli (like changing consumer preferences) that may also influence how a firm deals with emissions and climate change.

For the purposes of analysing possible explanatory variables it was necessary to consolidate the number of variables under consideration. This is because there are only a small number of respondents intending to abate. In addition, multicollinearity between many of the possible explanatory variables makes identifying the individual effects of each variable in econometric analysis more difficult the greater the number of variables included in the analysis.

In this study there are four core variables that we have focused on in seeking to explain the decisions firms take in response to the ETS:

- Significance of emissions costs to the business (as measured by energy intensity);
- Significance of emissions costs in the future (as measured by future price expectations);
- Shareholder/owner pressure (as measured by respondent perception of shareholder interest in carbon neutrality);
- Customer pressure (as measured by respondent perception of customer interest in carbon neutrality).

Simple graphical and statistical associations between each of these variables and intended response to the ETS indicate a weak relationship with energy intensity; a moderate positive relationship with future price expectations; and positive relationships with perceptions of stakeholder views on carbon neutrality and with perceptions of customer views. This finding may reflect the early stage at which the data was being collected and the relative significance of discourse (by business and consumers) as opposed to costs at the time of the survey.

To further investigate the significance of these variables simultaneously and to identify any other variable that may be significant in explaining business responses, we estimated a multinomial logit model. In this model we analyse the firm characteristics that correlate with a specified primary intention (coded as a 1), relative to the other stated intentions combined (coded as a 0).

We ran this model three times with different 'primary' intended responses: abate, raise prices, and absorb[19]. Because of overlapping intensions (a respondent could both abate and absorb for example) changing the rule about which intention is classified as 'primary' could therefore change what we infer about the driving factors of the various intentions.

Significance of energy intensity

What we found was that energy intensity was a significant explanatory variable for intentions to pay rather than abate – that is where 'raise prices' (positive relationship) or 'absorb the costs' (negative relationship) were the primary intentions. The direction of these results were as expected.

Where 'raise prices' was the primary intention, whether firms had a view on their shareholders preferences for carbon neutrality, and their own expectations about carbon prices were also very significant explanatory variables.

Where 'absorb costs' was the primary intention, export status, perceptions of shareholder views, emissions price expectations and industry all had stronger explanatory power than energy intensity.

Where 'abate' was the primary intention, energy intensity was not found to be statistically significant. The high variance of energy intensity amongst firms intending to abate, coupled with the positive relationship between energy intensity and 'raise prices' and the negative relationship between energy intensity and 'absorb costs', means that the 'abate' group of firms is not significantly different from other firms with regard to energy intensity. Sample size may also be a factor. Additionally there are other factors driving the response to abate.

We would have expected perceived scope to reduce emissions to be important but it wasn't used - in all size classes most firms consider that they have little or no scope to reduce emissions. The proportion considering that there is some modest scope increases with firm size. Most firms in all size classes stated that they were unlikely to undertake an energy audit to identify savings, but the

[19] It is important to note that all three responses are in line with the policy aim, to correct the environmental externality of emitting greenhouse gases. The environmental cost of the good or service is being internalised, either borne by the consumer (raise prices), producer (absorb costs) or by reducing the environmental cost (lessening exposure to the cost by reducing environmental harm in this case, emissions).

probability that they would undertake an audit increases with firm size.

It is possible that these other factors may be correlated with energy intensity but what this model indicates is that other variables not the energy intensity are stronger drivers of intended behaviour. It may also be possible that the most energy intensive firms (who we would have expected to undertake some abatement) are in a position where they can increase their prices, at least within the likely range of emissions prices expected under the ETS. Due to sample size limitations a question we have not been able to test is also the degree to which receipt of free allocations (by design to the most emissions intensive firms) affects intended response. This is an area for further research.

Future emissions price expectations

It will be recalled that the relationship between future price expectation and intended response was positive. The Logit models confirm that merely stating a view (regardless of that view) of future emissions prices was found to be a significant explanatory variable.

Where the primary intention was to 'abate' the relationship is positive suggesting that those who have a view about future emissions prices are more likely to be intending to abate. In addition, where the primary intention is to 'raise prices' or 'absorb' the relationship is negative suggesting that those who do not have a view are more likely to raise prices or absorb costs. Overall we infer that if firms have not thought about where emissions prices might be in the future they are less likely to take action to reduce emissions.

Significance of a view on Shareholder Preferences

We found a positive relationship between intended response and firm's perceptions about shareholder preferences for carbon neutrality. With the Logit models we found that merely stating a view (regardless of that view) of shareholder perceptions was found to be a significant explanatory variable where the primary intention is to raise prices (positive relationship).

Shareholder preferences were not found to be significant where the intention was to 'abate'. Where the primary intention was to 'absorb emissions costs' we found negative relationships between the strength of the perceived view and intending to either reduce emissions or intending to raise prices. In other words, the more firms perceive their shareholders as endorsing emissions reduction, the more likely they are to raise prices and/or take action to reduce energy/emissions costs, and the less likely they are to absorb emissions costs.

Significance of a view on Customer Preferences

We found a positive relationship between intended response and the expectations about customer preferences for carbon neutrality. From the Logit modelling it appears that amongst firms whose primary intended response is to abate, having a perception about the views of their New Zealand customers on carbon neutrality is a positive influence. Furthermore, as customers are perceived to move from 'uninterested' to 'interested, but not prepared to pay more', firms are more likely to absorb costs. The next step in customer endorsement sees firms raising prices. Stronger customer endorsement of carbon neutrality to the point where customers are prepared to pay higher prices leads to firms taking actions to reduce energy/emissions costs.

Export status

Being an exporter is positively associated with the intention to take actions to reduce energy/emissions costs (abating) and negatively related to the intention to absorb emissions costs.

Significance of industry classification

Literature suggests that industry classification is important. However, for most industries in this study there was not a strongly positive or negative association with intending to abate (reduce energy/emissions). There were, however, some exceptions.

A business that is in the Farming industry is relatively unlikely to raise prices and especially likely to absorb the ETS costs. The same applies to firms in the Food & Beverage industry.

The Construction industry shows a strong intention not to abate, nor absorb emissions costs. It is largely a non-traded industry so an increase in output prices is to be expected.

The Transport Equipment industry is also unlikely to abate, but raising prices and absorbing costs are both likely responses, suggesting that firms are either earning good margins and can absorb the ETS costs, or they are producing goods with a low price elasticity of demand; super yachts perhaps.

Findings on reason for response

It appears that firms undertaking abatement are driven not so much by the current characteristics of the NZ ETS but by respondent expectations of the durability/permanence of the ETS, as well as by other pressures. Similarly, those who intend to pay appear to have more cost effective options in absorbing the cost or raising prices, rather than undertaking abatement activities (indeed, many have not explored abatement options such as through an audit).

Therefore we accept the following hypotheses:

H3: those taking abatement action are driven by other pressures (ie not just emissions price)

H4: for those who intend to pay the relative costs of abatement are greater than other options (absorbing or passing the cost through to consumers)

Discussion of results

For the majority of firms the current ETS configuration (its carbon price cap, free allocation etc) is not likely to have such a marked effect on costs that firms have to do something about reducing energy and/or emissions immediately. Indeed many firms are responding by seeking to find out more information (rather than initiating action). Instead their response appears to be influenced more by their future emissions price expectations, and what they perceive about the views of their stakeholders (customers and shareholders) on lower emissions and carbon neutrality.

Industry type and size also play a role but these factors are probably also proxying for structural factors that are more directly relevant to emissions price effects; factors such production technology, price elasticity of demand for products and competition from imports. The design of carbon emissions mitigation policy may take these factors into account, but the policy itself has little impact on them. In contrast, price expectations and stakeholder perceptions are much more amenable to being influenced by government policy.

The results indicate that at the commencement of the ETS expectations about the scheme enduring were not high. Similarly, despite the current low transition price (capped at $12.50 per tonne) most respondents do not expect the price of emissions to rise in the future. Addressing these expectations overtime may be necessary to ensure efficient outcomes. This is an area for further exploration during the second phase of this research project when we re-survey business one year on.

Another point that is interesting to note is that while very few businesses have indicated an intention to abate, for those that have, 62% of businesses (who have estimated the savings that their responses to the NZ ETS could make to their business), found they could save over 5% on their energy costs. Programmes striving to improve business energy efficiency have had to tackle the information barriers (of not thinking there is anything you can do, or that it won't be efficient to do anything about it, or spend time exploring it). Some of the results about low expectations of abatement options may reflect this – in addition to genuine efficient and rational responses of not undertaking abatement activities at low emissions prices.

6. Results: Clean Technology Solutions Providers

Respondent profiles

Of the 24 respondents, for the part of their activities which could be classed as part of the low emission sector, 6 (25%) were principally involved in consulting, design and advice. A further 14 firms were principally involved in equipment manufacture, supply and/or installation.

For firms principally involved in 'making, providing and installing equipment' and 'other' activities, six firms claimed that 'power or fuel generation' were their main activities, four said that 'energy conservation devices' were their main activities, three that said 'carbon capture and storage/carbon sink technology' were their main activities and five firms mentioned 'some other activity'.

Recall that the sample for this survey is not random. Therefore we make no claim about the representativeness of the following set of characteristics to the broader solutions provider sector (to the extent there is such a sector). The characteristics of the respondents are as follows:

- The majority (75%) have both domestic and overseas customers (with over 88% of firms having domestic customers and 83% with overseas customers).
- Customers came from the following industries (most supplied two or more industries) (see figure 6.2). The "other" category includes a mix of retail, waste, automotive industry, schools, sales and service industries, households, industry associations and other business services.
- 59% were wholly New Zealand owned companies while only 4% were majority overseas owned. While equal numbers of firms from the consulting, design and advice category were majority NZ owned and wholly NZ owned, a far greater proportion of those categorised as making providing and installing equipment were wholly NZ owned.
- The majority of firms had turnover less than $5 million. The firms with turnover at the lower end of the range were (as expected) dominated by those in the consulting, design and advice.
- Most of the firms had less than 20 FTE but those that were larger were significantly so (max was 600). The smaller firms had all (or close to)

dedicated to low emission sector activities. For the larger firms only 51% were dedicated.

– The qualifications held by employees that are central to each of the firm's low emission work were dominated by science disciplines (note that some firms indicated more than one typical type of qualification).

Observed business responses

Impact on Domestic Market

For most respondents domestic demand for emissions reduction advice or equipment has not changed over the six months since the introduction of the ETS – measured both on the level of enquiries (which indicate potential future sales) and actual current sales.

When asked of their expectations of the impact of the ETS before it was introduced most expected little impact on their business while 19% expected a negative impact and 23.8% a positive impact. 85.7% said what actually happened was in line with their expectations.

71.5% said that their companies competitive advantage compared to overseas competitors had remained about the same in the New Zealand market over the last 6 months compared to before July 2010.

Some of the comments of respondents on why the lack of impact included that "not enough companies have realised the true impact of carbon", and "there hasn't been sufficient time to see and impact". For some, however, "the enquires or sales had picked up because of more public awareness of and improvement in tech and energy savings it can make".

When it came to using the ETS as a point of advantage is sales pitches, seven firms treated the ETS as a useful point in generating interest in their products or services while nine disagreed that the ETS was useful. Five firms said that it didn't come up.

Expectations for the future were slightly more optimistic with as many expecting an increase in domestic sales as it either staying the same or decreasing a little.

As a consequence of these findings we reject the hypothesis:

*H6: The ETS **has** increased the domestic market for emissions solutions*

But we find that the ETS is expected to increase the domestic market in future. While 5 firms expected some increase in the domestic market currently that number doubles to 10 when respondents consider the coming 12 months.

Impact on Foreign Markets

A similar result is found with respect to competitiveness in foreign markets. For most respondents overseas demand for emissions reduction advice or equipment has not changed over the six months since the introduction of the ETS – measured both on the level of enquiries (which indicate potential future sales) and actual current sales.

Similarly, most stated that their expectations at 1 July 2010 were that their sales would stay about the same. Again, 85% had expectations their met.

Most said that it hadn't affected competitive advantage in overseas markets (some stated that it had had a negative impact). Only 5% of respondents use the NZ ETS in sales presentations to overseas customers.

However a number expect an increase (either a lot or a little) in sales over the next 12 months. While the sample numbers are too small to draw strong inferences, we note that there appears to be slightly more optimism for the future.

As a consequence of these findings we reject the hypothesis:

*H7: The ETS **has** enhanced the competitive advantage of NZ solutions providers in overseas markets*

But again we note that we may find evidence to accept this hypothesis in the following year if expectations about a positive impact on foreign market sales are met.

Sensitivity of Solutions Provider Business Growth to Emissions Price Level

The ETS has had an effect on 47.5% of solutions provider businesses costs – the majority of whom absorbed the cost increase (did not put up prices). Two did put up price and two changed behaviour.

Turning to the impact of the ETS on their markets, when asked to rank the three most important factors to their firm, the emissions price level fell well down the list. As expected, issues such as access to capital and partnerships with other companies were more important. However, climate change did feature high up the list with the importance of an international agreement ranking third.

Given nine factors, all respondents were invited to choose one or more factors they thought the most

important for their firms in succeeding in the low emission sector – that is, this time we prompted them. 'Joint venture partnerships with other companies' was chosen by 21 respondents who considered it the most important factor for their firms in succeeding in the low emission sector, followed by 'NZ government grants or other programmes', 'overseas emissions price level or regulation' and 'access to skilled labour' which were mentioned by 19 respondents separately. All the rest of the factors, except 'overseas developed patents', were also important for firms and mentioned by more than 50% of respondents.

As a consequence we find that solutions provider businesses are not that sensitive to the domestic emissions price. International regulation and the prospect of an international climate change agreement do rate highly (recall that most of the respondents are exporters so we would expect sensitivity to the international regulatory environment). However, like many other high technology, innovative small firms, access to capital and networks loom largest. Therefore we reject:

H8: Growth of solutions providers businesses is sensitive to the emissions price level

Discussion of results

The responses by solutions providers, while 6 months later than the general business survey, provide further evidence that the impact of the ETS on abatement demand has been muted. Looking to the future, however, and despite a time of low general business confidence, many of the solutions provider businesses remain optimistic about the future. If, as we found in the general business survey, there is a period of information gathering being undertaken before decisions are taken, the levels of confidence of the solutions provider firms may provide an early indication of what we may find when we re-interview general businesses in mid 2011.

The results of the solution provider survey also further emphasise the importance of the international regulatory context and in particular the achievement of a global agreement that includes developing company competitors and partners. Government has an important role to play in the international arena in achieving steps towards this agreement. However, we note on the basis of the survey results that the businesses themselves see limits to the degree in which government can directly influence the challenges they face in growing their businesses.

7. Findings and Recommendations

In this paper we set out to develop a baseline against which the effects of the ETS on business behaviour can be monitored over time. We have collected data on indicators based on what the relevant literature suggests will be important in understanding and predicting firm behaviour and the ultimate impact on emission outcomes.

In doing so, we have also explored the relationships that exist in the data at this early stage of the ETS implementation and tested those against expectations developed from relevant literature. It is years too early to judge the success of the ETS. Many of the results of this study may simply indicate that, at the time of the survey, firms were at very early stages of formulating how they might be affected by the ETS and how they might respond (indeed 34% of firms had no intentions at all). Thus present intentions could be an unreliable guide to eventual practice.

That said, we have drawn three findings from this research.

Cost exposure

We can conclude with confidence that the ETS has had a muted financial impact on the majority of New Zealand businesses.

Assistance is being provided by the government to many of the most cost exposed firms to meet emissions costs. We have been unable to test the influence that receiving free allocation may have on response behaviour but will explore this again in the 2011 survey.

In this survey, we have identified that small firms (0-5 FTE's) are just as likely to be energy intensive as larger firms. What is unknown from our data is how many of these will actually receive free allocations. This is an area for further analysis in part two of this research project.

Economic abatement options

What this study has shown is that for most businesses there is an expectation that there are limited cost effective abatement options. This may well be the case. In this study we have not tested the degree to which those expectations are accurate. We do note, however, that programmes striving to improve business energy efficiency have had to tackle the information barriers (of not thinking there is anything you can do, or that it won't be efficient to do anything about it, or spend time exploring it). Some of the results about low expectations of abatement options may reflect this.

Indeed, for those that intend to abate, 62% of businesses who have estimated the savings that their responses to the NZ ETS could make to their business, and found they could save over 5% on their energy costs.

Policy Credibility

The results indicate that at the commencement of the ETS expectations about the scheme enduring were not high. In addition, despite the current low transition price (capped at $12.50 per tonne) most respondents do not expect the price of emissions to rise in the future. This may have influenced the finding that many respondents were yet to decide and were collecting further information before acting.

Expectations about the durability of the policy and confidence that the settings are robust will directly influence the decisions businesses take in responding and therefore the dynamic efficiency of the policy. After all, if the price was to be short in duration the most efficient response may be to simply pay as future emissions reductions would not have a market value.

This is an area that requires further monitoring. It may also warrant further attention from government.

Incentives for solutions providers

While much attention in recent years has been focused on those industries impacted by emissions pricing the policy can also have important incentive effects on the development of a so called 'clean tech' industry. What this research has found is that the ETS may have some impact in the future on domestic sales by solutions providers, but there are a range of other factors that are also important.

Viewed through an economic development lens, it is the generation of export receipts through high value added activities that will be important to New Zealand's future prosperity. As the global market for environmental solutions grows, so too do the opportunities for New Zealand businesses to gain a slice of that action. What this research indicates is that the ETS will be insufficient on its own to ensure that those businesses thrive internationally.

There may be options to enhance the incentive effect of the ETS itself (such as putting in place floor prices to create investment certainty[20]). But addressing other mainstream issues such as those of innovative start-up companies may also be required.

8. Next Steps

Part two of the research project will be carried out during the course of 2011 to explore the effect of the emissions price one year on for both general business and solution providers/clean technology firms. In this study we will again draw on the framework set out in chapter 2 to explore the effect of the ETS.

In doing so there are particular additional dimensions we will seek to explore:

- The extent to which environmental regulation such as the ETS leads to stimulation of competitiveness and business performance (or simply diverts capital);
- The extent to which dynamic responses are stimulated. In particular, we will seek to explore the degree to which investment activities are being stimulated to reduce business emissions in future (in addition to a comparative static analysis of 2010 and 2011 pay versus abate responses).

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[20]The Grattan Institute recommends that governments put in place floor prices. "Floor prices provide certainty for the builders of low-emissions power plant that they will not be undercut by existing high-emissions generators if carbon prices turn out to be low. This is an important issue for financing power generation where the prospective financiers of a project look at the returns for a "plausible but bad case" (say the worst 15% of outcomes) and refuse to provide finance if this would result in a significant loss. Boards are likely to insist on a transparent analysis that shows the financial outcome under certain key assumptions. A floor price provides significant assurance that is plausible" (Grattan Institute, 2010).

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Figure 1: Measuring the impact of the ETS

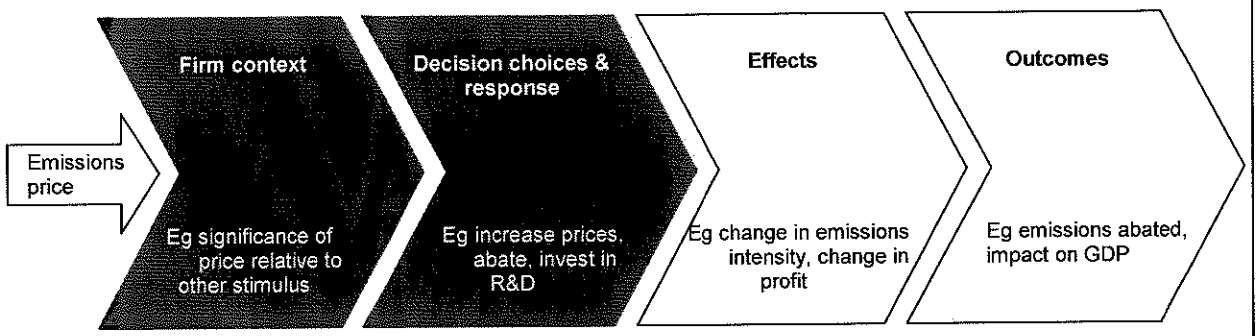


Figure 2 Stimulus-Response Framework

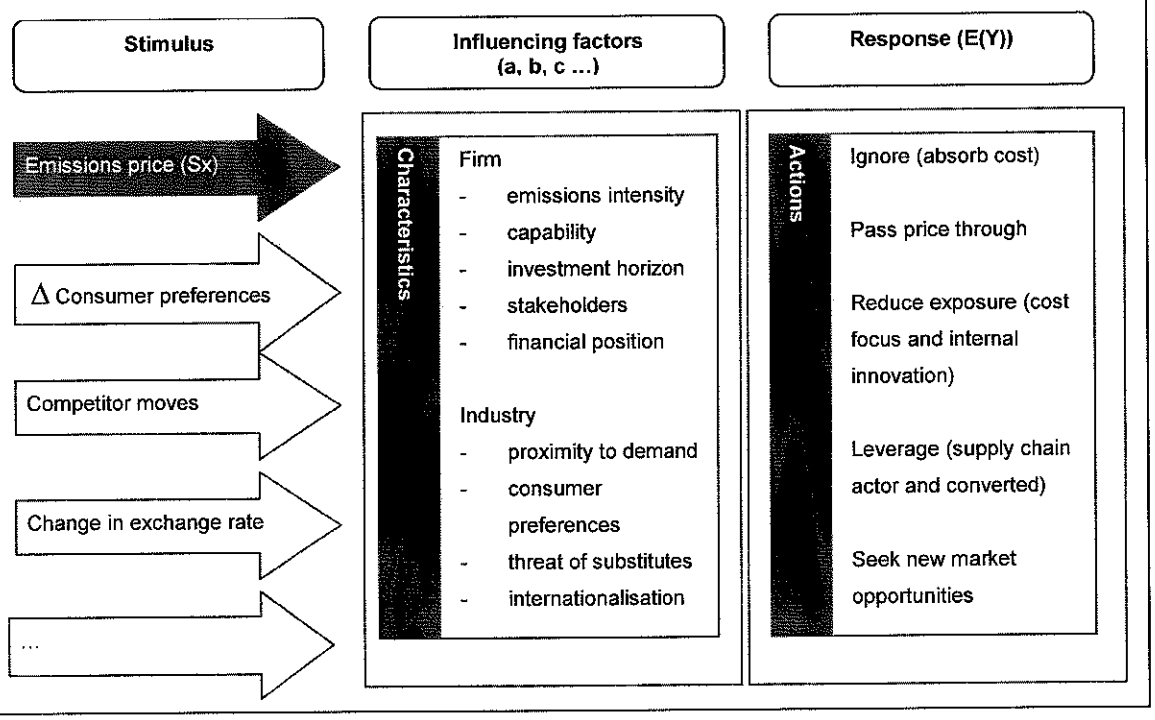


Figure 3: Response Strategies

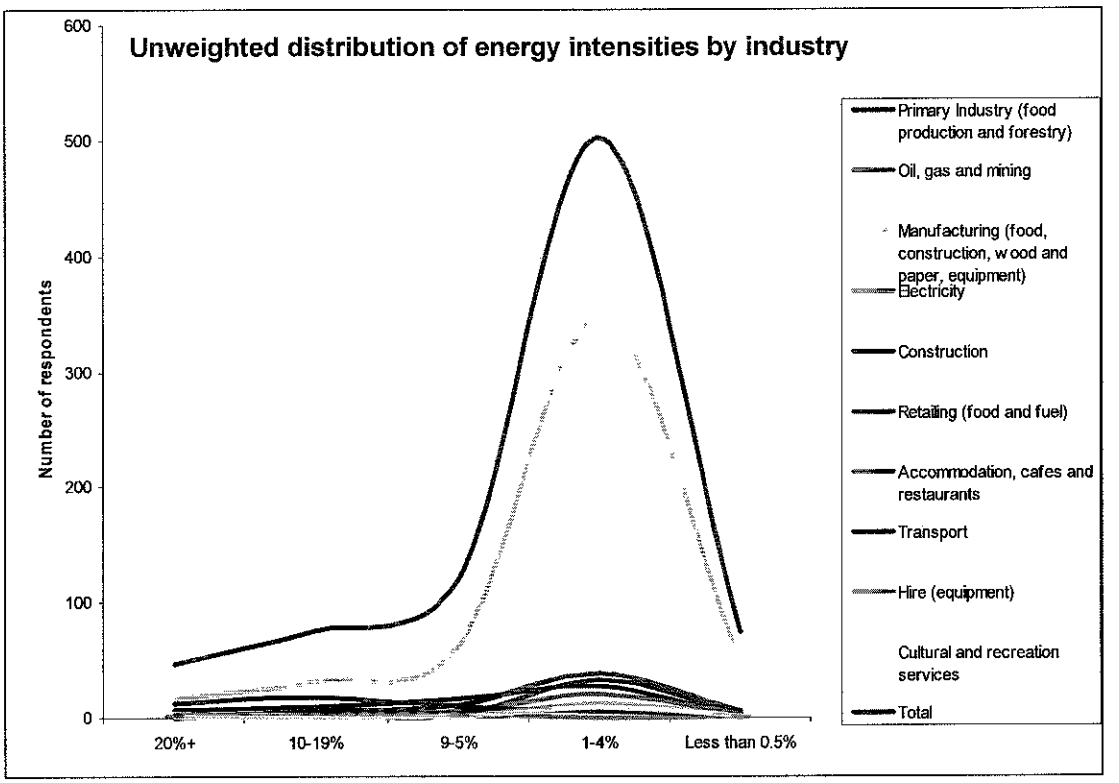
	Strategy	Response
Action responses	Exit industry/shift overseas	If applicable, run down domestic capital prior to exit.
	Ignore	Absorb cost and factor in to general price setting (no specific response); no involvement of top management (not a strategic issue); no attempt to reduce longer run cost exposure.
	Pass through	Recover cost through explicit price rises (notify customers of price increase and reasons for the increase), no attempt to reduce longer run cost exposure.
	Cost focus	Internal process focus such as efficiency improvements and fuel switching (improve existing processes rather than step change innovation or shifting to new outputs); responsibility likely to be added to an existing role – such as production manager; little employee environmental training or involvement.
	Internal innovator	Innovation focus (acquisition and installation of new technologies and shift in product mix); top management involvement – input across business units eg production, marketing etc; specialist staff (eg, in large firms, an environmental performance team in corporate or strategy division). May engage in offsetting projects for accreditation (eg planting trees); internal targets with reporting on progress; price increases/offer of "premium" product/service with emissions offset included in price.
Orientation responses	Supply-Chain Actor	Focus is on ensuring suppliers and intermediate consumers adhere to performance/life cycle requirements and keeping own firm in line with such requirements; exploration of alternative inputs with lower upstream emissions; Little/no focus on in house process emissions; sponsorship activities.
	Converted	Sustainable development is embedded in business competitive strategy; top management champion with involvement from whole organisation; likely to be consumer niche targeting but may not be driven by customer demand - may be leading demand; Participation in emissions trading (project offsets – esp CDM but less likely to purchase emissions units on domestic market); Internal reduction targets with public reporting on progress.
	Entrepreneur	Focus on new opportunities to generate profit created by market responses to ETS; focus on opportunities to produce low emissions products/services (eg clean tech) or generate revenue from emissions trading activities (such as offering trading services to emitters); Focus on financial economy; Might engage in JI and CDM – partnering with others; May or may not be participant in "real economy".

Figure 4: Characteristics by response type

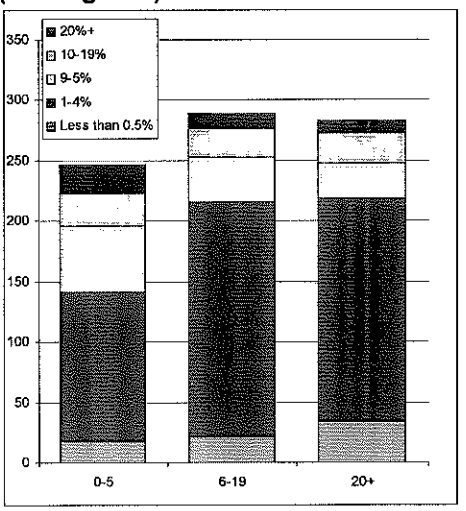
	Exposure	Firm characteristics	Industry characteristics
Ignore	Relatively low (low emissions intensity)	Addressing emissions not part of business strategy, stakeholders not interested or firm not attentive to stakeholders	Likely to have more of a domestic market focus, little product differentiation, threat of substitutes, may be up the supply chain away from end consumer
Pass through	Relatively low – moderate (some cost exposure but low price elasticity of demand)	Customers not price sensitive at the level of increase required, emissions prices viewed as a tax like GST, little opportunity to reduce cost exposure	All firms in industry passing cost through
Cost focus	Relatively moderate – high (material cost increases some or all of which can't be recovered from price increases)	Generally cost focused and attention paid to efficient processes, have feasible abatement options (eg energy efficiency measures).	Likely to have more of a domestic market focus, little product differentiation, threat of substitutes, may supply end consumer who are likely to be price focused but limited interest in emissions performance itself
Internal innovation	Relatively moderate – high (material/large cost increases some or all of which can't be recovered from price increases)	Generally view emissions abatement as an embedded issue requiring more systemic changes (such as production process redesign). Abatement may be driven by emissions costs avoidance but also competitive positioning.	May have more of a international market focus and face threat of substitutes. May supply end consumers who may have an interest in emissions abatement and may be prepared to pay a premium.
Exit the industry	Relatively high (high cost exposure with and high price elasticity)	Limited economic abatement opportunities. Business may have had low turnover or margins for some time and old capital equipment.	More competitive substitutes are likely to exist. Customers likely to be price focused but limited interest in emissions performance itself
Supply chain actor	Low (within business gates) value at stake and abatement cost	Likely to have upstream suppliers for which emissions are material but own	Likely to be an international business with a variety of inputs across the globe into the

		customers who are sensitive to life cycle management and product integrity.	supply chain. Production processes themselves likely to be carried out in developing nations where enviornmental standards may be different.
Converted	Low - high	Owners believe in low environmetnal impact and have built their business around a brand that has environmetnal integrity (ie at the outset)	Highly differentiated markets with international end consumers who are prepared to pay for integrity. Likely to be market niches rather than supplying mass market. Likely to exist in the product markets rather than services, and across many industries
Entrepreneur	Low	Opportunties to earn revenue assisting other companies to manage their emissions. Could involve provision of advice, installation of equipment or the development of new technologies.	Not confined to a single industry. Likely to be spread across equipment manufacturing, research/business services.

Figure 5: Energy Intensities



Energy intensity and firm size (unweighted)



Energy intensity and firm size (weighted)