Chapter 13
Direct Foreign Investment (DFI)

I. DFI

Definition: A *Direct Foreign Investment (*DFI*)* is a controlling ownership in a business enterprise in one country by an entity based in another country. Also called FDI.

- Controlling ownership: 10%+ of voting stock (World Bank/OECD).
- DFI is different from portfolio investing abroad.
- DFIs: Greenfield investments (building a new operational facility), mergers & acquisitions, a joint venture, etc.
- Instruments: Equity, Reinvestment of earnings, Debt.

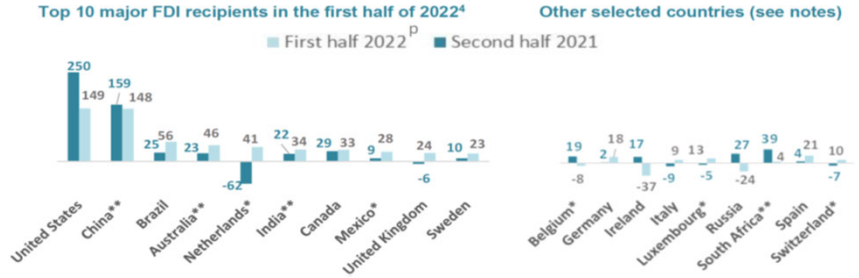
• According to OECD, global DFI in 2022 was **USD 1.01 trillion**. In **2020** (pandemic year), DFI was down **34%.**
- US biggest recipient of DFI, followed by China, Brazil, Australia, Canada.
- High income countries receive almost half DFI flows.

• **DFI: Global Flows**

Figure 2: FDI inflows for selected areas, Q1 2017-Q2 2022 (USD billion)

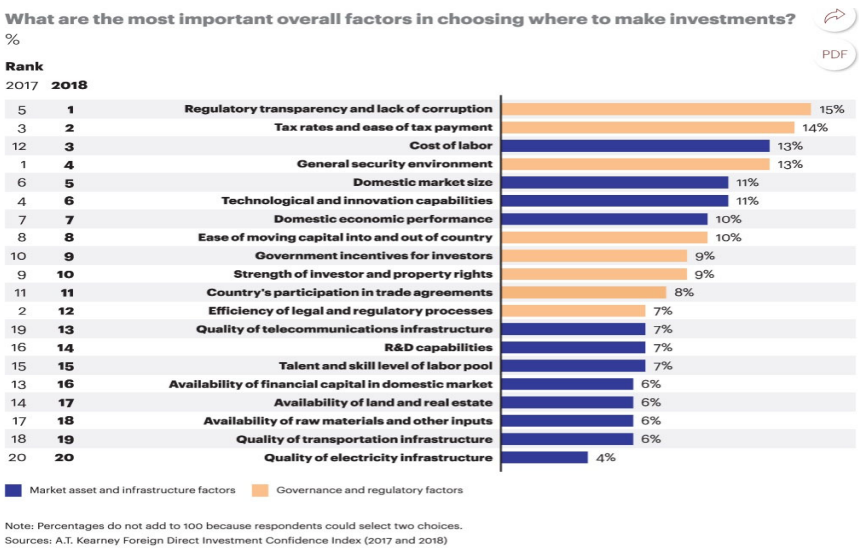
Notes: p: preliminary estimates
Source: OECD International Direct Investment Statistics database.

Figure 3: FDI inflows for selected countries, Q3 2021 – Q2 2022 (USD billion)



• **Factors behind DFI**:

According to the annual DFI survey of A.T. Kearney, the main drivers are *regulatory transparency/lack of corruption*, *taxes*, and *labor costs*.



Note: Percentages do not add to 100 because respondents could select two choices.
Sources: A.T. Kearney Foreign Direct Investment Confidence Index (2017 and 2018)

• **DFI**: **Why?**

• A domestic firm can sell a product abroad by:

- Producing at home and exporting production.
- Producing abroad (& do a DFI) and selling abroad.

• Q: Why DFI instead of exports?

A: Usual reasons:

◊ Access to cheap inputs (labor, energy, etc.)
◊ Avoid tariffs, quotas & reduce transportation costs
◊ Local management
◊ Take advantage of government subsidies
◊ Access to new technology
◊ Access to local expertise (including: contacts, red tape, etc.)
◊ Real option (investment today to make investments elsewhere later).
◊ *Reduce economic exposure*
◊ *Diversification*

• **Diversification through DFI**

MNCs have **many DFI projects**. MNCs select the project that improves their **risk-reward profile**.

• Popular risk-adjusted performance measures (RAPM):

Reward to variability (Sharpe ratio): **RVAR** = $E[(r_i - r_f)]/SD_i$.

Reward to volatility (Treynor ratio): **RVOL** = $E[(r_i - r_f)]/Beta_i$

Jensen's alpha measure: **Estimated constant** (α_i) on a CAPM-like regression

• We focus on RVAR & RVOL to evaluate projects. Q: RVAR or RVOL?

- **RVAR** (SR) uses total risk (σ); appropriate for *undiversified* portfolios. When asset *i* is a small part of a diversified portfolio; σ is inappropriate.

- **RVOL** (TR) emphasizes *systematic risk*, appropriate measure of risk, according to the CAPM, when a portfolio is diversified.

• **RVAR and RVOL**

Measures: $RVAR_i = \mathrm{E}[(r_i - r_f)]/\sigma_i$.

$RVOL_i = \mathrm{E}[(r_i - r_f)]/\beta_i$

Example: A U.S. investor considers foreign stock markets:

Market	$(r_I - r_f)$	σ_i	β_{WLD}	RVAR	RVOL
Brazil	0.2693	0.52	1.462	0.5170	0.1842
HK	0.1237	**0.36**	**0.972**	0.3461	0.1273
Switzerl	0.0548	0.19	0.759	0.2884	0.0722
Norway	0.0715	0.29	1.094	0.2466	0.0654
USA	0.0231	0.16	0.769	0.1444	0.0300
France	0.0322	0.22	1.073	0.1464	0.0300
Italy	0.0014	0.26	0.921	0.0054	0.0015
World	0.0483	**0.155**	1.0	0.3116	0.0483

Example: RVAR and RVOL (continuation)

Using RVAR and RVOL, we can rank the foreign markets as follows:

Rank	RVAR	RVOL
1	Brazil	Brazil
2	Hong Kong	Hong Kong
3	Switzerland	Switzerland
4	Norway	Norway
5	France	USA
6	USA	France

Note: RVAR and RVOL can produce different rankings. ¶

• Diversification through DFI: RVAR and RVOL

• Compute E[r_p] & Var[r_p] for a portfolio, compose by X & Y, as:

E[$r_{p=x+y}$] = ω_x * E[r_x] + (1 – ω_x) * E[r_y]

Var[$r_{p=x+y}$] = $\sigma^2_{x+y} = \omega_x^2 * \sigma_x^2 + \omega_y^2 * \sigma_y^2 + 2\,\omega_x\,\omega_y\,\rho_{x,y}\,\sigma_x\,\sigma_y$

$RVAR_p = (r_p - r_f)/\,\sigma_p$

• Compute β of the X+Y portfolio:

$\beta_{p=x+y} = \omega_x * \beta_x + (1 - \omega_x) * \beta_y$

$RVOL_p = (r_p - r_f)/\,\beta_p$.

Note: If project is added, MCN becomes X+Y

Y = Project MNC is considering

X = Existing portfolio of MNC –i.e., the "rest of the MNC."

Example: A US company considers two DFIs: Colombia & Brazil.

The firm has the following data, assuming r_f = 3%:

	E[r_i]	**SD[r_i] = σ_i**	**β_i**	**$\rho_{US,i}$**	**Weight**
US firm (EP)	**13%**	**12%**	**.90**	-	-
Colombia	18%	25%	.60	0.40	.30
Brazil	23%	30%	.30	0.05	.35

ω_{Col} = .30, $\Rightarrow (1 - \omega_{Col}) = \omega_{EP}$ = **.70**

ω_{Brazil} = .35, $\Rightarrow (1 - \omega_{Brazil}) = \omega_{EP}$ = .65

Q: Which project is better? Calculate a RAPM for each project:

- SR = E[$(r_i - r_f)$]/σ_i
- TR = E[$(r_i - r_f)$]/β_i

For the US company:

SR_{EP} = (**.13** – **.03**)/**.12** = .833

TR_{EP} = (**.13** – **.03**)/**.90** = .111

Example (continuation):

• Colombia – Calculation of SR and TR

$E[r_{EP+Col} - r_f] = \omega_{EP} * E[r_{EP} - r_f] + \omega_{Col} * E[r_{Col} - r_f]$

$= .70 * .10 + .30 * .15 = 0.115$

$\sigma^2_{EP+Col} = \omega^2_{EP} * \sigma^2_{EP} + \omega^2_{Col} * \sigma^2_{Col} + 2 * \omega_{EP} * \omega_{Col} * \rho_{EP,Col} * \sigma_{EP} *$

$= (.70)^2 * (.12)^2 + (.30)^2 * (.25)^2 + 2*.70*.30*0.40*.12*.25$

$= 0.017721$

$\sigma_{EP+Col} = (\sigma^2_{EP+Col})^{1/2} = (0.017721)^{1/2} = 0.1331$

$\beta_{EP+Col} = \omega_{EP} * \beta_{EP} + \omega_{Col} * \beta_{Col} = .70 * .90 + .30 * .60 = 0.81$

◊ $SR_{EP+Col} = E[r_{EP+Col} - r_f] / \sigma_{EP+Col} = 0.115/0.1331 = 0.8640$

◊ $TR_{EP+Col} = E[r_{EP+Col} - r_f] / \beta_{EP+Col} = 0.115/0.81 = 0.14198$

Example (continuation):

• Colombia – Interpretation of Ratios:

◊ $SR_{EP+Col} = E[r_{EP+Col} - r_f] / \sigma_{EP+Col} = 0.115/0.1331 = 0.8640$

Interpretation of SR: An additional unit of total risk (1%) increases returns by .864%.

◊ $TR_{EP+Col} = E[r_{EP+Col} - r_f] / \beta_{EP+Col} = 0.115/0.81 = 0.14198$

Interpretation of TR: An additional unit of systematic risk increases returns by .142%.

Example (continuation):

• Brazil

$E[r_{EP+Brazil} - r_f] = 0.135$

$\sigma_{EP+Brazil} = 0.1339$

$\beta_{EP+Brazil} = 0.69$

$SR_{EP+Brazil} = 0.135/0.1339 = 1.0082 > SR_{EP+Col} = 0.8640$

$TR_{EP+Brazil} = 0.135/0.69 = 0.19565 > TR_{EP+Col} = 0.14198$

$\Rightarrow$ Under both measures, Brazilian project is superior.

• Existing portfolio of the company (to compare to Brazilian project):

$SR_{EP} = (.13 - .03)/\mathbf{.12} = .833 < SR_{EP+Brazil} = 1.0082$

$TR_{EP} = (.13 - .03)/\mathbf{.90} = .111 < TR_{EP+Brazil} = 0.19565$

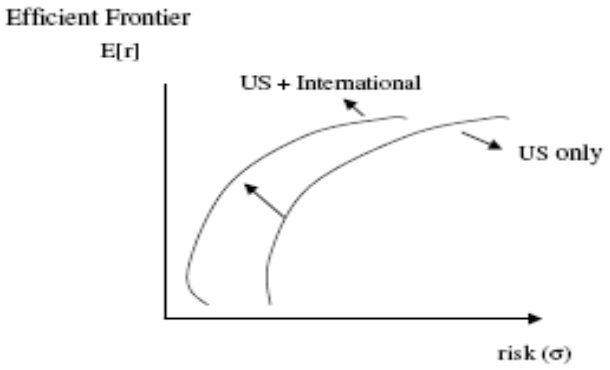
$\Rightarrow$ Using both measures, diversify internationally!

Q: Why? Because it improves the risk-reward profile for the company.

Why Go International?

• **Diversification**

If it is good to diversify in domestic markets, it is even better to diversify internationally.



Q: Why does the frontier move in the NW direction?

A: Low Correlations! Low correlations are the key to achieve lower risk.

• *Empirical Fact #1: Low Correlations*

The correlations across national markets (1970-2022) are lower than the correlations across securities in most domestic markets.

• Return correlations are moderate.
  - Average for developed markets: 0.52.
    ⇒ lowest average correlation in a developed market: Japan (0.38)
• Common economic policies matter:
  - Average intra-European correlation: .57
  - Average intra-Asian correlation: .42
• There is a regional (neighborhood) effect:
  - US & Canada = 0.76; Germany & France = 0.75
  - US & Japan = 0.39; US & New Zealand = 0.45.

• Emerging Markets tend to have lower correlations.

The lowest average correlations in our sample of 50 MSCI market:

Pakistan (0.21), Morocco (0.26), Nigeria (0.27), Argentina (0.28), Turkey (0.32), Indonesia (0.33) & Egypt (0.33).

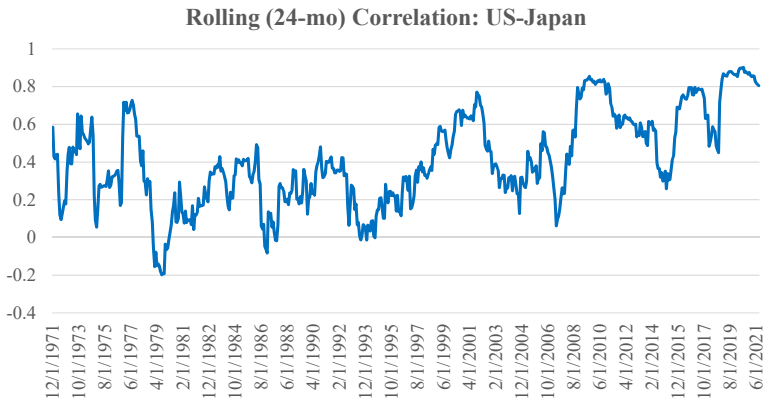
Remark: These are the countries that provide the highest diversification potential.

• *Empirical fact 2: Correlations are time-varying*

International correlations change over time. They can have wild swings.

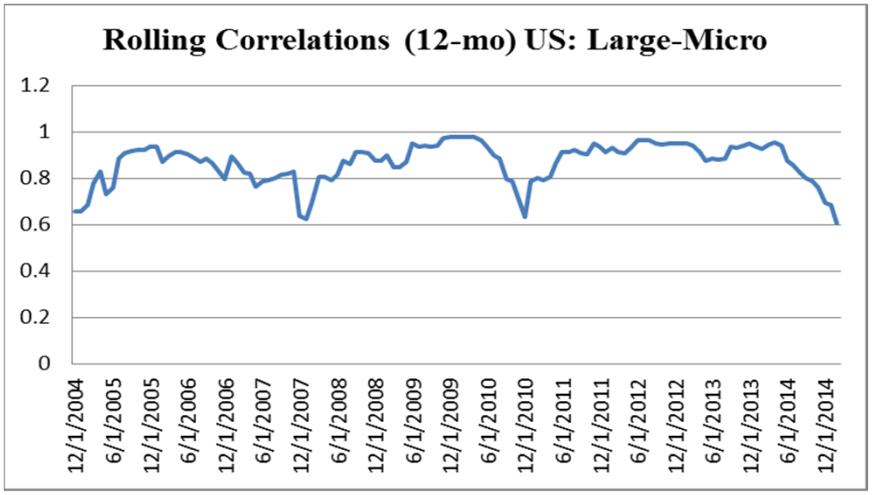
General finding: During bad global times, correlations go up

⇒ when you need diversification, you tend not to have it!



• *Empirical fact 2: Correlations are time-varying*

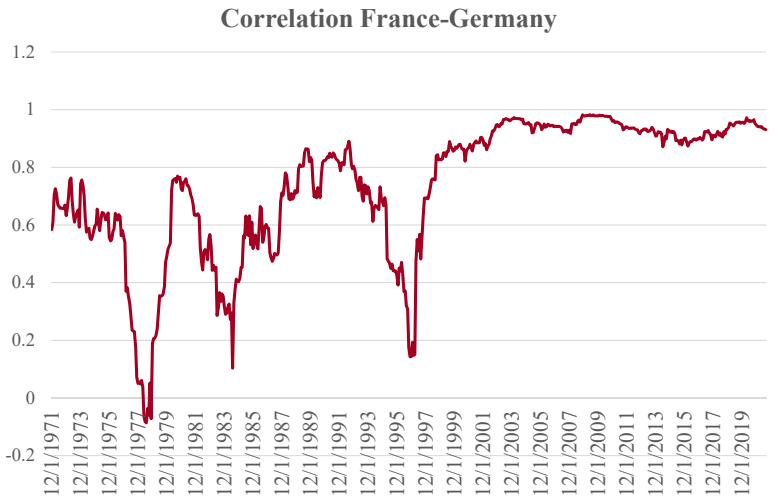
Correlations change over time: Also between U.S. stocks, but not as much as international correlation. Note also they are higher!



• *Empirical fact 2-A: Correlations seem to be increasing*

Correlations have increased over the last 25 years.

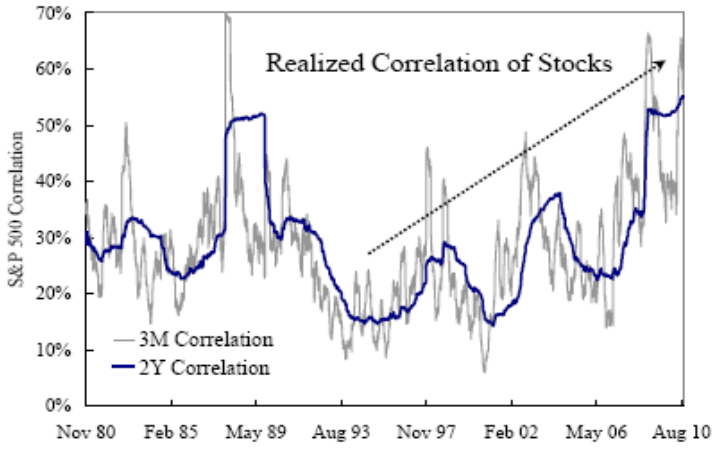
- Germany and France have become the *same* asset!



•*Empirical fact 2-A: Correlations seem to be increasing*

It also true at the domestic level. JPMorgan: "*Correlation Bubble*"

Figure 1: Realized Correlation of S&P 500 Stocks



Source: J.P. Morgan Equity Derivatives Strategy.

• *Empirical fact 2: Correlations are time-varying*

A "correlation bubble" is bad news for international (and domestic) investors: High correlations ⇒ more volatile portfolios.

• In addition, higher volatility ⇒ higher option premiums (higher insurance cost!).

• Investors like diversification. They look for low correlated assets: *treasury bonds*, *commodities* (gold, oil, etc.), *real* estate.

• But, diversification can work with highly correlated assets.

Example: The correlation between the U.S. and Canadian markets is .75, from 1970:Jan to 2021:June.

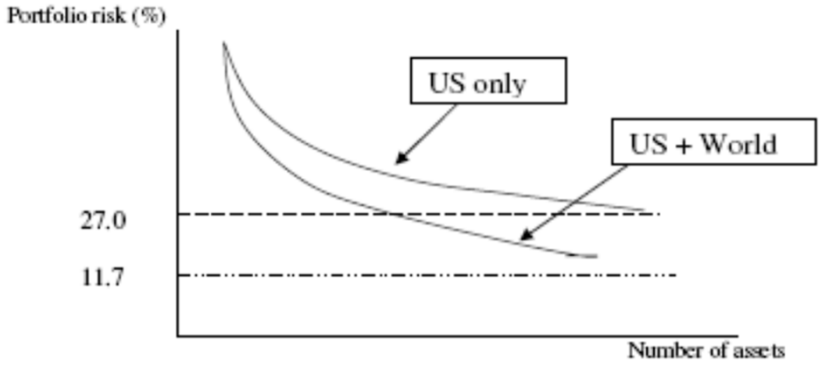
RVAR (U.S. only) = 0.15,

RVAR(50% US & 50% Canada)= 0.18.

• *Empirical Fact 3: Risk Reduction*

Past 12 stocks, the risk in a portfolio levels off, around 27%. For international stocks, the risk levels off at 12%

Figure 13.1: Effect of International Investment on Risk



• *Empirical Fact 4: Returns Increase*

Portfolios with international stocks have outperformed domestic portfolios in the past years. About 1% difference since 1978.

Q: Free lunch?

A: In the equity markets: Yes! Higher return (0.5%-1% more), lower risks (1%-2% less).

Example: Using monthly return data from **1970:Jan - 2021:June** we get:

$E[r_{p=US}] = 7.71\%$

$\sigma_{p=US} = 15.62\% \quad \Rightarrow RVAR_{p=US} = \mathbf{0.2055}$.

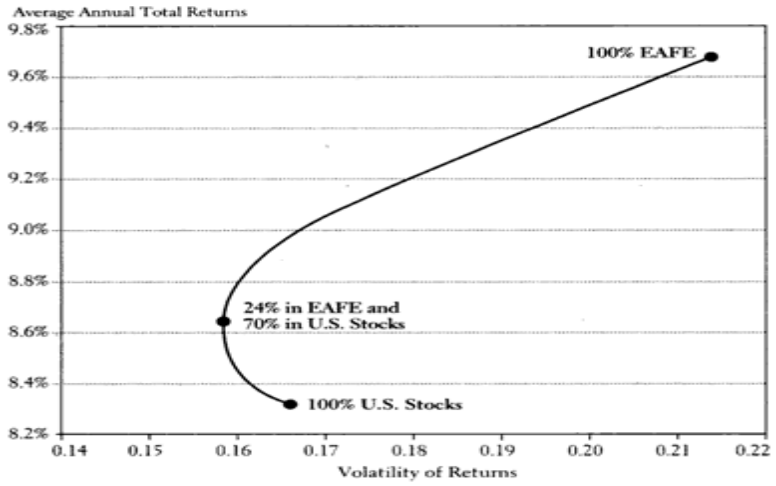
$E[r_{p=.75*US+.25*JAP}] = 8.32\%$

$\sigma_{p=.75*US+.25*JAP} = 14.53\% \quad \Rightarrow RVAR_{p=.75*US+.25*JAP} = \mathbf{0.2629}$.

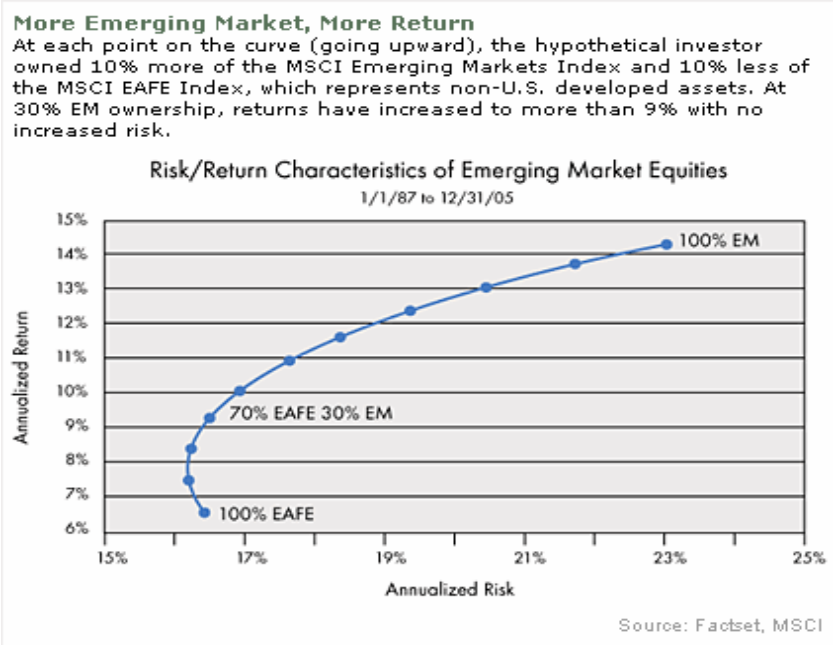
• Q: How to take advantage of facts 2 and 3?

A: True diversification: invest internationally.

Example: Lower Risk/Higher Returns!
Taken from H. Markowitz's "A Random Walk Down Wall Street."



Example: Lower Risk/Higher Returns II -The Case of EM



• *Empirical Fact 5: Investors do not diversify enough*

Many studies show that domestic investors tend to invest at home. In a 2002 UBS survey, the most internationally diversified investors are Netherlands (62%), Japan (27%) and the U.K. (25%).

⇒ The U.S. ranks at the bottom of list: only 11%.

More recent data, from Hu(2020), shows better proportions. For example, the U.K. & the U.S. international allocations are 70% & 30%, respectively.

This empirical fact is called the **Home Bias**.

Proposed explanations for home bias and low correlations:

(1) Currency risk.

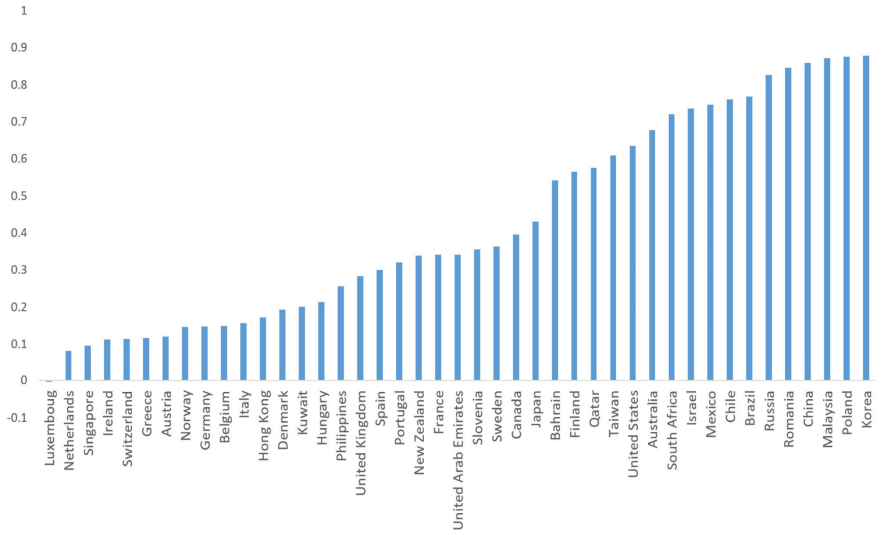
(2) Information costs.

(3) Controls to the free flow of capital.

(4) Country or political risk.

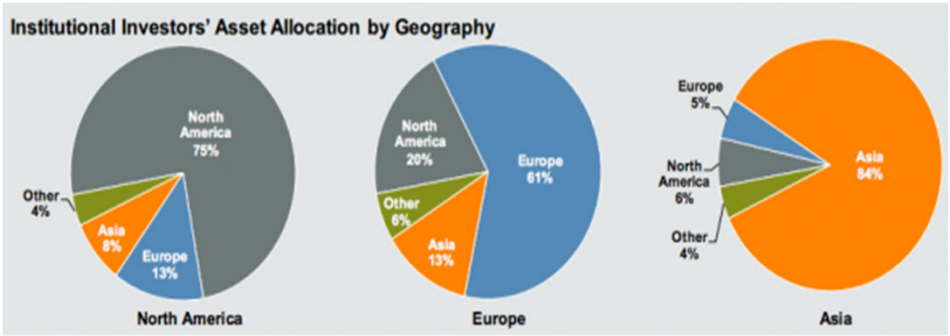
(5) Cognitive bias.

Example: Home Bias by Country, as reported by Hu (2020)



• Things have improved. I started teaching this class in 1995. The amount invested internationally by U.S. investors was less than 7%, one of the lowest numbers in the world!

• Home bias everywhere: Even for Institutional investors (2013 data)



• Why do we have a separate market segment: Emerging Markets?

- Information problem is big. It involves financial, product, and labor markets.
- Distortionary regulation and/or inefficient regulation
- Judicial system not reliable (contracts enforcement a question mark)

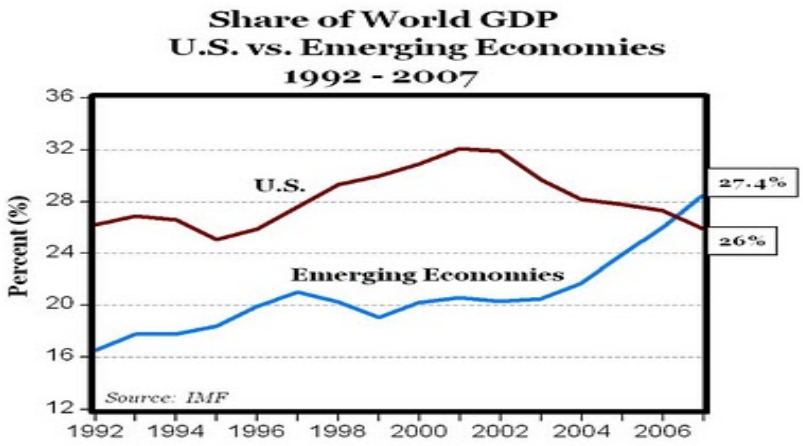
• Labor markets
  - Problems
    - Lack of educational institutions to train people
    - No certification and screening
    - Labor regulation that limits layoffs
  - Solutions
    - Groups provide training programs (group specific)
    - Internal labor markets

• Why do we have a separate market segment: Emerging Markets?

• Regulation
  - Problems
    - Too many regulations or unequal enforcement
  - Solution
    - Intermediation between government and individual companies. Lobbying & educating politicians.

• Judicial system
  - Problems
    - Contracts not enforceable
  - Solution
    - International arbitration clauses
    - Reputation for honest dealings

Related Question: What should be your international exposure?
- GDP weighted?



Related Question: What should be your international exposure?
- GDP weighted?
- Market capitalization weighted?