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Do foreign banks increase competition? Evidence from emerging Asian and Latin American banking markets

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ABSTRACT

In this paper we examine the impact of foreign bank penetration on the competitive structure of domestic banking sectors in host emerging economies. We focus our analysis on Asia and Latin America during the period 1997–2008. Using bank-level panel data to identify foreign banks and to estimate measures of banking competition, we are able to provide robust empirical evidence that an increase in foreign bank penetration enhances competition in these host countries' banking sectors. We find that this positive foreign bank penetration and banking competition link is associated with a spillover effect from foreign banks to their domestic counterparts. This spillover effect becomes stronger when more efficient and less risky foreign banks enter into less concentrated host country markets. We also find that the spillover effect is greater when foreign banks enter in the form of 'de novo penetration' than through mergers or acquisitions of domestic banks ('M&A penetration').

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1. Introduction

The presence of foreign banks in emerging economies has significantly increased since the early 1990s. The average share of total assets held by foreign banks in Latin America and Asia increased from 26% in 1997 to reach a peak of 38% only 5 years later in 2002.¹ This increasing trend in foreign bank penetration was even more prevalent in some countries such as Mexico, Peru and Uruguay in Latin America; and Korea and Indonesia in Asia (see Table 1).

The post-crisis financial reform efforts which placed an important emphasis on removing entry barriers to foreign bank penetration led to this widespread and increased internationalization of domestic banking markets in these countries. These reform efforts also allowed foreign banks additional freedom and to engage in a broader scope of activities, particularly as business strategies of foreign banks shifted towards universal banking (Moguillansky et al., 2004). As a result, foreign banks have been playing an

increasingly crucial role in restructuring and internationalizing banking markets in these economies.²

Assessing the impact of foreign bank penetration on the domestic banking sector in emerging economies is an important issue for academics and policy makers alike.³ The proponents in favor of foreign bank entry argue that it enhances competition in domestic banking markets, improves the efficiency of domestic bank operations, provides financial services at lower costs, and promotes economic growth by boosting the efficiency of resource allocation (Claessens et al., 2001; Crystal et al., 2002; Claessens and Laeven, 2004; Demircug-Kunt et al., 2004; Northcott, 2004; Levy-Yeyati and Micco, 2007; Yildirim and Philippatos, 2007; Claessens, 2009; Olivero et al., 2009; Wu et al., 2010). On the other hand, opponents are concerned with the fact that foreign banks may cherry-pick high quality (low default risk) borrowers, forcing domestic banks to specialize in serving customers with higher risk, and thus become

² This is especially true after the several rounds of banking reform efforts that followed the 1997 Asian financial crisis, the Mexican tequila crisis in 1994–5, the financial crisis in several Latin American countries in the early 2000s triggered by the default crisis in Argentina, and the recent 2007–2009 global economic crisis. For a survey on foreign bank entry into developing and emerging market economies, see Clarke et al. (2003). For the global expansion of multinational banks taking advantage of reduced information costs, see Tsai et al. (forthcoming).

³ For studies on the impact of foreign bank penetration during the post-crisis period in Latin America, see Dages et al. (2000), Crystal et al. (2002), Galindo et al. (2004), Martinez Peria and Mody (2004) and Yildirim and Philippatos (2007). For the case of Asia, see Laeven (2005), Yokoi-Arai and Kawana (2007) and Rajan and Gopalan (2009).

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¹ The trend of an increasing foreign bank penetration into Asian and Latin American banking markets has reversed somewhat since 2002.

Table 1
Foreign bank penetration rates in emerging Latin American and Asian countries, 1997–2008.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
<i>Argentina</i>												
Penetration (in terms of total assets)	.342	.509	.539	.574	.590	.469	.387	.328	.296	.295	.324	.339
Penetration (the number of banks)	.276	.382	.435	.474	.481	.451	.439	.409	.400	.381	.367	.373
<i>Bolivia</i>												
Penetration (in terms of total assets)	.161	.468	.434	.390	.346	.310	.302	.295	.213	.187	.188	.164
Penetration (the number of banks)	.333	.429	.417	.417	.417	.417	.417	.417	.400	.400	.400	.400
<i>Brazil</i>												
Penetration (in terms of total assets)	.176	.224	.264	.314	.365	.342	.294	.296	.300	.309	.308	
Penetration (the number of banks)	.341	.428	.445	.468	.451	.449	.434	.407	.411	.409	.404	
<i>Chile</i>												
Penetration (in terms of total assets)	.221	.235	.285	.296	.286	.414	.367	.354	.333	.338	.392	.376
Penetration (the number of banks)	.552	.538	.556	.556	.538	.520	.480	.423	.440	.440	.520	.500
<i>Colombia</i>												
Penetration (in terms of total assets)	.203	.271	.258	.244	.237	.197	.191	.181	.199	.237	.224	.215
Penetration (the number of banks)	.303	.367	.370	.393	.357	.345	.345	.321	.300	.375	.375	.333
<i>Mexico</i>												
Penetration (in terms of total assets)	.161	.175	.175	.198	.688	.746	.753	.819	.825	.808	.785	
Penetration (the number of banks)	.500	.526	.486	.500	.529	.556	.529	.516	.500	.500	.440	
<i>Paraguay</i>												
Penetration (in terms of total assets)	.601	.647	.701	.691	.690	.770	.795	.722	.676	.656	.618	.619
Penetration (the number of banks)	.556	.583	.636	.636	.650	.667	.643	.643	.615	.615	.583	.583
<i>Peru</i>												
Penetration (in terms of total assets)	.378	.417	.615	.604	.676	.631	.602	.615	.584	.602	.596	.620
Penetration (the number of banks)	.435	.478	.588	.556	.667	.667	.643	.667	.615	.667	.667	.750
<i>Uruguay</i>												
Penetration (in terms of total assets)	.317	.329	.395	.516	.598	.755	.515	.515	.467	.483		
Penetration (the number of banks)	.667	.632	.696	.789	.829	.850	.875	.889	.885	.880		
<i>Venezuela</i>												
Penetration (in terms of total assets)	.428	.433	.402	.478	.445	.392	.397	.319	.306	.295	.294	
Penetration (the number of banks)	.250	.308	.277	.326	.318	.270	.235	.200	.176	.176	.188	
<i>Hong Kong</i>												
Penetration (in terms of total assets)	.887	.885	.885	.890	.911	.918	.920	.923	.918	.918	.926	
Penetration (the number of banks)	.750	.732	.714	.773	.805	.810	.795	.771	.750	.767	.741	
<i>Indonesia</i>												
Penetration (in terms of total assets)	.065	.121	.062	.063	.057	.054	.168	.234	.263	.263	.270	
Penetration (the number of banks)	.329	.354	.373	.356	.358	.346	.400	.444	.444	.442	.571	
<i>Korea</i>												
Penetration (in terms of total assets)	.008	.006	.056	.045	.044	.045	.130	.164	.164	.173	.161	.178
Penetration (the number of banks)	.034	.050	.105	.111	.118	.118	.176	.235	.235	.188	.200	.200
<i>Malaysia</i>												
Penetration (in terms of total assets)	.235	.212	.225	.256	.229	.219	.231	.234	.213	.215	.227	.227
Penetration (the number of banks)	.333	.342	.371	.481	.444	.448	.448	.500	.517	.536	.536	.522
<i>Philippines</i>												
Penetration (in terms of total assets)	.157	.144	.142	.046	.035	.045	.043	.032	.016	.015	.013	
Penetration (the number of banks)	.222	.243	.303	.276	.241	.235	.206	.207	.179	.185	.167	
<i>Singapore</i>												
Penetration (in terms of total assets)	.065	.050	.037	.108	.177	.070	.059	.037	.043	.036	.044	
Penetration (the number of banks)	.429	.500	.438	.526	.588	.625	.615	.500	.545	.500	.500	
<i>Thailand</i>												
Penetration (in terms of total assets)	.020	.054	.073	.061	.062	.060	.058	.039	.047	.045	.052	.058
Penetration (the number of banks)	.053	.167	.278	.222	.222	.211	.211	.167	.118	.118	.118	.133
<i>Latin America</i>												
Penetration (in terms of total assets)	.299	.372	.408	.430	.495	.503	.461	.446	.421	.423	.414	.390
Penetration (the number of banks)	.421	.468	.494	.513	.525	.520	.504	.490	.475	.486	.438	.488
<i>Asia</i>												
Penetration (in terms of total assets)	.208	.210	.212	.211	.217	.202	.230	.235	.237	.240	.241	.156
Penetration (the number of banks)	.305	.340	.368	.392	.395	.401	.408	.404	.400	.392	.405	.283
<i>Total</i>												
Penetration (in terms of total assets)	.261	.305	.327	.340	.380	.379	.365	.359	.345	.347	.338	.312
Penetration (the number of banks)	.373	.415	.442	.463	.471	.471	.464	.454	.444	.447	.424	.420

Notes: The foreign bank penetration rates are measured in terms of assets and number of banks, e.g., the asset-based foreign bank penetration rate is estimated as the assets of foreign banks divided by the total banking sector assets in each country and year. The same measures are applied to the number of bank-based foreign bank penetration.

Table 2
Variable definitions and data summary statistics.

Variable	Definition	Data source	Mean	Std dev	Median	Min	Max
PRH (all banks)	Time-curved PRH-statistics derived from the data of all banks in the host country	Authors' own calculation based on <i>BankScope</i> data	.691	.215	.676	.122	1.115
PRH (domestic banks)	Time-curved PRH-statistics derived from the data of domestic banks only	Authors' own calculation based on <i>BankScope</i> data	.789	.398	.683	.059	1.954
Penetration (assets)	Ratio of assets owned by foreign commercial banks to the total commercial bank assets in the host country	<i>BankScope</i>	.343	.255	.290	.010	.940
Penetration (number)	Ratio of the number of foreign banks to the total number of banks in the host country	<i>BankScope</i>	.446	.193	.440	.030	.950
Concentration	Concentration level measured by the HHI index in the host banking sector	<i>BankScope</i>	.183	.141	.138	.047	.957
Size	Average bank size, measured by the bank assets in millions of US dollars	<i>BankScope</i>	7.356	12.844	2.356	.094	79.589
Liquidity	Average bank liquidity, measured by the ratio of liquid assets to total assets	<i>BankScope</i>	.318	.133	.297	.067	.747
Capitalization	Average bank capitalization, measured by the ratio of equity to total assets	<i>BankScope</i>	.097	.028	.092	.036	.211
Riskiness	Average ratio of banks' loan loss provisions divided by total loans	<i>BankScope</i>	.024	.030	.016	-.006	.252
Profitability	Average return on total assets of banks	<i>BankScope</i>	.010	.017	.012	-.073	.058
Efficiency	Average ratio of banks' non-interest expenses divided by total assets.	<i>BankScope</i>	.058	.036	.057	.010	.199
GDP	GDP in constant 2000 US dollar (in Billions)	<i>WDI</i>	198.236	211.637	113.981	7.071	812.567
GDP growth rate	Growth rate of real GDP	<i>IFS</i> data	.044	.058	.045	-.121	.301
Inflation	Inflation rate based on CPI	<i>IFS</i> data	.067	.077	.047	-.039	.583
Credit to private sector	Ratio of domestic credit to the private sector to GDP	Financial structure dataset by Beck (2009)	.605	.481	.369	.087	2.104
Stock market turnover rate	Stock market turnover ratio	Financial structure dataset by Beck (2009)	.431	.704	.260	0	6.220
Dummy (crisis)	Dummy equals to 1 if the country experiences a systematic banking crisis in a given year, otherwise equals to 0	Caprio and Klingebiel (2003) and Laeven and Valencia (2008)	.208	.406	0	0	1

unprofitable, inefficient, and less competitive.⁴ Opponents also argue that foreign banks tend to charge higher net interest margins than domestic banks and pursue rent-seeking behavior, which renders domestic banking markets less competitive.⁵

In summary, the empirical evidence on this issue remains mixed and the banking literature has reached no consensus on the foreign bank penetration–competition link. In addition, there has been very sparse research on identifying the specific mechanisms and channels through which foreign bank entry affects banking competition in the host country, and on how the penetration–competition link might depend on the particular entry mode chosen by foreign banks.⁶

This paper attempts to fill this gap in the literature by answering the following two questions. First, what is the impact of increased foreign bank penetration on banking competition in the host countries? Second, what are the main channels through which foreign bank entry alters the competitive structure of domestic banking? We focus our analysis on emerging economies in Asia and Latin America during the period 1997–2008. Using bank-level panel data to identify foreign banks and to obtain measures of the

degree of competition in banking, we are able to provide robust empirical evidence that an increase in foreign bank penetration enhances competition in these host countries' banking sectors.

The contribution of this paper is threefold. First, we focus our analysis of the foreign bank penetration–banking competition link on emerging economies in Asia and Latin America, two regions with significantly different degrees of foreign bank penetration. Second, we identify the conditions and channels through which foreign bank entry affects domestic banking competition in host countries. Third, we provide several measures of the extent of foreign bank penetration, based on bank-specific data, for a sample of seventeen emerging economies. Although these measures are important for both academic researchers and policy makers, a time series for these measures based on bank-level data has not been readily available due to the limited data availability in these emerging economies.⁷

Our results indicate that there is a positive link between foreign bank penetration and banking competition in the host emerging economies, and the positive link becomes stronger when more efficient and less risky foreign banks enter the host banking markets, when this entry is in the form of 'de novo penetration' rather than 'M&A penetration', and when these foreign banks penetrate less concentrated host local markets. We also document that this link has proved prevalent in both Latin America and Asia, and that the impact of foreign bank entry on domestic banking market competition is increasing in the length of foreign bank presence in emerging economies.

The remainder of the paper is organized as follows. Section 2 describes the econometric methodology and data used in this

⁴ On a related note, de la Torre et al. (2010) find evidence that foreign banks in some Latin American countries have recently adopted a strategy different from cherry-picking, a very aggressive policy to expand their activity in the small and medium enterprise (SME) sector (de la Torre et al., 2010).

⁵ For example, in Mexico, foreign bank entry did not stimulate competition in the domestic banking market, arguably due to a rent-seeking behavior by foreign banks when entering through the M&A entry mode (Moguillansky et al., 2004, p. 29). In Colombia, foreign banks' market segregation was observed to lead to limited competition in the domestic banking sector (Barajas et al., 2000).

⁶ One of the few exceptions is Lensink and Hermes (2004). They find evidence that the relationship between foreign bank entry and domestic bank behavior depends on the level of the host country's economic development.

⁷ We explain these data limitations in detail in Section 2.2.1.

study. Section 3 reports the empirical results and discusses the main findings of our analysis. Section 4 reports the results of various robustness tests. Section 5 presents conclusions.

2. Methodology and data

2.1. Econometric methodology

We adopt a two-step approach to study the impact of foreign bank penetration on domestic banking competition. In the first step we measure the degree of competition in the host country banking market. In the second step we estimate an equation linking foreign bank penetration to domestic banking market competition.

2.1.1. The Panzar–Rosse measure of banking competition

In the first step we calculate the Panzar–Rosse (1987) H statistics following Bikker and Haaf (2002) and Bikker and Spierdijk (2008) to measure the degree of banking competition in each country. The Panzar–Rosse statistic (hereafter PRH) is defined as the elasticity of revenue with respect to the marginal cost of the inputs used in the production of banking services. We estimate the PRH statistics for all banks as well as for the subsample of domestic banks only.

The competitive structure of the banking industry in Asia and Latin America has been observed to change over time. Some of the main factors contributing to the time-varying nature of competitive conditions in emerging and developing economies include the deregulation of banking services, privatization efforts, the increased availability of more advanced information technology, and the internationalization of domestic financial markets. In order to account for these market dynamics in the banking industry of emerging economies, we adopt a continuous-time curve model à la Bikker and Haaf (2002), and estimate time-varying PRH statistics by using nonlinear least squares to estimate the following bank revenue equation using bank-level panel data:⁸

$$\ln(R_{i,t}) = \alpha_i + [\beta_1 \ln(W_{1,i,t}) + \beta_2 \ln(W_{2,i,t}) + \beta_3 \ln(W_{3,i,t})] \exp(\varepsilon * \text{time}) + \alpha'_{i,t} \gamma + e_{i,t}. \quad (1)$$

In this equation i indexes banks and t indexes time. $R_{i,t}$ is financial income⁹ as a measure of the revenue for bank i in year t ; $W_{j,i,t}$ is the price of factor input j ($j = 1$ for financial expenses, $j = 2$ for administrative and operating expenses, and $j = 3$ for personnel expenses), all measured as the ratio of each type of expenses to total assets. $\alpha_{i,t}$ is a vector of exogenous control variables at the bank level, which includes the ratio of equity to total assets, the ratio of net loans to total assets, the ratio of total operating income to interest income, the ratio of loans to total assets, and dummies for different categories of asset size. These dummies are intended to capture otherwise

unobserved differences among banks that might be correlated with size.¹⁰ α_i is an individual bank effect, and $e_{i,t}$ is a random disturbance term.

The static and conventional PRH statistics are estimated as the sum of the elasticities of revenue with respect to input prices, $(\beta_1 + \beta_2 + \beta_3)$. To incorporate the time-varying property of the PRH statistics in the banking markets of host emerging countries, the revenue specification shown in Eq. (1) introduces a continuous time-curve model factor, given by $\exp(\varepsilon * \text{time})$, in estimating the PRH statistics. Based on this model, we calculate the PRH statistics as the sum of the elasticities of revenue with respect to input prices multiplied by the continuous-time curve model factor, i.e., $(\beta_1 + \beta_2 + \beta_3) * \exp(\varepsilon * \text{time})$. Note that $\varepsilon = 0$ indicates that the PRH statistic is constant over time at $(\beta_1 + \beta_2 + \beta_3)$. Otherwise, the PRH statistic is equal to $(\beta_1 + \beta_2 + \beta_3) * \exp(\varepsilon * \text{time})$, and is time-varying. The underlying assumption of this continuous-time curve model is that the banking market structure and competition change gradually over time.

Under monopoly or the banking market in short-run disequilibrium, $\text{PRH} < 0$; under perfect competition, $\text{PRH} = 1$; and under monopolistic competition, $0 < \text{PRH} < 1$.¹¹ As in Vesala (1995) and Bikker and Haaf (2002), we interpret estimates of the PRH statistic as providing a continuous measure of the level of competition, with larger values indicating stronger competition.

2.1.2. Estimation of the foreign bank penetration–bank competition link equation

In the second step we establish an empirical model which is suitable to study the effects of foreign bank penetration on banking competition in host emerging economies. To this end, we estimate the foreign bank penetration and domestic banking market competition link equation. The determinants of banking market competition in our sample economies from Latin America and Asia are categorized in four groups: (1) market structure in the banking industry; (2) bank-specific factors; (3) financial environment factors; and (4) macroeconomic environment factors, along with country and year-specific factors. The regression equation is specified as follows:

$$\text{PRH}_{i,t} = \beta_0 + \beta_1 \text{penetration}_{i,t} + \beta_2 C_{i,t} + \beta_3 \text{BCF}_{i,t-1} + \beta_4 \text{FEF}_{i,t} + \beta_5 \text{MEF}_{i,t} + \beta_6 D + \varepsilon_{i,t} \quad (2)$$

where i indexes the country and t indexes time. The dependent variable ($\text{PRH}_{i,t}$) is the PRH statistic measure of banking competition for country i in year t obtained by estimating Eq. (1) using bank-level data. Explanatory variables include the measure of the degree of foreign bank penetration ($\text{penetration}_{i,t}$), a concentration measure for the banking industry ($C_{i,t}$); a set of bank-specific characteristics ($\text{BCF}_{i,t}$) which includes measures of bank size, liquidity, capitalization, profitability, efficiency and riskiness.

⁸ This continuous time-curve model has two main advantages over estimating PRH statistics for each year in the sample. First, since the estimation based on this approach utilizes the observations of individual banks in each country during the entire sample period, this method helps to overcome the small sample bias problem. To obtain an accurate estimate of the PRH statistics for each country, we follow the threshold number of observations in the literature (see Bikker et al., 2007), and include only those estimates for which a minimum of 50 bank-term observations are available. The number of observations exceeds this threshold almost all in our case (see Table 15). Second, this model is better suited to capture the gradual changes in the banking market structure and competitiveness in these emerging and developing economies. The referee's suggestion on this issue is greatly appreciated. For an alternative way of estimating long-run equilibrium PRH statistics by applying a dynamic panel estimator to a dynamic model of the revenue equation, see Goddard and Wilson (2009).

⁹ Financial income consists of interest income on loans and other interest income retrieved from income statements of individual banks.

¹⁰ Bikker et al. (2009) caution that including a scale variable such as total assets or income in the control variable set in the revenue or price equations creates a significant upward bias and incorrect measures of the degree of competition. However, dummies for banking types are used in the literature including Bikker et al. (2007) and Bikker and Spierdijk (2008) as one of bank-specific factors as a reflection of differences in asset sizes and revenue structures. We use three different percentile dummies: $\text{dperc25} = 1$ if the bank is in the bottom 25th percentile of the distribution of assets in that country; $\text{dperc50} = 1$ if the bank is between the 25th and the 50th percentile; $\text{dperc75} = 1$ if the bank is between the 50th and the 75th percentile.

¹¹ See Panzar and Rosse (1987) for derivations of these results. Also, Bikker et al. (2009) argue that a negative value of the PRH statistic does not necessarily indicate monopoly by proving that when a revenue equation without a scale variable (i.e. total assets) in the explanatory variables set is used for estimation, even competitive firms can exhibit $\text{PRH} < 0$ if the market is in structural disequilibrium in the short run, i.e., if entry or exit is induced by current market conditions. Accordingly, additional information on long-run structural equilibrium and cost structure is needed in order to be able to discern the reasons for a negative value of the PRH statistic.

Table 3
The continuous-time curve model estimates of PRH statistics, 1997–2008.

	All banks					Domestic banks only				
	β_1	β_2	ε	PRH 1997	PRH 2008	β_1	β_2	ε	PRH 1997	PRH 2008
<i>Asia</i>										
Hong Kong	0.094 (0.054)	0.020 (0.041)	0.070 (0.040)	0.122	0.263	0.092 (0.103)	−0.038 (0.043)	0.098 (0.103)	0.060	0.176
Indonesia	0.847 (0.106)	−0.120 (0.056)	0.023 (0.006)	0.743	0.956	0.998 (0.191)	−0.215 (0.095)	0.022 (0.011)	0.800	1.015
Korea	0.744 (0.199)	−0.182 (0.081)	0.006 (0.010)	0.566	0.605	0.801 (0.214)	−0.182 (0.093)	−0.009 (0.011)	0.613	0.553
Malaysia	0.458 (0.096)	0.046 (0.061)	0.019 (0.007)	0.514	0.634	0.588 (0.166)	0.083 (0.125)	0.002 (0.006)	0.673	0.689
Philippines	0.557 (0.332)	0.423 (0.280)	0.004 (0.009)	0.984	1.027	0.485 (0.404)	0.768 (0.365)	0.003 (0.007)	1.257	1.301
Singapore	0.719 (0.147)	0.108 (0.115)	0.004 (0.007)	0.830	0.864	2.105 (0.338)	−0.137 (0.219)	−0.006 (0.004)	1.955	1.824
Thailand	0.543 (0.096)	0.051 (0.077)	−0.007 (0.006)	0.591	0.550	0.507 (0.110)	0.064 (0.085)	−0.002 (0.007)	0.569	0.556
<i>Latin America</i>										
Argentina	0.328 (0.042)	0.046 (0.038)	0.018 (0.006)	0.381	0.466	0.306 (0.055)	0.014 (0.048)	0.027 (0.009)	0.329	0.445
Bolivia	0.157 (0.119)	0.322 (0.113)	0.028 (0.012)	0.493	0.673	0.275 (0.128)	0.153 (0.123)	0.028 (0.013)	0.440	0.597
Brazil	0.440 (0.045)	0.127 (0.028)	0.026 (0.004)	0.581	0.769	0.271 (0.055)	0.126 (0.034)	0.035 (0.008)	0.412	0.606
Chile	0.528 (0.074)	0.241 (0.072)	0.003 (0.004)	0.771	0.795	1.306 (0.250)	−0.244 (0.142)	0.000 (0.006)	1.063	1.067
Colombia	0.187 (0.100)	0.298 (0.071)	0.025 (0.011)	0.497	0.658	0.144 (0.112)	0.464 (0.080)	0.011 (0.009)	0.614	0.693
Mexico	1.019 (0.113)	−0.097 (0.077)	−0.005 (0.008)	0.917	0.867	0.805 (0.161)	0.120 (0.097)	0.019 (0.009)	0.942	1.163
Paraguay	0.623 (0.038)	−0.037 (0.028)	0.042 (0.007)	0.612	0.975	0.665 (0.102)	−0.063 (0.081)	0.024 (0.014)	0.616	0.803
Peru	0.974 (0.152)	0.155 (0.135)	−0.012 (0.004)	1.116	0.982	0.746 (0.222)	0.178 (0.216)	−0.011 (0.006)	0.914	0.807
Uruguay	0.564 (0.067)	0.086 (0.061)	0.013 (0.009)	0.658	0.759	0.418 (0.148)	0.297 (0.164)	0.051 (0.021)	0.753	1.322
Venezuela	0.280 (0.076)	0.159 (0.066)	0.065 (0.014)	0.469	0.962	0.210 (0.085)	0.179 (0.075)	0.077 (0.020)	0.421	0.987

Notes: Standard errors are in parentheses.

We include two sets of additional control variables in the regression—financial environment factors ($FEF_{i,t}$) and macroeconomic environment factors ($MEF_{i,t}$). The financial environment variables are intended to capture the effects of financial development in the host country on the penetration–competition link. The FEF set includes financial deepening measured by the ratio of domestic credit to the private sector to GDP and the stock market turnover rate, which is expected to capture the effect of competition from the non-banking financial sector on banking competition. The term $MEF_{i,t}$ aims to control for heterogeneous macroeconomic environments across countries, and it includes real GDP in levels, the growth rate of real GDP and the inflation rate. In addition to country and year dummies, we introduce an additional dummy intended to capture crisis periods, built following Caprio and Klingebiel (2003) and Laeven and Valencia (2008).

2.2. Data description

We use annual bank-level balance sheet and income statement data retrieved from the *BankScope* database to estimate the degree of banking competition and foreign bank penetration. Our data set covers a total of 17 emerging economies from Asia and Latin America for the period 1997–2008.¹² We select commercial banks only, as the varying nature and business scope of other types of banking

institutions which conduct business in different areas of specialization could create a potential bias in the results (see Table A1 for the number of bank observations per country-year pair). Table 2 presents detailed summary statistics for all variables used in this study.

2.2.1. Bank ownership and foreign bank penetration

Building a bank-level panel dataset on the ownership structure of banking in selected Asian and Latin American countries is one important contribution of our work. A time series for this information, including the timing and mode of entry of foreign banks into these emerging markets, is an important source for both academic researchers and policy makers. However, this information is not readily available because *BankScope* records the ownership information only for the most recent year. Below we discuss the methodology that we follow to measure the degree of foreign bank penetration for each country-year pair.

We identify a bank as “foreign” if more than 50% of its capital ownership is held by foreign individuals, firms (including banks), or international organizations.¹³ To identify foreign-owned banks, we resort to various other sources in addition to *BankScope*, taking the following steps. First, we check the brief overview of each bank recorded in *BankScope*, which identifies ownership for only some banks. Second, we review each bank’s history from its own website. Third, we obtain banks’ mergers and acquisitions (M&A) information using the *SDC Platinum* database. Finally, if ownership has not yet been identified after following these three steps, we resort to various

¹² The countries include ten countries from Latin America: Argentina, Bolivia, Brazil, Chile, Colombia, Mexico, Paraguay, Peru, Uruguay, and Venezuela; and seven economies from Asia: Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, and Thailand.

¹³ Most of the foreign banks in our dataset are foreign-owned subsidiaries.

other sources, such as banks' annual reports, central banks' publications, and news reports from the Internet. After obtaining the ownership information at the bank-level, we construct three alternative measures of foreign bank penetration at the country-level: (1) the share of total bank assets held by foreign banks, (2) the share of total loans held by foreign banks, and (3) the number of foreign banks as a percentage of the total number of banks.¹⁴

As shown in Table 1, foreign bank penetration levels vary among the sample countries. On average during our sample period, the economies with the lowest levels of penetration (asset-base) are Thailand, the Philippines and Singapore, and those with the highest are Hong Kong, Mexico, Paraguay and Uruguay. Overall, our dataset reveals the fact that large-scale foreign direct investment in the financial sector is a relatively more recent phenomenon in emerging Asia than in Latin America, with Latin American countries showing significantly higher rates of penetration than Asian countries (41% in Latin America versus 24% in Asia, on average, in terms of total assets as of 2007).¹⁵

The levels of foreign bank penetration have increased dramatically in Indonesia and Korea after their governments relaxed entry restrictions in the banking sector as part of the post-crisis financial reform efforts. Although Asian countries have been deregulating their banking systems, they have approached this process with more caution for concerns that foreign banks may be a source of financial instability and contagion (Rajan and Gopalan, 2009). As a result, shareholding of foreign subsidiaries is still limited in Asia, even when foreign banks perform significantly better than domestic banks (Laeven, 2005).

2.2.2. Banking market concentration

We measure the degree of banking market concentration in each country and year in terms of total assets using the HHI index, which is defined as the ratio of the sum of squared market shares of each bank in the industry. As a robustness test, we also use the three-firm concentration ratio (CR3) and the five-firm concentration ratio (CR5), which is defined as the share of total assets held by the three or five largest banks in the country.¹⁶

2.2.3. Bank characteristics

The usage of bank-level data in the first step estimation of the PRH statistics allows us to control for the different degrees of financial constraints faced by heterogeneous banks. For the second step where we estimate the penetration–competition link, we aggregate these financial constraint measures to the national level by calculating national asset-weighted averages. The specific bank characteristics used in this study to proxy for these heterogeneities in financial constraints or in the strength of banks' balance sheet are bank size, liquidity, capitalization, profitability, efficiency and risk.

We measure bank size using total assets in US dollars. We compute liquidity using the ratio of a bank's liquid assets (cash and reserves) to total assets, and capitalization using the ratio of equity capital to total assets. We measure profitability using average returns on bank assets (ROA), and efficiency using the ratio of banks' non-interest expenses to total bank assets. Finally, we measure

credit risk using the ratio of loan loss provisions to total loans (see Table 2).

3. Empirical results

3.1. The benchmark estimation

Applying a two-step procedure, we first estimate Eq. (1) to obtain the continuous-time curve model-based PRH statistics for each country as the measure of banking competition. We then introduce these estimated PRH statistics into the foreign bank penetration–banking competition link equation, Eq. (2), to examine the impact of foreign bank entry on banking competition in the host countries.

In the first step, we obtain the continuous-time curve model estimates of the PRH statistics, for all banks as well as for the subsample of domestic banks only, for each of the 17 Asian and Latin American countries for the period 1997–2008.¹⁷ We do this to be able to assess the impact of foreign bank penetration on the level of competitiveness of the banking industry in the host country not only at the overall level, but also among the incumbent domestic banks.

The estimated PRH statistics, as reported in Table 3, indicate that overall the banking industry in Latin America seems to be more competitive than in Asia. The sample mean values of the PRH statistics for all banks in 1997 and 2008 are 0.650 and 0.791, respectively, for Latin American countries, while they are only 0.621 and 0.700 for Asian countries.¹⁸ Overall, the banking markets in these economies are characterized as monopolistically competitive. The PRH values show an increasing trend in both regions overall during our sample period 1997–2008, as reflected in the positive values of ε in the continuous time-curve model factor, given by $\exp(\varepsilon * \text{time})$. This finding implies that the degree of banking competition in the emerging economies in Asia and Latin America increased overall during the sample period. Exceptions to this increasing trend for all banks include Mexico, Peru and Thailand.

Competition has diminished among the subset of the incumbent domestic banks in Korea, Singapore, Thailand and Peru. Worthy of note are the cases of Peru and Thailand where, although only slightly, competition has dropped at both levels. The fact that in Korea and Singapore overall competition has followed an upward trend while competition among incumbents has diminished over time may indicate a lack of the spillover effects of foreign bank penetration to domestic banks in these particular countries.¹⁹ Of course, this is only a preliminary hypothesis and deserves a more detailed analysis of the reasons and spillover channels. The fact that in Mexico competition among domestic banks has increased while overall competition has followed a downward trend once foreign banks are also included in the sample is consistent with the results of previous studies. For example, Mogueuilansky et al. (2004) argue

¹⁷ We do not use the coefficients on β_3 , the personnel expenses, as part of the PRH statistics estimates since there are many missing data on the personnel expenses at the bank level and in most cases, the estimated coefficients using the available data are small and statistically insignificant.

¹⁸ We also estimated the PRH statistics for the three-year and four-year terms. They show a more volatile pattern of the estimates by country and over the multi-year term period. The main factors which contribute to the volatility of the 3-year and 4-year term PRH statistics may include small sample bias and instability of the banking industry in these emerging and developing economies during our sample period. The issue of the instability of short-run equilibrium in estimating the PRH statistics is discussed and its robustness is checked in the robustness tests section.

¹⁹ In the case of Korea, through several rounds of banking reform during the post-1997 financial crisis period, the number of domestic banks was reduced significantly from 33 in December 1997 to 18 in October 2006 via license revoked (5), merger (11), and new entry (1), while the number of foreign banks increased from 1 to 4 (See Jeon, 2010, pp. 120–122, and Table 2, p. 144, available at http://www.pennearl.com/pages/issues/volume_5/issue_1.php).

¹⁴ We find that the measures of foreign bank penetration in terms of assets and loans are highly correlated. This is not surprising because loans are the main component of banks' total assets in these economies.

¹⁵ In Asia, foreign participation in the financial system increased significantly after the 1997 Asian crisis as governments relaxed entry restrictions for foreign banks. For details, see BIS 2005. In the case of Latin America, the market share of foreign banks increased significantly during the early 2000s when large foreign banks acquired and merged with weak local banks during and after the financial crisis in the region.

¹⁶ For other measures of banking market concentration, see Gelós and Roldós (2004).

Table 4
Effects of foreign bank penetration on banking competition, 1997–2008.

	PRH (all banks)		PRH (domestic banks)	
	(1)	(2)	(3)	(4)
Dependent variable: continuous-time curve model based PRH				
<i>Banking market structure</i>				
Penetration (assets)	.141*** (.030)		.195*** (.031)	
Penetration (number)		.247*** (.041)		.373*** (.047)
Concentration (HHI)	-.034* (.018)	-.020 (.016)	-.015 (.017)	-.001 (.019)
<i>Banking specific factors</i>				
Liquidity	.077** (.033)	.086*** (.032)	.164*** (.036)	.202*** (.032)
Capitalization	-.307* (.183)	-.343* (.180)	-.876*** (.182)	-.411** (.167)
Size	-.002*** (.000)	-.002*** (.000)	-.006*** (.000)	-.006*** (.000)
Efficiency	.549** (.257)	.600*** (.230)	.686*** (.210)	.615*** (.194)
Riskiness	-.381* (.206)	-.336** (.182)	-.453*** (.175)	-.322** (.161)
Profitability	-.359 (.278)	-.069 (.250)	-.531* (.293)	-.239 (.272)
<i>Financial environment</i>				
Credit to private sector	-.077*** (.016)	-.059*** (.017)	-.052*** (.018)	.001 (.021)
Stock market turnover rate	-.021*** (.007)	-.019*** (.006)	-.044*** (.009)	-.034*** (.009)
<i>Macroeconomic environment</i>				
GDP	.000*** (.000)	.000*** (.000)	.001*** (.000)	.001*** (.000)
GDP growth rate	.027 (.053)	.036 (.050)	.002 (.061)	-.003 (.058)
Inflation	.073 (.049)	.034 (.044)	.144*** (.051)	.087 (.048)
<i>Dummies</i>				
Dummy (crisis)	.015* (.008)	.017** (.007)	.022*** (.007)	.024*** (.008)
Year dummies	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes
Constant	.617*** (.031)	.542*** (.035)	.553*** (.034)	.375*** (.039)
Observation	169	169	169	169
Goodness of fit	.958	.961	.989	.988

Notes: Standard errors are in parentheses.

* 10% Significance level.

** 5% Significance level.

*** 1% Significance level.

that foreign bank entry did not stimulate competition due to rent-seeking strategies adopted by foreign banks when entering the Mexican market through mergers and acquisitions.

In the second step, we estimate the foreign bank penetration–banking competition link equation, Eq. (2). We apply the GLS estimator allowing for heteroskedasticity across panels (countries), with country and year fixed effects.²⁰ To address potential endogeneity issues in determining the degree of banking competition, we use 1-year lag terms for all bank-specific characteristics ($BCF_{i,t}$) and financial deepening among financial environment factors ($FEF_{i,t}$). For the dependent variable, we use the estimated PRH statistics obtained from step one. We examine the impact of foreign bank entry on the overall level of competition in the banking market of the host country using all-bank PRH statistics, as well as on the level of com-

petition among the subset of incumbent domestic banks using domestic-bank only PRH statistics. Table 4 reports the estimation results for all banks in columns (1) and (2), and those for domestic banks only in columns (3) and (4).

Our results reveal that higher foreign bank penetration levels are associated with an increase in the degree of banking competition in the host emerging economies. This conclusion is both consistent across specifications and robust to whether penetration rates are measured in terms of the number of banks or total assets. The estimates presented in Table 4 imply that a 10% increase in the share of total bank assets owned by foreign banks (the ratio of the number of foreign banks to that of total banks) raises the PRH measure of competition by 0.014 (0.025) points for the overall industry and by 0.020 (0.037) points for the subsample of domestic banks only. These results are consistent with those in Claessens et al. (2001), according to which the degree of competition in a banking system is a function of the number of foreign banks as well as of the volume of assets that foreign banks control. The model's goodness of fit increases significantly as additional blocs of explanatory

²⁰ The estimation results by pooling all countries in our sample explain variations across countries, while the foreign bank entry–banking competition nexus over time within a country is explained when country-fixed effects are included in the estimation.

variables in each of the different categories are added progressively to the estimation equation. Worth noting is that the positive association between foreign bank penetration and banking competition remains prevalent after controlling for the effect of macroeconomic, financial market and bank-specific factors.

It is shown that higher market concentration may dampen competition. Actually, we find that the coefficient on the banking concentration (HHI) variable is mostly negative, although not statistically significant, especially for the case where the dependent variable is the degree of competition among domestic banks only. The negative coefficients imply that higher concentration in the market for loans is associated with a lower level of banking competition. This is consistent with the structure-conduct-performance (SCP) paradigm which predicts an inverse relationship between concentration and competition. Other studies have reported empirical evidence that an increase in concentration does not necessarily mean a reduced competition in the banking industry (e.g., Claessens and Laeven, 2004; Northcott, 2004; Wu et al., 2010).²¹

Several bank-specific characteristics which proxy for the strength of banks' balance sheet show a significant effect on competition. First, banking competition in the host economies is found to increase when the degree of liquidity of banks' balance sheet is higher and banking operations are less efficient.²² Second, the coefficients on bank size and capitalization are always negative and statistically significant, which indicates that competition seems to be less intense in markets dominated by larger and well-capitalized banks.²³ Lastly, profitability is negatively associated with competition. More than only indicating that higher profits lead to less competition, we interpret this negative coefficient on profitability as support for the expected fact that per unit profits are lower in more competitive markets. We also find evidence for a negative association between credit risk and banking competition, suggesting that bank competition becomes less intense in riskier environments. The negative and significant coefficients on the stock market turnover rate seem to suggest that a more developed substitute for bank credit makes competition in banking less intense. Also, competition seems to be more intense both in larger countries and in those with higher inflation rates. Bank competition increases during crisis periods. This is consistent with the fact that, in most of the countries severely affected by financial crises, reform began with a restructuring of the domestic banking sector with the goal of enhancing competition among domestic banks (BIS, 2005).

²¹ Several theories in the literature question the conventional view of a negative relationship between competition and concentration in banking. They include the contestability theory (Baumol, 1982) and the efficiency structure hypothesis (Demsetz, 1974). The former argues that the threat of entry alone can instigate competitive behavior by existing banks, independent of market concentration and the number of firms operating in the market, while the latter argues that strategic decisions made by efficient banks toward mergers in order to increase their market share can be more aggressive in cutting prices and enhancing competitiveness in the banking market. For a more detailed literature review on the relationship between bank concentration and competition, see Berger et al. (2004).

²² Efficiency is measured by non-interest expenses divided by assets. Hence, the higher the measure, the less efficient the banking sector.

²³ Different findings on the relationship between bank size and competition have been reported in the literature: A positive relationship (Bikker and Haaf, 2002), a negative relationship (Bikker et al., 2006), and an indeterminate relationship (Angelini and Cetorelli, 2003). Bikker et al. (2006) provide three potential explanations for a negative relationship. First, large banks are more likely to be in a better position to collude and may also benefit from a better reputation. Second, due to economies of scale in product development, large banks are more likely than smaller banks to create new products and services. Collectively, these reasons may allow large banks to exploit their market power. Third, large banks tend to operate in different product and geographical submarkets. In particular, the wholesale market is characterized by tailor-made products and services supplied by a select few large banks, which increases their market power.

We also test whether the effects of foreign penetration on competition vary across regions and periods. We find evidence that the presence of foreign banks boosts banking competition in both Latin America and Asia (see Table 5). The last question we ask is whether there exist any structural shifts in the penetration–competition link over time. To answer this question we divide our sample into two subperiods before and after 2003.²⁴ These estimation results are reported in Table 6. We find that foreign bank penetration increases competition in both periods, with a stronger effect in the second sub-period when foreign bank penetration is measured using total bank assets. Since the degree of penetration was on average increasing from 1997 to 2002 and falling afterwards, we interpret these findings as preliminarily suggesting that the competitive impact of foreign bank entry is increasing in the length of the presence of foreign banks in emerging economies.

3.2. What are the channels for the positive foreign bank penetration–competition link?

We next explore the channels through which foreign bank entry enhances competition in host emerging countries. We aim to identify the specific channels for the spillover effects of foreign bank penetration to competition in the domestic banking sector by conducting various subsample studies. First, we divide the sample into two groups, depending on whether foreign banks are more or less efficient than domestic banks. We measure efficiency at the bank-level using the ratio of non-interest expenses to total assets for each bank. We then calculate the country-wide efficiency measure as the asset-weighted average for the domestic and foreign bank groups separately. A country-year observation is included in the first (second) subsample if foreign banks' efficiency is above (below) domestic banks' efficiency. The subsample estimation results are reported in Table 7.

While we find that foreign bank penetration increases banking competition in the host country for the first subsample, we cannot find evidence of a positive association between foreign bank entry and banking competition when the sample is restricted to country-year observations for which foreign banks are on average less efficient than their domestic counterparts. Moreover, the size of the coefficient on foreign bank penetration is significantly larger than that of the average coefficient for the whole sample, as reported earlier in Table 4. This finding is consistent with previous research on the spillover effects of foreign bank penetration which argues that the entry of foreign banks forces domestic banks to increase their efficiency, hence driving the domestic banking market to become more competitive.

Another channel through which foreign bank entry could affect competition in the host country is by altering the overall degree of credit risk. It is generally argued that foreign banks are less risky since they have access to better screening techniques, which enable them to cherry-pick the best borrowers. To explore this idea we divide the sample into two subsamples depending on whether foreign banks are more or less risky than domestic banks. We measure riskiness at the bank-level using the ratio of loan loss provisions to total loans. We then calculate the country-wide risk measure as the asset-weighted average for the domestic and foreign bank groups separately. A country-year observation is included in the first (second) subsample if foreign banks are less (more) risky than domestic banks. These results are reported in Table 8. It is shown that the presence of foreign banks increases competition in the host country when foreign banks are on average less risky, but not otherwise. A way to explain this observation is

²⁴ This divides the sample in two sub-periods of the equal length. Also, 2002 is considered to be the year in which foreign bank entry to emerging economies surged significantly (BIS, 2005).

Table 5
Effects of foreign bank penetration on banking competition: Latin America vs. Asia.

	PRH (all banks)				PRH (domestic banks)			
	Latin America		Asia		Latin America		Asia	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable: continuous-time curve model based PRH								
<i>Banking market structure</i>								
Penetration (assets)	.063 [*] (.034)		.173 ^{***} (.041)		.146 ^{***} (.023)		.224 ^{***} (.055)	
Penetration (number)		.102 (.090)		.134 ^{***} (.033)		.226 ^{***} (.064)		.032 (.044)
Concentration (HHI)	-.041 (.035)	-.040 (.039)	-.039 ^{**} (.017)	-.038 ^{**} (.017)	.037 (.026)	.051 (.032)	-.042 [*] (.025)	-.041 [*] (.024)
<i>Banking specific factors</i>								
Liquidity	-.001 (.065)	-.007 (.064)	-.058 (.053)	-.060 (.052)	.123 ^{***} (.044)	.157 ^{***} (.050)	-.001 (.056)	-.025 (.061)
Capitalization	-.566 ^{***} (.218)	-.435 ^{**} (.212)	-.807 ^{***} (.297)	-.858 ^{***} (.282)	-1.518 ^{***} (.167)	-1.200 ^{***} (.178)	-.579 [*] (.300)	-.545 [*] (.318)
Size	-.002 (.008)	-.001 (.008)	-.001 ^{**} (.000)	-.001 [*] (.000)	-.002 (.005)	.002 (.005)	-.003 ^{***} (.001)	-.003 ^{***} (.001)
Efficiency	-.011 (.353)	.054 (.358)	.859 ^{***} (.232)	.777 ^{***} (.248)	-.168 (.202)	.052 (.240)	.346 (.212)	.557 ^{**} (.276)
Riskiness	.516 (.327)	.434 (.313)	-.793 ^{***} (.151)	-.812 ^{***} (.157)	.199 (.219)	.096 (.257)	-.438 ^{***} (.137)	-.706 ^{***} (.175)
Profitability	.640 (.498)	.772 (.502)	-.701 ^{***} (.270)	-.552 ^{**} (.253)	-.454 (.317)	.074 (.370)	-.420 [*] (.239)	-.418 (.263)
<i>Financial environment</i>								
Credit to private sector	-.125 (.086)	-.091 (.080)	-.029 ^{**} (.013)	-.009 (.014)	-.272 ^{***} (.062)	-.191 ^{***} (.066)	.029 [*] (.016)	.029 (.018)
Stock market turnover rate	-.119 [*] (.066)	-.109 (.068)	.003 (.002)	.003 (.002)	-.002 (.035)	-.016 (.042)	.003 (.003)	.001 (.003)
<i>Macroeconomic environment</i>								
GDP	-.001 ^{***} (.000)	-.001 ^{***} (.000)	.000 (.000)	.000 (.000)	.001 ^{***} (.000)	.001 ^{***} (.000)	.000 (.000)	.000 [*] (.000)
GDP growth rate	.164 (.112)	.132 (.110)	.021 (.045)	.032 (.044)	.065 (.076)	.025 (.084)	-.060 (.056)	-.010 (.059)
Inflation	.052 (.131)	-.024 (.123)	-.275 ^{***} (.067)	-.294 ^{***} (.068)	.257 ^{***} (.075)	.098 (.081)	-.240 ^{***} (.065)	-.301 ^{***} (.077)
<i>Dummies</i>								
Dummy (crisis)	-.054 ^{***} (.019)	-.050 ^{**} (.020)	.014 [*] (.008)	.013 (.008)	.024 ^{**} (.010)	.025 ^{**} (.012)	.008 (.013)	.000 (.013)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	.880 ^{***} (.062)	.817 ^{***} (.087)	.518 ^{***} (.079)	.513 ^{***} (.078)	.795 ^{***} (.042)	.651 ^{***} (.065)	.524 ^{***} (.113)	.469 ^{***} (.112)
Observation	96	96	73	73	96	96	73	73
Goodness of fit	.939	.937	.997	.998	.983	.979	.999	.999

Notes: Standard errors are in parentheses.

* 10% Significance level.

** 5% Significance level.

*** 1% Significance level.

Table 6
Effects of foreign bank penetration on banking competition: Structural shifts over time.

	PRH (all banks)				PRH (domestic banks)			
	1997–2002		2003–2008		1997–2002		2003–2008	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable: continuous-time curve model based PRH								
<i>Banking market structure</i>								
Penetration (assets)	.351*** (.100)		.941*** (.045)		.201*** (.056)		.545*** (.034)	
Penetration (number)		.971*** (.149)		.911*** (.096)		.599*** (.086)		.542*** (.063)
Concentration (HHI)	-.005 (.056)	.000 (.051)	.036 (.025)	.046 (.036)	.034 (.031)	.028 (.029)	.007 (.019)	.025 (.025)
<i>Banking specific factors</i>								
Liquidity	.340*** (.128)	.526*** (.133)	.134*** (.041)	.119** (.059)	.376*** (.084)	.515*** (.081)	.132*** (.033)	.098** (.045)
Capitalization	-1.841*** (.466)	-2.355*** (.482)	-.392 (.321)	-.224 (.522)	-1.670*** (.320)	-1.934*** (.332)	.387 (.253)	.572 (.386)
Size	.004 (.005)	-.006 (.004)	-.002*** (.001)	-.001 (.001)	-.003 (.002)	-.012*** (.002)	-.004*** (.000)	-.003*** (.001)
Efficiency	.313 (.462)	.082 (.406)	-1.760*** (.282)	-.854*** (.234)	.639** (.299)	.513** (.259)	-.849*** (.183)	-.384 (.253)
Riskiness	.494 (.397)	.620* (.329)	.124 (.289)	.250 (.295)	.086 (.242)	.088 (.212)	-.803*** (.285)	-.730** (.364)
Profitability	1.063 (.731)	.492 (.611)	-1.038*** (.383)	-.317 (.513)	.028 (.434)	-.704* (.378)	-1.323*** (.359)	-.824* (.467)
<i>Financial environment</i>								
Credit to private sector	-.138*** (.050)	.003 (.061)	-.042* (.022)	.014 (.058)	-.076** (.033)	.013 (.033)	-.026 (.031)	-.036 (.047)
Stock market turnover rate	.004 (.012)	.009 (.007)	-.013 (.014)	.010 (.035)	.002 (.004)	.007 (.005)	-.002 (.013)	.028 (.022)
<i>Macroeconomic environment</i>								
GDP	-.000 (.000)	.000 (.000)	.000** (.000)	.001*** (.000)	.001** (.000)	.001*** (.000)	.001*** (.000)	.001*** (.000)
GDP growth rate	.057 (.112)	-.001 (.133)	.168*** (.054)	.206** (.085)	-.052 (.077)	-.153** (.070)	.097 (.054)	.095 (.068)
Inflation	.253* (.133)	.353*** (.128)	-.034 (.100)	-.026 (.136)	.251*** (.090)	.326*** (.082)	.116 (.084)	.076 (.126)
<i>Dummies</i>								
Dummy (crisis)	-.017 (.025)	-.017 (.023)	.091** (.035)	.052 (.037)	.021 (.016)	.027* (.015)	.121*** (.033)	.106*** (.035)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	.680*** (.080)	.308*** (.104)	.533*** (.050)	.261*** (.096)	.603*** (.051)	.346*** (.064)	.458*** (.037)	.303*** (.072)
Observation	81	81	88	88	81	81	88	88
Goodness of fit	.874	.926	.985	.964	.986	.991	.996	.995

Notes: Standard errors are in parentheses.

* 10% Significance level.

** 5% Significance level.

*** 1% Significance level.

Table 7
Foreign bank efficiency and the effects of foreign bank penetration on banking competition.

	PRH (all banks)				PRH (domestic banks)			
	Foreign banks more efficient		Foreign banks less efficient		Foreign banks more efficient		Foreign banks less efficient	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable: continuous-time curve model based PRH statistics								
<i>Banking market structure</i>								
Penetration (assets)	.290*** (.041)		-.076 (.052)		.262*** (.046)		.019 (.066)	
Penetration (number)		.387*** (.051)		-.122** (.060)		.361*** (.054)		-.304*** (.083)
Concentration (HHI)	-.002 (.031)	.022 (.029)	-.035 (.030)	-.024 (.024)	.002 (.035)	.029 (.033)	-.046 (.039)	-.058 (.035)
<i>Banking specific factors</i>								
Liquidity	.265*** (.054)	.297*** (.055)	-.217*** (.070)	-.257*** (.066)	.199*** (.060)	.256*** (.058)	-.149* (.085)	-.193** (.080)
Capitalization	-1.050*** (.208)	-1.185*** (.215)	-.642 (.453)	-.924** (.419)	-.771*** (.243)	-.854*** (.233)	-.193 (.546)	-.298 (.495)
Size	-.001*** (.000)	-.003*** (.001)	-.001 (.001)	-.001 (.001)	-.004*** (.001)	-.005*** (.001)	-.006*** (.001)	-.004*** (.001)
Efficiency	-.022 (.220)	.319 (.238)	1.434*** (.462)	1.331*** (.464)	.178 (.292)	.424 (.272)	1.020** (.468)	1.632*** (.490)
Riskiness	-.021 (.214)	.054 (.256)	-1.145*** (.288)	-1.180*** (.303)	-.439 (.331)	-.403 (.322)	-.977*** (.294)	-1.389*** (.332)
Profitability	-1.071*** (.334)	-.065 (.362)	-.515 (.493)	-.411 (.489)	-1.055** (.416)	-.168 (.399)	-.911 (.598)	-.859 (.582)
<i>Financial environment</i>								
Credit to private sector	-.005 (.028)	.040 (.029)	-.170*** (.049)	-.173*** (.040)	-.054 (.036)	-.007 (.034)	-.248*** (.063)	-.187*** (.055)
Stock market turnover rate	-.001 (.003)	-.003 (.005)	-.021 (.018)	-.023 (.019)	-.010** (.005)	-.009* (.005)	-.024 (.022)	-.016 (.020)
<i>Macroeconomic environment</i>								
GDP	.000*** (.000)	.000*** (.000)	-.000 (.000)	-.000 (.000)	.001*** (.000)	.001*** (.000)	.000 (.000)	.000 (.000)
GDP growth rate	.066 (.083)	.121 (.079)	-.064 (.107)	-.003 (.100)	.079 (.094)	.111 (.084)	-.275** (.140)	-.215 (.134)
Inflation	.085 (.053)	.116** (.059)	-.427* (.221)	-.247 (.183)	.016 (.058)	.078 (.062)	-.433 (.281)	-.708*** (.229)
<i>Dummies</i>								
Dummy (crisis)	.010 (.010)	.003 (.011)	.029** (.013)	.021* (.013)	.045*** (.013)	.039*** (.012)	.048*** (.017)	.042** (.016)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	.644*** (.040)	.517*** (.045)	.677*** (.066)	.752*** (.071)	.573*** (.045)	.444*** (.048)	.570*** (.085)	.699*** (.087)
Observation	99	99	70	70	99	99	70	70
Goodness of fit	.955	.955	.959	.958	.979	.979	.994	.990

Notes: Standard errors are in parentheses.

* 10% Significance level.

** 5% Significance level.

*** 1% Significance level.

Table 8
Foreign bank riskiness and the effects of foreign bank penetration on banking competition.

	PRH (all banks)				PRH (domestic banks)			
	Foreign banks less risky		Foreign banks more risky		Foreign banks less risky		Foreign banks more risky	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable: continuous-time curve model based PRH statistics								
<i>Banking market structure</i>								
Penetration (assets)	.084** (.043)		.025 (.033)		.143*** (.036)		.018 (.027)	
Penetration (number)		.108** (.055)		.103 (.067)		.227*** (.050)		.103 (.075)
Concentration (HHI)	-.029* (.017)	-.063** (.026)	-.042 (.040)	-.052** (.023)	-.010 (.025)	.009 (.022)	-.017 (.028)	-.021 (.030)
<i>Banking specific factors</i>								
Liquidity	.194*** (.054)	.147** (.060)	.020 (.071)	-.020 (.037)	.323*** (.054)	.314*** (.050)	-.038 (.045)	-.016 (.048)
Capitalization	.360 (.269)	.399 (.309)	-.157 (.293)	-.954*** (.165)	-.781*** (.271)	-.676*** (.252)	-.449** (.223)	-.331 (.212)
Size	-.003*** (.000)	-.001** (.000)	-.001 (.001)	-.000 (.001)	-.004*** (.001)	-.005*** (.000)	-.004*** (.000)	-.005*** (.000)
Efficiency	-.164 (.335)	-.467 (.419)	1.262*** (.282)	.681*** (.190)	1.087*** (.347)	1.089*** (.345)	.875*** (.218)	.810*** (.215)
Riskiness	.064 (.250)	.186 (.316)	-.722*** (.268)	-.418** (.178)	-.734*** (.256)	-.671*** (.251)	-.524** (.211)	-.461** (.201)
Profitability	-.562 (.347)	-.252 (.392)	-.506 (.413)	-.208 (.247)	-.1.113*** (.411)	-.778** (.375)	-.272 (.338)	-.288 (.335)
<i>Financial environment</i>								
Credit to private sector	-.023 (.019)	.018 (.018)	-.093 (.059)	.055 (.041)	.055*** (.018)	.075*** (.018)	.009 (.045)	.010 (.045)
Stock market turnover rate	.001 (.002)	.002 (.003)	-.044*** (.016)	-.002 (.011)	-.001 (.005)	.004 (.006)	-.019 (.013)	-.020 (.014)
<i>Macroeconomic environment</i>								
GDP	.001*** (.000)	-.000 (.000)	.000 (.000)	.000 (.000)	.001*** (.000)	.001*** (.000)	.001*** (.000)	.001*** (.000)
GDP growth rate	-.057 (.067)	-.047 (.071)	.188** (.081)	.139*** (.044)	-.085 (.079)	-.042 (.070)	.000 (.066)	-.012 (.068)
Inflation	.022 (.060)	-.023 (.074)	.221*** (.081)	.093* (.052)	.003 (.066)	.032 (.068)	-.057 (.092)	-.074 (.095)
<i>Dummies</i>								
Dummy (crisis)	-.014 (.010)	-.016 (.011)	-.031** (.013)	-.004 (.009)	-.001 (.010)	.007 (.010)	.027*** (.010)	.026*** (.009)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	.536*** (.046)	.490*** (.059)	.603*** (.133)	.554*** (.040)	.465*** (.045)	.372*** (.054)	.507*** (.044)	.470*** (.051)
Observation	98	98	71	71	98	98	71	71
Goodness of fit	.974	.963	.971	.988	.993	.993	.964	.963

Notes: Standard errors are in parentheses.

* 10% Significance level.

** 5% Significance level.

*** 1% Significance level.

Table 9
Effects of foreign bank penetration on banking competition under different domestic market concentration levels.

	PRH (all banks)				PRH (domestic banks)			
	Banking market less concentrated		Banking market more concentrated		Banking market less concentrated		Banking market more concentrated	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable: continuous-time curve model based PRH statistics								
<i>Banking market structure</i>								
Penetration (assets)	.332*** (.021)		.086** (.034)		.265*** (.045)		.051 (.032)	
Penetration (number)		.312*** (.055)		.034 (.067)		.174*** (.068)		-.012 (.063)
<i>Banking specific factors</i>								
Liquidity	.162*** (.024)	.187*** (.035)	.129*** (.049)	.140*** (.053)	.169*** (.043)	.153*** (.047)	.231*** (.043)	.253*** (.045)
Capitalization	-.844*** (.101)	-1.044*** (.143)	.886*** (.242)	.743*** (.261)	-.855*** (.152)	-.892*** (.183)	-.585*** (.186)	-.564*** (.189)
Size	-.003*** (.000)	-.003*** (.001)	.003*** (.001)	.002** (.001)	-.005*** (.001)	-.004*** (.001)	-.003*** (.001)	-.003*** (.001)
Efficiency	.013 (.119)	.882*** (.189)	2.040*** (.548)	1.989*** (.585)	.509* (.275)	1.263*** (.258)	2.361*** (.440)	2.487*** (.439)
Riskiness	.204* (.106)	-.453*** (.162)	.004 (.191)	.075 (.195)	-.208 (.223)	-.858*** (.212)	.365** (.172)	.430** (.178)
Profitability	-.264 (.182)	.117 (.273)	.244 (.454)	.410 (.471)	.346 (.325)	.545 (.353)	1.658*** (.439)	1.834*** (.431)
<i>Financial environment</i>								
Credit to private sector	-.009 (.012)	.038* (.020)	-.025 (.036)	-.026 (.037)	.049** (.019)	.071*** (.026)	-.036 (.038)	-.040 (.038)
Stock market turnover rate	.001 (.003)	.003 (.005)	-.025 (.029)	-.015 (.029)	-.001 (.004)	-.000 (.005)	-.014 (.032)	-.008 (.032)
<i>Macroeconomic environment</i>								
GDP	.000*** (.000)	.000** (.000)	-.001*** (.000)	-.001*** (.000)	.000* (.000)	.000 (.000)	.000 (.000)	.000** (.000)
GDP growth rate	.115*** (.040)	.018 (.055)	-.220*** (.072)	-.231*** (.076)	.119* (.062)	.048 (.069)	-.149** (.076)	-.166** (.077)
Inflation	.059** (.024)	-.004 (.040)	.560*** (.159)	.438*** (.156)	-.003 (.046)	-.088* (.050)	.096 (.158)	.022 (.153)
<i>Dummies</i>								
Dummy (crisis)	.014*** (.005)	.016** (.008)	-.011 (.015)	-.006 (.016)	.035*** (.008)	.041*** (.010)	.035** (.016)	.040** (.017)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	.577*** (.016)	.537*** (.030)	.335*** (.049)	.369*** (.054)	.507*** (.025)	.512*** (.038)	.379*** (.045)	.392*** (.050)
Observation	92	92	77	77	92	92	77	77
Goodness of fit	.965	.967	.966	.967	.946	.944	.990	.989

Notes: The banking market is defined as less concentrated if the observation of concentration is lower than the median of the HHI index, otherwise, more concentrated. Standard errors are in parentheses.

* 10% Significance level.

** 5% Significance level.

*** 1% Significance level.

Table 10
Effects of foreign bank entry modes on banking competition in the host country.

	PRH (all banks)		PRH (domestic banks)	
	(1)	(2)	(3)	(4)
Dependent variable: continuous-time curve model based PRH				
<i>Banking market structure</i>				
De novo penetration (assets)	.158** (.070)		.409*** (.080)	
De novo penetration (number)		.136*** (.044)		.191*** (.052)
M&A penetration (assets)	.003 (.035)		.107*** (.031)	
M&A penetration (number)		.047 (.058)		.123** (.062)
Concentration (HHI)	-.025 (.018)	-.040*** (.015)	-.014 (.015)	-.034* (.020)
<i>Banking specific factors</i>				
Liquidity	-.002 (.034)	.061** (.030)	.112*** (.036)	.212*** (.032)
Capitalization	-.295 (.186)	-.546*** (.168)	-.667*** (.209)	-.558*** (.174)
Size	-.004*** (.000)	-.001* (.000)	-.007*** (.001)	-.003*** (.001)
Efficiency	.343 (.220)	.529** (.247)	.259 (.219)	.838*** (.242)
Riskiness	-.285* (.158)	-.436** (.195)	-.382** (.180)	-.559*** (.182)
Profitability	-.275 (.293)	-.249 (.236)	-.783*** (.302)	-.361 (.272)
<i>Financial environment</i>				
Credit to private sector	-.073*** (.016)	-.017 (.016)	-.046** (.019)	.029 (.019)
Stock market turnover rate	-.031*** (.009)	.001 (.002)	-.048*** (.010)	-.002 (.006)
<i>Macroeconomic environment</i>				
GDP	.001*** (.000)	.000* (.000)	.001*** (.000)	.001*** (.000)
GDP growth rate	.028 (.051)	-.016 (.047)	.024 (.062)	-.092 (.057)
Inflation	.010 (.049)	.021 (.045)	.049 (.061)	.053 (.058)
<i>Dummies</i>				
Dummy (crisis)	.010 (.006)	.013* (.007)	.023*** (.008)	.030*** (.008)
Year dummies	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes
Constant	.599*** (.057)	.647*** (.032)	.598*** (.070)	.479*** (.037)
Observation	169	169	169	169
Goodness of fit	.967	.964	.989	.990

Notes: Standard errors are in parentheses.

* 10% Significance level.

** 5% Significance level.

*** 1% Significance level.

that when foreign banks are less risky, domestic banks may be forced to work harder for survival, which raises competitive pressures on them.

Next, we study the type of market structure needed for foreign bank entry to enhance banking competition in the host country. To do so, we measure the degree of banking market concentration using the Herfindahl–Hirschman Index (HHI), which is defined as the sum of the squared market shares of total assets held by each bank in the host country banking market.²⁵ We then divide the sample into two subsamples depending on whether concentration is below or above the country-year median. These results are reported in Table 9. We find that the positive penetration–competi-

tion link is stronger when concentration in the host banking markets falls below the median of the sample. This implies that the less concentrated the banking sector in the host economy, the stronger the spillover effect of foreign bank entry.

3.3. The role of foreign entry mode on the penetration–competition link

The next question we ask is whether the strength of the impact of foreign bank penetration on banking competition in the host country depends on the type of entry mode chosen by foreign banks. In other words, does foreign bank entry through mergers and acquisitions (M&A) impact competition differently from greenfield or 'de novo' entry? To answer this question, we identify the entry mode by each foreign bank, and then estimate two ratios for each country-year pair: (i) the share of total bank assets (and number of banks) in the country owned by de novo foreign banks

²⁵ In the robustness tests discussion in Section 4, we examine whether the main findings on this issue change when various alternative measures of banking concentration and the measure of banking concentration using domestic banks only are adopted for the analysis.

Table 11
Robustness test I – addressing the endogeneity issue using 2SLS estimation.

	Whole sample		Efficiency		Riskiness		Market structure		Subperiods		Region	
	Entry mode		Foreign banks more efficiency	Foreign banks less efficiency	Foreign banks less risky	Foreign banks more risky	Banking market less concentrated	Banking market more concentrated	Before 2002	After 2002	Latin America	Asia
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dependent variable: continuous-time curve model based PRH (all banks)												
<i>Panel A: Penetration measured in terms of assets</i>												
Penetration (assets)	.438 ^{***}		.338 ^{***}	.066	.386 [*]	.136	.185 ^{**}	-.258	.177 [*]	.473 ^{***}	.125	.215 ^{**}
	(.201)		(.110)	(.057)	(.221)	(.155)	(.080)	(.160)	(.095)	(.138)	(.139)	(.061)
De novo penetration (assets)		.359 ^{***}										
		(.110)										
M&A penetration (assets)		-.061										
		(.064)										
Observation	152	152	90	62	89	63	82	70	64	88	86	66
Goodness of fit	.924	.977	.960	.998	.966	.963	.989	.994	.990	.985	.854	.998
<i>Panel B: Penetration measured in terms of bank numbers</i>												
Penetration (number)	.735 ^{***}		.577 ^{***}	.218 [*]	.486 ^{**}	.073	.326	-.330 [*]	.398 ^{***}	.544 ^{***}	.157	.115
	(.250)		(.211)	(.104)	(.204)	(.172)	(.188)	(.182)	(.121)	(.160)	(.320)	(.073)
De novo penetration (number)		.378 ^{**}										
		(.157)										
M&A penetration (number)		.176										
		(.197)										
Observation	152	152	90	62	89	63	82	70	64	88	86	66
Goodness of fit	.927	.968	.952	.999	.962	.992	.982	.994	.995	.987	.844	.998
Dependent variable: continuous-time curve model based PRH (domestic banks)												
<i>Panel C: Penetration measured in terms of assets</i>												
Penetration (assets)	.292 ^{***}		.350 ^{**}	.142	.324 ^{**}	.191	.360 ^{**}	.083	.077	.317 ^{***}	.175 ^{**}	.248 ^{**}
	(.094)		(.120)	(.086)	(.147)	(.128)	(.164)	(.145)	(.044)	(.097)	(.055)	(.095)
De novo penetration (assets)		.325 ^{***}										
		(.101)										
M&A penetration (assets)		.083										
		(.080)										
Observation	152	152	90	62	89	63	82	70	64	88	86	66
Goodness of fit	.990	.991	.983	.999	.994	.995	.988	.998	.990	.997	.969	.999
<i>Panel D: Penetration measured in terms of bank numbers</i>												
Penetration (number)	.420 ^{***}		.488 ^{**}	.175	.453 ^{**}	.241	.351	-.106	.112	.279 ^{***}	.009	.116
	(.120)		(.168)	(.168)	(.178)	(.216)	(.208)	(.142)	(.080)	(.095)	(.225)	(.122)
De novo penetration (number)		.416 ^{**}										
		(.153)										
M&A penetration (number)		.370 ^{**}										
		(.165)										
Observation	152	152	90	62	89	63	82	70	64	88	86	66
Goodness of fit	.988	.989	.979	.999	.994	.994	.984	.998	.999	.997	.963	.999

Notes: In this robustness test, the regression is conducted by using 2SLS, in which bank specific factors are instrumented by two lags of their observations. Standard errors are in parentheses.

To save space, here we show only the coefficients on the specific penetration variables. However, the full set of control variables is included in these regressions as in the benchmark estimations.

* 10% Significance level.

** 5% Significance level.

*** 1% Significance level.

Table 12
Robustness test II – using alternative measures of banking concentration.

	HHI (domestic banks)		CR3 (all banks)		CR5 (all banks)		CR3 (domestic banks)		CR5 (domestic banks)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Dependent variable: continuous-time curve model based PRH (all banks)</i>										
Penetration (assets)	.103***		.130***		.132***		-.027		.024	
	(.033)		(.030)		(.031)		(.033)		(.033)	
Penetration (number)		.214***		.259***		.247***		.171***		.180***
		(.042)		(.043)		(.041)		(.052)		(.044)
<i>Dependent variable: continuous-time curve model based PRH (domestic banks)</i>										
Penetration (assets)	.186***		.190***		.185***		.125***		.143***	
	(.031)		(.031)		(.031)		(.029)		(.029)	
Penetration (number)		.354***		.370***		.363***		.309***		.310***
		(.045)		(.047)		(.048)		(.050)		(.046)

Notes: In this robustness test, the measure of concentration, HHI (of all banks), is replaced by the following: HHI of only domestic banks, CR3 of all banks, CR5 of all banks, CR3 of only domestic banks, and CR5 of only domestic banks. Standard errors are in parentheses.

To save space, here we show only the coefficients on the specific penetration variables. However, the full set of control variables is included in these regressions as in the benchmark estimations.

* 10% Significance level.

** 5% Significance level.

*** 1% Significance level.

and (ii) the share of these assets (and number of banks) owned by banks that enter the host country banking markets through the M&A mode. We then replace the *penetration* variable in Eq. (2) by these two entry-mode ratios in the estimation using the whole sample. The estimation results for this exercise are presented in Table 10.

The coefficients on “de novo penetration” are positive and statistically significant in all specifications, whereas the coefficients on “M&A penetration” are positive and statistically significant only when the dependent variable is the measure of competition among the subset of domestic incumbent banks. Furthermore, the coefficients on the M&A entry are much smaller than those on the de novo entry, even when they are statistically significant. These results suggest that de novo foreign bank entry positively and significantly impacts competition, while weaker evidence can be found on this link for the cases when foreign banks enter host countries by merging with or acquiring existing domestic banks.

We believe that this result can be explained because ‘de novo’ foreign banks are more interested in rapidly building their market share than are banks that are merging with or acquiring domestic banks which have an already established customer base.²⁶ Therefore, the former banks may be more willing to charge lower loan rates, which should impose more intense competitive pressures on domestic banks. It has often been assumed in the literature that the merged banks’ behavior as regards their competitive stance and business mix do not change substantially after a merger (for example, see Kishan and Opiela (2000) for the US case, and Hempell (2002) for the German case).

4. Robustness tests

In this section we conduct various tests to assess whether our main findings on the impact of foreign bank entry on banking competition in the host countries are affected when further modifications of estimations and measurements are used for our analysis. These modifications include applying alternative estimations of the PRH statistics, alternative measures of the degree of banking concentration, and alternative estimation techniques to deal with potential endogeneity biases, and lifting the underlying assumption of long-run banking market equilibrium in the PRH model.

²⁶ Lehner (2009) shows that there has been a trend towards cross border lending and acquisition entry in banking markets in developing countries, while greenfield entry prevails in more developed country markets. She also shows that a tendency towards acquisition (greenfield) entry exists in smaller (larger) host countries.

First, we estimate the PRH statistics for multi-year terms, 3-year and 4-year term PRH statistics, as alternative measures of banking competition. The 3-year term PRH statistics are obtained by dividing the overall sample period into four sub-periods: 1997–1999, 2000–2002, 2003–2005, and 2006–2008; while the 4-year terms PRH statistics are obtained for three sub-periods: 1997–2000, 2001–2004, 2005–2008. The multi-year term estimations assume that changes in banking market structure and competition are only gradual with the exception of the events of financial crisis periods or banking reform. It also somewhat mitigates small sample bias problems in the estimation by year. We find that in most cases, our main findings reported earlier do not change significantly.²⁷

Second, to address the possible endogeneity of the bank-specific characteristics included in the BCF variable block in Eq. (2), we apply 2SLS to the re-estimation of the foreign bank penetration–banking competition link equation. In the first step we instrument bank characteristics (liquidity, capitalization, size, efficiency, riskiness, and profitability) and financial deepening (ratio of credit to private sectors to GDP) by using two lags of these variables. As shown in Table 11, we find that in most cases, our previous main results remain qualitatively the same. The coefficient on foreign bank penetration is positive and statistically significant; the impact of foreign banks entry on banking competition, either among all banks or domestic banks only, is shown to be stronger when more efficient and less risky foreign banks enter into less concentrated host banking markets. Foreign banks entering via the ‘de novo penetration’ mode are also shown to generate a stronger impact on the competitiveness of host banking markets than do foreign banks entering via the ‘M&A’ mode.²⁸ The foreign bank penetration–banking competition link is shown to be stronger in recent years, and the spillover effects from foreign bank entry to domestic banking competition exist in both Latin America and Asia.

Third, we use alternative measures of the degree of concentration in the banking sector: CR3 and CR5, which are defined as

²⁷ Most of our main findings do not change drastically when we use the 3-year term PRH statistics. However, when 4-year term PRH statistics are used, the estimation of the banking competition equation fails to detect statistically significant evidence on the impact of foreign bank penetration on banking competition in our sample economies during the period 2005–2008. The PRH statistics estimated by year or even multi-year terms suffer from small sample bias and volatility for several countries in our sample. The estimation results are available upon request.

²⁸ To save space, in the robustness tests results reported in Tables 11–14, we only show the coefficients on the specific penetration variables. However, the estimations include the full set of regressors as shown in Tables 4–9. The coefficients on those additional controls provide results qualitatively consistent with those in the benchmark specification.

Table 13
Robustness test III – using alternative measures of banking concentration, domestic banks only.

	Banking market less domestically concentrated			Banking market more domestically concentrated								
	HHI (domestic banks)	CR3 (domestic banks)	CR5 (domestic banks)	HHI (domestic banks)	CR3 (domestic banks)	CR5 (domestic banks)	CR3 (domestic banks)	CR5 (domestic banks)	CR5 (domestic banks)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<i>Dependent variable: continuous-time curve model based PRH (all banks)</i>												
Penetration (assets)	.064 [*] (.039)		.095 ^{**} (.038)		.091 ^{**} (.044)		-.028 (.027)		-.048 (.036)		-.046 (.037)	
Penetration (number)		.042 (.032)		.145 ^{***} (.053)		.231 ^{***} (.059)		.003 (.066)		-.067 (.079)		.059 (.041)
<i>Dependent variable: continuous-time curve model based PRH (domestic banks)</i>												
Penetration (assets)	.155 ^{***} (.049)		.078 ^{***} (.024)		.080 ^{***} (.020)		.089 ^{**} (.037)		.051 (.050)		.004 (.045)	
Penetration (number)		.208 ^{***} (.029)		.113 ^{***} (.046)		.137 ^{***} (.047)		.184 ^{**} (.089)		.012 (.109)		-.125 (.096)

Notes: The banking sector is defined more (less) domestically concentrated if the value is higher (lower) than the median of the following measures: HHI of domestic banks, CR3 of domestic banks and CR5 of domestic banks. Standard errors are in parentheses.

To save space, here we show only the coefficients on the specific penetration variables. However, the full set of control variables is included in these regressions as in the benchmark estimations.

* 10% Significance level.

** 5% Significance level.

*** 1% Significance level.

the sum of the market shares held by the largest three or five banks in host banking markets. All concentration measures are also alternatively calculated for the subsample of domestic banks only. Thus, we work with five alternative measures of concentration in the banking sector: HHI for domestic banks, and CR3 and CR5 for all banks and for domestic banks only. As reported in Table 12, we find that in all cases for domestic banks, the effect of foreign penetration on banking competition in the host country is not significantly changed.

Fourth, we examine whether our earlier finding that the impact of foreign banks on banking competition is stronger when they enter a less concentrated host banking market is affected if concentration in the domestic market is calculated using the data for the subset of domestic banks only. We use HHI (domestic banks), CR3 (domestic banks) and CR5 (domestic banks), and divide the whole sample into groups depending on whether concentration is higher or lower than the overall sample median of each measure. We expect that the impact of foreign bank penetration on banking competition be weaker (stronger) in the markets where domestic banks already control a large (small) share of the total banking market. As shown in Table 13, we find that in almost all cases, the positive impact of foreign bank penetration on banking competition in the host country is more pronounced when the concentration level among domestic banks is below the sample median. Therefore, we confirm that our main findings are not affected when alternative measures of banking market concentration are used.

Finally, we examine whether our main findings are robust to lifting the assumption of long-run equilibrium which is implicitly imposed in our benchmark specification. Shaffer (1982) and Panzar and Rosse (1987, p. 446) stress that it is necessary for the observations to be generated in long-run equilibrium for the monopolistic or perfect competition hypothesis in their model to hold true. One of the implications of the long-run equilibrium assumption is that bank returns are equalized across banks and that returns on assets (ROA) are uncorrelated with bank input prices in equilibrium. We conduct long-run equilibrium tests using Eq. (1), with the dependent variable replaced by ROA à la Bikker et al. (2007) and Bikker et al. (2009).²⁹ We reject the null hypothesis of long-run equilibrium at the 1% significance level for four countries: Korea, the Philippines, Bolivia, and Colombia. Notice that these countries have relatively unstable PRH statistics according to our first step estimation results. Next we rerun our benchmark estimation after deleting these four countries from the sample. Table 14 reports the estimation results of the foreign bank penetration–banking competition link equation for the 13 countries which meet the long-run equilibrium condition in their banking markets. The coefficients on foreign bank penetration are positive and statistically significant for the whole sample, both for all banks and domestic banks only, and overall, the main results from the subsample estimations are not significantly affected.

5. Conclusions

The presence of foreign banks has increased significantly in emerging Asian and Latin American countries since the early 1990s. Banking markets in these economies have become increasingly international due to financial liberalization, widespread privatization, financial integration, and banking reform efforts. Though widely debated, the banking literature has not yet reached a consensus regarding the impact of this increasing and widespread foreign bank entry on the competitive structure of domestic banking markets, especially in developing and emerging economies.

²⁹ We test for $H_0: H = 0$ (equilibrium) against $H_1: H < 0$ (disequilibrium) using one-sided t -tests. When the 5% significance level is used, the null of long-run equilibrium is rejected for three additional countries, Thailand, Paraguay, and Uruguay.

Table 14
Robustness test IV – using PRH statistics which pass long-run equilibrium tests.

	Whole sample		Efficiency		Riskiness		Market structure		Subperiods		Region	
	Entry mode		Foreign banks more efficiency	Foreign banks less efficiency	Foreign banks less risky	Foreign banks more risky	Banking market less concentrated	Banking market more concentrated	Before 2002	After 2002	Latin America	Asia
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dependent variable: continuous-time curve model based PRH (all banks)												
<i>Panel A: Penetration measured in terms of assets</i>												
Penetration (assets)	.091**		.129**	-.088***	.389***	-.017	.270***	-.037	.101*	.573***	.050	.105*
	(.040)		(.064)	(.023)	(.063)	(.034)	(.033)	(.036)	(.054)	(.071)	(.060)	(.059)
De novo penetration (assets)		.093***										
		(.041)										
M&A penetration (assets)		-.088***										
		(.023)										
Observation	129	129	78	51	80	49	71	58	61	68	77	52
Goodness of fit	.963	.978	.970	.849	.954	.857	.965	.873	.984	.994	.946	.998
<i>Panel B: Penetration measured in terms of bank numbers</i>												
Penetration (number)	.295***		.263***	-.205**	.265*	.080	.210***	-.029	.230**	.352***	-.072	.187***
	(.075)		(.075)	(.082)	(.141)	(.067)	(.064)	(.055)	(.109)	(.036)	(.074)	(.034)
De novo penetration (number)		.053										
		(.048)										
M&A penetration (number)		.166**										
		(.069)										
Observation	129	129	78	51	80	49	71	58	61	68	77	52
Goodness of fit	.953	.975	.968	.800	.944	.872	.988	.885	.983	.995	.965	.998
Dependent variable: continuous-time curve model based PRH (domestic banks)												
<i>Panel C: Penetration measured in terms of assets</i>												
Penetration (assets)	.067**		.803***	.054	.064	.027	.104*	.025	.152***	.159***	.105*	.124***
	(.023)		(.117)	(.033)	(.044)	(.037)	(.061)	(.047)	(.049)	(.060)	(.057)	(.039)
De novo penetration (assets)		.220***										
		(.038)										
M&A penetration (assets)		.063***										
		(.024)										
Observation	129	129	78	51	80	49	71	58	61	68	77	52
Goodness of fit	.994	.994	.965	.978	.995	.995	.962	.979	.997	.998	.972	.999
<i>Panel D: Penetration measured in terms of bank numbers</i>												
Penetration (number)	.358***		.581***	.080	.153**	-.085	.092*	.044	.216**	.132***	.429***	.065**
	(.059)		(.081)	(.052)	(.060)	(.111)	(.053)	(.069)	(.091)	(.041)	(.090)	(.026)
De novo penetration (number)		.139***										
		(.048)										
M&A penetration (number)		.258***										
		(.061)										
Observation	129	129	78	51	80	49	71	58	61	68	77	52
Goodness of fit	.991	.994	.981	.995	.995	.992	.954	.978	.996	.997	.972	.999

Notes: Four countries, Bolivia, Colombia, Korea and Philippines, are removed from the sample because they may not be in long-run structural equilibrium. Other variables and dummies are included in regressions but not reported in the table. Standard errors are in parentheses.

To save space, here we show only the coefficients on the specific penetration variables. However, the full set of control variables is included in these regressions as in the benchmark estimations.

* 10% Significance level.

** 5% Significance level.

*** 1% Significance level.

Table A1

Number of observations of banks per country-year pair.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Hong Kong	26	27	26	26	23	22	21	22	20	22	19	19	273
Indonesia	45	23	34	39	37	39	41	42	48	37	40	21	446
Korea	25	12	17	15	14	15	15	14	15	13	13	11	179
Malaysia	34	30	26	21	23	22	22	21	21	19	19	19	277
Philippines	30	31	30	28	23	27	25	22	22	14	14	14	280
Singapore	13	13	12	12	12	12	12	12	5	5	5	5	118
Thailand	12	9	12	12	17	17	18	17	14	15	13	12	168
Argentina	70	75	69	63	60	38	42	46	42	37	29	37	608
Bolivia	37	37	10	10	11	11	11	11	11	11	11	11	182
Brazil	100	109	100	106	106	96	81	76	61	67	55	48	1005
Chile	25	22	22	23	22	21	21	21	20	19	19	15	250
Colombia	29	22	21	20	24	23	24	24	19	13	13	13	245
Mexico	27	24	30	27	25	24	21	22	22	20	14	14	270
Paraguay	12	18	20	20	16	16	13	13	13	11	13	13	178
Peru	20	20	15	17	15	15	15	15	11	11	9	11	174
Uruguay	10	13	14	21	18	17	15	19	12	16	14	14	183
Venezuela	17	20	38	34	30	27	26	22	16	16	16	16	278

Whether proponents or opponents of foreign bank penetration are correct remains ultimately an empirical question. We provide answers to this question in this paper.

Moreover, we contribute to the literature by exploring the channels through which foreign bank penetration may alter the competitive structure of domestic banking markets in host emerging economies. Using bank-level data to identify foreign banks and to obtain measures of banking competition in seventeen Asian and Latin American economies during the period 1997–2008, we are able to provide robust empirical evidence for a positive link between foreign bank penetration and banking competition in the host emerging economies.

We also find that this link is associated with a spillover effect from foreign bank entry to domestic banking market competition, and that this effect is more conspicuous in recent years, but it is present only when banks with certain qualifications enter domestic markets. In particular, this spillover effect is stronger when foreign banks are more efficient and less risky than domestic counterparts, and when these foreign banks enter less concentrated banking markets in the host emerging economies. We also find that the entry of de novo foreign banks plays a more significant role in increasing competition than does the entry of foreign banks through mergers and acquisitions.

Our findings have important policy implications for both policy makers and banking regulators in host emerging countries that open their doors to foreign banks. Further research is called for in identifying the additional channels through which foreign bank entry can more effectively contribute to enhancing competition and efficiency in the banking sectors of host emerging economies.

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Appendix A

See Table A1.

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