Online Appendix to "Information Environment and the Investment Decisions of Multinational Corporations"

This document contains additional tests that are untabulated in the paper. The tests relate to (i) including controls for the decision to invest in a foreign country, and (ii) using total factor productivity as an alternative proxy for the subsidiary's investment efficiency.

The Entry Decision

One potential concern with our empirical tests is that our proxies for the information environment examined in our main tests could be capturing the factors that drive the MNC's initial decision to invest in a country. MNCs' investment decisions can be separated into two distinct stages: (i) the decision to first enter a country and (ii) the decision to make ongoing investments conditional on entry. While we focus on the second stage, prior literature finds that transparency is also important in the initial investment decision (see, e.g., Razin and Sadka 2007). This raises a potential concern that our findings could simply reflect the role of transparency in the initial investment decision. More broadly, foreign investments made by MNCs are a subset of FDI flows into a country and thus it is conceivable that our results are capturing the determinants of FDI documented in prior research.

To mitigate the above concerns, we re-run our analysis after controlling for additional time-varying drivers of FDI, such as the level of corruption (Alesina and Weder 2002), GDP growth, the currency exchange rate (Froot and Stein 1991), and the interest rate differentials between the parent's and subsidiary's countries (Gross and Trevino 1996).[1] We include the FDI determinants both as a main effect and as an interaction with *PE* to allow the determinants of the

[1] Corruption is measured using the country-level corruption measure from the IMD World competitiveness yearbook. GDP growth is the real GDP growth rate in the subsidiary's country, interest rate differential is the difference in real interest rates between the parent's and subsidiary's countries from IMF's International Financial Statistics (IFS), and real exchange rate is the real exchange rate of the local currency in the subsidiary's country (relative to the U.S. dollar) from IFS.

entry decision to affect the level of investment as well as *INV-PE* sensitivity in the post-entry period. Thus, if FDI determinants are driving our results, our findings should not hold after we include the above controls.

Table OA1 presents these results. We find that our main results continue to hold with similar economic magnitudes after controlling for these determinants. Further, our results reveal that subsidiary investment is negatively related to the level of corruption and interest rate differentials and positively related to GDP growth. However, all three drivers of FDI have insignificant effects on the *INV-PE* sensitivity. Thus while the factors that determine the initial entry decision continue to affect the subsequent *level* of investment, they have little effect on the *sensitivity* of investment to subsequent growth opportunities.

Total Factor Productivity (TFP)

In this section, we examine whether our results are robust to using an alternative measure of investment efficiency – Total Factor Productivity (TFP). TFP is the portion of output not explained by the inputs used in a firm's production and, therefore, measures how efficiently and intensely the inputs (capital and labor) are utilized in the production process. Following prior research (e.g., Schoar 2002), we measure subsidiary-level TFP by estimating a log-linear Cobb-Douglas production function for each country, industry, and year.[2] In the equation below, subsidiaries are indexed *i*, countries *c*, and industries *j* for each year *t* in the sample:

$$\ln(Y_{icjt}) = a_{cjt} + b_{cjt} \ln(K_{icjt}) + c_{cjt} \ln(L_{icjt}) + \varepsilon_{icjt.} \quad (2)$$

Because the coefficients for capital (*K*) and labor (*L*) can vary by country, industry, and year, this specification allows for different factor intensities in different countries and industries. We proxy for output (*Y*) using net sales, capital (*K*) using assets, and labor (*L*) using the number of

[2] Because the ORBIS database provides no information on intermediate input variables, we are not able to adjust for the possible simultaneity bias in our *TFP* estimates (Levinsohn and Petrin 2003). However, Giroud (2013) documents that the correlation between OLS estimates of *TFP* and *TFP* estimates using the Levinsohn and Petrin (2003) approach is 0.84.

employees.[3] Industries are defined at the two-digit ICB code level. *TFP* for each subsidiary is the estimated residual from these regressions, which captures the idiosyncratic part of each subsidiary's productivity.

We regress subsidiary-level *TFP* on our measures of *IE* controlling for *ROA*, *Parent CFO*, *Parent Ownership*, *Domestic Banking Credit*, and MNC indicators. The remaining control variables included in our earlier analyses – i.e., firm size and country, industry, and year fixed effects – are not included in our second stage *TFP* regressions because the first stage regression used to obtain the *TFP* values is estimated at the country-industry-year level and includes firm size as a covariate. Therefore, our *TFP* measure is, by design, orthogonal to these variables.

Table OA2 presents the results from this analysis. We find that *TFP* is positively associated with all our proxies for the transparency of the information environment. Specifically, the coefficient for *IE* equals 0.010, 0.009, 0.012, and 0.023 when we measure the *IE* with analyst coverage, press coverage, earnings transparency, and the average rank of the three proxies, respectively. All four coefficients are statistically significant at the 10% level or better. In economic terms, a change in *IE* from the bottom to the top quartile increases *TFP* from the median to the 90th percentile of its distribution. These results suggest that our prior results on the relation between the information environment and the sensitivity of investment to growth opportunities might manifest as higher productivity for subsidiaries located in more transparent information environments.

[3] Our method of estimating *TFP* differs from prior research in two ways. First, we estimate *TFP* at the country-industry-year level while prior research estimates it at the industry-year level, because the former is more suited to our setting. However, in untabulated results we find that our inferences are unchanged when we measure *TFP* at the industry-year level. Second, prior research includes "material inputs" as a third factor of production (in equation 2). However, data limitations preclude us from doing so.

TABLE OA1
Controlling for time-varying FDI Determinants

This table presents the results from subsidiary-level regressions of asset growth on industry growth opportunities, the information environments in each country-industry-year, an interaction term between growth opportunities and the information environment. *PE* is the price-to-earnings ratio of the country-industry-year of the subsidiary. *IE* is the yearly quartile rank of our proxies for the information environment. We proxy for *IE* using the median number of analysts following firms in the country-industry-year (*Analyst Coverage*), the median number of press articles about firms in the country-industry-year (*Press Coverage*), and -1 times the absolute value of the ratio of accruals scaled by the cash flow from operations for the median firm in each country-industry-year (*Earnings Transparency*). We include various controls for determinants of FDI at the time of entry. *Corruption* is the time-varying country-level corruption measure from the IMD World competitiveness yearbook. *Interest Rate Difference* is the difference in real interest rate between the parent's and subsidiary's countries from the IMF's International Financial Statistics (IFS). *Real Exchange Rate* is the exchange rate of the local currency in the subsidiary's country (relative to the U.S. dollar), and *GDP Growth* is the real GDP growth rate in the subsidiary's country from IFS. All regressions include the fixed effects of each parent firm, parent-country subsidiary-country pair, and the subsidiary's ICB industry. The regressions also include interaction terms between each subsidiary-country indicator and *PE*. T-Statistics are reported in parentheses below the regression coefficients and we cluster standard errors at the country-industry level. ***, **, and * denote statistical significance at the two tailed 1%, 5%, and 10% levels.

Indipendent Varibles:	**Dependent Variable: *Asset Growth***				
PE * IE	0.49***	0.53***	0.46***	0.52***	0.43**
	(2.96)	(3.02)	(2.65)	(3.36)	(2.33)
IE	-0.17***	-0.18***	-0.17***	-0.17***	-0.15***
	(-3.48)	(-3.19)	(-3.12)	(-3.76)	(-2.82)
Corruption	-0.16**				-0.13*
	(-2.43)				(-1.79)
PE * Corruption	0.37				0.42
	(1.55)				(1.47)
Interest Rate Difference		-0.01***			0.00
		(-3.52)			(-1.25)
PE * Interest Rate Difference		0.01			0.02*
		(1.39)			(1.66)
Real Exchange Rate			0.00		0.00
			(-0.69)		(-1.53)
PE * Real Exchange Rate			0.01		0.01
			(1.04)		(1.12)
GDP Growth				0.02***	0.02***
				(7.25)	(5.90)
PE * GDP Growth				0.00	0.01
				(0.48)	(0.47)
Control Variables from Earlier Tables	Yes	Yes	Yes	Yes	Yes
PE * Country Indicators	Yes	Yes	Yes	Yes	Yes
PE * Firm-level internal mechanisms	Yes	Yes	Yes	Yes	Yes
MNC Indicators	Yes	Yes	Yes	Yes	Yes
Parent - Subsidiary Country Pairs Indicators	Yes	Yes	Yes	Yes	Yes
Industry Indicators	Yes	Yes	Yes	Yes	Yes
SE clustering (Country-industry)	Yes	Yes	Yes	Yes	Yes
# firm-years	32,163	32,163	32,163	32,163	32,163
Adj. R-Square	13.2%	13.2%	13.1%	13.7%	13.4%

TABLE OA2
Total Factor Productivity Regressions

This table presents the results from subsidiary-level regressions of total factor productivity on industry-level information environments and control variables. *Total Factor Productivity* is the residual from estimating a log-linear Cobb-Douglas production function for each country, industry, and year where one regresses the value of output (net sales) on labor (number of employees) and capital stock (total assets). *IE* is the yearly quartile rank of our proxies for the information environment. We proxy for *IE* using the median number of analysts following firms in the country-industry-year (*Analyst Coverage*), the median number of press articles about firms in the country-industry-year (*Press Coverage*), and -1 times the absolute value of the ratio of accruals scaled by the cash flow from operations for the median firm in each country-industry-year (*Earnings Transparency*). *ROA* is net income scaled by total assets. *Parent CFO* is the cash flows from operations obtained by the parent firm that owns the subsidiary. *Parent Ownership* is the percentage of the subsidiary's stock that is owned by the parent. For subsidiaries that are held indirectly through other firms, we use the product of all observed percentage ownership connecting the subsidiary along each chain. *Domestic Banking Credit* includes all credit provided domestically by the banking sector as a percentage of GDP. All regressions include the fixed effects of each parent firm. T-Statistics are reported in parentheses below the regression coefficients and we cluster standard errors at the country-industry level. ***, **, and * denote statistical significance at the two tailed 1%, 5%, and 10% levels.

Dependent Variable: *Total Factor Productivity*				
	Information Environment(IE) Measures			
Variables	Analyst Coverage	Press Coverage	Earnings Transparency	Aggregate
IE	0.010*	0.009**	0.012**	0.023***
	(1.75)	(2.23)	(2.10)	(3.81)
ROA	0.419***	0.420***	0.420***	0.420***
	(17.55)	(18.91)	(17.44)	(18.89)
Parent CFO	0.076	0.076	0.082*	0.077
	(1.55)	(1.43)	(1.67)	(1.45)
Parent Ownership	0.002	0.005	0.005	0.003
	(0.04)	(0.17)	(0.08)	(0.11)
Domestic Banking Credit	-0.009	-0.011	-0.010	-0.013
	(-0.53)	(-0.92)	(-0.57)	(-1.06)
MNC Indicators	Yes	Yes	Yes	Yes
# firm-years	24,749	24,749	24,749	24,749
Adj. R-Square	38.4%	38.4%	38.4%	38.4%