STOCK MARKET CONSOLIDATION AND US EQUITY HOME BIAS

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ABSTRACT

In the last three decades, many stock markets around the world have consolidated their trade platforms or signed agreements to facilitate cross-country investments. The objective of this study is to investigate the effect of stock market consolidation on US equity home bias (HB) using Ordinary Least Square (OLS) panel regression controlling for numerous economic and stock market characteristics. We distinguish two stages of market consolidation into (i) an announcement stage and (ii) an implementation stage. The samples include 22 stock markets under six stock market consolidation groups during the year 2001-2016. The results suggest that the stock market consolidation is not a significant factor that could reduce US HB towards the consolidation groups that include US markets. However, the stock market consolidation even increases US home bias toward the consolidation groups that exclude US markets implying that US investors are less interested in investing in the equity markets of other groups. In addition, governance, indirect cost of investment, direct cost of investment, incentive of investment, financial crisis, and size are also important factors that impact HB.

Keywords : Stock Market Consolidation, Equity Home Bias, Equity Investment

INTRODUCTION

In the last three decades, many stock markets around the world have consolidated their trade platforms or signed agreements to facilitate cross-country investments. The motivation behind the stock market consolidation can be explained by merger and acquisition (M&A) theory of efficiency theory and synergy gain theory. According to the efficiency theory, companies went through M&A to enhance efficiency by taking advantage of specialized skills, sharing technologies and reducing transaction cost (Wolfe et al. 2011). Similar to firm-level M&A, stock market consolidation through M&A also aims at enhancing efficiency through the same channel. The fully consolidated stock markets are expected to share specialized skills and advance technology; thus, reducing the transaction cost of investment.

According to the synergy gain theory, companies went through M&A to gain benefit from synergy through economies of scale of operation where fixed cost is reduced due to larger scale of production and economies of scope where the two companies combine complementary resources (Leepsa and

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Mishra 2016). This motivation is also applied to the stock market consolidation where the fixed cost due to the common trading platform is distributed among the stock markets that are member of the consolidation group to achieve economies of scale. In addition, each stock markets can combine possible complementary resources to achieve economies of scope.

Early studies have observed the so-called "home bias puzzle" or the phenomenon where the domestic investors tend to outweigh domestic investment comparing to foreign investment (French and Poterba 1991; Cooper and Kaplanis 1994; Bekaert and Harvey 1995; Chan et al. 2005). Many studies tried to solve this puzzle by investigating the factors driving HB (Daly and Vo 2013; Mishra 2008; Mishra 2014; Dahlquist et al. 2003; Fidora et al. 2007; Chan et al. 2005; Ahearne et al. 2004). However, to the best of our knowledge, none of the previous literature has looked at the effect of the stock market consolidation on HB. The stock market consolidation is believed to decrease the degree of equity home bias (HB) as it is easier for investors to buy equity across country. Lower HB means investors are willing to decrease their portfolio weight toward the domestic country and increase diversification opportunity abroad.

We will use the ICAPM optimal portfolio weight to investigate the US HB toward 22 destination countries around the world that experienced stock market consolidation during the year 2001-2016. Float-adjusted ICAPM HB will be used as a robust measure of HB. US investor is chosen because the US is part of two stock exchange consolidations during that period. Thus, choosing the US as a home country can distinguish between the effect of the attractiveness of the destination countries consolidation group and the ease of being under the same stock market consolidation group.

The objectives are 1) to compare US HB between six stock market consolidation groups 2) to compare mean US HB in different stages and 3) to examine the factors affecting US HB especially the effect of different stages of the stock market consolidation on US HB controlling for numerous economic and stock market characteristics.

The result of this study is particularly relevant for the US policymakers when making any further policy decision regarding stock market consolidation as they can see the degree of US HB toward different countries around the world over time and the effect of the stock market consolidation on HB as well as the other factor that affect HB.

The rest of this paper is organized as followed: section 2 gives the literature review. Section 3 shows the data and variables used. Section 4 reveals the methodology including the conceptual and empirical model. Section 5 provides the result and discussion, and section 6 concludes.

LITERATURE REVIEW

There are two different settings that the previous studies used to calculate home bias. Firstly, the home bias from a home country perspective against the rest of the world (Chan et al. 2005; Fidora et al. 2007; Baele et al. 2007; Anderson et al. 2011). Secondly, the home bias in the bilateral setting which reflects the degree of the home bias from a home country perspective against each destination countries (Dahlquist et al. 2003; Ahearne et al. 2004; Mishra 2014; Daly and Vo 2013; Mishra 2008). In this study, we will apply the home bias in a bilateral setting as we would like to investigate the US HB against each destination countries under the six consolidation groups.

It is generally accepted that HB can be calculated from the formula

$$HB = 1 - \frac{Actual}{Optimal}$$

where actual is the actual weight of foreign securities holdings by domestic investors and optimal is the optimal foreign portfolio weights domestic investors should hold. When the actual and the optimal weights are equal, the home bias value is zero meaning

domestic investors diversify their investment abroad according to the optimal portfolio weight, and there is no home bias. When investors hold only domestic asset, the actual weight is zero and the home bias value is one meaning domestic investors do not diversify their investment abroad and invest only in their country. In most case, the actual weight is lower than the optimal weight. Therefore, the value of home bias lies between zero and one where the degree of home bias is higher when the value is closer to one. For example, if the actual weight is 20% and the optimal weight is 80%, the value of home bias will be 0.75.

Previous literatures widely used International Capital Asset Pricing Model (ICAPM) to calculate optimal portfolio weight due to its simplicity in term of calculation and interpretation (Baele et al. 2007; Daly and Vo 2013; Dahlquist et al. 2003; Fidora et al. 2007; Chan et al. 2005; Ahearne et al. 2004). ICAPM assumes that the optimal weight of domestic investor's foreign securities holding equals to the weight of each country market capitalization in the world market capitalization. However, Mishra (2008) and Mishra (2014) argue that the ICAPM home bias measure should be adjusted by the number of float share available to trade in each country.

Many studies argue that there has been a decreasing trend of home bias. Baele et al. (2007) found that home bias decreases sharply at the end of the 1990s for many countries following globalization and regional integration. From a single country perspective, Daly and Vo (2013) found that the Australian's equity home bias toward most destination countries decreased significantly from 1997 to 2005. However, recent evidence suggests that the degree of home bias is still high in many countries around the world with the value above 0.50 (Baele et al. 2007; Daly and Vo 2013; Mishra 2014).

There is also evidence that the degree of equity home bias of a country tends to be lower towards developed countries. Daly and Vo (2013)

discover that Australia's equity HB is lower toward the US and UK when comparing to other countries in the sample. Mishra (2008) found that in 2004, Australia has the highest home bias value of 0.970 toward the Czech Republic while the lowest value is 0.331 toward The Netherlands. In addition, Ahearne et al. (2004) reveals that US equity home bias varies from 0.98 for China to 0.44 for Ireland and the US home bias towards developed countries tend to be lower than the emerging countries in general.

According to the previous literature, the factors that affect home bias can be divided into the category of direct cost, indirect cost, incentive of investment, size, governance. First, the direct cost of investing in the destination country proxy by the withholding tax of dividend in destination countries (WT) and the capital account openness index (CO). Second, the indirect cost is the information cost of investing in the destination country proxy by the bilateral trade (BILAT), internet usage (INT) and distance (DIST). Third, the incentive of investment reflects the degree of the investment attractiveness of destination countries proxy by exchange rate volatility (EXVOL), diversification benefit (DIVER), risk-adjusted return (RAR), and stock market liquidity (ML). Next, the size variables can be proxy by the market capitalization (MCAP) and GDP growth (GROWTH). The governance variable is proxy by the governance indicator (GOV).

Table 1 summarizes previous literature on HB determinants and distinguishes those who found each variable to be a significant or insignificant factor that affect HB.

Table 1 HB determinants literature

Category	Variables	Significant	Insignificant
Direct cost	WT	Stulz (1981), Cooper and Kaplanis (1986), Mishra (2014)	Chan et al. (2005)
	CO	Ahearne et al. (2004), Daly and Vo (2013)	Chan et al. (2005)
Indirect cost	BILAT	Baele et al. (2007), Mishra (2008), Mishra (2014)	Fidora et al. (2007)
	INT	Mishra (2008)	-
	DIST	Portes and Rey (2005)	-
Incentive of investment	EXVOL	Fidora et al. (2007), Mishra (2014), Daly and Vo (2013)	-
	DIVER	Fidora et al. (2007), Mishra (2014) Mishra (2008)	Chan et al. (2005)
	RAR	-	Daly and Vo (2013), Ahearne et al. (2004), Mishra (2008)
	ML	Chan et al. (2005) and Daly and Vo (2013)	-
Size	MCAP	Chan et al. (2005), Anderson et al. (2011) and Mishra (2014)	Dahlquist et al. (2003) and Daly and Mishra (2014)
	GROWTH	Fidora et al. (2007) and Anderson et al. (2011)	Dahlquist et al. (2003) and Chan et al. (2005)
Governance	GOV	Chan et al. (2005), Fidora et al. (2007) and Daly and Vo (2013)	Dahlquist et al. (2003)

DATA AND VARIABLES

1) Sample

We estimated the bilateral US home bias with 22 destination countries. **Table 2** lists the stock market consolidation group and the consolidation timeline. Our sample covers the 2001-2016 period so that we have the data for the pre-and the post-consolidation years for the six stock market consolidations. We use yearly data as the US holding of equity data is only available on an annual basis. There are three subsamples used in this study as we would like to distinguish the result of the consolidation groups that include the US stock market and the consolidation groups that exclude the US stock market.

Table 2 Stock markets consolidation group

Consolidation Group	Stock Market Index	Announcement	Implement
NYSE-EURONEXT	Amsterdam Stock Exchange (Netherland)	September 2000	November 2003
	Brussels Stock Exchange (Belgium)	September 2000	November 2003
	Paris Stock Exchange (France)	September 2000	November 2003
	Lisbon Stock Exchange (Portugal)	February 2002	November 2003
	NYSE (USA)	June 2006	April 2007
NASDAQ- OMX	Stockholm Stock Exchange (Sweden)	May 2003	September 2004
	Helsinki Stock Exchange (Finland)	May 2003	September 2004
	Estonia Stock Exchange (Estonia)	May 2003	September 2004
	Copenhagen Stock Exchange (Denmark)	November 2004	February 2005
	Iceland Stock Exchange (Iceland)	September 2006	April 2007
	NASDAQ (USA)	May 2007	February 2008
LSE-BI	London Stock Exchange (UK)	June 2007	October 2007
	Italian Stock Exchange (Italy)	June 2007	October 2007
CEESEG	Budapest Stock Exchange (Hungary)	November 2008	January 2010
	Ljubljana Stock Exchange (Slovenia)	November 2008	January 2010
	Prague Stock Exchange (Czech Republic)	November 2008	January 2010
	Vienna Stock Exchange (Austria)	November 2008	January 2010
MILA	Lima Stock Exchange (Peru)	September 2009	May 2011
	Colombia Stock Exchange (Colombia)	September 2009	May 2011
	Chile Stock Exchange (Chile)	September 2009	May 2011
	Mexican Stock Exchange (Mexico)	July 2014	December 2014
ATL	Bursa Malaysia (Malaysia)	April 2011	September 2012
	Singapore Exchange (Singapore)	April 2011	September 2012
	Stock Exchange of Thailand (Thailand)	April 2011	October 2012

timeline

For the consolidation groups that include the US stock market, the first sample is NYSE-EURONEXT group consisting of 64 country-year observations. The second sample is NASDAQ-OMX group consisting of 80 country-year observations. For the consolidation groups that exclude the US stock market, the sample includes LSE-BI, MILA, CEESEG and ATL group consisting of 208 country-year observations.

2) Variable Description

The dependent variable is the degree of the US HB toward 22 destination countries under each stock market consolidation group. The holding data is obtained from the IMF's Coordinated Portfolio Investment Survey (CPIS) while the market capitalization data is from the World Bank's World Development Indicator (WDI).

The independent variables are dummy consolidation variables which are the variables of interest in this study, we included the dummy for the stock market consolidation announcement period (ANNOUNCE) which equals to 1 from the announcement date to the implement date and 0 otherwise and the dummy for stock market consolidation implement period (IMPLEMENT) which equals to 1 from the implement date until the end of the sample and 0 otherwise to distinguish between the effect from the announcement of the deal and the implementation of the deal. This data is obtained from the stock market consolidation's website.

We included the dummy control variable for the global financial crisis started in the US (CRISISUS) which equals to 1 during the period 2007 - 2009 and 0 otherwise and the dummy for the European debt crisis (CRISISEU) which equals to 1 during the period 2009 - 2011 and 0 otherwise. The crisis period data are obtained from the International Monetary Fund (IMF)'s World Economic Outlook (WEO) crisis and recovery report.

We also control for the direct cost including the withholding tax (WT) of dividend in the destination countries. The withholding tax is different for each destination country where the country that sign a treaty with the US charge lower tax. The tax ranges from 0 to 30 percent. This data is obtained from the Ernst and Young worldwide corporate tax guide. The other direct cost is the capital account openness (CO) proxy by

Chinn-Ito capital account openness. The index ranks the score of the capital account openness in each country from 0 meaning no capital account openness to 1 meaning full capital account openness using the information provided in the International Monetary Fund (IMF) Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). The data can be obtained from the Chinn-Ito index website.

In addition, the indirect cost includes bilateral trade (BILAT) proxy by bilateral import and export between US and destination country over US total import and export with all partner country. This data can be obtained from the United Nations website. Next, the usage of internet of the destination country (INT) calculated from the share of internet user in the destination country's population. The data is obtained from the world bank's world development indicator. The last indirect cost of home bias is the natural logarithm of the distance between the US capital city to the destination country's capital city (DIST). Many studies used this variable as a proxy for the information cost of cross-country equity investment. The data can be obtained from the chemical ecology website.

Furthermore, the Incentive of Investment variable includes the exchange rate volatility (EXVOL) calculated from the standard deviation of the previous year monthly exchange rate. Exchange rate is expressed in terms of each domestic currency per unit of USD. The exchange rate data can be obtained through Datastream. The other incentive of investment variable is the diversification opportunity of the destination country (DIVER) calculated from 1 minus the correlation between US and destination country monthly MSCI return in the previous year. The monthly return data is obtained from Datastream. Next, the historical risk-adjusted return of the destination countries (RAR) calculated from the historical average of monthly returns of the MCSI index over the standard deviation of returns in the previous year. The monthly return data is obtained from Datastream. The last incentive of investment variable is the equity market liquidity (ML) calculated from stock traded per GDP in the previous year. The data is obtained from the world bank's world development indicator.

To control for the size of the destination country, the first variable is market capitalization (MCAP) proxy by the destination country's market capitalization divided by the world market capitalization. Both of this data is available in the world bank's world development indicator website. The other variable growth proxy by the growth of the GDP per capita of the destination country. This data is obtained from Datastream.

Finally, to control for the governance of the destination country, we include the governance indicators (GOV) provided by the World Governance Indicators (WGI) normalized to between 0 and 1 with 1 meaning perfect governance and 0 meaning poor governance. All the variable definitions are summarized in **Table 3**

Table 3 Variable Definitions

Category	Independent Variables	Measurement
Dependent Variable	HB	HB= US HB toward 22 destination countries
Dummy Consolidations	ANNOUNCE	Stock market consolidation announcement period (= 1 from the announcement date to the implement date and 0 otherwise)
	IMPLEMENT	Stock market consolidation implement period (= 1 from the implement date onward and 0 otherwise)
Financial Crises	CRISISUS	US global financial crisis (= 1 during the period 2007 to 2009 and 0 otherwise)
	CRISISEU	European debt crisis (= 1 during the period 2009 to 2011 and 0 otherwise)
Direct Cost of investment	WT	Withholding tax of dividend in destination countries
	CO	Chinn-Ito capital account openness index
Indirect Cost of investment	BILAT	Bilateral import and export between US and each destination country over US total import and export with all partner country
	INT	Share of internet user in destination country's population
	DIST	Distance from capital to capital
Incentive of Investment	EXVOL	Standard Deviation of monthly exchange rate. Exchange rate is expressed in terms of local currency per USD
	DIVER	1- correlation between US and destination country monthly MSCI return
	RAR	average monthly returns over the standard deviation of returns in the previous year of destination country
	ML	stock traded per GDP of destination country
Size	MCAP	Market capitalization/ World market capitalization
	GROWTH	Growth in the GDP per capita of the destination country
Governance	GOV	World governance indicators (WGI) index normalize 0-1

3) Expected Sign and Hypothesis

For the comparison of US HB across consolidation groups, the hypothesis is that the mean of the US HB for the emerging countries should be higher than the developed countries as found by many previous literatures. We also expect the mean US HB for the consolidation groups that exclude US stock markets to be higher than those of the group that include the US stock markets.

When looking at the mean US HB in different period, for consolidation groups that include US stock

markets, we expect the mean US HB to decrease for both the ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage as the US investors are now facilitated to trade stock with those stock markets. The IMPLEMENT stage should have a higher decrease than the ANNOUNCE as it is the stage where stock markets under the consolidation groups are allowed to trade under the common trading platform.

For consolidation groups that exclude US stock markets, we expect the mean US HB to decrease for both ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage as the bigger consolidated markets make these stock markets more attractive to invest in. However, the mean US HB for the stock markets under consolidation groups that exclude US stock markets might increase during ANNOUNCE and IMPLEMENT stages as the US investors might be more interested in investing in its own group than other groups.

When analyzing the factors affecting US HB, for the consolidation group that include US stock markets, the ANNOUNCE and IMPLEMENT variables are expected to have a negative effect on US HB as it is now easier for the US investors to invest in those countries. For the groups that exclude US stock markets, we also expect the ANNOUNCE and IMPLEMENT to have a negative effect as the bigger consolidated markets make these stock markets more attractive to invest in. However, there is also a possibility that ANNOUNCE and IMPLEMENT might have a positive effect on US HB since as the US since the US investors might be more interested in investing in its own group than other groups.

For the financial crisis variable, we expect CRISISUS to have a negative effect on the US HB as US investors seek higher return in other countries. On the other hand, Next, CRISISEU is expected to have a positive effect on US HB as US investors would want to invest less in the EU countries.

For the direct cost of home bias, WT of dividend yield in destination country is expended to have a positive effect on the US HB as it directly affects US investors return on investment. Next, CO is expected to have a negative effect on the US HB as the higher the index means that the destination country has higher capital account openness.

For the indirect cost, BILAT is expected to have a negative effect on US HB as the higher BILAT is believed to lower the information cost between the two countries as investors can get more regulatory and accounting information via trade. Furthermore, INT is expected to have a negative effect on US HB as the higher INT means the internet is more accessible and the information cost of investing in the destination country should decline. Lastly, DIST is expected to have a positive effect on US HB as the higher DIST believed to increase the information cost.

For the incentive of investment, EXVOL is expected to have a positive effect on US HB as people would prefer to invest in the country with less volatile exchange rate. Next, DIVER is expected to have a negative effect on US HB as the higher the DIVER the higher the incentive that the US investors want to invest in that stock markets. In addition, RAR of the destination countries is expected to have a negative effect on US HB as the higher RAR gives more incentive of investment and the US should increase equity investment into that country. Lastly, ML is expected to have a negative effect on US HB as the higher the ML makes the destination country more attractive to invest in.

For the control variable regarding the size, MCAP and GROWTH of the destination countries makes the destination country more attractive for the US investors to invest in. Thus, both of this variable is expected to have a negative effect on US HB.

For the governance variable, GOV is expected to have a negative effect on the US HB as the higher the WGI means the governance performance of the destination country is strong. As investors would want

to invest in the country with better governance, the US investors would be more interested in investing in such a country. **Table 4** summarizes the expected sign for each independent variable.

Table 4 Expected sign

Independent Variables	Expected Sign
ANNOUNCE	-
IMPLEMENT	-
CRISISUS	-
CRISISEU	+
WT	+
CO	-
BILAT	-
INT	-
DIST	+
EXVOL	+
DIVER	+
RAR	-
ML	-
MCAP	-
GROWTH	-
GOV	-

METHODOLOGY

1) Conceptual Model

As mentioned earlier in the literature review part, it is generally accepted that the bilateral home bias can be calculated from equation (1)

$$\textbf{HB}_{\textbf{ij}} = \textbf{1} - \frac{\textbf{ACT}_{\textbf{ij}}}{\textbf{OPT}_{\textbf{ij}}} \qquad (1)$$

where HB_{ij} is the home bias of the country i toward country j. ACT_{ij} is the actual weight that the country i invest in country j calculated from the share of country i equity investment in destination country j. OPT_{ij} is the optimal weight that the country i should invest in country j calculated from the proportion of country j's market capitalization in the world market capitalization. In this chapter, the home country is US and the destination countries are the 22 countries that went under the 6 stock market consolidations. The actual weight of foreign holdings of domestic country can be calculated from equation (2)

$$Actual = \frac{\text{Foreign equity asset}}{\text{Foreign equity asset} + \text{Domestic market capitalization} - \text{Foreign equity liability}}$$

$$(2)$$

where the nominator is the domestic country's holding of foreign equity asset in each destination country and the denominator is the domestic country's total equity holding calculated from domestic country's holding of foreign equity asset plus the domestic total market capitalisation minus the foreign country's holding of domestic equity. The actual weight is then the domestic country's foreign equity holding divided by the total equity holding.

For the optimal portfolio weight, many studies use International Capital Asset Pricing Model (ICAPM) to calculate optimal portfolio weight (Ahearne et al. 2004; Chan et al. 2005; Sercu and Vanpée 2008; Bekaert and Wang 2009; Chan et al. 2009; Lau et al. 2010). The ICAPM assumes that every investor is of the mean-variance type and has the same beliefs about the distribution of real asset returns. All investors face identical investment opportunities and there are no transaction costs or taxes. The ICAPM implies that all investors hold the world market portfolio, which is a portfolio where the weight of each asset is equal to its relative share in the world market capitalization (Cooper and Kaplanis 1994). ICAPM optimal weight can be calculated from equation (3)

$$\textbf{ICAPM Optimal Weight} = \frac{\textbf{Market Capitalization of destination countries}}{\textbf{World Market Capitalization}}$$

$$(3)$$

Where the nominator is the destination countries' market capitalization of listed companies and the denominator is the world market capitalization of listed companies. To interpret the degree of bilateral home bias, the home bias value is zero when the actual and the optimal weights are equal, meaning domestic investors diversify their investment in each destination country according to the optimal portfolio weight, and there is no home bias toward that destination country. When investors hold only domestic asset, the actual weight is zero and the home bias value is one meaning domestic investors do not diversify their investment in that destination country and invest only in their country.

We will use float-adjusted HB (HB_FLOAT) as a robustness check for HB measure. Float share is the shares that are not closely held by small groups of

controlling shareholders and are freely available to trade in each country. This data is obtained from the Worldscope database access via Datastream. To calculate HB_FLOAT, the ICAPM optimal weight as shown in equation (3) is adjusted by the percentage of float share available to trade in each stock markets. The float-adjusted market capitalization of the destination countries is calculated from the market capitalization of destination countries multiplied by the percentage of float share in that country as shown in equation (4).

$$Float$$
$$- adjusted\ market\ capitalization\ of\ the\ destination\ countries$$
$$= Market\ Capitalization\ of\ destination\ countries$$
$$* \%\ of\ float\ share\ in\ that\ country$$
$$(4)$$

The float-adjusted world market capitalization is the sum of the float-adjusted market capitalization of all the countries that the US invest in as shown in equation (5).

$$Float - adjusted\ world\ market\ capitalization$$
$$= \sum_{0}^{n} Float$$
$$- adjusted\ market\ capitalization\ of\ the\ destination\ countries$$
$$(5)$$

Empirical Model

To investigate the stock market consolidations effect on US HB, we employed a random effect OLS panel regression to estimate equation (6). We use random effect as the Breusch and Pagan test suggests that the random effect model is preferred to the pooled OLS model and the Hausman test suggests that the random effect is preferred to the fixed effect model. Independent variable of different stages of stock market consolidation ANNOUNCE and IMPLEMENT are included. We also include the control variable of US global financial crisis, Euro debt crisis, direct cost of investment, indirect cost of investment, incentive of investment, size and governance.

$$\begin{aligned}
HB_{i,t} = \alpha_{i,t} &+ \beta_1 ANNOUNCE_{i,t} + \beta_2 IMPLEMENT_{i,t} \\
&+ \beta_3 CRISISUS_{i,t} + \beta_4 CRISISEU_{i,t} \\
&+ \beta_5 WT_{i,t-1} + \beta_6 CO_{i,t-1} \\
&+ \beta_7 BILAT_{i,t-1} + \beta_8 INT_{i,t-1} \\
&+ \beta_9 DIST_{i,t-1} \\
&+ \beta_{10} EXVOL_{i,t-1} + \beta_{11} DIVER_{i,t-1} \\
&+ \beta_{12} RAR_{i,t-1} + \beta_{13} ML_{i,t-1} \\
&+ \beta_{14} MCAP_{i,t-1} \beta_{15} GROWTH_{i,t-1} \\
&+ \beta_{16} GOV_{i,t-1} + \varepsilon_{i,t}
\end{aligned}$$
$$(6)$$

To make sure that the result is robust, we will report Newey-West robust standard error in the result to avoid potential issue arising from heteroscedasticity and autocorrelation. To check for omitted variable bias issue, we apply the Ramsey reset test and found that there is no omitted variable bias in the model. We also solved for the reverse causality problem by including the lagged independent variable as shown in equation (6). The result is clustered by the consolidation group to make sure that the result is not affected by the common characteristics within each group. To take into account for the outlier, all the variables are winsorized at a 95% confidence interval.

RESULTS AND DISCUSSION

1) **Comparison of US HB**

To see the overall picture, we compare the mean US HB for six stock market consolidation groups in our sample during the year 2001-2016. According to **Figure 1**, the stock market consolidation group that has the highest mean of the US HB is MILA (0.84) followed by ATL (0.83), CEESEG (0.82), NASDAQ-OMX (0.77), NYSE-EURONEXT (0.69), and the group that has the lowest mean is LSE-BI (0.63)

Figure 1 Mean US Home Bias (2001-2016)

Mean US HB (2001-2016)
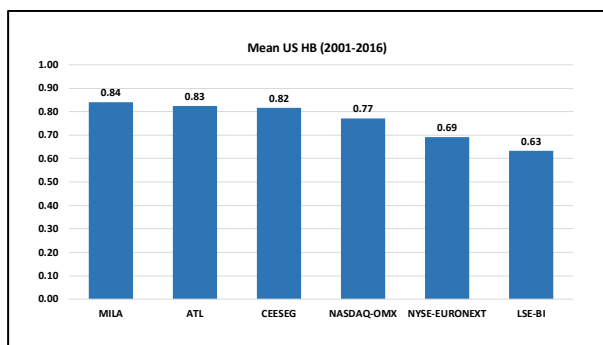
Consistent with the hypothesis, the stock market consolidation groups that contain emerging market country stock markets (MILA, ATL, CEESEG) seems to have a higher mean US HB comparing to those groups that contain developed country stock markets (NYSE-, NASDAQ-OMX, EURONEXT, LSE-BI). In addition, the mean US HB for the consolidation groups that exclude US stock markets (ATL, CEESEG, MILA) are higher than those of the group that include the US stock markets (NYSE-EURONEXT, NASDAQ-OMX).

This result is consistent when we look at the mean US HB for each stock market within the consolidation group that contain both developed and EM stock markets which are ATL and CEESEG. For ATL, the mean US HB for Malaysia which is EM country is higher than Singapore which is a developed country. For CEESEG, the mean US DB for the Czech Republic which is EM country is higher than Hungary and Austria which are developed countries. This result is consistent with the previous literature where the degree of HB toward EM countries is higher than those of the developed country (Daly and Vo 2013; Mishra 2008; Ahearne et al. 2004).

2) **Mean US HB in different stages**

We compare the mean US HB in the pre-announce, ANNOUNCE and IMPLEMENT stages for the stock market consolidation groups including US stock markets and the groups that exclude the US
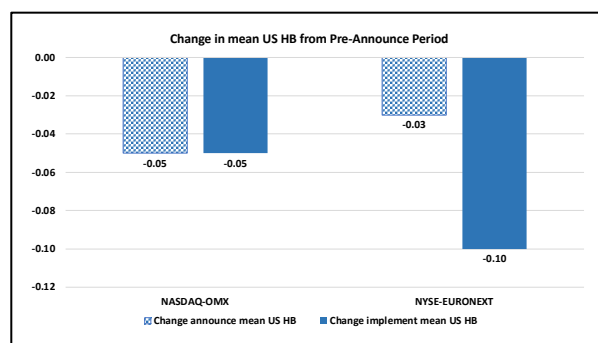
stock markets. For the groups that include the US stock market, **Figure 2** shows that mean US HB decreased for the ANNOUNCE and IMPLEMENT comparing to the pre-announce stage for both NYSE-EURONEXT and NASDAQ-OMX group.

Figure 2 Mean US HB for stock market consolidation groups including US stock markets in different stages
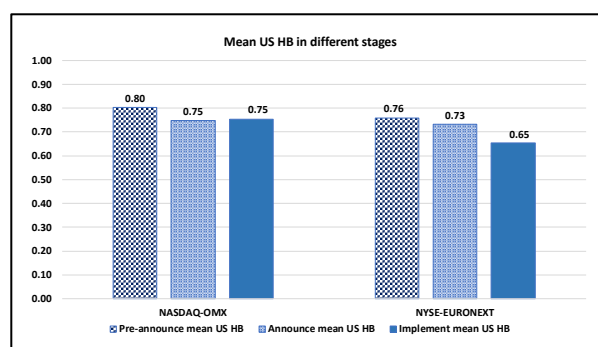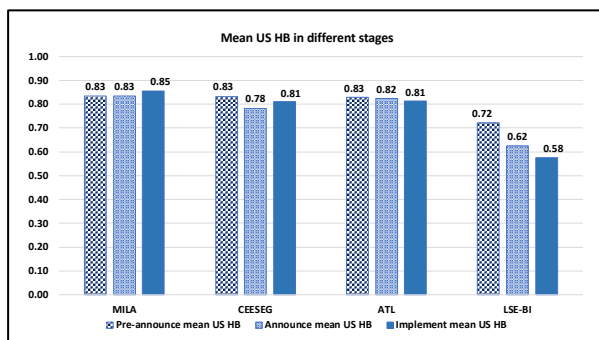

To make it easier to understand, we compare the change in mean US HB of ANNOUNCE and IMPLEMENT stages from the pre-announce stage for the two groups. According to **Figure 3**, for announce stage, NASDAQ-OMX has a higher decrease (-0.05) than the NYSE-EURONEXT (-0.03). For implement stage, NYSE-EURONEXT has a higher decrease (-0.10) than the NASDAQ-OMX (-0.05).

**Figure 3 Change in mean US HB from pre-announce stage**

For the groups that exclude the US stock market, **Figure 4** shows that mean US HB decreased for the ANNOUNCE and IMPLEMENT comparing to the pre-announce stage for CEESEG, ATL and LSE-BI group. However, the ANNOUNCE stage for MILA is the same as the pre-announce stage and increase a bit during the IMPLEMENT stage.

Figure 4 Mean US HB for stock market consolidation groups excluding US stock markets in different stages

To make it easier to understand, we compare the change in mean US HB of ANNOUNCE and IMPLEMENT stages from the pre-announce stage for all the four groups. According to **Figure 5**, for announce stage, LSE-BI has the highest decrease (-0.10) followed by CEESEG (-0.05), ATL (0.00) and MILA (0.00). For implement stage, LSE-BI has the highest decrease (-0.15) followed by CEESEG (-0.02), ATL (-0.01) and MILA (0.02).

Figure 5 Change in mean US HB from pre-announce stage
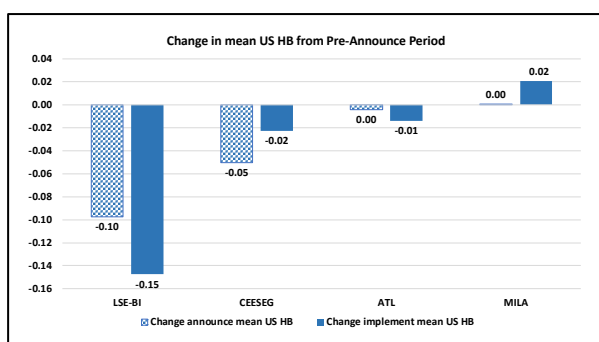
Consistent with the hypothesis, for the consolidation groups that include US stock markets, we found that the mean US HB decreases after ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage. This decrease is the effect of the fact that the US investors are now facilitated to trade stock with those stock markets. We also found that the mean US HB experience higher decrease during IMPLEMENT comparing to ANNOUNCE stage for NYSE-EURONEXT group as it is the stage where stock markets under the consolidation groups is allowed to trade under the common trading platform. Consistent with previous studies, there is evidence of an increase in foreign bias during the stock market consolidations (Giofré 2016).

For consolidation groups that exclude US stock markets, the mean US HB decreases for both ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage for most of the groups as the bigger consolidated markets make these stock markets more attractive to invest in. However, the mean US HB for MILA experience a slight increase in the IMPLEMENT stage as the US investors might be more interested in investing in its own group than investing in other groups.

3) Factors affecting US HB

From the previous section, we can see that the mean US HB for most consolidation groups decreased during the announcement and implement stages. However, this could be due to other factors, so we conduct the OLS random effect panel regression to see the effect of stock market consolidation on US HB controlling for other factors such as financial crisis, direct cost of investment, indirect cost of investment, incentive of investment, size and governance. We first conduct the OLS fixed effect panel regression for the consolidation group that includes US stock markets (NYSE-EURONEXT and NASDAQ-OMX) and the consolidation group that exclude the US stock markets (LSE-BI, CEESEG, MILA and ATL).

We analyze separately the effect of the ANNOUNCE and the IMPLEMENT stages on US HB. We use ICAPM optimal weight adjusted for float share (FLOAT) and ICAPM optimal weight (ICAPM) as measures of US HB for the result shown in Model (1) HB_FLOAT and Model (2) HB_ICAPM respectively. **Table 5** shows the OLS random effect panel regression result for NYSE-EURONEXT consolidation group.

For Model (1), the result shows that ANNOUNCE statistically significantly increases US HB by 0.090 while IMPLEMENT does not have a significant effect on US HB. For the control variable, the variable that has the highest positive and significant impact on US DB is BILAT (23.341). Furthermore, the variable that has the highest negative and significant impact on US HB is MCAP (-18.298) followed by INT (-0.844) and DIVER (-0.146). However, CRISISUS, CRISISEU, CO, DIST, EXVOL, RAR, ML GROWTH and GOV do not have a significant effect on US HB. The R-square for model (1) is 0.91.

For model (2), the result shows that ANNOUNCE and IMPLEMENT does not have a significant effect on US HB. For the control variable, the variable that has the highest positive and significant impact on US HB is EXVOL (0.995) followed by GROWTH (0.105). Furthermore, the variable that has the highest negative and significant impact on US HB is GOV (-1.192) followed by DIST (-0.600) and INT (-0.312). However, CRISISUS, CRISISEU, CO, BILAT, DIVER, RAR, ML and MCAP do not have a significant effect on US HB. The R-square for model (2) is 0.91.

Table 5 Random effect OLS panel regressions include US markets: NYSE-EURONEXT

Dependent Variable =	Model (1) HB_FLOAT	Model (2) HB_ICAPM
ANNOUNCE	0.090**	0.008
	(-0.03)	(-0.02)
IMPLEMENT	0.041	-0.042
	(-0.09)	(-0.03)
CRISISUS	0.026	0.044
	(-0.07)	(-0.03)
CRISISEU	0.005	0.043
	(-0.04)	(-0.04)
CO	0.107	0.133
	(-0.26)	(-0.13)
BILAT	23.341***	-4.294
	(-2.00)	(-3.13)
INT	-0.844***	-0.312**
	(-0.24)	(-0.11)
DIST	0.100	-0.600***
	(-0.17)	(-0.08)
EXVOL	0.024	0.995**
	(-0.57)	(-0.38)
DIVER	-0.146*	0.073
	(-0.07)	(-0.08)
RAR	0.045	0.011
	(-0.03)	(-0.02)
ML	0.023	-0.037
	(-0.05)	(-0.02)
MCAP	-18.298***	-1.783
	(-1.30)	(-1.26)
GROWTH	0.07	0.105**
	(-0.06)	(-0.04)
GOV	-0.48	-1.192***
	(-0.34)	(-0.12)
CONSTANT	0.388	7.125***
	(-1.83)	(-0.80)
Obs	64	64
R-Square	0.91	0.91
Cluster Country	Yes	Yes

Note: The dependent variable is US equity Home Bias (HB). ANNOUNCE is dummy for stock market consolidation announcement period. IMPLEMENT is the dummy for stock market consolidation implement period. Next, CRISISUS is the dummy for the global financial crisis started in the US. CRISISEU is the dummy for the European debt crisis. WT is the withholding tax, omitted due to collinearity. CO is the capital account openness index. BILAT is the percentage of the bilateral trade between the US and the destination countries. INT is the percentage of the individual using the internet per population. DIST is the distance from capital to capital. EXVOL is exchange rate volatility. DIVER is the diversification opportunity of the destination countries. RAR is the risk adjusted return. ML is the equity market liquidity measure by the stock traded per GDP. MCAP is the market capitalization over GDP of the destination country's stock market. GROWTH is the growth in GDP per Capita. GOV is the WGI governance indicators. For interpretation, the statistical significance is reported against 10% (*), 5% (**) and 1% (***) significance level.

The result for the stock market consolidation effect on US HB are robust across the two models where IMPLEMENT does not have a significant effect on US HB. However, ANNOUNCE is positive and significant for model (1) but insignificant for model (2). For other control variables, the results are robust for INT where the variable is negative and statistically significant. In addition, the result for CRISISUS, CRISISEU, CO, RAR, ML are also robust where the variables are not statistically significant. On the other hand, the result for BILAT, DIVER and MCAP are significant in model (1) but not in model (2) and the result for DIST, EXVOL, GROWTH and GOV are significant in model (2) but not in model (1).

Table 6 shows the OLS random effect panel regression result for NASDAQ-OMX consolidation group. For Model (1), the result shows that both ANNOUNCE and IMPLEMENT does not have a significant effect on US HB. For the control variable, the variable that has the highest positive and significant impact on US HB is DIVER (0.058) followed by EXVOL (0.003). Furthermore, the variable that has the highest negative and significant impact on US HB is DIST (-

0.794) followed by GOV (-0.718). However, CRISISUS, CRISISEU, CO, BILAT, INT, RAR, ML, MCAP GROWTH and do not have a significant effect on US HB. The R-square for model (1) is 0.68.

For model (2), the result shows that ANNOUNCE and IMPLEMENT does not have a significant effect on US HB. For the control variable, the variable that has the highest positive and significant impact on US HB is CO (0.443) followed by EXVOL (0.995). Furthermore, the variable that has the highest negative and significant impact on US HB is DIST (-0.600) followed by GOV (-1.192). However, CRISISUS, CRISISEU, BILAT, INT, DIVER, RAR, ML, MCAP and GROWTH do not have a significant effect on US HB. The R-square for model (2) is 0.78.

Table 6 Random effect OLS panel regressions include US markets: NASDAQ-OMX

Dependent Variable =	Model (1) HB_FLOAT	Model (2) HB_ICAPM
ANNOUNCE	-0.078	-0.091
	(-0.08)	(-0.09)
IMPLEMENT	-0.069	-0.067
	(-0.11)	(-0.13)
CRISISUS	0.035	0.027
	(-0.08)	(-0.10)
CRISISEU	0.006	-0.018
	(-0.03)	(-0.03)
CO	0.214	0.443**
	(-0.16)	(-0.17)
BILAT	24.087	33.021
	(-20.19)	(-27.87)
INT	0.183	0.162
	(-0.12)	(-0.11)
DIST	-0.794***	-1.178***
	(-0.19)	(-0.24)
EXVOL	0.003*	0.006***
	(0.00)	(0.00)
DIVER	0.058**	-0.049
	(-0.02)	(-0.05)
RAR	-0.03	-0.013
	(-0.04)	(-0.04)
ML	-0.01	-0.018
	(-0.02)	(-0.03)
MCAP	-1.077	-12.031
	(-16.96)	(-20.43)
GROWTH	0.02	-0.017
	(-0.10)	(-0.10)
GOV	-0.718***	-1.103***
	(-0.08)	(-0.18)
CONSTANT	8.026***	11.596***
	(-1.57)	(-1.97)
Obs	80	80
R-Square	0.68	0.78
Cluster Country	Yes	Yes

Note: The dependent variable is US equity Home Bias (HB). ANNOUNCE is dummy for stock market consolidation announcement per IMPLEMENT is the dummy for stock market consolidation implement period. Next, CRISISUS is the dummy for the global financial crisis sta in the US. CRISISEU is the dummy for the European debt crisis. WT is the withholding tax, omitted due to collinearity. CO is the capital acce openness index. BILAT is the percentage of the bilateral trade between the US and the destination countries. INT is the percentage of the indivi using the internet per population. DIST is the distance from capital to capital. EXVOL is exchange rate volatility. DIVER is the diversifica opportunity of the destination countries. RAR is the risk adjusted return. ML is the equity market liquidity measure by the stock traded per G MCAP is the market capitalization over GDP of the destination country's stock market. GROWTH is the growth in GDP per Capita. GOV is WGI governance indicators. For interpretation, the statistical significance is reported against 10% (*), 5% (**) and 1% (***) significance level

The result for the stock market consolidation effect on US HB are robust across the two models where ANNOUNCE and IMPLEMENT does not have a significant effect on US HB. For other control variables,

the results are robust for DIST and GOV where the variable is negative and statistically significant. The result is also robust for EXVOL where the variable is positive and statistically significant. In addition, the result for CRISISUS, CRISISEU, BILAT, INT RAR, ML, MCAP and GROWTH are also robust where the variables are not statistically significant. On the other hand, the result for DIVER is significant in model (1) but not in model (2) and the result for CO is significant in model (2) but not in model (1).

Table 7 shows the OLS random effect panel regression result for the consolidation group excluding US stock markets. For Model (1), the result shows that both ANNOUNCE and IMPLEMENT do not have a significant effect on US HB. For the control variable, the variable that has the highest positive and significant impact on US HB is CRISISEU (0.037). Furthermore, the variable that has the highest negative and significant impact on US HB is BILAT (-2.864) followed by RAR (-0.012). However, CRISISUS, WT, CO, INT, DIST, EXVOL, DIVER, ML, MCAP, GROWTH and GOV do not have a significant effect on US HB. The R-square for model (1) is 0.55.

For model (2), the result shows that both ANNOUNCE and IMPLEMENT positively and significantly increases US HB by 0.040 and 0.027 respectively. For the control variable, the variable that has the highest positive and significant impact on US HB is WT (0.502) followed by DIVER (0.124) and CRISISEU (0.021). Furthermore, the variable that has the highest negative and significant impact on US HB is BILAT (-1.314). However, CRISISUS, CO, INT, DIST, EXVOL, RAR, ML, MCAP, GROWTH and GOV do not have a significant effect on US HB. The R-square for model (2) is 0.71.

Table 7 Random effect OLS panel regressions exclude US markets

Dependent Variable =	Model (1) HB_FLOAT	Model (2) HB_ICAPM
ANNOUNCE	0.025	0.040**
	(-0.02)	(-0.01)
IMPLEMENT	0.002	0.027*
	(-0.03)	(-0.01)
CRISISUS	0.040	0.006
	(-0.02)	(-0.02)
CRISISEU	0.037**	0.021**
	(-0.01)	(-0.01)
WT	0.188	0.502***
	(-0.17)	(-0.13)
CO	-0.073	-0.056
	(-0.10)	(-0.07)
BILAT	-2.864**	-1.314***
	(-0.94)	(-0.40)
INT	-0.027	-0.144
	(-0.13)	(-0.12)
DIST	0.086	0.046
	(-0.08)	(-0.03)
EXVOL	0.000	0.000
	(0.00)	(0.00)
DIVER	0.093	0.124***
	(-0.09)	(-0.03)
RAR	-0.012*	-0.014
	(-0.01)	(-0.01)
ML	-0.04	-0.031
	(-0.04)	(-0.02)
MCAP	2.761	-1.716
	(-1.94)	(-0.94)
GROWTH	0.138	0.069
	(-0.12)	(-0.08)
GOV	-0.013	0.032
	(-0.06)	(-0.04)
CONSTANT	0.084	0.438
	(-0.72)	(-0.26)
Obs	208	208
R-square	0.55	0.71
Cluster Group	Yes	Yes

Note: The dependent variable is US equity Home Bias (HB). ANNOUNCE is dummy for stock market consolidation announcement per IMPLEMENT is the dummy for stock market consolidation implement period. Next, CRISISUS is the dummy for the global financial crisis sta in the US. CRISISEU is the dummy for the European debt crisis. WT is the withholding tax. CO is the capital account openness index. BILA the percentage of the bilateral trade between the US and the destination countries. INT is the percentage of the individual using the internet population. DIST is the distance from capital to capital. EXVOL is exchange rate volatility. DIVER is the diversification opportunity of destination countries. RAR is the risk adjusted return. ML is the equity market liquidity measure by the stock traded per GDP. MCAP is the ma capitalization over GDP of the destination country's stock market. GROWTH is the growth in GDP per Capita. GOV is the WGI governa indicators. For interpretation, the statistical significance is reported against 10% (*), 5% (**) and 1% (***) significance level.

The result for the stock market consolidation effect on US HB are not robust across the two models where ANNOUNCE and IMPLEMENT is significant in model (2) but insignificant in model (1). For other control variables, the results are robust for BILAT where the variable is negative and statistically significant. The result is also robust for CRISISEU where the variable is positive and statistically significant. In addition, the result for CRISISUS, CO, INT, DIST EXVOL, ML, MCAP, GROWTH and GOV are also robust where the variables are not statistically significant. On the other hand, the result for RAR is significant in model (1) but not in model (2) and the result for WT and DIVER is significant in model (2) but not in model (1).

For the consolidation group that include US stock markets, we found that there is no significant effect of ANNOUNCE and IMPLEMENT on US HB for both NYSE-EURONEXT and NASDAQ-OMX. This result is inconsistent with the hypothesis where ANNOUNCE and IMPLEMENT variables are expected

to have a negative and significant effect on US HB. The result implies that stock market consolidation is not a significant factor that could reduce US HB. For the groups that exclude US stock markets, we found that there is a positive and significant effect of both ANNOUNCE and IMPLEMENT on US HB. This result is inconsistent with the hypothesis where ANNOUNCE and IMPLEMENT variables are expected to have a negative and significant effect on US HB. However, this result implies that US investors are even less interested in investing in other groups.

Second, we found that there is a negative and statistically significant effect of GOV, INT and BILAT on US HB. This result is consistent with the hypothesis as investors would want to invest in the country with better governance and less information cost. Our results are consistent with many previous studies which also found that these variables have a statistically significant impact on HB. Similar to our study, Chan et al. (2005), Fidora et al. (2007) and Daly and Vo (2013) found that GOV is a significant factor that explains US HB while Dahlquist et al. (2003) found it to be insignificant. In addition, Mishra (2008) also found INT to be a significant variable that affect HB. Consistent with our study, many studies also found BILAT to be a significant variable (Baele et al. 2007; Mishra 2008; Mishra 2014) while Fidora et al. (2007) found it to be insignificant.

Third, there is a positive and statistically significant effect of EXVOL, WT and CRISISEU on US HB. This result is consistent with the hypothesis as US investors would want to invest in the country with lower exchange rate volatility, lower withholding tax of dividend yield and not during the financial crisis period of the destination countries. Our results are consistent with many previous studies which also found that these variables have a statistically significant impact on HB. Similar to our study, many studies found EXVOL to be a significant factor that affect HB (Fidora et al. 2007; Mishra 2014; Daly and Vo 2013). In addition, many studies found WT to be a significant factor (Stulz 1981;

Cooper and Kaplanis 1986; Mishra 2014) while Chan et al. (2005) found it to be insignificant.

Next, there is a positive and statistically significant effect of GROWTH, CO and DIVER on US HB. This result is inconsistent with the hypothesis as US investors would want to invest in the country with higher economic growth, capital account openness and diversification benefit. However, the result implies that US HB is higher toward the EM countries with the characteristic of high growth and high diversification benefit. For capital account openness, the result implies that US HB is higher toward the country with higher CO. Furthermore, there is a negative and significant effect of DIST on US HB. This result is inconsistent with the hypothesis as a higher distance is believed to increase information cost.

Fidora et al. (2007) and Anderson et al. (2011) found GROWTH to be a significant factor that affect HB while Dahlquist et al. (2003) and Chan et al. (2005) found it to be insignificant. Similar to our study, Ahearne et al. (2004) and Daly and Vo (2013) found that CO is a significant factor that affect HB while Chan et al. (2005) found it to be insignificant. Similar to our study, DIVER is found to have a significant effect on equity home bias by many studies (Fidora et al. 2007; Mishra 2014; Mishra 2008) while Chan et al. (2005) found it to be insignificant. Consistent with our study, Portes and Rey (2005) showed that the distance between capital and capital has a positive and significant effect on home bias.

Finally, we found that CRISISUS, RAR, ML, MCAP do not have a statistically significant effect on US HB. This result is inconsistent with the hypothesis as US investors would want to invest more in the country with higher incentive of investing and invest less during the financial crisis. Similar to our study, many studies also found RAR to be an insignificant factor that affect HB (Daly and Vo 2013; Ahearne et al. 2004; Mishra 2008). However, Chan et al. (2005) and Daly and Vo (2013) found that equity market liquidity

has a negative and significant effect on equity home bias. Consistent with our study, Dahlquist et al. (2003) and Daly and Vo (2013) found MCAP to be an insignificant factor that affect HB while Chan et al. (2005) and Anderson et al. (2011) and Mishra (2014) found it to be significant.

CONCLUSION

Firstly, consistent with the hypothesis, the mean US HB toward stock market consolidation groups that contain emerging market country stock markets (MILA, ATL, CEESEG) seems to be higher than those groups that contain developed country stock markets (NYSE-, NASDAQ-OMX, EURONEXT, LSE-BI). In addition, the mean US HB for the consolidation groups that exclude US stock markets (ATL, CEESEG, MILA) are higher than those of the group that include the US stock markets (NYSE-EURONEXT, NASDAQ-OMX).

Secondly, consistent with the hypothesis, we found that the mean US HB decreases after ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage for the consolidation groups that include US stock markets. This decrease is the effect of the fact that the US investors are now facilitated to trade stock with those stock markets. We also found that the mean US HB experience higher decrease during IMPLEMENT comparing to ANNOUNCE stage for NYSE-EURONEXT group as it is the stage where stock markets under the consolidation groups is allowed to trade under the common trading platform.

For consolidation groups that exclude US stock markets, the mean US HB decreases for both ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage for most of the groups as the bigger consolidated markets make these stock markets more attractive to invest in. However, the mean US HB for MILA experience a slight increase in the IMPLEMENT stage as the US investors might be more

interested in investing in its own group than investing in other groups.

Finally, we found that there is no significant effect of ANNOUNCE and IMPLEMENT on US HB for both NYSE-EURONEXT and NASDAQ-OMX which are the consolidation groups that include US stock markets. This result is inconsistent with the hypothesis where ANNOUNCE and IMPLEMENT variables are expected to have a negative and significant effect on US HB. The result implies that stock market consolidation is not a significant factor that could reduce US HB. For the groups that exclude US stock markets, we found that there is a positive and significant effect of both ANNOUNCE and IMPLEMENT on US HB. This result is inconsistent with the hypothesis where ANNOUNCE and IMPLEMENT variables are expected to have a negative and significant effect on US HB. However, this result implies that US investors are even less interested in investing in other groups.

For the other control variables, GOV, INT and BILAT and DIST have a negative and significant impact on US HB while EXVOL, WT, CRISISEU, GROWTH, CO and DIVER have a positive and significant impact on US HB. However, CRISISUS, RAR, ML, MCAP do not have a statistically significant effect on US HB.

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