Foreign Direct Investment and Uncertainty: Evidence from French Multinational Firms ☆

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March 6, 2017

Abstract

This paper studies the impact of uncertainty on the returns of French Direct Investment (DI) assets abroad and its impact on the internationalization strategy of French firms. We build a data-set of firm level assets and flows (including income) between 2000 and 2014 and match it with key country-specific uncertainty indicators. The results show that country-specific uncertainty has a significant and negative short-term impact on the yields of foreign affiliates. Following an uncertainty shock, French firms seem to be mostly either unwilling or unable to reallocate their assets internationally; whereas they respond to changes in the host country's growth rate or in the average return. However, country-specific shocks do seem to have a negative impact on their share in the over-all firm FDI portfolio. It suggests that firms allocate further investments to supposedly less uncertain destinations. We also look at the idiosyncratic return volatility of french multinationals and provide some evidence that it is correlated with the worsening of financial conditions in the destination country.

KEYWORDS: uncertainty; FDI flows; returns; volatility; multinational firms
JEL CLASSIFICATION: D81, F23, G10, G15

☆We thank Matthieu Bussiere, Jean-Charles Bricongne, Ludovic Gauvin and participants of the Banque de France Phd seminar. Lauren Diaz and Elisabeth Martin De Crozefon provided outstanding research assistance at various stages of this project. The views expressed in this paper are those of the authors and do not necessarily reflect those of the Banque de France.

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1. Introduction

The increasing financial integration of the last 30 years has led to the development of an international risk sharing system. Economies have simultaneously received and emitted capital flows and the size of their external balance sheet has strongly increased. This dynamic, different for each country, has also increased the heterogeneity of the composition of the world's International Investment Positions. Advanced economies tend to hold a net long position on riskier instruments (such as equities) and a short one on safer instruments (such as debt); while emerging economies typically present the opposite picture. Thus, advanced economies play a role close to that of an international insurer to emerging economies. During good times, insured countries pay a premium to insurer countries as the income from riskier assets is typically higher than the income from safer ones. However, the prices of riskier assets tend to be more volatile than safer ones and thus subject to large valuation effects. Therefore during bad times, a negative choc on the value of the external position of the insurer countries generates a wealth transfer. It reduces its position in risky assets and thus the corresponding liabilities held by the insured countries (Gourinchas and Rey, 2013). This mechanism, referred as exorbitant duty/privilege, has been intensively studied in the case of the United States (Gourinchas et al. (2012) or Curcuru et al. (2008)), much less so for other countries. Habib (2010) provides the most comprehensive study of this phenomenon for a panel of 49 countries between 1980 and 2007. He identifies political risk as one of the key determinants of asset prices and return on investment dynamics.

The goal of this study is to provide a clearer picture of the role of an insurer country, such as France, in the International Monetary System (IMS). Specifically, we examine the impact of uncertainty on the performance of French direct investing firms abroad and its impact on their investment and reallocation strategy. Uncertainty is known to have an impact on the investment decisions and output of firms, regardless of their residence status (Rodrik (1991), Baker et al. (2016)). Moreover, foreign owned firms are more exposed to country-specific shocks than domestic ones (DIXIT, 2012). Also Direct Investments flows, because of their irreversibility, are more sensitive to uncertainty than other type of capital flows (Julio and Yook, 2016).

With this in mind, we pair highly disaggregated data on French Direct Investment stocks, flows and income in order to compute various measures of returns and reallocations. We then match those measures of FDI activity for the period 2000-2014 with country-level measures of political and economic uncertainty.

We show that country-specific volatility is indeed associated with a lower rate and an increased dispersion of Direct Investment equity returns. We estimate that a moderate 10% increase of our uncertainty proxy results in a Return on Investment 0.23 percentage point lower and a dispersion 0.37% higher. Multinational firms have limited abilities to reallocate following an uncertainty shock due to the irreversibility of Direct Investments; indeed disinvestment flows to a given country are negatively associated with a rise in country-specific market volatility. We do find evidence however that parent firms will allocate further flow to less uncertain destinations. This ability to diversify by being present in multiple countries helps dampen the impact of an idiosyncratic shock.

Additionally, we study the determinants of FDI specific uncertainty. We find that the health of the financial sector, proxied by its Z-Score, seems to be the main driver of FDI uncertainty.

The structure of this paper is as follows. First, we review the literature on foreign assets, flows and returns as well as the literature on uncertainty (Section 2). Then, we introduce the French Direct Investment data and our empirical strategy (Section 3). Next, we econometrically test the relationship between uncertainty and returns of French DI assets abroad and its impact on the firms' international strategy (Section 4). Finally, we provide some clues as to which country-specific risks generate FDI idiosyncratic uncertainty and find that financial sector stress seems to be the strongest predictor of FDI uncertainty proxy (Section 5). Section 6 concludes.

2. Literature Review

Our paper is related to the literature on uncertainty in open economies. Since the seminal work of Lane and Milesi-Ferretti (2007) that documented the extent of the international financial integration, the literature on the growth of cross-country financial links and its interaction with global and local risk or uncertainty has been steadily growing.

Habib (2010) stresses the importance of investment income in imparting a drift to net foreign assets over the long-run. Also, he finds that excess yields on the International Investment Position (IIP) are positively associated with a good country risk rating. One canal through which local political risk may affect returns was illustrated by Rodrik (1991) who built a model in which policy uncertainty equals a tax on investment. Baker et al. (2016), using firm-level data, find that policy uncertainty raises stock price volatility and reduces investment and employment in policy-sensitive sectors like defense, healthcare, and infrastructure construction. At the macro level, they find that policy uncertainty innovations foreshadow declines in investment, output, and employment in the United States. Caldara and Iacoviello (2016) finds that higher geopolitical risk leads to a decline in real activity, capital flows and is associated with increases in the VIX.

A key finding of the literature has been the different response to uncertainty between local and foreign investors. Gourio et al. (2016) suggested a theoretical model based on an increase in probability of expropriation for foreigners as their share of the home economy grows bigger. They empirically find that stock market volatility is a strong predictor of political risk and that capital flows are significantly affected by political risk. Azzimonti (2016) builds a model based on the fractionalization of the society of the foreign country which leads to expropriation of foreigners and transfers to select social groups within the economy.

Using UNCTAD FDI data, Busse and Hefeker (2007) find a similar relationship between political risk, institutions and foreign direct investment. Weak institutions lead to political risk which results in lower FDI inflows. Julio and Yook (2016) uses elections data as a proxy for policy uncertainty and find that US firms postpone their investments abroad until after the election is over and that the overall effect is negative and also stronger for countries with weaker institutions.

Desai et al. (2008) using firm-level FDI data similar to ours find that US firms adjust their capital structure and diversify their portfolio to mitigate political risk abroad. However, they do find that in practice political risk will manifest itself nonetheless through a higher realized volatility of the returns of US multinational firms.

Return volatility of listed firms and uncertainty is the topic of many papers. For instance, Gilchrist et al.

(2014) study the effect of idiosyncratic return volatility on investment.Caldara et al. (2016) follows the same methodology in decomposing returns to build an idiosyncratic uncertainty proxy. Whereas Boutchkova et al. (2012) examine how local and global political risks affect return volatility at the industry level.

Finally, another strand of literature related to our study deals with the impact of uncertainty on firms' export activity. Héricourt et al. (2016) show how multi-destination firms shape the effect of exchange rate volatility on trade. They find that firms shy away from markets affected by Real Exchange Rate volatility, especially so in the case of firms already servicing multiple markets. In addition, they present evidence that firm exports also react to the relative volatility of a market compared to other possible markets. Meanwhile, De Sousa et al. (2016) study the effect of expenditure uncertainty on the exports of firms and find a negative relationship at both the intensive and extensive margin. Interestingly, they find that uncertainty has a bigger effect on the most productive firms than on the least productive ones.

Our contribution to the literature is fourfold:

- We build and use a novel firm-level dataset of direct investment. It allows us to study the evolution of firm level Direct Investment stocks, flows and income between 2000 and 2014.
- We reproduce key findings of the literature on capital flows and uncertainty (lower FDI flows, increased dispersion of firms returns, et cetera)
- We improve the quantifying of the international risk sharing burden borne by countries with a positive FDI position. We measure the increased dispersion and lower rate of returns on the French DI assets caused by country-specific uncertainty. We account not only for the wait and see effect of uncertainty (ie. smaller delayed canceled investments) but also for the direct loss in revenue, even after accounting for diversification and reallocation strategies.
- We provide evidence of the limited ability of multinational firms to actively reallocate their foreign assets after an uncertainty shock.
- We create a novel indicator of FDI specific uncertainty based on the idiosyncratic volatility of Direct Investment returns.

3. Data and Methodology

3.1. Direct Investment Assets and Income data

Our data on French Direct Investments abroad primarily comes from highly dis-aggregated data available at the Banque de France. Those databases are produced by the Direct Investment Service belonging to the Statistical General Directorate with the primary goal of calculating and publishing each year the Balance of Payment and International Investment Position.

Most of the information is obtained from an annual survey performed by the regional branches of the Banque de France. It covers French companies with assets, in France or abroad over €10M, and a direct financial link (at least 10 % of the invested firm's capital) to at least one foreign company. The parent company then has to report the data for every subsidiary for which it owns more than €5M in capital or whose acquisition cost was greater than €5M. The Direct Investment Service estimates that the uncollected data below the threshold represent less than 0.5 % of total stocks.

FDI asset and flow (including income) data are produced and kept separately and we cannot simply match one with the other at the most granular level as there are no explicit identifier between a given stock and flow. For instance, whereas the asset data allows us to track all the affiliates of a given parent firm in a given country , the flows data only records one observation per sector country for a given parent firm. We therefore collect stock and flow data and match them at the firm country level.

We discard Direct Investment debt and cash flows assets for two reasons. Data on the income generated by those assets has only become available since 2012. Also, Blanchard and Acalin (2016) details the strong correlation between the flows of FDI coming in and out of a country. They show that this high correlation represents flows that are just passing through rather than the acquisition of a lasting interest in a resident enterprise according to the IMF definition of a FDI. They suggest that Direct Investment cash and debt flows are the primary vehicle of those pass-through flows. Focusing only on equity flows should give us a better measure of MNEs exposure to country-specific uncertainty.

The final dataset includes over 75 000 observations, including about 68 000 matching stocks and incomes for each year between 2000 and 2014. We follow about 5000 French firms every year that on average owns

around €161Mn in equity assets abroad (Figure A.1). We present some select characteristics in the panel A of Table 1.

The law of motion and returns of foreign assets are calculated as in Lane and Milesi-Ferretti (2001, 2007):

$$A_{s,j,k,t} - A_{s,j,k,t-1} = NOF_{s,j,k,t} + RE_{_{s,j,k,t}} + VAL_{s,j,k,t} \tag{1}$$

where NOF_t is the net value of flows during the period t between the firm and its affiliate. It can either be positive (net investment) or negative (net disinvestment).

Data on the valuation effect is not explicitly collected; however it can be computed by measuring the difference between the assets in period t-1 and t that is not explained by flows in period t:

$$VAL_{s,j,k,t} = A_{s,j,k,t} - A_{s,j,k,t-1} - NOF_{s,j,k,t} \tag{2}$$

We introduce two different measures of returns. Since we have access to both flows and holdings data, we can compute both the Return on Assets (Equation 5) and the Return on Investment (Equation 6). Only x% of the firms in our sample have subsidiaries listed on equity markets abroad, therefor the market valuation effect is fairly small but not nonexistent (Figure A.3). Moreover, since equities are typically labeled in the destination country currency, the currency valuation effect may add extra noise around the true yield of the investment abroad:

$$A_{s,j,k,t} = COF_{s,j,k,t} + \sum_{t=1}^{T} VAL_{s,j,k,t} \tag{3}$$

For those reasons, we will use cumulated flows from the parent firm to its affiliate to compute our primary measure of returns.

$$COF_{s,j,k,t} = A_{s,j,k,t=0} + \sum_{t=1}^{T} NOF_{s,j,k,t} \tag{4}$$

As in Lane & Milesi-Ferretti (2004), we divide the investment income in year t over the stock of assets in year t-1. However, in order to limit the loss of observations when computing returns, we use the assets in

t minus the flow in t:

$$ROA_{s,j,k,t} = \frac{I_{s,j,k,t}}{A_{s,j,k,t}} = \frac{I_{s,j,k,t}}{A_{s,j,k,t} - NOF_{s,j,k,t-1}} \tag{5}$$

$$ROI_{s,j,k,t} = \frac{I_{s,j,k,t}}{COF_{s,j,k,t-1}} \tag{6}$$

Following Cezar and Vicard (2016), we exclude abnormal rate of returns[1], which are any rates below -1 and above 1 (-100% and 100%).

As shown by Desai et al. (2016), firms may develop strategies to mitigate their exposure to country specific factors. In particular, we suspect that firms may reallocate from certain locations to others following an uncertainty shock. In order to distinguish flows that follow the geographical weights of the previous year from flows those that do not, we use the method developed by Ahmed et al. (2016) to measure reallocation flows across a given portfolio (Figure A.4):

$$\psi_{s,j,k,t} = \frac{COF_{s,j,k,t}}{COF_{s,k,t}} \tag{7}$$

where $\psi_{s,j,k,t}$ is the weight of country j in the portfolio of firm s.

$$NOFG_{s,j,k,t} = NOF_{s,j,k,t} \times \psi_{s,j,k,t-1} \tag{8}$$

$$NOFR_{s,j,k,t} = NOF_{s,j,k,t} - NOFG_{s,j,k,t} \tag{9}$$

NOFG are therefore flows between firm s and its affiliate(s) in country j weighted by the share of j in the Direct Investment portfolio of firm s in year $t-1$. It should be a proxy for flows that follow the portfolio weights of the previous period. The difference between total net flows (NOF) and growth flows (NOFG) should give us a proxy for reallocation flows, that is, flows that did not follow the weight structure of the

[1] We also exclude observation combining a positive income and negative assets. As well as cases of negative incomes and assets.

previous year.

Table 1: Summary Statistics

	N	Mean	Median	Std.Dev.
Affiliate-level				
Affiliate Assets (Mn.)	45081	138.06	12.71	733.13
Affiliate Flows (Mn.)	45081	9.50	0.19	156.88
Affiliate Income (Mn.)	45081	8.39	0.55	60.21
Income Return on Investment (%)	45081	10.59	6.69	26.30
Firm-level				
Parent Firm Assets (Mn.)	16206	517.72	33.81	2435.65
Number of Affiliates	16201	4.62	3.00	5.50
Country-level				
Stock Price Vol.	913	20.99	19.38	9.80
Forex Vol.	913	30.97	0.11	158.47
VIX	913	20.79	21.98	6.42
GDP per capita (USD)	913	20689.89	13776.45	19765.96
Δ GDP	913	0.07	0.08	0.11
Δ CPI	913	0.04	0.03	0.05
Δ FX	913	0.02	0.00	0.08

Source: Panel A and B from authors and Banque de France, panel C from World Bank, Reuters and CBOE.

3.2. Measures of uncertainty

Our primary measure of country specific uncertainty is the Stock Price Volatility from the World Bank Global Financial Development Database. The volatility of the stock price index is the 360-day standard deviation of the return on the national stock market index. Gourio et al. (2015) finds that equity returns volatility appears as a plausible, market based, and real-time proxy for economic uncertainty.

Herricourt & Nedoncelle (2016) find that French exporting firms react not only to absolute country uncertainty, but also to the country uncertainty relative to the uncertainty of the other locations they are

already trading too. We therefore compute our own measure of relative volatility:

$$Multi\_Uncertainty_{s,t} = \frac{1}{J_{s,t}} \sum_{j=1}^{J_{s,t}} \psi_{s,j,t} \times Uncertainty_{j,t} \tag{10}$$

where $\psi_{j,s,t}$ is the weight of country j in the portfolio of firm s. As an alternative, we compute another measure of multilateral uncertainty with $\psi_{s,t}$ equals to the weight of country j in total French assets.

$$Rel\_Uncertainty_{s,j,t} = \frac{Uncertainty_{j,t}}{Multi\_Uncertainty\_s,t} \tag{11}$$

We present the summary statistics of our three measures of volatility in panel B of Table 1. The average market return volatility over the 2000 - 2014 period was 22.30 with a standard deviation of 13.40 (Figure A.5, upper left panel). In 2010, for instance, China had a value of 29.51, Canada a value of 24.63 and Russia a value of 45.31. The country with the highest market volatility in our sample was Iceland in 2009 with a value of 99.03, whereas Tanzania in 2010 had the lowest at 2.39.

The option-implied expected volatility of the S&P500 index (VIX), the most popular proxy for uncertainty in global financial markets, had a mean of 19.99, a standard deviation of 5.95 and reached its minimum value of 12.80 in 2006 and its maximum in 2008 (32.69)

3.3. Control variables

We employ several country-specific control variables that according to the literature on capital flows should account for the economic and institutional characteristics of the destination country. Our primary source is the World Development Indicators (WDI) database from the World Bank. Specifically, we import real GDP per capita, real GDP and CPI. We obtain daily exchange rate against the Euro data from World Market Reuters and use it to compute yearly average and volatility. Finally, we gather various governance variables from the World Governance Indicators (WGI) database from the World Bank. Panel C of Table 1 includes some key economic characteristics of the countries in our sample.

Using our Direct Investment data-set, we also introduce some parent-firm and affiliate level controls. We

compute the size of total assets held abroad by each firm as well as the number of destinations served.

Just as we computed a measure of multilateral uncertainty, we do the same for our key country characteristics. We have :

$$\chi_{s,t} = \frac{1}{J_{s,t}} \sum_{j=1}^{J_{s,t}} \psi_{s,j,t} \times X_{j,t} \tag{12}$$

where $\psi_{s,j,t}$ is the weight of each country j in the portfolio of firm s and $X_{j,t}$ is our vector country-level characteristics.

3.4. Empirical Strategy

While the effect of global and country-specific risk on capital flows has been the subject of many studies, we aim at quantifying the costs for the French multinational firms in terms of revenue losses and delayed or canceled investment projects. Rodrik (1991) showed that even a moderate amount of uncertainty acted as a significant tax on domestic investment. Foreign investors may suffer from an information disadvantage compared to domestics ones and therefor may face an even bigger cost, though multinational firms may have also ways of mitigating risks that are not accessible to a firm without a direct financial link to a non-resident.

Our first step is to investigate the relationship between uncertainty and the rate of Return On Investment. We expect country-specific uncertainty to have a negative impact on the performance of the affiliates.

We start by estimating the relationship between the yields (equation 5 or 6) of French Direct Investment abroad and the level of uncertainty in the counterparty country. The benchmark regression can be written as:

$$ROI_{s,j,k,t} = \alpha_1 \log X_{j,t} + \alpha_2 \log X_{s,t} + \alpha_3 \log X_{s,j,t} + \sum_{t=-1}^{0} \beta \log Uncertainty + \omega_s + \lambda_j \times \kappa_k + \upsilon_t + \varepsilon_{s,j,k,t} \tag{13}$$

Our dependent variable $ROI_{s,j,k,t}$ measures the return on the external assets owned by a French multinational firm s in country j in sector k and in year t.

We include a vector $\alpha_1 \log X_{j,t}$ of macroeconomic controls. As in Habib (2010), we control for the change in exchange rate measured in log difference. We also control for GDP growth and inflation (reference?), once again in log difference, and add firm ω_s, sector-country $\lambda_j.\kappa_k$ and time fixed effects υ_t.

We introduce controls for parent $\alpha_2 \log X_{s,t}$ and affiliate size $\alpha_3 \log X_{s,j,t}$ that measure the amount of foreign assets owned by, respectively, the parent and affiliate company.

Following Gourio et al. (2016), our main proxy for country uncertainty is the realized stock price volatility (SPV) of the current and previous year. See annex for other proxies (IMF FC errors, conflict data, etc.). In order to study the aggregate effect of uncertainty on the parent company, we will introduce weighted measures of uncertainty and country characteristics using the share of assets as weights.

As an alternative to time fixed effect υ_t, we use the VIX to account for the so-called global uncertainty (Gourio et al., 2016) and proxy for France specific uncertainty. $\epsilon_{s,j,k,t}$ is the error term.

We expect uncertainty to act as a tax on French Direct Investment abroad. Therefore, the estimated coefficient β of our uncertainty variable should be negative and statically significant. [interactions and heterogeneity of response]

In a second step, we study how uncertainty impacts the firm's FDI flows and portfolio reallocations. As most internationalized French firms are present in more than one country (Figure A.4), it is a crucial step in understanding the strategy used by MNEs to mitigate uncertainty shocks.

We compute a set of dependent variables measuring flows between the parent company and its affiliate. Despite the dis-aggregated nature of our data, we only have access to the net yearly flow between the parent and its affiliate. Therefor the company either reports a net investment or disinvestment. Since the motives behind those two decisions might be different, we divide our sample into net investors and net dis-investors. Using the log transformation detailed below (Equation 15), we also run regressions on the whole sample. We repeat the process for the Reinvested Earnings. Finally, we also use the share of the affiliate in the parent company portfolio as a dependent variable to explain the impact of uncertainty on the overall firm investment strategy.

Our baseline flow regression specification will be:

$$\log OF_{s,j,k,t} = \alpha_1 \log X_{j,t-1} + \alpha_2 \log X_{s,t-1} + \beta \log Uncertainty_{j,t-1} + \omega_s + \lambda_j \times \kappa_k + \upsilon_t + \varepsilon_{s,j,k,t} \quad (14)$$

Since some affiliates present negative flows (i.e. disinvestment) for certain years, some of the observations in our sample are negative. We use the following transformation on our dependent variable, as seen in Busse and Hefeker (2007):

$$y = sign(x) \times \ln(|x| + 1) \quad (15)$$

Where OF is the net flow between a subsidiary and its parent company. All the regressions include lagged control for growth and exchange rates changes, as in Gourio et al. (2016), GDP per capita and Foreign Exchange rate volatility as in Julio and Yook (2016) and a proxy for rule of law to account for the quality of the institutions. We also add the average ROI of French firms in the destination country as a substitute for the domestic market return that is usually found in the literature on capital flows. *adding controls for financial/trade openness and/or financial depth ?* We now distinguish between global uncertainty, proxied by the VIX as in Forbes and Warnock (2012), and country-specific uncertainty measured by the domestic stock market volatility.

According to the literature, firms will typically delay their investment and reduce the amounts invested in the face of country-specific uncertainty. Our coefficient β should once again be negative. [interactions and heterogeneity of response]

4. Assessing the Impact of Uncertainty on French FDI abroad

We study the effect of uncertainty on the activity of French firms abroad. We first estimate the impact on the returns of affiliates, then its effect on the aggregate level and dispersion of returns abroad of French MNE and finally on the investment flows between parent companies and their foreign subsidiaries.

4.1. Direct Investment Assets and Income data

Table 2 presents the result of estimating the effect of country uncertainty on our preferred measure of returns at the affiliate level.

Among our control variables, GDP growth appears as the strongest determinant of returns (Table 2, model 2-3). We find that bigger affiliates experience higher returns (model 3). Similarly, the size of the parent company (proxied by its amount of assets abroad) is also positively correlated with the affiliate ROI (model 3).

Table 2: Uncertainty and foreign affiliate returns

	(1)	(2)	(3)
Dep. Var.: $ROI_{s,j,k,t}$ (%)			
Log SPV	-3.237***	-2.158**	-2.236**
	(0.00)	(0.02)	(0.02)
L.Log SPV	-0.036	-0.867	-0.200
	(0.97)	(0.36)	(0.83)
Log GDP/cap.		2.756**	0.309
		(0.03)	(0.80)
Δ GDP		25.088***	20.843***
		(0.00)	(0.00)
Δ CPI		-3.478	2.600
		(0.71)	(0.78)
Δ FX		10.232**	8.443*
		(0.05)	(0.09)
Log Total Parent Firm Assets			0.901***
			(0.00)
Log Firm Assets			3.178***
			(0.00)
Time FE	Yes	Yes	Yes
Sector X Country FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	33812	32420	31331
Adjusted R^2	0.281	0.286	0.314

p statistics in parentheses, with robust SE

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Our variable of interest, the Return on Investment of French affiliates abroad, is negatively affected when uncertainty increases. Impact a year later is still negative though it is no longer statically significant

(Table 2, model 1-). A 10% increase of our uncertainty proxy decreases the rate of Return on Investment by about 0.23 percentage point (column 2). The estimate is robust to the inclusion of affiliates and-or parent-firm level control variables or fixed effects.

Since most parent firms in our sample are present in more than one location (Figure A.2), it is important to check whether multinationals are capable of mitigating a local increase in volatility. Table 3 presents regressions in which the dependent variable is the average ROI of all the affiliates owned by a parent company, and the independent variables include weighted measures of macroeconomic controls and uncertainty. The baseline parent-level regression can therefore be written as:

$$ROI_{s,k,t} = \alpha \log \chi_{s,t} + \alpha_2 X_{s,t} \log + \sum_{t=-1}^{0} \beta \log Multi\_Uncertainty_{s,t} + \omega_s + \kappa_k + \upsilon_t + \varepsilon_{s,k,t} \tag{16}$$

We present the results of estimating this equation in Table 3.

At the parent firm level, the average uncertainty of its Direct Investment portfolio has a positive but not statically significant impact in the year uncertainty rises but a negative and significant one a year later (Table 3, model 1-3). Indeed, the estimated coefficient of 0.60 in column 2 implies that a 10% increase in market volatility results in a 0.06% percentage point decrease of the parent firm return on investment. The aggregate impact of an increase in stock price volatility is slightly negative and much smaller than for the regression at the affiliate level (2.236), even after controlling for the number of destinations.

Our results suggest that internationalized firms present in more than one foreign location have the ability to mitigate at least some of the negative impact of a rise in country-specific uncertainty in their portfolio.

Table 3: Uncertainty and parent firm returns

	(1)	(2)	(3)
Dep. Var.: $ROI_{s,k,t}(\%)$			
Log GDP/cap.	-0.075	-0.098	-0.166
	(0.71)	(0.63)	(0.39)
Δ GDP	16.741***	16.925***	17.735***
	(0.01)	(0.01)	(0.00)
Δ CPI	-8.346	-9.277	-1.504
	(0.64)	(0.60)	(0.93)
Δ FX	3.613	3.688	6.875
	(0.61)	(0.60)	(0.33)
Log SPV	0.812	0.847	0.802
	(0.23)	(0.21)	(0.21)
L.Log SPV	-0.566*	-0.600*	-0.680**
	(0.10)	(0.08)	(0.05)
Number of destinations		0.205***	
		(0.00)	
Log Foreign Assets			3.007***
			(0.00)
Time FE	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	12869	12865	12648
Adjusted R^2	0.331	0.332	0.350

p statistics in parentheses, with robust SE

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4.2. From macro uncertainty to micro uncertainty

A rise in country idiosyncratic uncertainty may have additional adverse consequences beyond a lower output for foreign-owned firms operating in the affected country and lower dividends earned by parent companies. Desai et al. (2008) study the effect of country risk on the earnings of US direct investors abroad and find that an increase in the average country risk of a parent firm portfolio increases the dispersion of returns and the probability of a negative net income for the US multinational.

To check whether French firms data present similar properties, we estimate the following equation:

$$\log SD_{s,k,t} = \alpha_1 \log \chi_{s,t} + \alpha_2 \log X_{s,t} + \beta \log Multi\_Uncertainty_{s,t} + \omega_s + \kappa_k + \upsilon_t + \varepsilon_{s,k,t} \tag{17}$$

where $\chi_{s,t}$ is a vector of multilateral country characteristics in the firm portfolio, $X_{s,t}$ is the size of foreign assets owned by the firm and where

$$SD_{s,k,t} = \sqrt{\left[\frac{1}{J_{s,k,t}} \times \sum_{j=1}^{J_{s,k,t}} (ROI_{s,k,j,t} - ROI_{s,k,t})^2\right]} \tag{18}$$

We find similar results: an increase in average uncertainty (weighted or un-weighted SPV) faced by the

Table 4: Uncertainty and parent firm returns dispersion

	(1)	(2)	(3)
Dep. Var.: $SD_{s,k,t}$			
Log GDP/cap.	0.058	0.063	0.065
	(0.46)	(0.42)	(0.41)
Δ GDP	0.953	0.553	0.046
	(0.66)	(0.80)	(0.98)
Δ CPI	-2.670	-2.033	-1.838
	(0.65)	(0.73)	(0.75)
Δ FX	0.292	0.352	0.067
	(0.91)	(0.89)	(0.98)
Log SPV	0.324	0.376	1.108***
	(0.20)	(0.14)	(0.01)
Log Foreign Assets		-0.226**	-0.141
		(0.03)	(0.20)
SPVxForeign Assets			-0.070**
			(0.01)
Time FE	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	10276	10163	10163
Adjusted R^2	0.715	0.715	0.716

p statistics in parentheses, with robust SE

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

parent firm increases the dispersion of the returns of its affiliates (Table 4, model 1-3). We also find that bigger firms, i.e. multinationals with either more assets abroad, have a lower Return on Investment volatility (Table 4, model 1-3). A 10% increase in the amount of foreign assets causes, all other things equal, a 0.48% lower volatility of returns on those assets (model 1). However, controlling for the parent firm

size does not change the value of the coefficient of the weighted volatility of the stock markets returns. All other things equal, a 10% increase of the stock price volatility among the countries present in the MNE's portfolio, increases the volatility of its returns on investment by about 0.37% (model 2). When we interact our size variable with our uncertainty variable, we find that an increase in stock price volatility has an heterogeneous impact that depends on the size of the parent firm. These estimates are consistent with the results from Desai et al. (2008). That is evidence that multinational firms are one conduit of the cross-border transmission of uncertainty shocks. Also, those results are an interesting example of a macro uncertainty shock in one country that generates micro-uncertainty in another country.

So far, we've seen evidence that firms with more equity assets held abroad show higher average and lower dispersion of returns (Table 2, model 2 and Table 4, model 3).

4.3. Direct investors' reaction to uncertainty shocks

Most internationalized French firms are present in more than one country. Therefor we study how uncertainty might drive the firm's FDI flows and portfolio reallocation in order to understand the firm strategy used to mitigate uncertainty shocks.

The dependent variable in Table 5 column (1) measures the net flow in year t between the parent firm and its affiliate, using the log transformation introduced in subsection 3.4 to account for negative values (i.e. disinvestment). In columns (2) and (3) the dependent variable is, respectively, the log net investment and disinvestment. We use the log of Reinvested Earnings in columns (4) and the share of Reinvested Earnings in Total Earnings in column (5). Finally, the share of country j in the parent firm assets is our dependent variable in column (6).

We now distinguish between global uncertainty, proxied by the expected volatility (VIX) as in Forbes and Warnock (2012), and country-specific uncertainty measured by the realized domestic stock market volatility (SPV).

French investors have some ability to hedge a country's risk by being present in a few different countries (Figure A.2 & Table 2 3). However, they seem to have a limited capability or willingness to redeploy

following an uncertainty shock. Country specific uncertainty has no statically significant effect on flows from or to the affiliate (Table 5, model 1-4), nor is it correlated with a lower share of reinvested earnings or lower country share among the parent firm foreign assets. Whereas both the growth rate and average rate of return of French affiliates in the country exercise a push-pull effect.

Much as the literature predicted, global uncertainty negatively affects the level of flows but has no impact on the portfolio weights. Reinvested earnings seem to be the most sensitive to global uncertainty (model 4). Their overall level is negatively correlated with the VIX, whereas their share in total earnings increases with it (although the coefficient is not statically significant)(model 5). We might have expected it to be lower instead, with parent firms repatriating a higher share of their profits to use as insurance against a global shock.

Table 5: Uncertainty and flows to affiliates

	(1) Neglog Outflow	(2) Log Investment	(3) Log Disinvestment	(4) Neglog Reinvested Earnings	(5) $\frac{RE_{s,j,k,t}}{I_{s,j,k,t}}$(%)	(6) $\frac{OF_{s,j,k,t}}{A_{s,k,t}}$(%)
L.Country average ROI	0.030***	0.008***	0.001	0.037***	-0.016	0.037**
	(0.00)	(0.00)	(0.85)	(0.00)	(0.67)	(0.03)
L.Δ GDP	2.473***	0.181	-0.372	2.727***	2.206	2.846***
	(0.00)	(0.18)	(0.13)	(0.00)	(0.23)	(0.01)
L.Log GDP/cap.	-1.266***	0.544***	0.723***	-0.981***	-6.214***	6.856***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
L.Δ FX	1.231**	0.220	0.147	1.708***	0.781	6.907***
	(0.04)	(0.23)	(0.64)	(0.00)	(0.72)	(0.00)
L.Log FXV	0.156	0.083***	0.102*	0.162	0.773*	0.280
	(0.12)	(0.00)	(0.06)	(0.10)	(0.06)	(0.16)
L.Rule of Law	0.855**	-0.106	0.014	0.971**	-2.010	-1.493
	(0.04)	(0.40)	(0.95)	(0.02)	(0.25)	(0.12)
L.Log Total Parent Firm Assets	-0.226***	0.165***	0.291***	-0.184***	-1.632***	-4.490***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
L.Log SPV	0.230	-0.034	-0.053	0.246	0.513	0.050
	(0.22)	(0.52)	(0.58)	(0.18)	(0.49)	(0.91)
L.Log VIX	-1.065***	-0.167***	-0.089	-1.188***	1.119	-0.620
	(0.00)	(0.00)	(0.34)	(0.00)	(0.14)	(0.14)
Sector X Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	34046	21885	10060	34043	27476	32695
Adjusted R^2	0.0983	0.566	0.509	0.115	0.338	0.785

p statistics in parentheses, with robust SE.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Following Héricourt et al. (2016), we compute a measure of Relative Uncertainty (11) which we substitute in Table 6 instead of the absolute measure we've used so far. Indeed, multinationals might be more sensitive to the country volatility relative to the volatility in the other markets they have access too. The dependent and control variables stay the same as in Table 5.

Using the Relative Stock Price Volatility instead of the absolute SPV leaves our results mostly unchanged. The coefficient of Relative SPV in columns (1) through (5) is not statically significant. It indicates once again that a country-specific increase in uncertainty does not result in significant changes in the amount of investment or disinvestment into the affected country.

Table 6: Relative Uncertainty and Flows to Affiliates

	(1) Neglog Outflow	(2) Log Investment	(3) Log Disinvestment	(4) Neglog Reinvested Earnings	(5) $\frac{RE_{s,j,k,t}}{I_{s,j,k,t}}$(%)	(6) $\frac{OF_{s,j,k,t}}{A_{s,k,t}}$(%)
L.Country average ROI	0.028***	0.008***	0.001	0.035***	-0.022	0.037**
	(0.00)	(0.00)	(0.82)	(0.00)	(0.55)	(0.03)
L.Δ GDP	2.346***	0.202	-0.366	2.562***	1.567	3.044***
	(0.00)	(0.13)	(0.13)	(0.00)	(0.38)	(0.00)
L.Log GDP/cap.	-1.313***	0.530***	0.725***	-1.026***	-6.248***	6.497***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
L.Δ FX	1.089*	0.229	0.148	1.541***	0.523	6.793***
	(0.07)	(0.20)	(0.63)	(0.01)	(0.81)	(0.00)
L.Log FXV	0.184*	0.084***	0.116**	0.194*	0.720*	0.266
	(0.07)	(0.00)	(0.04)	(0.05)	(0.08)	(0.18)
L.Rule of Law	0.815*	-0.105	-0.005	0.885**	-2.036	-1.866**
	(0.05)	(0.40)	(0.98)	(0.03)	(0.25)	(0.05)
L.Log Total Parent Firm Assets	-0.238***	0.171***	0.314***	-0.200***	-1.647***	-4.421***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
L.Log Relative SPV	-0.084	-0.051	-0.083	-0.079	0.388	-0.909**
	(0.45)	(0.13)	(0.12)	(0.47)	(0.39)	(0.04)
L.Log VIX	-0.899***	-0.190***	-0.126*	-1.006***	1.489**	-0.493
	(0.00)	(0.00)	(0.09)	(0.00)	(0.01)	(0.12)
Sector X Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	33392	21477	9830	33389	26936	32504
Adjusted R^2	0.0992	0.566	0.509	0.115	0.335	0.786

p statistics in parentheses, with robust SE.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

However, locations that suffered from a relative uncertainty shock the year before saw their weights in the parent firm portfolio decrease (Table 6, model 6). A 10% increase in the volatility of the destination country relative to the volatility of the other destinations in the multinational's portfolio decreases the share of the affected country in its portfolio by 0.09 percentage point. Since uncertainty doesn't seem to have an effect on flows to the more uncertain location, the only explanation is that flows to the other locations in the firm global portfolio increased.

We now present the results of our estimations at the parent firm level, using this version of equation (14):

$$\log OF_{s,k,t} = \alpha_1 \log \chi_{s,t-1} + \alpha_2 \log X_{s,t-1} + \beta \log Multi\_Uncertainty_{s,t-1} + \omega_s + \kappa_k + \upsilon_t + \varepsilon_{s,k,t} \quad (19)$$

Where $X_{s,t-1}$ is a vector of parent company characteristics, namely its foreign assets and its weighted average return and $\chi_{s,t-1}$ is vector of destination country characteristics weighted by there share in the portfolio of firm s.

Table 7: Relative Uncertainty and Flows to Affiliates

	(1) Neglog Outflow	(2) Log Investment	(3) Log Disinvestment	(4) Neglog Reinvested Earnings	(5) $\frac{RE_{s,k,t}}{I_{s,k,t}}$(%)	(6) Number of destinations
L.Parent Firm average ROI	0.023***	0.015***	-0.002	0.023***	-0.171***	-0.003
	(0.00)	(0.00)	(0.74)	(0.00)	(0.00)	(0.59)
L.Log Foreign Assets	0.284***	0.279***	0.430***	0.296***	-4.053***	0.448***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
L.Δ GDP	0.057	0.090	-0.799**	0.104	7.938**	-0.645*
	(0.82)	(0.68)	(0.02)	(0.67)	(0.04)	(0.06)
L.Δ CPI	-0.507	0.074	1.971	-0.882	19.199	-0.615
	(0.75)	(0.96)	(0.36)	(0.55)	(0.40)	(0.78)
L.Δ FX	-0.148	-0.243	-0.897	0.063	8.731	0.243
	(0.70)	(0.50)	(0.11)	(0.87)	(0.10)	(0.66)
L.Log GDP/cap.	0.049**	0.019	0.011	0.052**	-0.134	0.002
	(0.03)	(0.38)	(0.73)	(0.02)	(0.67)	(0.95)
L.Rule of Law	-0.172**	-0.175***	0.080	-0.118*	-1.513*	-0.272***
	(0.02)	(0.01)	(0.39)	(0.07)	(0.08)	(0.01)
L.Log FXV	0.063*	0.035	-0.036	0.065**	-0.332	-0.072
	(0.07)	(0.29)	(0.42)	(0.04)	(0.50)	(0.13)
L.Log SPV	0.003	0.049	-0.140*	-0.023	0.116	0.213***
	(0.95)	(0.34)	(0.07)	(0.67)	(0.89)	(0.00)
L.Log VIX	-0.263***	-0.262***	0.156	-0.263***	1.796	0.181**
	(0.00)	(0.00)	(0.12)	(0.00)	(0.11)	(0.04)
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10657	8628	5779	10657	8367	10654
Adjusted R^2	0.556	0.643	0.512	0.552	0.417	0.857

p statistics in parentheses, with robust SE.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

An increase in rule of law decreases the aggregate amount of investment in the next period. (Table 7, model 1-2) even when controlling with the GDP per capita as a proxy for the level of economic development.

Local uncertainty only has a statistically significant, and in that case negative, impact on the parent firm aggregate disinvestment flows (Table 7, model 3). Once again, when facing country-specific uncertainty, firms do not seem to react by lowering their investment into the affected country (model 1 and 2) or closing down a destination (model 6). To the contrary, disinvestment flows behave in a contra-cyclical fashion. One possible explanation could be capital controls get tighter when a country is facing uncertainty times, robbing multinationals of the possibility of reallocating their assets.

An increase in VIX does cause, as expected, lower investment (Table 5, model 1-2), higher disinvestment (Table 7, model 3) and lower reinvested earning (Table 7, model 4) but not as a share of total earnings (model 5) and oddly enough it is associated with a higher number of foreign locations in the following year

(Table 7, model 5). Overall, those results support the idea that even though multinationals suffer from country-uncertainty, they do not diminish their exposure to the more uncertain markets but may, when able, allocate new flows to other, supposedly less uncertain, locations.

5. Complementary results: the roots of FDI-specific uncertainty

Drawing inspiration from Gilchrist et al. (2014), our new estimate of uncertainty is based on the following two-step procedure. First, we remove the forecastable component of the variation of affiliates' returns using a variation of (13):

$$ROI_{s,j,k,t} = \alpha_1 \log X_{j,t} + \alpha_2 \log X_{s,t} + \alpha_3 \log X_{s,j,t} + u_{s,j,k,t} \tag{20}$$

Where j indexes counterpart countries and s indexes the affiliates present in country j and sector k in year t. $ROI_{s,j,k,t}$ is the yearly return of firm s in j and $X_(j,t)$ is a vector of country-level economic variables. In the second step, we compute the country-specific standard deviation of French affiliates idiosyncratic returns:

$$\sigma_{j,t} = \sqrt{\left(\frac{1}{S_{j,t}} \sum_{s=1}^{S_{j,t}} (\hat{u}_{s,j,k,t} - \tilde{u}_{j,t})^2 \right)} \tag{21}$$

Where $\hat{u}_{s,j,k,t}$ denotes the residual from the estimation equation (20) and $\tilde{u}_{j,t}$ is the country average unexplained variance. Thus, $\sigma_{j,t}$ is a measure of the time varying volatility of the returns of French firms in country j.

In the 3rd step, to explore the role of various types of risk in creating uncertainty for multinational firms operating abroad, we estimate the relationship between our new measure of return volatility and different country-specific risk proxies. We present some select results in Table 8. We find that most of our variables (IMF growth and inflation forecast errors, World Bank World Governance indicators and various variables based on conflict data provided by the Uppsala Conflict Data Program) are not significantly correlated with our FDI return volatility proxy. Boutchkova et al. (2012) find a similar absence of correlation between

country variables and stock market idiosyncratic return volatility. However, the financial sector Z-Score (distance to default) has a negative and statically significant impact on our variable of interest. The further away from default the financial sector of the destination country is, the lower the idiosyncratic return volatility of French affiliates in that country is. Caldara et al. (2016) similarly find that the tightening of financial conditions exacerbate the impact of uncertainty shocks on economic performance.

Table 8: Country risk and FDI return volatility

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.: log $\sigma_{j,t}$						
L.log $\sigma_{j,t}$	0.144***	0.143***	0.144***	0.137**	0.138**	0.143***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
GDP FC ERR	0.006					
	(0.66)					
CPI FC ERR		-0.007				
		(0.62)				
Log BZS			-0.262**			
			(0.02)			
Political Stability				-0.036		
				(0.58)		
Regulatory Quality					0.100	
					(0.32)	
War						0.027
						(0.71)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1033	1033	1011	995	995	1034
Adjusted R^2	0.423	0.423	0.397	0.423	0.423	0.423

p statistics in parentheses, with robust SE

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In a final step, following Caldara et al. (2016), we build a global uncertainty proxy specific to FDI. We assume that the country-specific uncertainty $\sigma_{j,t}$ follows an auto-regressive process. Therefore, we estimate the following equation:

$$\log s_{j,t} = \lambda_j + \log_{j,t-1} + \upsilon_t + \varepsilon_{j,t} \tag{22}$$

Where λ_j is a country fixed effect and $\varepsilon_{j,t}$ the error term.

The IVOL-FDI uncertainty proxy is the sequence of estimated time fixed effects υ_t which capture shocks to the idiosyncratic volatility that are common to all firms. Interestingly, it seems to closely follow VIX variation, with a correlation above 50% (A.5, lower right panel).

6. Preliminary Conclusion

Uncertainty has a negative direct impact on the performance of French affiliates abroad. Moreover, it causes firms to delay or cancel investment decisions, which generates additional losses for multinationals.

We also find that internationalized French firms have limited ability to re-allocate their Direct Investment portfolio following a country-specific uncertainty shock, though most firms are present in more than one foreign location and therefor have some ability to hedge against a country-specific shock.

When analyzing international risk sharing, the literature usually focuses on wealth transfers through valuation effects. Our study shows that the perturbations caused by uncertainty leads to significant operating losses for multinational firms, especially the smaller ones spread across more locations.

Additionally, we study the determinants of FDI specific uncertainty. We find that the health of the financial sector, proxied by its Z-Score, seems to be the main driver of FDI uncertainty.

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Appendix

A. Figures

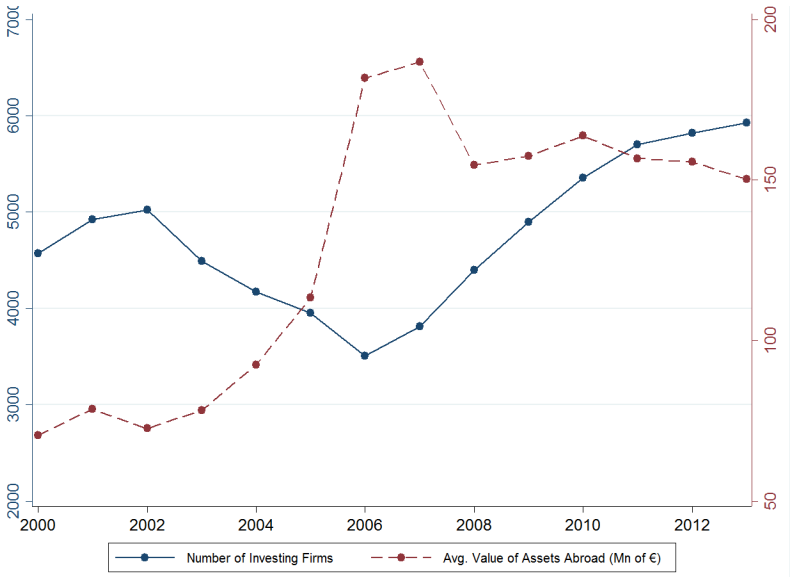

Figure A.1: Number of affiliates and average size (2000-2014).
Source: Authors and Banque de France

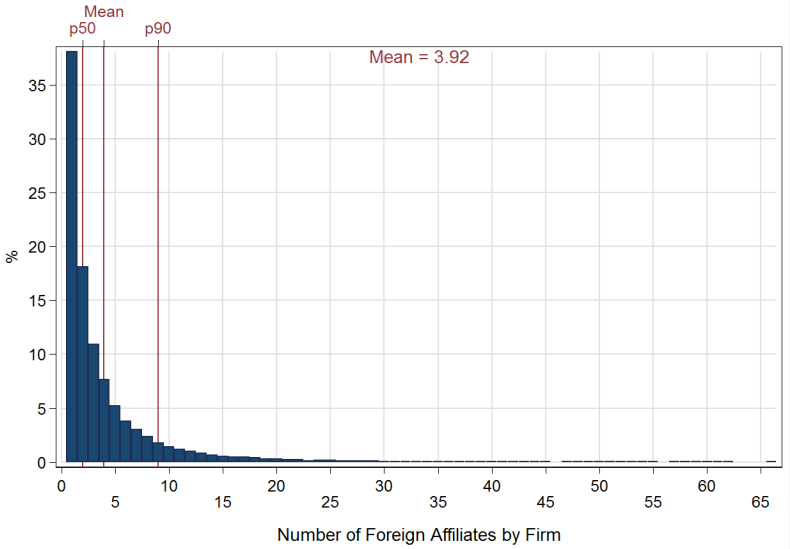

Figure A.2: Distribution of firms by amount of foreign destinations.
Source: Authors and Banque de France

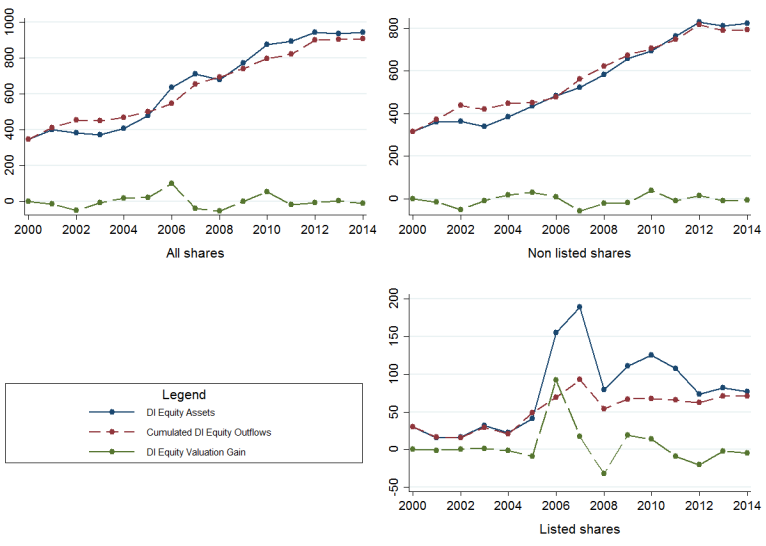

Figure A.3: Assets and cumulative outflows 2000-2014 (Bn. of €).
Source: Authors and Banque de France

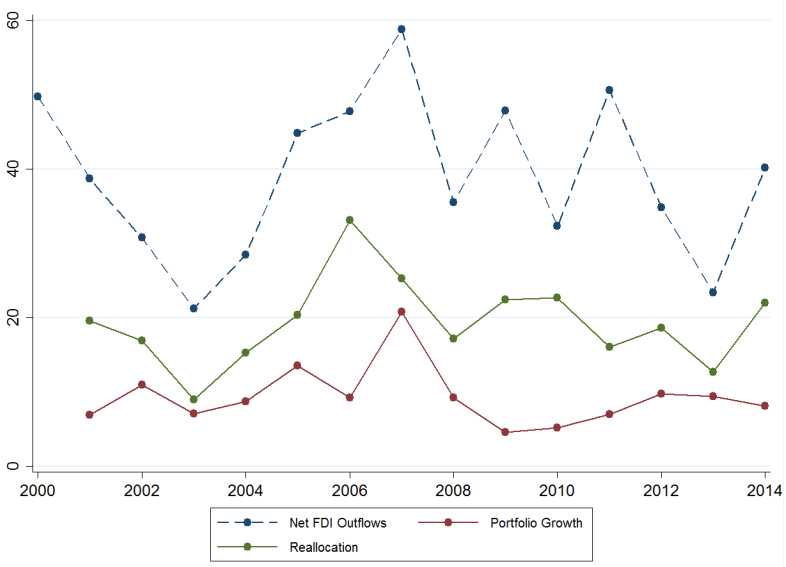

Figure A.4: Active reallocation and portfolio growth 2000-2014 (Bn. of €).
Source: Authors and Banque de France

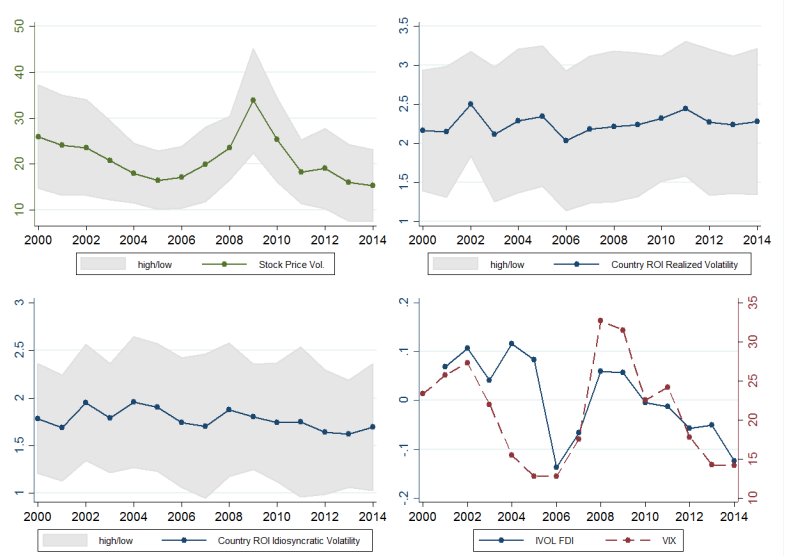

Figure A.5: Active reallocation and portfolio growth 2000-2014 (Bn. of €).
Source: Authors and Banque de France