

Microfinance Institutions and Diversification Benefits to Global Investors

Ki Han, Sukhun Lee, David Suk, and Hyunmo Sung*

Abstract

Microfinance institutions (MFIs) are major providers of financial services to millions of low-income borrowers in developing countries. MFIs are appealing investment opportunities for both profit and impact investors, offering attractive returns and serving as potentially useful vehicles for diversifying from global financial markets. We employed mean-variance spanning tests to examine these potential diversification benefits of including MFIs in globally diversified portfolios. Our results revealed that the magnitude of diversification benefits depended on the short sales restrictions assumption. When investors were allowed to go short on MFIs, adding MFIs greatly expanded the mean-variance frontier to the left. However, when investors are not allowed to go short on MFIs, the diversification benefits declined significantly. For profit-oriented global institutional investors, actively traded and large capitalized MFIs presented an attractive investable asset class to include in their portfolios. For socially responsible investors, listed MFIs represented an attractive venue to achieve their social aims while at the same time potentially benefiting from expanding their mean-variance efficient frontier to the left. An interesting finding was that even with short sales restrictions, euro and yen investors are expected to receive greater diversification benefits than USD investors.

Keywords: Microfinance institutions; emerging markets; diversification; mean-variance spanning test

JEL Classification: G11, G21

I Introduction

Microfinance institutions (MFIs) are a major provider of financial services to millions of low-income borrowers in developing countries. MFIs provide small-business loans, savings accounts, insurance, and fund transfers to low-income individuals to help boost financial inclusion and entrepreneurship within their communities. Over the past decade, we observed a significant increase in the number of low-income individuals around the globe utilizing services provided by MFIs. Furthermore, the microfinance industry has attracted the interest of global investors. For socially responsible investors, investment in MFIs provides an opportunity for them to make a positive financial and social impact in developing countries. For profit-oriented global institutional investors, MFIs present an attractive investable asset class to include in their portfolios. Some MFIs provide high returns, and investment in them aligns well with environmental, social, and governance (ESG) investing. In addition, MFIs stock has the potential to expand global investors' portfolio mean-variance efficient frontier to the left. Another notable change we observed in the microfinance industry is the doubling of MFIs going public. We expect these trends to continue in the foreseeable future and an in-depth study on MFIs will enhance our understanding of the different roles they play in the economy.

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The main objective of the paper is to examine the potential diversification benefits of including MFIs in globally diversified portfolios. The potential diversification benefits stem from the special nature of MFIs.¹ First, MFIs' clients operate in an informal economy and the demand for clients' products may be countercyclical. Clients of MFIs are micro-entrepreneurs who mostly sell cheaper, locally-produced goods and services to low-income domestic clients. Hence, both micro-entrepreneurs and their clients are to a certain degree detached from the formal domestic market and even more removed from the international market. Furthermore, during times of financial distress, the tendency for consumers to consume more less expensive, locally produced goods, helps micro-entrepreneurs to better weather the financial distress. These unique characteristics of micro-entrepreneurs' businesses will, to some extent, insulate MFIs' clients from major global economic shocks which in turn will help stabilize MFIs' revenues. Second, despite the lack of collateral, micro-entrepreneurs appear to default only under extreme conditions. According to Patten, Rosengard, and Johnston (2001), for the majority of micro-entrepreneurs, microfinancing represents the only access to borrowing and therefore, they have a strong incentive to make significant personal sacrifices to make timely payments. Without the timely repayments of current loan, access to future credit will be in jeopardy. Third, the MFIs' loans are less exposed to market risk since their loans carry short maturity and impose very short periods between installments. The very short periods between installments allows MFIs to monitor their portfolio quality on a timely basis and quickly adjust their lending practices, if needed. In addition, short maturity reduces interest rate mismatch risk between borrowing and lending rates. Lastly, publicly traded MFIs attract long-term funding from developmental investors. These socially responsible investors, both for-profit and nonprofit, have long-term developmental interest and are less sensitive to market movements.

The remainder of the paper is organized as follows. Section 2 discusses existing literature. Section 3 discusses data and methodology. Empirical results and discussions are presented in sections 4 and 5. Section 6 provides concluding remarks.

II Literature Review

Previous work on the impact of microfinance on international diversification is limited. Gonzalez (2007) examined the impact of domestic macroeconomic shocks on the quality of microfinance loan portfolios. Using annual accounting data from the Mix Market, he examined the performance of 639 MFIs from 88 countries during the 1999 to 2005 period. After controlling for MFI and country characteristics, his results showed no relationship between changes in Gross National Income per capita and asset quality. Hence, he concluded that MFIs' assets are resilient to domestic economic downturns and MFIs may provide attractive opportunities for portfolio diversification. Krauss and Walter (2009) examined the strength of correlations between the MFI portfolios with the value of broad asset categories available to both domestic and global commercial investors. Using the 1998 to 2006 annual accounting data from the Mix Market, they found that the top 325 MFIs from 66 emerging countries included in their study did not display a statistically significant relationship with global market movements. Gabriel Di Bella (2011) employed Krauss and Walter (2009) methodology with an expanded data set from the Mix Market that includes the global financial crisis of 2007-2008. Based on assets growth variable, it appears that the links of MFIs and international capital markets have grown stronger. However, based on other MFIs' performance measures including ROE, the links do not appear to have grown stronger. Galema,

¹ This section draws heavily from Krauss and Walter (2009).

Lensink, and Spierdijk (2011) employed the mean-variance spanning tests with short sales restrictions developed by De Roon, Nijman, and Werker (2001) to investigate whether adding microfinance institutions to a benchmark portfolio of international assets is beneficial for investors seeking to expand the efficient frontier. They used MFIs accounting annual data from 1997 to 2007 from the Mix Market. According to their findings, MFIs can be a valuable addition to a broad portfolio of stocks and bonds but are more beneficial as part of a fixed income investment. They also examined by geographical region and found that MFIs from Latin America were the most attractive investments from a diversification perspective whereas investing in Africa never improved the mean-variance frontier. Brière and Szafarz (2015) examined the impact of microfinance equity on globally diversified banking sector portfolios. Unlike earlier studies which relied on accounting data, they used marked-to-market valuation data from nine listed MFIs to conduct their analysis. From 1990 to 2010, nine MFIs went public and their shares were publicly traded in their respective country stock exchanges. They created a value weighted country index of publicly traded MFIs and employed the mean-variance spanning test with no short sales restrictions to examine if adding MFIs to a globally diversified portfolio of financial stocks would shift the portfolio's efficient frontier to the left. According to their findings, microfinance equity is now less risky than before, but it is also much more closely correlated with the financial sector since 2003. Hence, they conclude that adding MFIs to a globally diversified portfolio of financial stocks yields minimal diversification benefits, if any. Lastly, Ahmad and Shah (2019) also employed the mean-variance spanning test to examine the diversification benefits of including MFIs in global stock portfolio. They examined eight out of nine MFIs included in Brière and Szafarz (2015) study, and observed that even though there were cases of negative correlations between MFIs and the benchmark portfolio, adding MFIs to a global portfolio did not improve the mean-variance frontier.²

The paper makes four significant contributions to the existing literature. First, it expands the sample size and period. Since the Brière and Szafarz (2015) study, additional MFIs from four different countries have gone public and their shares are publicly traded in their respective country stock exchanges. The increased number of publicly traded MFIs from a larger number of emerging countries, as well as expanding the sample period to 2019 that covers the post global financial crisis period, will allow us to conduct a more comprehensive analysis on the risk-return impact of adding MFIs to globally diversified portfolios. Second, with the exception of two studies (Brière and Szafarz, 2015; Ahmad and Shah, 2019), previous studies discussed in this section relied on accounting data to conduct their analysis. A major concern with using accounting data is that it compares backward-looking accounting returns (i.e., return on equity, return on asset, etc.) with forward-looking stock returns (i.e., global benchmark stock portfolios). For our study, we used weekly marked-to-market stock return data to conduct our analysis. Thirdly, previous studies examined the diversification benefits from one currency perspective, mainly the USD. In this paper, we examined diversification benefits from the perspectives of USD, euro, and Japanese yen investors and found that investors across the globe can expand their mean-variance efficient frontiers to the left by including listed MFIs in their globally diversified portfolios. However, euro and yen investors are expected to receive greater diversification benefits than USD investors. Lastly, previous studies conducted mean-variance spanning tests with or without short sales restrictions, but not both. We conducted mean-variance spanning tests with and without short sales restrictions and found that our results are highly dependent on the ability of investors to go short

² The paper does not state the sample period covered in the study. Thus, we must use care in comparing Ahmad and Shah (2019) findings with other studies' findings, including ours.

on MFIs stocks. When investors are allowed to go short on MFIs stocks, we documented significant evidence in favor of diversification benefits. However, when short sales are not allowed, the benefits decline significantly.

III Data and Methodology

Data

On December 6, 1989, Bank Danamon Indonesia Tbk went public through an IPO in the Jakarta Stock Exchange, becoming the first MFI to go public. Since then, we identified 23 other MFIs that went public from 1990 to 2018. In the Appendix, we report MFI IPOs by year and the domicile of MFIs. As can be seen from the Appendix, India has the largest number of MFIs with nine IPOs whose shares are publicly traded, followed by South Africa and Tanzania. IPO data was collected from Exchange Data International, Thompson Reuters Datastream, and the World Federation of Exchanges.

Even though the first IPO took place on December 6, 1989, due to the limited number of IPOs in earlier years, we chose to start the study in January 2005. Prior to 2005, there were only four IPOs, two from Indonesia and two from South Africa. One of South Africa's MFIs, the African Bank, was dropped from the sample due to lack of data. Hence, prior to 2005, we only had three IPOs from two countries. Starting in 2005, more MFIs from different countries and regions of the world went public. In addition to the African Bank from South Africa, five additional MFIs were also dropped from the sample due to no changes in the stock price for a long period. For the remaining 18 MFIs, we collected weekly stock prices in local currency from the IPO date to June 2019. The number of weekly observations included in our study ranges from 755 for Capitec Bank from South Africa to 44 for CreditAccess Grameen from India. We obtained local currency return from Datastream by Refinitiv Eikon, and Datastream's foreign exchange rates were used to convert local currency return to US dollar return.

The financial characteristics of MFIs included in our sample are reported in Table 1. To provide a comparison with the rest of the MFIs in the developing world, we also provide financial characteristics of the following two MFI groups: (a) all MFIs included in the World Bank MixMarket data, excluding MFIs included in the study; and (b) all MFIs included in the World Bank MixMarket data from seven countries included in the sample, excluding MFIs included in the study. Before we compare financial characteristics, a word of caution is warranted. Due to the lack of data, statistics reported for MFIs included in the study are based on 2018 data for 10 MFIs.³ The average gross loan portfolio of our sample MFIs is \$2.032 billion compared to \$117 million for the rest of the MFIs and \$85 million for MFIs from seven countries included in the sample. As expected, on average, the listed MFIs are larger in terms of size.⁴ The average debt to equity ratio for our sample is 3.81 compared to 4.18 for the rest of the MFIs. It appears that MFIs included in our sample rely slightly more on equity than the rest of the MFIs in the developing world to finance their operation.

The average loan balance per borrower for our sample MFIs is \$1,224 which is half the size of the rest of the MFIs' average loan balance per borrower of \$2,640. However, the standard deviation of the average loan balance is \$1,533 for our sample MFIs compared to \$13,327 for the

³ Statistics for the average loan balance per borrower, PAR 90, write-offs variables are based on 2017 data for 9, 6 and 5 MFIs, respectively.

⁴ The average total assets for our 18 MFIs is \$2.916 billion compared to \$159 million for the rest of MFIs and \$124 million for MFIs from seven countries included in the sample.

rest of the MFIs.⁵ The operational self-sufficiency, which measures the frequency at which a firm's financial revenue covers its expenses, is 1.27 for our sample MFIs compared to 1.19 for the rest of the MFIs. That is, on average, the MFIs included in our sample generate more financial revenues to cover the firm's financial and operational expenses than the rest of the MFIs. The 18 MFIs included in the sample are not only operationally more self-sufficient but they are also more profitable. The average return on assets (ROA) for these firms is 0.0324 which is much higher than the ROA of 0.0211 for the rest of the MFIs. Lastly, the portfolio quality of MFIs included in our sample is lower than the portfolio quality of the rest of the MFIs. Our sample's portfolio at risk over 90 days (PAR 90) is 9.28% compared to 6.20% for the rest of the MFIs and 3.01% for MFIs from seven countries included in our sample.⁶ Furthermore, the write-offs rate for our sample MFIs is 5.81% compared to 3.65% for the rest of the MFIs. That is, MFIs included in our sample removed more bad loans from the balance of the gross loan portfolio but also had a greater percentage of remaining loan balance at arrear than the rest of the MFIs. In summary, MFIs included in our sample are larger in terms of size; rely more on equity than debt; have borrowers with a smaller loan balance; and are financially more self-sufficient and profitable but are also exposed to a greater level of institutional risk than the rest of the MFIs in developing countries.

To examine the potential diversification benefits of including MFIs in globally diversified portfolios, we applied the Brière and Szafarz (2015) procedure to create country, region, and global indices. For each country included in the sample, we create a local microfinance country return index starting with the first MFI stock price that is quoted in that country's stock exchange. As more MFIs are listed and traded in the country stock exchange, they are added to the country return index. These returns are weekly total returns (dividends are reinvested) and are converted into US dollar return based on the same day exchange rate. If there is only one MFI listed and traded on the country stock exchange, the sole MFI's returns become the country return index. If there is more than one MFI listed and traded on the country stock exchange, we create a value weighted country return index where a MFI's market capitalization (in USD) at the end of December 2019 is used for weighting.

For each region included in the sample, we create a regional microfinance index utilizing the same procedure used to create a country return index. Lastly, we create a Global Microfinance Index (GMI) utilizing the same procedure employed to create country and regional indices. The GMI starts on January 7, 2005, and is composed of the following four stocks: Apna Microfinance Banks (Pakistan), Bank Danamon (Indonesia), Bank Rakyat (Indonesia), and Capitec Bank (South Africa). In 2006, three more MFIs from Bangladesh, Kenya, and South Africa are added to the GMI. This process continued until August 2018 when the last MFI, CreditAccess Grameen from India, is added to the index. From August 23, 2018, to June 28, 2019, the GMI is a value weighted index of 17 MFIs from seven countries covering three geographical regions of the world.⁷ At the end of the sample period, June 2019, the GMI is composed of the following weights: 24.3% for Africa, 73.5% for Asia, and the remaining 2.2% for Latin America.

⁵ The median average loan balance per borrower for our sample MFIs is \$444 compared to \$663 for the rest of MFIs. The median value for the rest of MFIs is still larger than our sample MFIs' median value but the difference is much smaller.

⁶ We report PAR 90 instead of PAR 30 due to insufficient data. To provide a further comparison, PAR 90 for 762 financial service providers included in the MixMarket Global Outreach & Financial Performance Benchmark Report 2017-2018 was 4.7%.

⁷ In June 2013, Blue Financial Services Limited from South Africa was delisted from the Botswana Stock Exchange and is not included in the GMI index from June 2013.

Table 1: Financial Characteristics of MFIs Included in the Study and the Rest of the MFIs Included in the World Bank MixMarket Data, 2018

Type of MFIs	Gross loan portfolio (USD million)	Debt to equity ratio	Average loan balance per borrower (USD)	Operating self-sufficiency (OSS) ^a	ROA	Portfolio at risk 90 days (PAR 90)	Write-offs
MFIs included in the study^b							
Mean	\$2,032	3.81	\$1,224	1.27	0.0324	0.0928	0.0581
SD	\$2,168	1.93	\$1,533	0.24	0.0281	0.1069	0.0596
MFIs included in the World Bank MixMarket data, excluding MFIs included in the study							
Mean	\$117	4.18	\$2,640	1.19	0.0211	0.0620	0.0365
SD	\$345	6.24	\$13,327	0.38	0.0704	0.1259	0.0962
MFIs from seven countries included in the sample, excluding MFIs included in the study							
Mean	\$85	5.23	\$605	1.22	0.0295	0.0301	0.0370
SD	\$204	10.07	\$2,538	0.30	0.0566	0.0508	0.0726

Note:

^a OSS stands for operational self-sufficiency and it is defined as

$$OSS = \left[\frac{\text{Financial revenue}}{(\text{Financial expense} + \text{Net impairment loss} + \text{Operating expense})} \right].$$

^b Due to lack of data, the mean and SD reported for MFIs included in the study are based on 2018 data for 10 MFIs, except for the average loan balance per borrower (ALBB), PAR 90, and Write-off values. The mean and SD for ALBB, PAR 90, and Write-offs values are based on 2017 data for 9, 6, and 5 MFIs, respectively.

Source: World Bank MixMarket data.

Diversification benefits are measured in relation to a set of globally diversified benchmark portfolios. In the paper, we used the following benchmark portfolios in the mean-variance spanning tests: (1) MSCI World (in USD, euro, and yen), the Morgan Stanley Capital International developed market stock index, (2) MSCI EAFE, the Morgan Stanley Capital International developed market stock index, excluding the US and Canada, (3) MSCI AC, the Morgan Stanley Capital International all countries market stock index, (4) MSCI EM, the Morgan Stanley Capital International emerging market stock index, (5) S&P 500, (4) EURONEXT, and (5) NIKKEI 225. MFIs and benchmark returns (unhedged) are measured at a weekly frequency in US dollars. Our analysis is conducted from the perspective of globally diversified USD investors. In the robustness test section, we will examine potential diversification benefits from the perspective of globally diversified EURO and YEN investors.

Table 2 presents weekly descriptive statistics for the MFIs' country, region, and global indices. With the exception of India and Mexico, MFIs' country indices have a much higher weekly return than the MSCI EM's mean return. The volatility of weekly return for all MFIs' country indices is higher than the MSCI EM's standard deviation. Figure 1 presents the cumulative returns for GMI, MSCI World, and MSCI Emerging Markets indices. The cumulative return for GMI index is at least two times higher than the cumulative returns of MSCI World and Emerging Markets portfolios during the January 2005 to June 2019 period. Skewness of all MFIs indices, except for Mexico, Pakistan, and Africa and Latin American regions, are positive but less than one. Kurtosis of all MFIs indices are high (above 3) but, with the exception of Mexico, are lower than the kurtosis of global benchmark portfolios. For all MFIs indices, the normality assumption and the presence of unit roots are rejected at the 1% significance level.

Table 2: Descriptive Statistics for the MFIs Country, Region, and Global Indices

Indices	Period included	Weekly return (%)		Cumulative Return (%)	Skewness	Kurtosis	Jarque-Bera	ADF
		Mean	SD					
Bangladesh	2/07-6/19	0.47	5.20	286.41	0.59	5.65	227***	-26.91***
India	8/10-6/19	0.13	6.06	59.86	0.54	11.33	1354***	-19.73***
Indonesia	1/05-6/19	0.51	5.47	383.57	0.43	8.09	833***	-29.38***
Kenya	8/06-6/19	0.46	5.89	309.45	0.54	8.93	1015***	-26.30***
Mexico	11/07-6/19	-0.07	5.68	-45.15	1.67	18.47	6344***	-25.35***
Pakistan	2/05-6/19	0.65	12.79	485.06	1.14	9.55	1506***	-35.78***
South Africa	1/05-6/19	0.46	4.85	348.93	0.49	6.33	380***	-27.81***
Africa	1/05-6/19	0.37	5.02	280.50	1.27	12.42	2995***	-27.75***
Asia	1/05-6/19	0.37	5.13	281.42	0.31	9.78	1457***	-28.20***
Latin America	11/07-6/19	-0.07	5.68	-45.15	1.67	18.47	6344***	-25.35***
GMI	1/05-6/19	0.42	3.87	313.90	0.41	5.46	211***	-29.63***
MSCI World	1/05-6/19	0.11	2.39	85.79	-1.35	16.98	6380***	-29.19***
MSCI EM	1/05-6/19	0.20	3.09	147.29	-0.63	12.75	3043***	-27.70***

This table reports weekly descriptive statistics for the microfinance country, region, and global indices. All returns are in USD. The benchmark stock indices are (1) MSCI World: the Morgan Stanley Capital International developed market stock index, and (2) MSCI EM: the Morgan Stanley Capital International emerging market stock index. For each country included in the sample, a local microfinance country return index is created. If there is only one MFI listed and traded on the country stock exchange, the sole MFI's returns become the country return index. If there are more than one MFIs listed and traded on the country stock exchange, a value weighted country return index is created. For each region included in the sample, a regional microfinance US dollar return index is created. If there is only one country in the region, the sole country's returns become the regional return index. If there is more than one country from the region, a value weighted regional return index is created. A value weighted global microfinance index is created from regional indices. The Jarque-Bera test checks for normality. The Augmented Dickey-Fuller (ADF) test checks for unit roots. ***, **, * indicate 1%, 5%, and 10% significance levels.

Methodology

Some earlier (for example, Krauss and Walter, 2009) investigate the potential diversification benefit of adding microfinance institutions to a benchmark of a global market portfolio by only considering correlations between the MFI portfolios and global market movements. However, since this approach is too restrictive, more recently, researchers such as Galema, Lensink, and Spierdijk (2011), and Brière and Szafarz (2015) used the mean-variance spanning methodology developed by Huberman and Kandel (1987).

The mean-variance spanning methodology is based on the assumption that investment decisions of investors are solely determined by the mean-variance properties of assets. A mean-variance spanning test enables us to assess whether adding MFIs to a benchmark of a global market portfolio will expand the benchmark portfolio's efficient frontier to the left. Thus, we run the mean-variance spanning test employed by Galema, Lensink, and Spierdijk (2011), and Brière and Szafarz (2015) to investigate the potential diversification benefit of adding microfinance institutions to a benchmark of a global market portfolio. First, we run the mean-variance spanning tests with no short sales restrictions. We will also run the mean-variance spanning tests with short sales restrictions since exchanges may not allow short sales on smaller and less actively traded MFIs. Huberman and Kandel (1987) suggest a multivariate test of the hypothesis that the minimum-variance frontier of a set of K assets is the same as the minimum-variance frontier of the K assets plus another set of N assets. Following the methodology by Huberman and Kandel (1987), the inclusion of MFIs will expand the benchmark portfolio's efficient frontier to the left if and only if the MFIs are not mean-variance spanned by the benchmark portfolio. The mean-variance test with no short sales restrictions involves estimating the following OLS equation:

$$R_{MFI_{i,t}} = \alpha + \sum_{k=1}^K \beta_k R_{B,t}^k + \varepsilon_t \quad (1)$$

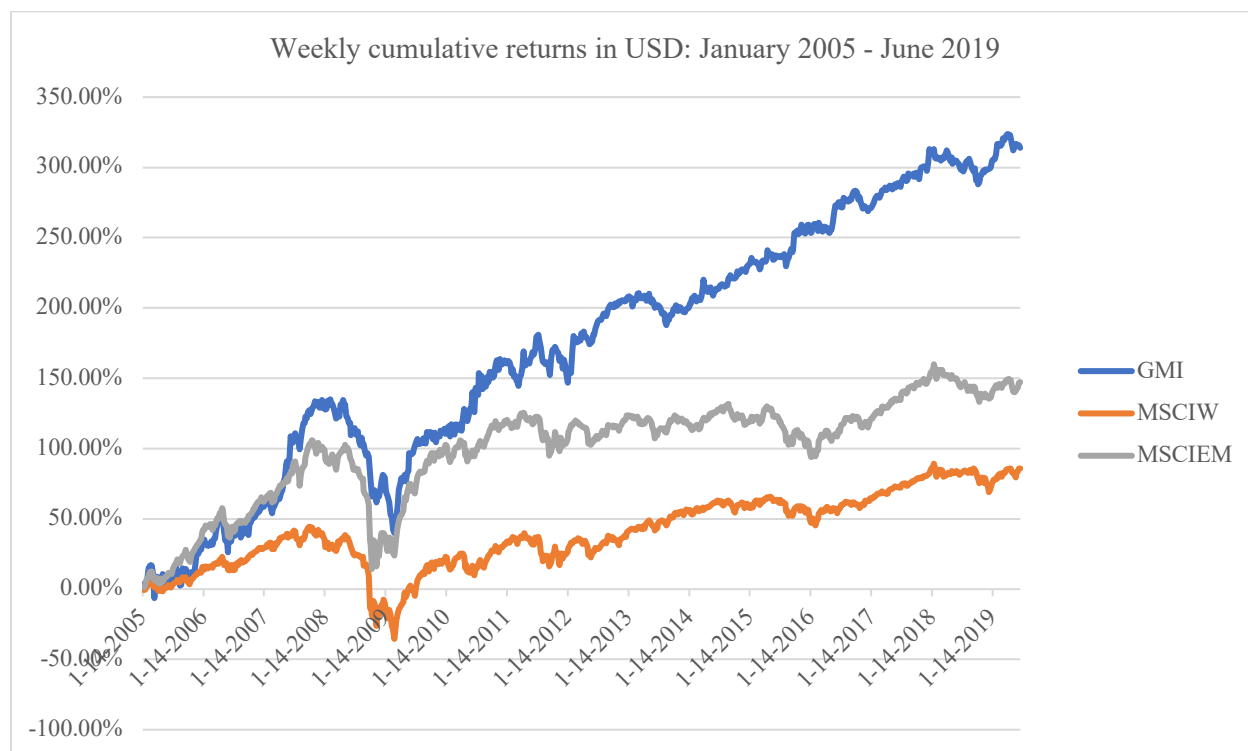
where R_{MFI_i} is the return on the i^{th} MFI and R_B^k is the return on the k^{th} benchmark portfolio. Furthermore, Huberman and Kandel (1987) show that under the null hypothesis of spanning, the following two conditions must hold: $\alpha = 0$ and $\sum_{k=1}^K \beta_k = 1$.

To examine the sensitivity of our results to short sales restrictions on MFI stocks, we employ spanning tests with short sales restrictions proposed by De Roon, Nijman, and Werker (2001). We impose short sales restrictions on MFIs but not on the benchmark portfolios. The test with short sales restrictions is testing the following intersection:

$$\begin{aligned} \alpha + (\beta_k - 1) R_{f,min} &\leq 0 \\ \alpha + (\beta_k - 1) R_{f,max} &\leq 0 \end{aligned} \quad (2)$$

where $R_{f,min}$ is the minimum risk-free rate and $R_{f,max}$ is the maximum risk-free rate. We test the intersection under short sales restrictions for a minimum and maximum risk-free rate. If intersection is rejected for both a minimum and maximum risk-free rate, it will also be rejected for all intermediate values of the risk-free rate (Galema, Lensink, and Spierdijk, 2011). We used the 1-year US T-bill rate as a proxy for risk-free rate. During the January 2005 to June 2019 sample period, the minimum and maximum risk-free rates were 0.09% and 5.27%, respectively.

Figure 1: Global Microfinance Index (GMI), MSCI World, and MSCI Emerging Market Indices, Weekly Cumulative Returns in USD, January 2005 – June 2019



IV Empirical Results and Discussion

Tables 3 and 4 present the mean-variance spanning test results with no short sales restrictions and corresponding p-values for 18 individual MFIs included in our sample. The mean-variance tests were conducted using three different benchmark portfolios: two globally diversified portfolios (MSCI World and MSCI EAFE) and the S&P 500. Since the estimated results are very similar across benchmarks, we will focus our discussion on results based on the MSCI World index. From Table 3 we observe that the spanning test is rejected at the 5% level or higher for eight out of 18 MFIs, indicating significant diversification benefit potential provided by these microfinance institutions. These eight MFIs are domiciled in six different countries, indicating that the diversification benefit is not concentrated in a few countries. In addition, the age of MFI post IPO does not appear to matter when it comes to diversification benefit potential. For example, three MFIs (Apna Microfinance Bank, Bank Rakyat Indonesia, and Capitec Bank) had an IPO in 2005 or earlier, whereas L&T Financial Services and Equitas Holdings went public in 2011 and 2016, respectively.

An interesting observation from Table 3 is that it is not the country of domicile that provides the diversification benefit potential, but rather it is the characteristic of each MFI that matters. Nine MFIs from India are included in the sample, but only two MFIs' spanning test results (Equitas Holdings and L&T Finance Holdings) are statistically significant while the remaining seven MFIs' test results are not. In the case of Indonesia, two MFIs are included in the sample and one MFI's (Bank Rakyat Indonesia) spanning test result is significant while the other MFI's (Bank

Danamon Indonesia) test result is not. The same holds true for Mexico. However, in the case of South Africa, both MFIs' spanning test results are significant at the 1% level.⁸

Panel A in Table 4 presents the mean-variance spanning test results for seven MFI country indices. For Bangladesh, Kenya, and Pakistan, we have one MFI from each country. Hence, for these three countries, the sole MFI's returns become the country return index. For countries with more than one MFI listed and traded on the country stock exchange, a value weighted country return index is created. According to results presented in Table 4, the spanning test results for India and Mexico are not statistically significant. As we have seen from Table 3, spanning test results for MFIs domiciled in India varied across MFIs. Some were statistically significant while others were not. Hence, when we create a value weighted MFI country index for India, it appears that offsetting is taking place and the diversification benefits from adding MFIs from India disappear. On the other hand, spanning test results for Bangladesh, Indonesia, Kenya, Pakistan, and South Africa are statistically significant at the 5% level or higher, indicating significant diversification opportunities for globally diversified portfolios.

Panel B in Table 4 presents the mean-variance spanning test results for three regions included in the sample. Since Mexico is the only country representing Latin America, test results for the Latin America region are the same as the results for Mexico presented in Panel A in Table 4. As we discussed above, the spanning test results for Latin America are not significant. On the other hand, test results for Africa are highly significant. Even though the spanning test results for three out of four country indices included in the Asia region are significant at the 5% level or higher, the spanning test results for the Asia region as a whole is significant only at the 10% level. This is because the Asia region's test results are driven by the performance of the indices from India and Indonesia. India and Indonesia country indices account for 32.4% and 66.4% of the region's index weight, respectively, and India's spanning test result was not significant while Indonesia's test result was significant at the 5% level (see Panel A in Table 4). Panel B in Table 4 also presents results for the global microfinance index. The GMI is a value weighted index of three regions included in the sample and the spanning test results are all statistically significant at the 5%. Hence, GMI index presents a significant diversification opportunity for globally diversified portfolios.

Table 5 presents spanning test results for individual MFIs with short sales restrictions. Similar to De Roon, Nijman, and Werker (2001) findings, the evidence in favor of diversification benefits declines significantly. The number of MFIs whose spanning test results reject the null hypothesis of spanning (using the MSCI World index as the benchmark portfolio and at the 10% level or higher) declines from 9 to 4. We also observed a similar significant decline in diversification benefits for country, regional, and GMI indices.⁹ Thus, our results are highly dependent on the ability of investors to go short on MFIs stocks.

Given the significant difference in results with and without short sale restrictions, the practicality of short selling MFIs stocks becomes important. The following two constraints may prevent short selling MFIs' stocks. First, the presence of government legal restrictions on short sale transactions. Jain, Jain, McInish, and McKenzie (2013) study reports global short selling regulations during the 2000 to 2009 period. According to Jain et al (2013), Mexico had no

⁸ We also examined the relationship between MFIs' stock return performance and diversification benefits. For each MFI, we calculated the Sharpe ratio and the correlation coefficient between Sharpe ratios and p-values. The correlation coefficient is negative but very small at -0.054. Hence, based on a simple correlation analysis, MFIs' risk-adjusted excess return does not appear to account for the difference in the potential diversification benefits provided by MFIs.

⁹ Results are available from authors upon request.

Table 3: Spanning Tests for Individual Microfinance Institutions From USD Investors' Perspective, January 2005 – June 2019

MFI	Number of observations	Benchmark (in USD)		
		MSCI - World	MSCI - EAFE	S&P 500
BRAC Bank	647	69.07*** (0.0000)	75.64*** (0.0000)	72.82*** (0.0000)
Bharat Financial Inc	461	0.03 (0.9743)	0.06 (0.9404)	0.40 (0.6734)
L&T Finance Holdings	410	3.50** (0.0310)	5.23*** (0.0057)	8.12*** (0.0003)
Satin Creditcare Network	199	0.83 (0.4372)	1.05 (0.3533)	2.94* (0.0549)
Equitas Holdings	165	3.18** (0.0441)	2.21 (0.1131)	8.04*** (0.0005)
Ujjivan Finance Services	162	1.16 (0.3148)	0.25 (0.7766)	4.86*** (0.0089)
Capital Trust	127	1.33 (0.2691)	1.15 (0.3200)	1.60 (0.2061)
MAS Financial Services	88	1.30 (0.2773)	1.01 (0.3676)	2.91* (0.0599)
Bandhan Bank	65	1.01 (0.3685)	1.08 (0.3453)	1.64 (0.2015)
CreditAccess Grameen	44	0.44 (0.6478)	0.59 (0.5611)	0.24 (0.7872)
Bank Danamon Indonesia	749	0.82 (0.4400)	0.40 (0.6708)	0.51 (0.6027)
Bank Rakyat Indonesia	749	3.27** (0.0386)	3.24** (0.0396)	3.04** (0.0483)
Equity Bank	671	16.63*** (0.0000)	23.76*** (0.0000)	17.49*** (0.0000)
Financiera Independencia	608	2.27* (0.1044)	3.97** (0.0194)	3.83** (0.0222)
Genera	444	0.41 (0.6665)	0.12 (0.8845)	1.32 (0.2673)
Apna Microfinance Bank	751	6.12*** (0.0023)	9.22*** (0.0001)	5.61*** (0.0038)
Capitec Bank	755	6.09*** (0.0024)	8.23*** (0.0003)	7.72*** (0.0005)
Blue Financial Services	346	3.84** (0.0225)	4.45** (0.0124)	4.20** (0.0158)

This table reports the Wald Statistics for the mean-variance spanning tests and p-values (in parenthesis). The benchmark stock indices are (1) MSCI World: the Morgan Stanley Capital International developed market stock index, (2) MSCI EAFE: the Morgan Stanley Capital International developed market stock index, excluding the US and Canada, and (3) S&P 500. ***, **, * indicate 1%, 5%, and 10% significance levels.

Table 4: Spanning Tests for MFIs Value Weighted Country, Regional, and Global Indices From USD Investors' Perspective, January 2005 – June 2019

Index	Number of observations	Benchmark (in USD)		
		MSCI - World	MSCI - EAFE	S&P 500
Panel A: Country				
Bangladesh	647	69.07*** (0.0000)	75.64*** (0.0000)	72.82*** (0.0000)
India	461	0.70 (0.4949)	2.13 (0.1198)	2.67* (0.0703)
Indonesia	749	3.23** (0.0401)	3.16** (0.0430)	2.96* (0.0523)
Kenya	671	16.63*** (0.0000)	23.76*** (0.0000)	17.49*** (0.0000)
Mexico	608	0.38 (0.6815)	0.55 (0.5791)	0.56 (0.5727)
Pakistan	751	6.12*** (0.0023)	9.22*** (0.00001)	5.61*** (0.0038)
South Africa	755	4.88*** (0.0078)	7.89*** (0.0004)	9.17*** (0.0001)
Panel B: Regional and Global				
Africa	755	6.82*** (0.0012)	11.07*** (0.0000)	12.07*** (0.0000)
Asia	755	2.48* (0.0844)	3.03** (0.0487)	4.02** (0.0183)
Latin America	608	0.38 (0.6815)	0.55 (0.5791)	0.56 (0.5727)
Global	755	3.94** (0.0199)	6.09*** (0.0024)	8.11*** (0.0003)

This table reports the Wald Statistics for the mean-variance spanning tests and p-values (in parenthesis). The benchmark stock indices are (1) MSCI World: the Morgan Stanley Capital International developed market stock index, (2) MSCI EAFE: the Morgan Stanley Capital International developed market stock index, excluding the US and Canada, and (3) S&P 500. For each country included in the sample, a local microfinance country return index is created. If there is only one MFI listed and traded on the country stock exchange, the sole MFI's returns become the country return index. If there are more than one MFIs listed and traded on the country stock exchange, a value weighted country return index is created. For each region included in the sample, a regional microfinance US dollar return index is created. If there is only one country in the region, the sole country's returns become the regional return index. If there is more than one country from the region, a value weighted regional return index is created. A value weighted global microfinance index is created from regional indices. ***, **, * indicate 1%, 5%, and 10% significance levels.

restriction on short selling, except naked short selling was prohibited. Pakistan, Philippines, and South Africa also had no restrictions on short selling, but short selling was allowed only in prescribed securities and naked short selling was banned. India banned short selling from 2001 to 2007 but allowed short selling starting on December 20, 2007; however, naked short selling remained illegal. Indonesia allowed short selling prior to October 2008 but made it illegal during the global financial crisis. From May 2009, Indonesia again allowed short selling but only for specified stocks. Short selling was prohibited in Bangladesh. Even though it is not discussed in Jain et al (2013) paper, short selling was not allowed prior to January 2018 when Kenya allowed short selling on a limited number of securities. Naked short selling is illegal in Kenya. Hence, based on short selling regulations reported by Jain et al (2013), legal restriction was not a major issue. The second and more relevant obstacle is that exchanges only allowed short selling on securities that met certain performance measures such as liquidity and financial performance. For some MFIs included in our sample, meeting these performance measures will be difficult. In the

robustness section, we will construct portfolios consisting of MFIs securities that have large capitalization and are actively traded, and re-estimate spanning tests results for these portfolios.

Table 5: Mean-Variance Spanning Tests With Short Sales Restrictions; Intersection Tests for Individual Microfinance Institutions From USD, Euro, and Japanese Yen Investors' Perspective, January 2005 – June 2019.

MFI	Number of obs.	Benchmark (in USD)					
		MSCI - World		MSCI - EAFE		S&P 500	
		R _{f,Min} = 0.09%	R _{f,Max} = 5.27%	R _{f,Min} = 0.09%	R _{f,Max} = 5.27%	R _{f,Min} = 0.09%	R _{f,Max} = 5.27%
BRAC Bank	647	2.94* (0.0867)	94.06*** (0.0000)	3.01* (0.0830)	97.62*** (0.0000)	2.92* (0.0877)	102.63*** (0.0000)
Bharat Financial Inc	461	0.00 (0.9934)	0.05 (0.8268)	0.04 (0.8399)	0.04 (0.8479)	0.02 (0.8755)	0.78 (0.3768)
L&T Finance Holdings	410	0.24 (0.6273)	5.43** (0.023)	0.43 (0.5125)	7.38*** (0.0069)	0.14 (0.7081)	14.12*** (0.0002)
Satin Creditcare Network	199	1.50 (0.2214)	0.00 (0.9766)	1.89 (0.1712)	0.80 (0.3713)	1.55 (0.2148)	2.75* (0.0986)
Equitas Holdings	165	0.07 (0.7922)	6.24** (0.0135)	0.03 (0.8529)	4.22** (0.0415)	0.05 (0.8220)	15.48*** (0.0001)
Ujjivan Finance Services	162	0.11 (0.7458)	1.89 (0.1707)	0.15 (0.7027)	0.22 (0.6394)	0.16 (0.6895)	8.42*** (0.0042)
Capital Trust	127	2.64 (0.1068)	0.09 (0.7674)	2.23 (0.1376)	0.03 (0.8618)	2.73 (0.1010)	1.22 (0.2708)
MAS Financial Services	88	0.03 (0.8528)	2.46 (0.1202)	0.00 (0.9502)	1.80 (0.1838)	0.07 (0.7898)	5.49** (0.0215)
Bandhan Bank	65	0.11 (0.7429)	1.45 (0.2328)	0.14 (0.7127)	1.40 (0.2416)	0.09 (0.7710)	2.58 (0.1134)
CreditAccess Grameen	44	0.57 (0.4543)	0.64 (4270)	0.70 (0.4069)	0.91 (0.3444)	0.48 (0.4918)	0.09 (0.7606)
Bank Danamon Indonesia	749	0.47 (0.4911)	1.61 (0.2050)	0.80 (0.3720)	0.18 (0.6690)	0.30 (0.5811)	0.31 (0.5763)
Bank Rakyat Indonesia	749	5.22** (0.0227)	3.94** (0.0475)	6.47** (0.0112)	1.54 (0.2144)	4.16** (0.0417)	0.23 (0.6317)
Equity Bank	671	2.72* (0.0993)	18.75*** (0.0000)	3.09* (0.0791)	26.23*** (0.0000)	2.35 (0.1255)	21.30*** (0.0000)
Financiera Independencia	608	3.44* (0.0640)	3.10* (0.0790)	2.59 (0.1083)	7.85*** (0.0052)	4.48** (0.0346)	6.28** (0.0125)
Gentera	444	0.57 (0.4509)	0.05 (0.8247)	0.19 (0.6639)	0.15 (0.7007)	1.10 (0.2958)	2.24 (0.1355)
Apna Microfinance Bank	751	1.38 (0.2408)	6.35** (0.0119)	1.45 (0.2293)	9.87*** (0.0017)	1.31 (0.2530)	5.97** (0.0148)
Capitec Bank	755	12.14*** (0.0005)	1.53 (0.2166)	13.88*** (0.0002)	0.05 (0.8167)	10.20*** (0.0015)	0.73 (0.3936)
Blue Financial Services	346	0.08 (0.7762)	6.33** (0.0123)	0.07 (0.7970)	6.94*** (0.0088)	0.09 (0.7626)	7.07*** (0.0082)

This table reports the Wald Statistics for the mean-variance intersection tests and p-values (in parenthesis). The benchmark stock indices are (1) MSCI World: the Morgan Stanley Capital International developed market stock index, (2) MSCI EAFE: the Morgan Stanley Capital International developed market stock index, excluding the US and Canada, and (3) S&P 500. ***, **, * indicate 1%, 5%, and 10% significance levels that the estimated coefficients are different from zero.

V Robustness Tests¹⁰

Diversification benefits from European and Japanese investors' perspective

So far, we examined potential diversification benefits from the USD investors' perspective. That is, all returns were measured in the US dollar. To examine potential diversification benefits from euro and yen investors' perspectives, we calculated all returns in euro and yen, respectively. Spanning test results for individual MFIs in euro and yen are presented in Table 6. For each currency, the mean-variance tests were conducted using two different benchmark portfolios: for euro investors, the MSCI World's weekly return measured in euro and Euronext, and for yen investors, the MSCI World's weekly return measured in yen and Nikkei 225. Since the estimated results are very similar between these two benchmarks, we will focus our discussion on results based on the MSCI World index. According to our results, there are significant diversification benefits for globally diversified euro investors. Fourteen out of 18 MFIs' spanning test results are significant at the 1% level, while another MFI's (MAS Financial Services) results are significant at the 10% level. Spanning results for yen investors are even more significant. For yen investors, 17 MFIs' spanning results are significant at the 5% level or higher. We also re-estimated spanning results for MFI country, regional, and global indices from euro and yen investors' perspectives. Given the results presented in Table 6, it is no surprise that all these indices (for both equally and value weighted) are significant at the 1% level.¹¹

Even though spanning test results are highly significant from USD, euro, and yen investors' perspectives, the spanning results are much more significant for euro and yen investors than for USD investors. To investigate this issue, we decompose the rate of return in USD (euro and yen) terms from investing in the i^{th} MFI, $R_{i\$}$, as

$$R_{i\$} = R_i + e_{i\$} + [(R_i)(e_{i\$})] \quad (3)$$

where R_i is the local currency rate of return from the i^{th} MFI and $e_{i\$}$ is the rate of change in the exchange rate between the local currency and the USD. Since R_i is the same for USD, euro and yen investors, the difference in spanning test results must be driven by $e_{i\$}$, $e_{i\text{€}}$, and $e_{i\text{¥}}$. To investigate the effect of $e_{i\$}$, $e_{i\text{€}}$, and $e_{i\text{¥}}$ on diversification benefits, we first examined the exchange rate system utilized by the seven countries included in our sample during the 2005 to 2019 sample period. According to the IMF's Annual Report on Exchange Rate Arrangements and Exchange Restrictions, India, Indonesia, Kenya, Mexico, and South Africa were operating under the floating exchange rate system. From 2005 to 2009, Bangladesh was operating under the floating exchange rate system, and from 2010 to 2019, the country pegged its currency to USD. From 2005 to 2016, Pakistan was operating under the stabilized arrangement and from 2017, the country pegged its currency to USD. Hence, five out of seven countries were operating under the floating exchange rate system. Even though the Bangladeshi taka and Pakistani rupee were under a managed system, both currencies fluctuated against the USD. The weekly standard deviation of rate of change in the

¹⁰ Robustness tests are based on spanning tests with no short sales restrictions. We also re-estimated robustness tests with short sales restrictions and the evidence in favor of diversification benefits declined significantly. These results are available from authors upon request.

¹¹ Results are available from authors upon request.

Table 6: Spanning Tests for Individual Microfinance Institutions From Euro and Yen Investors' Perspectives; Returns are Measured in Euro and Japanese Yen, January 2005 – June 2019.

MFI	Number of observations	Euro Investors		Yen Investors	
		MSCI-W(€)	EURONEXT	MSCI-W(¥)	NIKKEI 225
BRAC Bank	647	74.17*** (0.0000)	68.80*** (0.0000)	193.70*** (0.0000)	166.97*** (0.0000)
Bharat Financial Inc	461	6.60*** (0.0015)	6.48*** (0.0017)	18.54*** (0.0000)	21.67*** (0.0000)
L&T Finance Holdings	410	25.66*** (0.0000)	28.40*** (0.0000)	69.95*** (0.0000)	63.16*** (0.0000)
Satin Creditcare Network	199	6.21*** (0.0024)	2.40* (0.0931)	13.98*** (0.0000)	11.94*** (0.0000)
Equitas Holdings	165	14.32*** (0.0000)	8.31*** (0.0004)	37.21*** (0.0000)	30.58*** (0.0000)
Ujjiivan Finance Services	162	9.39*** (0.0001)	3.95** (0.0212)	23.63*** (0.0000)	16.48*** (0.0000)
Capital Trust	127	1.55 (0.2169)	1.62 (0.2019)	3.33** (0.0392)	2.89* (0.0594)
MAS Financial Services	88	2.61* (0.0794)	1.66 (0.1960)	7.00*** (0.0015)	9.29*** (0.0002)
Bandhan Bank	65	0.78 (0.4611)	0.56 (0.5750)	3.35** (0.0416)	3.67** (0.0311)
CreditAccess Grameen	44	0.18 (0.8325)	0.19 (0.8278)	0.37 (0.6945)	0.45 (0.6398)
Bank Danamon Indonesia	749	6.45*** (0.0017)	6.57*** (0.0015)	35.80*** (0.0000)	47.95*** (0.0000)
Bank Rakyat Indonesia	749	18.84*** (0.0000)	15.31*** (0.0000)	75.08*** (0.0000)	80.49*** (0.0000)
Equity Bank	671	38.24*** (0.0000)	38.29*** (0.0000)	88.83*** (0.0000)	90.22*** (0.0000)
Financiera Independencia	608	53.71*** (0.0000)	53.40*** (0.0000)	166.20*** (0.0000)	156.52*** (0.0000)
Genera	444	42.87*** (0.0000)	32.47*** (0.0000)	98.33*** (0.0000)	118.06*** (0.0000)
Apna Microfinance Bank	751	11.30*** (0.0000)	10.03*** (0.0001)	25.58*** (0.0000)	26.91*** (0.0000)
Capitec Bank	755	137.88*** (0.0000)	166.91*** (0.0000)	408.11*** (0.0000)	304.20*** (0.0000)
Blue Financial Services	346	19.97*** (0.0000)	24.51*** (0.0000)	52.96*** (0.0000)	38.14*** (0.0000)

This table reports the Wald Statistics for the mean-variance spanning tests and p-values (in parenthesis). The benchmark stock indices are (1) the MSCI World: the Morgan Stanley Capital International developed market stock index in euro and yen, (2) Euronext (in euro), and (3) NIKKEI 225 (in yen). ***, **, * indicate 1%, 5%, and 10% significance levels.

Bangladeshi taka and Pakistani rupee vs USD was 0.44% and 0.75%, respectively.¹² Furthermore, both currencies were floating against the euro and yen since both currencies were pegged to USD, and the USD was floating against the euro and yen. Hence, all seven currencies were operating under the floating exchange rate system against the euro and yen. Therefore, it does not appear that the exchange rate system that our sample countries were operating under account for the difference in spanning test results.

Next, we examined the correlation between the weekly return on the MSCI World Index (in USD) and $e_{i\$}$, the MSCI World Index (in euro) and $e_{i€}$, and finally the MSCI World Index (in yen) and $e_{i¥}$. For the entire sample period, the average correlation for the 18 MFIs included in the sample was 0.351, -0.353, and -0.626, respectively for the USD, euro, and yen.¹³ The rank ordering of these correlations is consistent with the significance of spanning test results. As was mentioned above, the spanning test results for euro and yen investors are much more significant than for USD investors. Furthermore, the spanning test results for yen investors is more significant than for euro investors. Hence, it appears that euro and yen investors received greater diversification benefits than USD counterparts due to lower correlations between their currency fluctuations vis-à-vis MFI currency and the globally diversified benchmark portfolio.

Sub-period results

Our sample period includes two of the most memorable times in US economic history: The Great Recession from December 2007 to June 2009 and the longest expansion from July 2009 to February 2020. During these two time periods, the average correlation coefficient between the MFIs' US dollar return and MSCI World portfolio's US dollar return went from 0.32 to 0.22, suggesting a potential increase in the diversification benefits to globally diversified portfolios. To examine if there was any shift in the efficient frontier of globally diversified portfolios as the US economy transitioned from recession to expansion, we re-ran spanning tests for individual MFI, country, regional and global microfinance indices for the two sub-periods. The sub-period spanning test results and the chi-square statistics (and p-values) for the equality of regression coefficients between two sub-periods are presented in Tables 7 and 8. Table 7 presents results for individual MFIs, and according to our results, spanning test results for both Indonesia's MFIs went from being statistically significant to insignificant. On the other hand, spanning test results for Equity Bank and Financiera Independencia went from being insignificant to significant. However, based on the chi-square analysis, the null hypothesis is rejected at the 5% level only for Bank Danamon Indonesia and Equity Bank from Kenya. Hence, even though the average correlation coefficient between the MFIs' US dollar return and MSCI World portfolio's US dollar return declined by 0.10, there does not appear to be a significant shift in the overall diversification benefits between these two sub-periods. Table 8 presents sub-period results for country, regional and global microfinance indices. According to the chi-square analysis, the null hypothesis is rejected at the 5% level for Kenya country index and at the 10% level for Asia region index. For all other indices, the results of the chi-square analysis are not significant.

¹² As a comparison, the weekly standard deviation of rate of change in Indian rupee, Indonesian rupiah, Kenyan shilling, Mexican peso, and South African rand vs USD was 0.96%, 1.07%, 0.92%, 1.67%, and 2.31%, respectively.

¹³ We also examined correlation between S&P 500 and $e_{i\$}$, Euronext and $e_{i€}$, and Nikkei 225 and $e_{i¥}$. The average correlations are 0.189, -0.164, and -0.545, respectively for USD, euro, and yen.

Table 7: Spanning Tests for Individual Microfinance Institutions for Two Subperiods: 2005-2009 and 2010-2019 From USD Investors' Perspective.

MFI	Benchmark: MSCI – World (in USD)		
	2005 - 09	2010 - 19	Equality test of regression coefficients
BRAC Bank	29.46*** (0.0000)	28.51*** (0.0000)	2.22 (0.3292)
Bharat Financial Inc	-	0.03 (0.9743)	-
L&T Finance Holdings	-	3.50** (0.0310)	-
Satin Creditcare Network	-	0.83 (0.4372)	-
Equitas Holdings	-	3.18** (0.0441)	-
Ujjivan Finance Services	-	1.16 (0.3148)	-
Capital Trust	-	1.33 (0.2691)	-
MAS Financial Services	-	1.30 (0.2773)	-
Bandhan Bank	-	1.01 (0.3685)	-
CreditAccess Grameen	-	0.44 (0.6478)	-
Bank Danamon Indonesia	4.09** (0.0178)	1.67 (0.1890)	6.57** (0.0374)
Bank Rakyat Indonesia	3.79** (0.0239)	1.90 (0.1502)	3.61 (0.1643)
Equity Bank	1.46 (0.2351)	37.60*** (0.0000)	6.18** (0.0456)
Financiera Independencia	0.07 (0.9297)	5.79*** (0.0033)	2.92 (0.2324)
Genera	-	0.41 (0.6665)	-
Apna Microfinance Bank	3.20** (0.0424)	4.06** (0.0178)	2.01 (0.3656)
Capitec Bank	3.59** (0.0291)	3.67** (0.0261)	3.02 (0.2211)
Blue Financial Services	2.28 (0.1054)	1.69 (0.1868)	0.19 (0.9081)

This table reports the chi-square (χ^2) statistics for the equality of regression coefficients (constant α and β coefficients) between 2005-2009 and 2010-2019 periods and p-values (in parenthesis). The benchmark is the MSCI World: the Morgan Stanley Capital International developed market stock index. ***, **, * indicate 1%, 5%, and 10% significance levels.

Table 8: Spanning Tests for MFIs Value Weighted Country, Regional and Global Indices for Two Subperiods: 2005-2009 and 2010-2019 From USD Investors' Perspective

Index	Benchmark: MSCI – World (in USD)		
	2005 - 09	2010 - 19	Equality test of regression coefficients
Panel A: Country			
Bangladesh	29.46*** (0.0000)	28.51*** (0.0000)	2.22 (0.3292)
India	-	0.70 (0.4949)	-
Indonesia	4.02** (0.0192)	2.07 (0.1267)	3.99 (0.1363)
Kenya	1.46 (0.2351)	37.60*** (0.0000)	6.18** (0.0456)
Mexico	0.07 (0.9297)	0.49 (0.6128)	0.11 (0.9480)
Pakistan	3.20** (0.0424)	4.06** (0.0178)	2.01 (0.3656)
South Africa	3.77** (0.0244)	1.82 (0.1633)	2.27 (0.3209)
Panel B: Regional and Global			
Africa	3.91** (0.0212)	3.33** (0.0364)	1.94 (0.3793)
Asia	3.71** (0.0258)	2.66* (0.0706)	5.64* (0.0596)
Latin America	0.07 (0.9297)	0.49 (0.6128)	0.11 (0.9480)
Global	9.88*** (0.0001)	17.32*** (0.0000)	0.50 (0.7771)

This table reports the chi-square (χ^2) statistics for the equality of regression coefficients (constant α and β coefficients) between 2005-2009 and 2010-2019 periods and p-values (in parenthesis). The benchmark is the MSCI World: the Morgan Stanley Capital International developed market stock index. For each country included in the sample, a local microfinance country return index is created. If there is only one MFI listed and traded on the country stock exchange, the sole MFI's returns become the country return index. If there are more than one MFIs listed and traded on the country stock exchange, a value weighted country return index is created. For each region included in the sample, a regional microfinance US dollar return index is created. If there is only one country in the region, the sole country's returns become the regional return index. If there is more than one country from the region, a value weighted regional return index is created. A value weighted global microfinance index is created from regional indices. ***, **, * indicate 1%, 5%, and 10% significance levels.

Large capitalization and actively traded MFIs

Based on the spanning test results with no short sales restrictions, there is significant potential for diversification benefits for investors across the globe. However, about half of the MFIs included in the sample are relatively smaller firms, and their stocks' trading volume and liquidity may not be sufficient to attract foreign investors. In addition, exchanges may impose short sales restrictions on smaller MFIs. Hence, to address these issues, we create two indices. First, we create an index composed of large MFIs with 2019 market capitalization in excess of \$1 billion. The second index is composed of MFIs that met the following two criteria: (1) 2019 market capitalization in excess

of \$1 billion; and (2) 2019 5-day average trading volume in excess of 1 million shares.¹⁴ Nine MFIs met the size criteria and the following six MFIs met both criteria: Bandhan Bank, Bank Danamon, Bank Rakyat, Equity, Gentera and L&T Holding.¹⁵ The spanning test results for large capitalized MFIs for USD, euro, and yen investors' perspectives are presented in Table 9. All spanning test results are significant at the 1% level. As we have seen before, spanning test results for euro and yen investors are stronger than for USD investors. Spanning test results for large capitalized and actively traded MFIs are significant at the 1% level for euro and yen investors. For USD investors, spanning test results are also significant but at a lower level of significance. Hence, consistent with earlier results, investors across the globe can expand their mean-variance efficient frontiers to the left by including large and actively traded MFIs in their globally diversified portfolios, but euro and yen investors are expected to receive greater diversification benefits than USD investors.

Benchmark indices

Our results reveal that there is a significant diversification benefit potential from including listed MFIs in globally diversified portfolios. However, our results are based on benchmark equity indices covering developed markets only and do not include emerging or frontier markets. Berger, Pukthuanthong, and Yang (2011) study have documented that globally diversified investors are able to achieve similar levels of expected return with lower risk by adding frontier equity markets. Two of the countries included in their study are also included in our sample. Hence, we need to investigate whether the diversification benefits documented in the paper are due to (a) adding equities from emerging or frontier markets or (b) adding MFIs. To address this issue, first, we re-estimate earlier results by replacing MSCI World Index with MSCI All Country (AC) World Index which includes developed and emerging markets. Second, to assess the diversification benefits to holders of globally diversified emerging market portfolio, we re-estimate previous results by replacing MSCI World Index with MSCI Emerging Markets (EM) Index. Lastly, we include both MSCI World Index and MSCI EM Index as benchmark portfolios and estimate the following regression:

$$R_{MFI_{i,t}} = \alpha + \beta_1(MSCI W)_t + \beta_2(MSCI EM)_t + \varepsilon_t \quad (4)$$

The mean-variance spanning test for equation (4) involves testing for the null hypothesis of $\alpha = 0$ and $\beta_1 + \beta_2 = 1$.

Table 10 presents the mean-variance spanning test results for individual MFIs from USD investors' perspective with a new set of benchmark portfolios. The third column in Table 10 presents results with MSCI AC as the benchmark portfolio and they are very similar to results presented in Table 3, except for Bank Rakyat Indonesia (BRI) whose significance level goes from 5% to 10%. According to spanning test results with MSCI EM as the benchmark portfolio, fourth

¹⁴ According to Datastream, the market capitalization at the end of 2019 for the 17 MFIs included in the sample ranges from \$44 million to \$38 billion with an average capitalization of \$4.5 billion and a standard deviation of \$9.33 billion. Also, in 2019, the 5-day trading volume for the 17 MFIs included in the sample ranges from 500 shares to 95 million shares with an average 5-day trading volume of 7.55 million shares and a standard deviation of 23.46 million shares.

¹⁵ All six MFIs that met the trading volume requirement also met the size requirement. Three MFIs that met the size but not the trading volume requirement are Bharat Finance, Capitec and CreditAccess. We did not have Bharat Finance's 2019 trading volume data.

column in Table 10, MFIs provide significant diversification benefits to globally diversified emerging market portfolio as the spanning test is rejected at the 5% level or higher for six out of 18 MFIs. Lastly, the spanning test results with both MSCI World Index and MSCI EM index as benchmark portfolios are reported in the last column in Table 10. As can be seen from the table, the mean-variance spanning test results are very similar to results presented in Table 3, except for L&T Finance Holdings from India whose significance level increases from 5% to 1% and for BRI. The test statistic for BRI is no longer significant and mean-variance spanning test is rejected. In sum, it appears that the diversification benefits documented in the paper is due to MFIs' unique characteristics and not because these MFIs are domiciled in emerging or frontier markets. In fact,

Table 9: Spanning Tests for Large Market Capitalization and Actively Traded MFIs Indices From USD, Euro, and Yen Investors' Perspective; Returns are Measured in USD, Euro, and Yen, January 2005 – June 2019

Index	Number of observations	Benchmark: MSCI – World		
		USD	EURO	YEN
Large Cap MFIs				
Value weighted	755	4.81*** (0.0084)	59.79*** (0.0000)	221.06*** (0.0000)
Equally weighted	755	5.69*** (0.0035)	92.06*** (0.0000)	344.95*** (0.0000)
Large Cap and Actively traded MFIs				
Value weighted	755	2.90* (0.0557)	26.21*** (0.0000)	99.20*** (0.0000)
Equally weighted	755	3.77** (0.0236)	47.83*** (0.0000)	175.62*** (0.0000)

This table reports the Wald Statistics for the mean-variance spanning tests and p-values (in parenthesis). The benchmark stock indices are MSCI World: the Morgan Stanley Capital International developed market stock index in USD, euro, and yen. Large Cap MFIs index is a weighted average of the following nine MFIs with 2019 market capitalization of \$1 billion or more: Bandhan Bank, Bank Danamon, Bank Rakyat, Bharat Finance, Capitec, Credit Access, Equity, Gentera, and L&T Holding. Large Cap and Actively traded MFIs index is a weighted average of the following six MFIs with 2019 market capitalization of \$1 billion or more and 2019 5-day average trading volume in excess of 1 million shares: Bandhan Bank, Bank Danamon, Bank Rakyat, Equity, Gentera, and L&T Holding. For both groups, we created equally and value weighted indices. ***, **, * indicate 1%, 5%, and 10% significance levels.

according to our results, adding MFIs' equities to pre-existing globally diversified emerging market portfolios will significantly enhance their risk-return profile.

VI Conclusion

Since the mid-1970s, MFIs have blossomed into a major provider of financial services to millions of low-income borrowers in developing countries. Furthermore, the microfinance industry has attracted the interest of global investors. To profit-oriented investors, investing in MFIs may be a useful vehicle for diversifying from global financial markets. To impact investors, MFIs present an attractive opportunity to make a positive financial and social impact in developing countries. Therefore, in this paper we employed mean-variance spanning tests to examine the potential diversification benefits of including MFIs in globally diversified portfolios.

Our estimation results are sensitive to the short sales restrictions assumption. When investors are allowed to go short on any stocks, including MFIs stocks, adding these listed MFIs

Table 10: Spanning Tests for Individual Microfinance Institutions From USD Investors' Perspectives With MSCI AC Index, MSCI EM Index, and MSCI World Index as Benchmark Portfolios, January 2005 – June 2019.

MFI	Number of observations	Benchmark (in USD)		
		MSCI - AC	MSCI - EM	MSCI World + EM
BRAC Bank	647	68.57*** (0.0000)	108.41*** (0.0000)	68.31*** (0.0000)
Bharat Financial Inc	461	0.03 (0.9718)	0.02 (0.9835)	0.02 (0.9850)
L&T Finance Holdings	410	3.39** (0.0347)	2.92* (0.0552)	5.01*** (0.0071)
Satin Creditcare Network	199	0.75 (0.4759)	1.56 (0.2132)	1.12 (0.3270)
Equitas Holdings	165	3.20** (0.0434)	2.22 (0.1122)	3.29** (0.0396)
Ujjivan Finance Services	162	1.15 (0.3193)	0.17 (0.8458)	1.05 (0.3507)
Capital Trust	127	1.47 (0.2331)	1.69 (0.1895)	1.37 (0.2580)
MAS Financial Services	88	1.31 (0.2744)	1.26 (0.2901)	1.00 (0.3734)
Bandhan Bank	65	0.98 (0.3801)	0.69 (0.5077)	0.74 (0.4802)
CreditAccess Grameen	44	0.41 (0.6633)	0.40 (0.6705)	0.63 (0.5391)
Bank Danamon Indonesia	749	0.70 (0.4993)	0.12 (0.8875)	0.18 (0.8333)
Bank Rakyat Indonesia	749	2.67* (0.0702)	1.94 (0.1444)	2.19 (0.1125)
Equity Bank	671	16.18*** (0.0000)	40.16*** (0.0000)	17.19*** (0.0000)
Financiera Independencia	608	2.74* (0.0657)	10.56*** (0.0000)	2.68* (0.0694)
Genera	444	0.62 (0.5376)	0.96 (0.3837)	0.22 (0.8001)
Apna Microfinance Bank	751	5.99*** (0.0026)	9.11*** (0.0001)	7.26*** (0.0008)
Capitec Bank	755	5.07*** (0.0065)	6.23*** (0.0021)	8.04*** (0.0003)
Blue Financial Services	346	3.84** (0.0225)	8.22*** (0.0003)	3.72** (0.0253)

This table reports the Wald Statistics for the mean-variance spanning tests and p-values (in parenthesis). The benchmark stock indices are (1) MSCI AC: the Morgan Stanley Capital International all countries market stock index, (2) MSCI EM: the Morgan Stanley Capital International emerging market stock index, and (3) both MSCI World: the Morgan Stanley Capital International developed market stock index and MSCI EM. ***, **, * indicate 1%, 5%, and 10% significance levels.

to globally diversified portfolios will significantly expand the mean-variance efficient frontiers to the left. Whether we measure returns from MFI investments in USD, euro or Japanese yen, the

mean-variance efficient frontiers shift to the left. However, when we do not allow investors to go short on MFIs stocks, the diversification benefits decline significantly. Even with short sales restrictions, adding MFIs such as BRAC Bank and Bank Rakyat to globally diversified portfolios will significantly expand the mean-variance frontier to the left but the majority of MFIs spanning test results do not reject the null hypothesis of spanning. An interesting observation from examining spanning test results with and without short sales restrictions is that regardless of the short sales assumption, the diversification benefits from the yen investors' perspectives is greater than those from the euro investors' perspectives, which in turn is greater than those from the USD investors' perspectives.

Our results have clear implications for profit-oriented and impact investors seeking investment opportunities in emerging countries. Since the magnitude of diversification benefits depends on the short sale restrictions assumption, implications for profit versus non-profit investors differs. For socially responsible investors motivated by worldwide financial inclusion, and most likely not interested in short selling MFIs' stocks, listed MFIs represent an attractive venue to achieve their social aims while at the same time potentially benefiting from expanding their mean-variance efficient frontier to the left. For profit-oriented global institutional investors, actively traded and large capitalized MFIs present an attractive investable asset class to include in their portfolios. However, the following two practical limitations may prevent for-profit oriented investors in taking full advantage of the diversification opportunity. First, only six MFIs are classified as actively traded and large capitalized MFIs, and they are located in four different stock exchanges. Second, even for these MFIs, their market capitalization is relatively small compared to the world market. Hence, the potential impact of including MFIs to global portfolio may be small.

This study does have limitations. First, as was mentioned in the Galema et al (2011) study, our analysis is based entirely on the mean-variance properties of assets and ignores other potentially significant MFIs characteristics that may influence socially responsible investors. Second, even though we included all MFIs IPOs with sufficient data, the sample size remains small.

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Appendix: Microfinance Institutions That Went Public From 1989 – 2018

Year	Number of IPOs	Microfinance Institutions	IPO date	Country
1989	1	Bank Danamon Indonesia Tbk	12/6/89	Indonesia
1990	1	African Bank	11/90	South Africa
2002	1	Capitec Bank Holdings Limited	2/18/02	South Africa
2003	1	Bank Rakyat Indonesia (BRI)	11/10/03	Indonesia
2005	1	Apna Microfinance Banks Ltd	1/24/05	Pakistan
2006	3	Equity	8/7/06	Kenya
		Blue Financial Services Ltd	10/13/06	South Africa
		BRAC Bank Limited	12/11/06	Bangladesh
2007	2	Compartamos (now known as Gentera SAB de CV)	4/20/07	Mexico
		Financiera Independencia	11/1/07	Mexico
2008	1	National Microfinance Bank PLC	11/06/08	Tanzania
2010	2	Bharat Financial (formerly SKS)	7/28/10	India
		NPF Micro Finance Bank PLC	12/1/10	Nigeria
2011	1	L&T Financial Services	8/12/11	India
2012	1	Fortis Microfinance Bank PLC	6/20/12	Nigeria
		Yetu Microfinance	8/17/15	Tanzania
		Satin Creditcare Network Ltd	9/4/15	India
2015	3	Mucoba Bank PLC	10/5/15	Tanzania
		Equitas Holdings	4/7/16	India
2016	2	Ujjivan Financial Services	5/10/16	India
2017	2	Capital Trust Ltd	1/16/17	India
		MAS Financial Services Ltd	10/18/17	India
2018	2	Bandhan Bank Ltd	3/27/18	India
		CreditAccess Grameen	8/23/18	India

Sources: Exchange Data International, Thompson Reuters Datastream, and the World Federation of Exchanges.