# FDI and credit constraints:
# The role of foreign subsidiaries

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# Ford in Valencia

- In June 2011, Ford announced its biggest reinvestment (€812 million or $1.2 billion) in the Spanish plant since 35 years (Reuters, 2011).

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# Outline

# This paper

1. presents a model for FDI finance which includes capital, labor and credit constraints.

   - gives theoretical substance to previous empirical findings (Gil-Pareja *et al.*, 2013)

2. provides a rationale to explain the role of settled affiliates in new FDI; and

3. provides empirical evidence suggesting that settled investors

   - Increase Greenfield FDI
   - Offset credit constraints at home
   - Offset distance costs

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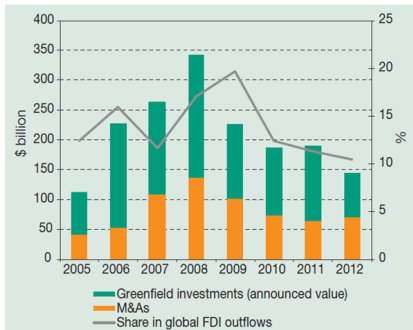   - Offset credit constraints at home
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# Global FDI flows (and projections)



Source: World Investment Report (WIR), 2013

# Fact 1: Credit constraints impact FDI.



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Greenfield projects represent a significant share of FDI outflows (WIR, 2013)

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Greenfield projects decreased during the crisis (Gil-Pareja *et al.*, 2013)

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Value of FDI greenfield projects, 2003–2012

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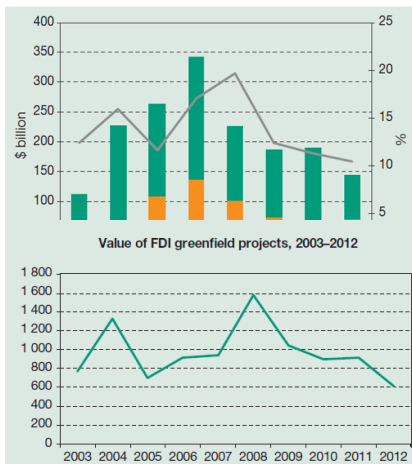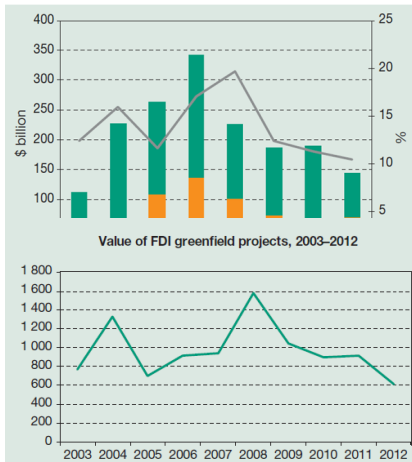


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# Fact 2: Reinvestment is a common practice



Top 100 TNCs

- Developing and transition economies New
- Developing and transition economies Expansion
- Developing and transition economies Co-Location
- Developed economies New
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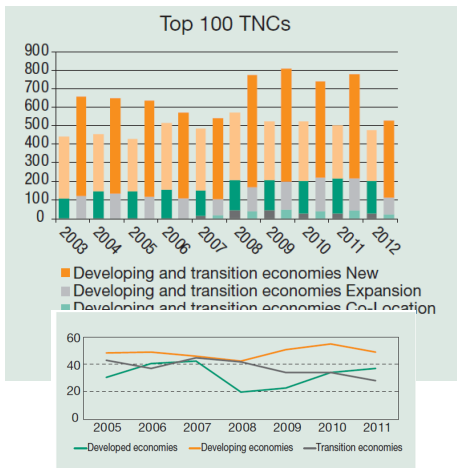Reinvestment are *less* affected by credit constraints (Gil-Pareja *et al.*, 2013)

# Summary statistics

Figure: Greenfield & Reinvestment FDI

Table: Summary statistics

|  |  | Greenfield | Reinvestment |
|---|---|---|---|
| Number of Projects | Total | 76,380 | 12,888 |
| Jobs created | Total | 15,071,984 | 3,092,384 |
|  | Average | 197 | 239 |
| Capital investment* | Total | 5,599,262 | 1,056,642 |
|  | Average | 73.30 | 82 |

Source: FDIMarkets, period 200-2010, (*million USD)

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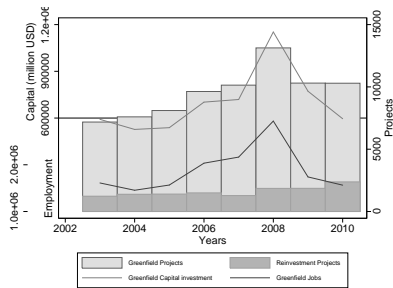


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# Take Away

- Credit constraints affect FDI

    - Empirical evidence reveals certain heterogeneity: greenfield vs. reinvestment

- Reinvestment in foreign affiliates may spill-over to other foreign firms

    - and financial constraints play a role in the magnitude of the spill-over

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# In a nutshell

- Greenfield firms choose between domestic and foreign capital finance in a Melitz framework
  - Domestic finance entails transfer costs and foreign finance bears search costs.

- Firms determine their financial choice with their financial ability in foreign markets.
  - Foreign affiliates alleviate the searching costs in the foreign financial market

- Credit constraints limit the effect of foreign affiliates
  - at the source country encourage the search for foreign finance
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# The setup

- A firm $k$ from country $i$ uses capital and labor to produce goods

- The firm procures capital through negotiation with domestic banks :

  - At this point, capital costs are only related to interest rates ($r_i + 1$)
  - We assume that search costs are irrelevant for domestic firms

- Limited commitment between the firm and the bank: incomplete contracts (Nunn, 2007)

Domestic Production

$$\max_{K,L} \pi_{iz}^{Dom} = \max \{ p_i \theta_z (K_D)^a (L)^b - (r_i + 1)((1 - \gamma_i) + \gamma_i \delta) K_D - w_i L - f_i \};$$

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# Trade

The firm starts exporting to country $j$ and faces transfer prices of $p_{ij} = p_i/\tau_{ij}$, where $\tau_{ij}$ is iceberg type costs between countries, which increases with distance:

$$\max_{K,L} \pi_{ijz}^{Exp} = \max\{p_i\tau_{ij}^{-1}\theta_z(K_D)^a(L)^b - (r_i+1)((1-\gamma_i)+\gamma_i\delta)K_D - w_iL - f_i\}$$

# Foreign Production with domestic finance

The MNE faces the following problem to determine its cross border investment:

$$\max_{K,L} \pi_{ijz}^{FDI(K_D)} = \max\{p_j \theta_z (K_D)^a (L)^b - \tau_{ij}(r_i+1)((1-\gamma_i)+\gamma_i \delta) K_D - w_j L - f_j\}$$

## Foreign Capital and labor

$$K_D^* = \begin{cases} \left( \dfrac{p_j \theta_z a\sigma^b}{\left(\tau_{ij}(r_i+1)((1-\gamma_i)+\gamma_i\delta)\right)^{1-b} w_j^b} \right)^{\frac{1}{1-\mu}} & \text{if } \pi_{ijz}^{FDI(K_D)} > \pi_{ijz}^{Exp} \\ 0 & \text{otherwise.} \end{cases}$$

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- The firm chooses finance if it is able to negotiate with foreign creditors in the same terms as indigenous firms.
- This scenario is similar to domestic production
  - the bank in $j$ lends capital to firm which will operate in $j$
  - no transaction costs associated with distance
- We assume that this depends on adeptness of other subsidiaries to the foreign financial market.

Our firm faces now the following limitation

$$\max_{K,L} \pi_{ijz}^{FDI(K_F)} = \max\{p_j \theta_z (K_F)^a (L)^b - c_{ijz}(r_j + 1)((1 - \gamma_j) + \gamma_j \delta) K_F - w_j L - f_j\}$$

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$$c_{ijz} = \begin{cases} 1 & \text{with a foreign subsidiary} \\ \tau_{ij} & \text{otherwise.} \end{cases}$$

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# Proposition: foreign finance decision

$$\rho = \frac{\tau_{ij}(r_i+1)((1-\gamma_i)+\gamma_i\delta)}{c_{ijz}(r_j+1)((1-\gamma_j)+\gamma_j\delta)} > 1$$

### Foreign finance increases in the:

1. distance between countries

   - if an affiliate is present!

2. financial frictions of the source country

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$$\rho = \frac{\tau_{ij}(r_i+1)((1-\gamma_i)+\gamma_i\delta)}{c_{ijz}(r_j+1)((1-\gamma_j)+\gamma_j\delta)} > 1$$

Foreign finance increases in the:

1. distance between countries
   - if an affiliate is present!
2. financial frictions of the source country
3. financial costs of the source country

Foreign finance decreases in the

1. financial frictions of the host country
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# Effect on capital and employment

- The foreign finance parameter $\rho$ measures the effect of access to foreign credit greenfield FDI:

$$K_F^* = \rho^{\frac{1-b}{1-\mu}} K_D^* \tag{1}$$

$$L_F^* = \rho^{\frac{a}{1-\mu}} K_D^*. \tag{2}$$

- The model leads to three main predictions for foreign capital investment and foreign jobs:

  1. Access to foreign credit through foreign affiliates reduces the negative impact of distance on FDI
     - If an affiliate is present, $\rho$ increases with distance
  2. and reduces the impact of systemic banking crises at home and increase investment, but
  3. foreign finance is limited by credit constraints at the host country.

# Gravity equation

$$FDI_{ijt} = exp \begin{pmatrix} \beta_1 \ln(D_{ij}) + \beta_2 \, border_{ij} + \beta_3 \, colony_{ij} + \beta_4 \, lang_{ij} \\ +\beta_5 smctry_{ij} + \beta_6 \, rel_{ij} + \beta_8 \, comcur_{ijt} + \beta_9 \, BIT_{ijt} \\ +\beta_{10} FTA_{ijt} + \rho \, Z_{ijt} + \rho_{\gamma_i} Z_{ijt} * GR_{it} \\ \rho_{\gamma_j} Z_{ijt} * GR_{jt} + \rho_D Z_{ijt} * \ln(D_{ij}) + \lambda_{it} + \lambda_{jt} \end{pmatrix} + e_{ijt}$$

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  - Extensive margin
  - Jobs (Paniagua & Sapena, 2014, 2015)
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# Results

| | FDI | | Extensive Margin | | Foreing Jobs | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $\ln(D_{\hat{\imath}})$ | -0.202*** | -0.427** | -0.073*** | -0.328*** | -0.221*** | -0.398*** |
| | (0.03) | (0.03) | (0.01) | (0.03) | (0.03) | (0.04) |
| $col_{\hat{\imath}}$ | 0.388*** | 0.537*** | 0.142*** | 0.559*** | 0.320*** | 0.471*** |
| | (0.07) | (0.05) | (0.02) | (0.06) | (0.07) | (0.07) |
| $lang_{\hat{\imath}}$ | 0.375*** | 0.472*** | 0.089*** | 0.426*** | 0.343*** | 0.673*** |
| | (0.06) | (0.05) | (0.02) | (0.06) | (0.06) | (0.07) |
| $smctry_{\hat{\imath}}$ | 0.175 | 0.130 | 0.002 | -0.007 | 0.196 | -0.084 |
| | (0.15) | (0.09) | (0.04) | (0.09) | (0.14) | (0.16) |
| $border_{\hat{\imath}}$ | 0.125 | 0.024 | 0.070** | 0.928 | 0.215*** | 0.132 |
| | (0.0768) | (0.06) | (0.02) | (0.06) | (0.07) | (0.08) |
| $rel_{\hat{\imath}}$ | 0.226* | 0.383*** | 0.094*** | 0.213*** | 0.168* | 0.128 |
| | (0.119) | (0.12) | (0.03) | (0.10) | (0.10) | (0.11) |
| $comcur_{\hat{\imath}t}$ | 0.012 | 0.051 | -0.005 | -0.005 | 0.048 | -0.041 |
| | (0.04) | (0.03) | (0.01) | (0.03) | (0.03) | (0.04) |
| $FTA_{\hat{\imath}t}$ | 0.0813 | 0.030 | -0.016 | 0.100** | 0.048 | 0.218*** |
| | (0.06) | (0.05) | (0.01) | (0.04) | (0.05) | (0.07) |
| $BIT_{\hat{\imath}t}$ | -0.152*** | -0.107** | -0.083*** | -0.158*** | -0.147*** | -0.090* |
| | (0.05) | (0.05) | (0.01) | (0.04) | (0.04) | (0.0) |
| $Z_{\hat{\imath}t}$ | 0.146* | 0.148** | 0.027 | 0.113 | 0.054 | 0.240** |
| | (0.08) | (0.07) | (0.03) | (0.09) | (0.07) | (0.09) |
| $Z_{\hat{\imath}t} * GR_{it}$ | -0.117 | 0.174 | -0.022 | -0.101 | -0.152 | -0.339 |
| | (0.221) | (0.14) | (0.09) | (0.21) | (0.23) | (0.22) |
| $Z_{\hat{\imath}t} * GR_{jt}$ | -0.384 | -0.115 | -0.167*** | -0.282** | 0.003 | 0.278 |
| | (0.32) | (0.26) | (0.05) | (0.12) | (0.33) | (0.31) |
| $Z_{\hat{\imath}t} * \ln(D_{\hat{\imath}})$ | 0.019** | 0.018** | 0.00353 | 0.014* | 0.007 | 0.025** |
| | (0.01) | (0.01) | (0.003) | (0.01) | (0.01) | (0.01) |
| Observations | 8877 | 27423 | 8877 | 27143 | 8877 | 27122 |
| $R^2$ | 0.45 | 0.70 | 0.42 | 0.71 | 0.68 | 0.77 |
| Method | OLS | PPML | OLS | PPML | OLS | PPML |

Robust standard errors in parentheses. Country*Year Fixed Effects included

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

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# Quantile Regressions

|  | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
|  | Q(0.10) | Q(0.25) | Q(0.50) | Q(0.75) | Q(0.90) |
| $Z_{ijt}$ | 0.282** | 0.144 | 0.225*** | 0.187** | 0.310*** |
|  | (0.14) | (0.12) | (0.08) | (0.09) | (0.07) |
| $Z_{ijt} * GR_{it}$ | 0.054 | 0.030 | 0.551** | 0.483* | 0.403* |
|  | (0.36) | (0.35) | (0.23) | (0.26) | (0.20) |
| $Z_{ijt} * GR_{jt}$ | 0.063 | -0.957* | -0.789* | -0.269 | -0.271 |
|  | (0.61) | (0.56) | (0.41) | (0.46) | (0.36) |
| $Z_{ijt} * \ln(D_{ij})$ | 0.035** | 0.022 | 0.028*** | 0.023** | 0.039*** |
|  | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
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Standard errors in parentheses

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| $Z_{ijt}$ | 0.282** | 0.144 | 0.225*** | 0.187** | 0.310*** |
| | (0.14) | (0.12) | (0.08) | (0.09) | (0.07) |
| $Z_{ijt} * GR_{it}$ | 0.054 | 0.030 | 0.551** | 0.483* | 0.403* |
| | (0.36) | (0.35) | (0.23) | (0.26) | (0.20) |
| $Z_{ijt} * GR_{jt}$ | 0.063 | -0.957* | -0.789* | -0.269 | -0.271 |
| | (0.61) | (0.56) | (0.41) | (0.46) | (0.36) |
| $Z_{ijt} * \ln(D_{ij})$ | 0.035** | 0.022 | 0.028*** | 0.023** | 0.039*** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| Observations | 8877 | 8877 | 8877 | 8877 | 8877 |

Standard errors in parentheses

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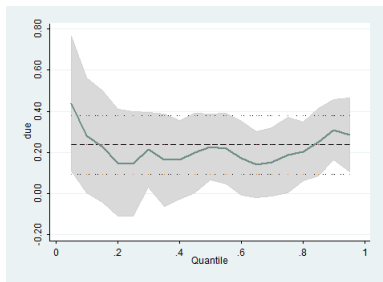
# Graphs



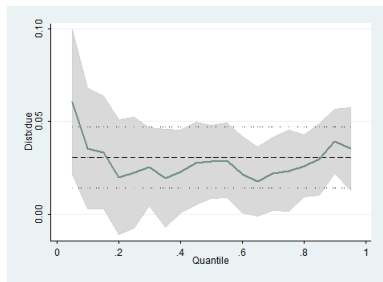Figure: Reinvestment effect by quantile



Figure: Distance by quantile

# Graphs
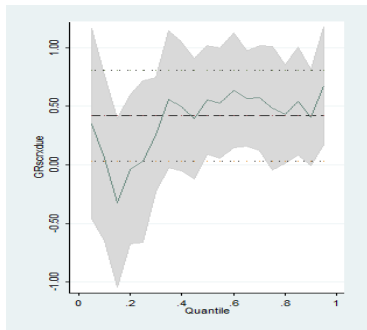


Figure: Credit constraints source
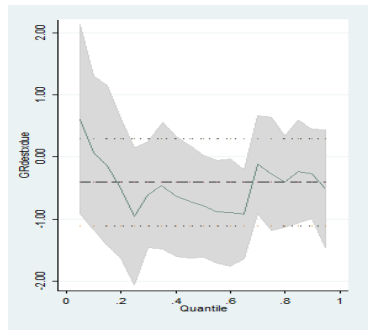


Figure: Credit constraints destination

# Results

| | FDI | | Extensive Margin | | Foreign Jobs | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $lnFDI_{ijt-1}$ | | 0.264*** | | | | |
| | | (0.07) | | | | |
| $lnN_{ijt-1}$ | | | | 0.139** | | |
| | | | | (0.06) | | |
| $lnjobs_{ijt-1}$ | | | | | | -0.051 |
| | | | | | | (0.08) |
| $\ln(D_{ij})$ | -0.195* | | -0.353*** | | 0.101 | |
| | (0.11) | | (0.10) | | (0.12) | |
| $col_{ij}$ | -0.016 | | -0.078 | | -0.067 | |
| | (0.17) | | (0.13) | | (0.20) | |
| $lang_{ij}$ | 0.471*** | | 0.472*** | | 0.548** | |
| | (0.18) | | (0.17) | | (0.23) | |
| $smctry_{ij}$ | 0.381 | | -1.473*** | | 0.431 | |
| | (0.34) | | (0.35) | | (0.33) | |
| $border_{ij}$ | -0.312 | | -0.252 | | 0.244 | |
| | (0.28) | | (0.36) | | (0.42) | |
| $rel_{ij}$ | 0.344 | | -0.220 | | 0.360 | |
| | (0.27) | | (0.17) | | (0.28) | |
| $comcur_{ijt}$ | -0.212* | 0.019 | 0.221** | 0.021 | -0.148 | -0.053 |
| | (0.12) | (0.04) | (0.09) | (0.04) | (0.15) | (0.05) |
| $FTA_{ijt}$ | 0.183 | -0.736** | -0.023 | 0.330 | -0.051 | -0.073 |
| | (0.19) | (0.31) | (0.21) | (0.23) | (0.21) | (0.52) |
| $BIT_{ijt}$ | -0.105 | -1.090 | -0.221* | 0.863 | 0.109 | -1.809 |
| | (0.19) | (1.11) | (0.13) | (0.74) | (0.23) | (1.77) |
| $\ln(Reinvestment_{ijt})$ | 0.204*** | 0.118* | 0.156*** | 0.065** | 0.143** | 0.149*** |
| | (0.05) | (0.06) | (0.05) | (0.03) | (0.06) | (0.06) |
| $\ln(Reinvestment_{ijt+1})$ | 0.021 | | -0.058 | | 0.075 | |
| | (0.04) | | (0.04) | | (0.06) | |
| $\ln(Reinvestment_{ijt-1})$ | 0.115* | | 0.063* | | 0.017 | |
| | (0.06) | | (0.04) | | (0.05) | |
| Observations | 511 | 871 | 513 | 871 | 511 | 871 |

# Results

| | FDI | | Extensive Margin | | Foreign Jobs | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $lnFDI_{ijt-1}$ | | 0.264*** | | | | |
| | | (0.07) | | | | |
| $lnN_{ijt-1}$ | | | | 0.139** | | |
| | | | | (0.06) | | |
| $lnjobs_{ijt-1}$ | | | | | | -0.051 |
| | | | | | | (0.08) |
| $\ln\left(Reinvestment_{ijt}\right)$ | 0.204*** | 0.118* | 0.156*** | 0.065** | 0.143** | 0.149*** |
| | (0.05) | (0.06) | (0.05) | (0.03) | (0.06) | (0.06) |
| $\ln\left(Reinvestment_{ijt+1}\right)$ | 0.021 | | -0.058 | | 0.075 | |
| | (0.04) | | (0.04) | | (0.06) | |
| $\ln\left(Reinvestment_{ijt-1}\right)$ | 0.115* | | 0.063* | | 0.017 | |
| | (0.06) | | (0.04) | | (0.05) | |
| Observations | 511 | 871 | 513 | 871 | 511 | 871 |
| Method | PPML | GMM | PPML | GMM | PPML | GMM |
| $R^2$ | 0.918 | | 0.993 | | 0.983 | |
| Country*Year FE | Yes | | Yes | | Yes | |
| Year FE | | Yes | | Yes | | Yes |
| Country Pair FE | | Yes | | Yes | | Yes |

# Results

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| | (1) | (2) | (3) | (4) | (5) | (6) |
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| | | (0.07) | | | | |
| $lnN_{ijt-1}$ | | | | 0.139** | | |
| | | | | (0.06) | | |
| $lnjobs_{ijt-1}$ | | | | | | -0.051 |
| | | | | | | (0.08) |
| $\ln\left(Reinvestment_{ijt}\right)$ | 0.204*** | 0.118* | 0.156*** | 0.065** | 0.143** | 0.149*** |
| | (0.05) | (0.06) | (0.05) | (0.03) | (0.06) | (0.06) |
| $\ln\left(Reinvestment_{ijt+1}\right)$ | 0.021 | | -0.058 | | 0.075 | |
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| $\ln\left(Reinvestment_{ijt}\right)$ | 0.204*** | 0.118* | 0.156*** | 0.065** | 0.143** | 0.149*** |
| | (0.05) | (0.06) | (0.05) | (0.03) | (0.06) | (0.06) |
| $\ln\left(Reinvestment_{ijt+1}\right)$ | 0.021 | | -0.058 | | 0.075 | |
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| Year FE | | Yes | | Yes | | Yes |
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| $lnFDI_{ijt-1}$ | | 0.264***<br>(0.07) | | | | |
| $lnN_{ijt-1}$ | | | | 0.139**<br>(0.06) | | |
| $lnjobs_{ijt-1}$ | | | | | | -0.051<br>(0.08) |
| $\ln\left(Reinvestment_{ijt}\right)$ | 0.204***<br>(0.05) | 0.118*<br>(0.06) | 0.156***<br>(0.05) | 0.065**<br>(0.03) | 0.143**<br>(0.06) | 0.149***<br>(0.06) |
| $\ln\left(Reinvestment_{ijt+1}\right)$ | 0.021<br>(0.04) | | -0.058<br>(0.04) | | 0.075<br>(0.06) | |
| $\ln\left(Reinvestment_{ijt-1}\right)$ | 0.115*<br>(0.06) | | 0.063*<br>(0.04) | | 0.017<br>(0.05) | |
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| Country*Year FE | Yes | | Yes | | Yes | |
| Year FE | | Yes | | Yes | | Yes |
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| Country*Year FE | Yes | | Yes | | Yes | |
| Year FE | | Yes | | Yes | | Yes |
| Country Pair FE | | Yes | | Yes | | Yes |

# Conclusions

1. A stylized model to explain FDI under credit contraints

   - Incomplete contracts & FDI finance

     - Foreign subsidiaries

2. Reinvestment in foreign subsidiaries alleviates:

   - The negative effect of distance on greenfield FDI
   - Credit constraints at home

3. The effect of subsidiaries is driven by the intensive margin

   - Foreign jobs

4. Policies targeted to established serve a double purpose

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