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# Foreign direct investment and macroeconomic risk

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Motivated by the macroeconomic fluctuations and policy regime switches frequently observed in developing countries, this paper provides cross country-industry evidence on the links between a host country's macro risks and foreign direct investment (FDI) activities. For each industry I measure vertical FDI share as a ratio of exports to a parent country relative to local sales by foreign affiliates. Using a panel sample from 1989 to 1999, I find that FDI activities of US multinationals in industries with higher share of vertical FDI respond disproportionately more to negative effects of macro-level demand, supply, and sovereign risks. However, when institutional quality and total FDI share of the host country are sufficiently low, the merits of cross-industry vertical versus horizontal FDI in response to macro risks disappear. *Journal of Comparative Economics* **35** (3) (2007) 509–519. Division of Economics, Nanyang Technological University (NTU), S3-B2A-06, Singapore 639798.


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## 1. Overview

What is the main driving force of foreign direct investment (FDI)? This paper adds to a series of literatures studying the association between institutions, macroeconomic risks, and FDI.[1]

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[1] Another strand of literature focuses on static conditions under which vertical FDI is more efficient than horizontal FDI. There, vertical FDI arises when a multinational firm fragments its production process internationally, locating each stage of the production in the host country where it can be done at the least cost. Hummels et al. (2001) and Yi (2003)

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Table 1
Share of vertical FDI across industries, US multinationals

| Industry | $\frac{\text{Exports back to US}}{\text{Local sales}}$ | Industry share in total sales (%) |
|---|---|---|
| Utilities$^{+}$ | 0.006 | 1.5 |
| Information$^{+}$ | 0.022 | 3.2 |
| Food and kindred products | 0.042 | 5.0 |
| Services | 0.054 | 3.9 |
| Other industries | 0.056 | 5.3 |
| Wholesale trade | 0.066 | 1.9 |
| Chemicals and allied products | 0.077 | 9.0 |
| Other manufacturing | 0.128 | 8.5 |
| Finance, insurance, and real estate | 0.160 | 5.9 |
| Petroleum$^{-}$ | 0.161 | 16.6 |
| Primary and fabricated metals | 0.166 | 1.9 |
| Machinery$^{+}$ | 0.207 | 2.8 |
| Electronic and other electric equipment$^{-}$ | 0.240 | 1.1 |
| Electrical equipment, appliances, and components | 0.320 | 4.2 |
| Mining$^{+}$ | 0.368 | 2.9 |
| Industrial machinery and equipment$^{-}$ | 0.395 | 9.1 |
| Transportation equipment | 0.555 | 10.9 |
| Computer and electronic products$^{+}$ | 0.580 | 8.8 |
| Difference in Vertical FDI Share | *0.443* | |

*Notes*. $+(-)$ codifies industries started (stopped) reporting in the B.E.A. surveys from year 1999 on. Some industries which the survey started reporting in 1999 are closely related to some pre-1999 industries: "Industrial machinery and equipment" (pre-1999), "Machinery" (post-1999), and "Computer and electronic products (post-1999); "Electronic and other electric equipment" (pre-1999) and "Electrical equipment, appliances, components" (post-1999). Difference in Vertical FDI Share is the average difference between the ratios of industries located below the 25th percentile and the ratios of industries located above the 75th.

In Aizenman and Marion (2004), a simple real-option model of FDI is supported by country-level evidence that macroeconomic volatility has larger effects on vertical FDI than horizontal FDI. Delving into the industry level, I investigate whether a priori FDI structure—vertical versus horizontal—determines the association between FDI activity and macro-level risks. If so, negative effects of risks in a host country on FDI activity ex post then not only exist but are also dependent on the share of vertical FDI across industries.

Using a sample of activity by US multinationals, Table 1 reports for each industry a vertical FDI share, measured by the level exported back to US divided by local sales.[2] To tabulate the numbers, it is assumed that production technology underlying the share of horizontal versus

show that vertical FDI has emerged as another explanation to the growth of world trade. Carr et al. (2001) show that the choice between vertical and horizontal FDI depends on country characteristics, such as relative size, relative endowment, and investment costs. See also Braconier et al. (2005), Davies (2003), Hanson et al. (2005), and Waldkirch (2006) for the comparative-advantage consideration of vertical FDI.

[2] This method follows Hanson et al. (2002) and Aizenman and Marion (2004). I measure the output of vertical production as foreign affiliates' exports to the parent firm, assuming that these exports represent intermediate goods requiring further processing in the parent country. The output of horizontal production is measured by the affiliates' sales in the local market where the affiliates operate, assuming that these are sales of final goods. This measure sums together the affiliates' exports that sent back to the parent firm as in Helpman (1984), but not that sent to other countries (export platform FDI) as in Ekholm et al. (2003). This measure of vertical FDI is a narrow version and coefficient estimates provide a lower bound of its effects.

vertical FDI is applicable to all affiliates operating abroad for each industry.[3] The dissimilarity across industries is apparent: a ratio of exports back to US relative to local sales by foreign affiliates of industries below the 25th percentile (Utilities, Information, Food, Services) is, on average, 44 percent smaller than that of industries above the 75th percentile (Mining, Industrial Machinery, Transportation Equipment, and Computer Products). In the next section, I investigate empirically the implication of this dissimilarity by projecting cross country-industry patterns of FDI activity onto a vector of macro risks.

## 2. Estimation

To quantify the differential impact of macro risks on vertical versus horizontal FDI activities, I estimate the following equation:

$$\begin{aligned}&\text{FDI Activity of Industry } j \text{ in Host Country } k\\ &= \text{Constant} + \beta_{1\ldots m} \cdot \text{Country Indicators} + \beta_{m+1\ldots n} \cdot \text{Industry Indicators}\\ &\quad + \beta_{n+1} \cdot (\text{Host Country } k\text{'s Share of Total Sales in industry } j \text{ in 1989})\\ &\quad + \beta_{n+2} \cdot [\text{Vertical FDI of Industry } j \times \text{Macro Risk in Host Country } k] + \varepsilon_{j,k}\end{aligned}$$

where $\beta$'s are coefficient estimates. I use dummy variables to control for country and industry time-invariant unobserved characteristics. For this econometric specification, a negative and statistically significant $\beta_{n+2}$ indicates that FDI activities of industries with higher share of vertical FDI respond more adversely to macro risks in a host country. The advantage of this setting is that it makes predictions about within-country differences between industries based on the interaction between country and industry characteristics. It should also be less subjected to omitted variable bias and model misspecification.[4]

I use the 1989, 1994, and 1999 benchmark surveys on US multinational activities compiled by the US Bureau of Economic Analysis. Table 2 provides a list of countries, together with their share and level of vertical FDI. Countries in the top half of the table witness, on average, more than 25 billion USD (in 1995$) of total sales generated by affiliates of US multinationals. In contrast, the bottom half of Table 2 shares just a little below 10 percent of total sales.[5] This feature of the sample is useful for guiding the robustness check. Although there is a presumption that horizontal FDI should dominate in large destinations, high-income, industrial countries, I find in this sample set that the average share of vertical FDI is 19 percent for both large and small hosts (excluding Barbados, Bermuda, Netherlands Antilles, Nigeria, and UAE as outliers).

[3] If the production technology determining vertical FDI does not carry over to all foreign affiliates and changes frequently over time, the choice of export versus FDI becomes an important consideration. For studies on export versus FDI, see for example Brainard (1997), Grossman and Helpman (2004), and Helpman et al. (2004). On the insensitivity of production technology to host-country conditions, see for example Morley and Smith (1977).

[4] Rajan and Zingales (1998) use similar empirical approach to study whether industrial sectors that are relatively more in need of external finance develop disproportionately faster in countries with more-developed financial markets.

[5] Using the total sales numbers is admittedly a crude approximation. The immediate concern is transfer pricing. Swenson (2001) finds an association between foreign corporate tax rates and the reported transaction prices between parent firms and foreign affiliates. Because of data availability, it is difficult to measure cross industry-country differences in transfer-pricing manipulation over time. I treat this distortion as a random component.

Table 2
Total sales by affiliates of US multinationals, 1989–1999

| Host country | US$bn | Country share (%) | Exports back to US / Local sales |
|---|---|---|---|
| United Kingdom | 734.7 | 15.47 | 0.07 |
| Canada | 665.9 | 14.02 | 0.37 |
| Germany | 480.2 | 10.11 | 0.04 |
| France | 301.1 | 6.34 | 0.04 |
| Japan | 282.7 | 5.95 | 0.05 |
| Netherlands | 235.9 | 4.97 | 0.07 |
| Italy | 172.6 | 3.64 | 0.04 |
| Switzerland | 160.1 | 3.37 | 0.22 |
| Australia | 143.9 | 3.03 | 0.04 |
| Singapore | 139.3 | 2.93 | 0.88 |
| Mexico | 136.0 | 2.86 | 0.41 |
| Belgium | 129.2 | 2.72 | 0.09 |
| Brazil | 122.5 | 2.58 | 0.07 |
| Spain | 104.9 | 2.21 | 0.03 |
| Hong Kong | 94.0 | 1.98 | 0.34 |
| Ireland | 87.6 | 1.85 | 0.31 |
| Sweden | 47.4 | 1.00 | 0.09 |
| Bermuda | 41.8 | 0.88 | 5.06 |
| Taiwan | 39.5 | 0.83 | 0.21 |
| Malaysia | 38.7 | 0.81 | 0.55 |
| Argentina | 38.2 | 0.81 | 0.03 |
| Norway | 31.5 | 0.66 | 0.13 |
| Thailand | 29.9 | 0.63 | 0.18 |
| Austria | 29.8 | 0.63 | 0.14 |
| Indonesia | 24.1 | 0.51 | 0.26 |
| China | 22.7 | 0.48 | 0.09 |
| Denmark | 20.2 | 0.43 | 0.06 |
| Korea | 19.1 | 0.40 | 0.16 |
| Colombia | 19.1 | 0.40 | 0.08 |
| Portugal | 18.4 | 0.39 | 0.01 |
| Venezuela | 18.2 | 0.38 | 0.02 |
| Philippines | 16.8 | 0.35 | 0.17 |
| Chile | 16.2 | 0.34 | 0.10 |
| New Zealand | 14.9 | 0.31 | 0.02 |
| South Africa | 14.4 | 0.30 | 0.01 |
| Turkey | 13.2 | 0.28 | 0.02 |
| Finland | 12.3 | 0.26 | 0.04 |
| Nigeria | 9.8 | 0.21 | 2.64 |
| Greece | 9.2 | 0.19 | 0.01 |
| Saudi Arabia | 8.4 | 0.18 | 0.02 |
| Poland | 7.7 | 0.16 | 0.01 |
| Israel | 7.7 | 0.16 | 0.59 |
| United Arab Emirates | 7.3 | 0.15 | 1.33 |
| Peru | 7.2 | 0.15 | 0.12 |
| Panama | 6.6 | 0.14 | 0.38 |
| Hungary | 6.4 | 0.13 | 0.22 |
| Barbados | 5.7 | 0.12 | 2.19 |
| India | 5.7 | 0.12 | 0.03 |
| Costa Rica | 4.8 | 0.10 | 0.78 |
| Dominican Republic | 4.7 | 0.10 | 0.68 |

Table 2 (*continued*)

| Host country | US$bn | Country share (%) | Exports back to US / Local sales |
|---|---|---|---|
| Czech Republic | 4.4 | 0.09 | 0.01 |
| Netherlands Antilles | 4.0 | 0.08 | 8.13 |
| Honduras | 3.6 | 0.08 | 0.14 |
| Ecuador | 2.8 | 0.06 | 0.45 |
| Jamaica | 2.5 | 0.05 | 0.63 |
| Bahamas | 1.8 | 0.04 | 0.23 |
| Guatemala | 1.7 | 0.03 | 0.06 |

Table 3
Summary and correlations of macro risks

| Variable | Value-added risk | Labor-strike risk | Demand risk | Sovereign risk |
|---|---|---|---|---|
| *Summary* | | | | |
| Observations | 468 | 468 | 468 | 468 |
| Mean | 0.03 | 0.43 | 0.03 | 5.07 |
| Standard deviation | 0.02 | 0.32 | 0.03 | 1.69 |
| Minimum | 0.00 | 0.07 | 0.00 | 1.00 |
| Maximum | 0.10 | 1.55 | 0.18 | 8.00 |
| *Correlations* | | | | |
| *a* Value-added risk | 1.00 | | | |
| *b* Labor-strike risk | 0.05 | 1.00 | | |
| *c* Demand risk | 0.12 | 0.12 | 1.00 | |
| *d* Sovereign risk | −0.20 | 0.04 | 0.26 | 1.00 |

The estimation covers three measures of FDI activity: Total Assets, Net Property, and Employee Compensation.[6] Following the theoretical model of Aizenman and Marion (2004), there are broadly three types of macro-level uncertainty: demand, supply, and sovereign risks. I measure demand risk by coefficient of variation of monthly real effective exchange rates of a host country.[7] There are two measures of supply risk: coefficient of variation of value added and variation in the number of labor market strikes and lockouts in a host country. I use a numerical assessment of investment profiles to measure sovereign risk. The summary and correlations of macro risks are provided in Table 3. The risk variables have positive but small correlations (except for a negative correlation between value-added risk and sovereign risk). The final sample covers eighteen industries and thirty-seven host countries. The Appendix provides details on data source and construction of these variables.

[6] Aizenman (2003) proposes that a negative association between Employee Compensation and uncertainty may stem from production diversification that increases the responsiveness of the multinational employment to host country's productivity shocks (the multinational channels its employment from the more to less volatile location).

[7] Beyond the scope of this paper is whether the demand risk via real exchange rate channel arises from shocks in the affiliate's parent country or host country. See Russ (2007) for some further treatment. Aizenman and Marion (2004) use terms of trade volatility as a measure of demand uncertainty. Note that for periods of significant and persistent exchange-rate changes, host-country currency can influence FDI. For example, Blonigen (1997) finds that real dollar depreciations make Japanese acquisitions more likely in US industries, particularly those which more likely have firm-specific assets. Froot and Stein (1991) find that a depreciation of the host-country currency may systematically lower the relative wealth of domestic agents and lead to foreign acquisition of domestic assets. See also Klein and Rosengren (1994) and Rangan and Lawrence (1993).

Table 4
Macro-level risks and measures of FDI activity

| Affiliate activities | Interaction of $\frac{\text{Exports back to US}}{\text{Local sales}}$ × Supply risk: Value added | | × Supply risk: Labor strikes | | × Demand risk | | × Sovereign risk | | Obs. | $R^2$ |
|---|---|---|---|---|---|---|---|---|---|---|
| | *I. Full Sample* | | | | | | | | | |
| *A* | −43.9 | (18.7)** | −2.5 | (1.5)* | −1.7 | (8.0) | −0.7 | (0.3)** | 468 | 0.71 |
| *B* | −45.5 | (19.0)** | −2.8 | (1.4)* | 0.1 | (8.0) | −0.5 | (0.3)* | 468 | 0.81 |
| *C* | −38.6 | (15.6)** | −2.1 | (1.2)* | 5.9 | (7.6) | −0.5 | (0.2)* | 468 | 0.76 |
| | *II. Total Affiliate Sales ⩾ 25 billion USD* | | | | | | | | | |
| *A* | −144.9 | (62.6)** | −4.3 | (3.4) | −4.3 | (27.6) | −1.5 | (0.7)** | 307 | 0.67 |
| *B* | −163.7 | (58.3)*** | −6.1 | (3.0)** | 10.2 | (27.1) | −1.4 | (0.6)** | 307 | 0.78 |
| *C* | −112.8 | (46.2)** | −5.3 | (2.5)** | 30.0 | (27.8) | −1.0 | (0.4)** | 307 | 0.72 |
| | *III. Total Affiliate Sales < 25 billion USD* | | | | | | | | | |
| *A* | −5.5 | (3.5) | −0.1 | (0.2) | 1.2 | (1.1) | −0.0 | (0.0) | 161 | 0.86 |
| *B* | −5.2 | (3.5) | −0.2 | (0.3) | 1.7 | (1.1) | −0.1 | (0.1) | 161 | 0.81 |
| *C* | −7.4 | (4.9) | 0.2 | (0.3) | 1.9 | (1.7) | −0.1 | (0.1) | 161 | 0.78 |

*Notes*. The dependent variables are measures of FDI activity share of US multinationals for each industry in each host country: *A* is total assets, *B* is employee compensation, *C* is net property. Vertical FDI share is the ratio of Exports back to US relative to Local Sales from 1989 to 1999. The interaction variable is a product of vertical FDI share and macro-level risk. Supply risks are volatility of value added and variation in the number of labor market strikes. Demand risk is volatility of real exchange rates. Sovereign risk is a score on investment profile. All regressions include both host country and industry fixed effects, and host country's share of total sales in the industry in 1989 (coefficient estimates not reported). Heteroskedasticity robust standard errors are reported in parentheses.

* Statistically significant at the 10% level.
** Idem, 5%.
*** Idem, 1%.

Table 4 reports the coefficient estimates. Because the econometric specification controls for country-specific and industry-specific effects, those being identified are the effects relative to variables that vary both cross host countries and cross industries. Table 4 thus reports only the coefficients of interaction measures of macro risks. For the full sample reported in Panel I, we can see that supply and sovereign risks have larger effects on the total assets of industries with higher share of vertical FDI, while the demand risk lacks statistical power in explaining any differential impact. A host country's share of Total Sales in industry in 1989 (coefficient not reported) is positive and statistically significant. Further, these findings apply to all three accounts of FDI activity.[8]

To provide a robustness check, I take on a sample feature that half of the countries register less than 0.5 percent or 25 billion USD of total US FDI. Short of macroeconomic data, the estimation cannot confront with censoring, which also requires data points for countries with zero US FDI (those not included in Table 2). By disregarding countries that are unable to attract US FDI, we

[8] If there are technological reasons that an industry relies on vertical FDI more than other industries, and these technological differences persist for all foreign affiliates across host countries over periods under consideration, we can consider the industry's dependence on vertical FDI applicable to all FDI destinations. All we really need is that statements of the following sort hold: If Computer Products industry requires more vertical FDI in its production structure than Food industry from 1989–1999, FDI activity by the foreign affiliates in Computer Products industry responds disproportionately more than Food industry to the negative effects of macro risks in host countries.

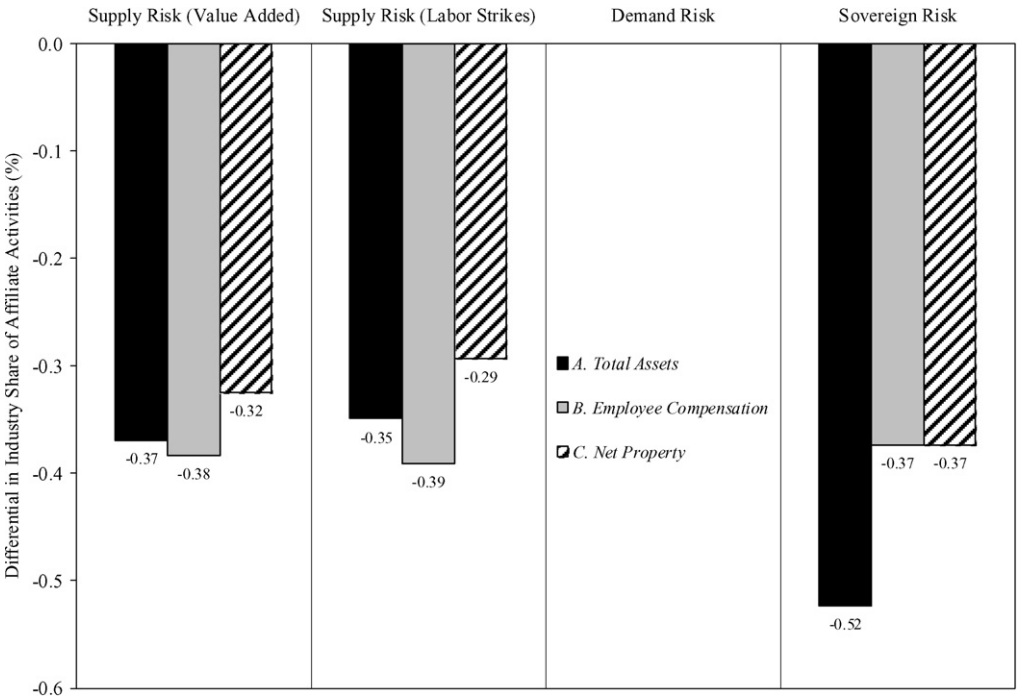
disregard close to a third of the observations. With such limitations in mind, I report in panels II and III of Table 4 the regression results using the 25 billion USD cutoff. We can see that the vertical-versus-horizontal differential impact of macro risks is not applicable to those smaller-share destinations. The merits of cross-industry vertical versus horizontal FDI in response to macro-level risks apply only to a subset of medium and large host-country destinations.

To a degree, the results are in line with theory and country-level evidence in Aizenman and Marion (2004): at industry-level, we also see in a subset of FDI destinations that supply and sovereign risks have more deleterious impact on vertical FDI, whereas demand risk discourages both vertical and horizontal production modes. The estimation also performs quite well, explaining 67–86 percent of variation in the data. One method in which we can quantify economic significance of the coefficient estimates is as follows. Industries above the 75th percentile of vertical FDI share (average = 0.47) include Mining, Industrial Machinery, Transportation Equipment, and Computer Products. Industries below the 25th percentile (average = 0.03) are Utilities, Information, Food, and Services. A one standard deviation change of sovereign risk is 1.7 score on host-country's investment profile. If we set the host country's initial share of total sales at its overall mean, the coefficient estimate on sovereign risk then predicts that total assets of the higher vertical-FDI share group (the 75th percentile) should adversely respond 0.52 percent more than the lower share group. Summing together the negative effects of supply, demand, and sovereign risks on the total assets, a differential of 1.24 percent is found. In comparison, the size of total assets for the top half of Table 2 is, on average, 88 billion USD. Therefore, a differential of 1.24 percent is significant. Fig. 1 provides a summary of the vertical-versus-horizontal differential response of FDI activity to macro risks.

## 3. Discussion

Interaction between contractual incompleteness and uncertainty plays a central role in the evaluation of the relative costs of governance through market-based bilateral contracts versus governance through internal organizations (Joskow, 2005). Assuming there is industry-specific uncertainty that drives vertical FDI, the results reported here can then be interpreted as increases in macroeconomic risks having stronger effects when the industry-specific uncertainty is small. In a longer sample, the estimation may also be exposed to multicollinearity as productivity shocks tend to account for the long-run movements in real exchange rate fluctuations by Balassa–Samuelson's (Alexius, 2005). Another reservation on the regression results is that the flow and stock of US FDI data can provide rough approximations to country distributions of FDI sources and destinations, but are poor approximations to industry distributions of FDI and to changes over time in country and industry distributions (Lipsey, 2007).

While there is much at stake in eliminating macro risks, to understand the means to the end poses quite a challenge. Consider, for example, the supply risk. A negative association between the risk of labor strikes and FDI activity casts doubt on the welfare implication of centralized versus decentralized wage setting regimes (Leahy and Montagna, 2000). As for demand risk generated by the volatility of real exchange rates, a risk considered relatively easy to fix, choosing an exchange rate regime as a policy prescription to eliminate it may actually miss the target and is likely to be of second order importance to the development of good fiscal, financial, and monetary institutions (Calvo and Mishkin, 2003). At a broader level, we can consider the findings in this paper as a first attempt at understanding the role of policy coordination as countries try to attract new investments and extract benefits from market potential (Barrell and Pain, 1999;




*Notes*. Differential FDI Activity measures in percentage how much larger an industry above the 75th percentile level of vertical FDI share responds negatively with respect to an industry below a 25th percentile level when it faces a one standard deviation change of macro-level risks. Each bar is the product of coefficient estimate (−0.7 for FDI Activity on Sovereign Risk) and standard deviation of explanatory variable (1.7 score for Sovereign Risk), multiplied by a difference in vertical FDI share between industries at the 75th and 25th percentile (0.44). Missing bars represent statistically insignificant coefficient estimates.

Fig. 1. One standard deviation change of risks and differential in FDI activity

Petroulas, in press). Hence, the three types of macro risks identified here can be considered as measurable stochastic attributes of structural and institutional inefficiencies facing policymakers.

Of the 234 countries recognized by the United Nations,[9] only a quarter attracts FDI from US multinationals. In our sample of 57 FDI destinations, those located below the 25th percentile of total FDI share have investment profiles that are one standard deviation riskier than those located above the 75th percentile. Contrasting destinations according to their total FDI share, vertical-versus-horizontal differential impact of macro risks turns out to not be applicable to smaller-share destinations, suggesting that FDI activity of both types are equally vulnerable to macro risks in countries with low institution qualities. When the institutional quality of a country is sufficiently low, US multinationals are hardly interested in direct foreign investment. Information from those countries with zero US FDI, however, may be useful for understanding international investment flows. Exploring this feature of the data, which is largely being ignored in current literature, is left for future works.[10]

[9] Based on the latest listing on the United Nations web site, http://unstats.un.org/unsd/methods/m49/m49alpha.htm.

[10] See Helpman et al. (2007) in the context of international trade flows.

For developing countries, consumer potentials, abundant natural resources, and labor cost advantages are all attractive for FDI (Hanson et al., 2002). On the other hand, developing countries are characterized by larger macroeconomic fluctuations and more frequent policy regime switches than industrial countries (Aguiar and Gopinath, 2007). That these stylized facts of macro risks across countries is a driving factor to the sensitivity of vertical versus horizontal FDI activity corroborates the institutional consideration of international allocation of resources. Much progress has been made on linking institutional analysis to international trade; Anderson and Marcouiller (2002), Berkowitz et al. (2006), Blomberg and Hess (2006), Greif (1992), Levchenko (in press), Marin and Schnitzer (2002), Nunn (2007), Rauch (1999), Rodrik et al. (2004), and Svaleryd and Vlachos (2005). As a corollary to cross-border trading in goods in the presence of institutional risks, multinationals likewise face a risk that their investment will be expropriated for the simple reason that international contracts are practically impossible to enforce (Thomas and Worral, 1993). Greaney (2003) proposes that the observed trade frictions between countries, such as the occasional US versus Japan row, are a result of asymmetric trade and investment flows that may stem from differences in the strength of business and social networks in international trade and FDI. On the empirical front, Aizenman and Spiegel (2006) find that institutional efficiency is positively associated with the ratio of subsequent foreign direct investment flows to both gross fixed capital formation and to private investment. As the theoretical and empirics of multinational firms are not as well developed as other areas of international economics, a combination of lessons drawn from international trade with comparative institutional analysis applying to FDI is a promising direction for future research.

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**Appendix A**

FDI Activity: survey data over five-year interval (1989, 1994, and 1999) compiled by the BEA's *US Direct Investment Abroad* (from http://www.bea.gov/international/index.htm#omc). Nominal values are deflated by the US GDP deflator (base year = 1995; US GDP deflator is the implicit price deflator for Gross Domestic Product from the National Income and Product Accounts at the BEA, http://www.bea.doc.gov/bea/dn/nipaweb/). Three measures of FDI activity share by foreign affiliates are: Total assets [BEA Table III.B5], Compensation of employees [BEA Table III.H5], and Net property, plant, and equipment [BEA Table III.B7]. BEA changed industry classification in 1999. Some of the industries that the survey started reporting in 1999 are closely related to some pre-1999 industries. These include "Industrial machinery and equipment" (pre-1999), "Machinery" (post-1999), and "Computer and electronic products" (post-1999); "Electronic and other electric equipment" (pre-1999) and "Electrical equipment, appliances, components" (post-1999).

Vertical FDI Share: ratio of foreign affiliates' exports back to US relative to local sales for each industry, averaged over the period 1989–1999. Exports are sales by foreign affiliates to the US [BEA Table III.F4]. Local sales are sales by foreign affiliates to the local market in host country [BEA Table III.F7].

Supply Risks: (i) volatility of value added of host country, measured by lagged three years coefficient of variation of annual gross value added indices; (ii) variation in the number of labor

market strikes and lockouts in host countries, measured by coefficient of variation over the current and past five years. The types of strikes and lockouts covered are constitutional or official, unofficial, political or protest, sympathetic and general or widespread strikes and lockouts, and any other forms of action due to labor disputes, e.g. sit-ins, working to rule, go-slows and overtime bans. Source: International Labor Organization's *LABORSTA* (from http://laborsta.ilo.org/).

Demand Risk: volatility of real effective exchange rates, measured by coefficient of variation of monthly values. Source: JP Morgan's real broad effective exchange rate indices from *DataStream*.

Sovereign Risk: investment profile, measured by a numerical assessment on three factors relating to investment risks in host country: (1) viability of contracts/expropriation; (2) profits repatriation; (3) payments delays. Countries are ranked monthly on a 0–12 scale, with a higher value indicating lower risk. The reported scores have been rescaled by subtracting from 12 so that a higher value indicates a greater sovereign risk. Source: *International Country Risk Guide*, Political Risk Services Group (from http://www.prsgroup.com/).

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