Online Appendix

A. Comparative statics for relative shadow prices

Starting with (2) in the text

$$\frac{\frac{\partial R}{\partial x_k}}{\frac{\partial R}{\partial x_j}} = \frac{w_k - \frac{\partial U}{\partial x_k}\left[\frac{\partial U}{\partial \pi}\right]^{-1}}{w_j - \frac{\partial U}{\partial x_j}\left[\frac{\partial U}{\partial \pi}\right]^{-1}} = \frac{w_k^S}{w_j^S}$$

we can define relative price efficiency as:

$$\frac{w_k^S}{w_j^S}\frac{w_j}{w_k} = \frac{w_k - \frac{\partial U}{\partial x_k}\left[\frac{\partial U}{\partial \pi}\right]^{-1}}{w_j - \frac{\partial U}{\partial x_j}\left[\frac{\partial U}{\partial \pi}\right]^{-1}}\frac{w_j}{w_k}.$$

Defining $a = \frac{\partial U}{\partial x_k}$, $c = \frac{\partial U}{\partial x_j}$, and $b = \frac{\partial U}{\partial \pi}$ we can write:

$$\frac{w_k^S}{w_j^S}\frac{w_j}{w_k} = \frac{w_k - \frac{a}{b}}{w_j - \frac{c}{b}}\frac{w_j}{w_k}$$

and the derivative with respect to b is

$$\begin{aligned}\frac{\partial\left(\frac{w_k^S}{w_j^S}\frac{w_j}{w_k}\right)}{\partial b} &= \frac{\frac{a}{b^2}\left(w_j - \frac{c}{b}\right) - \frac{c}{b^2}\left(w_k - \frac{a}{b}\right)}{\left(w_j - \frac{c}{b}\right)^2}\frac{w_j}{w_k} \\ &\iff \frac{aw_j - cw_k}{\left(w_j - \frac{c}{b}\right)^2 b^2}\frac{w_j}{w_k}\end{aligned}$$

as wj/w_k is positive the sign depends on $aw_j - cw_k$. Thus, whether relative price efficiency increases or decreases with the profit sensitivity of utility depends on the ratio of market prices and how sensitive utility is to input use. If $\frac{a}{c} = \frac{w_k}{w_j}$ relative price

efficiency does not depend on profit sensitivity. Suppose utility decreases in management $a < 0$ but increases in the other input $c > 0$. In that case $\frac{a}{c} < \frac{w_k}{w_j}$ and $aw_j - cw_k < 0$. Thus, relative price efficiency decreases, i.e. moves towards efficiency, when the responsiveness to profit increases.

B. Derivation of shadow prices

This Appendix proves that (19) in the text holds when firms minimize shadow total cost subject to the input distance function (IDF). The constrained optimization problem can be written using the same notations as before:

$$\begin{aligned} &\min_X W^{S\prime} X \\ &\text{subject to } \; D = X_1 \cdot D(\widetilde{X}, Y, t). \end{aligned} \tag{1}$$

The Lagrangian of the above problem can be written as:

$$\mathcal{L} = W^{S\prime} X + \lambda [X_1 \cdot D(\widetilde{X}, Y, t) - D] \tag{2}$$

where λ is the Lagrange multiplier. The first-order conditions are:

$$\frac{\partial \mathcal{L}}{\partial X_1} = w_1^S + \lambda \left[D(\cdot) + \frac{\partial D(\cdot)}{\partial X_1} \cdot X_1 \right] = 0 \tag{3}$$

and

$$\frac{\partial \mathcal{L}}{\partial X_k} = w_k^S + \lambda \left[X_1 \cdot \frac{\partial D(\cdot)}{\partial \widetilde{X}_k} \cdot \frac{\partial \widetilde{X}_k}{\partial X_k} \right] = 0, \; \forall k = 2, \ldots, K. \tag{4}$$

The above first-order conditions can be re-written as:

$$w_1^S + \lambda \left[D(\cdot) - \sum_{k=2}^{K} \frac{\partial D(\cdot)}{\partial \widetilde{X}_k} \widetilde{X}_k \right] = 0 \tag{5}$$

and

$$w_k^S + \lambda \cdot \frac{\partial D(\cdot)}{\partial \widetilde{X}_k} = 0, \; \forall k = 2, \ldots, K, \tag{6}$$

respectively. We can simplify them as

$$\frac{w_k^S}{w_1^S} = \frac{\partial D(\cdot)/\partial \widetilde{X}_k}{D(\cdot) - \sum_{k=2}^{K} \frac{\partial D(\cdot)}{\partial \widetilde{X}_k} \widetilde{X}_k}, \; \forall k = 2, \ldots, K. \tag{7}$$

Multiply both sides of (26) in the text by X_k/X_1, and then divide the numerator and denominator of the right-hand-side of (26) by $D(\cdot)$, and we would have:

$$\frac{X_k w_k^S}{X_1 w_1^S} = \frac{\beta_k}{1 - \sum_{k=2}^{K} \beta_k}, \; \forall k = 2, \ldots, K, \tag{8}$$

where $\beta_k = \frac{\partial D/D}{\partial \widetilde{X}_k/\widetilde{X}_k} = \frac{\partial \ln D}{\partial \ln \widetilde{X}_k}$ is the elasticity of the IDF with respect to input ratios by definition. Equivalently,

$$\frac{w_k^S}{w_1^S} = \frac{\beta_k X_1}{\beta_1 X_k}, \ \forall k = 2, \ldots, K,$$

where $\beta_1 = 1 - \sum_{k=2}^{K} \beta_k$.

C. Elasticity calculation

The Dual Morishima Elasticity of Substitution can be written as the sum of the cross and own quantity elasticities:

$$M_{kj} = \frac{\partial \ln w_j^S}{\partial \ln X_k} - \frac{\partial \ln w_k^S}{\partial \ln X_k},\ \forall k, j = 1, \ldots, K. \tag{9}$$

To calculate these elasticities, we take the natural logs of both sides of (19) in the text and get:

$$\ln w_k^S = \ln \beta_k + \ln X_1 + \ln w_1^S - \ln \beta_1 - \ln X_k,\ \forall k = 2, \ldots, K. \tag{10}$$

The following own and cross quantity elasticities are then obtained under the translog specification:

$$\frac{\partial \ln w_k^S}{\partial \ln X_k} = \frac{\theta_{kk}}{\beta_k} + \frac{1}{\beta_1} \sum_{j=2}^{K} \theta_{jk} - 1,\ \forall k = 2, \ldots, K, \tag{11}$$

$$\frac{\partial \ln w_k^S}{\partial \ln X_1} = 1 - \frac{1}{\beta_k} \sum_{j=2}^{K} \theta_{kj} - \frac{1}{\beta_1} \sum_{k=2}^{K} \sum_{j=2}^{K} \theta_{kj},\ \forall k = 2, \ldots, K, \tag{12}$$

and

$$\frac{\partial \ln w_j^S}{\partial \ln X_k} = \frac{\theta_{jk}}{\beta_j} + \frac{1}{\beta_1} \sum_{k'=2}^{K} \theta_{k'k},\ \forall k, j = 2, \ldots, K, \text{ and } k \neq j. \tag{13}$$

In addition, $\frac{\partial \ln w_1^S}{\partial \ln X_k} = 0$, $\forall k = 1, \ldots, K$, for the reason that w_1^S is the shadow price of the numeraire input.

D. Survey Questions

Table D.1: The Management Practice Dimensions

Categories	Score from 1-5 based on:
1) Introduction of modern manufacturing techniques	What aspects of manufacturing have been formally introduced, including just-in-time delivery from suppliers, autonomation, flexible manpower, support systems, attitudes, and behavior?
2) Rationale for introduction of modern manufacturing techniques	Were modern manufacturing techniques adopted just because others were using them, or are they linked to meeting business objectives like reducing costs and improving quality?
3) Process problem documentation	Are process improvements made only when problems arise, or are they actively sought out for continuous improvement as part of a normal business process?
4) Performance tracking	Is tracking ad hoc and incomplete, or is performance continually tracked and communicated to all staff?
5) Performance review	Is performance reviewed infrequently and only on a success/failure scale, or is performance reviewed continually with an expectation of continuous improvement?
6) Performance dialogue	In review/performance conversations, to what extent is the purpose, data, agenda, and follow-up steps (like coaching) clear to all parties?
7) Consequence management	To what extent does failure to achieve agreed objectives carry consequences, which can include retraining or reassignment to other jobs?
8) Target balance	Are the goals exclusively financial, or is there a balance of financial and nonfinancial targets?
9) Target interconnection	Are goals based on accounting value, or are they based on shareholder value in a way that works through business units and ultimately is connected to individual performance expectations?
10) Target time horizon	Does top management focus mainly on the short term, or does it visualize short-term targets as a "staircase" toward the main focus on long-term goals?
11) Targets are stretching	Are goals too easy to achieve, especially for some "sacred cows" areas of the firm, or are goals demanding but attainable for all parts of the firm?
12) Performance clarity	Are performance measures ill-defined, poorly understood, and private, or are they well-defined, clearly communicated, and made public?
13) Managing human capital	To what extent are senior managers evaluated and held accountable for attracting, retaining, and developing talent throughout the organization?
14) Rewarding high performance	To what extent are people in the firm rewarded equally irrespective of performance level, or are rewards related to performance and effort?
15) Removing poor performers	Are poor performers rarely removed, or are they retrained and/or moved into different roles or out of the company as soon as the weakness is identified?
16) Promoting high performers	Are people promoted mainly on the basis of tenure, or does the firm actively identify, develop, and promote its top performers?
17) Attracting human capital	Do competitors offer stronger reasons for talented people to join their companies, or does a firm provide a wide range of reasons to encourage talented people to join?
18) Retaining human capital	Does the firm do relatively little to retain top talent or do whatever it takes to retain top talent when they look likely to leave?

Note: This table is reproduced from Bloom and Van Reenen (2010).

E. Regression Estimates

Table E.1 gives the coefficient estimates from our translog distance function in (16) in the text. The subscripts K, M, and t stand for Capital, Management and time, respectively.

Table E.1: Regression results

	Estimate	Std. Error	t value	Pr(>|t|)
α_0	4.1732	0.3932	10.6129	0.0000
ϑ_{K}	0.2235	0.1381	1.6180	0.1058
ϑ_{M}	0.2453	0.1197	2.0491	0.0406
α_{t}	−0.0082	0.0156	−0.5302	0.5961
ϑ_{KK}	0.0114	0.0265	0.4314	0.6662
ϑ_{KM}	0.0020	0.0183	0.1084	0.9137
δ_{Kt}	0.0019	0.0022	0.8618	0.3889
ϑ_{MM}	0.0284	0.0219	1.2940	0.1958
δ_{Mt}	−0.0003	0.0022	−0.1160	0.9077
α_{tt}	0.0046	0.0012	3.7274	0.0002

Notes: This table gives the coefficient estimates for our translog distance function.