

Harms, Philipp; Knaze, Jakob

Conference Paper

Bilateral De-Jure Exchange Rate Regimes and Foreign Direct Investment: A Gravity Analysis

Beiträge zur Jahrestagung des Vereins für Socialpolitik 2018: Digitale Wirtschaft - Session: Foreign Direct Investment, No. G09-V1

Provided in Cooperation with:

Verein für Socialpolitik / German Economic Association

Suggested Citation: Harms, Philipp; Knaze, Jakob (2018) : Bilateral De-Jure Exchange Rate Regimes and Foreign Direct Investment: A Gravity Analysis, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2018: Digitale Wirtschaft - Session: Foreign Direct Investment, No. G09-V1, ZBW - Leibniz-Informationszentrum Wirtschaft, Kiel, Hamburg

This Version is available at:

<https://hdl.handle.net/10419/181559>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Bilateral De-Jure Exchange Rate Regimes and Foreign Direct Investment: A Gravity Analysis

Philipp Harms* and Jakub Knaze†

This version: August 24, 2018

Abstract

This paper uses a newly constructed dataset on *bilateral de-jure exchange rate regimes* to estimate the effect of expected exchange rate volatility on foreign direct investment (FDI). The new dataset accounts for the fact that officially pegging to one currency is uninformative about the exchange rate regime prevailing vis-à-vis other currencies, and it allows characterizing bilateral exchange rate regimes based on countries' ex-ante announcements rather than ex-post observations. We present a simple model that suggests that announced exchange rate stability enhances bilateral FDI flows. The empirical evidence we provide offers some support to this claim: countries that are linked by a non-floating exchange rate regime seem to attract significantly more FDI from each other. In particular, relationships with no separate legal tender like currency unions are most favorable to FDI in both developed and developing countries. Moreover, we find substantial differences between developing and developed countries, with the effect of announced exchange rate stability being much stronger for the former group than for the latter.

Keywords: Exchange rate regimes · Foreign direct investment · Gravity equation
JEL codes: F21, F23, O24

1 Introduction

It is often claimed that exchange rate stability, by reducing uncertainty and lowering transaction costs, enhances foreign direct investment (FDI).¹ However, the empirical evidence on the relationship between exchange rate regimes and FDI is rather mixed, with some contributions supporting the notion of a positive effect and others denying any significant influence of the exchange rate regime on FDI.² In this paper, we argue that the inconclusive evidence may be due to flaws in identifying the relevant exchange rate regime, and we introduce a new dataset that allows overcoming these drawbacks.

*Johannes Gutenberg University Mainz, Gutenberg School of Management and Economics, Jakob-Welder-Weg 4, 55128 Mainz, Germany, phone: + 49-6131-39-22559, e-mail: lsharms@uni-mainz.de. We are indebted to audiences at the 2017 ETSG conference in Florence and the 2018 Goettingen workshop on International Economics as well as seminar participants at Johannes Gutenberg University Mainz for helpful comments. Special thanks go to Udo Broll for commenting on a very early draft of this paper.

†Johannes Gutenberg University Mainz, Gutenberg School of Management and Economics, Jakob-Welder-Weg 4, 55128 Mainz, Germany, phone: + 49-6131-39-25140, e-mail: jakub.knaze@uni-mainz.de.

¹For example, when Jaguar Land Rover announced a large FDI investment in Slovakia, the official press release stated that: “As well as benefiting from lower labour costs in Slovakia, having a plant in the Eurozone will help insulate Jaguar Land Rover from currency movements” (The Telegraph, 2015).

²Faeth (2009) provides a survey on determinants of FDI, including exchange rate stability as a potentially relevant variable. Other studies on the determinants of bilateral FDI have been provided by Bloningen et al. (2007), Baltagi et al. (2007), Bénassy-Quéré et al. (2007) and Davies et al. (2008).

So far, the existing literature offers several approaches to analyze the relationship between exchange rate regimes and FDI. Those studies that explore whether exchange rate stability raises *total* FDI inflows into a country focus on the question whether the domestic currency is pegged against one “anchor” currency (see, e.g., Abbott et al., 2012). However, this approach ignores the fact that officially pegging to one currency is uninformative about the exchange rate regime prevailing vis-à-vis *other* potential FDI source countries. Moreover, given the uncertainty about which currency is the relevant anchor, the resulting classification is subject to some arbitrariness and may undergo sudden changes.³ An example from the IMF’s Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) demonstrates why the use of unilateral data can be misleading: Until the year 2006, AREAER classified Germany – being a member of the Euro area – as having an exchange rate arrangement *with no separate legal tender*.⁴ The AREAERs covering the years 2007 and later classify Germany as having a *freely floating exchange rate arrangement*, since the exchange rate of the euro against the US dollar and many other currencies is flexible. What is then the correct description of Germany’s exchange rate arrangement? Both classifications are correct, depending on whether the respective counterparty of Germany is a member of the euro area or not.

Such problems can be mitigated by shifting the focus from *aggregate* to *bilateral* FDI flows, and by relating these flows to the stability of *bilateral* exchange rates.⁵ This approach has been adopted by Klein and Shambaugh (2006) who analyze the relationship between exchange rate stability and bilateral *trade*, using “de-facto bilateral exchange rate arrangements” which are based on the dataset of Shambaugh (2004). However, considering observed exchange rate volatility as a potential determinant of international investment – rather than trade – meets two important problems: First, fluctuations of the exchange rate are endogenous, potentially reacting to international capital flows and investment decisions. Second, and perhaps more importantly, investment decisions are based on expectations about the future, and ex-ante announcements about exchange rate policies should therefore be at least as relevant as *ex-post* observations on de-facto exchange rate volatility.⁶

A third strand of literature devotes its attention to the effect of *currency unions* on FDI (see, e.g., Schiavo, 2007). However, while the sharing of a common currency clearly represents a particularly strong ex-ante commitment to exchange rate stability, the findings of these studies are uninformative about the influence of *other* exchange rate arrangements. We argue that the potential benefits of exchange rate stability do not exclusively apply to countries that are in a currency union, but also to other types of hard pegs – e.g. currency boards. Moreover, similar benefits are likely to result from conventional pegged arrangements as long as the peg is not expected to change, and it should also hold – albeit to a smaller extent – for currencies whose exchange rate fluctuations are significantly dampened by the actions of some monetary authority, for example crawling pegs, crawl-like arrangements and exchange rates pegged within horizontal bands.

This brief review illustrates the need to use data on the stability of *bilateral* exchange rates that are based on *policy announcements* rather than observed exchange rate fluctuations, and that do not only focus on currency-unions as a special version of a fixed bilateral exchange rate.

³The effort devoted by Ilzetzi et al. (2017) to identifying the correct anchor currency for a large set of countries illustrates the relevance of this claim.

⁴Throughout the paper, the terms “exchange rate regime” and “exchange rate arrangement” will be used interchangeably.

⁵Such studies have been made increasingly feasible by the growing availability of bilateral investment data which are based, e.g., on the IMF’s Coordinated Direct Investment Survey (CDIS) and Coordinated Portfolio Investment Survey (CPIS).

⁶In one of their robustness checks, Klein and Shambaugh also use a bilateral regime classification that is based on countries’ *official announcements*. However, they only distinguish between pegs and non-pegs, while our taxonomy (introduced below) allows for a much richer set of regime choices.

So far, such data does not exist, and this is the gap our paper tries to close.⁷

We estimate a gravity equation that includes the *bilateral de-jure exchange rate regime* as a potential determinant of bilateral FDI. The construction of these exchange rate regimes is based on an algorithm that processes data from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER), and that combines information on each country's official exchange rate regime vis-à-vis all potential anchor currencies. Eventually, we come up with a *bilateral* exchange rate flexibility index, which ranges from one (hard pegs) to ten (pure floats), and a set of dummy variables that distinguish between seven bilateral exchange rate regimes.⁸

By applying our new dataset, we show that – compared to freely floating exchange rates – countries that are linked by a non-floating exchange rate regime attract significantly more FDI from each other. Once we focus on different country groups, it turns out that exchange rate regimes with no separate legal tender are most favorable to FDI in both developed and developing countries. In addition, developing countries seem to attract significantly more FDI flows under both conventional pegs and other soft pegs than under (official) floats. By contrast, the relationship between announced exchange rate stability and FDI seems to be non-monotonic for developed economies. These results are robust with respect to various robustness checks, including sample variations and the use of alternative empirical approaches.

The rest of the paper is structured as follows: Section 2 presents a simple partial-equilibrium model which analyzes the decision of a firm that has to decide between different modes of market entry (exports vs. FDI), facing a proximity/concentration trade-off. The volatility of the nominal exchange rate is relevant since firms have to determine their prices one period in advance. Using this model, we derive the hypothesis that a lower expected volatility of the nominal exchange rate makes FDI more attractive, regardless of whether an exporting firm would set its prices in the domestic or in the foreign currency. Section 3 describes the construction of the new dataset on *bilateral de-jure exchange rate regimes* and outlines our empirical methodology. Section 4 summarizes the results, section 5 presents further extensions, and section 6 concludes.

2 A simple model of expected nominal exchange rate volatility and FDI

2.1 Motivation

While the intuitive arguments brought forward in favor of a positive effect of exchange rate stability on FDI – the elimination of disturbances in relative prices and, possibly, currency conversion costs (Santos Silva and Tenreyro, 2010) – are compelling, there are few theoretical analyses of this relationship. An exception is the study of Aizenman (1992). His model focuses on horizontal FDI and stresses the diversification of risks as the main reason of firms' internationalization. Aggregate investment is found to be higher under a fixed exchange rate regime than under a flexible regime. Since FDI is part of aggregate investment, it is also expected to increase if a fixed regime is adopted. However, the paper does not directly model the decisions of multinational enterprises. Moreover, it distinguishes only between two exchange rate arrangements: flexible and fixed regimes, describing a fixed exchange rate as an integration of

⁷We thus follow up on Abbott et al. (2012) who caution that an exchange rate is usually pegged to only one currency, but is implicitly floating vis-à-vis many other currencies. In fact, the authors explicitly stress the desirability of examining the effect of *bilateral* exchange rate regimes.

⁸Our data set on bilateral de-jure exchange rate regimes will soon be available on the homepage of International Economics at Johannes Gutenberg University Mainz (<http://www.international.economics.uni-mainz.de/>).

national money markets, i.e. a currency union. Our model introduced below suggests that the potential benefits of expected exchange rate stability should be investigated for *all* types of regimes, not only for the special case of currency unions.

To analyze the influence of expected nominal exchange rate volatility on FDI, we present a simple partial equilibrium model that focuses on firms' choice between exports and horizontal FDI.⁹ Combining the well-known proximity-concentration trade-off with the assumption of short-run price rigidity, we show that a higher variance of the nominal exchange rate induces firms to export instead of producing abroad. *Ceteris paribus*, we should thus expect countries with a fixed exchange rate vis-à-vis another country to attract more FDI from that country.

2.2 Model structure

We consider a firm that serves a foreign market, and that enjoys monopoly power with respect to the good it produces. Firm owners are risk neutral, hence managers are guided by the objective to maximize the firm's expected profit. In the foreign market, the firm faces a demand function that is characterized by a constant elasticity of demand, i.e.

$$X_t = (P_t)^{-\theta} \quad (1)$$

In equation (1), P_t represents the price faced by consumers, and $\theta > 1$ is the demand elasticity in absolute value. If the firm produces domestically, marginal costs equal average costs, and for simplicity we set them equal to one. However, exports are associated with trade costs, which raise the firm's effective marginal costs to a level of $\tau > 1$ (in domestic currency units). By contrast, if the firm produces abroad – i.e. engages in horizontal FDI – it faces a constant average cost of κ (in foreign currency units). Moreover, it has to incur a fixed cost C (in domestic currency units) which reflects the cost of running an additional facility, and which is at the heart of the well-known proximity/concentration trade-off (Brainard, 1997; Helpman et al., 2006).

Our crucial assumption is that the firm has to set its price one period before it observes the realization of the nominal exchange rate, and that it adjusts its supply to demand.¹⁰ Exchange rate fluctuations are the only source of uncertainty, and the effect of such fluctuations on profits depends both on the firm's mode of entry and on its pricing strategy:

- If the firm supplies the market by producing abroad (**horizontal FDI**), there is no uncertainty with respect to the amount produced since – by assumption – demand only depends on prices, which are predetermined in the customers' currency. However, revenues have to be converted into the domestic currency by using the (ex-ante uncertain) nominal exchange rate.
- If the firm supplies the market by producing domestically and exporting, costs are denominated in domestic currency units. With respect to its pricing decision, the firm has the choice between two alternatives:
 - The firm can set the price in domestic currency-units (**Producer Currency Pricing, PCP**). In this case, the price faced by foreign customers – and thus their demand and the firm's output – depends on the nominal exchange rate.

⁹Using the WTO's terminology, firms thus decide whether to supply foreign markets via “mode 1” or “mode 3”.

¹⁰By considering a firm's pricing decision in the presence of nominal rigidities, our analysis is reminiscent of Bacchetta and van Wincoop (2005) who, however, do not account for the option of engaging in FDI.

- Alternatively, the firm can set the price in foreign-currency units (**Local Currency Pricing, LCP**). In this case, the demand faced by foreign customers – and thus the firm’s output – is predetermined. However, the size of revenues (denominated in domestic currency units) depends on the nominal exchange rate.

In what follows, we will first consider the choice between PCP and LCP for an exporting firm. As we will show, the firm chooses PCP unless the exchange rate is expected to remain constant (in which case the firm is indifferent between PCP and LCP). In a next step, we will then focus on the export vs. FDI decision.

2.3 Exports vs. FDI

Using our assumptions on demand and cost functions, we start by defining an exporting firm’s expected profit (as of period t) for the case of producer currency pricing and local currency pricing, respectively. We denote the price set by a firm choosing PCP – a “PCP-firm” – by P_t^{PCP} , and the price set by a “LCP-firm” by P_t^{LCP} . Recall that a firm that produces domestically and exports its output does not face a fixed cost, but that marginal costs including trading costs are given by τ . Denoting a firm’s profit by Π , we can thus write

$$\mathbf{E}_t(\Pi_{t+1}^{PCP}) = (P_t^{PCP} - \tau) \mathbf{E}_t \left[\left(\frac{P_t^{PCP}}{E_{t+1}} \right)^{-\theta} \right] \quad (2)$$

$$\mathbf{E}_t(\Pi_{t+1}^{LCP}) = [\mathbf{E}_t(E_{t+1}) P_t^{LCP} - \tau] (P_t^{LCP})^{-\theta} \quad (3)$$

Here, the (bold-type) letter \mathbf{E} denotes the expectations operator, while E_{t+1} reflects the nominal exchange rate in period $t + 1$. Note that we are using the price notation, i.e. the nominal exchange rate reflects the price of the foreign currency in terms of domestic currency units, and an increase of E_{t+1} reflects a *nominal depreciation* of the domestic currency. For the sake of simplicity, we assume that $\mathbf{E}_t(E_{t+1}) = 1$. The crucial difference between the two pricing decisions is that, in case of PCP, the uncertainty stems from the effect of exchange rate fluctuations on demand. By contrast, there is no uncertainty about demand in the case of LCP, since the price is fixed ex-ante in the customers’ currency. However, exchange rate fluctuations affect the difference between revenues and costs.

In period t , the firm chooses its optimal price, accounting for the specific type of uncertainty that it is exposed to. Solving for the optimal price of a PCP-firm yields

$$P_t^{PCP,opt} = \frac{\theta}{\theta - 1} \tau \quad (4)$$

Substituting this into the definition of a PCP-firm’s expected profit yields

$$\mathbf{E}_t(\Pi_{t+1}^{PCP,opt}) = \Theta \tau^{1-\theta} \mathbf{E}_t \left[(E_{t+1})^\theta \right] \quad (5)$$

with $\Theta \equiv \theta^{-\theta}(\theta - 1)^{\theta-1}$. Performing the same steps for a LCP-firm yields the optimal price

$$P_t^{LCP,opt} = \frac{\theta}{\theta - 1} \frac{\tau}{\mathbf{E}_t(E_{t+1})} \quad (6)$$

which equals $P_t^{PCP,opt}$, due to our assumption that $\mathbf{E}_t(E_{t+1}) = 1$. A LCP-firm’s maximal profit is given by

$$\mathbf{E}_t(\Pi_{t+1}^{LCP,opt}) = \Theta \tau^{1-\theta} \quad (7)$$

Obviously, the two expressions for expected profits are not the same, and it is easy to show that $\mathbf{E}_t(\Pi_{t+1}^{PCP,opt}) > \mathbf{E}_t(\Pi_{t+1}^{LCP,opt})$ if $\mathbf{E}_t \left[(E_{t+1})^\theta \right] > 1$. Given the assumption that $\theta > 1$, it follows from Jensen's inequality that this inequality is satisfied. Hence, firms who decide to supply the foreign market by exporting (instead of engaging in FDI) choose to set prices in their own currency, i.e. choose PCP, unless the exchange rate is fixed. In the latter case, the firm is indifferent between the two alternatives.¹¹

We now turn to the scenario that the firm runs a facility abroad to supply the foreign market. In this case, it faces marginal costs κ (in foreign currency units) and a fixed cost C (in domestic currency units). The expected profit (in domestic currency units) of a firm engaged in foreign direct investment (an "FDI-firm") can thus be written as

$$\mathbf{E}_t(\Pi_{t+1}^{FDI}) = \mathbf{E}_t(E_{t+1}) (P_t^{FDI} - \kappa) (P_t^{FDI})^{-\theta} - C \quad (8)$$

Apparently, the optimal price does not depend on the exchange rate, and we can easily derive

$$P_t^{FDI,opt} = \frac{\theta}{\theta - 1} \kappa \quad (9)$$

Substituting this expression into the definition of expected profits and using the assumption that $\mathbf{E}_t(E_{t+1}) = 1$ yields

$$\mathbf{E}_t(\Pi_{t+1}^{FDI,opt}) = \Theta \kappa^{1-\theta} - C \quad (10)$$

As we have seen above, an exporting firm strictly prefers PCP over LCP unless the exchange rate is fixed. To find out how exporting under PCP compares to (horizontal) FDI, we have to compare the expressions in (5) and (10). Such a comparison demonstrates that exporting is strictly preferred over FDI if

$$\Theta \tau^{1-\theta} \mathbf{E}_t \left[(E_{t+1})^\theta \right] > \Theta \kappa^{1-\theta} - C \quad (11)$$

To shed more light on the role of exchange rate volatility, we take a second-order approximation to $\mathbf{E}_t \left[(E_{t+1})^\theta \right]$ in the point $\mathbf{E}_t(E_{t+1}) = 1$. This yields

$$\mathbf{E}_t \left[(E_{t+1})^\theta \right] \approx 1 + \frac{\theta(\theta - 1)}{2} \text{Var}_t(E_{t+1}) \quad (12)$$

where $\text{Var}_t(E_{t+1})$ is the (conditional) variance of the nominal exchange rate. Inserting (12) into (11), we find that horizontal FDI is strictly preferred over exporting with PCP if

$$\text{Var}_t(E_{t+1}) < \frac{2}{\theta(\theta - 1)} \left[\left(\frac{\tau}{\kappa} \right)^{\theta-1} - 1 \right] - \frac{2C}{(\theta - 1)^\theta \theta^{1-\theta} \tau^{1-\theta}} \quad (13)$$

Figure 1 illustrates this relationship for $\theta = 2$ by depicting the RHS of (13) as a function of $\left(\frac{\tau}{\kappa} \right)$. The critical level of relative costs above which the firm prefers FDI over exporting, $\left(\frac{\tau}{\kappa} \right)^{crit}$, is determined by the point of intersection between the RHS and $\text{Var}_t(E_{t+1})$. Let's first consider the case of $\text{Var}_t(E_{t+1}) = 0$, i.e. a fixed exchange rate. In this case, horizontal FDI is preferred over exporting if marginal costs of production abroad (κ) are much lower than marginal costs including transportation costs (τ), such that cost savings per unit produced abroad dominate the fixed cost (C) associated with running an additional plant. This is the standard proximity-concentration trade-off. If the exchange rate is *not* fixed, the left hand side of the inequality in (13) is greater than zero, and exporting with PCP may become attractive

¹¹As shown by Bacchetta and van Wincoop (2005), this result holds even if the cost function is non-linear, as long as the elasticity of costs with respect to output is smaller than $1 + 1/\theta$.

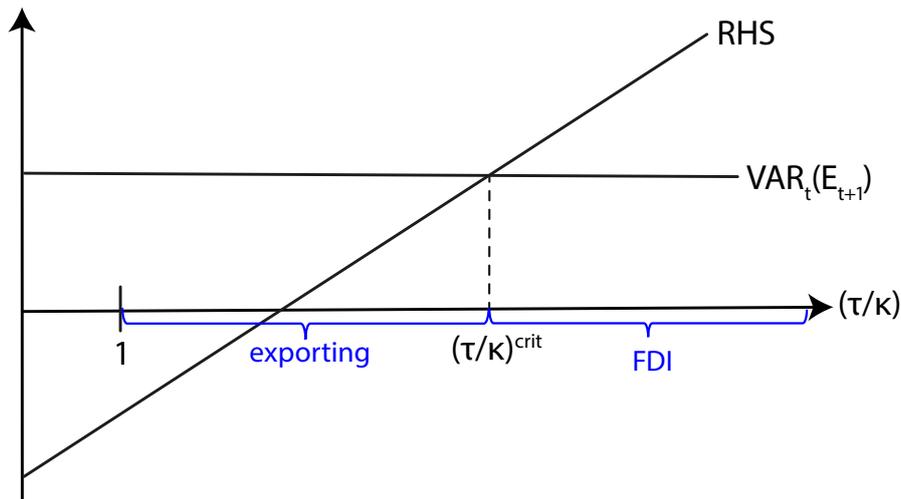


Figure 1: The critical level of relative domestic production costs (for $\theta = 2$). If $(\frac{\tau}{\kappa}) < (\frac{\tau}{\kappa})^{crit}$ the firm supplies the foreign market by exporting its output. If $(\frac{\tau}{\kappa}) > (\frac{\tau}{\kappa})^{crit}$ the firm serves the foreign market through a subsidiary, i.e. engages in FDI.

relative to FDI even if a firm would have chosen FDI under a fixed exchange rate. Increasing $Var_t(E_{t+1})$ shifts the horizontal line upward and raises $(\frac{\tau}{\kappa})^{crit}$: the more volatile the exchange rate, the greater the level of $(\frac{\tau}{\kappa})$ at which exporting is still more attractive than FDI.

While our partial equilibrium model has considered the decision of only one firm, it can easily be extended to explain *total* bilateral FDI flows between two countries. Suppose that the fixed costs of running a foreign plant (C) differ across domestic firms. In this case, the critical threshold $(\frac{\tau}{\kappa})^{crit}$ is firm-specific and increasing in C . If exchange rate volatility is high, only a small share of firms engages in FDI. Once the variance of the exchange rate declines, FDI becomes attractive for a larger number of firms, and aggregate (bilateral) FDI increases.¹²

This establishes a testable hypothesis: if we consider two country pairs which are identical except for the prevailing exchange rate regime, the countries that are linked by a fixed exchange rate should be characterized by more bilateral FDI. In fact, if we abandon the notion of a world with just two extreme exchange rate regimes (pegs and floats), the above result suggests a more nuanced version of the hypothesis: the more flexible the exchange rate regime – i.e. the more we depart from a credible peg – the lower the volume of bilateral FDI that we should observe. Note that all these statements refer to decisions at time t , i.e. firms have to form expectations about the variability of the exchange rate in period $t + 1$. We argue that this expectation crucially hinges on policy announcements, i.e. on the de-jure exchange rate regime in place.

¹²The same reasoning can be applied with respect to differences in *relative costs* $(\frac{\tau}{\kappa})$ across firms. By contrast, the isolated effect of domestic production and trading costs (τ) is more complex: equation (13) indicates that, for a given level of κ , a lower value of τ has an ambiguous effect on the attractiveness of FDI. Note, finally, that the negative relationship between exchange rate volatility and FDI holds even if the condition in footnote 11 is not satisfied. In that case, exporting firms decide to set their prices in the importers' currency. As a consequence, profits are a linear function of the exchange rate – as they are if firms engage in horizontal FDI. Expected profits are thus unaffected by the volatility of the exchange rate, and the choice between exports and FDI does not depend on the exchange rate regime. Under the (plausible) assumption that firms face different demand and cost structures, with some firms choosing PCP and others LCP, the expectation of a stable exchange rate has a positive influence on *aggregate* FDI.

3 Bilateral de-jure exchange-rate regimes: data and methodology

3.1 Data on exchange rate regimes

The IMF’s Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) has been tracking exchange arrangements and capital flow restrictions for all member countries starting as early as 1950. The AREAERs include country chapters that contain information about the exchange rate structure as reported by the member countries, thus providing us with *de-jure exchange rate regimes*. Starting in 2001, the IMF has been adding valuable information on members’ de-facto exchange rate policies, as analyzed by IMF staff, thus classifying members’ *de-facto regimes*. These de-facto regimes may differ from countries’ officially announced arrangements (IMF, 2001).

We decided to use the de-jure exchange rate regimes published in the AREAER as a building block for our new bilateral dataset. The reason is that the *de-facto* regimes are mainly built on the behavior of the exchange rates observed *ex-post* and as such may not appropriately capture the potential effect of ex-ante announcements on firms’ expectations. Of course, it is possible that the credibility of an announced regime breaks down - e.g. if a country decides (or is forced) to abandon a peg currently in place (for example as a result of a currency crisis). Moreover, a country may deliberately decide to implement an exchange rate regime that differs from the announced policy. We will later use two ways to account for these possibilities: first, we will exclude observations from countries that experienced a currency crisis in the years covered by our dataset. Second, we will use a set of *de-facto* bilateral exchange rate regimes based on the classification by Ilzetzi et al. (2017) which, in our interpretation, reflects markets’ perception of the exchange rate stability actually implemented by monetary authorities.

Based on the IMF’s information on de-jure exchange-rate regimes, we define a (bilateral) “exchange-rate flexibility index” (*ERflex*) running from 1 to 10, with 1 reflecting hard pegs with no separate legal tender and 10 the complete absence of any exchange-rate target, i.e. a pure float. The mapping of the IMF’s definitions into that index is described in Table 1.¹³ The

¹³Starting in the year 2009, the IMF has revised its system for the classification of exchange rate arrangements. More specifically, “managed floating with no predetermined path for the exchange rate has become too

1998 System	2009 System	Exchange rate flexibility (index)	Exchange rate regime
<i>Hard pegs</i>			
No separate legal tender	No separate legal tender	1	Regime ₁
Currency board arrangement	Currency board arrangement	2	Regime ₂
<i>Soft pegs</i>			
Conventional (fixed) peg	Conventional pegged arrangement	3	Regime ₃
-	Stabilized arrangement	4	Regime ₄
Crawling peg	Crawling peg	5	Regime ₄
Crawling band	Crawling-like arrangement	6	Regime ₄
Pegged within horizontal bands	Pegged within horizontal bands	7	Regime ₅
-	Other managed (residual)	8	Regime ₅
<i>Floating arrangements</i>			
Managed floating	Floating	9	Regime ₆
Independently floating	Free floating	10	Regime ₇

Table 1: AREAER exchange rate arrangements based on old and revised methodology, mapping into a *exchange rate flexibility index* and *regime dummies* (source: AREAER, IMF)

	<u>U.S.</u>	<u>Uzbekistan</u>	<u>Jordan</u>	<u>Germany</u>	<u>Austria</u>	<u>Denmark</u>
U.S.	-	6	3	10	10	10
Uzbekistan	6	-	6	10	10	10
Jordan	3	6	-	10	10	10
Germany	10	10	10	-	1	3
Austria	10	10	10	1	-	3
Denmark	10	10	10	3	3	-

Table 2: Computing bilateral exchange-rate regimes: an example

last column of the table describes the mapping of the flexibility index into a – somewhat coarser – set of seven *dummy variables* that identify different (sets of) regimes ($Regime_i$).¹⁴ Note that, while we adopt the IMF’s terminology and categories, our classification characterizes *bilateral* exchange rate regimes. The construction of these bilateral relationships will be described in the following subsection.

3.1.1 Constructing a dataset on bilateral de-jure exchange rate regimes

The basic structure of our algorithm builds on the observation that most countries that do not let their currency float freely are pegging it either to the U.S. dollar (USD) or to the euro (EUR).¹⁵ Referring to the “exchange rate flexibility index” introduced above, the strength of the peg against the U.S. dollar or euro may take values between 1 (no separate legal tender) and 8 (other managed float with ad-hoc interventions). The USD/EUR exchange rate itself is freely floating and thus gets a value of 10. Therefore, all countries that are pegging against the U.S. dollar to some extent are at the same time implicitly freely floating against all Eurozone countries and all the euro peggers. Also, all countries pegging to the euro are at the same time implicitly floating against both the U.S. and all U.S. dollar peggers. However, this does not exhaust the set of potential constellations – in particular those situations when countries’ currencies are pegged to the same anchor (USD or EUR), but differ in the strength of the commitment.

Table 2 illustrates our approach by means of a simple example containing six countries. The matrix shows that the United States as well as U.S.-dollar peggers such as Uzbekistan and Jordan are categorized as freely floating – i.e. exhibiting a value of 10 – towards the Euro area countries Germany and Austria and a euro pegger such as Denmark. Further, Uzbekistan is classified as having a crawling peg against the US dollar and therefore takes a value of 6 vis-à-vis the USD. Jordan is classified as having a conventional peg against the US dollar and therefore takes a value of 3. What is then the implicit exchange rate regime between Uzbekistan and Jordan? Here and for all similar cases in our dataset, we focus on the *weakest link* between the two countries, i.e. we assume that market participants’ perception of the stability of the bilateral exchange rate is dominated by the more flexible regime vis-à-vis the two countries’ anchor currency. The bilateral exchange rate regime between Uzbekistan and Jordan thus takes a value of $MAX(3, 6) = 6$.

Taking the *weakest link* for the countries that are pegging their exchange rates is plausible

heterogeneous” and there was a need to make a further distinction between formal fixed and crawling pegs, and arrangements that are merely peg-like or crawl-like (see IMF AREAER, 2009, page xliv (44) in the Appendix). Table 1 refers to both the old and the new methodology.

¹⁴We do not map $ERflex_{ijt}$ into a full set of ten dummies because some exchange rate regimes (such as “crawl-like arrangements”) have too few observations. In fact, the categories of “stabilized arrangements” and “other managed” regimes did not even exist before the year 2009.

¹⁵Of course, we also account for the (rather rare) cases that currencies are pegged against alternative anchors such as the Indian rupee, the South African rand or the Singapore dollar.

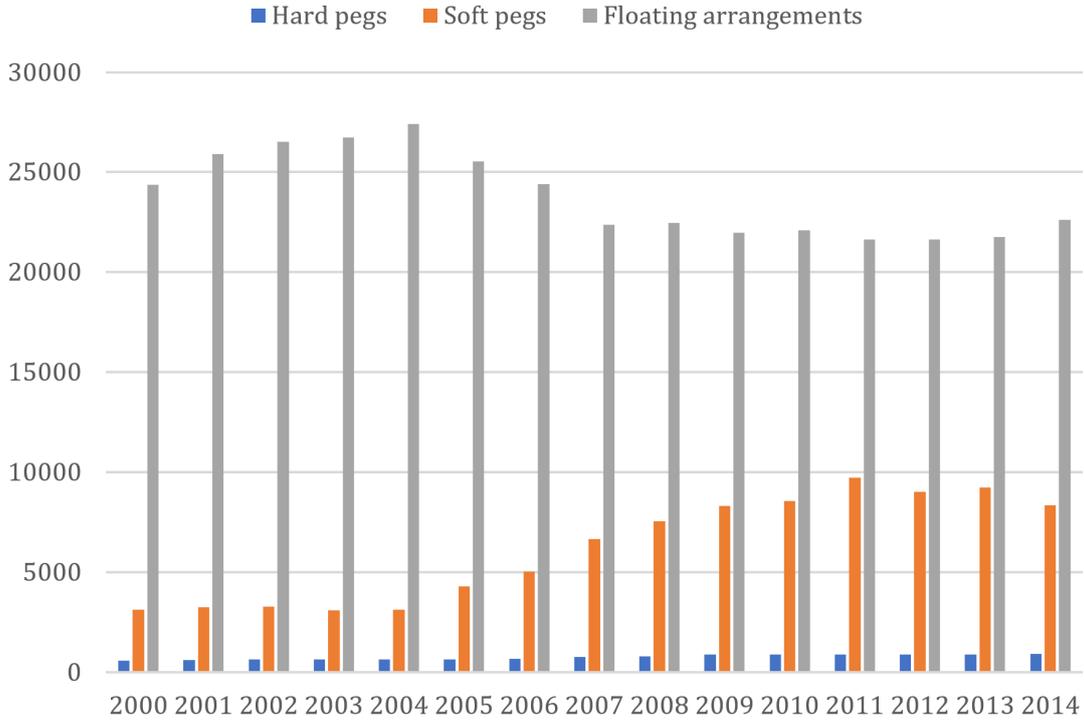


Figure 2: The number of bilateral de-jure exchange rate regimes (coarse categories) between 2000 and 2014. Source: IMF and own computation

if we are willing to assume that the interventions of an individual country with respect to the U.S. dollar (euro) do not influence the actions of other peggers against the same currency. In this case there is no reason to believe that the exchange rate regime between Uzbekistan and Jordan should be less flexible than the exchange rate regime between Uzbekistan and the U.S. As another example, we can take Bolivia, which has a crawling peg against the U.S. dollar ($ERflex_{BOL,USA} = 5$), and El Salvador, which has no separate legal tender against the U.S. dollar ($ERflex_{SLV,USA} = 1$). As a consequence, the implicit de-jure exchange rate regime between El Salvador and Bolivia must be the same as the explicit de-jure exchange rate regime between the U.S. and Bolivia, computed as $ERflex_{BOL,SLV} = MAX(1, 5) = 5$.¹⁶ We conjecture that market participants are able (and have enough incentives) to replicate our algorithm and are thus aware of bilateral de-jure exchange rate regimes although there is no institution that explicitly publishes such information. A graphical representation of how we constructed our set of bilateral de-jure exchange rate regimes can be found in Figure A1 (in Appendix A.1).

When we apply this algorithm to our entire sample we get a symmetric 185x185 matrix for each year between 2000 and 2014, covering 185 countries, resulting in a total of 492 594 observations. The panel is not balanced since we dropped 10 percent of the observations for countries that were pegging their exchange rate to a composite index containing several currencies.

¹⁶Expressing this idea in more formal terms starts from the fact that the nominal exchange rate between currencies A and B , which peg their currencies to some extent against the common anchor currency C , can be expressed as $E_{A,B} = E_{A,C} \cdot E_{C,B}$, with the first subscript letter denoting the base currency and the second letter denoting the counter currency. Taking logarithms and defining $e \equiv \ln(E)$ yields $e_{A,B} = e_{A,C} + e_{C,B}$. The variance of the left-hand side is given by $Var(e_{A,B}) = Var(e_{A,C}) + Var(e_{C,B}) + 2Cov(e_{A,C}, e_{C,B})$. Apparently, $Var(e_{A,B}) = Var(e_{C,B})$ if $Var(e_{A,C}) = 0$. If none of the two variances is zero, it is quite plausible to assume that $Cov(e_{A,C}, e_{C,B}) < 0$, reflecting appreciations and depreciations of currency C against *all* other currencies. But even in this case, $Var(e_{A,B})$ is likely to be dominated by the larger of the two variances vis-à-vis currency C .

Figure 2 illustrates how the distribution of bilateral exchange rate regimes evolved over time. To draw this figure, we assigned the ten different regimes to three groups: Hard pegs ($ERflex_{ij} = 1, 2$), soft pegs ($ERflex_{ij} = 3, 4, 5, 6, 7, 8$) and floating arrangements ($ERflex_{ij} = 9, 10$). It can be seen from Figure 2 that hard pegs make up only a small share of bilateral exchange rate regimes. This is not surprising, given our approach to use the more flexible of two exchange rate regimes towards a respective anchor currency. Also, from a bilateral perspective only a relatively small share of countries is connected via direct or indirect soft pegs.

3.2 Empirical specification

Our goal is to estimate the effect of de-jure bilateral exchange rate flexibility on FDI. While our model described firms' choice between different modes of serving a foreign market – via exports or through a foreign affiliate – our empirical analysis will focus on direct investment flows as a dependent variable. Of course, foreign-affiliate sales would be preferable, but we argue that, in the absence of such (bilateral) data, FDI flows are an appropriate proxy for these sales. Moreover, our regression equation includes a large set of variables that reflect the *general* attractiveness of the foreign market, such that the inclusion of the exchange rate regime allows identifying the effect of exchange-rate stability on the mode of supply (affiliate sales vs. exports).

We use the Pseudo Poisson Maximum Likelihood (PPML) estimator introduced by Santos Silva and Tenreyro (2006) in order to avoid two important drawbacks of OLS estimation: first, the standard procedure of considering the logarithm of the dependent variable implies that observations with zero values are dropped. Second, as demonstrated by Santos Silva and Tenreyro (2006), OLS estimation of log-linearised models results in biased estimates if the disturbances are heteroskedastic. Our PPML model specification reads as follows:

$$FDI_{ijt} = \exp(\alpha_0 + \beta ERflex_{ijt} + \delta'W_{ijt} + \phi'X_{jt} + \lambda'Y_{it} + \varphi'Z_{ij} + \alpha_i + \alpha_j + \xi_t) + \varepsilon_{ijt} \quad (14)$$

where FDI_{ijt} denotes direct investment inflows from country i (source) to country j (host) at time t . $ERflex_{ijt}$ denotes the exchange rate flexibility index taking the values from 1 to 10, as described in Table 1. Based on the theoretical results from Section 2, we expect the coefficient β to be negative and statistically significant. W_{ijt} denotes a set of bilateral time-variant control variables, X_{jt} (Y_{it}) denotes a set of time-variant control variables of the host (source) country, Z_{ij} denotes a set of bilateral time-invariant control variables, α_i (α_j) denotes source (host) country fixed effects and ξ_t denotes year fixed effects.¹⁷

While the specification in equation (14) uses the “linear” exchange rate flexibility index ($ERflex_{ijt}$), we also test for the existence of non-linear effects of exchange-rate stability by employing the set of *Regime* dummies defined in Table 1. In this case, the model specification for the PPML estimator is given by

$$FDI_{ijt} = \exp(\alpha_0 + \sum_{k=1}^6 \beta_k Regime_{k,ijt} + \delta'W_{ijt} + \phi'X_{jt} + \lambda'Y_{it} + \varphi'Z_{ij} + \alpha_i + \alpha_j + \xi_t) + \varepsilon_{ijt} \quad (15)$$

where $Regime_{k,ijt}$ is an exchange rate regime dummy, with k ranging from 1 (no separate legal tender) to 6 (managed floating). The dummy characterizing bilateral free floats ($k = 7$) is

¹⁷In one of our robustness checks in Section 5, we will later replace country-specific variables by *time-variant* country fixed effects. Note, however, that we do not include country-pair fixed effects since our main variable of interest – the bilateral de-jure exchange rate regime – exhibits little time variation in the period under consideration.

excluded, such that β_k reflects the differential impact of regime k on FDI, relative to the case of a pure float.

The sources and summary statistics of the control variables we use are listed in Tables A2 and A3 in the Appendix A.1. The time-variant bilateral control variables include the logs of the host and source countries' GDP ($LgdpH_{jt}$ and $LgdpS_{it}$); trade openness ($OpennessH_{jt}$ and $OpennessS_{it}$), defined as the sum of exports and imports over GDP, and "direct investment restrictions" on outflows in the source country and inflows in the host country ($RestrictionsH_{jt}$ and $RestrictionsS_{it}$) as published by Fernandez et al. (2016). A dummy variable reflecting countries' membership in regional trade agreements is denoted by RTA_{ijt} . Bilateral time-invariant control variables include the (log) distance between the countries' capitals ($Ldistance_{ij}$) and dummies for a common border ($Border_{ij}$), a common language ($Comlang_{ij}$), a common colonial history ($Colony_{ij}$) and a common religion ($Religion_{ij}$). We expect the signs of all explanatory variables – with the exception of distance – to be positive.

Data on bilateral FDI flows are available for the years 2001 through 2012 and taken from UNCTAD (see Table A2 in the Appendix for more details). In our benchmark specification, we use FDI inflows instead of (bilateral) FDI stocks – mainly to avoid the influence of valuation changes, which give rise to fluctuations in FDI stocks that do not reflect variations in real activity.¹⁸ Finally, to avoid results that are driven by multinational firms' tax optimization rather than production and supply decisions, we exclude observations for all host countries that are classified as tax havens by either OECD (2000) or Dharmapala and Hines (2006).

4 Bilateral de-jure exchange regimes and FDI: empirical results

In the following tables, we report the results of estimating equations (14) and (15), respectively. We start by using all observations and then split the sample, depending on whether the host country is classified as a *developed* or a *developing* country by UNCTAD (see Table A2 in the Appendix).

4.1 Effects of Exchange Rate Flexibility

Table 3 reports the results of estimating equation (14) with host country, source country and time fixed effects. Apparently, all coefficients of the standard gravity variables have the expected sign. For example, column 1 documents that a one per cent increase in the host country's GDP is associated with a 1.18 percent increase in FDI inflows. Moreover, a one percent increase in distance is associated with a decrease in FDI by around 0.53 percent, and this effect is significant at the 99 percent level.¹⁹ The coefficients of the common language and colonial history dummies are positive and statistically significant. For example, countries that share a common language receive on average $(exp(0.39) - 1) \cdot 100 = 48$ percent more FDI inflows from each other. The coefficients of common border and religion have the expected sign, but turn out to be statistically insignificant. Finally, the coefficients of host and source country

¹⁸Wacker (2015) argues that, in theory, it should not matter whether one uses FDI flows or FDI stocks, because the former are only a homogeneous function of the latter. In fact, he shows that the correlation in the data between stocks and flows is very high, indicating that the choice between stocks and flows is not really consequential. In Section 5 we will report the results of estimating our model using stock data, and confirm that our findings do not change by much if we use stocks instead of flows.

¹⁹Note that the influence of distance on FDI is somewhat weaker than on goods trade, where the estimated elasticity tends to be around minus one percent (Shepherd, 2013). One reason may be that distance plays an ambivalent role for FDI, with greater distance reducing the attractiveness of a country as a trading partner *in general*, but also raising transport costs and thus the attractiveness of foreign-affiliate sales vs. direct exports.

FDI restrictions are negative (although not always significant), while the effect of RTAs is significantly positive.

Turning to our main regressor of interest, we see in column 1 that the exchange rate flexibility index has a negative, but statistically insignificant effect for the entire sample. However, once we split the sample into developed and developing *host* countries, we find that *ERflex* has a significantly negative effect on FDI in *developed* countries: a move towards a less flexible exchange rate regime by 1 degree is associated with an increase in FDI flows by about 6 percent. This result is also highly economically significant: country pairs with the least flexible exchange rate regimes receive bilateral FDI flows that are on average 60 percent higher compared to country pairs with freely floating regimes. The sign of the coefficient for *developing* countries (column 3) is also negative, but narrowly misses the threshold for a 90-percent significance level.

	All countries	Developed	Developing
	1	2	3
Regime	-0.0181 (-0.92)	-0.0610*** (-3.43)	-0.0452 (-1.63)
LgdpH	1.183*** (8.68)	1.168*** (4.22)	1.151*** (4.96)
LgdpS	1.098*** (7.65)	0.952*** (4.53)	1.080*** (6.61)
Ldistance	-0.528*** (-8.24)	-0.568*** (-7.02)	-0.524*** (-5.55)
OpennessH	0.567*** (3.28)	1.070*** (2.96)	0.491*** (2.69)
OpennessS	0.127 (0.81)	0.0593 (0.17)	-0.0730 (-0.39)
RestrictionsH	-0.573*** (-2.86)	-1.178*** (-3.97)	-0.186 (-0.81)
RestrictionsS	-0.627*** (-3.34)	-0.621*** (-2.72)	-0.107 (-0.41)
RTA	0.453** (2.31)	-0.177 (-1.15)	0.464*** (3.41)
Border	0.213 (1.36)	-0.0786 (-0.53)	1.281*** (5.92)
Comlang	0.390*** (3.00)	0.268** (2.07)	0.830*** (3.88)
Colony	0.551*** (3.71)	0.275* (1.92)	0.625** (2.45)
Religion	0.272 (1.16)	0.185 (0.58)	0.478** (2.21)
Constant	-13.46*** (-9.32)	-6.249* (-1.89)	-10.27*** (-4.45)
R ²	0.531	0.600	0.833
Observations	29334	12030	15089

* significant at 10%; ** significant at 5%; *** significant at 1%.

Standard errors clustered at country pair level.

Host, source and year fixed effects included but not reported.

Table 3: **Exchange rate flexibility index** and bilateral FDI flows. PPML estimation of the gravity model (equation 14) with host country, source country and year fixed effects

	All countries	Developed	Developing
	1	2	3
Regime 1	0.354** (1.98)	0.641*** (3.89)	1.271** (2.44)
Regime 2	-1.244** (-2.25)	-0.0561 (-0.13)	-0.253 (-0.59)
Regime 3	0.363* (1.69)	-0.419* (-1.65)	0.528** (2.47)
Regime 4	0.452 (1.42)	-0.727* (-1.80)	0.378 (1.55)
Regime 5	0.343** (1.99)	0.253 (1.25)	0.0337 (0.07)
Regime 6	0.211** (1.97)	0.274 (1.35)	0.226* (1.90)
LgdpH	1.179*** (8.76)	1.163*** (4.12)	1.162*** (4.87)
LgdpS	1.134*** (7.68)	0.919*** (4.43)	1.128*** (6.32)
Ldistance	-0.506*** (-7.60)	-0.571*** (-7.03)	-0.505*** (-5.14)
OpennessH	0.533*** (3.25)	1.073*** (2.95)	0.470** (2.55)
OpennessS	0.0662 (0.42)	0.0385 (0.11)	-0.0428 (-0.22)
RestrictionsH	-0.566*** (-2.83)	-1.160*** (-3.86)	-0.181 (-0.80)
RestrictionsS	-0.603*** (-3.19)	-0.589** (-2.54)	-0.142 (-0.52)
RTA	0.422** (2.32)	-0.162 (-1.05)	0.460*** (3.39)
Border	0.171 (1.17)	-0.0910 (-0.61)	1.276*** (5.97)
Comlang	0.438*** (3.58)	0.254** (1.98)	0.854*** (3.99)
Colony	0.477*** (3.39)	0.286** (1.98)	0.580** (2.22)
Religion	0.386* (1.79)	0.201 (0.56)	0.545** (2.44)
Constant	-9.008*** (-5.08)	-6.334** (-1.97)	-12.01*** (-4.36)
R ²	0.549	0.600	0.837
Observations	29334	12030	15089

* significant at 10%; ** significant at 5%; *** significant at 1%.

Standard errors clustered at country pair level.

Host, source and year fixed effects included but not reported.

Table 4: **Exchange rate regime dummies** and bilateral FDI flows. PPML estimation of the gravity model (equation 15) with host country, source country and year fixed effects

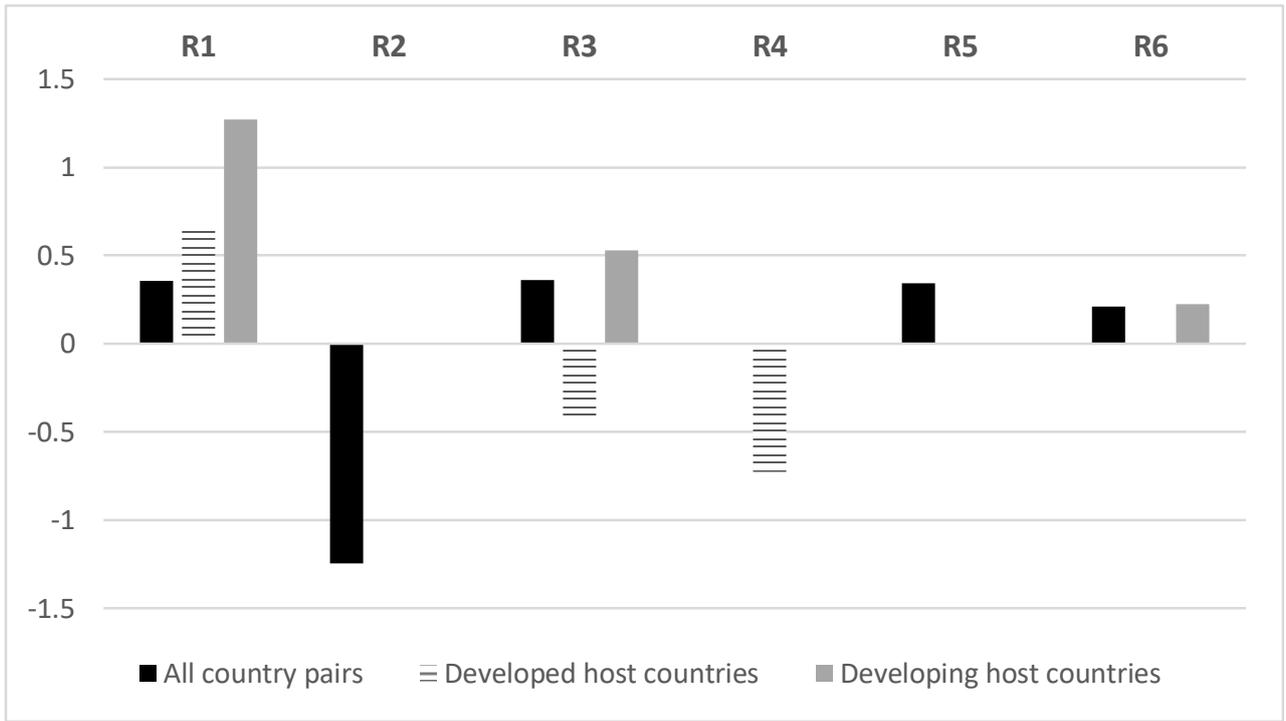


Figure 3: Effects of exchange rate regime dummies on bilateral FDI. The bars illustrate the coefficients displayed in Table 4, omitting those coefficients that do not significantly differ from zero

4.2 Effects of Regime Dummies

The specification in equation (14) characterized countries' exchange rate regimes by using the flexibility index $ERflex$, imposing a linear relationship between de-jure exchange rate stability and FDI. In this subsection, we abandon this restriction, using the *regime dummies* described in Table 1 and thus allowing for a non-linear effect of exchange rate stability on FDI. When estimating the specification in equation (15), we hypothesize that more stable regimes are associated with higher FDI inflows. The results of this estimation are reported in Table 4.

The numbers presented in column (1) of Table 4 show that country pairs with no separate legal tender (*Regime*₁) receive on average $(exp(0.354) - 1) * 100 = 42$ percent more FDI inflows than country pairs that are not tied through (direct or indirect) exchange rate arrangements. By contrast, the coefficient of *Regime*₂ (currency board arrangements) is significantly negative, which comes as a surprise. For all other regimes, the effects are positive, though not always significant. Interestingly, the coefficients decrease almost monotonically, as we move from *Regime*₃ (conventional pegs) to *Regime*₆ (managed floating), confirming our hypothesis that reducing the ex-ante variance of exchange rate fluctuations enhances bilateral FDI flows. Columns (2) and (3), however, demonstrate that there are substantial differences between developed and developing host economies.

Figure 3 illustrates the coefficients displayed in Table 4, omitting those coefficients that are not significantly different from zero. While the decreasing size of the (positive) coefficients for *developing* host countries supports our hypothesis that announced exchange rate stability enhances FDI inflows, the negative coefficients of regimes 3 and 4 for *developed* host countries are rather surprising. We conjecture that these results may be driven by the fact that many developing *source* countries peg their currencies against developed countries, and that direct investment flows from developing to developed countries – especially horizontal FDI as described by our model – are close to zero. As a result, the negative coefficients of *Regime*₃ and *Regime*₄ may be driven by bilateral pegs, many of which are associated with zero FDI flows to developed

	All countries	Developed	Developing
	1	2	3
Regime 1	0.590*** (3.72)	0.755*** (4.49)	1.426* (1.87)
Regime 2	0.320 (1.02)	0.923** (2.08)	0.584 (1.02)
Regime 3	0.178 (0.66)	-0.0719 (-0.25)	0.749** (2.06)
Regime 4	0.422** (2.04)	0.0138 (0.03)	0.920*** (3.66)
Regime 5	0.487*** (2.92)	0.357 (1.64)	0.988** (2.23)
Regime 6	0.192* (1.90)	0.692*** (3.08)	0.171 (1.30)
LgdpH	1.138*** (7.40)	1.147*** (3.94)	1.023*** (3.63)
LgdpS	0.795*** (3.45)	0.654*** (2.64)	1.087*** (3.26)
Ldistance	-0.570*** (-7.82)	-0.600*** (-6.96)	-0.778*** (-6.00)
OpennessH	0.542*** (2.59)	1.104*** (3.03)	0.453* (1.79)
OpennessS	-0.622 (-1.11)	-0.666 (-1.07)	0.614 (0.75)
RestrictionsH	-0.735*** (-3.50)	-1.195*** (-3.83)	-0.340 (-1.47)
RestrictionsS	-0.619*** (-2.67)	-0.536** (-2.03)	-0.743* (-1.90)
RTA	-0.108 (-0.79)	-0.257* (-1.65)	0.279 (1.50)
Border	-0.0597 (-0.41)	-0.0719 (-0.47)	0.703*** (3.05)
Comlang	0.307** (2.42)	0.229* (1.75)	0.700** (2.57)
Colony	0.406*** (2.96)	0.201 (1.36)	0.786*** (2.93)
Religion	0.527*** (3.07)	1.802* (1.67)	0.344* (1.65)
Constant	-8.728*** (-3.76)	-9.893** (-2.51)	-11.51*** (-2.93)
R ²	0.579	0.594	0.616
Observations	16750	6410	8881

* significant at 10%; ** significant at 5%; *** significant at 1%.

Standard errors clustered at country pair level.

Host, source and year fixed effects included but not reported.

Table 5: Exchange rate regime dummies and bilateral FDI flows, excluding developing **source** countries. PPML estimation of the gravity model (equation 15) with host country, source country and year fixed effects

host countries. To check whether our conjecture was correct, we re-estimated equation (15) for the three different host country groups, omitting observations for developing **source** countries. As demonstrated by Table 5, this restriction reduces our sample by 50 percent, but the resulting coefficients for developed host countries are much closer to what we would have expected. For both developed and developing host countries, the estimation with the smaller sample confirms our hypothesis that expected exchange rate stability raises FDI inflows. The fact that, by and large, the influence of fixed exchange rates is stronger for developing than for developed host countries – especially when we omit developing source countries as in Table 5 – can be explained by referring to the higher likelihood of large exchange rate swings in developing economies. An expected reduction of exchange-rate volatility associated with an official peg is apparently more important and effective in such a context than in an environment where even flexible exchange rates are characterized by rather moderate fluctuations.

5 Extensions and robustness tests

5.1 Time-varying multilateral resistance terms

While our inclusion of explicit control variables combined with country and time fixed effects goes a long way in reducing omitted variable bias, we may not capture all factors that affect bilateral FDI. If those factors are correlated with our main variable of interest – the bilateral de-jure exchange rate regime – the findings presented so far may be biased. To test whether this is the case we replaced the vectors X_{jt} and Y_{it} in equation (15) by a set of country-time fixed effects.²⁰ The results displayed in Table 6 demonstrate that this modification does not alter our main findings, indicating that our results are not affected by omitted variable bias.

5.2 Lagged explanatory variables

Our theoretical model suggests that firms make their FDI decisions at time t , when they form an expectation on the variability of the exchange rate in period $t + 1$. However, the model does not specify the duration of each period. Moreover, there is some uncertainty about the exact date at which FDI data are recorded by UNCTAD. Hence, it is possible that the effect of announced exchange regimes on FDI only materializes with a lag, and there might be a delay between the decision of engaging in FDI and the FDI being actually reported in the data. To account for this possibility, we lagged all explanatory variables by one year. As demonstrated by Table A4 in Appendix A.3, the estimated coefficients are very similar to our baseline results. The only major difference we find is that while developing countries receive significantly higher FDI inflows if connected by soft pegs (*Regime*₄), the coefficients of the “least pegged” regimes (*Regime*₅ and *Regime*₆) now turn out to be statistically insignificant for the complete sample.

5.3 Accounting for deviations from the de-jure regime

Our key hypothesis that anticipated exchange-rate stability affects FDI flows hinges on the assumption that the announced exchange rate regime is credible. Otherwise, investors would not use the official regime to form their expectations about the future variability of the exchange rate. To check whether deviations from the de-jure regime matter, we compared de-jure and de-facto exchange rate arrangements in our dataset, using the IMF’s de-facto assessments provided in the AREAER country reports. Based on this information, we created a dummy

²⁰To implement this specification, we used the Stata command `ppml_panel_sg` introduced by Larch et al. (2017). Note that all robustness tests refer to the *entire* sample, including developing country source countries.

	All countries	Developed	Developing
	1	2	3
Regime 1	-0.0415 (-0.38)	0.309*** (3.04)	0.887*** (2.79)
Regime 2	-1.218*** (-5.80)	-0.312* (-1.71)	-0.412 (-1.47)
Regime 3	-0.00636 (-0.03)	-0.719** (-2.05)	0.514*** (4.00)
Regime 4	1.286*** (4.77)	-0.427 (-0.78)	1.253*** (6.73)
Regime 5	0.147 (0.86)	0.142 (0.73)	-0.174 (-0.45)
Regime 6	0.278*** (2.71)	0.0833 (0.48)	0.475*** (5.18)
RTA	0.982*** (11.87)	0.635*** (7.12)	0.723*** (9.52)
Border	0.693*** (9.14)	0.476*** (5.27)	1.881*** (23.01)
Comlang	0.172** (2.48)	-0.0794 (-0.94)	0.916*** (10.51)
Colony	0.426*** (6.12)	0.294*** (3.72)	0.479*** (4.59)
Religion	0.708*** (8.16)	0.277 (1.36)	0.778*** (10.57)
R ²	0.615	0.709	0.889
Observations	42646	17000	19233

* significant at 10%; ** significant at 5%; *** significant at 1%.

Standard errors clustered at country pair level.

Host-year, source-year and year fixed effects included but not reported.

Table 6: Exchange rate regime dummies and bilateral FDI flows. PPML estimation of the gravity model (equation 15) with **time-variant** host country and source country fixed effects

variable for those country/year-observations in which de-jure and de-facto arrangements differed substantially. We then estimated the following specification:

$$FDI_{ijt} = \exp(\alpha_0 + \sum_{K=1}^6 \beta_K Regime_{K,ijt} + \gamma_1 JFhost_{jt} + \delta' W_{ijt} + \phi' X_{jt} + \lambda' Y_{it} + \varphi' Z_{ij} + \alpha_i + \alpha_j + \xi_t) + \varepsilon_{ijt} \quad (16)$$

where $JFhost_{jt}$ is a dummy variable that assumes a value of one if the **host country** has a de-jure exchange rate regime that differs from its de-facto exchange rate regime by more than 1 degree. The results of the estimation are shown in columns (1) to (3) in Table A5 (in Appendix A.3). In columns (4) to (6) we report the results of estimating equation (15), excluding all observations for which $JFhost_{jt}$ was equal to one.

We find that the dummy $JFhost$ has a negative, but statistically insignificant coefficient. More importantly, the results of both specifications do not differ from the findings of our baseline specification, suggesting that our results are robust to explicitly accounting for limits to credibility. Digging deeper, we found that most countries in our sample, for which the IMF's de-facto assessment deviated from the de-jure arrangement were characterized by "excess stability", i.e. a de-facto regime that was more stable than the official announcement. Against this background, the results presented in Table A5 thus indicate that – at least with respect to FDI inflows – there are no benefits from "secretly" fixing the exchange rate.

5.4 A focus on currency unions

5.4.1 Currency unions vs. dollarization

Among hard pegs, the classification system of the IMF introduced in Table 1 distinguishes between exchange rate regimes *with no separate legal tender* (NSLT) and *currency board arrangements*. The AREAER defines the NSLT category as a regime consisting of (a) countries where a foreign currency circulates as the sole legal tender (frequently also referred to as “dollarization”) and (b) countries that belong to a monetary or currency union in which the same legal tender is shared by the members of the union. Given the large interest of the academic literature in the special case of currency unions, we adjust our dataset by splitting up the NSLT regime category ($Regime_1$) into currency union members ($CUdummy$) and “dollarized” countries²¹ ($OtherNSLT$) subcategories.

The results of this exercise are shown in Table A6 (in Appendix A.3). We find that developed countries that are in a currency union receive on average $(exp(0.635) - 1) \cdot 100 = 89$ percent more FDI inflows from other currency union members compared to country pairs that have no explicit or implicit exchange rate arrangement. The effect is even stronger for host developed countries if they have no separate legal tender without being members of a currency union.²² Column (3) of Table A6 replicates column (3) of Table 4, since there are no observations on bilateral FDI for host developing countries that belong to a currency union. The developing host countries belonging to the $OtherNSLT$ country pairs receive on average $(exp(1.271) - 1) \cdot 100 = 256$ percent higher FDI inflows compared to free floating pairs. Taken together, these results suggest that it is the effect of expected exchange rate stability – rather than the specific institutional arrangement – that attracts higher FDI.

5.4.2 Direct vs. indirect effects of currency unions

So far, our specification has been based on the idea that a currency union enhances bilateral FDI if *both* countries are members of that union. However, looking at the special case of the European Monetary Union (EMU), Schiavo (2007) found that EMU has resulted in larger FDI flows not only between EMU members, but also with the rest of the world. The intuition behind this result is compelling: membership in a currency union enhances a country’s attractiveness for FDI not only from other member countries, but also from firms located outside the union who appreciate the access to a large single-currency market. To test this hypothesis, we created a new currency union dummy ($CUunilateral$) which equals one if a host country is a member of a currency union in year t , but which does not require that the source country also is a member of that union. The results are reported in columns (4) to (6) of Table A6.²³

In contrast to Schiavo (2007), we find that the coefficient $CUunilateral$ is negative, but statistically insignificant, suggesting that currency union membership does not have an effect on FDI inflows beyond the implied exchange rate stability vis-à-vis other members of that union.

5.5 Using bilateral *de-facto* exchange rate regimes

While the preceding robustness test accounted for the possibility of de-facto regimes deviating from official announcements, but entirely relied on IMF/AREAER information, we also

²¹Of course, the term “dollarization” does not imply that the currency in circulation has to be the U.S. dollar.

²²Note that for most of these “dollarization arrangements”, the source country is a country that adopts the currency of the developed host country, e.g. Ecuador and the United States.

²³Note that, while we do not have data on bilateral FDI for developing host countries that are part of the same currency union as the host country, we do have data on bilateral FDI from countries outside the currency union to developing-country members of a currency union (e.g. the WAEMU).

checked whether our findings were robust to focusing on the “natural classification” developed by Reinhard and Rogoff (2004) and recently updated by Ilzetzki et al. (2017, henceforth IRR). We interpret the IRR classification as using the announced regime as a starting point, but correcting it whenever the official or parallel exchange rate was excessively volatile or stable. Moreover, the IRR classification offers a separate “freely falling” category, to which all country-year episodes with an inflation rate higher than 40 percent are assigned. The algorithm we used to compute *bilateral* de-facto (IRR-based) exchange rate regimes is similar to the procedure described in Section 3. However, we had to account for the separate “freely falling category” and – for ease of comparison – we assigned the 12 non-flexible regimes used by IRR to six non-flexible regimes. Finally, we introduced a “de-facto dummy” which equals one whenever IRR define a regime to be purely “de facto” – e.g. a *de facto* crawling peg as opposed to a *pre-announced* crawling peg. Further details are provided in Appendix A.2.

The results of using the (modified) IRR regime dummies in equation (15) are presented in Table A7. Interestingly, most of the de-facto fixed exchange regimes still exert a significantly positive effect on bilateral FDI flows, especially for developing countries. This effect is even stronger if we add the *de-facto* dummy, which characterizes regimes that – according to IRR – were fixed de-facto, but not de-jure. The combination of coefficients in column (6) can be interpreted as follows: while a crawling peg/band ($Regime_4^{df} = 1$) raises bilateral FDI by $(exp(1.010) - 1) \cdot 100 = 175$ percent (relative to a pure float), the effect was by $(exp(0.431) - 1) \cdot 100 = 54$ percent weaker if the crawling peg/band existed only de-facto, but not de-jure.

We thus interpret the results of this robustness test as evidence that *announced* exchange rate regimes matter for FDI – even (or especially) if we account for the possibility that some countries may at times deviate from their official arrangements.

5.6 Further robustness tests

We have noted before that the benefit of a credible announcement in terms of anchoring expectations holds only as long as the exchange rate regime in place is credible and does not change ad hoc. We already controlled for limited credibility by using a dummy for countries whose de-facto exchange rate regimes differed from their de-jure announcements, and by using the IRR de-facto regime classification. We perform an additional robustness check by excluding observations for all countries that experienced a currency crisis in any year of our sample.²⁴ The results are reported in Table A8 (in Appendix A.3). Apparently, the exclusion of countries with currency crises does not substantially change our previous results. However, the somewhat higher (positive) coefficients of $Regime_1$, $Regime_3$ and $Regime_5$ for developing countries can be interpreted as evidence that the effect of announced exchange-rate stability is even stronger if non-credible announcements are omitted.

We also tested whether our findings were robust to the consideration of FDI *stocks* instead of *flows*. The numbers displayed in Table A9 indicate that the results are similar to the specification using FDI flows.

Finally, we performed further robustness checks by dropping all countries with a population below one million, by dropping small island states and by using a different classification of tax havens. Our results turned out to be robust to all of these variations.²⁵

²⁴The data on currency crises are taken from the updated Systemic Banking Crises Database compiled by Luc Laeven and Fabian Valencia (2012) and available at <https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Systemic-Banking-Crises-Database-An-Update-26015>

²⁵The results for these estimations are available upon request.

6 Summary and conclusion

Using a newly developed dataset on bilateral de-jure exchange rate regimes, we investigated the claim that the expected stability of the nominal exchange rate is an important determinant of foreign direct investment. Our theoretical model suggested that higher exchange rate stability raises the attractiveness of serving foreign markets through foreign affiliates, thus rising FDI. Our novel dataset allowed testing this hypothesis.

The empirical evidence generally supports our theoretical predictions: We find that country pairs with no separate legal tender receive significantly more FDI inflows from each other. This holds for both currency unions and other “dollarized” regimes. The effect of the remaining exchange rate regimes differs between country groups. In particular, developed host countries with a fixed exchange rate attract more FDI inflows only if they have no separate legal tender, while conventional peg arrangements seem even detrimental to FDI inflows in these countries. As we have shown, however, this result is driven by low FDI flows from developing source countries that peg their currencies to developed economies’ currencies. Once we omit this group of (potential) source countries, the results are much more in line with our theoretical hypothesis. For developing *host* countries, the effect of a fixed exchange rate is either positive or not significantly different from zero, with the size of estimated coefficients confirming the notion that a growing extent of flexibility reduces FDI inflows to these economies. We interpret this as evidence that the influence of announced exchange rate stability on investors’ decisions is particularly strong in an environment where other monetary policy rules fail to anchor expectations.

References

- [1] A. Abbott, D. O. Cushman, and G. De Vita. Exchange rate regimes and foreign direct investment flows to developing countries. *Review of International Economics*, pages 95–107, 2012.
- [2] J. Aizenman. Exchange rate flexibility, volatility and foreign direct investment. *IMF Staff Papers*, 39:890–922, 1992.
- [3] P. Bacchetta and E. van Wincoop. A theory of the currency denomination of international trade. *Journal of International Economics*, 67(2):295 – 319, 2005.
- [4] B. H. Baltagi, P. Egger, and M. Pfaffermayr. Estimating models of complex FDI: Are there third-country effects? *Journal of Econometrics*, 140(1):260–281, September 2007.
- [5] A. Benassy-Quere, M. Coupet, and T. Mayer. Institutional determinants of foreign direct investment. *The World Economy*, 30(5):764–782, 2007.
- [6] B. A. Blonigen, R. B. Davies, G. R. Waddell, and H. T. Naughton. FDI in space: Spatial autoregressive relationships in foreign direct investment. *European Economic Review*, 51(5):1303–1325, July 2007.
- [7] S L. Brainard. An empirical assessment of the proximity-concentration trade-off between multinational sales and trade. *American Economic Review*, 87(4):520–44, 1997.
- [8] R. B. Davies, D. Ionascu, and H. Kristjánssdóttir. Estimating the impact of time-invariant variables on fdi with fixed effects. *Review of World Economics*, 144(3):381–407, Oct 2008.
- [9] D. Dharmapala and J. R. Hines Jr. Which Countries Become Tax Havens? NBER Working Papers 12802, National Bureau of Economic Research, Inc, December 2006.
- [10] P. Egger and M. Larch. Interdependent preferential trade agreement memberships: An empirical analysis. *Journal of International Economics*, 76(2):384–399, December 2008.
- [11] A. Fernandez, M. Klein, A. Rebucci, M. Schindler, and M. Uribe. Capital Control Measures: A New Dataset. *IMF Economic Review*, 64(3):548–574, August 2016.
- [12] E. Helpman. Trade, fdi, and the organization of firms. *Journal of Economic Literature*, XLIV:589–630, 2006.
- [13] E. Ilzetzki, C. M. Reinhart, and K. S. Rogoff. Exchange arrangements entering the 21st century: Which anchor will hold? Working Paper 23134, National Bureau of Economic Research, February 2017.
- [14] International Monetary Fund. Annual report on exchange arrangements and exchange restrictions. <http://www.elibrary-areaer.imf.org/Pages/YearlyReports.aspx>, 2000–2015.
- [15] International Monetary Fund. Annual report on exchange arrangements and exchange restrictions. <http://www.elibrary-areaer.imf.org/Pages/YearlyReports.aspx>, 2009.
- [16] M. W. Klein and J. C. Shambaugh. Fixed exchange rates and trade. *NBER Working Paper*, 10696, 2004.
- [17] M. W. Klein and J. C. Shambaugh. Fixed exchange rates and trade. *Journal of International Economics*, 70:359–383, 2006.

- [18] M. Larch, J. Wanner, Y. Yotov, and T. Zylkin. The Currency Union Effect: A PPML Re-assessment with High-Dimensional Fixed Effects. School of Economics Working Paper Series 2017-7, LeBow College of Business, Drexel University, April 2017.
- [19] L. Leaven and F. Valencia. Systemic banking crisis database: An update. *Working paper, International Monetary Fund*, 2012.
- [20] OECD. Towards Global Tax Cooperation: Progress in Identifying and Eliminating Harmful Tax Practices. Technical report, Paris: OECD, 2000.
- [21] C. Reinhart and K. S. Rogoff. The modern history of exchange rate arrangements: a reinterpretation. *Quarterly Journal of Economics*, 119:1–48, 2004.
- [22] J. M. C. Santos Silva and S. Tenreyro. The log of gravity. *The Review of Economics and Statistics*, 88(4):641–658, 2006.
- [23] J. M. C. Santos Silva and S. Tenreyro. Currency unions in prospect and retrospect. *Annual Review of Economics*, 2:51–74, 2010.
- [24] S. Schiavo. Common currencies and fdi flows. *Oxford Economic Papers*, 59(3):536–560, 2007.
- [25] B. Shepherd. The gravity model of international trade: A user guide. <http://www.unescap.org/sites/default/files/tipub2645.pdf>, 2013.
- [26] The Teleraph. Jaguar land rover revving up production with new factory in slovakia. <http://www.telegraph.co.uk/finance/newsbysector/industry/12045191/Jaguar-Land-Rover-revving-up-production-with-new-factory-in-Slovakia.html>, 11 Dec 2015.
- [27] K. M. Wacker. When should we use foreign direct investment data to measure the activities of multinational corporations? theory and evidence. *Review of International Economics*, 24(5):980–999, 2016.

A Appendix

A.1 Computing bilateral de-jure exchange rate regimes: a graphical representation

Figure A1 summarizes the structure of the algorithm underlying our set of bilateral exchange rate regimes. Note that for the time periods covered by our sample (2001 - 2012), there are only two anchor currencies, the US dollar and the Euro. The blue diamonds denote the direct connections between two countries (for example U.S. against Jordan and Uzbekistan). The red diamonds denote the indirect connections that are computed using our weakest link approach (for example Uzbekistan against Jordan). The countries belonging to the red **circles** are members of Eastern Caribbean Currency Union (ECCU, circle D), West African Economic and Monetary Union (WAEMU, circle O) and Central African Economic and Monetary Community (CAEMC, circle P). The advantage of the bilateral dataset is that we can capture the members of the same currency union as well as their relationship against the rest of the world. For example, members of the ECCU (circle D) are assigned a regime 1 (no separate legal tender) in bilateral pairs against each other but each member of the ECCU has assigned a regime 2 in the bilateral pair against the U.S. Following the “weakest link principle”, the indirect arrangement of a ECCU member vis-à-vis an economy that formally sustains a crawling peg to the US dollar also is a crawling peg. Finally, all countries that have the US dollar as an anchor currency are freely floating against all countries for whom the anchor currency is the Euro.

A.2 Computing bilateral de-facto exchange rate regimes

We transform the most-recent unilateral exchange rate regime data provided by Ilzetzi et al. (2017) by applying the basic logic of our algorithm. The de-facto exchange rate regimes range from 1 (no separate legal tender or currency union) to 13 (freely floating). The mapping of the exchange rate regimes into our dummy specification (similar to the de-jure exchange rate regimes) is reported in Table A1. Using data starting from 1973, Ilzetzi et al. (2017) provide nine potential anchor currencies that were in place in this period (AUD, DEM, EUR, FRF, GBP, INR, PTE, USD, ZAR). Note that our dependent variable (bilateral FDI data) is available only for the years 2001 through 2012, therefore some of the anchor currencies are not relevant for our investigation.

The structure of our bilateral algorithm for the various anchors is presented in Figure A2, where the rhombus shaped nodes represent the years during which the individual anchor currencies were connected to each other. The blue nodes represent the connections of the direct peggers and the red nodes represent the connections of the indirect peggers. Further technical details on the construction of the bilateral dataset are available upon request.

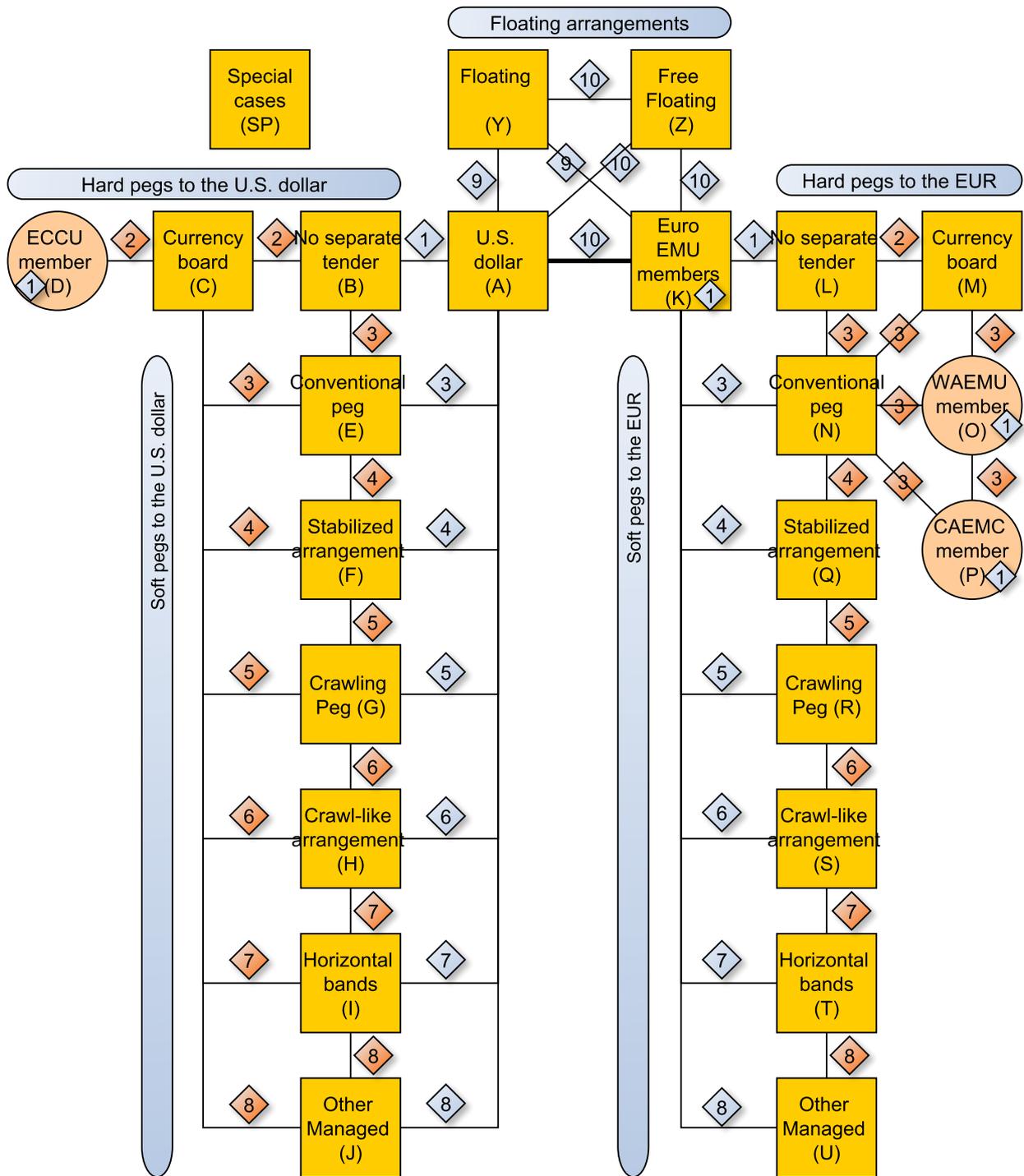


Figure A1: Structure of the bilateral exchange rate regimes dataset

De-facto exchange rate regimes	Exchange rate		
	flexibility (index)	Exchange rate regime	De-facto dummy
<i>Hard pegs</i>			
No separate legal tender or currency union	1	Regime ₁ ^{df}	0
Pre announced peg or currency board arrangement	2	Regime ₂ ^{df}	0
<i>Soft pegs</i>			
Pre announced horizontal band that is narrower than or equal to +/-2% *	3	-	-
De facto peg	4	Regime ₃ ^{df}	1
Pre announced crawling peg; de facto moving band narrower than or equal to +/-1%	5	Regime ₄ ^{df}	0
Pre announced crawling band / de facto horizontal band that is narrower than or equal to +/-2%	6	Regime ₄ ^{df}	0
De facto crawling peg	7	Regime ₄ ^{df}	1
De facto crawling band that is narrower than or equal to +/-2%	8	Regime ₅ ^{df}	1
Pre announced crawling band that is wider than or equal to +/-2%	9	Regime ₅ ^{df}	0
De facto crawling band that is narrower than or equal to +/-5%	10	Regime ₅ ^{df}	1
Moving band that is narrower than or equal to +/-2%	11	Regime ₆ ^{df}	0
<i>Floating arrangements</i>			
De facto moving band +/-5%/ Managed floating	12	Regime ₆ ^{df}	1
Freely floating	13	Regime ₇ ^{df}	0
<i>Residuals</i>			
Freely falling **	-	Regime _{FF} ^{df}	-
Dual market in which parallel market data is missing **	-	-	-

* We do not include the category "Pre announced horizontal band that is narrower than or equal to +/-2%" in our specification as we had no observations for this regime in our sample.

** Residuals 'Freely falling' and 'Dual market in which parallel market data is missing' were dropped in the index.

Table A1: IRR **de-facto** exchange rate regimes mapped into exchange rate flexibility index and regime dummies (source: Ilzetzi et al. (2017))

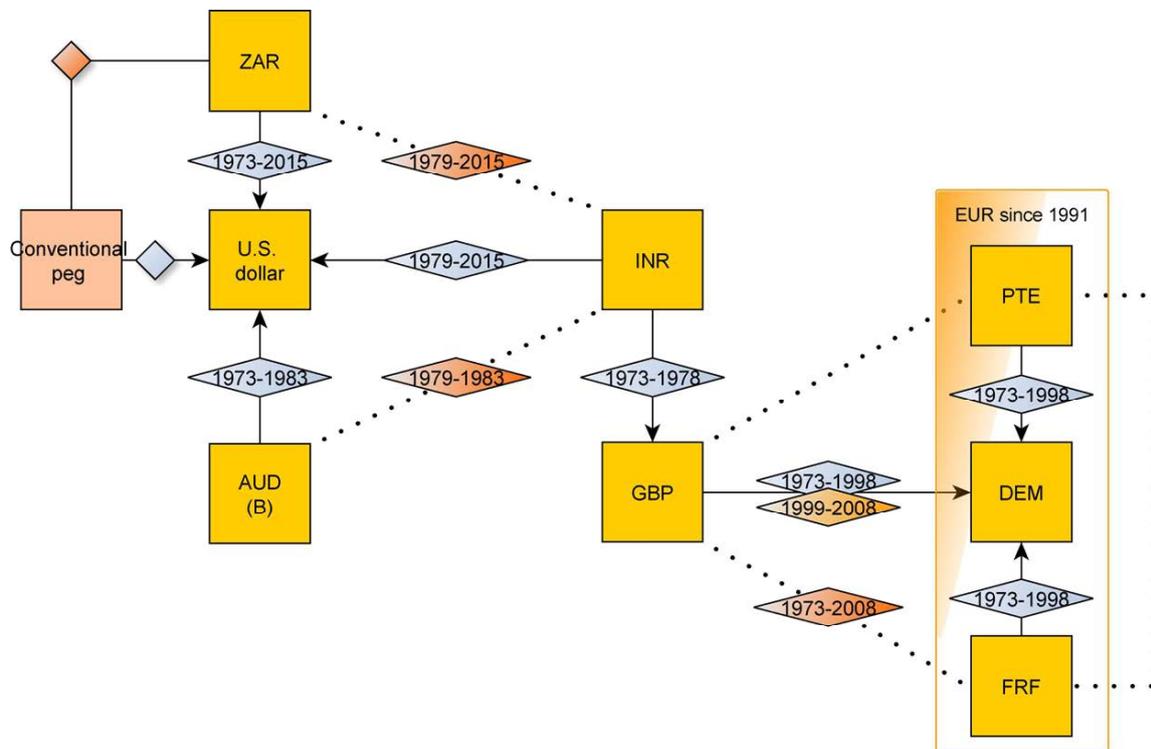


Figure A2: Structure of the bilateral exchange rate regimes dataset based on the unilateral IRR **de-facto** regime classification

A.3 Output tables

Table A2: Data sources

Variable	Description	Source
<i>Main variables</i>		
De-jure regime (dummies)	Bilateral de-jure exchange rate regime variable	IMF AREAER, own computation
JF host	De-jure ERR differs from the de-facto ERR by more than 1 degree.	
De-facto regime (dummies)	Bilateral de-facto exchange rate regime variable.	Own computation, based on Ilzetzki et al. (2017). Link: http://www.carmenreinhardt.com/data/browse-by-topic/topics/11/
FDI stocks	FDI stock data from UNCTAD.	United Nations, UNCTAD: Bilateral FDI Statistics. Link: http://unctad.org/en/Pages/DIAE/FDI%20Statistics/FDI-Statistics-Bilateral.aspx
FDI flows	FDI flow data from UNCTAD.	
<i>Other control variables</i>		
LgdpH	GDP of the host country (current US\$).	World Bank (World Development Indicators)
LgdpS	GDP of the source country (current US\$).	
OpennessH	Log of host country's openness.	GDP from the World Bank (World Development Indicators), exports and imports from the DOTS of the IMF, own computation
OpennessS	Log of source country's openness.	
RestrictionsH	Average direct investment restrictions of the host and source country.	Fernández, Klein, Rebucci, Schindler and Uribe (2016)
RestrictionsS		
RTA	Dummy, existence of a regional trade agreement.	Egger and Larch (2008)
Ldistance	Log of distance between the two capitals.	
Border	Dummy for common border.	CEPII
Comlang	Dummy for common language.	http://www.cepii.fr/CEPII/en/cepii/cepii.asp
Colony	Dummy for common colonial history.	
Religion	Dummy for common religion.	CIA, the World Factbook library
Note: country classification is taken from UNCTAD		http://unctadstat.unctad.org/EN/Classifications.html

Table A3: Summary statistics

	From	To	Obs	Mean	Std. Dev.	Min	Max	Unit
<i>Main variables</i>								
De-jure regime (IMF based)	2000	2015	486286	8.796367	2.158848	1	10	Categorical
JF host	2000	2015	544640	0.0962838	0.2949803	0	1	Dummy
De-facto regime (IRR based)	2000	2015	492800	10.52832	3.490688	1	15 *	Categorical
FDI flows	2001	2012	63540	203.2662	2160.58	-59599.37	117617.9	Millions of
FDI stocks	2001	2012	68258	1918.688	14123.05	0	592273.2	US dollars
GDPH	2000	2014	496616	3.03E+11	1.23E+12	1.32E+07	1.73E+13	Current US\$
GDPs	2000	2014	496616	3.03E+11	1.23E+12	1.32E+07	1.73E+13	
<i>Other control variables</i>								
OpennessH	2000	2014	488336	0.7911606	0.99579	3.69E-06	15.22144	Index
OpennessS	2000	2014	488336	0.7911606	0.99579	3.69E-06	15.22144	Index
RestrictionsH	2000	2013	252448	0.3658892	0.3970779	0	1	Index
RestrictionsS	2000	2013	252448	0.3658892	0.3970779	0	1	Index
KAopenH	2000	2014	483000	0.5208695	0.379126	0	1	Index
KAopenS	2000	2014	483000	0.5208695	0.379126	0	1	Index
RTA	2000	2014	472590	0.1736431	0.3788027	0	1	Dummy
<i>Time invariant variables</i>								
Distance	-	-	487200	7644.271	4378.152	10.47888	19812.04	km
Border	-	-	487200	0.0181281	0.1334147	0	1	Dummy
Comlang	-	-	487200	0.1457471	0.3528529	0	1	Dummy
Colony	-	-	487200	0.0116913	0.1074925	0	1	Dummy
Religion	-	-	465120	0.4736842	0.4993075	0	1	Dummy

* Residuals 'Freely falling' (de facto regime 14) and 'Dual market in which parallel makret data is missing' (de facto regime 15) were dropped in the index.

Table A4: Exchange rate regime dummies and bilateral FDI flows: lagged explanatory variables

	All countries	Developed	Developing
	1	2	3
Regime 1	0.362** (2.03)	0.635*** (3.80)	1.272** (2.35)
Regime 2	-1.284** (-2.37)	-0.107 (-0.26)	-0.301 (-0.72)
Regime 3	0.429** (2.32)	-0.474* (-1.91)	0.520** (2.43)
Regime 4	0.490 (1.62)	0.243 (0.61)	0.435** (2.13)
Regime 5	0.223 (1.30)	0.163 (0.74)	-0.0275 (-0.06)
Regime 6	0.140 (1.23)	0.166 (0.88)	0.174 (1.37)
LgdpH	1.264*** (9.35)	1.048*** (3.78)	1.490*** (6.02)
LgdpS	1.184*** (7.79)	1.094*** (4.75)	1.073*** (5.57)
Ldistance	-0.508*** (-7.88)	-0.563*** (-6.97)	-0.515*** (-5.12)
OpennessH	0.678*** (4.30)	1.116*** (3.36)	0.770*** (4.37)
OpennessS	0.275 (1.37)	0.675** (2.11)	-0.0954 (-0.42)
RestrictionsH	-0.565*** (-3.19)	-1.148*** (-4.04)	-0.101 (-0.51)
RestrictionsS	-0.545*** (-3.01)	-0.485** (-2.08)	-0.349 (-1.52)
RTA	0.414** (2.43)	-0.134 (-0.88)	0.401*** (2.93)
Border	0.165 (1.12)	-0.0959 (-0.64)	1.287*** (5.73)
Comlang	0.432*** (3.55)	0.252* (1.94)	0.841*** (3.97)
Colony	0.465*** (3.32)	0.286** (1.98)	0.578** (2.24)
Religion	0.385* (1.81)	0.197 (0.59)	0.533** (2.39)
Constant	-10.57*** (-5.33)	-8.466** (-2.50)	-14.19*** (-7.13)
R ²	0.549	0.598	0.827
Observations	29128	11966	14951

* significant at 10%; ** significant at 5%; *** significant at 1%.

Standard errors clustered at country pair level.

Host, source and year fixed effects included but not reported.

Table A5: Exchange rate regime dummies and bilateral FDI flows: accounting for deviations from the de-jure exchange-rate regime (*JF host*)

	All	Developed	Developing	All	Developed	Developing
	1	2	3	4	5	6
	<i>JF host as a dummy variable</i>			<i>Observations excluded if JF host=1</i>		
JF host	-0.113 (-0.89)	-0.0364 (-0.12)	-0.218 (-1.36)			
Regime 1	0.354** (1.98)	0.642*** (3.89)	1.259** (2.44)	0.398** (2.36)	0.610*** (3.60)	1.369*** (2.58)
Regime 2	-1.244** (-2.25)	-0.0559 (-0.13)	-0.269 (-0.63)	-0.929** (-2.23)	-0.0848 (-0.20)	-0.191 (-0.46)
Regime 3	0.353* (1.67)	-0.419* (-1.65)	0.480** (2.21)	0.477* (1.68)	-0.439* (-1.74)	0.686*** (2.89)
Regime 4	0.424 (1.29)	-0.726* (-1.80)	0.291 (1.16)	0.702** (2.10)	-0.722* (-1.78)	0.710*** (3.15)
Regime 5	0.323* (1.83)	0.256 (1.25)	-0.0657 (-0.14)	0.363* (1.87)	0.211 (1.02)	-0.198 (-0.43)
Regime 6	0.226** (2.05)	0.274 (1.35)	0.241** (1.98)	0.208* (1.73)	0.267 (1.33)	0.314** (2.27)
LgdpH	1.220*** (8.60)	1.169*** (4.07)	1.278*** (5.33)	1.289*** (8.70)	1.174*** (4.05)	1.476*** (5.81)
LgdpS	1.126*** (7.61)	0.918*** (4.44)	1.095*** (6.22)	1.054*** (7.31)	0.953*** (4.57)	1.081*** (6.35)
Ldistance	-0.505*** (-7.58)	-0.571*** (-7.02)	-0.505*** (-5.13)	-0.533*** (-8.15)	-0.566*** (-6.92)	-0.519*** (-5.43)
OpennessH	0.530*** (3.22)	1.083*** (2.80)	0.475*** (2.62)	0.593*** (3.60)	1.057*** (2.72)	0.599*** (3.18)
OpennessS	0.0664 (0.43)	0.0379 (0.11)	-0.0362 (-0.19)	-0.540* (-1.83)	0.0609 (0.17)	-0.670*** (-3.29)
RestrictionsH	-0.576*** (-2.86)	-1.162*** (-3.84)	-0.200 (-0.85)	-0.692*** (-3.18)	-1.156*** (-3.82)	-0.334 (-1.13)
RestrictionsS	-0.605*** (-3.22)	-0.590** (-2.54)	-0.148 (-0.54)	-0.484*** (-2.72)	-0.554** (-2.41)	-0.205 (-0.76)
RTA	0.425** (2.32)	-0.162 (-1.05)	0.475*** (3.51)	0.183 (1.10)	-0.142 (-0.90)	0.253* (1.74)
Border	0.172 (1.18)	-0.0908 (-0.61)	1.271*** (5.92)	0.0809 (0.57)	-0.104 (-0.70)	1.154*** (5.81)
Comlang	0.437*** (3.57)	0.254** (1.98)	0.857*** (4.00)	0.446*** (3.75)	0.294** (2.24)	0.777*** (3.61)
Colony	0.479*** (3.40)	0.286** (1.98)	0.574** (2.21)	0.408*** (2.95)	0.284* (1.96)	0.544* (1.94)
Religion	0.388* (1.80)	0.201 (0.56)	0.541** (2.41)	0.543** (2.45)	0.199 (0.55)	0.599** (2.55)
Constant	-9.121*** (-5.09)	-6.354** (-1.96)	-12.93*** (-4.62)	-13.05*** (-7.17)	-6.980** (-2.13)	-16.66*** (-5.89)
R ²	0.548	0.600	0.836	0.552	0.600	0.731
Observations	29334	12030	15089	26886	11971	13049

* significant at 10%; ** significant at 5%; *** significant at 1%.

Standard errors clustered at country pair level.

Host, source and year fixed effects included but not reported.

Table A6: Exchange rate regime dummies and bilateral FDI flows: focus on currency unions

	All	Developed	Developing	All	Developed	Developing
	1	2	3	4	5	6
	<i>CU members and other 'dollarized'</i>			<i>Unilateral membership in the CU</i>		
CUdummy	0.362** (1.96)	0.635*** (3.79)		0.362** (1.96)	0.634*** (3.78)	
CUunilateral				-0.0406 (-0.22)	0.112 (0.55)	-1.372 (-1.06)
OtherNSLT	0.0716 (0.18)	1.765*** (3.91)	1.271** (2.44)	0.0715 (0.18)	1.765*** (3.90)	1.271** (2.44)
Regime 2	-1.245** (-2.25)	-0.0578 (-0.14)	-0.253 (-0.59)	-1.245** (-2.25)	-0.0567 (-0.14)	-0.253 (-0.59)
Regime 3	0.362* (1.68)	-0.421* (-1.66)	0.528** (2.47)	0.362* (1.68)	-0.420* (-1.65)	0.528** (2.47)
Regime 4	0.450 (1.42)	-0.727* (-1.80)	0.378 (1.55)	0.451 (1.42)	-0.739* (-1.83)	0.378 (1.55)
Regime 5	0.344** (1.99)	0.250 (1.23)	0.0337 (0.07)	0.343** (1.99)	0.248 (1.22)	0.0337 (0.07)
Regime 6	0.212** (1.97)	0.273 (1.35)	0.226* (1.90)	0.211* (1.95)	0.275 (1.36)	0.226* (1.90)
LgdpH	1.179*** (8.76)	1.163*** (4.12)	1.162*** (4.87)	1.182*** (8.78)	1.107*** (3.51)	1.162*** (4.87)
LgdpS	1.131*** (7.64)	0.922*** (4.44)	1.128*** (6.32)	1.132*** (7.64)	0.916*** (4.40)	1.128*** (6.32)
Ldistance	-0.506*** (-7.60)	-0.568*** (-6.96)	-0.505*** (-5.14)	-0.506*** (-7.61)	-0.569*** (-6.95)	-0.505*** (-5.14)
OpennessH	0.533*** (3.25)	1.073*** (2.95)	0.470** (2.55)	0.535*** (3.26)	1.067*** (2.94)	0.470** (2.55)
OpennessS	0.0655 (0.41)	0.0392 (0.11)	-0.0428 (-0.22)	0.0651 (0.41)	0.0411 (0.12)	-0.0428 (-0.22)
RestrictionsH	-0.566*** (-2.83)	-1.160*** (-3.86)	-0.181 (-0.80)	-0.567*** (-2.83)	-1.158*** (-3.85)	-0.181 (-0.80)
RestrictionsS	-0.602*** (-3.18)	-0.590** (-2.54)	-0.142 (-0.52)	-0.602*** (-3.18)	-0.588** (-2.53)	-0.142 (-0.52)
RTA	0.423** (2.33)	-0.159 (-1.03)	0.460*** (3.39)	0.423** (2.33)	-0.161 (-1.04)	0.460*** (3.39)
Border	0.171 (1.17)	-0.0895 (-0.60)	1.276*** (5.97)	0.171 (1.17)	-0.0900 (-0.60)	1.276*** (5.97)
Comlang	0.436*** (3.53)	0.256** (1.99)	0.854*** (3.99)	0.436*** (3.53)	0.256** (1.99)	0.854*** (3.99)
Colony	0.478*** (3.40)	0.286** (1.98)	0.580** (2.22)	0.478*** (3.40)	0.286** (1.98)	0.580** (2.22)
Religion	0.386* (1.79)	0.201 (0.56)	0.545** (2.44)	0.385* (1.79)	0.203 (0.56)	0.545** (2.44)
Constant	-14.04*** (-9.58)	-6.392** (-1.99)	-12.01*** (-4.36)	-14.01*** (-9.56)	-5.791* (-1.80)	-12.01*** (-4.36)
R ²	0.549	0.600	0.837	0.549	0.601	0.837
Observations	29334	12030	15089	29334	12030	15089

* significant at 10%; ** significant at 5%; *** significant at 1%.

Standard errors clustered at country pair level.

Host, source and year fixed effects included but not reported.

Table A7: IRR *de-facto* exchange rate regime **dummies** and bilateral FDI flows.

	All	Developed	Developing	All	Developed	Developing
	1	2	3	4	5	6
	<i>IRR de-facto classification</i>			<i>IRR classification with de-facto dummy</i>		
De-facto dummy				-0.302*	0.139	-0.431*
				(-1.78)	(0.70)	(-1.94)
Regime 1	0.192	0.641***	0.767	0.247	0.633***	0.809
	(1.19)	(4.16)	(1.35)	(1.52)	(4.18)	(1.42)
Regime 2	-0.796***	-0.188	-0.473	-0.784***	-0.193	-0.399
	(-2.94)	(-0.99)	(-1.38)	(-2.85)	(-1.02)	(-1.14)
Regime 3	0.689***	0.0927	0.728**	0.980***	-0.0462	1.281***
	(2.59)	(0.21)	(2.52)	(2.72)	(-0.09)	(3.24)
Regime 4	0.618***	0.245	0.744***	0.698***	0.224	1.010***
	(3.07)	(1.17)	(2.59)	(3.11)	(1.04)	(2.91)
Regime 5	-0.180	0.313	-0.148	0.0730	0.209	0.332
	(-1.00)	(1.54)	(-0.56)	(0.31)	(0.79)	(0.92)
Regime 6	-0.300**	-0.0212	-0.632**	-0.198	-0.0475	-0.276
	(-2.25)	(-0.16)	(-2.53)	(-1.31)	(-0.32)	(-0.93)
Regime 'freely falling'	-0.372	0.377	-0.720**	-0.440*	0.388	-0.765**
	(-1.42)	(0.60)	(-2.09)	(-1.70)	(0.61)	(-2.25)
LgdpH	1.234***	1.161***	1.202***	1.202***	1.173***	1.178***
	(8.93)	(4.13)	(5.36)	(8.62)	(4.14)	(5.30)
LgdpS	1.120***	0.937***	0.998***	1.090***	0.947***	0.956***
	(7.43)	(4.61)	(5.85)	(7.14)	(4.67)	(5.20)
Ldistance	-0.581***	-0.577***	-0.597***	-0.588***	-0.572***	-0.587***
	(-8.94)	(-7.04)	(-6.70)	(-9.14)	(-7.10)	(-6.79)
OpennessH	0.616***	1.019***	0.612***	0.591***	1.021***	0.587***
	(4.00)	(2.75)	(3.51)	(3.75)	(2.76)	(3.34)
OpennessS	0.0192	-0.00140	-0.169	-0.00697	0.00253	-0.230
	(0.11)	(-0.00)	(-0.89)	(-0.04)	(0.01)	(-1.11)
RestrictionsH	-0.522**	-1.147***	-0.135	-0.528**	-1.143***	-0.131
	(-2.52)	(-3.81)	(-0.56)	(-2.54)	(-3.79)	(-0.56)
RestrictionsS	-0.630***	-0.627***	-0.0749	-0.628***	-0.623***	-0.0450
	(-3.44)	(-2.70)	(-0.29)	(-3.44)	(-2.67)	(-0.17)
RTA	0.375**	-0.195	0.253*	0.362**	-0.211	0.210
	(2.47)	(-1.35)	(1.77)	(2.42)	(-1.46)	(1.45)
Border	0.161	-0.0848	1.072***	0.176	-0.0914	1.118***
	(1.16)	(-0.57)	(6.09)	(1.26)	(-0.61)	(6.30)
Comlang	0.408***	0.253**	0.678***	0.385***	0.259**	0.617***
	(3.58)	(2.01)	(3.44)	(3.35)	(2.06)	(3.13)
Colony	0.428***	0.263*	0.666***	0.438***	0.256*	0.700***
	(3.18)	(1.85)	(2.78)	(3.25)	(1.79)	(2.94)
Religion	0.387*	0.177	0.665***	0.401**	0.183	0.699***
	(1.95)	(0.58)	(3.41)	(2.05)	(0.60)	(3.68)
Constant	-7.603***	-9.592**	-8.879***	-6.881***	-9.933**	-8.478***
	(-3.73)	(-2.18)	(-3.46)	(-3.26)	(-2.24)	(-3.26)
R ²	0.564	0.601	0.848	0.567	0.601	0.848
Observations	30941	12575	15959	30941	12575	15959

* significant at 10%; ** significant at 5%; *** significant at 1%.

Standard errors clustered at country pair level.

Host, source and year fixed effects included but not reported.

Table A8: Exchange rate regime dummies and bilateral FDI flows: excluding all observations for countries (host or source) that experienced a currency crisis

	All countries	Developed	Developing
	1	2	3
Regime 1	0.394** (2.17)	0.650*** (3.92)	1.341*** (2.62)
Regime 2	-1.246** (-2.23)	-0.0447 (-0.11)	-0.167 (-0.38)
Regime 3	0.443* (1.96)	-0.425 (-1.60)	0.645*** (2.84)
Regime 4	0.518 (1.55)	-0.651 (-1.56)	0.490** (1.99)
Regime 5	0.390** (2.22)	0.260 (1.27)	0.0563 (0.12)
Regime 6	0.265** (2.31)	0.275 (1.31)	0.304** (2.27)
LgdpH	1.166*** (8.32)	1.156*** (4.07)	1.100*** (4.50)
LgdpS	1.150*** (7.43)	0.930*** (4.38)	1.136*** (5.97)
Ldistance	-0.483*** (-6.97)	-0.571*** (-6.98)	-0.446*** (-4.12)
OpennessH	0.542*** (3.27)	1.078*** (2.97)	0.459** (2.51)
OpennessS	0.0889 (0.55)	0.0459 (0.13)	0.00408 (0.02)
RestrictionsH	-0.771*** (-3.47)	-1.207*** (-3.92)	-0.403 (-1.29)
RestrictionsS	-0.649*** (-3.21)	-0.621*** (-2.60)	-0.202 (-0.60)
RTA	0.448** (2.33)	-0.168 (-1.08)	0.464*** (3.02)
Border	0.185 (1.24)	-0.0873 (-0.58)	1.384*** (5.86)
Comlang	0.411*** (3.25)	0.246* (1.92)	0.832*** (3.61)
Colony	0.465*** (3.22)	0.275* (1.90)	0.576** (2.03)
Religion	0.401* (1.81)	0.204 (0.57)	0.555** (2.48)
R ²	0.551	0.599	0.845
Observations	23990	10708	11772

* significant at 10%; ** significant at 5%; *** significant at 1%.

Standard errors clustered at country pair level.

Host, source and year fixed effects included but not reported.

Table A9: Exchange rate regime dummies and bilateral FDI stocks

	All countries	Developed	Developing
	1	2	3
Regime 1	0.234 (1.37)	0.537*** (3.54)	1.195*** (2.73)
Regime 2	-1.525*** (-3.75)	-0.0952 (-0.27)	-0.992** (-2.29)
Regime 3	0.380 (1.50)	-0.619*** (-2.91)	0.826*** (4.40)
Regime 4	0.853*** (3.18)	-0.451 (-1.36)	0.944*** (3.41)
Regime 5	0.281 (1.28)	-0.122 (-0.56)	0.156 (0.31)
Regime 6	0.0776 (0.57)	0.262 (1.34)	0.226 (1.14)
LgdpH	0.997*** (7.06)	1.108*** (7.63)	0.135 (0.39)
LgdpS	0.753*** (5.36)	0.898*** (6.82)	0.316* (1.65)
Ldistance	-0.499*** (-7.26)	-0.667*** (-8.34)	-0.434*** (-4.66)
OpennessH	0.394*** (2.92)	0.797*** (3.14)	-0.210 (-0.94)
OpennessS	-0.196 (-0.95)	0.0734 (0.51)	-0.472** (-2.16)
KAopenH	0.550** (2.49)	0.921*** (3.77)	-0.311 (-1.24)
KAopenS	0.707* (1.80)	0.777*** (3.41)	-0.557 (-0.83)
RTA	0.506*** (3.59)	-0.141 (-0.98)	0.635*** (5.46)
Border	0.356*** (2.76)	0.0555 (0.43)	1.587*** (7.80)
Comlang	0.497*** (3.93)	0.316*** (2.65)	0.868*** (5.69)
Colony	0.643*** (5.30)	0.523*** (4.07)	0.486** (2.46)
Religion	0.143 (0.84)	-0.232 (-0.50)	0.407** (2.10)
Constant	-10.11*** (-6.29)	-9.226*** (-4.55)	13.08*** (3.42)
R ²	0.777	0.880	0.882
Observations	53451	21237	26040

* significant at 10%; ** significant at 5%; *** significant at 1%.

Standard errors clustered at country pair level.

Host, source and year fixed effects included but not reported.