UNU-MERIT Working Paper Series

#2013-055

Determinants of firms' investment behaviour: A multilevel approach

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Working Paper Series on Institutions and Economic Growth: IPD WP15

This working paper is part of the research programme on 'Institutions, Governance and Long-term Economic Growth', a partnership between the French Development Agency (AFD) and the Maastricht Graduate School of Governance (Maastricht University – UNU-Merit). The research builds on the Institutional Profiles Database IPD, jointly developed by AFD and the French Ministry of the Economy since 2001.

ISSN 1871-9872

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In 2010, the French Development Agency (AFD) initiated a partnership with the Maastricht Graduate School of Governance (Maastricht University - UNU-Merit) with a view to exploring the conceptual and econometric relationships between institutions and long-term growth. As a development bank with a long-term lending horizon, AFD is particularly interested in better understanding the determinants of countries' long term economic, social, and political trajectory.

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(ii) Testing the econometric relationship between institutional measures and long term growth;
(iii) Exploring through a series of country case studies the historical relationship between processes of economic accumulation, forms of political organisation, and social cohesion;
(iv) Discussing conceptual frameworks for making sense of the interaction between political, social and economic forces in the process of development;
(v) Developing methodologies for political economy analyses.

The MGSoG/UNU-Merit team is involved in the five dimensions with a particular focus on the first two. Its primary objective is to explore the Institutional Profiles Database jointly developed by AFD and the French Ministry of the Economy since 2001. Institutional Profiles Database is unique by its scope (about 350 elementary questions pertaining to all institutional dimensions covering 148 countries in 2012), its entirely free access, and its ambition to incorporate the most recent theoretical advances in the field of political economy.

The present series intends to convey the results of our ongoing research, and in so doing to reflect the wealth of issues that can be fruitfully addressed from an "institutionalist" perspective. We hope that readers will find these papers stimulating and useful to develop their own understanding and research.

Nicolas Meisel (AFD)
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Determinants of Firms' Investment Behaviour: a multilevel approach*

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15/09/2013

Abstract

This paper investigates micro and macro determinants of firms' investment behaviour using firm data from 101 developing and emerging economies. A substantial number of firms in our sample does not invest in fixed capital or invests little relative to sales revenue. Using a multilevel probit model we study what factors trigger investment and using a multilevel Heckman selection model we study what factors influence a firm's investment to sales ratio. Although we find that both micro and macro determinants explain investment behaviour, firms' investment behaviour is heterogeneous in nature and has little dependency on a country's macroeconomic setting. In addition, we find that, on average, firms which are completely foreign owned have a relatively lower investment to sales ratio. Finally, we find evidence which suggests that the probability of investing is higher for firms located in countries with more property rights protection and control of corruption and we find some evidence which suggests that foreign owned firms located in countries with 'good' institutions invest relatively more.

Keywords: Multilevel, Investment, Foreign ownership, Institutions
JEL Classification: E22, F20, O11, O12, O43

*This study benefited from collaboration with the French Ministry for the Economy, Industry and Employment (MINEIE), the French Development Agency (AFD), and from suggestions by Denis de Crombrugghe and Bart Verspagen. The views expressed in this paper are the views of the author and do not necessarily represent views or policies of Maastricht University, UNU-MERIT, AFD, and other affiliated institutions. All remaining errors are those of the author.

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1 Introduction

Investors' confidence in making a profit is fundamentally important to economic success and long-term development. There is a large literature that investigates the role of risk in determining investors' willingness to invest and both the empirical literature as well as theory concludes that uncertainty over future revenues influences investment behaviour. Investment in fixed capital is particularly costly when investment is highly irreversible, i.e. when investors are limited in their possibility to resell such capital goods because of the firm-specific nature of investment or lacking second-hand markets for capital (Pindyck, 1991). As a result of high irreversibility of investment, uncertainty causes firms to delay investment (e.g. Pattillo, 1998).

This study contributes to the literature by empirically exploring the extent to which systemic uncertainties, e.g. related to countries' institutional and political environment, as well as other macroeconomic factors have an impact on firms' investment behaviour. An extensive macroeconomic literature suggests a strong relation between institutions and political stability and investment (e.g. Everhart et al., 2009; Acemoglu and Johnson, 2005; Mauro, 1995). We assess the *relative* impact of these and other macroeconomic factors on both the likelihood of investment and on firms' investment to sales ratio.

In addition, this study aims at contributing to the literature by investigating the extent to which private sector investment is influenced by firm-specific factors. We primarily focus on determining the degree to which there may be advantages associated with foreign equity ownership. If foreign investors have better access to finance, attracting foreign investors (i.e. in terms of equity ownership shares) can be an important source for the accumulation of capital. Yet, because cross-country microeconomic studies of the effect of foreign equity ownership on investment are scarce, there is no or limited evidence that provides an understanding of the extent to which firms with foreign ownership invest relatively more or relatively less. On the one hand, foreign equity ownership may decrease financing constraints and risks associated with investment and hence, foreign ownership may be related to relatively high investment in fixed capital. On the other hand, foreign investors may operate relatively more intensely in industries that require less long-term commitments.[1] And, if this hypothesis holds, we expect to see a negative relation between foreign ownership and investment. Additionally, we investigate whether there is a mediating effect of institutions on the relationship between foreign ownership and investment. Again, we assess both the determinants of the likelihood of investment and the determinants of firms' investment to sales ratio. We expect that countries with stronger protection of property rights and control of corruption are better able to attract foreign equity.

Whilst on the basis of macroeconomic studies, it is difficult to empirically separate foreign investment from domestic investment (e.g. Agosin and Machado, 2005), the microeconomic literature has been more successful in determining the relative benefit of foreign capital investment over investment under national control. For example, Koo and Maeng (2006) finds that Korean firms with high foreign ownership have relatively higher investment levels because foreign ownership decreases cash-flow sensitivity.[2] We

[1] One possibility is that foreign investors are relatively more dominantly active in or alongside extractive industries and/or high growth industries which require large initial investments but are less capital intensive over time. This hypothesis is merely tentative and more industry specific expertise is required to outline the dynamics of foreign investors' behaviour.

[2] Koo and Maeng (2006) use GMM and firm data from 1992-2002. Investment is measured as the ratio of capital expenditure at the beginning of each year over the capital stock at the beginning of each

are unaware of previous studies on the effect of foreign ownership on investment in a cross-country (firm-level) setting. Yet, several scholars do find a positive effect of foreign equity ownership on firms' performance, (Goedhuys and Srholec, 2010; Aitken and Harrison, 1999) and on firms' innovative behaviour (Srholec, 2010).

If firms' behaviour is influenced by the countries' institutional-policy mix, and is also determined by firm specific characteristics, to what extent is the investment level of a firm determined by a country's institutional environment? Furthermore, under what conditions is an increase in private sector investment associated with foreign equity ownership and other firm specificities? In order to reconcile evidence from the microeconomic investment literature with evidence from the macroeconomic investment literature, this study aims to unbundle firm-level and macroeconomic determinants of investment behaviour. We use a multilevel model to take into account both the firm-level and macroeconomic variation. To the best of our knowledge, this research is the first to use investment data from a large sample of developing countries for this purpose.

In conformity with previous studies on investment in developing countries, we find a high incidence of non-investment. As such, we resort to examine both the determinants of a firm's decision to invest and the determinants of a firm's investment to sales ratio in a multilevel context. On the basis of 101 countries and data for 45,580 firms and a probit model we find no clear evidence of a (positive or negative) relationship between foreign ownership and a firms' decision to invest. However, a negative relation between foreign equity ownership and investment becomes clearly visible following the results of a Heckman outcome model that examines the determinants of a firm's investment to sales ratio. A predictor of country-specific effects is used to determine the effect of a country's overall macroeconomic context on investment behaviour. Our analysis indicates a significant but relatively small impact of a country's overall macroeconomic context on investment (i.e. the likelihood of investment and the investment to sales ratio). This finding highlights that firms are heterogeneous in nature and are relatively unconstrained, in terms of investment, by a country's macroeconomic context. We find a significant effect of some macro-level variables on investment. For example, the likelihood of investment is higher in countries with relatively stronger property rights protection and control of corruption. Additionally we find a positive mediating effect of property rights protection and control of corruption on the relation between foreign ownership and investment.

2 Literature Review

In this study we aim to assess specific micro and macro determinants of investment. We focus on establishing the effect of foreign equity ownership and of institutions on firms' investment behaviour. These factors contribute to explaining a firm's degree of investment related uncertainty to the extent that foreign equity ownership and e.g. property rights protection may help reduce investment related risk. The relation between investment and uncertainty is described in real option theory. Real options investment theory generally predicts a negative relation between investment and uncertainty because high uncertainty is associated with high risk and therefore uncertainty causes investors to reduce investment in fixed capital (Pindyck, 1991). Especially when investment is highly irreversible, uncertainty can cause firms to delay investment. Overall, real options theory outlines a micro-mechanism by means of which different factors that influence uncertainty

year.

are related to investment.

Aside from foreign equity ownership and institutions, there are several other factors that influence the investment uncertainty relation: e.g. risk attitudes (Nickell, 1978), competition, financing constraints, and other macroeconomic factors. And, some of these other factors may set-off a positive relation between investment and uncertainty. Likewise on the basis of real options theory, Hartman (1972) argues that investment increases with the marginal revenue product of capital. And, Abel et al. (1996, pp 754) argue that "the future acquisition price of capital may be higher than its current acquisition price" and thereby, under uncertainty, firms may be more limited in their possibility to expand investment in the future. Several studies aim at determining the overall effect of uncertainty on investment or seek to establish the effect of macro-level uncertainties on investment. First, we proceed by providing a brief overview of the micro literature on investment and uncertainty. Second, we provide an overview of the macro literature that emphasizes the importance of the development of institutions for investment.

Empirical evidence on the effect of uncertainty on investment is inconclusive on the direction of this relationship but largely suggests that the negative investment uncertainty relation dominates the positive investment uncertainty relation (e.g. Fuss and Vermeulen, 2008; Lensink et al., 2005; Green et al., 2001; Guiso and Parigi, 1999 and see also the literature review by Carruth et al., 2000 and meta-analysis by Koetse et al., 2009). In particular, most evidence on the investment uncertainty relationship in developing countries suggests that uncertainty (as well as irreversibility) has a negative effect on investment. Here, researchers follow two distinct approaches. On the one hand, researchers measure uncertainty using micro data; for instance Ninh et al. (2004), Darku (2000), and Pattillo (1998) proxy uncertainty using firms' expectations of future sales, supply, and/or sales growth and Leefmans (2011), Shiferaw (2009), and Bo and Zhang (2002) measure uncertainty using data on firms' volatility of supply and/or demand and/or labour costs. On the other hand, Kumo (2006), Aizenman and Marion (1999), Serven (1998), and Serven and Solimano (1993) conduct a macroeconomic study where uncertainty measurements include volatility of GDP growth, volatility of real effective exchange rate, term of trade volatility, inflation.[3] Alternatively, Bigsten et al. (2005) find evidence for irreversibility by studying the dynamics of investment behaviour. Using investment data on African manufacturing firms, Bigsten et al. (2005, pp. 22) show that "firms refrain from investing during extended periods of time, rarely sell off capital stock, and adjust slowly to a new long-run equilibrium".

In addition to firm-specific sources of risk, it is likely that a country's institutional and political environment also influences investment behaviour. The role of macroeconomic factors in influencing firm-level investment behaviour has already been discussed in the work of Bernanke (1983). Examples of macroeconomic factors that drive investment include shocks from property markets, agriculture, trade, and monetary, fiscal, and regulatory policy (Bernanke, 1983). Several studies use microeconomic data to capture the effect of firm idiosyncratic factors on investment behaviour but do not specifically distinguish between idiosyncratic and systemic factors of uncertainty. Such studies rely on controlling for macroeconomic effects by means of time dummies and fixed effects in panel data analysis (for instance the work of Fuss and Vermeulen, 2008). Otherwise, firm-level studies on investment are limited to a cross-section analysis of a given country.

[3] Contrary to evidence on a negative uncertainty investment relation are the findings by Abdul-Haque and Shaoping (2008) who measure uncertainty using data about Chinese stock market return volatility and find that uncertainty positively effects investment.

For example, Darku (2000) studies firm investment behaviour using a cross-section of firms located in Uganda and interprets the negative uncertainty investment relation as partly stemming from investors' perceptions on macroeconomic policy i.e. privatization, trade liberalization, taxation, and interest rates.

Aside from macroeconomic factors, a country's institutional environment can arguably play an important role in determining firms' competitiveness and return to investment and can potentially act as a major growth driver influencing investment, R&D, innovation, and new business take-off. In developing countries where institutions are weak and/or failing, investment risk is higher. If 'bad' institutions are a source of uncertainty, a weak institutional development will negatively influence firms' choice to invest and possibly also firms' investment level. In fact, the macroeconomic literature concludes that favourable institutions and political stability are positively related to a country's level of (foreign and domestic) investment (Everhart et al., 2009; Daude and Stein, 2007; Acemoglu and Johnson, 2005; Mauro, 1995).

There are few attempts in the literature to investigate the impact of (cross-country) institutional factors on domestic investment on the basis of firm-level data. Asiedu and Freeman (2009); Batra et al. (2003); Gaviria (2002) find a negative effect of corruption on firm-level investment growth. However, because the authors measure investment *growth* as the percentage of growth of investment over a three year period the data does not capture the underlying structure of investment, i.e. frequent non-investment, low investment levels, as well as lumpy investments.

Literature on firm-level evidence on the relation between institutions and foreign direct investment yields more robust evidence on investment behaviour (Ayca; Javorcik and Wei, 2009; Kinda, 2010; Kesternich and Schnitzer, 2010; Henisz, 2000; James R. Hines, 1995). One interesting study in this respect is the cross-country study of Javorcik and Wei (2009), who specifically focus on the relation between corruption and foreign direct investment (FDI). According to the authors' theory, FDI and ownership structure is influenced by corruption because corruption increases the cost of obtaining licenses and permits. Javorcik and Wei (2009) also find that joint ventures can decrease transaction costs associated with corruption. The study of Kinda (2010) likewise uses cross-country firm data and finds a negative relation between some 'institutional problems' (e.g. firms' perception on crime) and FDI.

3 Data

3.1 Micro Data

This study is primarily based on firm data from the World Bank Enterprise Surveys (ES).[4] The firms included in the analysis are surveyed in the years 2006-2011 on the basis of a comparable data collection method over countries. This ES data collection is based on stratified random sampling with replacement where the strata are firm size, geographic region, and sector; stratification reflects the non-agricultural economic structure of each country.[5] Our analysis (and overall the ES data) excludes firms with 100% public ownership and firms operating in the following sectors: utilities, financial

[4] The data used in this study are collected from the ES 'comprehensive' dataset that combines various country survey data sets.

[5] The ES contain sampling weights but these weights were not used in the analysis mainly because some of the weights are extreme, causing single observations to impact results.

intermediation, real estate, and renting activities. The number of regions where surveys are conducted differs across countries. A relatively larger number of surveys are conducted in regions and economies that are larger in size and have a relatively high income level. Overall, firm size is stratified according to the number of permanent employees: small (5-19 employees), medium (20-99 employees), and large (100 or more employees).

Our dataset consists of 45,480 firms, 121 surveys, and data for 101 developing and emerging economies (20 countries are surveyed twice). Table 7 in Appendix A lists the countries considered in the analysis. By country, we also list the (fiscal) year(s), the total number of firms and the number of firms that invest, the number of firms defined as foreign owned, and the number of firms categorized by sector and by firm size. Overall, the sample consists of a reasonable number of observations given the limited availability of firm-level data that is fit for comparing developing countries. Nevertheless, because the samples are relatively small we remain mindful that the country samples are merely approximations for investment behaviour of each respective economy. As a result of item non-response, miss-codifications and sampling errors a total of 14,759 firms are excluded from the analysis.

Investment data collected in the surveys measure the total annual expenditure for purchases of equipment and machinery during a given fiscal year. The definitions of the firm-level variables are indicated in Table 8 in Appendix A. We code firms to have zero investment whenever a firm indicated that it did not invest in fixed assets in the last fiscal year and data on the amount of investment is also missing.[6] Whenever investment is larger than zero, our dependent variable ($Investment$) is equal to the natural logarithm of the investment to sales ratio and hence excludes all observations with zero investment. As shown in the first histogram of Figure 3 in Appendix A, $Investment$ has a log-normal distribution. Alternative measures for firms' investment level used in the literature are the natural logarithm of investment, investment as a ratio of the capital stock, and capital as a ratio of labour. Because of ES data limitations we prefer the measure of investment to sales over the later two alternative measures and prefer our scaled measure of investment over the non-scaled measure. The dependent variable (i.e. investment and sales data) is the biggest culprit of item non-response and causes the exclusion of 8,707 observations. Still, overall, we expect that the item non-response follows a random process and does not inflict serious bias.

In agreement with the findings of Gebreeyesus (2009) and Bigsten et al. (2005) on investment in Africa, a significant share of firms in our sample of developing countries invest close to zero or do not invest. The total number of firms that do not invest is 21,829; 52% of the firms in our sample invest. The average percentage of firms located in Africa that invest is 45%. This percentage is lower than the average percentage of firms that invest in Latin and Central America which is 56% and in Eastern Europe which is 60%. This pattern of non-investment is different from that documented by Lensink et al. (2005) who use a sample of firms located in the Netherlands, out of which about 87% have positive investment. In order to capture a firm's decision to invest we construct a

[6] From the sample of firms used in this study, 161 firms reported to not have invested but in fact did report a positive level of investment. Another 232 firms reported to have invested (in either machinery and equipment or land and buildings) but did not report the amount of investment in machinery and equipment and neither invested in land and buildings. We expect that this (possible) bias does not affect estimations because of the relative small number of occurrences. For methodological reasons, countries (i.e. surveys) where none of the firms have positive investment are not included in our sample. Also, the surveys for Nigeria-2007, Venezuela-2006, and Pakistan-2007 are not considered in the analysis because of missing variables.

binary dependent variable '*Invest*'. This variable is equal to 1 whenever a firm invests and otherwise is equal to 0.

As already mentioned, many firms in our sample invest close to zero. When only taking into account the firms that invest, the median level of investment—measured as the investment to sales ratio—is 3%. Overall, this suggests that firms frequently postpone investment, possibly because investment is largely irreversible. The distribution of investment as a ratio of sales is plotted in the second histogram of Figure 3 in Appendix A. To improve data visualization, a ceiling is placed on values where the investment to sales ratio is higher than 1. Still, it is clear that the distribution is positively skewed and has a long right-tail. Mainly because this distribution has such a strong degree of skewness we prefer to measure investment as the natural logarithm of the investment to sales ratio.

We measure the effect of foreign ownership using dummy variables. Because the effect of partial foreign ownership on investment may be different from that of completely foreign equity ownership on investment we experiment with a dummy which is equal to 1 if a firm has any level of foreign equity ownership but not a 100% ownership share (*P_Foreign*, 2,739 firms). And, we construct a dummy which captures the effect of whether a firm has a 100% share of foreign equity ownership (*Foreign*100, 3,028 firms).[7]

We control for the effect of labour costs (wages, salaries, and bonuses) as a ratio of sales revenue (*Labour*) and for the effect of a firm's age (*Age*).[8] Moreover, on the one hand, we expect that the propensity of investment in fixed assets (including investment in replacement equipment and machinery) is relatively higher for large firms than for small firms. Large firms have a greater production capacity and are more able to redistribute the cost of capital and adjustment costs over time. On the other hand, we expect that the relative fixed cost of investment is higher for smaller firms than for larger firms, for example because of scale effects. Therefore, in a given year, we expect that on average smaller firms invest less in fixed assets than larger firms. As a proxy for size we use the logarithm of the number of permanent full-time employees (*Size*). Observations are excluded when the number of full-time permanent employees of the firm is less than five.[9] Additionally, we control for the effect of firms' access to foreign markets using the variable *Export*. *Export* is a binary variable that is equal to 1 when a least part of a firms' sales are exported and that is equal to 0 when all the establishments' sales are national.

The Enterprise Surveys are based on a range of difference industry classifications. We adopt the following industry classification: (1) leather, garments and textiles, (2) food, (3), metals and machinery, (4) chemicals and pharmaceuticals, (5) other manufacturing, (6) retail and wholesale trade, (7) hotels, restaurants and other services, and (8) construction and transportation and include these sector classifications as additional dummy variables in the analysis.

Finally, three variables are used as controls for a firm's decision to invest and as selection variables required for the analysis on firms' investment to sales ratio. These variables measure the perception of a given firm/entrepreneur on obstacles that could inhibit investment: access to land (*Land*), access to finance (*Finance*), and informal

[7] The distribution of foreign equity shares is illustrated in Figure 4 in Appendix A.

[8] *Labour* = ln(labour costs) - ln(sales); *Age* = ln(year in which the surveys were sampled - year of establishment + 1). A small number of firms were established in the year the survey was conducted.

[9] As a result of stratification difficulties, the variable used to stratify firms according to size does not always correspond to the number of full-time permanent employees reported on the basis of the survey analysis. We only exclude observations that are outside our sample population of interest.

sector competitors (*Competitor*). We expect that entrepreneurs that are interested in investing are relatively more concerned with obstacles related to finance, acquiring land and competitors. We recode these variables as dummy variables where 0 represents no obstacles, minor obstacles, or that the obstacle is not applicable to the firm. And, the variables are coded 1 whenever a firm indicated the obstacles are moderate, major, or very severe.

3.2 Macro Data

Why do firms invest less or less frequent in, for example, Angola than in Brazil? Why do some countries attract more foreign equity than other countries do? In an attempt to explain some of this cross-country variation in investment we explore the impact of macro determinants on investment. We control for real GDP per capita (*GDP*) in constant prices, and growth measured as the logarithmic change in GDP with respect to the previous year (*Growth*) from Heston et al. (2012) (chain series). Moreover, we control for a country's degree of *de jure* financial openness (*Kaopen*) using data collected by Chinn and Ito (2008) (updated to 2010) and *de facto* trade openness (*Openness*) using data from Heston et al. (2012). In addition, we control for the percentage of real interest rates (*Interest*) using data from World Bank (2012).[10]

A country's institutional development is measured using two proxies. First, property rights protection (*Property*) is measured using data from the Heritage Foundation (2013).[11] Second, data from Transparency International (2011) is used to measure control of corruption (*CPI*).[12] In agreement with the macroeconomic literature on institutions, we expect that investment is positively related to property rights protection and control of corruption. We additionally use a proxy for political stability from Marshall and Jaggers (2009) (*Polity*) in the regression analysis. *Polity*2 measures the degree to which the political economy of a country approximates either a democratic or an autocratic regime. Higher values of *Polity*2 correspond to more democracy. Because property rights, corruption and political economy are closely related we do include these variables in the same regression model.

Because of missing data the analysis with macro data excludes data on the following countries: Afghanistan, Benin, Burkina Faso, Cote d'Ivoire, Democratic Republic of Congo, El Salvador, Eritrea, Ghana, Guinea, Guinea-Bissau, Kazakhstan, Kosovo, Mali, Montenegro, Niger, Senegal, Serbia, Timor Leste, Togo, Turkey, Uzbekistan, Vanuatu, and Zimbabwe. Analysis using *Property* additionally excludes data on Iraq. Analysis using *CPI* additionally excludes data on Samoa and Micronesia, and analysis using the *Polity*2 data additionally excludes data on the following countries: Bosnia and Herzegovina, Iraq, Micronesia, Samoa, Tonga, and Trinidad and Tobago. Unless indicated otherwise, the micro data are matched with the macro data on the basis of the last

[10] To avoid the exclusion of several firms from the analysis we replacing missing data on interest rates in 2009 for Ecuador with data from 2006. And, we replace missing data on interest rates in 2010 for Ethiopia with data from 2008.

[11] To avoid excluding several countries because of missing data on property rights, we replace data on property rights from 2009 for the missing observations of the following counties: Bhutan, Micronesia, Tonga, and Samoa. Additionally, we use data from 2006 to replace missing data for Angola (2005 only) and Burundi.

[12] To avoid excluding several countries as a result of missing observations, we replace Transparency International (2011) data from 2005 or 2006 for the missing CPI data for 2005 for Burundi, Mauritania, Rwanda, and Swaziland. Also, we use data from 2005 for the missing CPI data for 2008 for Fiji.

complete fiscal year in which investment and sales data are recorded - *1*.[13] As such, we assume that (on average) when deciding whether and how much to invest firms are sensitive to country-level signals from the preceding year.

4 Method

At this point, it is unrealistic to assume that a firm's observed investment is independent of country effects given our observed covariates. In particular, we wish to relax the assumption that the effect of foreign ownership on investment is the same across countries. On the basis of a random-intercept model we account for the nested structure of our dataset and identify the extent to which firms' behaviour is influenced by both firms' specificities as well as by the macroeconomic and institutional structure of a firms' country. The random-intercept model can also be referred to as a multilevel model, a hierarchical model, or as a mixed effects model.[14] The advantage of a multilevel modelling approach is that we can estimate the degree of dependency of a firm on a given country context. Also, the standard errors of multilevel models are more accurate than those of a single-level model because they are dependent on the number of countries on the basis of which we identify the country effects and they are not dependent on the number of firms. A random-intercept model with level-one (micro) and level-two (macro) covariates is given in equation 1.

$$\begin{aligned} y^*_{ij} &= \beta_1 + \beta'_2 x1_{ij} + \beta'_3 x2_j + \varepsilon_{ij} + \upsilon_j \\ &= (\beta_1 + \upsilon_j) + \beta'_2 x1_{ij} + \beta'_3 x2_j + \varepsilon_{ij} \end{aligned} \tag{1}$$

Here the latent variable, investment, is denoted by y^*_{ij}, where i represents a given firm and j represents a given country. $x1_{ij}$ is a vector that contains the micro-level covariates and $x2_j$ is a vector that contains the macro-level covariates. The total residual error component contains a level-one residual and a level-two residual: $\epsilon_{ij} \equiv \upsilon_j + \varepsilon_{ij}$. We assume that $E(\upsilon_j | x1_{ij}, x2_j) = 0$ and that $E(\varepsilon_{ij} | x1_{ij}, x2_j, \upsilon_j) = 0$. Hereafter, the β_1, β_2, and β_3 are also referred to as 'fixed' parameters and υ_j is referred to as a 'random' parameter that remains constant within a country.

We produce a two-step Heckman selection model (type II Tobit) that takes into account the non-linear nature of our investment variable that is caused by the high level of non-investment as was discussed in section 3.1. The first step of the Heckman selection model consist of a probit model that estimates the determinants of firms' decision to invest. Here, the decision to invest is summed as a binary dependent variable $y_{ij} = 1[y^*_{ij} > 0]$. Following equation 1 and the probit model, the error terms $\upsilon_j | x1_{ij}, x2_j$ and $\varepsilon_{ij} | x1_{ij}, x2_j, \upsilon_j$ have a probabilistic distribution.

In the second step of the Heckman selection model we use a random-effect model to estimate the determinants of firms' investment to sales ratio. This second step of the Heckman selection model is also referred to as the 'outcome' model. Here, $y_{ij} = y^*_{ij} \times 1[y^*_{ij} > 0]$. As such, the specification of y^*_{ij} (equation 1) is different between the probit and the outcome model (i.e. for step one and step two of the Heckman selection model). In the second step, the Heckman selection model uses the so-called inverse Mills ratio (λ) as an additional explanatory variable to correct for the fact that the probability of investment is higher for certain types of firms. The inverse Mills ratio is computed on the

[13] The last complete fiscal year of a firm is either one or two years prior to the data collection.
[14] See for example the work of Greenland (2000) for an introduction to multilevel modelling.

basis of the $\hat{\beta}$ estimates of our probit model and corresponds to the respective ratio of the standard normal density distribution function over the cumulative standard normal distribution function: i.e. $\lambda(z)=\frac{\phi(z)}{\Phi(z)}$.

In section 3.1 we already outlined three variables *Land*, *Finance*, and *Competitor*, that may help control for the selection bias. These three variables are part of vector $x1_{ij}$ in the probit selection model. Darku (2000), Bigsten et al. (1999) and Pattillo (1998) also use a Heckman selection model to estimate investment levels. These authors do not find a significant selection effect (of the coefficient of λ) in the outcome model. To investigate the impact of the selection effect on our covariates of interest we also produce random-effect models that do not include λ. Finally, in order to improve our prediction of υ_{ij} we use restricted maximum likelihood estimation, which in contrast to unrestricted maximum likelihood estimation, corrects for the loss in degrees of freedom and therefore does not suffer from downward bias in estimating the between-country population variance (Rabe-Hesketh and Skrondal, 2008).

We are fairly comfortable assuming that, within the context of analysis, our analysis on the effect of macroeconomic variables on investment does not suffer from endogeneity problems. Specifically, it is unlikely that the investment behaviour of a single firm has a significant influence on macro-level outcomes. However, as a result of unobserved heterogeneity some of the firm-level explanatory variables may not be strictly exogenous. For example, labour costs may be lower in underdeveloped countries that lack protection in the form of formal labour rights and/or minimum wages and have lower educational achievement. Moreover, some countries may have regulations that are beneficial for start-ups and small enterprises which can stimulate such firms to invest more. Some scholars find evidence that foreign equity concentration can have a positive spillover effect on domestic firms (i.e. stimulating investment) as well as crowd-out domestic firms (i.e. reducing investment). According to Aitken and Harrison (1999), in Venezuela, foreign equity ownership negatively influences the overall productivity of domestic firms. And, Kosovà (2010) studying firms located in the Czech Republic and Backer and Sleuwaegen (2003) studying firms located in Belgium find that foreign firm presence increases domestic firms sales growth and/or survival. However, both authors also find that foreign entry is positively related to domestic firms exiting the market (indicating a short-term crowding out effect). A Hausman test comparing a fixed and random effects model typically (as in our case) yields a significant test statistic, thereby rejecting the random-effect model over a fixed-effect model. In our case, we seek to identify macroeconomic determinants of investment and we require a non-linear model in the first step of the Heckman selection model and therefore a fixed-effect model is not a feasible option. However, the endogeneity issue may be alleviated by the inclusion of the macroeconomic variables. We follow the suggestion of Mundlak (1978) and augment our model introducing country means of *Labour*, *Size*, *Age*, and of the percentage of foreign equity ownership in our analysis (i.e. $\overline{Labour}$, $\overline{Size}$, $\overline{Age}$, and $\overline{Foreign}$).[15] Hereafter, these country mean firm-level variables are also referred to as the 'Mundlak' covariates. The covariates are part of vector $x2_j$. We expect that the macro covariates and 'Mundlak' covariates can act as controls for the (possibly) endogenous firm-level variables and contribute to the estimation of the corresponding within-effects.

[15] Mundlak (1978) provides proof for the equivalence of a linear random-effect model with additional time-averaged covariates and a linear fixed-effect model. The assumptions of Mundlak may not apply to our context of 'firm-series' on a cross-section of countries and *non-linear* models and therefore we merely expect that the 'Mundlak' covariates help alleviate endogeneity issues.

For both the Probit and Heckman selection model we also empirically examine the (possible) effect of institutions and political economy on the relationship between foreign ownership and investment. Formally, we express this model as following:

$$\begin{aligned} y^*_{ij} = \beta_1 + \beta'_2 x1_{ij} + \beta'_3 x2_j \\ + \beta_4 P\_Foreign \times G_{ij} + \beta_5 Foreign100 \times G_{ij} \\ + \varepsilon_{ij} + \upsilon_j \end{aligned} \tag{2}$$

$P\_Foreign \times G_{ij}$ represents the interaction term between the binary variable $P\_Foreign$ (partially foreign owned) and either $Property$, CPI or $Polity2$. $Foreign100 \times G_{ij}$ represents the interaction term between $Foreign100$ (100% foreign owned) and either $Property$, CPI or $Polity2$.

Most of the analysis in this study is based on a conventional random-intercept model as presented in equations 1 and 2. Yet, in the final section of this study we augment the model outlined in equation 2. Two additional random coefficients are included in the model with the aim of identifying the extent of cross-country differences in the foreign ownership investment relation. Here, in addition to the country specific-intercept, we produce country-specific slopes for the binary variables $P\_Foreign$ and $Foreign100$. The random coefficient model is presented in equation 3. δ_{1j} is the slope for $P\_Foreign_{ij}$ and δ_{2j} is the slope for $Foreign100_{ij}$. Empirically, the random effect parameters are expressed in units of standard deviation and show the degree to which the intercept and the slope coefficients are distributed around the estimated mean of each country.

$$\begin{aligned} y^*_{ij} = \beta_1 + \beta'_2 x1_{ij} + \beta'_3 x2_j \\ + \beta_4 P\_Foreign \times G_{ij} + \beta_5 Foreign100 \times G_{ij} \\ + \varepsilon_{ij} + \upsilon_j + \delta_{1j} P\_Foreign_{ij} + \delta_{2j} Foreign100_{ij} \end{aligned} \tag{3}$$

5 Results

We begin the analysis by studying the effect of micro-level factors on investment behaviour. Thereafter, we gradually include more variables to the models. First, presented in Table 1 are the results of a probit selection model (model 1), a random effect (RE) regression (model 2), and the results of a two-step Heckman selection outcome model (model 3—referred to as 'Outcome'). These models take into account the degree to which firms are clustered by countries, i.e. the models are multi-level models. The RE and outcome models are based on the selection of firms which report a level of investment that is higher than zero. The difference between the RE model and the outcome model is that the later model includes λ which is computed on the basis of the probit selection model (model 1).

The results show that several of the covariates are highly significant in the probit selection model and in the RE and outcome models. $P\_Foreign$ is not significant in models 1-3 and $Foreign100$ is not significant in model 1. The coefficient of $Foreign100$ has a negative sign and is significant in models 2 and 3. This result suggests that firms that are completely foreign owned invest less, relative to sales, than domestic firms.[16]

[16] In Appendix B are provided additional estimations using alternative measures of investment. Overall, these analysis confirm that firms that are completely foreign owned invest relatively less.

Based on this contrasting evidence, it is clear that the effect of foreign equity ownership on investment is dependent on the degree of foreign equity ownership.

As expected, the coefficient of *Age* is negative, indicating that older firms invest less in fixed capital. The coefficient of *Export* is positive and significant following the probit selection model (firms that export invest more frequently). This coefficient is not significant in model 2 and is positive and significant in model 3 (firms that export invest relatively more). The coefficient of *Labour* has a negative sign and is significant in the selection model but is significant and positive in model 2 and model 3. The coefficient *Size* is significant in models 1-3; however the coefficient is positive in the probit model and is negative in the models using *Investment* as the dependent variable. This result means that larger firms invest more frequently than smaller firms but when smaller firms invest, they invest more relative to their sales volume. Two of the selection variables are significant and positive: the probability of investment is higher for firms that indicate they face obstacles related to land and informal competitors. These positive coefficients may indicate that firms that seek to invest are confronted by restrictions with respect to access to land and market share. Additionally, a possible interpretation for the positive coefficient of *Competitor* is that competition stimulates investment. The coefficient of *Finance* is not significant. Model 3 includes the inverse Mills ratio (λ) which is used to correct for the selection bias. λ is computed on the basis of the estimations of the probit selection model in model 1 and has a significant and positive effect on the level of investment indicating that the additional covariate λ statistically improves the models fit. Following the multilevel models, when correcting for selection bias the sign of the coefficient for *Export* turns significant.

Finally, we are interested in the estimates for the 'random' (unobserved) part of our models. The population variance σ_v^2 (indicated as standard deviation σ_v) denotes the variance of v_j, the country-level random-intercept.[17] The log restricted-likelihood ratio (LR) test statistics which test H_0: $\sigma_v^2 = 0$ against H_a: $\sigma_v^2 > 0$ are significant for models 4-6 and thereby indicate the presence of country effects. The degree of significance of the LR test statistics are reported next to the coefficients of σ_v.

ρ is an estimate of the residual between-country correlation such that $\rho = \frac{\sigma_v^2}{(\sigma_v^2+\sigma_\varepsilon^2)}$ where σ_ε^2 is the variance of ε_{ij}. We are particularly interested in the estimated values of ρ which is an indicator of the degree of country dependency with possible range of [0,1].[18] Following the selection model 1, $\widehat{\rho}$ is 0.12 and following the RE and outcome models the $\widehat{\rho}$'s are 0.06. These results suggest that the variance at the country-level is much less than the variance at the firm-level and thereby indicate that firm heterogeneity is relatively independent of the country-specific context.

[17] The significance of the 'random effects' is tested at $p < 0.05$ and $p < 0.01$.

[18] ρ is also known as the variance partition coefficient and the measure of intraclass correlation.

Table 1: Multilevel models with and without 'Mundlak' covariates

Dependent variable: Invest (models 1 & 4) and Investment (models 2, 3, 5 & 6)

	(1) Probit selection	(2) RE	(3) Outcome	(4) Probit selection	(5) RE	(6) Outcome
FIXED EFFECTS ('OBSERVED' EFFECTS)						
P_Foreign	0.04	0.01	0.02	0.04	0.01	0.01
	(0.03)	(0.04)	(0.04)	(0.03)	(0.04)	(0.04)
Foreign100	-0.03	-0.19***	-0.21***	-0.03	-0.20***	-0.21***
	(0.03)	(0.04)	(0.04)	(0.03)	(0.04)	(0.04)
Age	-0.11***	-0.12***	-0.15***	-0.11***	-0.12***	-0.14***
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)
Export	0.17***	0.03	0.07*	0.17***	0.03	0.06*
	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)
Labour	-0.04***	0.45***	0.44***	-0.04***	0.45***	0.44***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Size	0.25***	-0.15***	-0.10**	0.25***	-0.15***	-0.11***
	(0.01)	(0.01)	(0.03)	(0.01)	(0.01)	(0.03)
Land	0.14***			0.14***		
	(0.01)			(0.01)		
Finance	0.01			0.01		
	(0.01)			(0.01)		
Competitor	0.04**			0.04**		
	(0.01)			(0.01)		
$\overline{Labour}$				0.17	-0.24*	-0.21+
				(0.11)	(0.12)	(0.12)
$\overline{Age}$				-0.04	-0.40**	-0.41**
				(0.15)	(0.15)	(0.15)
$\overline{Foreign}$				0.01**	0.00	0.01
				(0.00)	(0.00)	(0.01)
$\overline{Size}$				0.17+	-0.11	-0.08
				(0.09)	(0.09)	(0.10)
λ			0.41*			0.33
			(0.21)			(0.20)
Constant	-0.82***	-1.62***	-2.12***	-1.03*	-0.78+	-1.23*
	(0.05)	(0.06)	(0.26)	(0.40)	(0.41)	(0.50)
RANDOM EFFECTS ('UNOBSERVED' EFFECTS)						
σ_υ	0.36**	0.38**	0.38**	0.34**	0.33**	0.33***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
LR Chi2	2390.0	916.1	916.0	2142.9	608.3	609.4
LR df(1)	***	***	***	***	***	***
ρ	0.12	0.06	0.06	0.11	0.05	0.05
# of firms	45480	23651	23651	45480	23651	23651
# of countries	101	101	101	101	101	101

In parentheses are standard errors. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
All models contain sector dummies

Up to now, we have assumed that macro-level covariates have an impact on the 'random effect' of a country and that these effects are captured by the intercept. We further extend the analysis of the probit selection, RE, and outcome models by including the variables $\overline{Labour}$, $\overline{Size}$, $\overline{Age}$, and $\overline{Foreign}$ as additional controls. As explained in section 4, adding the 'Mundlak' covariates to the models possibly reduces endogeneity. These results are presented in models 4-6 of Table 1. Overall, we find that our variables of interest are not sensitive to the inclusion of the additional variables. As a result of adding

these country-level covariates the $\widehat{\rho}$'s decrease from 0.12 to 0.11 and from 0.06 to 0.05 depending on the model. Regarding the probit selection model, σ_{υ} marginally decreases from 0.36 (model 1) to 0.34 (model 4). With respect to the results discussed earlier, we find no systematic change in the sign or significance of the other covariates presented in model 1. Adding the 'Mundlak' covariates changes the coefficient of $Foreign100$ from -0.19 to -0.20 in the RE model but the coefficient remains significant. Following the results of the outcome model, the coefficient of $P\_Foreign$ changes from 0.02 to 0.01 but remains insignificant. Additionally, for the outcome model, we observe some marginal changes in the coefficients of Age, $Export$, and $Size$.

Regarding the 'Mundlak' covariates, only the coefficients of $\overline{Foreign}$ and $\overline{Size}$ are significant in the probit selection model. And, following the RE and outcome models (5-6), only the coefficients of $\overline{Labour}$ and $\overline{Age}$ are significant. Here, perhaps the most interesting is the coefficient of $\overline{Age}$ which in comparison to the coefficient Age is high and negative. This result can be interpreted as an indication that countries with a favourable investment climate have relatively more start-ups. The coefficient of λ, whilst significant in model 3, is no longer significant in model 6. We find no major discrepancies between the two models with the exception of the coefficient of $Export$ which is significant in the outcome model but is not significant in the RE model.

Following the results described above, country-level factors have a relatively stronger effect on a firm's decision to invest than on a firm's decision on the relative level of investment. Still, the estimated ρ are rather low suggesting a low country-level dependency. As suggested by Hawawini et al. (2004) one possibility is that country-effects are less pronounced because markets are to some extent economically and politically integrated. Despite the relative low intraclass correlation, the LR test statistics computed for the random-intercept models described above are all significant at $p < 0.01$ and therefore are in favour of analysis including a country effect component. Moreover, considering the context of analysis we still consider these ρ relatively substantial in size. A 12% macro-level dependency on a firm's decision to invest and a 6% effect on a firm's level of investment should not be understated when considering that these factors may determine if a country chronically under-invests (or over-invests). These considerations motivate further inquiry into the meaning of σ_{υ}.

Table 2 presents the correlations between the estimate of υ_j of model 3 and model 6 (Table 3) and our country-level variables of interest. We find that the correlations between $\widehat{\upsilon}_j$ of model 3 and the macro-level variables aside from $Openness$, $Growth$ and $Interest$ are rather high. $\widehat{\upsilon}_j$ of model 6 are predicted values following the outcome model that includes $\overline{Labour}$, $\overline{Size}$, $\overline{Age}$, and $\overline{Foreign}$ as additional covariates. On average, the correlations between $\widehat{\upsilon}_j$ model 6 and the macroeconomic and institutional variables are lower. For example, the correlation between $\widehat{\upsilon}_j$ model 3 and $Property$ is equal to -0.16 and the correlation between $\widehat{\upsilon}_j$ model 6 and $Property$ is equal to -0.14. The correlation between $\widehat{\upsilon}_j$ model 3 and $Growth$ is low and negative but the correlation between $\widehat{\upsilon}_j$ model 6 and $Growth$ is slightly higher and positive. In conclusion, because the correlation between several of the macro-level variables and $\widehat{\upsilon}_j$ of model 3 and 6 are not close to zero, these descriptive results support including the macro variables in the analysis as additional covariates.

Table 2: Pairwise Correlations between Countries

	$\widehat{v}_j$ model 3	$\widehat{v}_j$ model 6	Openness	Kaopen	GDP	Growth	Interest	Property	CPI	Polity2
$\widehat{v}_j$ model 3	1									
$\widehat{v}_j$ model 6	0.88	1								
Openness	0.03	0.05	1							
Kaopen	-0.30	-0.13	0.18	1						
GDP	-0.36	-0.13	0.36	0.50	1					
Growth	-0.01	0.04	0.16	0.11	0.37	1				
Interest	0.04	0.03	-0.07	0.04	-0.17	-0.10	1			
Property	-0.16	-0.14	0.17	0.41	0.41	0.17	0.12	1		
CPI	-0.20	-0.08	0.24	0.42	0.54	0.23	-0.10	0.77	1	
Polity2	-0.37	-0.20	-0.01	0.49	0.43	0.19	0.01	0.39	0.41	1

The number of countries (observations) used for each pairwise correlation ranges from 101 to 75.

Next, we include the additional macro-level variables *Openness*, *Kaopen*, *GDP*, *Growth*, *Interest*, *Polity*2, *CPI* and *Property* in the regression analysis. The institutional and political indicators are entered separately in the analysis. We first present the results of the probit selection models in Table 3. Model 1 presents the results including *Property*, model 2 includes *CPI* and model 3 includes *Polity*2. The effect of adding the macro-level variables to the model has little or no effect on the significance and the magnitude of the coefficients of the micro-level regressors. As before, we find no significant effect of foreign ownership on the probability of investment. Several of the macro-variables are not significant. The coefficient of *Growth* is significant and rather surprisingly negative. The coefficient of *Interest* is positive and significant in models 2 and 3. Additionally, we find a positive and significant effect of control of corruption (*CPI*) and property rights protection (*Property*) on the probability of investment. The coefficient of *Polity*2 is not significant. We test whether the coefficients of the country-level variables are zero using a Wald test and reject this hypothesis for each of estimation results presented in models 1, 2 and 3. Following model 3, the ρ is 0.10 which is lower than the ρ documented in Table 1 model 4. We suspect that the decreasing effect of adding additional macro-level covariates is not fully observable in models 1-3 of Table 3 because of the change in sample size.

In models 4, 5 and 6 of Table 3 we control for the effect of institutions (*Property* and *Corruption*) and political economy on relation between foreign ownership and the probability of investment. We find that property rights protection and control of corruption have a positive mediating effect on the relation between completely foreign owned firms and the probability of investment. This result can be interpreted as evidence that foreign firms invest more frequently in countries that are (viewed as) having better institutions. We find no significant effect of institutions and political economy on the relation between partial foreign ownership and the probability of investment. The coefficient of *Foreign*100 turns significant and negative in the models 4, 5 and 6 that include the interaction terms. This indicates that the probability of investment is lower for firms that are 100% foreign owned.

Table 3: Multilevel Probit selection equations with macro-level covariates and with and without interaction terms

Dependent variable: Invest						
	(1)	(2)	(3)	(4)	(5)	(6)
FIXED EFFECTS ('OBSERVED' EFFECTS)						
P_Foreign	0.04	0.04	0.03	-0.02	0.05	0.02
	(0.03)	(0.03)	(0.03)	(0.08)	(0.08)	(0.05)
Foreign100	-0.03	-0.03	-0.04	-0.23**	-0.23**	-0.10*
	(0.03)	(0.03)	(0.03)	(0.07)	(0.08)	(0.04)
Age	-0.11***	-0.11***	-0.11***	-0.11***	-0.11***	-0.11***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Export	0.18***	0.18***	0.18***	0.18***	0.18***	0.18***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Labour	-0.05***	-0.05***	-0.05***	-0.05***	-0.05***	-0.05***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Size	0.26***	0.26***	0.26***	0.26***	0.26***	0.26***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Land	0.14***	0.14***	0.14***	0.14***	0.14***	0.14***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Finance	0.00	0.00	0.01	0.00	0.00	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Competitor	0.05**	0.04**	0.05**	0.05**	0.04**	0.05**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Openness	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Kaopen	-0.04	-0.02	-0.01	-0.04	-0.02	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
GDP	-0.01	-0.06	0.03	-0.02	-0.07	0.03
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Growth	-0.02**	-0.02**	-0.01*	-0.02**	-0.02**	-0.01*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Interest	0.00	0.01**	0.01**	0.00	0.01**	0.01**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Property	0.01**			0.01**		
	(0.00)			(0.00)		
CPI		0.20***			0.19***	
		(0.04)			(0.04)	
Polity2			0.00			0.00
			(0.01)			(0.01)
P_Foreign × Property				0.00		
				(0.00)		
Foreign100 × Property				0.00**		
				(0.00)		
P_Foreign × CPI					-0.00	
					(0.02)	
Foreign100 × CPI					0.06**	
					(0.02)	
P_Foreign × Polity2						0.00
						(0.01)
Foreign100 × Polity2						0.01*
						(0.01)
Constant	-1.48*	-1.13+	-1.64*	-1.46*	-1.11+	-1.62*
	(0.64)	(0.61)	(0.65)	(0.64)	(0.61)	(0.65)
RANDOM EFFECTS ('UNOBSERVED' EFFECTS)						
σ_v	0.37**	0.35**	0.34**	0.37**	0.35**	0.34**
	(0.04)	(0.03)	(0.04)	(0.04)	(0.03)	(0.04)

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LR Chi2	1642.1	1582.3	1491.7	1642.5	1586.9	1494.7
LR df(1)	***	***	***	***	***	***
ρ	0.12	0.11	0.10	0.12	0.11	0.10
# of firms	37471	37997	36691	37471	37997	36691
# of countries	77	76	72	77	76	72

In parentheses are standard errors. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
All models contain sector dummies
Results for $\overline{Labour}$, $\overline{Age}$, $\overline{Size}$ and $\overline{Foreign}$ are available upon request

Table 4 presents the results of the RE and outcome models including the macroeconomic and institutional variables. Again, *Property*, *CPI*, and *Polity*2 are entered separately in the models. The various λ included in the outcome models are based on the regression output of models 1-3 of Table 3. Unlike in Table 1 model 6, where the coefficient of λ was not significant, the coefficient of λ is significant in Table 4 models 2, 4, and 6. As such, we give preference to the results presented in model 2 (including *Property*), model 4 (including *CPI*), and model 6 (including *Polity*2). With the exception of λ, we find that the sign and significance of the coefficients of the micro-level covariates are not sensitive to the addition of the macro-level covariates. *Export* remains only positive and significant when correcting for sample selection bias.

No significant effect is found of *Openness* and *Kaopen* on firms' investment to sales ratio. The coefficient of *GDP* is significant and negative in all models which suggests that firms located in countries with a relatively lower level of GDP per capita invest relatively more in fixed capital. The coefficient of *Growth* is significant and positive in the RE models that do not control for selection bias (model 1, 3, and 5) and is also significant when controlling for selection bias and using *Polity*2 (model 6). In addition, *Interest* has a negative and significant effect on investment in RE model 3 but this covariate is insignificant in all other models. We do not find a significant effect of institutions on investment when using the proxies *CPI* and *Property*. However, the coefficient of *Polity*2 is significant (following both model 5 and 6) and, somewhat contrary to expectations, is negative.[19] According to the work of Mathur and Singh (2013), one explanation is that investment is driven by economic freedoms and not by political freedoms and that, as a result of competing political interest, countries with emerging democratic institutions may lack the ability to enforce economic freedoms.[20]

Table 4: Multilevel RE and outcome models with macro-level covariates

Dependent variable: Investment						
	(1)	(2)	(3)	(4)	(5)	(6)
	RE	Outcome	RE	Outcome	RE	Outcome
Fixed Effects ('observed' effects)						
P_Foreign	0.02	0.03	0.02	0.03	0.01	0.02
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)

Continued on next page

[19] Estimation results for Table 4 using robust standard errors computed using maximum likelihood estimation (instead of restricted maximum likelihood estimation) yield similar results. Wald tests based of the estimations presented in models 1-6 reject the hypothesis that the coefficients of the country-level variables are zero.

[20] Mathur and Singh (2013) studies determinants of FDI using a macroeconomic framework. The authors' theory may contribute to explain why, for example, China scores low on democracy and high on property rights protection and is able to attract high flows of FDI.

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Foreign100	-0.19***	-0.21***	-0.18***	-0.20***	-0.18***	-0.20***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Age	-0.11***	-0.16***	-0.11***	-0.16***	-0.11***	-0.15***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Export	0.02	0.10**	0.02	0.09**	0.02	0.08*
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Labour	0.44***	0.42***	0.44***	0.42***	0.44***	0.42***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Size	-0.15***	-0.04	-0.15***	-0.05+	-0.15***	-0.06*
	(0.01)	(0.03)	(0.01)	(0.03)	(0.01)	(0.03)
Openness	0.00	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Kaopen	-0.01	-0.03	-0.01	-0.02	-0.00	-0.01
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
GDP	-0.13*	-0.14*	-0.13*	-0.16**	-0.12*	-0.11+
	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)	(0.06)
Growth	0.02**	0.01	0.02**	0.01	0.02**	0.02*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Interest	-0.00	-0.00	-0.00+	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Property	-0.00	0.00				
	(0.00)	(0.00)				
CPI			-0.03	0.05		
			(0.04)	(0.04)		
Polity2					-0.02+	-0.02+
					(0.01)	(0.01)
λ		0.86***		0.78***		0.68**
		(0.20)		(0.19)		(0.21)
Constant	-0.15	-1.54*	-0.39	-1.48*	-0.60	-1.79*
	(0.58)	(0.67)	(0.58)	(0.65)	(0.63)	(0.73)
RANDOM EFFECTS ('UNOBSERVED' EFFECTS)						
σ_v	0.31**	0.31**	0.31**	0.31**	0.31**	0.31**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
LR Chi2	437.3	447.8	471.1	481.2	442.4	446.5
LR df(1)	***	***	***	***	***	***
ρ	0.04	0.04	0.04	0.04	0.04	0.04
# of firms	19978	19978	20143	20143	19571	19571
# of countries	77	77	76	76	72	72

In parentheses are standard errors. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
All models contain sector dummies
Results for $\overline{Labour}$, $\overline{Age}$, $\overline{Size}$ and $\overline{Foreign}$ are available upon request

Table 5, models 1-6 present the results of the multilevel selection models that include the macro variables and the interaction terms for foreign ownership and institutions/political economy. The λ included in the outcome models are based on the probit selection models 4-6 of Table 3. Adding the interaction terms to the models has some effect on the coefficient of $P\_Foreign$ but does not systematically change the other micro-level covariates. In contrast to the findings previously discussed, we find that the coefficient of $P\_Foreign$ is significant and negative in the RE model that includes the interaction term for $P\_Foreign$ and CPI. In the outcome model and the models including $Property$ and $Polity2$ as covariates we do not find any evidence that partially foreign owned firms invest less relative to sales. The coefficient of $Foreign100$ remains significant and negative in all models. Similar to the results presented in Table 5 we find that, overall, growth is positively related to investment and GDP is negatively related

to investment. Moreover, the coefficient of $Polity2$ remains significant and negative in models 5-6 of Table 6 and the coefficients of CPI and $Property$ remain insignificant.

The interaction terms $P\_Foreign \times CPI$ (models 3 and 4) and $Foreign100 \times Property$ (model 2 only) are significant and positive but the other interaction terms are not significant. Hence, in agreement with some scholars (Asiedu and Lien, 2011; Kinda, 2010; Javorcik and Wei, 2009) that study the effect of governance on FDI, we find some evidence which suggests that countries with low corruption can attract more foreign capital. We also find weak evidence indicating that firms with 100 percent foreign equity ownership avoid investing in countries with poor protection of property rights. Based on our sample, countries that score relatively high on the variables CPI and $Property$ are Chile, Estonia and Uruguay and countries that score relatively low on these variables are Angola, Chad and Venezuela.

Across country-level averages, what is the relation between foreign equity ownership and investment? The analysis including the additional random slope parameters are presented in models 1-6 of Table 6. The random slope effects are expressed in units of standard deviation with respect to $P\_Foreign$ and $Foreign100$. We refer to these random effect estimates as $\sigma_{P\_Foreign}$ and $\sigma_{Foreign100}$. The random effect estimates are distinctly estimated (i.e. we allow for covariance). The join LR test statistics are significant (even though the resulting p-values are conservative) and thereby indicate cross-country differences in $\sigma_{P\_Foreign}$ and $\sigma_{Foreign100}$. Models 2, 4, and 6 build upon the inverse Mills ratios computed following the estimation results of probit selection models with interaction terms (4, 5 and 6) of Table 3.

The inclusion of the additional random coefficients has some effect on the magnitude of the coefficients but does not influence our interpretation. The interaction term $Foreign100 \times Property$ in model 2 (including λ) and the interaction terms $P\_Foreign \times CPI$ (models 3-4) remain significant. Also, we find some positive and significant effect of $Openness$ following models 1 and 3 that do not include λ (the coefficients are close to zero). The inverse mills ratio, the coefficient of λ is significant in models 2, 4, and 6 and as such we prefer these estimation results over those presented in models 1, 3, and 5. In comparison to the results presented in Table 5, we do not find any other systematic differences in the estimation results.[21]

Next, we compute the—full—conditional marginal effects of foreign ownership on investment. These results are presented in the line plots Figures 1 and 2. The point estimates are based on the results of models 2, 4, and 6 presented in Table 6 which include random-coefficients. We estimate the marginal effect of $P\_Foreign$ on $Investment$ and of $Foreign100$ on $Investment$ given different values of $Property$, CPI, or $Polity2$. We use the values that correspond to the 5th, 25th, 50th, 75th, and 95th percentiles of the institutional and political economy indicators that are defined at the country-level. These indicators are placed on the horizontal axis of the different line plots; as ordered from top to bottom $Property$, CPI, and $Polity2$. Figure 1 presents the marginal effect of $P\_Foreign$ on investment and Figure 2 presents the marginal effect of $Foreign100$ on investment. These results show that the marginal effect of $P\_Foreign$ and $Foreign100$ on investment changes along with institutional development ($Property$ and CPI) but remains fairly constant for different values of $Polity2$. In particular, the marginal effect of $P\_Foreign$ on $Investment$ whilst negative at high levels of corruption turns positive

[21] We also experimented using the natural logarithm of the ratio of investment in machinery, equipment, *land, and buildings* over sales as the dependent variable. Analysis using this alternative dependent variable supports the results of the analysis reported in Table 6.

at lower levels of corruption (i.e. control of corruption). However, these marginal effects remain close to zero and are insignificant. The marginal effect of $Foreign100$ on $Investment$ is usually negative and significant. These line plots indicate that firms that are completely foreign owned invest relatively more when these firms are located in countries with better protection of property rights and control of corruption. In fact, the negative marginal effect of foreign ownership is lower for countries that score high on $Property$ and CPI. This effect is not captured by the interaction term $Foreign100 \times CPI$ in the outcome model.

Finally, we interpret the random effects $\sigma_{P\_Foreign}$ and $\sigma_{Foreign100}$. In order to interpret these random effects we assume that they have a normal distribution. Figure 5 in Appendix A plots the distribution of the random effects (as well as that of the random intercept) that are derived on the basis of model 2 of Table 6.[22] Overall, the distributions look approximately normal. Model 2 shows that the fixed effect coefficient of $Foreign100$ is equal to -0.47. The coefficients' corresponding random effect parameter shows that for 95% of our sample population of countries the coefficient of $Foreign100$ falls within the range of [-0.94, 0.00]. This result is derived as following: $-0.47 \pm 1.96 \times 0.24$. This result suggests that, indeed in the majority of countries, the country-averages are that completely foreign owned firms invest less than domestic firms and partially foreign-owned firms. Using model 2 as a reference, the proportion of countries for which the average slope is equal to or larger than 0 amounts to 2.51% (which corresponds to a z-score of 1.96). Following model 4, which uses CPI as a covariate, the random effect parameter of $Foreign100$ suggests that on average in the majority of countries foreign-owned firms invest less than domestic firms. Here, based on a normal distribution assumption, the coefficient of $Foreign100$ for 95% of our sample population of countries falls within the range [-0.78, 0.12]. This range includes positive values and as such suggests that, in several countries in our sample, firms that are 100% foreign owned on average invest relatively more. Given a z-score of 1.43, the percentage of countries in which foreign owned firms invest the same or more than domestically owned firms is 7.58%. Model 6 yields somewhat similar evidence; i.e. in 14.92% of the countries' foreign firms invest the same or relatively more than domestically owned firms. Therefore, despite that foreign equity ownership appears to be associated with relatively less investment, our results by no means contradict the work of Koo and Maeng (2006) who on the basis of a country case study (on Korea) argue that foreign ownership positively influences investment.

The coefficient of $P\_Foreign$ in model 3 that uses CPI as a proxy is significant and negative. Following model 3, the random effect parameter $\sigma_{P\_Foreign}$, the 95% range of the coefficient for partially foreign-owned firms is [-0.77, 0.21]. Following this model, on average, in 13.14% of the countries (i.e. about 10 countries) partially foreign owned firms invest the same or more than domestically owned firms and completely foreign owned firms. The coefficients of $P\_Foreign$ in model 1,2,4,5 and 6 (i.e. including either $Property$ or $Polity2$ and/or including λ) are not significant and the coefficients are substantially smaller in magnitude albeit the spread of $\sigma_{P\_Foreign}$ remains wide. Altogether, this evidence suggests that the point estimate coefficients of $P\_Foreign$ are rather unreliable.

[22] To save space we do not report the distributions of the random slopes for the other models.

Table 5: Multilevel RE and outcome models with macro-level covariates and interaction terms

Dependent variable: Investment						
	(1) RE	(2) Outcome	(3) RE	(4) Outcome	(5) RE	(6) Outcome
FIXED EFFECTS ('OBSERVED' EFFECTS)						
P_Foreign	-0.06	-0.05	-0.23*	-0.18	0.03	0.04
	(0.10)	(0.10)	(0.11)	(0.11)	(0.07)	(0.07)
Foreign100	-0.33**	-0.41***	-0.23*	-0.29**	-0.19**	-0.24***
	(0.10)	(0.10)	(0.11)	(0.11)	(0.06)	(0.06)
Age	-0.11***	-0.16***	-0.11***	-0.16***	-0.11***	-0.16***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Export	0.02	0.10**	0.02	0.09**	0.02	0.08*
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Labour	0.44***	0.42***	0.44***	0.42***	0.44***	0.42***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Size	-0.15***	-0.04	-0.15***	-0.06*	-0.15***	-0.06+
	(0.01)	(0.03)	(0.01)	(0.03)	(0.01)	(0.03)
Openness	0.00	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Kaopen	-0.01	-0.03	-0.02	-0.02	-0.00	-0.01
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
GDP	-0.14*	-0.14**	-0.13*	-0.16**	-0.12*	-0.11+
	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)	(0.06)
Growth	0.02**	0.01	0.02**	0.01	0.02**	0.02*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Interest	-0.00	-0.00	-0.00+	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Property	-0.00	0.00				
	(0.00)	(0.00)				
CPI			-0.04	0.04		
			(0.04)	(0.04)		
Polity2					-0.02+	-0.02+
					(0.01)	(0.01)
P_Foreign × Property	0.00	0.00				
	(0.00)	(0.00)				
Foreign100 × Property	0.00	0.00*				
	(0.00)	(0.00)				
P_Foreign × CPI			0.07*	0.06*		
			(0.03)	(0.03)		
Foreign100 × CPI			0.02	0.03		
			(0.03)	(0.03)		
P_Foreign × Polity2					-0.00	-0.00
					(0.01)	(0.01)
Foreign100 × Polity2					0.00	0.01
					(0.01)	(0.01)
λ		0.84***		0.73***		0.70***
		(0.20)		(0.19)		(0.21)
Constant	-0.13	-1.49*	-0.36	-1.39*	-0.60	-1.83*
	(0.58)	(0.67)	(0.58)	(0.65)	(0.63)	(0.73)
RANDOM EFFECTS ('UNOBSERVED' EFFECTS)						
σ_v	0.31**	0.31**	0.31**	0.32**	0.31**	0.31**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
LR Chi2	439.1	449.3	472.2	481.5	442.4	446.9
LR df(1)	***	***	***	***	***	***
ρ	0.04	0.04	0.04	0.04	0.04	0.04

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# of firms	19978	19978	20143	20143	19571	19571
# of countries	77	77	76	76	72	72

In parentheses are standard errors. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
All models contain sector dummies
Results for $\overline{Labour}$, $\overline{Age}$, $\overline{Size}$ and $\overline{Foreign}$ are available upon request

Table 6: RE and outcome random-coefficient models models with macro-level covariates and interaction terms

Dependent variable: Investment

	(1) RE	(2) Outcome	(3) RE	(4) Outcome	(5) RE	(6) Outcome
	FIXED EFFECTS ('OBSERVED' EFFECTS)					
P_Foreign	-0.07	-0.06	-0.28*	-0.23	0.01	0.02
	(0.14)	(0.14)	(0.14)	(0.14)	(0.09)	(0.09)
Foreign100	-0.38**	-0.47***	-0.27+	-0.33*	-0.20*	-0.24**
	(0.13)	(0.14)	(0.14)	(0.14)	(0.08)	(0.08)
Age	-0.11***	-0.16***	-0.11***	-0.16***	-0.11***	-0.16***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Export	0.02	0.10**	0.02	0.09**	0.02	0.09**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Labour	0.44***	0.42***	0.44***	0.42***	0.44***	0.42***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Size	-0.15***	-0.04	-0.15***	-0.06*	-0.15***	-0.06+
	(0.01)	(0.03)	(0.01)	(0.03)	(0.01)	(0.03)
Openness	0.00+	0.00	0.00+	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Kaopen	-0.01	-0.03	-0.02	-0.03	0.00	-0.00
	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)
GDP	-0.15**	-0.15**	-0.16**	-0.18***	-0.13*	-0.11*
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Growth	0.02**	0.01	0.02**	0.01	0.02**	0.02*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Interest	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Property	-0.00	0.00				
	(0.00)	(0.00)				
CPI			-0.03	0.05		
			(0.04)	(0.04)		
Polity2					-0.02*	-0.02*
					(0.01)	(0.01)
P_Foreign × Property	0.00	0.00				
	(0.00)	(0.00)				
Foreign100 × Property	0.00	0.01+				
	(0.00)	(0.00)				
P_Foreign × CPI			0.09*	0.08*		
			(0.04)	(0.04)		
Foreign100 × CPI			0.02	0.04		
			(0.04)	(0.04)		
P_Foreign × Polity2					0.00	0.00
					(0.01)	(0.01)
Foreign100 × Polity2					0.00	0.00
					(0.01)	(0.01)
λ		0.84***		0.74***		0.71***
		(0.20)		(0.19)		(0.21)

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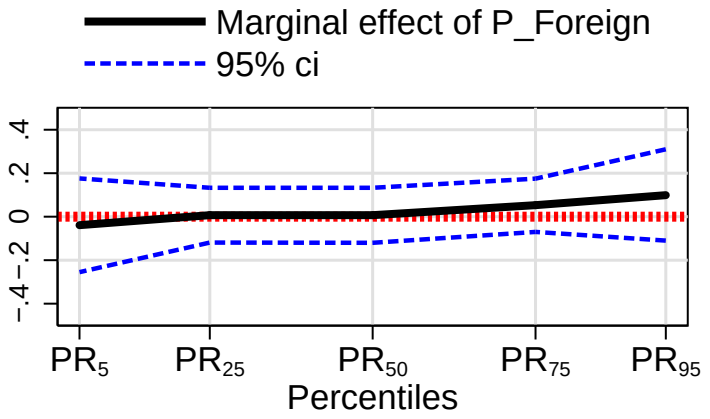
Constant	-0.13	-1.46*	-0.21	-1.25*	-0.71	-1.93**
	(0.55)	(0.64)	(0.55)	(0.62)	(0.60)	(0.70)
RANDOM EFFECTS ('UNOBSERVED' EFFECTS)						
$\sigma_{P\_Foreign}$	0.27**	0.27**	0.25**	0.25**	0.30**	0.29**
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
$\sigma_{Foreign100}$	0.24**	0.24**	0.23**	0.23**	0.24**	0.23**
	(0.07)	(0.07)	(0.07)	(0.07)	(0.08)	(0.08)
σ_{υ}	0.32**	0.33**	0.33**	0.33**	0.32**	0.33**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Joint LR Chi2	454.9	465.1	487.5	496.7	460.3	464.9
Joint LR df(6)	***	***	***	***	***	***
ρ	0.04	0.05	0.05	0.05	0.04	0.05
# of firms	19978	19978	20143	20143	19571	19571
# of countries	77	77	76	76	72	72

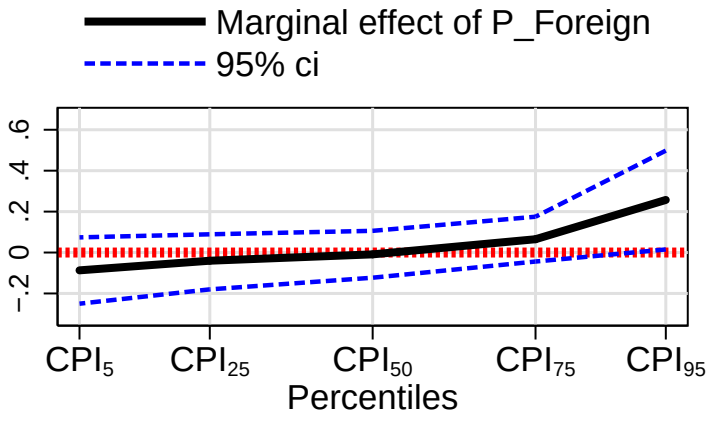
In parentheses are standard errors. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
All models contain sector dummies
Results for $\overline{Labour}$, $\overline{Age}$, $\overline{Size}$ and $\overline{Foreign}$ are available upon request

Figure 1: Conditional marginal effects of *P_Foreign* on investment

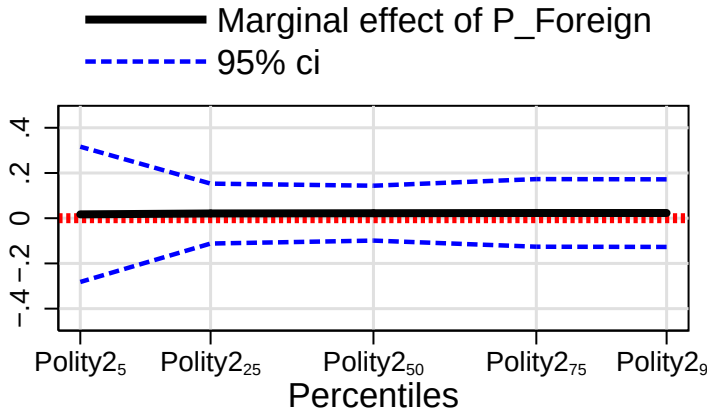
Percentiles defined at the country-level.
Random coefficient models: Table 9 Models 2, 4, & 6



ES & HF (PR = Property)



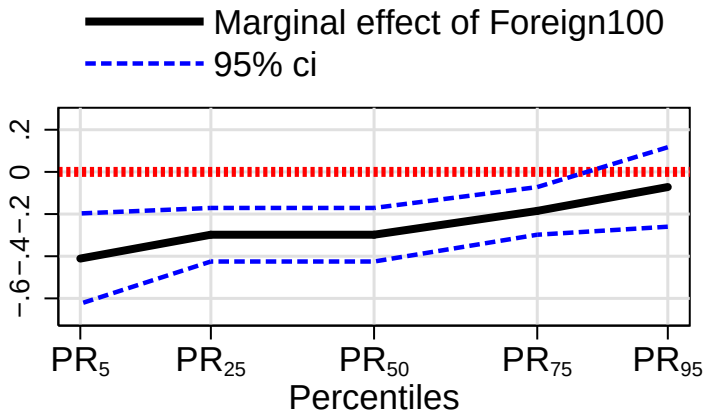
ES & TI



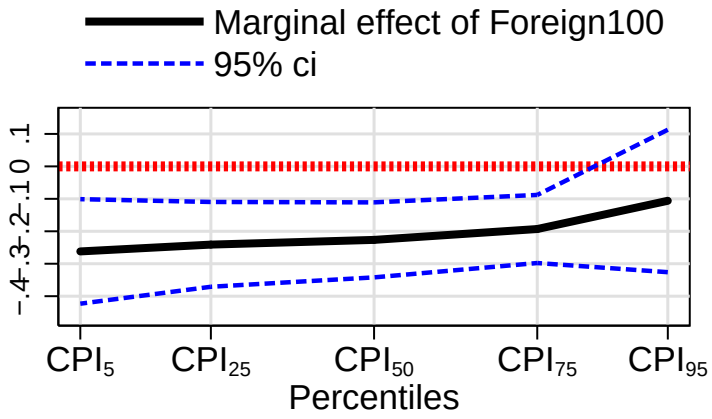
ES & Polity IV

Figure 2: Conditional marginal effects of *Foreign*100 on investment

Percentiles defined at the country-level.
Random coefficient models: Table 9 Models 2, 4, & 6



ES & HF (PR = Property)



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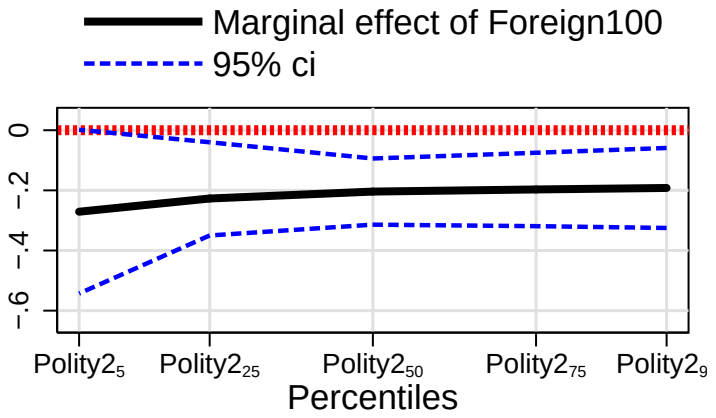

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6 Conclusion

In this study we have discussed how uncertainty related to irreversibility of fixed capital in developing countries can hamper investment. In conformity with previous studies on investment in developing countries we find that the high level of non-investment across firms suggests that irreversibility of fixed capital is a strong obstacle to investment.

We further investigate the role of foreign equity ownership on investment behaviour and find substantial evidence suggesting that there is a negative relation between foreign ownership and firms' level of investment relative to sales. More specifically, we find that, on average, firms that are completely foreign owned invest relatively less in fixed capital. We find weak evidence which suggests that firms that are 100% foreign owned invest less frequently and we find no such evidence for partially foreign owned firms. This distinction suggests that, under specific conditions, limiting foreign equity ownership could have a beneficial effect on overall investment levels provided that such limitations on ownership do not discourage foreign investors to enter the market and/or limit domestic industry development. Further research is required to outline the specific conditions under which foreign firms invest relatively less than domestically owned firms. Nonetheless, analysis using random-effect models reveals that in a minority of countries there is, on average, a positive relation between foreign equity ownership and investment.

The second major contribution of this study is the identification of the effect of macroeconomic factors and institutions on investment behaviour. We find that such determinants have relatively little explanatory power on the level of firms' investment. In comparison with this result, a country's macroeconomic and institutional context has a relatively higher impact on the probability that a firm invests e.g. in new investment opportunities, replacement capital and/or restructuring. Further research assessing the sensitivity of investment behaviour to a country's macroeconomic environment in specific (innovative) industries would enrich this understanding.

The overall lack of explanatory power of the macroeconomic indicators in our sample of mostly developing countries may indicate that the ability of investors located in these countries in forecasting expected revenues on the basis of macroeconomic signals is low. Moreover, in some countries, markets are highly volatile and therefore macroeconomic indicators can be poor predictors. Regardless of the underlying cause, should this interpretation be correct, positive macroeconomic trends may fail to further stimulate investment behaviour and markets may not be able to act as stabilizers and accelerators or growth. The effectiveness of policy may also be limited in this respect. Darku (2000, pp. 21) states that "the best way out is to ensure more policy credibility and stability that will lead to a reduction in firms' perceived uncertainty".

Further research on the extent to which this pattern may be different in developed economies could provide more insight on the way forward. For example, macroeconomic predictors, such as growth and interest rates (as well as real estate markets and stock markets) are generally considered strong predictors of investors' confidence in developed countries and, as a result, it is possible that the country-level effect on firm-level investment is greater in developed countries. Previous research on the determinants of firms' performance suggests the contrary. Hawawini et al. (2004) decompose firm-level, industry, and country effects on firms' performance in six developed countries and find that the country effect is small—smaller than the country-effect documented in this study. Using a broader set of 37 countries, Burstein Goldszmidt et al. (2011) find similar levels of country-effects as documented in our study and the authors argue that the country-level

effect on firm performance is larger in emerging economies than in developed economies.

This research has had the ambition to close the gap between a macro approach towards studying investment and a micro approach towards studying investment. We have gained a preliminary understanding on the degree to which micro and macro evidence on investment behaviour is complementary; e.g. in suggesting that control of corruption is positively related to (the probability of) investment. The extent to which the negative effect of political economy on firms' investment levels is robust and/or can be explained using a theoretical model may require further exploration. Moreover, the inability of this study to explore investment dynamics has been a major limitation. Our application of a multilevel, cross-country investment model can be extended with the exploration of the dynamic relation between a firm's past investment behaviour and firms' outlook on future investment. As a result of firm-level heterogeneity we expect that such research avenues will be an important development towards better understanding investment behaviour.

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7 Appendix A

Table 7: Countries and Number of Firms

Country	Fiscal year	Firms	Firms investing	Foreign firms (<100)	Foreign firms (100)	Small firms	Medium firms	Large firms	Manufacturing	Transport	Services
Afghanistan	2007	356	142	15	1	242	94	20	91	110	155
Albania	2006	157	91	10	15	91	55	11	54	19	84
Angola	2005/09	685	265	95	35	498	150	37	376	21	288
Argentina	2005/09	1,627	1,110	90	152	514	648	465	1,175	39	413
Armenia	2007	238	120	17	7	133	72	33	83	23	132
Azerbaijan	2007	306	102	22	14	156	107	43	89	27	190
Bangladesh	2006	1,475	699	18	18	474	427	574	1,251	75	149
Belarus	2007	164	111	14	3	48	64	52	65	9	90
Benin	2008	71	35	7	5	43	20	8	27	5	39
Bhutan	2008	237	112	2	12	119	91	27	84	59	94
Bolivia	2005/09	594	362	54	35	292	209	93	342	39	213
Bosnia and Herzegovina	2007	238	174	16	4	87	91	60	90	30	118
Botswana	2005/09	528	308	79	166	303	157	68	210	51	267
Brazil	2007	1,032	705	35	30	373	422	237	786	14	232
Bulgaria	2006/07	1,018	603	57	59	401	400	217	834	110	74

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Burkina Faso	2008	262	134	22	12	159	70	33	73	32	157
Burundi	2005	268	153	6	41	221	41	6	139	12	117
Cameroon	2008	299	146	33	21	128	109	62	96	12	191
Cape Verde	2008	106	59	13	7	47	46	13	40	15	51
Chad	2008	111	71	14	17	61	37	13	41	14	56
Chile	2005/09	1,600	1,105	68	87	483	689	428	1,152	34	414
Colombia	2005/09	1,696	943	70	40	787	596	313	1,189	89	418
Costa Rica	2009	352	230	12	44	129	147	76	222	4	126
Cote d'Ivoire	2007	345	142	23	40	218	91	36	137	11	197
Croatia	2006	454	352	34	18	168	158	128	310	24	120
Czech Republic	2007	160	127	16	13	53	65	42	68	15	77
Congo, DR	2005/09	542	250	33	64	401	109	32	273	25	244
Dominican Republic	2009	305	139	22	31	95	113	97	103	13	189
Ecuador	2005/09	800	507	61	74	319	311	170	402	23	375
El Salvador	2005/09	789	439	57	62	305	293	191	469	39	281
Eritrea	2008	92	16	2	3	59	28	5	51	2	39
Estonia	2007	204	154	12	27	74	74	56	71	30	103
Ethiopia	2010	363	144	5	11	181	120	62	363	0	0
Fiji	2008	73	45	10	6	39	28	6	18	5	50
Gambia, the	2005	165	104	20	31	113	47	5	62	12	91
Georgia	2007	223	94	10	4	110	83	30	78	40	105
Ghana	2006	491	228	12	13	368	93	30	289	1	201
Guatemala	2005/09	811	439	37	61	304	293	214	513	44	254
Guinea	2005	220	122	8	16	196	18	6	134	7	79
Guinea-Bissau	2005	154	60	5	10	136	17	1	77	5	72
Honduras	2005/09	520	207	32	30	256	162	102	288	48	184
Hungary	2007	252	120	23	29	78	88	86	99	25	128
Indonesia	2008	1,028	285	28	47	593	242	193	824	20	184
Iraq	2010	641	234	1	7	509	127	5	403	40	198
Jamaica	2009	245	86	19	8	113	106	26	87	8	150
Kazakhstan	2007	382	188	14	6	115	163	104	135	52	195
Kenya	2006	630	363	29	50	289	213	128	392	54	184
Kosovo	2007	130	68	0	0	93	31	6	45	16	69
Kyrgyz Republic	2007	164	60	19	8	71	71	22	74	20	70
Laos	2007	353	87	20	43	165	123	65	142	13	198
Latvia	2007	206	178	20	26	67	65	74	69	24	113
Lithuania	2007	190	151	7	16	70	68	52	70	23	97
Macedonia	2007	272	191	26	13	102	117	53	96	41	135
Madagascar	2007	326	154	50	83	126	144	56	156	21	149
Malawi	2008	121	81	11	26	39	41	41	53	10	58
Mali	2006/09	574	224	20	20	476	90	8	329	11	234
Mauritania	2005	227	81	18	8	182	40	5	123	12	92
Mauritius	2007	299	182	14	23	145	111	43	140	14	145
Mexico	2005/09	2,464	1,011	128	104	1016	771	677	1,980	41	443
Micronesia	2007	52	31	7	4	36	16	0	9	3	40
Moldova	2007	295	175	24	11	106	122	67	94	32	169
Mongolia	2007	316	198	14	7	138	121	57	114	51	151
Montenegro	2007	69	50	2	2	32	26	11	24	3	42
Mozambique	2006	471	155	26	64	307	141	23	335	6	130
Namibia	2005	314	168	19	52	221	78	15	145	11	158
Nepal	2008	341	145	11	3	182	130	29	118	1	222

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Nicaragua	2005/09	516	191	22	26	302	165	49	344	16	156
Niger	2008	78	39	9	8	51	22	5	21	2	55
Panama	2005/09	511	239	20	39	287	163	61	249	78	184
Paraguay	2005/09	587	365	33	33	259	254	74	328	31	228
Peru	2005/09	1,301	869	101	68	475	506	320	887	22	392
Philippines	2008	909	338	138	95	297	411	201	665	18	226
Poland	2007	210	125	7	14	97	61	52	77	25	108
Romania	2007	253	178	20	18	81	82	90	91	30	132
Russia	2007	609	424	23	15	145	232	232	431	33	145
Rwanda	2005/10	289	119	16	34	195	79	15	146	8	135
Samoa	2008	63	38	10	6	45	15	3	16	5	42
Senegal	2006	505	141	20	11	418	66	21	259	3	243
Serbia	2007	329	227	25	22	110	109	110	123	39	167
Slovakia	2007	162	119	13	10	52	56	54	56	23	83
Slovenia	2007	242	216	21	19	92	74	76	90	35	117
South Africa	2006	936	388	40	81	373	371	192	680	15	241
Sri Lanka	2010	497	135	18	5	272	141	84	275	1	221
Swaziland	2005	288	158	14	91	205	54	29	101	31	156
Tajikistan	2007	244	88	19	2	120	83	41	83	39	122
Tanzania	2005	407	205	23	27	268	104	35	277	16	114
Timor Leste	2008	103	66	0	16	77	26	0	49	19	35
Togo	2008	109	50	14	26	67	28	14	22	13	74
Tonga	2008	133	69	21	2	118	15	0	50	1	82
Trinidad and Tobago	2009	294	95	32	9	134	83	77	101	22	171
Turkey	2007	789	440	27	5	233	302	254	628	6	155
Uganda	2005	550	221	27	65	373	145	32	334	22	194
Ukraine	2007	488	249	30	5	193	179	116	339	20	129
Uruguay	2005/09	788	479	42	63	314	304	170	465	43	280
Uzbekistan	2007	336	116	42	6	117	133	86	111	36	189
Vanuatu	2008	92	69	11	24	58	34	0	7	19	66
Venezuela	2009	137	55	6	14	58	51	28	54	2	81
Vietnam	2008	927	631	45	86	221	370	336	693	52	182
Yemen	2009	276	116	10	0	178	72	26	150	1	125
Zambia	2006	479	185	38	78	270	146	63	301	4	174
Zimbabwe	2010	550	193	84	6	215	202	133	301	14	235
Total		45,480	23,651	2,739	3,028	21,225	15,228	9,027	27,075	2,483	15,922

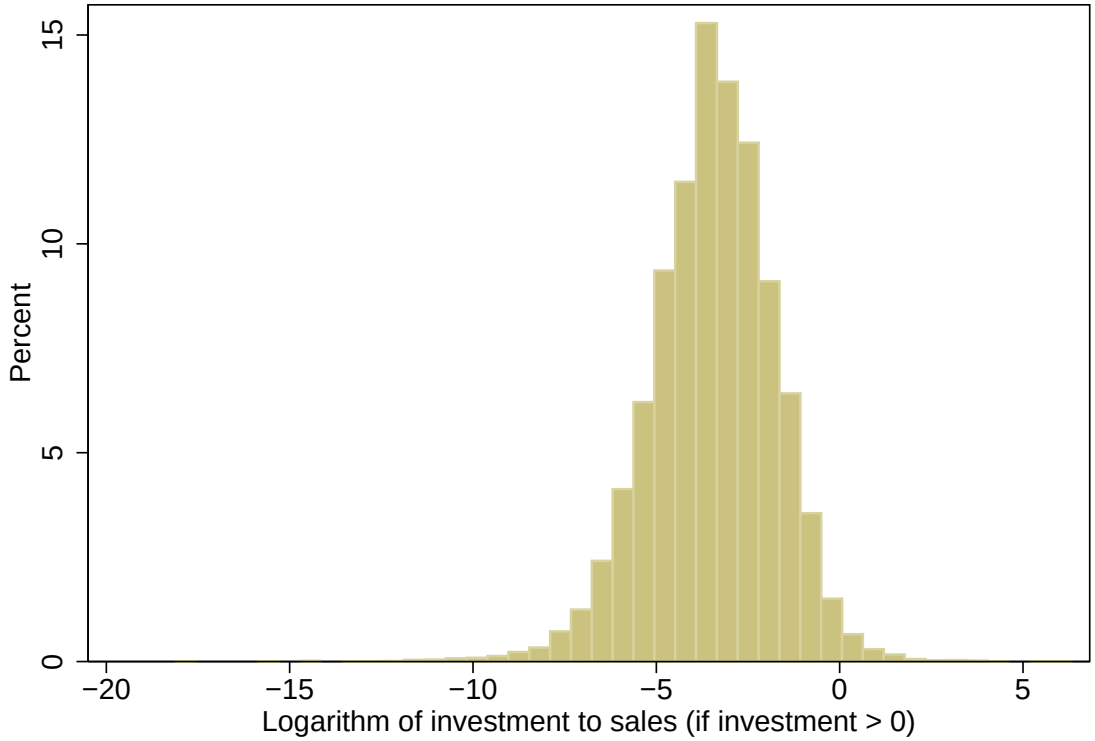
Small firms have 5-19 permanent employees, medium firms 20-99 permanent employees, and large firms 100 or more permanent employees.
Manufacturing includes leather, garments, textiles, food, metals and machinery, chemicals and pharmaceuticals, and other manufacturing industries.
Transport includes construction and transportation.
Services includes retail and wholesale trade, hotels, restaurants, and other services.

Table 8: Definition of firm-level variables

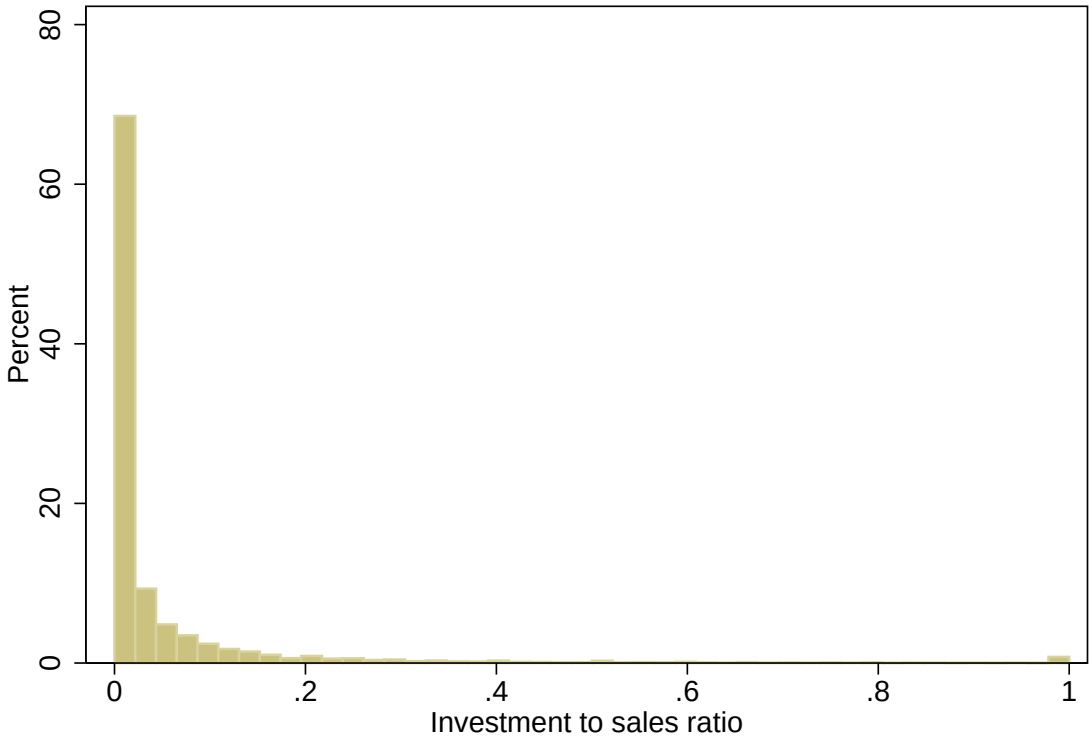
Corresponding variable	Data description
Investment	Total annual expenditure for purchases of equipment and machinery in last fiscal year
	Total annual sales in last fiscal year
Foreign	Individuals, companies or organizations that are privately owned and have 10% or more foreign equity ownership
P_Foreign	Individuals, companies or organizations that are privately owned and are partially foreign owned
*Foreign*100	Individuals, companies or organizations that are privately owned and that are 100% foreign owned
Labour	Total labor cost (including wages, salaries, bonuses, etc.) in last fiscal year
	Total annual sales in last fiscal year
Age	In what year did this establishment begin operations in this country?
Export	The percentage of the establishment's sales that were: national sales/direct exports/indirect exports
Size	Number of permanent, full-time employees of this firm at the end of last fiscal year
Land	How much of an obstacle is access to land to the operations of this firm?
Finance	How much of an obstacle is access to finance to the operations of this firm?
Competitor	How much of an obstacle are the informal sector competitors to your operations?
Sector	Industrial sector classification recoded to (1) leather, garments and textiles, (2) food, (3), metals and machinery, (4) chemicals and pharmaceuticals, (5) other manufacturing, (6) retail and wholesale trade, (7) hotels, restaurants and other services, and (8) construction and transportation
K	Net book value of machinery vehicles, and equipment in last fiscal year

Source: ES

Figure 3: Histograms of the Distribution of Investment to Sales

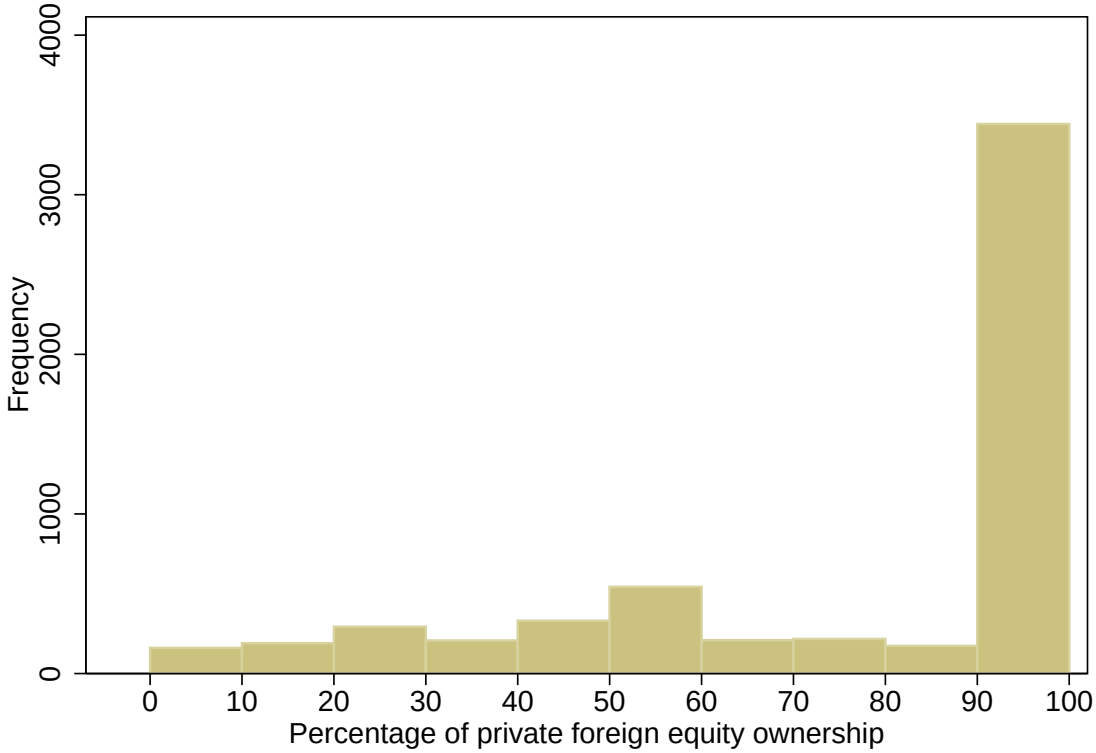


Sources: ES



Sources: ES

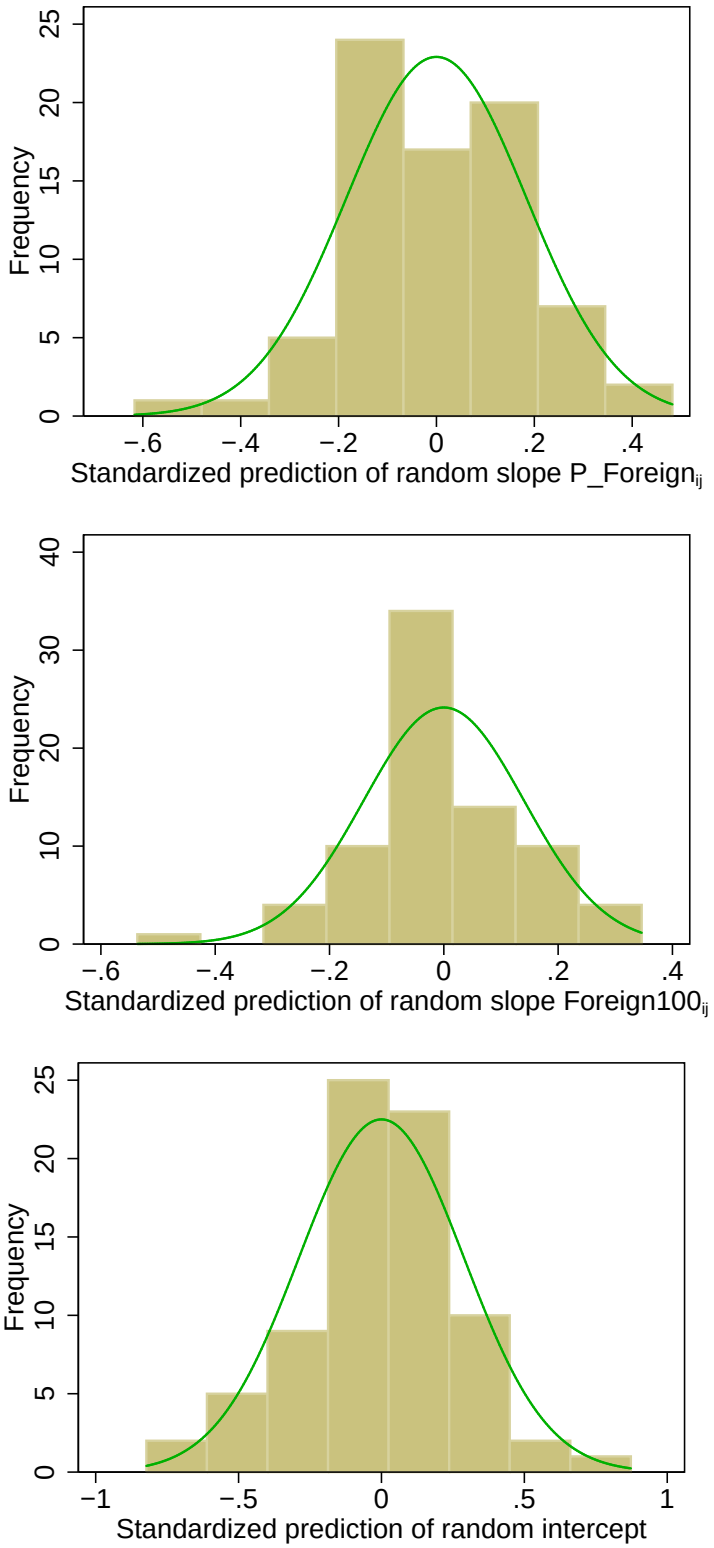
Figure 4: Histogram of the Distribution of Foreign Ownership



Sources: ES

Figure 5: Histograms of the Distribution of $\widehat{\delta}_{1j}$, $\widehat{\delta}_{2j}$, and $\widehat{\upsilon}_j$

Random coefficient model: Table 9 Model 2



8 Appendix B

8.1 Robustness Analysis for the Dependent Variable

This appendix presents the results of a sensitivity analysis that explores the effect of using alternative dependent variables to capture the determinants of investment behaviour (and/or aspects thereof). These results are comparable to the results of the probit and outcome model that are presented in models 1 and 3 of Table 1. First, Model 2 of Table 9 presents the results using the natural logarithm of the ratio of investment to labour costs ($ln(I/Labour)$) as the dependent variable. Both the probit selection model and the outcome model (model 1-2) do not include *Labour* as an explanatory variable. Second, model 4 uses the natural logarithm of the ratio of investment to capital ($ln(I/K)$) as the dependent variable. Capital (K) is a measure of firms' net book value of machinery vehicles, and equipment. In terms of definition this dependent variable is a preferred measure of investment. However, as a result of missing observations for K, the probit selection model 3 and the outcome model 4 exclude the following countries in the analysis: Benin, Bhutan, Cape Verde, Chad, Eritrea, Fiji, Malawi, Micronesia, Niger, Samoa, Timor Leste, Togo, Tonga, and Vanuatu. Moreover, missing observations reduce the sample used in the outcome model to 11,646 firms. Finally, model 6 uses the natural logarithm of investment ($ln(I)$) as the dependent variable. The natural logarithm of sales ($Sales$) is included as an explanatory variable in both the probit selection model 5 and the outcome model 6. Investment and sales is converted from local currency to US dollar amounts using annual average official exchange rates from the World Bank, WDI. This Heckman selection model excludes observations for the countries Ecuador (for 2009 only), Kosovo, Slovenia, Uzbekistan, and Zimbabwe because of missing data on exchange rates.

We find no systematic differences between the probit selection models 1 and 3 presented in Table 9 with respect to the results presented in Table 1. In model 5 however, the coefficient of $P\_Foreign$ is negative but this coefficient remains insignificant. The coefficient of $Foreign100$ turns significant and remains negative. And, the coefficient of *Labour* turns positive and remains significant. These differences in the results are likely to be the effect of including *Sales* in the model. The coefficient of *Sales* is significant and positive.

We proceed by examining the differences between models 2, 4, and 6 of Table 9 with respect to model 3 of Table 1. The results of the outcome models (2, 4, and 6) show that the coefficients of λ are not significant; these Heckman selection models are not successful in controlling for selection bias. Because a large number of firms are omitted in model 4 it is not surprising that the coefficient of λ (of model 4) is not significant. Another difference is that the coefficient of λ in model 2 has a negative sign.

The results displayed in Table 9 provide some evidence suggesting a positive effect of acquiring a foreign partner on investment. Following model 2 and 6 the coefficient of $Foreign\_P$ is positive and significant; in model 4 this coefficient is negative but insignificant. The coefficient of $Foreign100$ is negative in models 2, 4, and 6 but is only significant in models 2 and 4. The result presented in model 2 suggests that firms that are completely foreign owned invest more in labour (in terms of wages) relative to fixed capital. Overall, the results support the findings presented in Table 1 that suggest that firms that are completely foreign owned invest relatively less in fixed capital formation. Some additional notable differences are that the coefficients of *Export* and *Labour* are

negative but not significant following model 4 and the coefficient of *Size* is positive and significant in model 6. For the outcome models, the ρ are higher than 0.06 (which is observed in model 3 of Table 1). In particular, analysis using the natural logarithm of investment as the dependent variables (model 6) yields a ρ of 0.15. One possibility is that this result is sensitive to the exchange rate conversion.

Table 9: Probit and outcome random-intercept models models using alternative dependent variables

	Invest	ln(I/Labour)	Invest	ln(I/K)	Invest	ln(I)
	(1) Probit Selection	(2) Outcome	(3) Probit Selection	(4) Outcome	(5) Probit Selection	(6) Outcome
FIXED EFFECTS ('OBSERVED' EFFECTS)						
P_Foreign	0.04	0.07+	0.04	-0.10	-0.01	0.15***
	(0.03)	(0.04)	(0.03)	(0.06)	(0.03)	(0.04)
Foreign100	-0.02	-0.08+	-0.04	-0.16*	-0.08**	-0.02
	(0.03)	(0.04)	(0.03)	(0.06)	(0.03)	(0.04)
Age	-0.11***	-0.10***	-0.11***	-0.14***	-0.12***	-0.08***
	(0.01)	(0.02)	(0.01)	(0.03)	(0.01)	(0.02)
Export	0.18***	0.06	0.18***	-0.07	0.15***	0.12***
	(0.02)	(0.03)	(0.02)	(0.05)	(0.02)	(0.03)
Labour			-0.04***	-0.00	0.04***	0.19***
			(0.01)	(0.02)	(0.01)	(0.01)
Size	0.26***	-0.14***	0.25***	-0.11*	0.14***	0.25***
	(0.01)	(0.03)	(0.01)	(0.05)	(0.01)	(0.02)
Sales					0.11***	0.62***
					(0.01)	(0.02)
Land	0.14***		0.14***		0.14***	
	(0.01)		(0.01)		(0.01)	
Finance	0.01		0.01		0.02	
	(0.01)		(0.01)		(0.01)	
Competitor	0.04**		0.04**		0.04**	
	(0.01)		(0.01)		(0.01)	
λ		-0.09		0.05		0.04
		(0.23)		(0.34)		(0.19)
Constant	-0.76***	-0.77**	-0.84***	-0.54	-1.63***	1.14**
	(0.05)	(0.28)	(0.05)	(0.42)	(0.07)	(0.34)
RANDOM EFFECTS ('UNOBSERVED' EFFECTS)						
σ_v	0.36**	0.48**	0.36**	0.45**	0.36**	0.62**
	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)	(0.05)
Joint LR Chi2	2366.2	1255.1	2301.4	698.0	2224.1	1771.1
Joint LR df(1)	***	***	***	***	***	***
ρ	0.11	0.08	0.11	0.07	0.11	0.15
# of firms	45480	23651	44039	11634	43925	22871
# of countries	101	101	87	87	97	97

In parentheses are standard errors. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
All models contain sector dummies

8.2 Robustness Analysis for Partial Foreign Equity Ownership

In this section we present the results of additional experimentation with the measurement of foreign equity ownership. Specifically, we build on the analysis of Table 1 models 1 and 3 and use a set of dummies that identifies firms with different levels of partial

foreign ownership using separate categories: firms with less than 50% foreign ownership ($Partial-50$: 1,182 firms) and firms with 50% or more than 50% foreign ownership but not 100% foreign ownership ($Partial+50$: 1,557 firms). We also control for the effect of $Foreign100$ on investment. These results are presented in Table 10.

When using this set of dummy variables we find no effect of foreign equity ownership on the probability of investment (model 1). Moreover, the coefficients of $Partial-50$ and $Partial+50$ are also insignificant following the outcome model (model 2). Albeit insignificant, the coefficient of $Partial-50$ is positive and the coefficient of $Partial+50$ is negative. Still, we find no significant evidence which suggest that there is a non-linear relation between partial foreign equity ownership and investment. In agreement with the results previously discussed, there is a negative relation between $Foreign100$ and firms' investment to sales ratio.

Table 10: Probit and outcome random-intercept models models using an alternative measure for partial foreign ownership

	(1) Probit Selection	(2) Outcome
	Fixed Effects ('observed' effects)	
Partial-50	0.02	0.08
	(0.04)	(0.06)
Partial+50	0.06	-0.03
	(0.04)	(0.05)
Foreign100	-0.03	-0.21***
	(0.03)	(0.04)
Age	-0.11***	-0.15***
	(0.01)	(0.02)
Export	0.17***	0.07*
	(0.02)	(0.03)
Labour	-0.04***	0.44***
	(0.01)	(0.01)
Size	0.25***	-0.10**
	(0.01)	(0.03)
Land	0.14***	
	(0.01)	
Finance	0.01	
	(0.01)	
Competitor	0.04**	
	(0.01)	
λ		0.41*
		(0.21)
Constant	-0.82***	-2.12***
	(0.05)	(0.26)
	Random Effects ('unobserved' effects)	
σ_υ	0.36**	0.38**
	(0.03)	(0.03)
Joint LR Chi2	2388.8	916.6
Joint LR df(1)	***	***
ρ	0.12	0.06
# of firms	45480	23651
countries	101	101

In parentheses are standard errors. + $p<0.10$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$
All models contain sector dummies

8.3 Regression Analysis by Sector

Variations in investment behaviour are partly attributable to industry and sector specificities. The effect of foreign equity ownership on investment behaviour may also be influenced by these specificities. In this section we control for the robustness of the results of model 1 and 3 of Table 1 across sector. First, in models 1 and 2 of Table 11 we limit the sample to firms operating in manufacturing industries. Manufacturing industries include leather, garments, textiles, food, metals and machinery, chemicals and pharmaceuticals, and other manufacturing industries. Second, in models 3 and 4 of Table 11 we limit the sample to firms operating in service industries which includes retail and wholesale trade, hotels, restaurants, and other service industries. Because we have no data for firms operating in services in Ethiopia this country is excluded from the analysis in models 3 and 4. The regression models 1-4 do not include sector dummies.

We find no significant relation between foreign equity ownership and the probability of investment. Model 4, which is based on a sample of firms operating in service industries, suggests that firms with partial foreign equity ownership invest relatively more than domestically owned firms. Firms that are completely foreign owned invest less in fixed capital relative to sales. The coefficient of $Foreign100$ in model 4 (services) is roughly double the coefficient of $Foreign100$ in model 2 (manufacturing). For both models 2 and 4, λ is not significant. The magnitude of the ρ are comparable in size with the results previously discussed on the basis of Table 1.

Table 11: Probit and outcome random-intercept models models by sector

	Manufacturing	Manufacturing	Services	Services
	(1) Probit Selection	(2) Outcome	(3) Probit Selection	(4) Outcome
FIXED EFFECTS ('OBSERVED' EFFECTS)				
P_Foreign	0.06	-0.03	0.07	0.14+
	(0.04)	(0.05)	(0.05)	(0.07)
Foreign100	-0.02	-0.15**	-0.03	-0.31***
	(0.03)	(0.05)	(0.04)	(0.07)
Age	-0.11***	-0.13***	-0.09***	-0.14***
	(0.01)	(0.02)	(0.02)	(0.03)
Export	0.16***	-0.06	0.24***	0.10
	(0.02)	(0.04)	(0.04)	(0.07)
Labour	-0.06***	0.38***	-0.02*	0.56***
	(0.01)	(0.01)	(0.01)	(0.01)
Size	0.24***	-0.13***	0.28***	-0.15*
	(0.01)	(0.04)	(0.01)	(0.06)
Land	0.17***		0.12***	
	(0.02)		(0.02)	
Finance	-0.02		0.03	
	(0.02)		(0.02)	
Competitor	0.02		0.05*	
	(0.02)		(0.02)	
λ		0.03		0.30
		(0.25)		(0.36)
Constant	-0.64***	-1.66***	-0.78***	-1.66***
	(0.06)	(0.29)	(0.06)	(0.45)
RANDOM EFFECTS ('UNOBSERVED' EFFECTS)				
σ_υ	0.38**	0.33**	0.38**	0.44**

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	(0.03)	(0.03)	(0.03)	(0.04)
Joint LR Chi2	1550.5	510.4	915.8	347.8
Joint LR df(1)	***	***	***	***
ρ	0.13	0.05	0.13	0.07
# of firms	27075	14420	15922	7601
# of countries	101	101	100	100
In parentheses are standard errors. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$				

8.4 Robustness Analysis for Crisis

Finally we present the results of a robustness analysis that controls for the possible effect of the financial crisis on investment behaviour. As a result of the financial crisis, the economy in many developed countries has slowed down. Arguably, in developing countries the effect of the crisis has been less severe. Yet, it may be possible to observe differences in the determinants of investment behaviour when comparing investment behaviour in pre-crisis years with the investment behaviour since 2008. In this section we seek to establish the degree to which foreign investors behave differently in the years preceding the recent financial crisis with respect to the 'crisis years'.

The sample of observations is divided into a 'pre-crisis' sample (investment in fiscal years 2005, 2006 and 2007) and a 'crisis' sample (investment in fiscal years 2008, 2009 and 2010). Rwanda is excluded from the 'crisis' sample because there are no firms in our sample population that have positive investment in this country in the fiscal year 2010. Because the sample of countries differs across the 'pre-crisis' and the 'crisis' sample we cannot be certain that differences in results are attributable to the effect of the crisis. The results are presented in Table 12: models 1 and 2 are based on the 'pre-crisis' sample and models 3 and 4 are based on the 'crisis' sample. These analyses build on the random-intercept models that include only the micro-level covariates.

The analysis based on the 'pre-crisis' sample does not indicate an effect of partial foreign equity ownership on the probability of investment or on the investment to sales ratio. However, the outcome model suggests that completely foreign owned firms invest less than domestically owned firms. The analysis using the 'crisis' sample likewise suggests that the coefficient of $Foreign100$ is negatively related to $Investment$. Model 3 also indicates that $P\_Foreign$ is positively related to the probability of investment.

Table 12: Probit and outcome random-intercept models models (pre-crisis & crisis years)

	Pre-crisis	Pre-crisis	Crisis	Crisis
	(1) Probit Selection	(2) Outcome	(3) Probit Selection	(4) Outcome
Fixed Effects ('observed' effects)				
P_Foreign	-0.01	0.01	0.14**	0.11
	(0.04)	(0.05)	(0.04)	(0.07)
Foreign100	-0.04	-0.23***	-0.02	-0.14*
	(0.03)	(0.05)	(0.05)	(0.06)
Age	-0.11***	-0.13***	-0.09***	-0.19***
	(0.01)	(0.02)	(0.02)	(0.03)
Export	0.19***	0.09*	0.12***	0.03
	(0.02)	(0.04)	(0.03)	(0.05)

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Labour	-0.06***	0.43***	-0.04***	0.46***
	(0.01)	(0.01)	(0.01)	(0.02)
Size	0.25***	-0.11***	0.26***	-0.03
	(0.01)	(0.03)	(0.01)	(0.06)
Land	0.15***		0.12***	
	(0.02)		(0.02)	
Finance	0.05**		-0.06*	
	(0.02)		(0.02)	
Competitor	0.05**		0.04+	
	(0.02)		(0.02)	
λ		0.20		1.04**
		(0.23)		(0.37)
Constant	-0.76***	-2.03***	-0.97***	-2.77***
	(0.06)	(0.27)	(0.09)	(0.52)
RANDOM EFFECTS ('UNOBSERVED' EFFECTS)				
σ_υ	0.36**	0.34**	0.42**	0.47**
	(0.03)	(0.03)	(0.05)	(0.06)
Joint LR Chi2	1623.7	512.6	974.8	376.1
Joint LR df(1)	***	***	***	***
ρ	0.11	0.05	0.15	0.09
# of firms	29139	15574	16261	8077
# of countries	72	72	47	47

In parentheses are standard errors. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
All models contain sector dummies

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