Domestic Interest Rate and Foreign Direct Investment under Institutional Uncertainty

Nadine McCloud*
Department of Economics
University of the West Indies at Mona

Michael S. Delgado†
Department of Agricultural Economics
Purdue University

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Abstract

It has been argued that foreign direct investment can exert upward or downward pressure on the domestic interest rate depending on foreign investors' relative weights on internal and external finance with respect to the domestic economy. Additionally, a country's level of institutional uncertainty can influence firms' ability to obtain external finance. Using corruption to measure institutional uncertainty, we find that across countries a 1 percent increase in FDI inflows (outflows) is more likely to reduce the domestic interest rate by as much as 0.7 (1) percent. This empirical association between domestic interest rates and FDI flows is non-monotonically uncertainty-contingent.

Keywords: Interest Rate; Foreign Direct Investment; Institutional Uncertainty; Instrumental Variables; Generalized Method of Moments; Semiparametric Estimation.

JEL Codes: C14; C26; E02; E43; E44; F21; F34.

*Nadine McCloud, Department of Economics, University of the West Indies at Mona, Kingston 7, Jamaica. Phone: 876-977-1188, Fax: 876-977-1483. Email: nadine.mccloud02@uwimona.edu.jm

†Michael S. Delgado, Department of Agricultural Economics, Purdue University, West Lafayette, IN 47907-2056. Phone: 765-494-4211, Fax: 765-494-9176, Email: delgado2@purdue.edu.

1 Introduction

The literature suggests that foreign firms may increase domestic credit by injecting capital into the domestic banking system thus lowering interest rates, or exacerbate the host country's scarce monetary resources through borrowing of domestic credit thus raising domestic interest rates.[1] Hence the relative weights foreign investors place on internal and external finance with respect to the domestic banking system can have important implications for the price at which domestic firms borrow from banks in response to investment opportunities and challenges within their economy that necessitate added external finance: a key development arm. Despite the presence of credit-based interactions between foreign firms and the domestic banking system,[2] and relevant studies on FDI and domestic credit constraints (see, e.g., Harrison & McMillan 2003, Harrison et al. 2004, Héricourt & Poncet 2009), empirical evidence on the relationship between FDI flows and the domestic lending rate across countries is nonexistent.

This paper provides empirical evidence on the type and size of the relationships between both FDI inflows and outflows and the domestic lending rate across countries. The traits of any link between FDI flows and domestic interest rates, however, may be contingent on the domestic economy's level of institutional uncertainty. Indeed, banks consider the institutional uncertainty in the domestic economy as part of their risk-return criteria when lending to firms (see, e.g., Qian & Strahan 2007, De Haas et al. 2010). Corruption, specifically, influences the ability of firms to obtain external finance (Beck et al. 2005, Beck, Demirguc-Kunt & Levine 2006, Barth et al. 2009), and foreign firms' financial decisions are quite sensitive to the institutional uncertainty induced by corruption in the domestic economy (Brunetti et al. 1997, UNCTAD 2007). In essence, the literature is rife with evidence that suggests corruption can have an effect on how much finance foreign investors absorb from or inject into the domestic economy, and therefore can influence the relationship between FDI flows and domestic interest rates. Consequently, this paper also characterizes empirically the role of institutional uncertainty across countries in the association between the domestic lending rate and FDI inflows and outflows.

[1] See, for e.g., Calvo et al. (1996), Sun (2002), Agosin & Machado (2005), Magud et al. (2014), Harrison & McMillan (2003), Harrison et al. (2004).

[2] Using data from over 135,000 manufacturing firms in 135 countries from 2005 to 2014, the Enterprise Surveys record different qualifiers that signal foreign firms and banks in host countries do engage in credit-based interactions. For example, of all foreign firms surveyed, an average of approximately 90 percent have a checking or savings accounts, 35 percent have a bank loan or line of credit, 25 percent use banks to finance investments, and 29 percent use banks to finance working capital. These averages are from the authors' computations.

Many international organizations also subscribe to the view that institutions matter in the interaction among economic agents. World Bank (2002), for example, posits that high quality institutions increase market opportunities by managing risks from market exchange and increase efficiency through the lowering of transaction costs.[3] This view can be taken to imply that across countries, reducing the prevailing level of institutional uncertainty will have a monotonic effect on the relationship between FDI flows and domestic lending rates by, say, making it easier for foreign investors to obtain more external finance from the domestic economy. Yet, this first-best interpretation suggests that foreign investors' attitude towards any prevailing level of domestic institutional uncertainty is similar across countries. However, recent empirical works by, for example, Cuervo-Cazurra (2008), Brada, Drabek & Perez (2012), and Brada et al. (2017) document significant cross-country heterogeneity in the magnitude or ilk of the interaction between FDI flows and host-country corruption levels. In particular, Brada et al. (2017) argue that how much capital foreign investors commit to a domestic economy is contingent on the premium domestic corruption imposes on their firms' productivity or economic efficiency, and the degree of their experience-based competitive advantage in navigating a corrupt environment.[4]

This first-best interpretation also seems at odds with the widely known quiddity of institutional uncertainty: it is associated with multiple distortions that obstruct the free flow of resources among economic agents (see, for e.g., Mauro 1995, Acemoglu, Johnson & Robinson 2005). By virtue of the General Theory of Second Best (Lipsey & Lancaster 1956), the presence of multiple distortions means that no definitive statement can be made *a priori* on the type of changes in any distortion on the economic relationship of interest. In the present context, reducing institutional uncertainty from its prevailing level may induce more distortions that may weaken, strengthen or render no change in the effects of FDI flows on the domestic lending rate.

[3]Different international organizations have conducted surveys to assess the factors that impinge on investors' decision to undertake business in their respective host countries. A country's level of institutional uncertainty is the common denominator across the principal subsets of factors identified by these surveys. For example, in 1996, a World Bank survey of 3,685 firms in 69 countries reveals that (of 15 obstacles) corruption ranks as the *second* most important obstacle to business worldwide (Brunetti et al. 1997, pg. 59). In 2007, the Worldwide Survey of Foreign Affiliates, conducted jointly by UNCTAD and the World Association of Investment Promotion Agencies, involving 96 chief executive officers of foreign affiliates around the world were asked to indicate the policy area that governments should improve upon to render their locations more attractive to FDI; the most important policy area was the regulatory and institutional environment – which includes curbing corruption (UNCTAD 2007).

[4]Detailed summaries of the FDI-corruption literature with evidences of nonmonotonic interactions are included in Cuervo-Cazurra (2008), Brada et al. (2012), and Brada et al. (2017), and the references cited therein.

If more FDI inflows are associated with a higher lending rate within a country and there is a reduction in institutional uncertainty, then foreign investors may substitute internal finance for external finance, thereby absorbing less domestic credit that consequently leads to a decrease in the upward pressure of FDI inflows on the domestic lending rate. Such a scenario is likely in countries where foreign investors experience increased confidence in the domestic economy due to a reduction in institutional uncertainty, that may arise from added regulations or the creation of agencies with a mandate to lower institutional uncertainty. Beck, Demirguc-Kunt & Levine (2006), for example, look at the relationship between bank supervisory policies and the negative effects that corruption in lending has on firms' abilities to raise external finance. Results speak to the manifestation of corruption through the power of officials, as firms face more finance-sourcing obstacles in countries where banks are highly monitored by official supervisory agencies rather than by private agencies.

To shed some light on whether the empirical role of institutional uncertainty in the cross-country nexus between the domestic lending rate and FDI flows is more consistent with a first-best or second-best characterization, we do not select a parametric functional form of the uncertainty-contingent heterogeneity in our domestic lending rate equation; rather, we assume its functional form is unknown.[5] For plausible reasons, unobservable country- or time-specific factors (fixed effects) may affect the domestic lending rate equation in a non-affine manner, and substantial parameter heterogeneities stemming from cross-country differences in uncertainty may also exist between the domestic lending rate and its other correlates. To address these added sources of bias in the domestic lending rate function, we therefore presume the parameters on all regressors to be unknown smooth functions of corruption, and unobserved country- and time-specific effects.

To exact identification of the effects of FDI inflows and outflows on the domestic lending rate, we use the semiparametric regression apparatus put forward by Cai & Li (2008) that allows us to obtain consistent coefficient function estimates in the presence of parameter heterogeneities of unknown form and to use instrumental variables to address regressor endogeneity that may yet exist. Heuristically, this semiparametric apparatus uses the data to select the appropriate form of parameter heterogeneity in the domestic lending rate equation; in general, an adaptive

[5]The aim of this paper is not to develop, and simulate the predictions of, an interest rate-FDI second-best theory that accommodates institutional uncertainty; rather, an aim is to see whether our uncertainty empirical results are consistent with the predictions of the General Theory of Second Best.

method to modeling heterogeneity militates against biased empirical results that may stem from using an ad hoc parametric form of heterogeneity that does not fit the data, and by extension biased inferences and policy prescriptions.

Using an unbalanced panel data of 137 developed and developing countries over the period 1984 to 2010, we estimate our domestic lending rate model with and without controlling for corruption – our proxy for institutional uncertainty. The juxtaposition of these two empirical results indicates that there is heterogeneity in the relationships between FDI inflows and outflows and the lending rate across countries after we control for corruption. On the one hand, the exclusion of corruption from the regression model yields that across all countries there is statistical parity in the effects of FDI inflows and outflows on the domestic lending rate, and more FDI inflows are associated with higher domestic lending rates, whereas more FDI outflows are associated with lower domestic lending rates. Furthermore, within all countries, there is (i) statistical parity in the positive and negative effects of FDI inflows and outflows, respectively, on the domestic lending rate; and (ii) statistically significant equal and opposite effects of FDI inflows and FDI outflows, which means the overall effect of FDI inflows and outflows on domestic lending rate is indicative of a zero-sum game. On the other hand, the inclusion of corruption into the regression model reveals that across countries, there is a higher incidence of FDI inflows and outflows exerting downward pressures on domestic interest rate. Our evidence therefore overwhelmingly corroborates the view that corruption influences the ability of foreign firms to obtain external finance within the domestic economy.

We also find that the FDI effects are non-monotonically uncertainty-contingent: lower uncertainty may strengthen, weaken, or have no effect on the relationship between FDI flows and the domestic lending rate within a particular country. Hence, foreign investors do not always obtain added external finance within the domestic economy as a result of lower corruption. Our results therefore imply that changes in uncertainty from its prevailing level can induce socially undesirable effects of FDI flows on the domestic lending rate. Moreover, our data do not lend support to the view that there is a global threshold of corruption. Overall, this peculiar non-monotonic role of institutional uncertainty that is exhibited by the data appears to have second-best, rather than first-best, traits. The presence of institutions-induced second-best traits in the association between the domestic lending rate and FDI flows provides empirical

support for the argument that changes in the "institutional landscape" of developing countries warrant a second-best – rather than a first-best – perspective (Rodrik 2008). Also, our qualitative implications are unperturbed in the presence of an auxiliary and plausible set of third factors that may be correlated with both the domestic lending rate and FDI flows.

Our work is germane to important studies on the effects of FDI inflows on an array of domestic credit constraints (see, e.g., Harrison & McMillan 2003, Harrison et al. 2004, Héricourt & Poncet 2009). Harrison & McMillan (2003) find that borrowing by foreign firms tightens credit constraints faced by domestic firms, whereas Héricourt & Poncet (2009) show joint-ventures with foreign firms help private domestic firms to circumvent both financial and legal constraints at home. Harrison et al. (2004) establish that across countries FDI inflows are associated with a decrease in financing constraints of host-country firms. We add to this strand of literature by highlighting the role of domestic institutional uncertainty in association between FDI inflows and outflows and domestic credit constraints. Our work also overlaps with the literature on institutions and finance (e.g., La Porta et al. 1997, La Porta et al. 1998, Beck et al. 2005, Beck, Demirguc-Kunt & Levine 2006, Djankov et al. 2007, Qian & Strahan 2007, Barth et al. 2009, De Haas et al. 2010). In particular, Beck, Demirgüç-Kunt, Laeven & Maksimovic (2006) document that cross-country differences in institutional development is the main reason for variation in the level of financial obstacles; their empirical analysis, however, does not contain an assessment of the association between institutional development and a high interest rate, which they label as a financial obstacle. Furthermore, our work considers the direct and indirect effects of institutions on the domestic lending rate. In broader terms, the purported role of uncertainty-contingent heterogeneity in our paper is related to, for example, Borensztein et al. (1998) and Alfaro et al. (2010) who emphasize that the effect FDI inflows have on growth is dependent on certain domestic factors.

2 A Semiparametric Model of the Interest Rate

We use a varying coefficient regression specification to model the relationship between the lending interest rate and FDI flows. Let I_{it} denote the domestic lending interest rate, define FI_{it} and FO_{it} to respectively be FDI inflows and outflows, and let the indices $i = 1, 2, \ldots, n$

and $t = 1, 2, \ldots, T$ denote country and time, respectively. The empirical model is

$$I_{it} = \gamma_0(Z_{it}) + I_{i,t-1}\gamma_1(Z_{it}) + FI_{it}\gamma_2(Z_{it}) + FO_{it}\gamma_3(Z_{it}) + X'_{it}\gamma_4(Z_{it}) + \epsilon_{it}, \tag{2.1}$$

in which X_{it} is a l-dimensioned vector of control variables that vary both across countries and over time, and ϵ_{it} is a zero mean error term. We include the one period lag of the lending rate, $I_{i,t-1}$, to capture the stylized fact of interest rate inertia that may stem from, among other factors, continuity in monetary policy over time or persistent shocks. Interest rates, in general, seem to possess inertia; recently, Coibion & Gorodnichenko (2012), for example, provide an in-depth analysis of the degree of inertia in the Federal Reserve's policy rates. We model the effects of FDI flows and the control variables on the lending rate as functions of a p-dimensioned vector of uncertainty variables, Z_{it}, through the unspecified but smooth coefficient functions $\gamma_j(Z_{it})$.[6] Stability of the dynamic model in (2.1) warrants the estimates of $\gamma_1(Z_{it})$ to lie within the unit circle. Our functions of interest are $\gamma_2(Z_{it})$ and $\gamma_3(Z_{it})$.

To address empirically this important issue of endogeneity, we adopt the local-linear semi-parametric estimator proposed by Cai & Li (2008); this is a nonparametric generalized method of moments (GMM) framework that uses a single-step instrumental variables estimator to recover consistent estimates of both the $\gamma_j(\cdot)$'s and the first order partial derivatives of the $\gamma_j(\cdot)$'s with respect to Z in the presence of endogeneity of all explanatory variables (the uncertainty variables are assumed to be exogenous).[7] We use a wild-bootstrap to obtain standard errors of our estimates as this bootstrap procedure is robust to heteroscedasticity of unknown form (see Davidson & Flachaire 2008). Details are provided in the Technical Appendix to this paper.

3 Data

We collate an unbalanced panel of data on 137 developed and developing countries over the period 1984-2010. Most of the data comes from the World Bank (2012). To reduce the serial

[6] Given the structure of Equation (2.1), readers should note that $\gamma_j(Z_{it}) : \mathbb{R}^p \to \mathbb{R}$ for $j = 0, 1, 2, 3$ but $\gamma_j(Z_{it}) : \mathbb{R}^p \to \mathbb{R}^l$ for $j = 4$.

[7] The nonparametric estimator approximates the unknown functions by locally weighting the data in the neighborhood of each evaluation point, and not through additional parameterization as would be done in a flexible parametric specification. This difference is important because in the nonparametric case we do not run into the usual degrees-of-freedom problem as might be the case in a flexible parametric model. This Cai & Li (2008) estimator was recently used in an empirical macroeconomic model by Delgado, McCloud & Kumbhakar (2014).

correlation within the annual data, thereby minimizing the effects of business cycles and other annual fluctuations on our results, we construct 3-year time-averaged panels from our data. Though the effective sample size for each regression varies because of data limitations for different control variables, our primary sample of 3-year averaged observations is of size 514 and covers 97 countries.[8] We provide the source and definition of each variable in Table 1.

Table 1: List of data sources and definitions

Variable	Source	Definition
Outcome		
Domestic Interest Rate	WDI 2012	Nominal lending interest rate adjusted for inflation
FDI		
FDI Inflows	WDI 2012	Net FDI inflows as % of GDP in constant 2002 dollars
FDI Outflows	WDI 2012	Net FDI outflows as % of GDP in constant 2002 dollars
Control Variables		
Lagged Interest Rate	WDI 2012	One-period lag of the domestic interest rate
Savings	WDI 2012	Gross national income less total national consumption, plus net transfers.
Investment	WDI 2012	Gross capital formation as a % of GDP, including net changes in inventories as well as fixed capital formation that includes land developments, plants and machinery investments, infrastructural development, and public, private, and commercial construction.
Money Supply	WDI 2012	Growth rate of broad money. Broad money is the sum of currency outside banks; demand deposits other than those of the central government; the time, savings, and foreign currency deposits of resident sectors other than the central government; bank and travelers checks; and other securities such as certificates of deposit and commercial paper.
Growth Rate	WDI 2012	Real GDP per capita growth (annual %)
Inflation Rate	WDI 2012	Log of the annual rate of inflation
Exchange Rate	WDI 2012	Exchange rate (domestic currency per US$)
Uncertainty Variable		
Corruption	ICRG	6 point index of corruption in the political system, with 0 representing most corrupt and 6 representing the least corrupt
External Instrumental Variables from Top Five Major Trading Partners (MTPs)		
Economic Growth	WDI 2012	Arithmetic mean of real GDP per capita growth for top 5 MTPs
Saving Rate	WDI 2012	Arithmetic mean of saving rate for top 5 MTPs
Exchange Rate	WDI 2012	Arithmetic mean of exchange rate for top 5 MTPs

Response and Explanatory Variables The domestic lending interest rate – our response variable I_{it} – is defined as the nominal lending interest rate adjusted for inflation. FDI inflows

[8]The wild bootstrap that we use to estimate the standard errors mitigates, among other things, imprecision of the estimates that may arise as a result of estimation using a small sample.

and outflows – our key explanatory variables, FI_{it} and FO_{it} – are respectively defined as the net inflows and net outflows of FDI as a percentage of GDP. We include the one period lag of the lending rate, $I_{i,t-1}$. Guided by the expansive canonical open-economy macroeconomic literature on interest rates, we include domestic investment, gross national savings, the growth rate of real GDP per capita, the inflation rate, the exchange rate, and money supply growth rate as the explanatory variables in X_{it}; see Table 1.

There are direct and indirect evidences that suggest these variables may matter empirically for interest rate determination. For example, Alvarez, Atkeson & Kehoe (2002) find that an increase in the money supply generally reduces the interest rate; Boyd & Champ (2003) mention that banks adjust their nominal rates to account for inflation shocks, whereas Demirgüç-Kunt, Laeven & Levine (2004) find that inflation positively and significantly impacts the net interest margins of banks; and Magud et al. (2014) suggest that bank credit expands faster in countries with less flexible exchange rates.[9]

Institutional Uncertainty We proxy for institutional uncertainty using the popular index of corruption that comes from the International Country Risk Guide (ICRG) published by Political Risk Services; this corruption index captures "actual or potential corruption in the form of excessive patronage, nepotism, job reservations, 'favor-for-favors', secret party funding, and suspiciously close ties between politics and business."[10] This ICRG corruption index ranges from 0 to 6, with 0 representing most corrupt and 6 representing the least corrupt.

To control for country- and time-specific unobserved heterogeneity in all the coefficient variables, we include an unordered country variable and ordered year categorical variable in Z_{it}. Examples of unobservable country effects are productivity shocks and FDI-related government policies,[11] whereas an example of a time-specific effect is an oil price shock. Our use of non-neutral fixed effects is important in reducing biases in our empirical analysis because the country-specific effects in Z_{it} control for many time-invariant measures of institutional un-

[9]Note that many of these explanatory variables have been linked theoretically to FDI flows (see, for example, Calvo et al. 1996), and some variables such as domestic investment and economic growth, have been found to be correlated empirically with FDI flows across countries; thus, these explanatory variables should mitigate omitted variable bias in the estimated effects of FDI on the lending rate.

[10]The first year that this corruption index is available is 1984; hence, the availability of the corruption index places a restriction on the beginning year of our analysis.

[11]It has been documented (e.g., World Bank 1997*a*, World Bank 1997*b*, UNCTAD 2000) that governments may try to attract FDI by offering tax credits, infrastructure subsidies and import duty exemptions to foreign investors.

certainty, such as legal origin , which may directly or indirectly impact firms ability to obtain external finance (e.g., La Porta et al. 1998, Djankov et al. 2007, Qian & Strahan 2007). Thus, fixed effects can have direct and indirect effects on interest rate determination.

4 Empirical Evidence

In this section, we estimate variants of the standard smooth varying-coefficient model in (2.1) that rely on the preceding continuous controls – which we first assume to be exogenous – and fixed effects for identification. Our general, flexible control of heterogeneity across countries and time should mitigate quantitatively large biases from unobservables being subsumed in the error term. Nevertheless, in the subsequent section, we compare these results to the Cai & Li (2008) nonparametric GMM estimates from model (2.1) with endogenous controls. We obtain observation-specific coefficient estimates, and tabulate the estimates with the corresponding observation-specific standard error at the 25th, 50th (median), 75th percentiles, and the mean.

4.1 Heterogeneity without Institutional Uncertainty?

We first investigate empirically the existence of heterogeneous estimates in the nexus between the lending rate and FDI that vary non-neutrally across country-year observations. To our 3-year averaged panel dataset, we semiparametrically fit the smooth coefficient model in (2.1) with only country and year indicators as discrete Z-variables and lagged interest rate, FDI inflows and outflows as explanatory variables.[12] Table 2 contains results for our semiparametric estimates of this parsimonious smooth coefficient model, showing an absence of statistical parity among the reported percentiles for both FDI inflows and outflows. For example, the 95 percent confidence interval for the estimated 75th percentile associated with FDI inflows comfortably excludes the other corresponding percentiles, which are all positive and statistically insignificant. The reported percentiles for FDI outflows are all negative and statistically significant. These results seem to suggest heterogeneity in the relationship between FDI flows and the domestic lending rate is induced by country and year fixed effects; this parsimonious specification, however, can engender such results.

[12]Using only discrete variables in Z reduces our local-linear least squares smooth coefficient estimator to a local-constant least squares smooth coefficient estimator. We refer to Li & Racine (2007) for technical details.

Table 2: Semiparametric regression using only discrete regressors: parsimonious model

	Dependent Variable: Interest Rate			
	25th	50th	75th	Mean
Coefficients				
Intercept	0.029***	0.046***	0.061***	0.048***
	0.002	0.003	0.004	0.001
Lag Interest	0.628***	0.676***	0.720***	0.677***
	0.006	0.001	0.006	0.004
FDI Inflows	0.010	0.105	0.191***	0.088***
	0.064	0.115	0.020	0.021
FDI Outflows	−0.742***	−0.353***	−0.164***	−0.496***
	0.092	0.030	0.016	0.025
Sample size		589		
Country bw		0.017		
Year bw		0.731		
In-sample R^2		0.996		
Out-of-sample R^2		0.959		
Out-of-sample $ASPE$		0.007		

Note: 25th, 50th, 75th refer to percentiles in the distribution of coefficient estimates. Estimate specific standard errors are reported below each estimate, and statistical significance is denoted by *p<0.1; **p<0.05; ***p<0.01. We compute $R^2 = corr[I, \widehat{I}]^2$ and $ASPE = n^{-1} \sum (I - \widehat{I})^2$ with the out-of-sample prediction measures being the mean of 1000 out-of-sample replication exercises (see the Supplemental Appendix for details). Observations are based on 3-year averages.

Therefore, to examine whether the other explanatory variables play a role in the association between FDI flows and the lending rate, we add savings, domestic investment, the growth rate of the money supply, economic growth, inflation and the exchange rate to our specification in Table 2; the results are in Table 3. We now obtain estimates of the FDI inflows and outflows that are statistically significant at conventional levels and exhibit statistical parity among the reported percentiles and means, which strongly suggest parameter homogeneity within the interquartile ranges of the relationship between the lending rate and FDI inflows and outflows. In fact for all variables in this discrete model almost all estimated percentiles display parameter homogeneity. This model therefore demonstrates that if there is parameter heterogeneity in the relationship between the lending rate and FDI inflows and outflows, country- and time-specific effects are not sufficient to accurately capture such heterogeneity net of changes due to other factors of the domestic lending rate. Alternatively, Table 3 suggests that ignoring significant explanatory factors can yield erroneous results on sources of parameter heterogeneity in the

Table 3: Semiparametric regression using only discrete regressors: full model

	Dependent Variable: Interest Rate			
	25th	50th	75th	Mean
Coefficients				
Intercept	0.072***	0.073***	0.074***	0.073***
	0.008	0.007	0.007	0.007
Lag Interest	0.664***	0.664***	0.665***	0.664***
	0.019	0.019	0.019	0.020
FDI Inflows	0.066*	0.071**	0.077**	0.072**
	0.036	0.034	0.037	0.037
FDI Outflows	−0.085**	−0.078**	−0.073*	−0.078**
	0.039	0.039	0.039	0.039
Savings	−0.041***	−0.039***	−0.037**	−0.040***
	0.013	0.013	0.014	0.013
Investment	−0.086**	−0.082**	−0.076**	−0.083**
	0.032	0.032	0.032	0.032
Money Supply	−0.017***	−0.017***	−0.016***	−0.017***
	0.002	0.002	0.002	0.002
Growth	−0.070	−0.065	−0.060	−0.067
	0.069	0.081	0.076	0.081
Inflation	0.138***	0.138***	0.138***	0.138***
	0.026	0.026	0.026	0.026
Exchange Rate	0.000***	0.000***	0.000***	0.000***
	0.000	0.000	0.000	0.000
Sample size		514		
Country bw		0.223		
Year bw		1.000		
p-value		0.000		
In-sample R^2		0.980		
Out-of-sample R^2		0.950		
Out-of-sample $ASPE$		0.004		

Note: 25th, 50th, 75th refer to percentiles in the distribution of coefficient estimates. Estimate specific standard errors are reported below each estimate, and statistical significance is denoted by *p<0.1; **p<0.05; ***p<0.01. We compute $R^2 = corr[I, \widehat{I}]^2$ and $ASPE = n^{-1}\sum(I - \widehat{I})^2$ with the out-of-sample prediction measures being the mean of 1000 out-of-sample replication exercises (see the Supplemental Appendix for details). Observations are based on 3-year averages.

interest rate equation.[13]

4.2 Does Institutional Uncertainty Matter?

The signs on the percentile estimates in Table 3 suggest that the domestic lending rate increases with an increase in FDI inflows but lowers with an increase in FDI outflows. A deep look at our

[13]We highlight the stability of the dynamic specifications in both Tables 2 and 3, which can be deduced from the magnitude and statistical significance of the reported percentiles for the one-period lagged interest rate regressor.

Table 4: Uncertainty regression

	Dependent Variable: Interest Rate			
	25th	50th	75th	Mean
Coefficients				
Intercept	0.017***	0.045***	0.089***	0.057***
	0.003	0.009	0.010	0.003
Lag Interest	0.372***	0.656***	0.822***	0.600***
	0.050	0.013	0.022	0.007
FDI Inflows	−0.136*	−0.025***	0.042***	−0.059***
	0.078	0.005	0.006	0.014
FDI Outflows	−0.080	−0.021	0.044	−0.015
	0.129	0.021	0.037	0.016
Savings	−0.073***	−0.029	0.004	−0.039***
	0.018	0.034	0.013	0.005
Investment	−0.065*	−0.005	0.042**	−0.008
	0.039	0.022	0.020	0.007
Money Supply	−0.027**	−0.007***	0.002	−0.014***
	0.010	0.001	0.006	0.002
Growth	−0.097***	−0.018***	0.050***	−0.043**
	0.021	0.002	0.012	0.020
Inflation	0.083***	0.169***	0.297***	0.184***
	0.025	0.004	0.041	0.007
Exchange Rate	0.000	0.000	0.002***	0.005***
	0.000	0.000	0.000	0.001
Uncertainty Partials				
Intercept	−0.049***	0.005	0.093***	0.035**
	0.009	0.005	0.007	0.016
Lag Interest	−0.818**	−0.240	0.000***	−0.513***
	0.275	0.193	0.000	0.074
FDI Inflows	−0.036***	0.001***	0.492**	0.143
	0.004	0.000	0.217	0.126
FDI Outflows	−1.037***	−0.003***	0.002***	−0.596***
	0.280	0.000	0.000	0.151
Savings	−0.040***	0.001***	0.193	0.147***
	0.006	0.000	0.230	0.034
Investment	−0.018***	0.010***	0.474***	0.176***
	0.004	0.002	0.088	0.041
Money Supply	−0.079***	−0.010	0.048***	−0.032***
	0.022	0.013	0.012	0.008
Growth	−1.258	−0.001***	0.020***	−0.541***
	0.969	0.000	0.003	0.124
Inflation	−0.120	0.000	0.240***	0.071
	0.130	0.000	0.070	0.046
Exchange Rate	−0.003***	0.000***	0.001***	0.004
	0.001	0.001	0.000	0.005
Sample size		514		
Uncertainty bw		0.129		
Country bw		0.345		
Year bw		0.693		
In-sample R^2		0.998		
Out-sample R^2		0.918		
Out-sample $ASPE$		0.004		

Note: 25th, 50th, 75th refer to percentiles in the distribution of coefficient estimates. Estimate specific standard errors are reported below each estimate. The level of statistical significance of estimates are denoted by *p<0.1; **p<0.05; ***p<0.01. Uncertainty measure is the ICRG corruption index. See notes in Table 3 and variables' description in Table 1 for details.

country-specific results behind Table 3 reveals that across all countries there is statistical parity in the effects of FDI inflows and outflows on the domestic lending rate, and more FDI inflows are associated with higher domestic lending rates, whereas more FDI outflows are associated with lower domestic lending rates. That is, this model implies that all foreign firms tend to obtain external finance from their host countries' banking system. More notably, within all countries, we observe the following: (i) statistical parity in the positive and negative effects of both FDI inflows and outflows, respectively, on the domestic lending rate; and (ii) statistically significant equal and opposite effects of FDI inflows and FDI outflows, which means the overall effect of FDI inflows and outflows on the domestic lending rate is indicative of a zero-sum game. Clearly, these patterns and their implications suggest the unlikely scenario that all investors have the same attitude and tolerance irrespective of the country in which they undertake venturesome investments. Yet, countries do differ in their levels of institutional uncertainty which may be associated with differences across countries in how much foreign investors lean on the domestic banking system for financial support, and consequently be associated with variations across countries in domestic lending rates. To examine whether a country's level of institutional uncertainty significantly affects the relationship between FDI flows and the domestic lending rate, we re-estimate the full semiparametric model in Table 3, but including corruption in the Z vector. We report maps of these results in Figure 1 and a statistical summary in Table 4.

4.2.1 FDI Inflows

In Table 4, we find that across quartiles of estimates, FDI inflows now have a significantly heterogeneous association with the domestic interest rate. This is evident in the absence of statistical parity among the reported percentiles for FDI inflows; for example, the 95 percent confidence interval for the estimated 75th percentile associated with FDI inflows is positive and comfortably excludes the 50th and 25th percentiles, which are all negative and statistically significant at the 1 percent and 10 percent levels respectively. In addition, the 95 percent confidence interval for the estimated mean excludes all the reported percentiles. These FDI percentile estimates are also economically significant. A twofold increase in FDI inflows is associated with a 2.5 percent decrease at the 50th percentile but a 4.2 percent increase at the 75th percentile in the domestic lending rate. These percentile estimates signal marked

differences in FDI inflows effects between the fully discrete and uncertainty models.

Digging deeper into these distributions of estimates in Figure 1 and matching the heterogeneous parameter estimates with their respective countries and years reveals a few noteworthy observations. *One*, the type and magnitude of the relationship between FDI inflows and the domestic lending interest rate is heterogeneous within countries, after we control for institutional uncertainty. In essence, within many countries, the conflicting theoretical arguments – foreign firms can exacerbate the host country's scarce monetary resources through borrowing on domestic credit thus raising the domestic interest rate (Sun 2002, Agosin & Machado 2005) or inject credit into the economy thus lowering interest rates (Calvo et al. 1996, Magud et al. 2014) – appear to be empirically valid in the presence of a country's prevailing level of uncertainty, and net of the FDI inflows effects acting through savings, domestic investment, the growth rate of money supply, economic growth, inflation, and the exchange rate. That is, the variation in corruption within a country affects foreign firms' ability to obtain external finance from the domestic economy, which results in changes over time in the relative weights they place on internal and external finance.

Two, the type and size of the relationship between FDI inflows and the domestic interest rate are heterogeneous across countries, after we control for institutional uncertainty. More important, in comparison to the fully-specified discrete model, FDI inflows now have more significantly negative – than positive – estimated effects on the domestic lending rate. That is, the overriding pattern in the fully-specified discrete model that across countries an increase in FDI inflows is associated with only an increase in the domestic lending rate – which suggests that FDI inflows is exclusively associated with an absorption of domestic credit – does not hold once we control for corruption. Our analysis therefore strongly indicates that corruption influences the capacity of foreign firms to acquire external finance from the domestic economy; consequently, foreign firms are likely to borrow less, but inject more, funds into the domestic economy thus putting a downward pressure on the domestic lending rate. A foreign firm may either seek external finance outside of the host economy or simply draw more from its own coffers thus substituting internal finance for external finance. In either case, funds for its investment are directed to the host economy's banking system. In fact, Beck, Demirgüç-Kunt, Laeven & Maksimovic (2006) and Barth et al. (2009) assert that foreign firms – relative to

non-foreign firms – might be less influenced by corruption in the domestic economy because they could tap the international financial system for external finance. Although our results do not go against this assertion, the change in pattern from all positive to mostly negative FDI inflows effects after we control for corruption supports the notion that the level of corruption in the domestic economy matters for foreign firms' ability to obtain external finance domestically. More generally, our result accords with the notion that institutional uncertainty within the domestic economy matters in the credit-based interaction between foreign firms and the domestic banking system (Beck et al. 2005, Beck, Demirguc-Kunt & Levine 2006, Barth et al. 2009).

Three, the range of the estimated FDI inflows coefficients is quite wide. Focusing on the extreme estimates, we find that for four countries in our data – Israel, Niger, Thailand and Uruguay – a 10 percent increase in FDI inflows is associated with 6 to 7 percent decrease in the domestic lending rate; furthermore, these large and statistically significant reductions occur within the pre-2000 era. For thirteen countries in our data, a 10 percent increase in FDI inflows is associated with approximately 3 percent increase in the domestic lending rate; interestingly, with the exception one country, all these large and statistically significant increases occur within 2004 – that is, within the post-2000 era.[14]

To delve into the role of uncertainty in the heterogeneous association between FDI inflows and the domestic interest rate, we discuss our estimates of the partial derivative of $\gamma_2(Z_{it})$ with respect to corruption that are in the lower half of Table 4. To proceed, recall that an increase in the corruption index is interpreted as a decrease in the level of corruption (institutional uncertainty). The partial effect of a reduction in the level of corruption on the FDI inflows coefficient is negative and significant at the 25th percentile, and is positive and significant at the 50th and 75th percentiles. In particular, there is a clear absence of statistical parity across reported percentiles. This is further evidence that uncertainty has a significant role in the heterogeneous association between FDI inflows and the domestic interest rate. We find that a one unit decrease in the level of corruption is associated with approximately 0.04 percent decrease but 0.49 percent increase at the 25th and 75th percentile, respectively, in the magnitude of the relationship between FDI inflows and the domestic interest rate.

Yet, looking across the distribution of estimates we see that the estimated partial effect

[14]The thirteen countries are Albania, Angola, Azerbaijan, Bahrain, Bolivia, Cameroon, Kenya, Kuwait, Latvia, Libya, Malawi, Mexico and Poland.

of a one-unit reduction in the level of corruption on the FDI inflows coefficient can be much larger than these percentiles, ranging from approximately -0.5 to 6.83 percent. Matching the more extreme estimated partial effects to countries, we find that (i) 9 countries are associated with effects greater than 6.1 percent, and (ii) 10 countries are associated with effects in less than -0.4 percent; for the former group, all these statistically significant extreme estimates occur within 1989, whereas for the latter group, all but one of these statistically significant extreme estimates occur within post 2002 era. To appreciate the economic significance of these extreme partial effects of corruption, we focus on Thailand for two reasons: Thailand attains positive and negative extreme estimates; and in the fully-specified discrete model, however, FDI inflows do not exert statistically significant pressure on Thailand's domestic lending rate, irrespective of the year we consider. For the 1989 period, a one unit decrease in the level of institutional uncertainty is associated with approximately 6.83 percent increase in the strength of the relationship between FDI inflows and the domestic interest rate. Also, for this period, a 10 percent increase in FDI inflows is associated with a 6 percent decrease in Thailand's lending rate. Collectively, these estimates therefore yield that a 10 percent increase in FDI inflows is associated with a 6.4 percent decrease in Thailand's lending rate if the level of institutional uncertainty were to decrease by one unit. For the 2007 period, a one unit decrease in the level of institutional uncertainty is associated with approximately 0.5 percent decrease in the strength of the relationship between FDI inflows and the domestic interest rate. Also, for this period, a 10 percent increase in FDI inflows is associated with a 1.275 percent increase in Thailand's lending rate. Collectively, these estimates therefore yield that a 10 percent increase in FDI inflows is associated with a 1.269 percent increase in Thailand's lending rate if the level of institutional uncertainty were to decrease by one unit. This country-specific focus clearly suggests that although corruption is an obstacle to foreign firms raising external finance domestically, lower corruption will not necessarily induce firms to borrow more; firms may opt to borrow less.

In total, our results therefore typify a non-monotonic uncertainty-contingent relationship between FDI inflows and the domestic interest rate: across countries, the magnitudes of the pressures of FDI inflows on domestic lending rates respond upward or downward to changes in the level of uncertainty in the domestic economy.

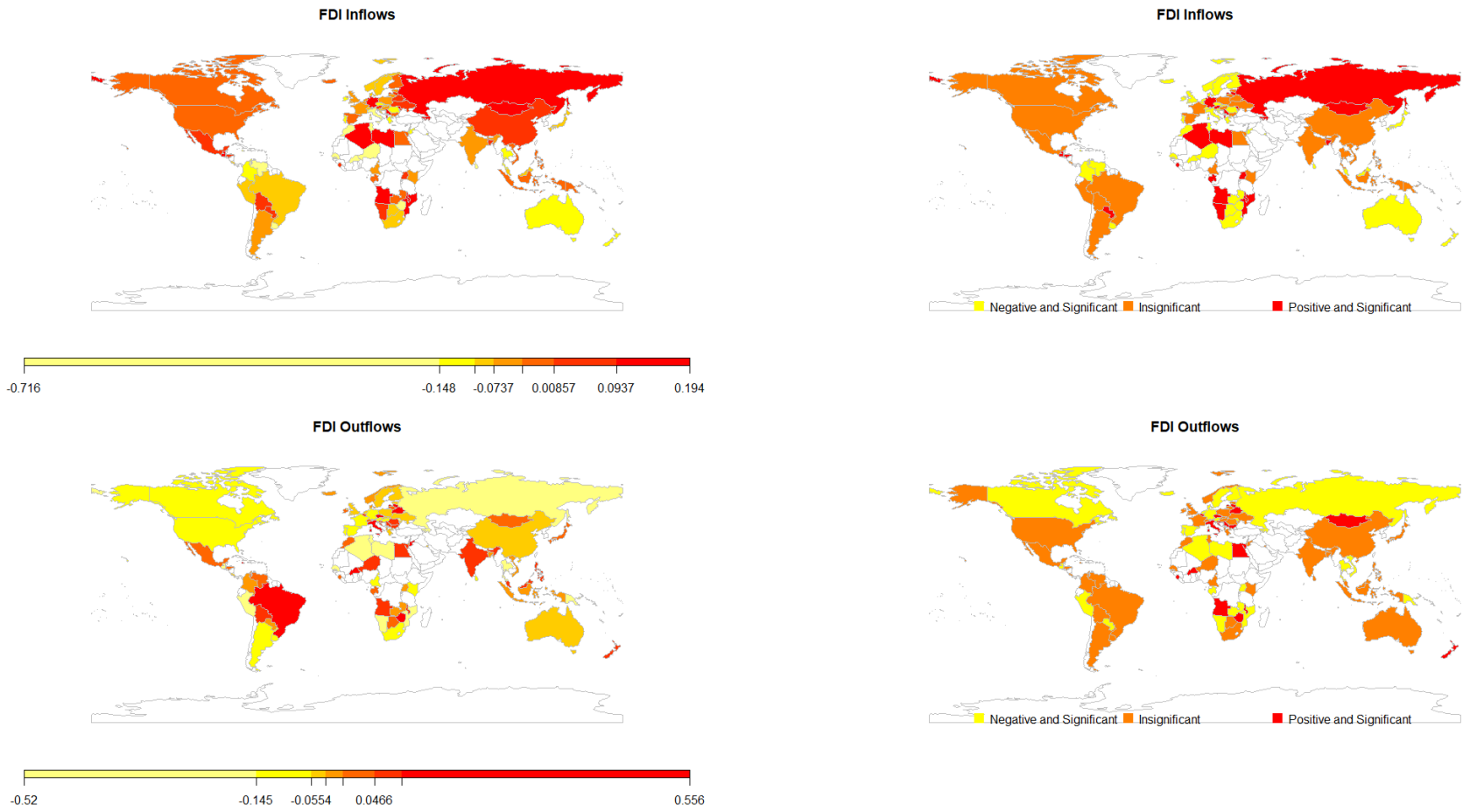

Figure 1: Heatmaps of the uncertainty-contingent FDI Inflows and Outflows coefficient estimates. The panels on the left display the time-averaged continuous coefficient estimate for each country in the sample, and the panels on the right indicate whether these averaged point estimates are significantly negative, significantly positive, or insignificant.

First-best versus Second-best Traits It is important to note that the existence of a non-monotonic uncertainty-contingent relationship between FDI inflows and the domestic interest rate is necessary but not sufficient for us to suggest a second-best label. For example, a quadratic specification for $\gamma_2(Z_{it})$ can also produce a non-monotonic uncertainty-contingent relationship but is relatively less consistent with a second-best characterization and more consistent with a first-best characterization. Thus, the immediate question is whether our non-monotonic uncertainty-contingent relationship between FDI inflows and the domestic interest rate, as implied by the data, is more consistent with a first-best characterization or a second-best characterization. To shed light on this important policy question, we plot the joint kernel density of FDI inflows estimated coefficients and corruption to better elucidate the uncertainty-contingent relationship between FDI inflows and the domestic interest rate.[15] A few observations are noteworthy. *One*, there is no global optimum in the joint density; this clearly rules out a quadratic specification for $\gamma_2(Z_{it})$. This means that our data are inconsistent with a view that for all developed and developing countries there exists a level of corruption below and above which corruption has a monotonic effect on the interaction between FDI inflows and domestic lending rate. *Two*, it would be difficult to accurately parameterize $\gamma_2(Z_{it})$ prior to estimation. That is, commonly used parametric functions that allow for interactions among regressors would not accurately approximate our semiparametric results. These observations lend less support to a first-best characterization but more support to a second-best characterization.[16]

In the main, the second-best characterization suggests that lowering the prevailing level of corruption seems to come at the expense of added distortions that differ across countries in association between the domestic lending rate and FDI inflows. Added distortions from changes in the level of corruption can differ across countries if, for example, the strategy to reduce corruption differs across countries. Beck, Demirguc-Kunt & Levine (2006) find that the type of oversight agency commissioned to supervise banks determines the extent to which corruption of bank officials is an obstacle to firms raising finance. Thus, as a result of lower corruption, in some countries foreign firms may acquire more external finance from the domestic banking system, whereas in other countries foreign firms may acquire less external finance. Although our

[15] This graph can be retrieved from the appendix.

[16] A careful analysis of the relationship between FDI inflows coefficient estimates and partial effects reveals no dependence between the type and magnitude of the FDI inflows coefficient estimates and those of their partial effects.

evidence strongly supports our hypothesis that corruption matters in the relationship between the domestic lending rate and FDI inflows, our evidence strongly undermines the first-best policy of reducing corruption to achieve identical effects on the association between FDI inflows and the domestic lending rate in all countries. Given that lowering corruption can induce added distortions, countries should give careful consideration to how they curb corruption.

4.2.2 FDI Outflows

Table 4 shows that FDI outflows have a statistically insignificant association with the domestic lending rate at all reported percentiles and at the mean, after we control for corruption. It is important to note that these statistically insignificant first moments should not be taken to imply that all unreported estimates are also insignificant. In fact, when looking deeper into the distribution of estimates in Figure 1, we clearly see that FDI outflows exhibit a significantly positive and negative association with the domestic lending rate in some countries but no association in other countries, when adjusted for corruption and FDI effects acting through domestic investment, gross national savings, growth rate of real GDP per capita, inflation rate, exchange rate, and money supply growth rate. These results provide empirical validation for our view that FDI outflows is germane to domestic interest rate determination across many countries. Further, a substantial departure of the FDI outflows estimated effects generated by the presence of corruption from their all-negative counterparts generated by the absence of corruption in the fully-specified discrete model. Yet, we find that there is a higher incidence of FDI outflows having significantly negative than positive effects on the domestic lending rate. This shift in pattern suggests that corruption affects the capacity of firms to raise external finance within the domestic economy. Some firms opt to undertake more investments in other environments that are more conducive to their financial needs; consequently, this leads to a transfer of funds from the domestic economy to pursue overseas investments, putting upward pressure, or in some cases dampening downward pressure, on the domestic lending rate.

In a few countries, a 10 percent increase in FDI outflows is associated with more than a 5 percent but less than a 10 percent change in the domestic lending rate. For example, a 10 percent increase in FDI outflows is associated with approximately 5.4 percent decrease and 8.4 percent increase in the domestic lending rate in Jordan in the 1992 and 1995 period,

respectively; this downward pressure on the domestic lending rate is an increase by a factor in excess of 8 in comparison to its counterpart in the model without corruption. Thus, corruption does alter investors' financing decisions. Nevertheless, the statistically significant effects of FDI outflows, including the more extreme ones, are economically significant after we control for corruption. In addition, the lower half of Table 4 shows that the partial effect of a reduction in the level of corruption on the FDI outflows coefficient is negative and significant at the 25th and 50th percentiles, and is positive and significant at the 75th percentiles. In terms of economic significance, these estimates suggest that a one unit decrease in the level of corruption is associated with approximately a 1.04 percent decrease but 0.002 percent increase at the 25th and 75th percentile, respectively, in the magnitude of the relationship between FDI outflows and the domestic interest rate. These percentile magnitudes are quite modest, however, in comparison to the wide range of these partial effects recovered from the model.[17] Nevertheless, a non-monotonic uncertainty-contingent relationship between FDI outflows and the domestic interest rate is borne out by our model. Although corruption affects the capacity of firms to raise external finance, a reduction in the level of corruption can make it easier or more difficult for firms to borrow domestically.

Similar to our analysis of FDI inflows, we investigate whether our finding of a non-monotonic uncertainty-contingent relationship between FDI outflows and the domestic interest rate is more consistent with a first-best characterization or a second-best characterization. In looking at the joint kernel density of FDI outflows estimated coefficients and corruption, we find strong support to a second-best characterization over a first-best characterization.[18]

4.2.3 Explanatory Variables

In general, the absence of statistical parity within the set of reported percentiles for each explanatory variable reflects parameter heterogeneity across countries in the domestic interest rate equation after we control for uncertainty. This result is in clear contrast to its counterpart in Table 3.[19] Our empirical results show that the inflation coefficient has a heterogeneously

[17] A careful analysis of the relationship between FDI outflows coefficient estimate and partial effects shows no general association between the type and size of the FDI outflows coefficient estimates and those of their partial effects.

[18] This joint kernel density can be retrieved from the appendix.

[19] The kernel densities coupled with the density equality test of Li, Maasoumi & Racine (2009), as well as significance plots, for these coefficients all reveal that the densities of estimated coefficients for these explanatory variables are statistically different from their counterparts in Table 3.

positive and significant association with the domestic lending rate in many countries. Thus, an increase in inflation is associated with an increase in the domestic lending rate in many countries; this positive association in consistent with theory. Although percentiles for the exchange rate coefficients are all positive, statistical significance is attained only at the 75th percentile. Thus, in some countries, depreciation of the domestic currency puts an upward pressure on the domestic lending rate.

The coefficients for savings, domestic investment, money supply growth and economic growth all have negative estimates at their 25th and 50th percentiles but positive estimates at their 75th percentile. The estimated coefficients for lagged interest remain positive and are statistically different from unity, at the 1 percent level of significance at all percentiles. This result implies that our dynamic semiparametric model with corruption possesses stable inertia. In addition, the significance of the coefficients for lagged interest suggests that there is some relationship between the past and current domestic lending rate net of effects acting through FDI flows, domestic investment, gross national savings, economic growth rate, inflation rate, exchange rate, and money supply growth rate. That is, the lagged lending rate is a significant predictor of the current lending rate: a result that is emblematic of the empirical regularity of interest-rate inertia (see, e.g., Coibion & Gorodnichenko 2012).

Many of the estimated partial effects of corruption on the estimated coefficients are statistically significant and exhibit heterogeneity both in type and magnitude. A reduction in the level of corruption can weaken or strengthen the magnitude of the association between the domestic interest rate and these variables. Thus, we have strong evidence that uncertainty matters in the relationship between the explanatory variables and the domestic interest rate. Specifically, our results lend strong support to the existence of non-monotonic uncertainty-contingent relationships between the domestic interest rate and the savings, domestic investment, money supply growth and economic growth variables across countries. Note that the estimated coefficients and the corresponding partial for the intercept in this model strongly suggest that although uncertainty has a direct effect on the domestic lending rate, this direct effect is also non-monotonically uncertainty-contingent. The result that lower institutional uncertainty reduces the domestic lending rate is consistent with the implication of Qian & Strahan (2007) that countries with better institutions have lower lending rates.

4.2.4 Model Assessment

In summary, many coefficient estimates and their corresponding partials in Table 4 are tightly estimated, which provide added evidence in favor of our hypothesis that corruption is an important source of heterogeneity in the relationship between FDI flows and the domestic interest rate. More important, the cross-validated bandwidth on our corruption index is less than twice the standard deviation of the corruption index in the sample, confirming our conclusion that corruption has a non-monotonic interaction with the other conditioning variables. In addition, we obtain a p-value of 0.000 for a model specification test of parameter constancy for corruption model. This test provides more evidence that our semiparametric model with uncertainty is a better fit to the data than a parametric model with homogeneous parameters. In terms of model performance, our in-sample R^2 for the uncertainty specification is slightly lower than its counterparts in the previous discrete specification, which suggests that less over-fitting is exhibited by the corruption model. As an additional check, we compare the distributions of FDI inflows and outflows coefficient estimates to several parametric alternative specification of coefficient heterogeneity; specifically, linear, linear interactions, and quadratic interactions.We report these distributions in Figure 2, and find that there are significant differences in terms of the distributions of estimated coefficients. Formal testing of density equality via the Li et al. (2009) test lead us to reject the null hypothesis of equality with a p-value of 0.000. Therefore, all our model assessment criteria signal that domestic lending rate determination is non-monotonically uncertainty-contingent.

5 Investigating Sources of Model Misspecification

So far, we have suggested an unequivocal interpretation of our empirical findings. However, it is well known that neglected parameter heterogeneity (from unobserved factors) – and more generally the omission of third factors that are correlated with both FDI and the domestic interest rate – can introduce correlation between explanatory variables and the error term. Other possible sources of bias in the domestic lending rate equation are reverse causality, and measurement errors in FDI flows as a consequence of differences in data collection mechanisms across countries. We address these concerns by re-estimating the model using initial-valued

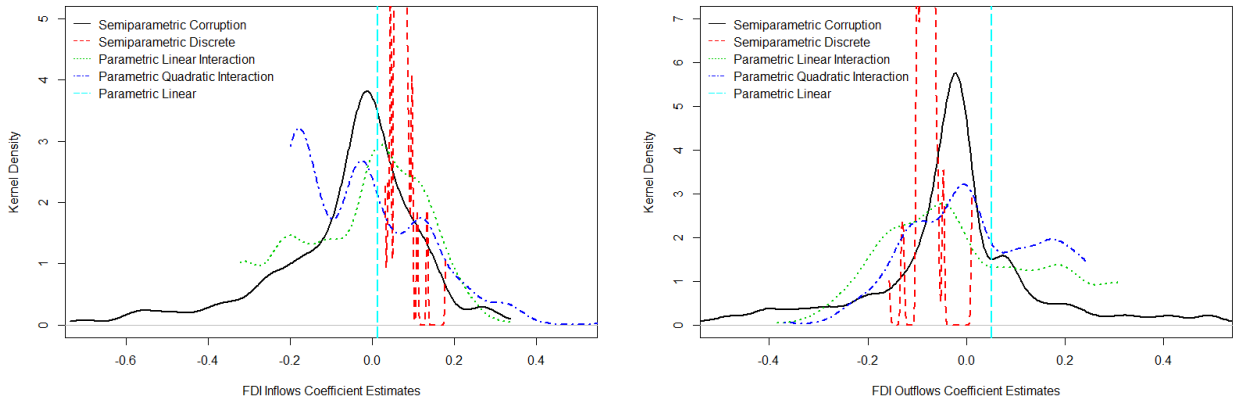

Figure 2: Kernel density plots of FDI inflows (top) and outflows (bottom) coefficient estimates. The parametric densities come from a parametric two-way fixed effect panel data model that includes corruption as an additional linear control variable that is separate from FDI inflows and outflows, and interacted with FDI inflows and outflows via linear and quadratic functional form.

regressors, and through external instrumental variables, and systematically augment the model with plausible third factors that might otherwise influence the FDI-interest rate relationship.[20] For brevity, we report much of these specification diagnostics in the Supplemental Appendix.

Semiparametric Instrumental Variables Regressions Domestic conditions that affect the domestic lending rate may influence a multinational corporation's decision on the allocation of its capital and other resources and the quantity of external finance sought across countries. In addition, the domestic interest rate has been argued or empirically established to be a determinant of FDI inflows.[21] To this end, FDI may be endogenous in the domestic lending rate equation. Macroeconomic conditions within a country's major trading partners can be valid candidates of exogenous variation for FDI inflows and outflows in the domestic lending rate equation; this is because such external macroeconomic conditions are unlikely to be driven by the domestic lending rate in any particular domestic country, yet are correlated with both FDI inflows and outflows for the country. We use economic conditions in the major trading partners (MTPs) as externally measured instrumental variables for causally identifying the effects of FDI inflows and outflows on the domestic lending rate.[22] Specifically, we use three

[20]For the intial-valued regressions our primary results remain largely unchanged, indicating that our main results are not driven by substantial biases.

[21]See, for example, Frankel et al. (1988), and Arbatli (2011).

[22]External economic conditions as exogenous sources of variation in regressors of interest have been used in other related contexts. For example, Frankel & Roubini (2003) demonstrate that macroeconomic conditions in economies that have been highly developed in the post-war period are forces behind capital flows in developing

external instrumental variables – the economic growth rate, savings rate, and exchange rate – each defined as averages over the top five MTPs of each country in the first year of each panel period.[23]

We use the Cai & Li (2008) one-step nonparametric GMM approach to fit our semiparametric model with instrumental variables to the data. We continue to find a statistically significant, non-monotonically uncertainty-contingent relationship between FDI inflows and outflows and the domestic lending rate. In addition, our instrumental variables results seem to preserve both the higher incidence of FDI inflows and outflows exerting downward pressures on domestic interest rate, and the second-best traits of uncertainty in the nexus between FDI flows and the domestic lending rate.

Unlike the existing parametric instrumental variable methods, an accompanying specification test of instrument validity for the Cai & Li (2008) estimator has not yet been developed. To acquire some knowledge about the validity of our instruments, we exploit the conditional moment restriction on the residuals by estimating a two-way fixed effects parametric regression of our GMM residuals on all regressors, including corruption. We interpret statistical insignificance of each regressor in such a residual regression as evidence that it is uncorrelated with our GMM residual – that is, evidence for validity of our external instruments. For comparison, we also estimate a two-way fixed effects parametric residual-regression for each model specification in Tables 2, 3, and 4. Given the parametric nature of all the residual regressions, we use the R^2, adjusted R^2, and the F-test for the null hypothesis of no regression as model fit and comparison standards.

Table 5 contains the residual-regression results. Columns 1, 2 and 3 report the results associated with residuals from Tables 2, 3, and 4, respectively, whereas columns 4 and 5 use the residuals from NPGMM model as dependent variable. In columns 1 and 2, we find that all or a sizable number of the coefficients are statistically significant at the 5 percent level; these result suggest that our two discrete models suffers from endogeneity. In column 3, however, we see fewer traces of endogeneity in two aspects: (1) only one of the ten regressors is statistically

countries; Desai, Foley & Hines (2009) use the growth rate of foreign economies as exogenous source of variation for changes in foreign investment by American multinational firms.

[23]We use the Barbieri & Keshk (2012) trade data from the Correlates of War database to identify each countries top five MTP. MTP was based on country with the largest volume of exports to the host nation at beginning of each time period as per the *dyadic_trade_3.xls* file. Unlike averaging, this method was less sensitive to the distortions across time periods.

Table 5: Fixed effect regressions of residuals from semiparametric models on covariates

	Dependent Variable: Semiparametric Residuals				
	Non-IV Residuals			MTP IV Residuals	
	Discrete	Discrete	Uncertainty	Uncertainty	Uncertainty
	(1)	(2)	(3)	(4)	(5)
Lagged Interest	0.005**	−0.015**	−0.004	−0.002	−0.002
	0.002	0.007	0.002	0.005	0.005
FDI Inflows	−0.094**	−0.068	−0.043*	−0.005	−0.008
	0.048	0.071	0.023	0.048	0.048
FDI Outflows	0.129**	0.088	0.017	0.045	0.041
	0.054	0.075	0.024	0.047	0.048
Uncertainty			0.001	0.002	0.002
			0.001	0.002	0.002
Savings		0.048	−0.008	−0.043	−0.046*
		0.040	0.013	0.027	0.027
Investment		0.096*	0.048***	0.047	0.052
		0.055	0.018	0.039	0.039
Money		0.025**	0.004	0.003	0.002
		0.011	0.004	0.007	0.007
Growth		−0.050	−0.016	−0.010	0.004
		0.071	0.023	0.051	0.053
Inflation		0.025**	0.004	0.002	0.003
		0.010	0.003	0.007	0.007
Exchange		0.0004	−0.0001	−0.0001	−0.0001
		0.0004	0.0001	0.0003	0.0003
MTP Growth					−0.126
					0.116
MTP Savings					−0.007
					0.049
MTP Exchange Rate					0.0003
					0.0004
Observations	589	514	514	451	451
R^2	0.027	0.050	0.031	0.019	0.024
Adjusted R^2	0.022	0.039	0.024	0.015	0.018
F-Statistic	4.400***	2.340**	1.267	0.691	0.655

Note: Standard errors are reported below each estimate. The level of statistical significance of estimates is denoted by *p<0.1; **p<0.05; ***p<0.01. F-statistic has a null hypothesis of no regression. Uncertainty measure is the ICRG corruption index. Column 1 uses the residuals from the parsimonious discrete specification in Table 2. Column 2 uses the residuals from the full discrete specification in Table 3. Column 3 uses the residuals from the uncertainty specification in Table 4. Columns 4 and 5 use the residuals from the (Cai & Li 2008) NPGMM uncertainty specification. See notes in Table 3 and variables' description in Table 1 for more details.

significant at the 5 percent level, and (2) unlike the discrete specifications in columns 1 and 2, the null hypothesis of no regression is not rejected at any conventional level of significance. Thus, the inherent flexibility of our semiparametric modeling framework – coupled with the inclusion of uncertainty and country and time fixed effects – seems to neutralize many, but not all, sources of bias in the domestic lending rate equation. In columns 4 and 5, however, all but one estimated coefficients are statistically insignificant and the null hypothesis of no regression

is not rejected at any conventional level of significance. This is strong corroborative evidence that our external instruments are likely to be valid and consequently correct for endogeneity of FDI flows. Therefore, the qualitative implications of our results from the Cai & Li (2008) nonparametric GMM approach do not appear to be plagued by sizable biases.

Other Measures of Time-Varying Uncertainty Foreign investors may also take into account country risk and other aspects of institutional uncertainty that are not captured by corruption in their relative preference for internal and external finance. In addition, the domestic interest rate may be sensitive to other sources of uncertainty. Hence, our main result on the role of corruption in the association between domestic interest rate and FDI flows may be dominated by important yet omitted sources of risks, as well as our default measure on institutional uncertainty.We individually add exchange rate volatility, and use the corruption index from Transparency International (TI) and Worldwide Governance Indicators (WGI) in lieu of the ICRG index of corruption.[24] These data perturbations do not materially alter our main findings.[25]

A Public Debt Interpretation? A legitimate reservation is that higher levels of public debt are associated with increased absorption of domestic credit, which may affect foreign firms' internal- and external-financing commitments with respect to the domestic economy. Thus, our finding of a non-monotonically uncertainty-contingent relationship between the domestic lending rate and FDI flows may be attributed to the level of public debt in the economy. Indeed, the literature identifies public debt as a main force driving the domestic interest rate (see, e.g., Engen & Hubbard 2005, Gale & Orszag 2004, Kinoshita 2006, Paesani et al. 2006, Chinn & Frankel 2007). We therefore control for the domestic country's level of public debt using

[24]We construct exchange rate volatility following Clark et al. (2004) as the standard deviation of the first difference of the logarithm of the bilateral real exchange rate in the five preceding years; this variable is from the IMF's International Financial Statistics. The additional TI and WGI regressions have smaller sample sizes relative to our main model due to their initial coverage years.

[25]We also consider different measures of institutional uncertainty from the ICRG index; specifically, we replace corruption in our main model (one at a time) with Investment Profile, Law and Order, Democratic Accountability, and Bureaucracy Quality. Though there are some differences in these heterogeneous estimates, the overall qualitative features of these distributions are remarkably similar across measures of institutions. More specifically, for each of these models, each point estimate at the 25th percentile is negative, while each point estimate at the 75th percentile is positive. The sign of the median and mean estimate varies across uncertainty measure, but it is important to keep in mind that these measures are different and these descriptive statistics are summaries across the entire distribution of marginal effects. Our general conclusion of non-monotonic effects of institutional uncertainty carry over into other measures of institutional quality.

"public debt as a share of GDP". Consistent with the literature, we find that public debt exerts an independent influence on the domestic lending rate. Nevertheless, the addition of public debt to our main model does not absorb the effects of FDI flows, and does not wipe out the dominant pattern of more downward pressures on the domestic interest rate from FDI inflows and outflows. Also, controlling for public debt does not change our conclusion that non-monotonically uncertainty-contingent relationships exist between the domestic lending rate and FDI flows across countries; furthermore, the nature of this result continues to mimic second-best, rather than first-best, traits.

An Economic-Financial Development Interpretation? Lack of information lessens the transparency of borrowing firms as the sharing of credit history is prevented. Without proper institutions such as credit bureaus to facilitate the sharing of information on credit history, banks are obliged to limit their supply of credit (De Haas et al. 2010, Barth et al. 2009). As Beck, Demirguc-Kunt & Levine (2006) further explain, when strategies are put in place that force the disclosure of accurate information and impedes the possibility of asymmetric information, efficiency in corporate finance is encouraged. In its entirety though, a high interest rate is seen as a reflection of the underdeveloped infrastructural facilities in the financial sector, coupled with an inefficient institutional regime (World Bank 2002).

In essence, our empirical association between FDI flows and the domestic lending rate may be a sheer manifestation of the information asymmetry between borrowers and lenders. Formal mechanisms to reduce information asymmetry between borrowers and lenders are more likely to exist in countries that are more financially and economically developed. We therefore control for the domestic country's banking sector development using "credits by banks to the private sector as a share of GDP," and the domestic country's level of economic development using the log of GDP per capita.[26] Our result that the relationship between FDI flows and the domestic lending rate is non-monotonically uncertainty-contingent does not disappear after we control concurrently for the levels of financial and economic development, despite the statistical significance of these latter variables in the augmented model. Downward pressures on the domestic lending rate from FDI inflows and outflows are also prevalent in this augmented

[26]These are widely used proxies for financial and economic development in the empirical literature; moreover, in pooled data of developed and developing countries, such as our data, a strong correlation between corruption and each of these proxies is an empirical regularity.

specification. More important, the presence of uncertainty-induced second-best traits in the association between the domestic lending rate and FDI flows remains a fixture in these results.

A Doubly Interest Rate Interpretation? If bank loans' interest rates respond to changes in the money market interest rates, then this might have implications for foreign firms that partake in trading in the domestic money market. Indeed, different domestic interest rates signal different investment and external financing options for foreign firms. Many different interest rates from different financial institutions compete for the same pool of resources. In addition, central banks' policy rates may be strongly correlated with the domestic lending rate and the size of foreign firms' financial commitment to the domestic economy. Thus, it is plausible that our non-monotonically uncertainty-contingent empirical relationship between FDI flows and the domestic lending rate is merely capturing (1) different investment opportunities in the domestic financial sector or (2) the association between the government's policy rate and the size of foreign firms' financial commitment.

To test the empirical validity of these arguments, we consider six other interest rates: the deposit rate, discount rate, government security rate, government security T-bill rate, money market rate and saving rate.[27] We individually add each of these interest rates to the control set that includes the preceding measures of economic and financial development. For all six resultant model specifications, the effective sample size is significantly reduced and there is a statistically significant heterogeneous effect of the added interest rate. Nevertheless, our result that there is a higher incidence of FDI inflows and outflows exerting downward pressures on the domestic interest rate remains unperturbed by the inclusion of these other interest rates. In addition, our finding that the relationship between FDI flows and the domestic lending rate is non-monotonically uncertainty-contingent continues to be borne out. All these model specifications for lending rate determination are more consistent with a second-best, rather than a first-best, characterization of our peculiar uncertainty result.

Discussion We argue that institutional uncertainty, proxied by corruption, in host countries affects how much external finance foreign investors seek from the domestic economy. Our empirical results suggest a dominant pattern across countries that foreign investors are more

[27]This seemingly ad-hoc choice set is driven by data paucity. However, the interest rates that we do not control for are highly correlated with those in this set.

likely to seek less external finance domestically and thereby inject capital into domestic credit markets resulting in downward pressure on domestic lending rates. This non-monotonically uncertainty-contingent pattern is net of the effects of FDI inflows on the domestic lending rate acting through domestic investment and appears to have second-best, not first-best, traits.

A downward pressure on the domestic lending rate due to the presence of foreign investors can be a benefit to the host country if domestic investors can borrow at the lower rate. Yet, delving further into our results suggest that in some countries domestic investment exerts a negative and statistically significant pressure on the domestic lending rate once we control for host country corruption. That is, domestic firms do not always enjoy the reduction in the lending rate that is engendered by the presence of foreign firms and are therefore limited in their response to investment opportunities and challenges within their economy that necessitate added external finance. Collectively, therefore, these findings suggest a lack of local borrowing by both domestic and foreign investors as a result of corruption which leads to credit markets with added – rather than limited – funds to lend to investors. This paper points to another mechanism by which corruption impedes the efficient allocation of capital.

The empirical pattern of credit hoarding by the domestic banking system in some corrupt countries is certainly unsustainable given that banks must lend to be profitable. Consequently, banks may be forced to issue other types of loans, such as consumer loans, to remain profitable net of dividends to their lenders. To the extent that consumption profiles in these countries are dominated by imported goods, such consumer loans may not enhance economic growth. Some financially-constrained domestic investors may exit their industries which can lead to a lack of competition in goods and product markets.[28] The inability of domestic investors to access well-needed finance can also foster the growth of informal credit markets in these corrupt host countries. To sum up, growth stagnation may eventually result in such countries.

Governments in corrupt countries should therefore try to encourage coping mechanisms that ensure that domestic benefits will accrue from a lower lending rate brought on by the injection of foreign capital in the domestic banking system. Barth et al. (2009) find that banking competition and information sharing lower lending corruption, and that information sharing also helps increase the favorable effect of competition in curbing corruption in bank lending;

[28]In China, Héricourt & Poncet (2009) show that joint ventures between foreign and private domestic firms is a source of finance for the latter in the presence of legal and financial domestic obstacles.

specifically, the cross-country empirics show that private credit bureaus with long histories and those that report both negative and positive credit information are useful tools in reducing the incidence of corruption in lending. Qian & Strahan (2007) find that in countries where creditor rights are developed, maintained, and complemented by asset tangibility, bank loans are provided at lower interest rates, as banks feel secure and assured of receiving repayment even in unfavorable circumstances such as debtor bankruptcy. Beck, Demirguc-Kunt & Levine (2006) find that private, relative to official supervisory, agencies are effective in arresting corruption in lending. The non-monotonic nature of our results, however, suggests an important caveat: these policies may not yield identical outcomes in all countries.

6 Conclusion

It has been echoed that foreign investors can effect changes in the domestic interest rate by changing the amount of available credit in an economy through either borrowing from or injecting credit into the domestic banking system. It has also been argued that a country's level of institutional uncertainty – corruption – influences firms' ability to raise external finance within the domestic banking system. Consequently, a country's level of institutional uncertainty may matter in the association between the domestic lending rate and foreign direct investment (FDI) inflows and outflows. Yet, to the best of our knowledge, there is no empirical evidence on the direct relationship between the domestic lending rate and FDI inflows and outflows across countries, and the effects of institutional uncertainty on these relationships.

Using corruption as a measure of institutional uncertainty within a semiparametric framework reveals that a country's level of institutional uncertainty matters in the association between the domestic lending rate and FDI inflows and outflows by influencing firms' ability to raise external finance within the domestic banking system. Specifically, after controlling for corruption, we find that across developed and developing countries there is a higher incidence of FDI inflows and outflows exerting downward pressure on the domestic interest rate. We find that FDI inflows and outflows have non-monotonically uncertainty-contingent effects on the domestic lending rate: lower uncertainty may increase, decrease or have no effect on the strength of the relationship between the domestic interest rate and FDI flows. Hence, foreign investors do not always obtain added external finance within the domestic economy as a result of lower

corruption. A plausible rationale is that in some countries measures that are introduced to reduce corruption may impose additional pecuniary or non-pecuniary costs on foreign investors, discouraging them from obtaining external finance from the domestic banking system.

Our non-monotonically uncertainty-contingent finding appears more consistent with a second-best, rather than a first-best, characterization of the role of institutional uncertainty. An implication of our empirical analysis, therefore, is that uniform institutional-reform policies across countries are at odds with the data. Instead, policy prescriptions to reduce a country's institutional uncertainty should be guided by the dominant binding distortions that are induced by such uncertainty. We find that our uncertainty-contingent result remains invariant to various data perturbations that account for alternative interpretations of our finding. Moreover, different model assessment tools strongly favor the fit of our semiparametric regression model of lending rate determination to the data.

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