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ABSTRACT

Business strategy can be defined as a firm's plan to generate economic profits based on lower cost, better quality, or new products. The analysis of business strategy is thus at the intersection of market competition and a firm's efforts to secure persistently superior performance via investments in better management and organization. We empirically analyze the interaction of firms' business strategies and their managerial practices using a unique, detailed dataset on business strategy, internal firm organization, performance and innovation, which is representative of the entire Canadian economy. Our empirical results show that measures of business strategy are strongly correlated with firm performance, both in the cross-section and over time, and even after controlling for unobserved profit shocks exploiting intermediates utilization. Results are particularly striking for innovation, as firms with some priority in business strategies are significantly more likely to innovate than firms without any strategic priority. Furthermore, our analysis highlights that the relationship between strategy and management is driven by two key organizational trade-offs: employee initiative vs. coordination as well as exploration of novel business opportunities vs. exploitation of existing profit sources.

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1 Introduction

What drives different types of persistent comparative advantages across firms? Recent applied models in a variety of fields such as industrial organization, macroeconomics, or international trade describe the equilibrium implications of different types of comparative advantages between businesses. For example, static trade models are often based on cost or quality differences across firms, while comparative advantages in endogenous growth models are often based on new products or drastically better quality. However, even conditional on a particular comparative advantage, there typically exist alternative models with different implications for equilibrium outcomes. A case in point are models of cost competition, which can exhibit either constant markups, as in Melitz (2003), or markups which are declining in marginal costs, as in Bernard, Eaton, Jensen and Kortum (2003) or Melitz and Ottaviano (2008). Differences in firms' behavior imply differences in the impact of policy affecting competition and trade. Despite this theoretical ambiguity, empirical evidence on how firms act when they pursue different types of performance advantages remains rare.

At the same time, a parallel empirical literature argues that a large part of persistent firm performance differences can be explained by differences in management practices; see e.g., Bloom and Van Reenen (2007) and Bloom, Eifert, McKenzie, Mahajan and Roberts (2013a). This literature mostly focuses on management practices that every optimizing firm should adopt, as argued by Bloom, Sadun and Van Reenen (2013c). Yet, the adoption of some management practices might be a function of the type of comparative advantage pursued by the firm. For example, a firm pursuing high-quality might adopt management practices such as training programs for high-skilled workers, while a low-cost producer might not. Using the concept of business strategy, we join these two questions and link the structure of management practices to the types of comparative advantage pursued. Business strategy can be defined as a firm's plan to generate economic profits through higher value creation due to lower cost, better quality, or newer products compared to competitors.

To our knowledge, this is the first empirical paper to analyze the interaction of business strategies, the management of firms, and firm performance in a representative sample of businesses. To this end, we exploit unique detailed data on business strategies, internal organization, and firm performance which is representative of all Canadian business firms. We build on recent advances in models of firm heterogeneity, in which superior value creation is based on cost advantages, higher quality, or newer products, to guide our empirical analysis. We therefore measure business strategy as a firm's top priority to compete in a product market via lower costs, better quality, or newer products. This leads us to categorize firms into four types: (i) *novelty firms* have the development of new products or services as top strategic priority; (ii) *high-quality firms* pursue higher-quality products or services; (iii) *low-cost firms* have low-cost as their top strategic priority; and we use (iv) *firms for which business strategy is not important* as the main comparison group.

Four sets of results stand out. First, business strategy priorities are systematically correlated with firm performance, and these correlations are robust in a number of ways. They hold for performance data that is entirely based on auxiliary tax information which has been gathered independently of the survey data we utilize. They hold in the cross-section and also after including firm fixed effects and controlling for unobserved profit shocks exploiting intermediates usage. These systematic correlations reassure us about the validity of our measures of business strategy.

Second, we provide stylized facts that are of importance for different static models of firm heterogeneity with high-quality or low-cost as the source of performance differences. For instance, models such as Melitz (2003) predict that markups should be unrelated to cost differences across firms, while models such as Bernard et al. (2003) or Foster, Haltiwanger and Syverson (2008) predict that firms with lower marginal costs exhibit higher markups. We show that firms with low-cost strategies exhibit higher market shares, but also lower markups. Similarly, high-quality firms in models such as Johnson (2012) and Kugler and Verhoogen (2012) do not have higher markups than lower-quality firms, in contrast to models such as Sutton (2012), where higher quality implies higher markups. We find that high-quality firms exhibit systematically higher markups, higher market shares, and higher profitability compared to firms with other strategic priorities.

Third, we document correlations between innovation and business strategy that are potentially interesting for further theory development of endogenous growth models. For example, in models such as Klette and Kortum (2004) and Acemoglu, Akcigit and Celik (2014), exogenous differences in the ability to innovate drive performance differences across firms. Our evidence suggests that differences in the likelihood to innovate are systematically related to business strategy. Firms with some strategic priority are significantly more likely to innovate than firms without any strategic priority. Furthermore, firms with novelty as their top strategic priority are more likely than firms with high-quality or low-cost as their top strategic priority to generate new products or processes instead of just improving upon existing ones. These patterns suggest that modeling the choice of business strategy is a promising way forward to endogenize firms' comparative advantage to innovate.

Fourth, we document systematic correlations between firms' business strategies and a broad range of management practices, such as the distribution of real authority within the firm, the implementation of performance pay, the demand for skilled employees, the use of job-training programs, and operational practices like coordination along the value chain and re-engineering. Together with our empirical results on business strategy and firm performance, our analysis suggests that the joint choice of strategy and management is driven by two key organizational trade-offs, summarized in table 1 and similar to those discussed by Roberts and Saloner (2013). First, organizations need to trade off employee initiative vs. employee coordination, as many management practices that encourage employee initiative—such as the decentralization of decision-making—can directly reduce the extent of employee coordination. The second trade-off is between the exploration of future business opportunities and the exploitation of current profit sources, since incentives tied

Table 1: Business strategies and organizational trade-offs

		Business opportunities	
		`exploration`	`exploitation`
Employee	`initiative`	novelty firm	high-quality firm
	`coordination`		low-cost firm

to short-term profits may conflict with activities that promote long-term performance; see e.g., March (1991), Holmstrom and Milgrom (1991), and Manso (2011). Our baseline results suggest that novelty firms tend to adopt management practices that emphasize the exploration of future business opportunities at the expense of current profitability, while they systematically value employee initiative more than employee coordination. In contrast, high-quality firms tend to implement organizational designs that exploit current profit opportunities despite a heavy emphasis on employee initiative. These high-quality firms in turn differ systematically from low-cost firms, which adopt management practices that foster the coordination of employees by professional managers and emphasize the exploitation of current profitability.

It is worth highlighting that these systematic correlations between business strategy and management are open to different interpretations. On the one hand, these correlations might suggest patterns of consistency or "fit" across management practices for firms with a given business strategy. On the other hand, unobserved heterogeneity in managerial talent could drive the correlations of strategy and management practices, as pointed out by Athey and Stern (1998). However, even in this case, these stylized facts are still interesting as they reflect different "managerial styles", similar to Bertrand and Schoar (2003).

2 Theories of Business Strategy and the Management of Firms

2.1 Business Strategy and Types of Comparative Advantages

Recent models of firm heterogeneity in industrial organization, international trade, and macroeconomics emphasize persistent performance differences within narrowly defined industries. These performance differences are typically due to cost advantages, quality advantages, or novel products, and they have different implications for the sources of

profitability across firms.

A very popular class of models are constant elasticity models such as Lucas (1978) and Melitz (2003). The most basic version of these models implies that higher firm productivity is reflected in lower marginal costs, which in turn imply a lower price and a higher market share. Since in constant elasticity models markups are constant, low-cost firms are more profitable overall. These models therefore imply that market shares across firms are uncorrelated with markups, while market shares are negatively correlated with marginal costs. In contrast, cost advantages in models of endogenous markups—such as Bernard et al. (2003), Melitz and Ottaviano (2008) and Foster et al. (2008)—imply that low-cost firms also generate higher markups.

A second popular class of models generates performance differences across firms using quality differences in products and services. These models are capable of explaining industries with differentiated goods in which higher-quality products exhibit high market shares despite selling at higher prices. A simple variant of these models is a reinterpretation of the setup in Melitz (2003) in which more productive firms charge lower quality-adjusted prices, but charge higher prices without quality adjustment. These higher prices reflect firms' higher marginal costs of producing high quality products, as in Johnson (2012) and Kugler and Verhoogen (2012). Note that since these models are based on CES preferences with monopolistic competition, markups are again constant across firms so that the higher profitability of high-quality firms is due to their higher market shares despite charging higher prices. In contrast, in models of quality competition, such as Shaked and Sutton (1982) and Sutton (2012), high-quality firms are able to reduce price competition through higher quality, i.e., using product differentiation. As a result, in these models, markups are higher for high-quality firms.

While product differentiation in these models works through firms offering marginally better qualities of existing products, in models of endogenous innovation novel products generate monopoly rents for innovating firms, either through new varieties as in Romer (1990) or by offering drastically better-quality products as in Aghion and Howitt (1992), Klette and Kortum (2004), Akcigit and Kerr (2010) or Acemoglu et al. (2014). In these models, comparative advantages are driven by successful innovation. Several of these models, such as Klette and Kortum (2004) and Acemoglu et al. (2014), generate performance differences by assuming exogenous differences in the ability to innovate. However, what drives these differences in innovation ability is still an open empirical and theoretical question.

Based on this brief survey of popular applied models, we are most interested in the three types of business strategies that emphasize lower costs, higher quality, or newer products than competitors. Our theory discussion also foreshadows our analysis of the correlations of business strategy and measures of performance such as markups, market shares, and profits.

2.2 Business Strategy and Management Practices

While the models of firm heterogeneity discussed so far are useful in understanding what types of comparative advantages firms pursue with their business strategies, these models are silent on how firms organize to achieve these competitive advantages. In other words, these models do not explain the specific mechanisms through which some firms are able to maintain persistently higher quality, lower cost, or more novel products.

Research on the "fit" between strategy and management practices has been limited in scope, as emphasized by Roberts and Saloner (2013). Notable exceptions include Porter (1980), Rotemberg and Saloner (1994), and Milgrom and Roberts (1995). Porter (1980) provides a categorization of business strategies into "cost leadership," "product differentiation," and "focus" on niche markets, which is in many respects similar to our categorizations. In this context, Porter (1980) conjectures that a simultaneous pursuit of a low-cost strategy and a high-quality strategy implies organizational contradictions that lower firm performance. While this "stuck in the middle" hypothesis is supported in Porter (1980) mainly by anecdotal evidence, Rotemberg and Saloner (1994) provide a possible micro-foundation of the mechanism by pointing out that narrow business strategies can have motivating effects on effort investment by employees in incomplete contract environments. Milgrom and Roberts (1995) extensively discuss the idea of strategy and organizational fit in the context of a case study of the Lincoln Electric Company. According to Milgrom and Roberts (1995), Lincoln Electric pursued a low-cost strategy, supported by various management practices such as performance pay, high job security, and extensive job training. While this case is suggestive and insightful, there seems to be a clear need for more comprehensive evidence on business strategy and firm organization. Our study can be seen as a starting point in the endeavor to better understand the link between strategy and management practices link empirically and conceptually.

3 Measurement and Validation of Business Strategies

3.1 Data

The source of our data is the Workplace and Employee Survey (WES), which is a random stratified sample of establishments with the universe of Canadian firms as the target population and is conducted by Statistics Canada. The survey has a cross-sectional dimension of approximately 6,500 firms over the time period 1999 to 2006, with a low overall attrition rate of around 20% cumulatively. Of these 6,500 firms, we focus on the sample of around 5,500 for-profit business firms. As in other government-sponsored surveys, response to the WES was mandatory, so that the overall response rate was typically close to 90%. The WES survey tool provides us with detailed information on business strategy, the internal organization of firms, and their innovative activity. Additionally, in cooperation with Statistics Canada and with support from Industry Canada, we linked the WES

to balance sheet data from administrative tax records. The administrative tax data based on the General Index of Financial Information (GIFI) provides balance sheet information that is the basis for the calculation of profit taxes. We therefore create a comprehensive data set not only of firms' management practices but also of their performance as reported to tax authorities. We use this auxiliary data, based on administrative records, to validate our measures of business strategy that are based on the survey responses. There are several advantages of this data compared to other existing micro-level data on management practices and internal firm organization. First, the WES has a comprehensive sectoral coverage, in contrast to either more narrow industry studies such as Ichniowski, Shaw and Prennushi (1997) or manufacturing-based studies such as Bloom, Brynjolfsson, Jarmin, Saporta and Van Reenen (2014a). Second, since the target population is the universe of business firms, the WES is not biased towards certain size classes as is the World Management Survey Data by Bloom and Van Reenen (2007).

3.2 Measurement Issues

The WES reports detailed information on business strategy every other year between 1999 and 2006. The raw information on business strategy in the WES survey comes in the form of Likert-score responses to the question "Please rate the following factors with respect to their relative importance in your workplace general business strategy." Responses vary from "not applicable," scored at 1, and "not important," scored at 2, to "very important" and "crucial," scored at 5 and 6, respectively.

In extracting information about business strategy, we face two conceptual challenges. First, there are a variety of factors that can be rated, only some of which can be categorized as reflecting business strategies, while other factors are related to a firm's operations. Second, the survey does not reveal any objective numerical information.

To address the first issue, we follow the popular theories of firm heterogeneity surveyed in section 2, according to which firms generate higher profits if they provide products at lower cost than competitors, or if they offer higher value to customers than competitors do. The latter can typically be achieved either by offering a novel product or service or by offering a product or service of higher quality. We therefore concentrate on those strategy scores that relate to a firm's intention to reduce costs, provide higher quality, or supply new products or services. The two factors underlying what we categorize as cost-based strategy are "reducing labor costs" and "reducing other operating costs." In contrast, the categorization of a quality-based strategy is based on the two factors "total quality management" and "improving product or service quality." The third business strategy is a focus on the development of a novel product or service. We therefore categorize firms as following a novelty-based strategy, based on the factors "undertaking research and development" and "developing new products/services." Although we categorized these factors based on economic reasoning, we also verify that the pairwise correlations between the factors we selected was the highest among all possible factors listed in the business strategy section.

The second issue is the problem of interpreting the cardinality in the reported Likert scores. As Bloom and Van Reenen (2010) note, the problem is that Likert scores are inherently subjective, because a score like "important" could mean different things to different respondents. For instance, one respondent might be anchored around a score of 3, as she thinks that strategy is on average only "slightly important." In contrast, a second respondent might be anchored around a score of 5, as he considers strategy to be "very important" on average. In short, we are concerned about unobserved differences in the mean Likert scores that are unrelated to the firm's actual evaluation of strategy. Bloom and Van Reenen (2010) succinctly summarize the issue: "Since these responses are not even comparable across respondents, they are certainly not comparable across firms."

To enable cross-sectional comparisons of firms' attitudes toward business strategies, we therefore focus on extracting information on the relative priorities of different business strategies. This completely avoids dealing with the cardinality of the Likert scores, instead exploiting the ordinal information in the data. Specifically, for the three mentioned basic measures of business strategy—low-cost strategy, high-quality strategy, and novelty strategy—we infer that the firm assigns a top priority to this strategy if the respondent's numerical ranking of the factors associated with this strategy is highest. For example, a firm that ranks "reducing labor costs" with a response of 5 but all other strategies with a response of 4 will be classified as having low-costs as its top strategic priority. Similarly, if a firm ranks "reducing labor costs" with a response of 5 but also rates "total quality management" with a response of 5 and gives all other factors a response of 4, this firm will be classified as both a low-cost and a high-quality firm. Note that we therefore explicitly allow firms to have more than one strategic priority. To establish a comparison group with respect to all three strategic priorities, we do not assign any strategic priority to a firm if the highest rating is a 3, which means that the respondent rates all factors as being at most "slightly important." Hence, in order to be assigned a strategic priority, at least one factor needs to be rated as "important." The resulting variables measuring business strategies are indicator variables, which are 1 if a particular business strategy is a top priority, and are called I(`novelty`), I(`hig-quality`), and I(`low-cost`), respectively.

While we focus on these measures of business strategy priorities for cross-sectional comparisons, we also report several estimations that use establishment fixed effects and for which the mentioned respondent-specific mean problem is less of an issue. In these establishment fixed effect regressions, we estimate the within-firm change in the subjective importance of a strategic factor, which avoids making cross-firm comparisons[1]. Whenever we use establishment fixed effects, we therefore use a normalized average response of the factors underlying a strategy category. For example, for low-cost strategy, it is an average of responses to "reducing labor costs" and "reducing other operating costs," with mean zero and standard deviation of one.

[1] Note that this assumes that respondents at a specific firm are typically not changing over time. To the extent that respondents change over time, one would expect attenuation bias to arise in our within-firm effects due to measurement error.

3.3 Business Strategies across Sectors

We begin by reporting the distributions of business strategy priorities across broad sectors. We separate out the largest sectors of business activity in the Canadian economy, which include manufacturing, wholesale trade, retail trade,and service sectors such as finance and insurance as well as business services. These sectors differ in the importance of technological factors such as returns to scale as well as in the relative importance of local compared to national and international competition. It is therefore instructive to compare the relative frequencies of strategic priorities across sectors. This is done in the first three columns of table 2.

Several notable features emerge from these cross-sectoral comparisons. First, only a minority of firms report novelty as a top strategic priority, while the majority of firms have high quality as a top priority. This is true for individual sectors as well as for the economy as a whole, as shown in the last row of table 2. Second, the relative proportion of firms with different strategic priorities varies across sectors. For instance, novelty is much more likely to be a top priority in manufacturing than in service sectors such as finance and insurance. On the other hand, high-quality seems to be more frequently a top strategic priority outside of manufacturing.

Our simple measures of strategic priorities do not differentiate between long-term business strategies and short-term strategic decisions. A firm might, for instance, respond to a temporary negative profit shock by emphasizing cost reduction, although its long-term strategic priority is the development of new services. To capture these long-term, persistent strategic priorities, we focus on strategic priorities that a firm had for at least two consecutive survey rounds, or for a time horizon of at least 2-3 years. The results are reported in the last three columns of table 2. Overall, the fraction of firms with a specific strategic priority falls significantly, indicating that a large part of business strategy priorities are temporary rather than permanent[2]. On the other hand, the persistent strategy results mostly preserve the relative popularity ranking of the different strategies. For instance, novelty is still the least popular strategic priority, while high quality is the most popular priority, and low cost is in between. Similarly, differences in the sectoral rankings are mostly unchanged. While manufacturing has the highest fraction of novelty firms (13%), novelty is much less important for the typical service sector, for which high-quality is a relatively more important strategy.

3.4 Validation using Administrative Records

In this section, we validate of our business strategy measures by analyzing the correlation of business strategy with performance measures, mostly based on administrative records. In particular, we correlate business strategies with current performance measures such as profits, markups, TFP, and ROA. For these current performance measures, about half of the variables are based on data that is not provided in the WES survey, but

[2]This pattern is also likely to reflect measurement error.

that firms report on their official tax forms in the GIFI database. For performance data taken from the WES, such as sales revenue or wage bill, we cross-validated the reported values with the balance sheet information from GIFI. Note that, unless otherwise noted, all performance measures are log values.

It is helpful to emphasize what kind of validation this section seeks to provide in contrast to the rest of the paper. There are two main concerns with measures of business strategy based on survey data. First, respondents might have no incentive to correctly answer survey questions, so survey evidence might primarily reflect measurement error. It is this issue that we address in this section by reporting correlations of business strategy measures with outcomes such as profitability and market shares from sources other than the survey itself. Second, respondents might have an incentive to misreport their actual business strategies in an attempt to safeguard trade secrets. The most important reason why this seems implausible is that government surveys are filled out under a legal guarantee of non-disclosure, with severe punishments even in cases of accidental disclosure of the respondents' identities. Furthermore, our comprehensive empirical analysis along several dimensions of firm performance and organization can be seen as an indirect plausibility check on our measures of strategic priorities.

3.4.1 Pooled Estimation

In this section, we pool all data on firm performance from all four survey waves, spanning an eight-year time horizon. Our approach to evaluating the validity of our measures is to regress measures of firm performance or closely related variables such as markups on our proxies for strategic priorities and various control variables. All pooled regressions control for 4-digit NAICS industry fixed effects as well as time fixed effects. We also include self-reported measures of the intensity of competition as control variables, to avoid confounding the correlation of strategy with firm performance with the correlation with competition.

We start with measures of market shares and profitability to validate our strategy measures. Our measure of market share is the revenue share of a firm within a 4-digit NAICS industry. Firms pursuing current comparative advantages such as low-costs or high-quality might be expected to have systematically higher market shares than their competitors. As the first column in table 3 shows, this is indeed the case. Note that the specification reported in the first column of table 3 is very conservative as it includes a control for firm size as measured by the number of employees, which should be highly correlated with firm revenues. These results show that even when controlling for size, reported strategic priorities indeed translate into systematic advantages in market shares for low-cost and high-quality firms.

In terms of profitability, we use log operating margin, defined as the log of operating revenue over operating costs. Operating costs do include overhead costs of operation, so that the operating margin variable captures overall net profits of the firm. As an alternative measure of profitability, we use ROA, defined as ratio of operating income

divided by the book value of assets[3]. Again, we find that business strategy priorities are significantly correlated with profitability, as shown in the second and third columns of table 3. However, in contrast to the market share results, low-cost and high-quality firms exhibit opposite signs. In other words, low-cost firms tend to have systematically lower profitability than firms without strategic priorities, while high-quality firms exhibit higher profitability. These results might be taken as an indication for the following plausible mechanism through which profitability determines business strategy instead of the other way around: low-profit firms might rationally focus on cost cutting, while high-profit firms can "afford" to offer better-quality services.

To explore whether firm-level productivity supports this interpretation, we analyze two popular measures of firm-level total factor productivity (TFP). Both measures are based on the GMM estimator of factor shares developed by Ackerberg, Caves and Frazer (2006) and are calculated at the 4-digit NAICS level. The first measure is simple revenue-based TFP, or TFP-R, which uses revenues as measure of output. For the second measure, we follow Klette and Grilliches (1996) and Hsieh and Klenow (2009) and impose a CES demand system with an elasticity of substitution of 3 to recover real output from revenue. This measure is reported as TFP-Q. The results for these measures of TFP are displayed in columns four and five of table 3. If the reverse causality mechanism drives most of the correlation between strategy and profitability, one would expect that low-cost firms have systematically lower TFP than firms without strategy priorities, while high-quality firms have higher TFP than firms without strategy priorities. In fact, while it is true that high-quality firms have higher TFP, so do low-cost firms.

To summarize, our measures of business strategy priorities are strongly and significantly correlated with current firm performance data, suggesting that the variation in our strategy measures does not just reflect measurement error.

3.4.2 Within-Firm Effects

The previous sections established that our measures of business strategy are significantly correlated with measures of firm performance. It is important to emphasize that these correlations suggest that strategy and performance are related, but these correlations are not causal. Establishing a causal link between business strategy and firm performance is beyond the scope of this study. One can, however, ask whether the strategy-performance correlations are exclusively driven by reverse causality. For instance, we reported that low-cost priorities are systematically correlated with negative profit margins, while high-quality priorities are positively correlated with profits. Reverse causality could occur, for example, if firms which forecast negative profit shocks respond by cutting costs today, while firms which expect positive profit shocks can afford to spend money on improving quality. A simple econometric model illustrates the associated biases. Suppose that the

[3] Note that ROA is not logged, since it is by construction a percentage and can also take negative values.

true model is given by

$$y_{i,t+1} = \theta_A a_{i,t+1} + \theta_S s_{i,t} + \varepsilon_{i,t+1}$$
$$s_{i,t} = \gamma E_{i,t}\left[a_{i,t+1}\right]$$

where $y_{i,t+1}$ denotes profits of firm i in $t+1$, $a_{i,t+1}$ is an unobserved profit shock in $t+1$, $s_{i,t}$ is the firm's strategy set at t, and $\varepsilon_{i,t+1}$ is an error. For simplicity, assume that a firm's current strategy is a function of the firm's expected future profit shock $a_{i,t+1}$. Neither this shock nor the firm's expectation of the shock is observed by the econometrician. For the case that the strategy variable $s_{i,t}$ is a low-cost strategy, $\gamma < 0$, since negative expected productivity will make the adoption of a low-cost strategy more likely. Since the econometrician can only observe outcomes and strategies, the estimated model is

$$y_{i,t+1} = \beta s_{i,t} + u_{i,t+1},$$

with the OLS estimator given by

$$\hat{\beta} = \theta_S + \frac{Cov(s_{i,t}, a_{i,t+1})}{Var[s_{i,t}]}.$$

As this example shows, the simple OLS estimate of performance on strategy might be biased depending on the correlation between strategy and the unobserved profit shock. In the case of $\gamma < 0$, this term will be negative and could potentially explain why the regression coefficients on low-cost strategies are negative in the pooled regressions. Similarly, if $\gamma > 0$ holds for high-quality strategies, this could explain why quality is positively correlated with performance.

In order to gauge whether reverse causality drives all the performance results, we run the following variant of our performance regressions. To control for any cross-sectional differences, and especially potential respondent differences discussed before, we include a full set of establishment fixed effects. Furthermore, to address the reverse causality issue in a simple way, we follow in spirit Petrin and Levinsohn (2003) and include the log-value of intermediates usage, such as materials, electricity, and other intermediate inputs. The logic is that these intermediates are usually acquired in spot markets and are therefore not subject to any adjustment frictions. Consequently, they respond contemporaneously to any unobserved profit shocks $a_{i,t}$ and can therefore be used to control for the effect of these unobserved profit shocks.

Table 4 shows that even in this very conservative specification with firm fixed effects and intermediates usage to control for unobserved shocks, strategy is systematically correlated with firm performance. Note in particular that operating margin as basic measure of profitability remains strongly positively correlated with high-quality strategies and negatively correlated with low-cost strategies. We conclude from this that although reverse causality from expected performance to strategy potentially plays an important role (as it should), the data suggests that it is far from being the only driver of the systematic correlation between strategy and firm performance.

The fixed effects regressions also show that in many specifications, the correlations between strategy and performance become insignificant. We take this as an indication that much of the systematic variation between strategy and performance is driven by the cross-sectional variation. This is a result we would expect if the relationship between strategy and performance is very persistent. Moreover, one would not expect to see frequent changes in strategy, which are typically decided by the business owner or the board of directors, particularly compared to management practices that usually capture business operations decisions.

4 Empirical Relation between Strategy and Comparative Advantages

We now turn to the empirical analysis of firm performance in the context of recent applied models of firm heterogeneity. We split this discussion into two parts. In the first part, we reconsider the correlations of strategic priorities with current performance, this time through the lens of static equilibrium models of firm heterogeneity. In the second part, we document stylized facts centering around business strategy and innovation. These moments will be most interesting for current theories of endogenous growth with incumbent innovation.

4.1 Current Performance and Static Firm Heterogeneity Models

A particularly informative empirical variable to distinguish different models of firm heterogeneity are markups. Since reliable information on markups is hard to obtain, we report two alternative measures of markups. First, we follow Ackerberg et al. (2006) and De Loecker and Warzynski (2012) and estimate markups by taking the ratio of the revenue share of labor to the output-elasticity of labor. As in these studies, the latter elasticity is calculated using the panel dimension of the data and exploiting timing differences between intermediate input and capital usage in a GMM estimation. The second measure of markups are gross margins, calculated as the ratio of operating revenue relative to cost of goods sold (COGS). The COGS variable is directly reported in the GIFI balance sheet data and does not include any overhead costs of operation. The gross margin measure of markups relies less on a specific econometric model but is available only for a subset of the firms in the data. Both markup measures are logged values.

4.1.1 Models of Low-Cost Competition

In principle, firms with low-costs as their strategic priority could target lower marginal costs, lower fixed costs, or a combination of the two goals. Most models of firm heterogeneity aim to describe firm size distributions within narrow industries. As a consequence,

marginal cost differences play a prominent role, since fixed cost differences impact only profitability, not market shares and firm size. The first column of table 3 shows that low-cost firms have systematically larger market shares compared to firms with no strategic priority. This is compatible with models where marginal costs drive differences in prices across firms, such as Melitz (2003), Bernard et al. (2003), Melitz and Ottaviano (2008), and Foster et al. (2008). In these models, more efficient firms exhibit lower marginal costs, which translate into lower prices. This interpretation of the data is tentatively supported by data on firm-level TFP estimates, as displayed in columns four and five of table 3. If one follows Hsieh and Klenow (2009) in their interpretation of TFP-R and TFP-Q, then TFP-Q primarily reflects efficiency differences across firms, while TFP-R captures firm-level "distortions," such as markups or financial frictions. The TFP-Q results therefore indicate that low-cost firms tend to be more efficient, compatible with models such as Melitz (2003).

Although models of cost competition such as Melitz (2003) and Melitz and Ottaviano (2008) have similar implications for prices and therefore market shares, they differ with respect to the predictions about markups. While markups are constant in Melitz (2003), firms with lower marginal costs might optimally charge higher markups, either due to non-constant demand elasticities as in Melitz and Ottaviano (2008) or due to limit pricing as in Bernard et al. (2003). The last two columns of table 3 report the correlations of our two alternative measures of markups with business strategy priorities. There is no evidence for systematically higher markups at low-cost firms using either measure of markups, or even using TFP-R as a measure of firm-level distortions. If anything, the data seems to suggest that markups tend to be lower at low-cost firms, as is evident in the gross margin measure. This possibility is supported by direct measures of profitability, such as operating margin and ROA. As discussed before, low-cost firms tend to be less profitable than firms with no strategic priority. This lower profitability in turn is inconsistent with models of constant or even increasing markups.

One possible way to reconcile our results on market shares, firm efficiency, and profitability with models of low-cost competition would be to have low-cost firms charge lower instead of higher markups. We are currently not aware of any prominent model of firm heterogeneity which pursues this direction, but we see it as a promising avenue for further theory development.

4.1.2 Models of high-quality Competition

Models of quality competition are often constructed to match evidence on differentiated-goods industries, where some firms are able to charge higher prices while exhibiting larger market shares than competitors. Quality is therefore often modeled as a demand-shifter, enabling firms either to sell the same quantity at higher prices or to sell a higher quantity at the same price. In other words, firms pursuing higher quality create more customer value, which is reflected in higher market shares. The evidence reported in table 3 is consistent with such models. High-quality firms exhibit not only higher market shares

than firms without strategic priorities, but also higher market shares than low-cost firms. Furthermore, as was shown by Hsieh and Klenow (2009), measures of TFP-Q reflect not only process efficiency but also product quality, which is consistent with the evidence that TFP-Q is systematically higher for high-quality firms.

Despite sharing a number of common features, models of quality competition differ in their predictions of what drives price differences across competitors. In models such as Johnson (2012) and Kugler and Verhoogen (2012), high-quality firms charge higher prices since their marginal costs are higher, for example due to the use of higher-quality inputs. At the same time, markups across firms with high and low quality are constant. In contrast, in models such as Shaked and Sutton (1982) and Sutton (2012), high-quality firms are able to charge higher markups. The data supports such a quality competition model with endogenous markups: markups tend to be systematically higher at high-quality firms, as shown in the last two columns of table 3. The evidence of higher markups in our two alternative markup measures is supported by our measures of TFP-R and profitability. As Hsieh and Klenow (2009) and Peters (2012) note, markup differences can show up in TFP-R differences. Furthermore, measures of profitability such as operating margin and ROA are significantly higher at high-quality firms than at any other type of firm. This is compatible with the fact that high-quality firms exhibit both higher market shares and higher markups. In this context, we note that in models of quality competition, not all firms pursue a high-quality strategy due to the fact that high-quality also implies higher fixed costs. Our evidence on higher market shares and markups for high-quality firms can therefore be generated by equilibrium models, where firms trade off higher quality with higher fixed costs, such as in Sutton (2012). It is therefore also consistent with heterogeneous firm models in which fixed costs increase with the level of technology, such as in Bollard, Klenow and Li (2014).

4.2 Innovation and Endogenous Growth Models

We use self-reported measures of innovation and technology adoption from the WES. We validate these innovation measures in Hong, Kueng and Yang (2014b), by showing that the measures of innovation are significantly correlated with firm growth and that innovation by other firms in the industry significantly depresses growth at non-innovating firms.

Table 3 shows that the adoption of a novelty strategy is not systematically positively correlated with current measures of firm performance. Yet, as shown in table 2, a significant number of firms still adopt novelty as a strategic priority. An obvious explanation for the absence of any significant correlation of novelty strategy and current firm performance is that developing new products and services generates innovations, which imply higher future instead of current profits.

We therefore move to the analysis of the correlation of strategic priorities and four types of innovation: (i) new products or services, (ii) new business processes, (iii) improved products or services, and (iv) improved business services. The advantage of our

innovation data is that it allows us to roughly differentiate between incremental and radical innovations, as has been highlighted by endogenous growth models such as Klette and Kortum (2004), Akcigit and Kerr (2010), and Acemoglu et al. (2014). A subset of these theories—namely the studies by Klette and Kortum (2004) and Acemoglu et al. (2014)—highlight differences in innovation abilities across firms, to generate different degrees of radical innovations. The key difference is that in the model of Akcigit and Kerr (2010), firm size is the main driver behind a firm's pursuit of radical, exploratory innovations, since large firms run into diminishing returns that increase the incentive to focus on incremental, exploitative innovations. In contrast, in the models of Klette and Kortum (2004) and Acemoglu et al. (2014), there is an additional factor that determines the comparative advantage of radical innovations. In other words, in these models, there is an additional determinant of the innovativeness of firms, even controlling for firm size. We argue that business strategy mirrors this additional "innovation ability" factor in the data.

Table 5 reports our baseline innovation results. For each type of innovation, the dependent variable is a dummy that is 1 if an innovation is reported. We estimate the regressions with probit models, but results are very similar when using logits or linear probability models[4].

There are main results from the innovation regressions. First, firms with any type of business strategy priority are systematically more likely to innovate than firms without any strategic priority, in particular novelty and high-quality firms. This follows from the fact that all strategy measures are significantly positive in at least one of the four types of innovation, even after including firm size and age as the most important control variables as suggested by theory.

Second, across all specifications, novelty is most strongly correlated with innovation, and firms with a high-quality strategy are also significantly more likely to innovate across all four types of innovations than firms without strategic priorities. To establish whether one can rank the extent of the correlation of different strategies with innovation, we report Wald-tests of the equality of the coefficients in the bottom rows. Novelty is by far the strongest strategy predictor for the innovation of new products and processes. In contrast, the Wald test cannot reject the hypothesis that the regression coefficients on novelty and high-quality strategies are the same for improvements in products or services and for improvements in business processes. Hence, firms that rank novelty as their top strategic priority systematically innovate more than firms with high product quality as a priority, especially with respect to the development of new products or services and business processes. In this sense, firms with a novelty strategy correspond to firms with high innovation ability in models of Klette and Kortum (2004) and Acemoglu et al. (2014). Note also that firms with low-cost strategies typically do not innovate more than firms without strategic priorities, except in the area of improvement of business processes.

A closely related issue to innovation is the adoption of existing technologies. The

[4] The innovation regressions control for a host of other potential determinants of innovation, such as spending on technology adoption described below, the percentage of workers with a college degree, and a number of organizational measures.

WES provides extensive information on both the number of new technologies adopted as well as expenditures on technology adoption. Which we use this information to derive two measures of technology adoption. First, an indicator for whether a firm reported adopting at least one new technology in the past year. Second, a measure of intensity of technology spending, defined as expenditure on new technology in the past year as a fraction of annual revenues. The results are reported in the last two columns of table 5. Firms with a high-quality strategy are as likely to adopt a new technology as firms pursuing a novelty strategy. However, novelty firms systematically spend more on technology adoption than high-quality firms. Furthermore, firms following a low-cost strategy systematically spend less on technology adoption, as the last column shows.

5 Strategy, Management Practices and Organizational Design

The WES panel also provides comprehensive data on management practices and organizational design, similar in scope to, but different in focus from, the World Management Survey by Bloom and Van Reenen (2007). Bloom and Van Reenen (2007) aggregate the information in the World Management Survey into a single score of "good management" in order to characterize both differences in levels and cross-firm dispersions distributional in management practices across countries. There are at least two good reasons why Bloom and Van Reenen (2007) aggregate their measured management practices into an overall score. First, nearly all of their questions focus on areas where a ranking in terms of benchmark management practices can be established. In other words, these questions can be ranked such that higher scores capture "better management," and their "double blind" survey protocol ensures accurate measurement. Second, many benchmark management practices in the World Management Survey are strongly correlated so that the consolidation into a single overall score captures at least the dominant underlying factor of "good management."

In our analysis of management practices and internal organization, we deviate from the strategy in Bloom and Van Reenen (2007) and do not aggregate management practices into a single overall score. The main reason is that many of the management practices and organizational choices we analyze often cannot be ranked according to which practices reflect "better management." What is more, our measures of management practices are much less strongly correlated. Therefore, instead of aggregating our results into a single management score, we report results for three broad categories of a firm's organizational design and management practices.

Our empirical approach is motivated by the two key organizational trade-offs highlighted in Roberts and Saloner (2013). First, firms are trading off employee initiative against employee coordination. We are interested in the degree to which firms allow their employees discretion and encourage them to make decisions based on decentral information, rather than explicitly controlling and coordinating decisions. For this purpose, we

start out with an analysis of organizational design practices which focus on the allocation of decision authority within the organization as well as special job design features for non-managerial employees, such the use of problem-solving teams. Second, firms are trading off the exploration of new business opportunities against the exploitation of existing sources of rent, as in March (1991). A firm's decisions about employee compensation and hiring is an area of management which is strongly affected by this trade-off. First, compensation policies are not only important to encourage employee initiative, but are also crucial for inducing exploratory activities, which can be beneficial for long-run performance. As Holmstrom and Milgrom (1991) show in the context of a principal-agent analysis with multitasking, high-powered incentives that mainly focus on current performance can be detrimental to long-run productivity. As a result, the design of performance pay systems is at the heart of the exploration-exploitation trade-off. Second, a firm's relative priorities for employee initiative and exploration of new business areas are reflected in the intensity with which internal resources are allocated towards hiring and training scientists who explore new business ideas. We therefore also analyze the occupational composition as well as job-training programs used by firms with different strategic priorities. At the end of this empirical analysis, we supplement our results in these broad areas with information about the operation of firms and the likelihood of specific organizational changes.

5.1 Decision Authority and Non-Management Job Design

5.1.1 Decision Authority and Decision Layers

The measurement of decentralization requires a credible approach to quantifying decision authority by organizational layer.[5] To understand the potential measurement issues involved, take for example measures of formal decision authority based on occupational titles or organizational charts. As indicated by Aghion and Tirole (1997), managers higher up the hierarchy often only "rubberstamp" decisions actually made by non-managerial employees. Therefore, an increased range of formal responsibilities and reporting relations can imply either increased control or alternatively an even more limited attention to certain decisions and thus and a de facto *reduction* in control.

In contrast to measures based on organizational charts, the WES includes detailed information regarding real decisions on 12 tasks across five layers in the organizational hierarchy. The survey questions are similar to the ones designed to measure worker autonomy, such as those used by Bresnahan, Brynjolfsson and Hitt (2002) or Bloom, Garicano, Sadun and Van Reenen (2013b), in that they allow us to measure the degree to which principals or agents are making decisions across 12 potential *tasks*. Specifically, the survey asks "Who normally makes decisions with respect to the following activities?" The respondent is then given a choice of 12 possible activities ranging from "daily planning of individual work" or "quality control" to "product and service development." There are five possible responses to the question of who makes decisions, which we call organizational *layers*: (i)

[5] This section draws heavily on Hong, Kueng and Yang (2014a).

non-managerial employees, (iii) work supervisors, (iv) senior managers, (v) individuals or groups outside the workplace—typically headquarters for multi-establishment firms, and (vi) business owners[6].

A particular advantage of the WES survey format is that it allows us to clearly separate principals from agents. Principals are defined as residual claimants of profit flows from the firm. In particular, since most firms are single-establishment entities, the separation between professional senior managers and business owners is important for identifying principals. Furthermore, for multi-unit firms, decision-makers outside the establishment are typically headquarters, so that we identify the principal with the headquarters in such cases. On the other hand, agents are defined as any type of employee, including managers and non-managerial employees.

Since the data on the allocation of tasks to organizational layers is multi-dimensional, we use three functions that map to the real line, each providing different information about the decentralization of real decision authority. For the precise definition of our three measures of the degree of decentralization, let us begin by defining the following sets: $D^{\texttt{Principal}}$ is the set of activities or tasks that principals are involved in, $D^{\texttt{Manager}}$ the set of activities that management is involved in, $D^{\texttt{NonManager}}$ the set of tasks that non-managerial employees are involved in, and $D^{\texttt{Agent}} = D^{\texttt{Manager}} \cup D^{\texttt{NonManager}}$ the set of tasks that agents—that is, managerial or non-managerial employees—are involved in. Our three measures of the allocation of decision control within the firm are then defined as follows:[7]

$$\begin{aligned}
\texttt{Control}_{it}^{\texttt{Principal}} &= \sum_{d=1}^{12} 1\{d \in D_{it}^{\texttt{Principal}} \backslash D_{it}^{\texttt{Agent}}\} \\
&= \sum_{d=1}^{12} 1\{d \in D_{it}^{\texttt{Principal}} \backslash (D_{it}^{\texttt{Manager}} \cup D_{it}^{\texttt{NonManager}})\}, \\
\texttt{Control}_{it}^{\texttt{Manager}} &= \sum_{d=1}^{12} 1\{d \in D_{it}^{\texttt{Manager}} \backslash (D_{it}^{\texttt{Principal}} \cup D_{it}^{\texttt{NonManager}})\}, \text{ and} \\
\texttt{Control}_{it}^{\texttt{NonManager}} &= \sum_{d=1}^{12} 1\{d \in D_{it}^{\texttt{NonManager}} \backslash (D_{it}^{\texttt{Principal}} \cup D_{it}^{\texttt{Manager}})\}.
\end{aligned}$$

The indicator function $1\{d \in X\}$ equals 1 if condition X is satisfied by d. $\texttt{Control}_{it}^{\texttt{Principal}}$ counts the number of tasks that are exclusively carried out by the principal—i.e., business owner or headquarters—and is thus a measure of *centralization* of real decision authority. In contrast, the measures $\texttt{Control}_{it}^{\texttt{Manager}}$ and $\texttt{Control}_{it}^{\texttt{NonManager}}$ count the number of

[6] In principle there is a sixth layer, the "work group" which we ignore since it is unclear whether to assign it to principals or agents.

[7] We also analyzed the aggregate measure of tasks exclusively carried out by agents, $\sum_{d=1}^{12} 1\{d \in D_{it}^{\texttt{Agent}} \backslash D_{it}^{\texttt{Principal}}\}$. The results were similar to $\texttt{Control}_{it}^{\texttt{Principal}}$, but with opposite sign, hence we do not report it here separately. Moreover, since in the data the concept of the "agent" is much more ambiguous than that of the "principal," we focus on the two disaggregated agent measures of managers and non-managers.

tasks exclusively allocated to agents, either managers (i.e., worker supervisors and senior management) or non-managers (i.e., non-managerial employees), respectively. Hence, the latter two variables measure the degree of *decentralization* of control.

The survey allows tasks to be decided by multiple layers. For the sake of completeness, we also report two types of shared decision structures: (i) the number of joint decisions taken by both principals and managerial employees, and (ii) the number of joint decisions taken by managerial and non-managerial employees,

$$\texttt{shared}^{\texttt{P\&M}} = \sum_{d=1}^{12} 1\{d \in D_{it}^{\texttt{Principal}} \cup D_{it}^{\texttt{Manager}}\} \text{ and}$$

$$\texttt{shared}^{\texttt{M\&N}} = \sum_{d=1}^{12} 1\{d \in D_{it}^{\texttt{Manager}} \cup D_{it}^{\texttt{NonManager}}\}.$$

These joint decision structures can be thought of as capturing, for instance, what Gibbons, Matouschek and Roberts (2013) call "decentralization with coordinated control," where a higher-ranked employee leaves lower-ranked employees some discretionary space to make optimal decisions; see also Alonso and Matouschek (2008).

In addition to these five measures of the allocation of decision tasks across layers in the organization, we also construct a measure of the overall number of decision layers present in the organization. In this context, we are motivated by models of the endogenous formation of hierarchical layers as a response to the optimal division of labor among employees of different problem-solving skills; see Garicano (2000) and Garicano and Van Zandt (2013). In these models, a higher number of organizational layers is indicative of a larger degree of gains of specialization from the division of labor among employees. We construct this measure in the following manner: for each possible decision layer, we check whether the firm has assigned any of the 12 decision tasks to this layer. If it has done so, we infer that this layer exists; otherwise, we presume that the firm does not use this layer in decision-making problems and hence we ignore it.

Table 6 reports the results of regressing these measures of decision authority and decision layers on our measures of business strategy priorities and a set of controls, including industry and year fixed effects. Both novelty and high-quality strategies share a systematic tendency to having more decision layers. Additionally, the Wald tests show that firms with high-quality strategies exhibit the highest number of decision layers. What does the distribution of decision tasks tell us about firms' trade-offs between employee initiative and coordination? Here, the clearest contrast can be drawn between low-cost and high-quality strategies. Firms with low-cost strategies tend to concentrate decision control at the level of professional management. Although this is in principle a form of decentralization, since it is not the business owner or the headquarters who makes most of the decisions, it does speak to the need to coordinate employees from a relatively high rank in the organizational hierarchy. In contrast, firms pursuing a high-quality strategy not only tend to decentralize decisions from principals to employees; they also actively promote joint decision-making by both principals and managerial employees as well as by

managerial and non-managerial employees. That is, there seems to be a greater emphasis on employee initiative in high-quality firms compared to low-cost firms.

5.1.2 Non-Management Job Design

Our baseline measures of real decision authority provide a useful starting point to evaluate the degree to which firms with different strategies focus on employee initiative vs. coordination. Yet, they also provide a somewhat incomplete picture of organizational design choices that firms might pursue to encourage employee initiative, for at least two reasons. First, firms might be able to benefit from employee information through other means than employees making decisions within the organizational hierarchy. One example would be communication of ideas by employees. A second way firms might benefit from employee initiative is by using problem-solving teams in which employees make important decisions, but which operate outside of standard organizational hierarchies.

Fortunately, the WES includes a number of survey questions that attempt to provide broader coverage of these issues. Specifically, the WES survey asks: "For non-managerial employees, which of the following practices exist on a formal basis in your workplace?" Among the possible responses are:

- Employee suggestion programs
- Flexible job design, which includes "job rotation, job redesign (broadened job definitions), job enrichment (increased skills, variety or autonomy of work)."
- Information sharing with employees, which is defined as informing employees about the "firm's performance, colleagues' wages, technological or organizational changes. This implies that employees can provide feedback on policies."
- Problem-solving teams, which are defined as teams that are "limited to specific areas such as quality or work flow."
- Joint labor-management committees, which are defined as "task teams that generally cover a broad range of issues, yet tend to be consultative in nature."

These special non-managerial work practices provide additional margins along which firms can benefit from non-managerial employee initiative by either eliciting information or giving non-managerial employees the opportunity to participate through problem-solving teams.

Table 7 reports the results of regressing the adoption of these special non-managerial work practices on measures of strategic priorities using a probit model. Although novelty firms do not systematically decentralize decisions to non-managerial employees within the organizational hierarchy, as shown in table 6, they do tend to use nearly all types of special work practices to encourage non-managerial employee initiative. Especially notable is the use of problem-solving teams, which novelty firms are most likely to adopt, compared

to either high-quality or low-cost firms. In contrast, low-cost firms are systematically less likely to use problem-solving teams. This result is compatible with the view that low-cost firms emphasize employee coordination much more than employee initiative, especially for non-managerial employees. It is also consistent with the previous results on the concentration of control on the managerial level. Furthermore, both implementation of employee suggestion programs and information-sharing practices in novelty firms point toward the importance of inspiring employees to acquire and communicate information.

5.2 Employee Compensation and Skills

5.2.1 Performance Pay

Our data includes detailed information on the adoption of different types of performance pay, by occupation. There are five different types of performance pay:

- Individual incentive systems: "such as bonuses, piece-rate and commissions are systems that reward individuals on the basis of individual output or performance."
- Group incentive systems: "such as productivity/quality gain-sharing systems are systems that reward individuals on the basis of group output or performance."
- Profit sharing systems: "any plan, by which employees receive a share of the profits from the workplace."
- Merit pay or skill-based pay: "a reward or honor given for superior qualities, great abilities or expertise that come from training, practice, etc."
- Employee stock plans: "employee stock purchase plans, ownership plans or stock options."

Although the data provides information on the adoption of all of these types of performance pay systems by occupation, most firms do not differentiate performance pay options by occupation, conditional on adopting a specific compensation practice.

Table 8 shows the baseline results of regressing the adoption of performance pay systems on our measures of business strategy. Reassuringly, both novelty and high-quality firms make extensive use of performance pay systems. This is compatible with the earlier evidence of the importance of employee initiative for novelty and high-quality firms. Note that, in this context, low-cost firms do not seem to make use of any type of performance pay system, which is consistent with the interpretation that low-cost strategies are associated with more employee coordination and control instead of employee initiative.

Regarding the trade-off of exploration and exploitation, it should be highlighted that only novelty firms systematically adopt stock compensation programs for employees. This evidence could reflect the notion that novelty firms use these stock compensation programs to balance other more short-run performance pay programs as would be predicted by multitasking principal-agent models such as Holmstrom and Milgrom (1991). A closely related

argument has been developed by Manso (2011), who shows that stock compensation can be a key component in motivating the exploration of uncertain ideas.

5.2.2 Occupational Composition and Job Training

We now turn to the question of whether a firm's priorities over employee initiative vs. coordination and exploration vs. exploitation are also reflected in the skill level of its employees. In this context, there are two related dimensions. First, we look at the occupational composition of a firm's workforce using the fraction of employees in a certain occupational category as the dependent variable. To account for the fact that firms can have zero employees in an occupational category, we estimate Tobit models. Table 9 reports results for five different types of broad occupational categories: (i) managers, (ii) production workers, (iii) professionals, (iv) administrative staff, and (v) sales workers. The WES defines professionals as workers with a college degree. The results show that novelty firms systematically hire more professionals than firms with no strategic priority. This result could reflect the novelty firms' need to hire scientists who then explore new product and service opportunities and innovate. The Wald tests indeed show that the coefficient on novelty is significantly larger than the coefficient on high-quality strategies. Hence, although high-quality firms are active in all types of innovations, they do systematically hire fewer skilled workers than novelty firms. This supports the notion that in their pursuit of new products and processes, novelty firms allocate an over-proportional amount of their resources to exploration rather than exploitation.

Second, we analyze job-training programs to get a sense for what types of human capital accumulation firms with different strategies encourage. We focus in particular on the adoption of six types of job training programs: (i) orientation for new employees, (ii) managerial training, (iii) professionals training, (iv) sales worker training, (v) group decision training, and (vi) leadership training. Table 10 reports probit regressions of an indicator of the adoption of these programs on our measures of business strategy. A result that stands out is that only novelty firms are systematically more likely to adopt training programs for professionals than firms without strategic priorities. There are two additional results that help to contrast business strategies. First, both novelty and high-quality firms are likely to adopt group decision and leadership training programs. This might be driven by the need to facilitate joint decision-making and teamwork, since both types of strategies rely more on employee initiative than on direct managerial coordination and control. Second, both low-cost and high-quality firms systematically invest in employee orientation. In contrast to professionals training, orientation training is much more short-run in nature. Its emphasis is therefore much more focused on current performance than on long-run exploration.

5.3 Operations and Organizational Change

5.3.1 Operations

To broaden our overview of management practices beyond the specific features of organizational design discussed so far, we turn to the way firms run their operations. Data on operations is also based on the business strategy section of the WES, but it does not refer to the product market orientation of the firm. We provide evidence on six factors which are informative regarding firms' operating decisions. Specifically, firms rate the importance of the following factors on a scale from 1 to 5:

1. reorganization of the work process,
2. improving coordination with customers and suppliers, i.e., the value chain,
3. enhancing labor-management cooperation,
4. increasing employees' involvement or participation,
5. improving measures of performance, and
6. improving employee skills.

In order to avoid the issues of interpreting the cardinality of the Likert scores, we use ordered probits to estimate the correlation between these factors and our measures of strategic priorities. Table 11 shows that both novelty and high-quality strategies are strongly correlated with an emphasis on employee involvement and participation. This is compatible with both strategies putting a large weight on employee initiative. But the results on operations also show where high-quality and novelty strategies diverge. Notice especially that high-quality firms place special emphasis on improving measures of performance, while novelty firms have no such emphasis. In contrast, both high-quality and low-cost strategies put emphasis on improving current measures of performance in their overall operations. What is more, both of these strategies are likely to put a high priority on improving coordination among firms along their value chain. These results therefore support the notion that both quality and cost strategies are much more oriented toward exploitation of current rent sources than on the exploration of new business opportunities.

5.3.2 Organizational Change

We finish our analysis of the cross-sectional relation of strategy and the management of firms by reporting empirical results on organizational change. This analysis serves two important purposes. First, it reinforces some results we obtained in our prior analysis on strategy and organizational design. Second, it is an important starting point for the subsequent analysis of strategic change.

The WES provides information on 14 different types of organizational changes and a residual category for "other organizational changes." We focus here on the seven categories of organizational changes that reveal information on how firms with different strategies

tend either to restructure internal business processes or pursue changes in firm boundaries. Specifically, the seven organizational changes we analyze are:

1. functional integration: "Greater integration among different functional areas,"
2. delayering: "Reduction in the number of managerial levels,"
3. downsizing: "reducing the number of employees on payroll to reduce expenses, it is part of a reorganization in the workplace and not simply a response to a drop in demand,"
4. re-engineering: "redesigning processes to improve performance and cost,"
5. job rotation: "greater reliance on job rotation, multi-skilling,"
6. outsourcing: "greater reliance on external suppliers of products or services," and
7. inter-firm R&D: "greater inter-firm collaboration in R&D, production or marketing."

Results in table 12 indicate that when analyzing organizational changes, the biggest differences among business strategies relate to delayering and downsizing. Both of these organizational changes are pursued exclusively by firms with low-cost as top strategic priority. The results on downsizing provide another confirmation that our low-cost strategy measure indeed captures firms that pursue a low-cost strategy. Furthermore, the result that low-cost firms are more likely to pursue delayering of managerial hierarchies is compatible with the view that these firms use professional management to directly coordinate employees rather than implementing widespread division of labor between management and non-management. In this sense, the evidence is consistent with the view that low-cost firms emphasize employee coordination more than either high-quality or novelty firms.

Another notable result that emerges from table 12 is that both novelty and high-quality firms are very active in cooperating across firm boundaries. They are both systematically more likely to pursue both more outsourcing and more inter-firm cooperation in R&D than firms without any strategic priorities. It should also be noted that novelty firms are far more likely to adopt inter-firm R&D cooperation than high-quality firms, while both of those types of strategies are about equally likely to pursue outsourcing. This result might be expected if exploration is more important for novelty firms than for high-quality firms, while outsourcing is important to improve current performance.

5.4 Summary

In this section, we offer a unifying interpretation of our results on business strategy and performance as well as our results on strategy and the management of firms. We caution the reader that none of the results in this paper are causal. For instance, the fact that certain management practices and business strategies are correlated could be driven

by the fact that there exist a complementarity between some management practices and specific strategies, or it could mean that an unobservable factor, like CEO style, might determine both management practice and strategic priority. This identification issue, however, does not diminish the value of the stylized facts we provide, as they can be interpreted as capturing different managerial styles.

An organizing framework of our results is summarized in figure 1, which displays the two key organizational trade-offs along which we framed the discussion of our empirical results: first, the trade-off between employee initiative and coordination, and second, the trade-off between exploration and exploitation. Firms with different priorities in business strategies seem to emphasize different ends of these two trade-offs. The majority of empirical results indicate that firms pursing novelty as top strategic priority focus on employee initiative and the exploration of new business opportunities. Novelty firms make extensive use of special non-management work practices such as problem-solving teams, employee suggestion programs, and employee information-sharing programs to benefit from employee initiative. At the same time, while novelty firms do not exhibit systematically better current performance than firms without strategic priorities, they do innovate far more than any other type of firm. This points towards a greater importance of exploration of new business opportunities rather than the exploitation of existing rent sources. Compatible with this view is the fact that only novelty firms provide stock compensation, which can potentially be used to reward long-run rather than just short-run performance.

In contrast, firms that report providing high-quality products or services as their top strategic priority seem to place a much greater emphasis on current performance, as shown throughout section 4. This is also reflected in the strong correlation of those high-quality firms with measures of current profitability such as market share, markups, and profits, documented in section 3. Although high-quality firms are also active in innovation, they are far less invested in generating new products or services and processes as opposed to improved products and processes. Both of these results indicate that quality firms focus more on the exploitation of existing rent sources than on the exploration of future business opportunities. However, high-quality firms share with novelty firms an emphasis on the importance of employee initiative. High-quality firms use a wide range of performance pay systems to reward employee initiative and structure decision authority within the standard organizational hierarchy to include even non-managerial employees in decision processes. Firms with high quality as top strategic priority are therefore associated with management practices that emphasize both employee initiative and exploitation of current profit options.

Firms with low-cost strategies differ from both novelty and high-quality firms in that they mostly do not emphasize initiative by non-managerial employees. As reported in section 4, these firms tend to concentrate decision control at the level of managerial employees and are systematically less likely to use problem-solving teams than any other firm type. Additionally, low-cost firms do not use any type of performance pay, nor do they invest in job training programs beyond initial employee orientation. Low-cost firms

therefore seem to place a much larger emphasis on the coordination of non-managerial employees via managers. On the other hand, low-cost firms do place emphasis on current performance targets. This is consistent with evidence in section 3 that low-cost firms also have systematically higher market shares and TFP-Q than firms without any strategic priority. To summarize, low-cost firms can be characterized as exhibiting a combination of management practices that emphasize employee coordination and exploitation of current profit sources.

6 Conclusion

While neglected for a long time by economists, we argue that the analysis of business strategy is an important area of research for analyzing the sources of performance differences across firms and their implications for aggregate productivity. We see three particularly promising areas for ongoing and future research.

First, our empirical results highlight the need for new heterogeneous-firm models with an endogenous choice of business strategies, where low-cost, high-quality, and novelty firms compete in the same product market. Yang (2014) develops such a model and traces out its implications for reallocation and aggregate productivity. Alternative novel theoretical frontiers suggested by our research are new models of endogenous innovation combining business strategy choice with the adoption of managerial practices. These models could, for instance, combine organizational exploration vs. exploitation trade-offs as in Manso (2011) with endogenous growth models such as Klette and Kortum (2004) or Acemoglu, Akcigit, Bloom, Kerr and Van Reenen (2013).

Second, the analysis of types of competition differing by business strategy is a matter of growing interest for the literature in international trade. This idea is best exemplified by Bloom, Draca and Van Reenen (2012), who analyze the impact of an exogenous shift in low-cost competition from China on innovative activities of European firms. The related theoretical model in Bloom, Romer, Terry and Van Reenen (2014b) offers an explanation of these results based on the idea that labor is stuck in firms hit by low-cost competition, so firms internally reallocate their workers to R&D. A complementary channel would be that firms with low-cost strategies switch to either novelty or quality strategies to avoid competing with the factor price advantages of Chinese competitors. In Kueng, Li and Yang (2014), we empirically explore this idea with data on business strategies of Canadian firms during the aftermath of China's entry into the WTO.

Third, further empirical work is needed to separate the role of unobserved "managerial style" from complementarity between strategy and organizational design. Such empirical work could show whether the patterns we document represent potentially transferable, disembodied knowledge, or whether they require managers with certain abilities to successfully implement strategies.

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Table 2: Strategy across Sectors

				persistent priorities		
Top priority bus. strategy:	I(`novelty`)	I(`low-cost`)	I(`high-qual`)	I(`novelty`)	I(`low-cost`)	I(`high-qual`)
Sectors:						
Manufacturing	0.3343	0.6233	0.6710	0.1327	0.3286	0.4208
Wholesale trade	0.2832	0.6146	0.6420	0.0513	0.2522	0.3249
Retail trade	0.1848	0.5206	0.6621	0.0286	0.2090	0.4557
Finance and insurance	0.2508	0.4137	0.8203	0.0669	0.1313	0.6061
Business services	0.2185	0.3691	0.6739	0.0302	0.1131	0.3459
Construction	0.1785	0.5326	0.7125	0.0424	0.2945	0.3538
Transport and wareh.	0.0979	0.4878	0.5761	0.0000	0.2166	0.3031
All sectors	0.2360	0.500	0.6900	0.0352	0.2039	0.3539

Notes: The first three columns report uncorrected strategic priority measures. The last three columns report the fraction of firms that have same strategic priority over at least two years and are therefore called "persistent priorities;" see text for details. Summary statistics use sampling weights.

Table 3: Strategy and Performance

Dependent var.:	market share	operating margin	ROA	TFP-R	TFP-Q	markup	gross margin
Strategy priority:							
I(`novelty`)	0.012	-0.005	-0.024**	0.019	0.064	-0.001	0.025
	(0.021)	(0.016)	(0.011)	(0.020)	(0.080)	(0.017)	(0.032)
I(`low-cost`)	0.046**	-0.021**	-0.026**	0.042	0.172**	0.026	-0.049**
	(0.020)	(0.010)	(0.010)	(0.026)	(0.087)	(0.019)	(0.019)
I(`high-qual.`)	0.101***	0.038***	0.023***	0.099**	0.357***	0.082***	0.034*
	(0.025)	(0.014)	(0.009)	(0.041)	(0.109)	(0.026)	(0.020)
Firm characteristics:							
I(multi-unit)	0.153*	0.078***	0.016	-0.379**	1.428***	0.245**	-0.032
	(0.078)	(0.029)	(0.013)	(0.172)	(0.386)	(0.103)	(0.054)
log(age)	0.081***	0.020	-0.005	-0.027*	0.374***	0.012	0.002
	(0.018)	(0.013)	(0.006)	(0.016)	(0.063)	(0.018)	(0.017)
I(exporter)	0.139***	-0.017	0.001	0.088	0.819***	0.126**	0.017
	(0.037)	(0.023)	(0.012)	(0.062)	(0.211)	(0.050)	(0.031)
log(employ.)	1.084***	-0.027***	0.012**	0.089	0.572***	-0.165***	-0.039**
	(0.027)	(0.010)	(0.005)	(0.059)	(0.132)	(0.026)	(0.017)
Wald tests:							
novel = l-cost	1.58	0.83	0.01	0.49	0.72	1.01	4.87
novel = h-qual	6.17	4.88	9.54	3.81	4.52	9.49	0.05
l-cost = h-qual	3.04	14.47	12.81	1.88	2.46	3.07	6.79
joint all zero	7.33	5.1	6.29	2.36	4.34	3.98	3.02
N	22,135	22,135	18,770	16,880	16,880	22,046	12,199

Notes: Industry fixed effects are at the 4-digit NAICS level. Additional controls, not reported are measures of perceived competition from local, Canadian, US and other international competition. Standard errors are clustered by sampling strata, which are broad industry-size-region categories. All regressions use sampling weights.

Table 4: Strategy and Performance: Within-Firm Effects

Dependent var.:	markup	gross margin	operating margin	market share	ROA	TFP-R	TFP-Q
Strategy priority:							
I(`novelty`)	-0.014	-0.001	-0.013	0.007	-0.013	-0.017	-0.024
	(0.018)	(0.019)	(0.013)	(0.021)	(0.013)	(0.026)	(0.074)
I(`high-qual.`)	0.033*	0.005	0.039***	0.032	0.011	0.049*	0.170**
	(0.017)	(0.011)	(0.012)	(0.021)	(0.013)	(0.026)	(0.080)
I(`low-cost`)	-0.025**	-0.003	-0.035***	-0.031	0.006	-0.039**	-0.115*
	(0.012)	(0.012)	(0.011)	(0.020)	(0.008)	(0.017)	(0.065)
Intermediates usage:							
log(intermediates)	0.175***	-0.049**	0.118***	0.383***	-0.014	0.172***	0.660***
	(0.024)	(0.019)	(0.018)	(0.032)	(0.011)	(0.028)	(0.087)
Firm characteristics:							
I(multi-unit)	-0.125	-0.017	-0.025	-0.078	-0.063	-0.109	-0.072
	(0.186)	(0.032)	(0.068)	(0.168)	(0.047)	(0.199)	(0.480)
log(age)	-0.013	-0.024	0.045	0.044	-0.051*	-0.008	0.204
	(0.052)	(0.028)	(0.046)	(0.045)	(0.027)	(0.058)	(0.155)
I(exporter)	0.062	0.032	-0.012	0.041	0.012	0.030	0.106
	(0.049)	(0.045)	(0.024)	(0.040)	(0.022)	(0.045)	(0.133)
log(employ.)	-0.387***	0.011	-0.110**	0.370***	0.034	-0.256***	0.765***
	(0.060)	(0.033)	(0.046)	(0.069)	(0.027)	(0.070)	(0.172)
Industry FE	YES	YES	YES	YES	YES	YES	YES
N	22,018	12,178	22,018	22,018	18,688	16,972	16,972

Notes: Industry fixed effects are at the 4-digit NAICS level. Standard errors are clustered by sampling strata, which are broad industry-size-region categories. All regressions use sampling weights.

Table 5: Strategy and Innovation

	I(new)		I(improved)		technology	
Dependent var.:	products	processes	products	processes	I(adoption)	intensity
Strategy priority:						
I(`novelty`)	0.476***	0.423***	0.372***	0.350***	0.1501***	0.4536***
	(0.054)	(0.051)	(0.051)	(0.051)	(0.0457)	(0.0382)
I(`low-cost`)	0.046	0.051	0.044	0.100**	-0.0616	-0.251***
	(0.055)	(0.051)	(0.050)	(0.050)	(0.0491)	(0.0746)
I(`high-qual.`)	0.202***	0.260***	0.242***	0.258***	0.1491***	0.363***
	(0.053)	(0.055)	(0.050)	(0.055)	(0.0361)	(0.0682)
Firm characteristics:						
log(employ.)	0.045	0.034	0.057	0.041	0.1914***	0.5008***
	(0.039)	(0.040)	(0.038)	(0.038)	(0.0235)	(0.0289)
log(age)	-0.053*	-0.071**	-0.055**	-0.064**	-0.0688***	-0.1724***
	(0.029)	(0.029)	(0.027)	(0.029)	(0.024)	(0.0358)
I(multi-unit)	0.051	0.015	-0.146	-0.037	0.0147	0.3728***
	(0.100)	(0.098)	(0.108)	(0.106)	(0.0717)	(0.0316)
I(exporter)	0.095	0.126**	0.159**	0.131**	0.018	-0.096
	(0.067)	(0.058)	(0.062)	(0.056)	(0.0532)	(0.0598)
Tech. intensity	3.187***	6.445***	5.118***	5.739***		
	(1.024)	(0.971)	(1.104)	(0.994)		
Frac. high-skill	0.017	-0.066	0.002	0.091		
	(0.115)	(0.121)	(0.113)	(0.132)		
Wald tests:						
novel = l-cost	28.16	27.24	20.86	12.72	9.79	282.25
novel = h-qual	13.52	4.55	3.29	1.42	0.00	7.43
l-cost = h-qual	3.92	8.32	7.6	4.64	9.33	234.5
joint all zero	31.51	31.54	26.17	25.71	19.63	1110
Industry FE	YES	YES	YES	YES	YES	YES
N	22,064	22,034	22,061	22,040	22,285	22,135

Notes: Additional unreported control variables are task scope, measures of centralization, indicator variable for individual, group, and profit sharing incentive systems adoption. Industry fixed effects are at the 4-digit NAICS level. Technology intesity is expenditure on new technology in the past year as a fraction of annual revenues. Standard errors are clustered by sampling strata, which are broad industry-size-region categories. All regressions use sampling weights.

Table 6: Strategy and Real Decision Authority

Dependent var.:	# of dec. layers	# of tasks controlled by principal	manager	non-mgr	shared task P&M	M&N
Strategy priority:						
I(`novelty`)	0.1023**	-0.0304	0.0617	-0.0116	0.0565	-0.0333
	(0.0446)	(0.061)	(0.0616)	(0.0668)	(0.0684)	(0.0752)
I(`low-cost`)	-0.0152	-0.0097	0.211***	-0.1024*	-0.0705	0.0376
	(0.0327)	(0.0541)	(0.0598)	(0.058)	(0.057)	(0.0614)
I(`high-qual.`)	0.2166***	-0.2396***	0.0613	0.0119	0.2647***	0.1907***
	(0.037)	(0.0594)	(0.0713)	(0.062)	(0.0621)	(0.0677)
Firm characteristics:						
log(employ.)	0.4611***	-0.5089***	0.3964	0.0239	0.2955***	0.5527***
	(0.0175)	(0.0303)	(0.026)	(0.0314)	(0.0258)	(0.0284)
log(age)	-0.0155	0.0382	0.0001	0.0298	-0.0512	0.0423
	(0.0187)	(0.0322)	(0.0365)	(0.0362)	(0.0326)	(0.0332)
I(multi-unit)	-0.0561	-0.1909**	-0.1161	-0.3165***	-0.3498***	0.12
	(0.0907)	(0.0835)	(0.0927)	(0.0894)	(0.0968)	(0.075)
I(exporter)	0.063	0.1376	-0.1566**	0.0881	-0.0262	0.0941
	(0.0484)	(0.0778)	(0.074)	(0.0717)	(0.0757)	(0.0752)
Wald tests:						
novel = l-cost	4.25	0.06	2.96	1.02	1.87	0.58
novel = h-qual	3.94	5.91	0	0.06	4.74	4.91
l-cost = h-qual	18.84	8.07	2.31	1.85	14.35	2.58
joint all zero	13.22	5.57	5.15	1.07	6.65	2.98
Industry FE	YES	YES	YES	YES	YES	YES
N	22285	11684	11684	11684	11684	11684

Notes: Industry fixed effects are at the 4-digit NAICS level. Standard errors are clustered by sampling strata, which are broad industry-size-region categories. All regressions use sampling weights.

Table 7: Strategy and Special Non-Management Work Design

Adoption of:	employee suggestions	flex. job design	inform. sharing	prob.-solv. teams	labor-mgmt committees
Strategy priority:					
I(`novelty`)	0.196***	0.269***	0.212***	0.336***	-0.019
	(0.070)	(0.084)	(0.072)	(0.085)	(0.071)
I(`low-cost`)	-0.040	-0.017	-0.036	-0.152**	0.110*
	(0.068)	(0.064)	(0.063)	(0.070)	(0.063)
I(`high-qual.`)	0.103	0.121	0.072	0.096	0.057
	(0.085)	(0.077)	(0.071)	(0.084)	(0.080)
Firm characteristics:					
log(employ.)	-0.052	-0.043	-0.036	-0.013	0.015
	(0.041)	(0.042)	(0.037)	(0.042)	(0.037)
log(age)	0.231**	-0.142	0.272***	0.204**	0.090
	(0.090)	(0.093)	(0.081)	(0.091)	(0.076)
I(multi-unit)	-0.063	-0.087	-0.059	-0.001	0.003
	(0.084)	(0.086)	(0.067)	(0.080)	(0.072)
I(exporter)	0.186***	0.002	0.178***	0.220***	0.450***
	(0.036)	(0.042)	(0.035)	(0.039)	(0.033)
Wald tests:					
novel = l-cost	5.84	7.62	6.14	19.01	1.97
novel = h-qual	0.63	1.66	1.92	4.19	0.53
l-cost = h-qual	1.33	1.83	1.38	5.11	0.25
joint all zero	3.48	4.35	3.27	6.93	1.29
Industry FE	YES	YES	YES	YES	YES
N	14,708	14,563	14,712	14,684	14,629

Notes: Industry fixed effects are at the 4-digit NAICS level. Standard errors are clustered by sampling strata, which are broad industry-size-region categories. All regressions use sampling weights.

Table 8: Strategy, Performance Pay and Compensation

Adoption of:	individual incentives	group incentives	profit sharing	merit-based	stock comp.	avg annual salary
Strategy priority:						
I(`novelty`)	0.128**	0.138*	0.160**	0.119*	0.207***	1.198**
	(0.055)	(0.074)	(0.069)	(0.062)	(0.075)	(0.580)
I(`low-cost`)	0.030	-0.090	0.027	0.054	-0.076	-0.675
	(0.049)	(0.062)	(0.059)	(0.050)	(0.067)	(0.467)
I(`high-qual.`)	0.280***	0.269***	0.156**	0.111**	0.015	0.477
	(0.056)	(0.079)	(0.066)	(0.056)	(0.095)	(0.532)
Firm characteristics:						
log(employ.)	-0.051*	-0.030	-0.009	-0.093***	-0.166***	1.266***
	(0.029)	(0.036)	(0.031)	(0.029)	(0.048)	(0.288)
log(age)	0.376***	0.427***	0.276***	0.448***	1.169***	4.708***
	(0.084)	(0.129)	(0.099)	(0.086)	(0.108)	(1.461)
I(multi-unit)	0.155**	-0.199**	0.017	0.036	0.148	1.697***
	(0.061)	(0.087)	(0.067)	(0.071)	(0.101)	(0.331)
I(exporter)	0.405***	0.415***	0.350***	0.331***	0.385***	2.204***
	(0.026)	(0.028)	(0.027)	(0.025)	(0.039)	(0.798)
Wald tests:						
novel = l-cost	1.58	6.11	1.95	0.69	7.61	6.15
novel = h-qual	3.44	1.43	0	0.01	2.49	0.78
l-cost = h-qual	9.51	12.19	2.18	0.57	0.66	2.74
joint all zero	12.14	5.78	4.51	2.9	2.89	2.46
Industry FE	YES	YES	YES	YES	YES	YES
N	22,166	21,990	21,691	22,153	15,290	22,285

Notes: Industry fixed effects are at the 4-digit NAICS level. Standard errors are clustered by sampling strata, which are broad industry-size-region categories. All regressions use sampling weights.

Table 9: Strategy and Occupational Composition

Fraction of:	managers	production workers	profess.	admin. staff	sales workers
Strategy priority:					
I(`novelty`)	0.005	-0.033	0.068**	-0.014	0.053**
	(0.013)	(0.031)	(0.034)	(0.017)	(0.026)
I(`low-cost`)	0.001	0.001	0.005	0.012	-0.029
	(0.012)	(0.025)	(0.027)	(0.015)	(0.023)
I(`high-qual.`)	0.014	-0.031	-0.032	0.004	0.086***
	(0.013)	(0.028)	(0.031)	(0.018)	(0.029)
Firm characteristics:					
log(employ.)	-0.004	0.028*	-0.017	0.016*	-0.030**
	(0.007)	(0.015)	(0.014)	(0.009)	(0.015)
log(age)	-0.037***	-0.029	0.017	-0.107***	0.024
	(0.013)	(0.049)	(0.040)	(0.025)	(0.039)
I(multi-unit)	-0.002	0.156***	0.145***	0.057***	0.135***
	(0.007)	(0.014)	(0.013)	(0.009)	(0.014)
I(exporter)	-0.001	0.004	0.134***	0.008	0.016
	(0.016)	(0.036)	(0.040)	(0.020)	(0.035)
Wald tests:					
novel = l-cost	0.04	0.79	2.05	1.28	4.92
novel = h-qual	0.24	0	4.59	0.58	0.65
l-cost = h-qual	0.62	0.78	0.89	0.11	10.91
joint all zero	0.49	0.83	1.7	0.47	5.26
Industry FE	YES	YES	YES	YES	YES
N	22,285	22,285	22,285	22,285	22,285

Notes: Industry fixed effects are at the 4-digit NAICS level. Standard errors are clustered by sampling strata, which are broad industry-size-region categories. All regressions use sampling weights.

Table 10: Strategy and Job Training

	training					
Dependent var.:	new empl	managers	profess.	sales reps.	group dec.	leadership
Strategy priority:						
I(`novelty`)	0.103*	0.105	0.247***	0.191***	0.190**	0.262***
	(0.058)	(0.067)	(0.062)	(0.063)	(0.077)	(0.067)
I(`low-cost`)	0.095**	-0.041	-0.057	-0.070	-0.018	-0.037
	(0.047)	(0.055)	(0.053)	(0.059)	(0.071)	(0.057)
I(`high-qual.`)	0.231***	0.087	0.028	0.168***	0.262***	0.260***
	(0.053)	(0.065)	(0.058)	(0.058)	(0.070)	(0.067)
Firm characteristics:						
log(employ.)	-0.075***	-0.021	0.008	-0.107***	-0.019	0.004
	(0.028)	(0.033)	(0.030)	(0.038)	(0.038)	(0.037)
log(age)	0.100	0.436***	0.138	0.294***	0.299***	0.273***
	(0.099)	(0.088)	(0.091)	(0.085)	(0.091)	(0.089)
I(multi-unit)	-0.025	-0.151**	0.095	-0.064	0.081	0.020
	(0.064)	(0.066)	(0.069)	(0.076)	(0.077)	(0.074)
I(exporter)	0.633***	0.579***	0.362***	0.450***	0.327***	0.450***
	(0.028)	(0.029)	(0.025)	(0.029)	(0.028)	(0.029)
Wald tests:						
novel = l-cost	0.01	2.67	12.89	8.76	3.45	9.85
novel = h-qual	2.42	0.04	6.72	0.07	0.45	0
l-cost = h-qual	3.63	2.26	1.01	7.45	7.14	11.27
joint all zero	9.68	1.54	5.57	6.73	7.17	10.5
Industry FE	YES	YES	YES	YES	YES	YES
N	22,225	22,191	22,067	21,941	21,881	22,056

Notes: Industry fixed effects are at the 4-digit NAICS level. Standard errors are clustered by sampling strata, which are broad industry-size-region categories. All regressions use sampling weights.

Table 11: Strategy and Operations

		improving or enhancing				
Dependent var.:	work proc. reorganiz.	value chain	labor mgmt	employee involv.	perform. measures	employee skills
Strategy priority:						
I(`novelty`)	0.1445***	0.025	0.1766***	0.0925**	-0.0362	0.0406
	(0.0405)	(0.0415)	(0.0416)	(0.0453)	(0.0421)	(0.0441)
I(`low-cost`)	0.1262***	0.1474***	0.0224	0.0421	0.2225***	0.1394***
	(0.0341)	(0.0363)	(0.0434)	(0.0358)	(0.0343)	(0.0363)
I(`high-qual.`)	-0.102***	0.3956***	0.1834***	0.3861***	0.3864***	0.4108***
	(0.038)	(0.0395)	(0.0388)	(0.0393)	(0.0413)	(0.0415)
Firm characteristics:						
log(employ.)	0.0399	-0.0121	0.1222***	0.1155***	0.0727***	0.1002***
	(0.0173)	(0.0167)	(0.02)	(0.0168)	(0.0177)	(0.0175)
log(age)	-0.0165	-0.0274	-0.0058	-0.0284	-0.0417**	0.0153
	(0.0192)	(0.0199)	(0.0229)	(0.0191)	(0.0187)	(0.02)
I(multi-unit)	0.1006	0.0167	-0.0506	0.0068	0.0594	0.0826
	(0.0802)	(0.0589)	(0.0769)	(0.0497)	(0.0605)	(0.0807)
I(exporter)	0.0281	0.0799	-0.0532	-0.0256	0.0532	0.0085
	(0.0478)	(0.0476)	(0.0531)	(0.0508)	(0.0542)	(0.0483)
Wald Tests						
novel = l-cost	0.11	4.5	6.34	0.76	21.78	2.89
novel = h-qual	17.88	35.82	0.01	21.57	43.28	38.98
l-cost = h-qual	17.65	17.55	5.59	37.86	8.28	21.29
joint all zero	10.62	50.82	18.2	37.16	49.84	42.12
Industry FE	YES	YES	YES	YES	YES	YES
N	22285	22285	22285	22285	22285	22285

Notes: Industry fixed effects are at the 4-digit NAICS level. Standard errors are clustered by sampling strata, which are broad industry-size-region categories. All regressions use sampling weights.

Table 12: Strategy and Organizational Change

Type of org. change:	functional integration	delayer	downsize	re-engin.	job rot.	outsource	inter-firm R&D
Strategy priority:							
I(`novelty`)	0.198***	0.040	0.046	0.234***	0.179***	0.294***	0.407***
	(0.065)	(0.091)	(0.068)	(0.065)	(0.065)	(0.077)	(0.072)
I(`low-cost`)	-0.018	0.227***	0.225***	0.105*	0.075	0.085	-0.117*
	(0.055)	(0.083)	(0.061)	(0.054)	(0.053)	(0.068)	(0.062)
I(`high-qual.`)	0.122**	0.018	-0.068	0.195***	0.149**	0.149**	0.150**
	(0.060)	(0.088)	(0.066)	(0.067)	(0.064)	(0.069)	(0.071)
Firm characteristics:							
log(employ.)	-0.081***	0.023	-0.033	-0.064**	-0.115***	-0.051	-0.125***
	(0.030)	(0.038)	(0.032)	(0.031)	(0.034)	(0.036)	(0.037)
log(age)	0.322**	0.261***	0.142*	0.103	0.097	-0.007	0.169
	(0.138)	(0.098)	(0.073)	(0.080)	(0.145)	(0.087)	(0.105)
I(multi-unit)	0.343***	0.243***	0.127***	0.330***	0.313***	0.173***	0.328***
	(0.026)	(0.032)	(0.030)	(0.026)	(0.024)	(0.027)	(0.028)
I(exporter)	0.180***	0.059	0.161**	0.237***	0.180**	0.358***	0.467***
	(0.066)	(0.100)	(0.075)	(0.071)	(0.074)	(0.079)	(0.082)
Wald tests:							
novel = l-cost	5.67	1.86	3.6	2.13	1.38	3.67	25.97
novel = h-qual	0.64	0.04	1.33	0.17	0.1	1.97	6.07
l-cost = h-qual	2.89	2.54	9.52	0.92	0.79	0.36	6.61
joint all zero	5.37	3.1	4.9	10.1	6.16	8.23	12.54
Industry FE	YES	YES	YES	YES	YES	YES	YES
N	22,023	21,261	21,868	22,088	22,042	21,820	21,809

Notes: Industry fixed effects are at the 4-digit NAICS level. Standard errors are clustered by sampling strata, which are broad industry-size-region categories. All regressions use sampling weights.