Ethnic Investing and the Value of Firms*

Jonas Hjort
UCL
& BREAD & CEPR & U. Oslo

Changcheng Song
U. Florida

Christopher Yenkey
U. South Carolina

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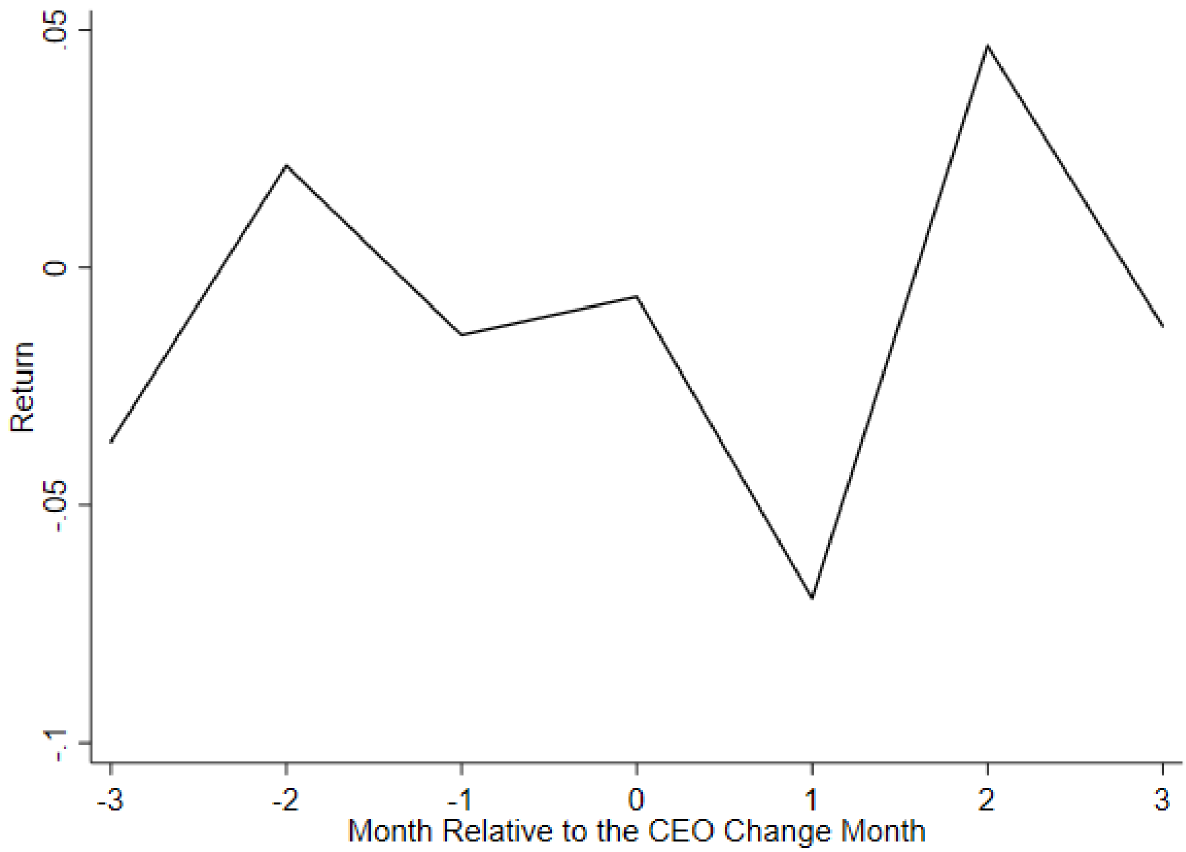
*j.hjort@ucl.ac.uk, songc@ufl.edu, cyenkey@moore.sc.edu We are grateful to John Y. Campbell, Francesco D'Acunto, Kent Daniel, Stefano DellaVigna, James Fenske, Raymond Fisman, Andrew Hertzberg, Harrison Hong, Jianfeng Hu, Amit Khandelwal, Weikai Li, Roger Loh, Suresh Naidu, Michaela Pagel, Tommaso Porzio, Jonah Rockoff, Paul Tetlock, and seminar participants at AEA/ASSA 2022, CERGE-EI, Columbia, Harvard/MIT, HKUST, Marseille School of Economics, University of Namur, NYU, Ottawa, Paris School of Economics, UCLA, UCSD, USC, Warwick, and Wharton for helpful suggestions; to Kenya's Central Depository and Settlement Corporation, Ltd. (CDSC) for data access; and to Sawal Acharya, Josephine Gantois, Naman Garg, Sakshi Gupta, Alokik Mishra, and especially Junyi Que and Xinyi Shen for superb research assistance.

Online Appendix

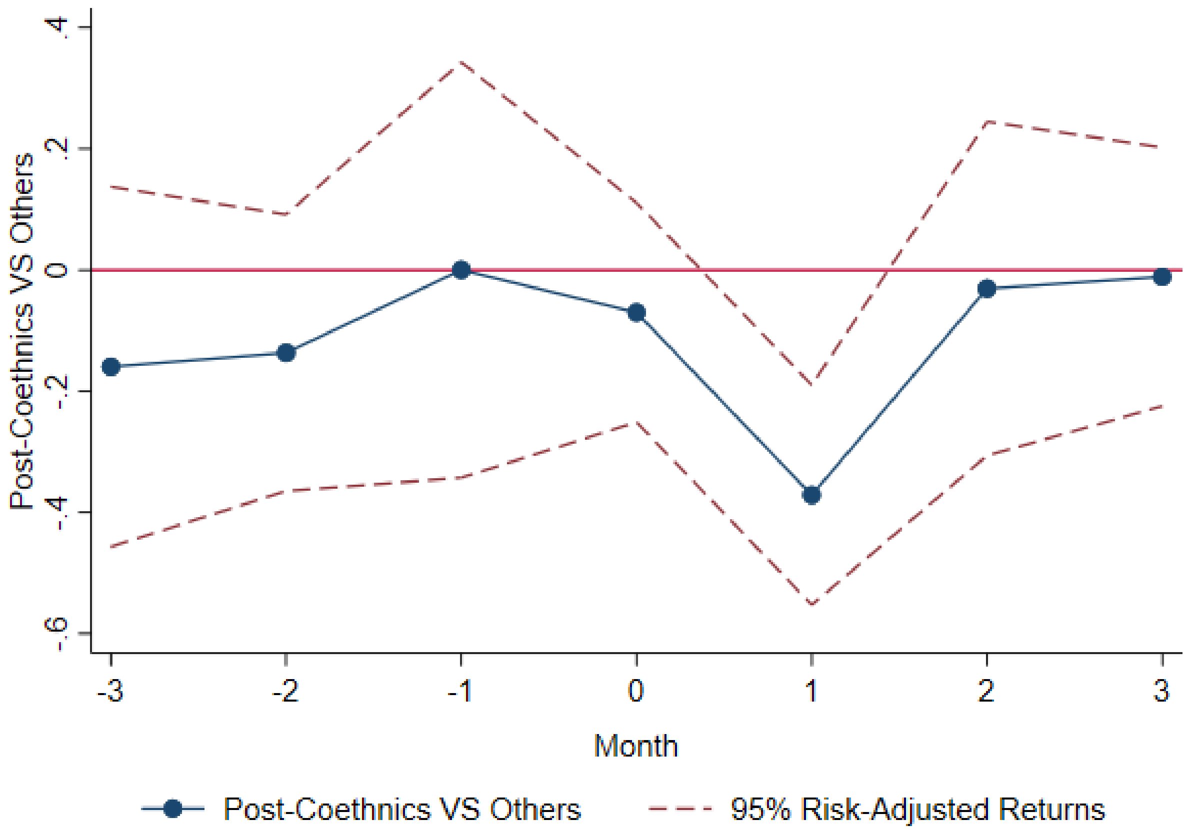
Appendix figures

FIGURE A1: ONE MONTH RETURNS WHEN A FIRM "CHANGES ETHNICITY" DUE TO CEO TURNOVER



The average monthly return over the change month of CEO. The sample uses only those firm where the ethnicity of the CEO changes at least once. The change occurs at month 0.

FIGURE A2: RISK-ADJUSTED RETURNS FROM "POST-COETHNICS" VS OTHERS WHEN A FIRM "CHANGES ETHNICITY" DUE TO CEO TURNOVER



We regress the monthly Risk-adjusted returns between post-coethnics and others. Post-coethnics mean the investor and the firm are coethnic after the firm switches CEO. Others means the investor and the firm aren't coethnic both before and after the firm switches CEO. Risk-adjusted returns correspond to the Sharpe Ratio, which is defined as the difference between the risk unadjusted returns and the treasury bill rates in Kenya, divided by the standard deviation of the difference. The sample uses only those firms where the ethnicity of the CEO changes at least once, and we delete the pre-coethnics sample. The change occurs at month 1.

Appendix Tables

TABLE A1: SUMMARY STATISTICS

Variable	Mean	Std. Dev.
Panel A: Investor level		
N = 54915		
Average portofolio value 2006 (USD)	5995	66898
Average portofolio value 2010 (USD)	4713	48714
Panel B: Firm level		
N = 47		
Listed by 2006	.894	.312
Agricultural	.085	.282
Service	.532	.504
Industrial	.383	.491
Market cap. 2006 (USD 000's)	260599	466847
Market cap. 2010 (USD 000's)	285579	488948
Panel C: Investor × firm × month level		
N = 658188		
Investment	.548	.405
Order Imbalance	.069	.985
CoethnicCEO	.270	.444
CoethnicBoard	.407	.491
CEOCoethnicityIndex	.184	.294
BoardCoethnicityIndex	.152	.168
Risk-adjusted Returns	.070	0.575

The dataset spans January 2006-December 2010. The data consists of all investors observed over the period that have made at least five trades (buying or selling) in a given year, as well as 47 firms that were listed on the NSE during some part of the period. These firms include ACCS, BAMB, BAT, BBK, CABL, CMC, DTK, EABL, EQTY, EVRD, HFCK, ICDC, JUB, KCB, KEGN, KENO, KNRE, KPLC, KQ, MSC, NBK, NIC, NMG, OCH, PORT, REA, SCAN, SCBK, SCOM, SGL, TOTL, TPSE, ARM, SASN, FIRE, PAFR, UNGA, BERG, CFC, UCHM, COOP, CandG, MASH, KUKZ, BOC, UTK, CARB. The trades have been aggregated to the investor-firm-month level. For any given investor and firm, only those months where a trade has been made are included. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

TABLE A2: INVESTOR-FIRM COETHNICITY AND BUYING STOCKS

	(1)	(2)	(3)	(4)
	Buy	Buy	Buy	Buy
CoethnicCEO	0.00424*			
	(0.00239)			
CEOCoethnicityIndex		0.00629**		
		(0.00276)		
CoethnicBoard			0.0350***	
			(0.00517)	
BoardCoethnicityIndex				0.0589***
				(0.00945)
Value Controls	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
CEO Ethnicity FE	Yes	Yes	Yes	Yes
Mean of Dep. Var.	0.542	0.538	0.553	0.537
R2	0.337	0.331	0.351	0.323
N	395714	583348	271310	627549

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The specification is estimated on investor-firm-month-level data. The sample consists of all months in which a trade is made by any investor in any firms stock. This table shows the outcome buy, which is a dummy variable measuring whether the investor purchases the stock during that month. All specifications include investor, firm, month, and CEO ethnicity fixed effects and we control for the value control return on equity (ROE) in the prior 12 month period in both panels. Standard errors are clustered at the investor ethnicity $\times$ CEO ethnicity level. The dataset spans January 2006-December 2010. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

TABLE A3: INVESTOR-FIRM COETHNICITY AND INVESTMENT: ETHNICALLY KENYAN INVESTORS

	(1) Investment	(2) Investment	(3) Investment	(4) Investment
CoethnicCEO	0.0117***			
	(0.00418)			
CEOCoethnicityIndex		0.0122***		
		(0.00473)		
CoethnicBoard			0.0134*	
			(0.00706)	
BoardCoethnicityIndex				0.0394***
				(0.0111)
Value Controls	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
CEO Ethnicity FE	Yes	Yes	Yes	Yes
Mean of Dep. Var.	0.548	0.544	0.567	0.542
R2	0.413	0.406	0.450	0.399
N	166462	263370	111470	290803

	(1) OI	(2) OI	(3) OI	(4) OI
CoethnicCEO	0.0100*			
	(0.00535)			
CEOCoethnicityIndex		0.0152**		
		(0.00628)		
CoethnicBoard			0.0290**	
			(0.0133)	
BoardCoethnicityIndex				0.0549***
				(0.0194)
Value Controls	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
CEO Ethnicity FE	Yes	Yes	Yes	Yes
Mean of Dep. Var.	0.0734	0.0628	0.102	0.0584
R2	0.349	0.338	0.343	0.328
N	251677	401706	168550	444100

The specification is estimated on investor-firm-month-level data. The sample consists of all months in which a trade is made by any investor in any firms stock. The sample is restricted to ethnically Kenyan investors. Panel A shows the outcome investment, which is the proportion of the investors' portfolio that is held in the share. Panel B shows order imbalance, which measures how much the investor net buys or sells a particular firm's stock, as a proportion of the investor's total traded stock of the same stock during the same month. All specifications in both panels include investor, firm, month, and CEO ethnicity fixed effects and we control for the value control return on equity (ROE) in the prior 12 month period. Standard errors are clustered at the investor ethnicity × CEO ethnicity level. The dataset spans January 2006-December 2010. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

TABLE A4: INVESTOR-FIRM COETHNICITY AND RETURNS: REALIZED RETURN

	(1) Risk-adjusted Returns	(2) Risk-adjusted Returns	(3) Risk-adjusted Returns	(4) Risk-adjusted Returns
CoethnicCEO	-0.0116**			
	(0.00482)			
CEOCoethnicityIndex		-0.0132**		
		(0.00539)		
CoethnicBoard			-0.101***	
			(0.0153)	
BoardCoethnicityIndex				-0.0355
				(0.0224)
Value Controls	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
CEO Ethnicity FE	Yes	Yes	Yes	Yes
Mean of Dep. Var.	0.110	0.0906	0.120	0.0860
R2	0.562	0.544	0.605	0.527
N	86720	128777	61070	139721

The specifications are estimated on investor-firm-month-transaction level data. The sample is restricted to those accounts with a realized return who have both buy and sell. Risk-adjusted returns correspond to the Sharpe Ratio, which is defined as the difference between the risk unadjusted returns and the treasury bill rates in Kenya, divided by the standard deviation of the difference. The month indicates origination of the transaction. All specifications include investor, firm, month, and CEO ethnicity fixed effects. We control for the value control return on equity (ROE) in the prior 12 month period in both panels. Standard errors are clustered at the investor ethnicity $\times$ CEO ethnicity level. The dataset spans January 2006-December 2010. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

TABLE A5: INVESTOR-FIRM COETHNICITY AND RETURNS: SAMPLE WITH NO CEO ETHNICITY CHANGE

	(1) Risk-adjusted Returns	(2) Risk-adjusted Returns	(3) Risk-adjusted Returns	(4) Risk-adjusted Returns
CoethnicCEO	-0.0158**			
	(0.00626)			
CEOCoethnicityIndex		-0.0176**		
		(0.00759)		
CoethnicBoard			-0.0496***	
			(0.00813)	
BoardCoethnicityIndex				-0.00820
				(0.0230)
Value Controls	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
CEO Ethnicity FE	Yes	Yes	Yes	Yes
Mean of Dep. Var.	0.147	0.131	0.160	0.106
R2	0.637	0.618	0.658	0.593
N	171695	243379	133967	267735

The table shows results from the regression, which is estimated on investor-firm-month-transaction-level data. The sample is restricted to those firms for which the (ethnicity of the) CEO did not change during our data period. Risk-adjusted returns are defined as the difference between the return on investment of the transaction and the risk-free return, divided by the risk or standard deviation of the monthly returns over the holding period. The sample consists of all transactions initiated during the period. The month indicates origination of the transaction. All specifications include investor, firm, month of origination, and CEO ethnicity fixed effects and we control for the value control return on equity (ROE) in the prior 12 month period. Standard errors are clustered at the investor ethnicity $\times$ CEO ethnicity level. The dataset spans January 2006-December 2010. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

TABLE A6: INVESTOR-FIRM COETHNICITY AND RETURNS: ONE YEAR RETURNS

	(1)	(2)	(3)	(4)
	One Year Return	One Year Return	One Year Return	One Year Return
CoethnicCEO	-0.00398**			
	(0.00159)			
CEOCoethnicityIndex		-0.00407**		
		(0.00183)		
CoethnicBoard			-0.0454***	
			(0.00527)	
BoardCoethnicityIndex				-0.0193**
				(0.00808)
Value Controls	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
CEO Ethnicity FE	Yes	Yes	Yes	Yes
Mean of Dep. Var.	0.0315	0.0294	0.0340	0.0274
R2	0.526	0.518	0.553	0.505
N	220818	323944	152852	348844

The specifications are estimated on investor-firm-month-transaction level data. One Year Return is calculated based on transaction price and the price of last day in the first calendar year. The sample consists of all transactions initiated during the period. The month indicates origination of the transaction. Specifications in both Panel A and Panel B include investor, firm, month, and CEO ethnicity fixed effects. We control for the value control return on equity (ROE) in the prior 12 month period in both panels. Standard errors are clustered at the investor ethnicity × CEO ethnicity level. The dataset spans January 2006-December 2010. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

A1 Data and variables

A1.1 Data

We use the following data sources. The NSE's Transactions Registry is recorded by the Central Depository and Settlement Corporation, Ltd. (CDSC), the "back office" that manages the clearing and settlement of NSE transactions. The CDSC also maintains a Registry of NSE Investor Accounts. They gave us access to a de-identified version that contains, in addition to a scrambled id, the investor's gender, residential location (typically a town or city), account creation year, account type (individual/institutional investor/broker), nationality (Kenya/East African Community (Burundi, Rwanda, South Sudan, Tanzania, and Uganda)/"foreign"), and last name. Information on firm characteristics (book value, outstanding shares, etc) comes from the firms' financial reports.

A1.2 Variables definition

To construct a measure of an investor's portfolio, we begin by assuming that all investors have zero holdings as of 2006. We thereafter simply add any observed purchases to investor i's inferred holdings, and subtract any observed sales. What we term **Investment**, or holdings imbalance, ranges from 0 to 1. It measures, at the investor-firm-month level, the value of a particular investor's holdings of a particular stock, as a proportion of the value of the investor's total portfolio.[1]

Order Imbalance ranges from -1 to 1. It measures, at the investor-firm-month level, how much the investor net buys or sells a particular firm's stock, as a proportion of the investor's total traded stock of the same stock during the same month (see e.g. Chordia *et al.*, 2002). Specifically,

$$\text{Order Imbalance} = \frac{\text{(Total value of stocks bought)} - \text{(Total value of stock sold)}}{\text{Total volume traded within the month}}$$

In the sample of investors who bought and sold the same stocks during our sample period, we define **Risk Unadjusted Returns** as the realized return based on the buy and sell price during the holding period. In the sample of investors who bought but not subsequently sold before the end of our data period, the 31st of December 2010, we compute the **Risk Unadjusted Returns** as unrealized paper returns at the 31st of December 2010.

Sharpe Ratio is defined as the difference between the returns of the investment and the risk-free return, divided by the standard deviation of the difference, which represents the additional amount of return that an investor receives per unit of increase in risk. Specifically,

$$\text{Sharpe Ratio} = \frac{E[R - R_b]}{\sqrt{var[R - R_b]}}$$

[1] Recall that the NSE was much less active before 2006: our results are very similar if we instead focus only on investors who opened their NSE account in 2006 or later, in which case we observe investors' full portfolio at every point in time.

where R is the risk unadjusted returns, and R_b is the risk-free return. We use the treasury bill rates in Kenya as the risk-free return here.

CoethnicInvestorBase$_{jt}$ is the portfolio value investors that are active—that is, that trade—at time t and who belong to the same ethnicity as firm j's CEO hold, relative to that of all potentially active coethnic investors. We define potentially active coethnic investors as all investors who are Kenya individual investors and have invested on the NSE up to and including the month in question.

NeutralInvestorBase$_t$ is the portfolio value of neutral investors that are active—that is, that trade—at time t, relative to that of all potentially active investors. We define potentially active investors as all investors who are Kenya individual investors and neutral investors, and have invested on the NSE up to and including the month in question. We proxy for neutral investors with foreign and institutional investors.

Alpha is another risk-adjusted returns we define as abnormal return (alpha) based on standard CAPM. In this specification, the risk-free return is defined as the treasury bill rates in Kenya and the market return is calculated based on the Nairobi Securities Exchange 20 Share Index(NSE20). NSE20 is a major stock market index which tracks the performance of 20 best performing companies listed on the Nairobi Securities Exchange. Then, we estimate β and alpha using the return of each stock, the risk-free return in Kenya, and the market return in Kenya.

A2 Coding ethnicity and coethnicity

We probabilistically assign ethnicities to investors, CEOs, and board-members using their last names. As described in Section 2, the starting point is name×ethnicity match probability information recorded by Yenkey (2015, 2018a,b). The author hired eight Kenyan research assistants (RAs), each of whom reported if they were highly confident that a given name could belong to a given ethnicity or not.[2] For each last name, each RA was asked to assign a 1 to any ethnicity that the RA felt 75 percent confident that the name was likely to belong to, and a 0 otherwise. There is overlap in the names used by some ethnicities so that the RAs could assign a given name to multiple ethnicities. We start by taking the average of the 1's and 0's across all RAs for each name to arrive at a single number for each name n and ethnicity e, p_{en}.

From this information we need to construct measures of whether an individual investor is likely to be of the same ethnic group as a given CEO and board. We say that ethnicity e is name n's *Likely Ethnicity* if $p_{en} \geq 0.4$ and p_{en} is ≤ 0.3 for all other ethnicities.[3] If this it not true for any ethnicity, n does not have a *Likely Ethnicity*.

[2] The ethnicities the RAs were asked about, and that we observe, are Anglo, Embu, Kalenjin, Kamba, Kikuyu, Kisii, Luhya, Luo, Maasai, Meru, Somali, South Asian, and Swahili.

[3] These cut-offs were chosen with the goal of minimizing both type 1 and type 2 errors. We also wish to make use of a high proportion of the sample of investors; for this reason the 0.4 threshold is relatively low and the 0.3 threshold relatively high, given considerable overlap in the names used by some Kenyan ethnic groups. In sub-section B1 of this appendix we show that our results are qualitatively very similar if we vary the thresholds.

We construct four measures of an investor's ethnic proximity to a firm's CEO and board respectively.[4] As described in Section 2, the first CEO measure, CoethnicCEO$_{ijt}$, is an indicator variable equal to 1 if investor i and the CEO running firm j in month t share a Likely Ethnicity, and 0 if not.

The second CEO measure, CEOCoethnicityIndex$_{ijt}$, is a 0 (minimum proximity) to 1 measure of the expected ethnic proximity between the investor's and the CEO's name, given each person's expected probability of belonging to each ethnicity. More precisely, the index is equal to the inner product of the investor and the CEO's name$\times$ethnicity match probabilities, or 1 minus Lieberson (1969)'s index of population diversity.

The first board measure, BoardCoethnicityIndex$_{ijt}$, is equal to the proportion of board-members that are coethnic with the investor, where coethnicity is measured as for the CoethnicCEO$_{ijt}$.

The other board measure, CoethnicBoard$_{ijt}$, is a 0/1 variable, and essentially repeats the construction of CoethnicCEO$_{ijt}$ twice, first between individual board-members and the investor, then for the board as a whole vis-a-vis the investor. To set CoethnicBoard$_{ijt} = 1$ in month t, we require, first, each individual board-members to be relatively likely to belong to the same ethnicity and relatively unlikely to belong to a different ethnicity than the investor, or vice versa, and second, for the board as a whole—given the expected individual board-member/investor co-ethnicity/non-coethnicity statuses—to be relatively likely to belong to the same ethnicity as the investor and relatively unlikely to belong to another ethnicity.

A3 Robustness checks

In Appendix Table B1 we show that our results from Section 3 of the paper are qualitatively very similar if we vary the thresholds used to define investors' and managers' ethnicities. The coethnicity variables are defined differently than in Table 1: the cutoffs, both to define individual and board level ethnicity are a high of 0.3 and low of 0.2, compared to 0.4 and 0.3, respectively in the main analysis.

In Appendix Table B2 we restrict our sample to investors who open their stock market accounts during our data period so that we have their full transaction history after the account opening. We find that the results are similar to Table 1. The results imply that lack of transaction history for investors before 2006 will be unlikely to affect our results.

In Appendix Table A4 we show that the results are very similar to those in Table 3 if we restrict our sample to investors who bought and sold during our sample period and study the relationship between coethnicity and realized returns. In Appendix Table A5, we restrict the sample to firms whose CEO ethnicity remains constant during our data period.

To investigate returns over different horizons, in Appendix Table A6, we show the relationship between coethnicity and one year return. One year return is defined based on transaction price and the price of last

[4] There are several potential reasons why board coethnicity may affect investment somewhat more (or less) than CEO coethnicity. It could for example be that changes in which ethnic group dominates a board are less frequent than changes in the identity of the CEO and hence provide a more deeply rooted measure of a firm's perceived identity.

day in the first calendar year. We show that the results are similar with our main Table 3. We also investigate very short-run (1-day and 5-day) returns on coethnic investments in Appendix Table B3. We find that the one- and five-day return on coethnic investments is—in terms of point estimates—extremely close to that of non-coethnic investments. The only somewhat larger and statistically significant difference we find is for CoethnicBoard measure, which is lower for coethnic investments.

In Appendix Table B4, we define our risk-adjusted returns as abnormal return (alpha) based on standard CAPM. We estimate β and alpha using the return of each stock, the risk-free return in Kenya, and the market return in Kenya. The risk-free return is defined as the treasury bill rates in Kenya and the market return is calculated based on the Nairobi Securities Exchange 20 Share Index(NSE20). NSE20 is a major stock market index which tracks the performance of 20 best performing companies listed on the Nairobi Securities Exchange. We show that the results are similar to those in Table 3.

We focus on the differential returns individual investors make on coethnic investments on *average*. This is the appropriate basis for investigating the most common motivations underlying Kenyan stock market investors discriminating against non-coethnic firms on average, as we saw in Section 3 that they do. However, it would be surprising if there wasn't considerable heterogeneity in the extent to which investors favor coethnic firms, or their reasons for doing so.

A4 Model notation, details, and proofs of propositions

A4.1 Equilibrium and results details

Let I denote the total number of investors; x_i and x_{ni} denote the number of shares of type i owned by biased and neutral investors, respectively, and p_i the price per share of firm type i. The total outstanding shares of stocks in the market are given by N_i. Firms of a given type have the same production technology, characterized by a normally distributed cash flow with mean μ_i and variance σ_i^2, where $i = 1, 2$.

Given CARA preferences and normally-distributed cash flows, the optimal portfolio choices satisfy the following first order conditions:

$$x_i = \frac{\tau(\mu_i - p_i)}{\sigma_i^2} \tag{1}$$

$$x_{n1} = \frac{\tau[\sigma_2^2(\mu_1 - p_1) - \sigma_{12}(\mu_2 - p_2)]}{\Delta} \tag{2}$$

$$x_{n2} = \frac{\tau[\sigma_1^2(\mu_2 - p_2) - \sigma_{12}(\mu_1 - p_1)]}{\Delta} \tag{3}$$

where $\Delta = \sigma_1^2\sigma_2^2 - \sigma_{12}^2$.

Equilibrium prices are solved by imposing the constraints:

$$\alpha I x_{n1} + (1-\alpha)\beta I x_1 = N_1,$$
$$\alpha I x_{n2} + (1-\alpha)(1-\beta) I x_2 = N_2.$$

which give:

$$p_1 = \mu_1 - \frac{\sigma_1^2[(1-\alpha)(1-\beta)N_1\Delta + \alpha(N_1\sigma_1^2 + N_2\sigma_{12})\sigma_2^2]}{I\tau[\beta(1-\beta)(1-\alpha)^2\Delta + \alpha\sigma_1^2\sigma_2^2]}$$
$$p_2 = \mu_2 - \frac{\sigma_2^2[(1-\alpha)\beta N_2\Delta + \alpha(N_2\sigma_2^2 + N_1\sigma_{12})\sigma_1^2]}{I\tau[\beta(1-\beta)(1-\alpha)^2\Delta + \alpha\sigma_1^2\sigma_2^2]}$$

With only neutral investors ($\alpha = 1$), prices become:

$$p_1^N = \mu_1 - \frac{N_1\sigma_1^2 + \sigma_{12}N_2}{I\tau}, \quad p_2^N = \mu_2 - \frac{N_2\sigma_2^2 + \sigma_{12}N_1}{I\tau}.$$

We now derive the results, assuming the two firm types differ only in ethnicity—their return structures are the same ($\sigma_1 = \sigma_2 = \sigma$ and $\mu_1 = \mu_2 = \mu$). The equilibrium prices simplify to:

$$p_1 = \mu - \frac{\sigma^2[N_1(1-\rho^2)(1-\beta)(1-\alpha) + \alpha(N_1 + N_2\rho)]}{I\tau A}$$
$$p_2 = \mu - \frac{\sigma^2[N_2(1-\rho^2)\beta(1-\alpha) + \alpha(N_1\rho + N_2)]}{I\tau A}$$

where $A = (1-\rho^2)\beta(1-\beta)(1-\alpha)^2 + \alpha$ and ρ denotes the correlation coefficient. The respective prices with only neutral investors are:

$$p_1^N = \mu - \frac{\sigma^2(N_1 + \rho N_2)}{I\tau}, \quad p_2^N = \mu - \frac{\sigma^2(N_2 + \rho N_1)}{I\tau}.$$

Barring extreme correlation cases, group 1 share prices are generally higher under complete investor neutrality than with both biased and neutral investors when β is small and α is large, as the crowd-out effect dominates. A low cash flow correlation also contributes to this outcome by strengthening the diversification demand effect. A high relative supply of group 1 shares amplifies the supply effect, further favoring the complete neutrality scenario. We formally substantiate these claims in the next subsection.

A4.2 Prices in the only-neutral and mixed scenarios

We now examine conditions under which prices are higher under complete investor neutrality compared to the mixed scenario. First, note that when cash flows are perfectly negatively correlated ($\rho = -1$), prices are equal under both scenarios:

$$p_1^N = p_1 = \mu - \frac{\sigma^2(N_1 - N_2)}{I\tau}, \quad p_2^N = p_2 = \mu - \frac{\sigma^2(N_2 - N_1)}{I\tau}$$

Opposing risks offset naturally and firms are valued symmetrically based on share quantities. Diversification eliminates risk asymmetry, making investor composition irrelevant for equilibrium prices.

Similarly, when cash flows are perfectly positively correlated ($\rho = 1$), both firm types have identical prices:

$$p|_{\rho=1} = \mu - \frac{\sigma^2(N_1 + N_2)}{I\tau}$$

Identical return structures and perfect cash flow correlation lead firms to be perceived as interchangeable, so investor composition has no impact on equilibrium prices.

When $-1 < \rho < 1$, firm group 1's price is higher under complete investor neutrality if:

$$N_1 > \frac{\beta(1-\alpha)\rho}{1-\beta(1-\alpha)} N_2. \tag{4}$$

Firm group 2's price is higher under complete neutrality if:

$$N_2 > \frac{(1-\beta)(1-\alpha)\rho}{1-(1-\beta)(1-\alpha)} N_1. \tag{5}$$

From expressions (4) and (5), the price of shares from firm group $i = 1, 2$ is more likely to be higher under complete neutrality when:

- **The share of biased investors in group i is smaller:** In group 1, the share of biased investors, $\beta(1-\alpha)$, decreases as $\beta \to 0$, making (4) more likely to hold. Similarly, in group 2, $(1-\beta)(1-\alpha)$ decreases as $\beta \to 1$, increasing the likelihood of (5)

  The biased investors demand effect is weak with a low share of biased investors from the corresponding group. Consequently, the crowd-out effect dominates in the scenario with both biased and neutral investors, leading to higher prices under complete investor neutrality.

- **The share of neutral investors is larger:** As $\alpha \to 1$, the share of neutral investors increases, reducing the overall share of biased investors. This makes the right-hand side of inequalities (4) and (5) approach zero, increasing the likelihood that the conditions hold.

  As the share of neutral investors grows, more investors avoid overpriced shares due to bias (crowd-out effect), potentially increasing demand for the risk-free asset. The reduced influence of biased investors prevents prices in the mixed scenario from exceeding those under complete neutrality.

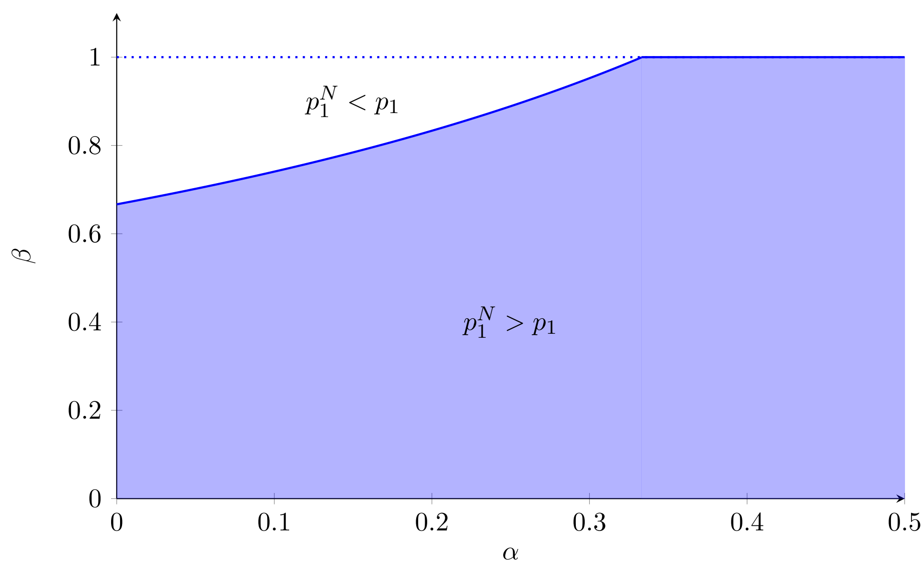
- **The correlation between cash flows is lower:** when $\rho \leq 0$, (4) holds if $N_1 > 0$, and (5) holds if $N_2 > 0$.

For $0 < \rho < 1$, smaller ρ increases the likelihood of both inequalities. Low correlation enables neutral investors to diversify more effectively, increasing the demand and prices of both share types. Biased investors do not exploit these benefits, as they only invest in coethnic firms. Hence, for small values of ρ, prices are more likely to be higher under complete neutrality.

- **The number of shares from group i is large relative to the other group:** When group 1's share supply is large, the supply effect is strong. If this supply exceeds the ratio of biased investors in group 1 to all other investors in the mixed scenario, downward pressure on p_1 is intensified by biased investors' preference for Firm 2 shares or the risk-free asset. As a result, the price of group 1 is more likely to be higher under complete investor neutrality.

Figure A3 compares p_1 and p_1^N across α and β values for $N_1 = N_2$ and $\rho = 0.5$ (substituting into (4)). The blue region indicates $p_1^N > p_1$, while the area above the curve shows $p_1^N < p_1$. For low α, most investors are biased, so a sufficient share in group 1 strengthens the biased investors' demand effect, making prices higher in the mixed scenario when β is large. For $\alpha > 1/3$, neutral investors dominate, and large β cannot make the biased demand effect outweigh the crowd-out effect, resulting in higher prices under complete neutrality.

FIGURE A3: COMPARISON OF p_1 AND p_1^N WHEN $\rho = 0.5$ AND $N_1 = N_2$



A4.3 Proof of Proposition 1

Proof. Taking derivatives of p_1 with respect to β gives:

$$\frac{\sigma^2(1-\rho^2)(1-\alpha)}{I\tau A^2}\{N_1[\alpha+\alpha(1-\alpha)(1-2\beta)+(1-\beta)^2(1-\alpha)^2(1-\rho^2)] \\ +(1-\alpha)(1-2\beta)\rho\alpha N_2\}$$

which is positive if and only if

$$N_1 > \frac{(2\beta-1)\rho\alpha(1-\alpha)N_2}{\alpha+\alpha(1-\alpha)(1-2\beta)+(1-\beta)^2(1-\alpha)^2(1-\rho^2)} \tag{6}$$

□

Inequality (6) holds for a wide range of parameters, including for example when the prices of the two types of stocks are uncorrelated.

The value of ρ that maximizes the right-hand side of (6) (when it is positive) is $\rho = 1$. Assuming $N_1 = N_2 > 0$, $0 < \alpha < 1$, and $\rho = 1$, the inequality holds if and only if

$$\beta < \frac{1}{2} + \frac{1}{4(1-\alpha)}.$$

It follows that as $\alpha \to 0$, β must remain below $3/4$ for p_1 to increase with β.

A4.4 Proof of Proposition 2

Proof. Let ΔN denote the number of shares issued by the firm and suppose $\beta > \frac{1}{2}$. The stock price for the firm before the CEO switch is simply p_2. The stock price after the switch is

$$\tilde{p_1} = \mu - \frac{\sigma^2[(N_1+\Delta N)(1-\rho^2)(1-\beta)(1-\alpha)+\alpha(N_1+\rho N_2+\Delta N(1-\rho))]}{I\tau A}$$

The firm benefits from the switch if and only if $\tilde{p_1} > p_2$, that is

$$N_2 > \frac{(1+\rho)(1-\alpha)(1-\beta)+\alpha}{(1+\rho)(1-\alpha)\beta+\alpha}(N_1+\Delta N) \tag{7}$$

□

Inequality (7) is more likely to hold when N_2, the total outstanding shares of minority-ethnicity firms, is large compared to $N_1 + \Delta N$, the sum of outstanding shares of majority firms and the switching firm, and when β is large. When N_2 is large relative to N_1 and when β is large, the stock price for type 1 firms tends to be higher than that for type 2 firms before the ethnicity switch. In this case there is greater demand for the stocks of type 1 firms and relatively smaller supply. Moreover, when ΔN is small, the additional supply of stocks of type 1 firms is marginal, so the switch won't reduce the stock price for type 1 firms by much.

With only neutral investors, (7) simplifies to $N_2 > N_1 + \Delta N$. Hence, the condition for a firm to benefit from switching from firm 2 to firm 1 only depends on the relative supply of shares, leaving the correlation term out.

A4.5 Proof of Proposition 3

Proof.

$$TMV = N_1 p_1 + N_2 p_2$$

$$= \mu(N_1 + N_2) - \frac{\sigma^2}{I\tau A}\left[(1-\rho^2)(1-\alpha)[(1-\beta)N_1^2 + \beta N_2^2] + \alpha(N_1^2 + 2\rho N_1 N_2 + N_2^2)\right]$$

Case when $\rho \in \{-1, 1\}$. In this case, total market value is the same under complete investor neutrality (TMV^N) and under neutral and biased investors (TMV).

$$TMV^N = TMV = \mu(N_1 + N_2) - \frac{\sigma^2(N_1 + N_2)^2}{I\tau}, \quad \text{when } \rho = 1.$$

$$TMV^N = TMV = \mu(N_1 + N_2) - \frac{\sigma^2(N_1 - N_2)^2}{I\tau}, \quad \text{when } \rho = -1.$$

When cash flows are perfectly negatively correlated, bias has no effect, as the market offsets opposing risks, valuing both firms based solely on share supply. Conversely, with perfectly positively correlated cash flows, shares from both firms are interchangeable, making market value unaffected by bias.

Case when $-1 < \rho < 1$.

$$\begin{aligned}\frac{\partial TMV}{\partial \alpha} =& \frac{\sigma^2(1-\rho^2)}{I\tau A^2}\{[(1-\beta)N_1^2 + \beta N_2^2][1-(1-\rho^2)\beta(1-\beta)(1-\alpha)^2] \\ & - (N_1^2 + 2N_1N_2\rho + N_2^2)\beta(1-\beta)(1-\alpha^2)\} \\ =& \frac{\sigma^2(1-\rho^2)}{I\tau A^2}M \\ \frac{\partial M}{\partial \alpha} =& 2[(1-\beta)N_1^2 + \beta N_2^2](1-\rho^2)\beta(1-\beta)(1-\alpha) \\ & + 2\alpha(N_1^2 + 2N_1N_2\rho + N_2^2)\beta(1-\beta) \\ \geq& 0\end{aligned}$$

To prove $M \geq 0$, it suffices to show $M \geq 0$ when $\alpha = 0$.

$$\begin{aligned}M|_{\alpha=0} =& (1-\beta)^2[1-(1-\rho^2)\beta](N_1 - \frac{N_2\rho\beta}{(1-\beta)[1-(1-\rho^2)\beta]})^2 \\ & + \frac{N_2^2\beta^3(1-\beta)(1-\rho^2)^2}{1-(1-\rho^2)\beta} \\ \geq& 0\end{aligned}$$

□

We now provide a formal proof for $TMV^N > TMV$ when $-1 < \rho < 1$. First, note that in this case:

$$TMV^N = \mu(N_1 + N_2) - \frac{\sigma^2}{I\tau}\left(N_1^2 + 2\rho N_1 N_2 + N_2^2\right).$$

For $TMV^N > TMV$, we require:

$$\frac{\sigma^2}{I\tau[(1-\rho^2)\beta(1-\beta)(1-\alpha)^2+\alpha]}\left[(1-\rho^2)(1-\alpha)[(1-\beta)N_1^2 + \beta N_2^2] + \alpha(N_1^2 + 2\rho N_1 N_2 + N_2^2)\right] >$$

$$\frac{\sigma^2}{I\tau}\left(N_1^2 + 2\rho N_1 N_2 + N_2^2\right)$$

$$(1-\beta)N_1^2 + \beta N_2^2 > \beta(1-\beta)(1-\alpha)\left(N_1^2 + 2\rho N_1 N_2 + N_2^2\right)$$

To demonstrate that this last inequality always holds for $-1 < \rho < 1$ and $0 \leq \alpha < 1$, note that the value of α that maximizes the right-hand side is $\alpha = 0$. For any other value $0 < \alpha < 1$, the right-hand side decreases. Therefore, we will first show that the left-hand side exceeds the right-hand side when $\alpha = 0$; it will then follow that the inequality remains true for all other values of α.

If $\alpha = 0$, the inequality is:

$$(1-\beta)N_1^2 + \beta N_2^2 > \beta(1-\beta)\left(N_1^2 + 2\rho N_1 N_2 + N_2^2\right).$$

$$(1-\beta)^2 + \beta^2\left(\frac{N_2}{N_1}\right)^2 - 2\rho\beta(1-\beta)\left(\frac{N_2}{N_1}\right) > 0.$$

Let $x \equiv \frac{N_2}{N_1}$, then:

$$f(x) \equiv (1-\beta)^2 + \beta^2 x^2 - 2\rho\beta(1-\beta)x > 0.$$

The expression above is a quadratic function in x of the form $ax^2 + bx + c$, where $a = \beta^2 \geq 0$. If $\beta = 0$, then $f(x) = 1$ and the inequality holds trivially. If $\beta = 1$, $f(x) = (N_2/N_1)^2 > 0$ and the inequality also holds trivially.

Now suppose $0 < \beta < 1$ and let $D_f(x)$ be the discriminant of $f(x)$. Then $D_f(x) = (-2\rho\beta(1-\beta))^2 - 4\beta^2(1-\beta)^2$. Since $\beta > 0$, $a > 0$. Hence, if we can show that the discriminant is negative, it follows that $f(x) > 0$. Expanding $D_f(x)$:

$$D_f(x) = 4\rho^2\beta^2(1-\beta)^2 - 4\beta^2(1-\beta)^2$$

$$D_f(x) = 4\beta^2(1-\beta)^2(\rho^2 - 1)$$

Since $\rho \in (-1, 1)$, $\rho^2 < 1$, and hence $D_f(x) < 0$. Thus, we conclude that $TMV^N > TMV$ when $\alpha = 0$. For $0 < \alpha < 1$, the right hand side is smaller than when $\alpha = 0$, and hence the inequality also holds. Thus, $TMV^N > TMV$ holds for $-1 < \rho < 1$.

A4.6 Proof of Proposition 4

Proof.

$$\begin{aligned}\frac{\partial P_1}{\partial \alpha} =& \frac{\sigma^2}{I\tau A^2}\{N_1(1-\rho^2)(1-\beta)[1-(1-\rho^2)\beta(1-\beta)(1-\alpha)^2]- \\ &(N_1+N_2\rho)(1-\rho^2)\beta(1-\beta)(1-\alpha^2)\} \\ \frac{\partial P_2}{\partial \alpha} =& \frac{\sigma^2}{I\tau A^2}\{N_2(1-\rho^2)\beta[1-(1-\rho^2)\beta(1-\beta)(1-\alpha)^2]- \\ &(N_1\rho+N_2)(1-\rho^2)\beta(1-\beta)(1-\alpha^2)\}\end{aligned}$$

$\frac{\partial P_1}{\partial \alpha} > \frac{\partial P_2}{\partial \alpha}$ if and only if the following inequality holds:

$$\begin{aligned}&N_1(1-\beta)[1-(1-\rho^2)\beta(1-\beta)(1-\alpha)^2-\beta(1-\rho)(1-\alpha^2)] \\ >&N_2\beta[1-(1-\rho^2)\beta(1-\beta)(1-\alpha)^2-(1-\beta)(1-\rho)(1-\alpha^2)]\end{aligned}$$

If $N_1 = N_2$ the condition can be simplified to $\beta < \frac{1}{2}$ □

A5 Alternative Parametrization

The model and propositions above correspond most directly to a situation in which investors' bias is is observable. But even in the case where only ethnicity is observable, the main results of our model still hold. To see this, it's more convenient to reparametrize the model in the following way.

As before, let I denote the total number of investors. But we group investors by their ethnicity first this time. Let α' denote the share of all investors that belong to ethnic group 1 and β_i the share of type i investors that are neutral. The reparametrization can thus be summarized by

$$\begin{aligned}\alpha &= \alpha'\beta_1 + (1-\alpha')\beta_2 \\ \beta &= \frac{\alpha'(1-\beta_1)}{1-\alpha'\beta_1-(1-\alpha')\beta_2}\end{aligned}$$

With no other information, we assume the proportion of biased investors is the same across different ethnic groups, i.e., $\beta_1 = \beta_2 = \beta'$. Thus the reparametrization can be simply given by

$$\begin{aligned}\alpha &= \beta' \\ \beta &= \alpha'\end{aligned}$$

Given the additional assumption, Proposition 1 above can be interpreted in an alternative manner.

Proposition 5 (Proposition 1′)**.** *The stock price of firms is increasing in the share of total investors who have the same ethnicity as their CEOs under reasonable conditions.*

Proof. In this case, inequality (6) is replaced by

$$N_1 > \frac{(2\alpha' - 1)\rho\beta'(1-\beta')N_2}{\beta' + \beta'(1-\beta')(1-2\alpha') + (1-\alpha')(1-\beta')^2(1-\rho^2)^2}$$

□

TABLE B1: INVESTOR-FIRM COETHNICITY AND INVESTMENT: ALTERNATIVE ETHNICITY CODING

	(1) Investment	(2) Investment	(3) Investment	(4) Investment
CoethnicCEO	0.00983**			
	(0.00402)			
CEOCoethnicityIndex		0.0121***		
		(0.00389)		
CoethnicBoard			0.00252	
			(0.00593)	
BoardCoethnicityIndex 2				0.0166
				(0.0103)
Value Controls	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
CEO Ethnicity FE	Yes	Yes	Yes	Yes
Mean of Dep. Var.	0.554	0.546	0.522	0.543
R2	0.395	0.393	0.446	0.389
N	183768	399457	68062	429519

	(1) OI	(2) OI	(3) OI	(4) OI
CoethnicCEO	0.00310			
	(0.00564)			
CEOCoethnicityIndex		0.0182***		
		(0.00521)		
CoethnicBoard			-0.00563	
			(0.0156)	
BoardCoethnicityIndex 2				0.0157
				(0.0182)
Value Controls	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
CEO Ethnicity FE	Yes	Yes	Yes	Yes
Mean of Dep. Var.	0.0838	0.0731	0.0404	0.0700
R2	0.333	0.325	0.396	0.317
N	274674	602420	109361	648131

The specification is estimated on investor-firm-month-level data. The sample consists of all months in which a trade is made by any investor in any firms stock. The coethnicity variables are defined differently than in Table 1 from the main tables. The cutoffs, both to define individual and board level ethnicity are a high of 0.3 and low of 0.2, compared to 0.4 and 0.3, respectively in the main analysis. Panel A shows the outcome investment, which is the proportion of the investors' portfolio that is held in the share. Panel B shows order imbalance, which measures how much the investor net buys or sells a particular firm's stock, as a proportion of the investor's total traded stock of the same stock during the same month. All specifications in both panels include investor, firm, month, and CEO ethnicity fixed effects and we control for the value control return on equity (ROE) in the prior 12 month period. Standard errors are calculated at the investor ethnicity × CEO ethnicity level. The dataset spans January 2006-December 2010. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

TABLE B2: INVESTOR-FIRM COETHNICITY AND INVESTMENT: NEW INVESTORS

	(1) Investment	(2) Investment	(3) Investment	(4) Investment
CoethnicCEO	0.0146***			
	(0.00376)			
CEOCoethnicityIndex		0.0185***		
		(0.00478)		
CoethnicBoard			0.0202***	
			(0.00482)	
BoardCoethnicityIndex				0.0526***
				(0.0110)
Value Controls	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
CEO Ethnicity FE	Yes	Yes	Yes	Yes
Mean of Dep. Var.	0.574	0.570	0.588	0.567
R2	0.400	0.395	0.431	0.391
N	169034	245884	115888	264094

	(1) OI	(2) OI	(3) OI	(4) OI
CoethnicCEO	0.0111**			
	(0.00499)			
CEOCoethnicityIndex		0.0180***		
		(0.00582)		
CoethnicBoard			0.0644***	
			(0.0113)	
BoardCoethnicityIndex				0.112***
				(0.0194)
Value Controls	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
CEO Ethnicity FE	Yes	Yes	Yes	Yes
Mean of Dep. Var.	0.0764	0.0667	0.0929	0.0642
R2	0.385	0.379	0.393	0.371
N	259675	380841	178311	408938

The specification is estimated on investor-firm-month-level data. The sample consists of all months in which a trade is made by any investor in any firms stock. The sample is restricted to the investors opening accounts during our sample period so we have the full transaction information of them. Panel A shows the outcome investment, which is the proportion of the investors' portfolio that is held in the share. Panel B shows order imbalance, which measures how much the investor net buys or sells a particular firm's stock, as a proportion of the investor's total traded stock of the same stock during the same month. All specifications in both panels include investor, firm, month, and CEO ethnicity fixed effects and we control for the value control return on equity (ROE) in the prior 12 month period. Standard errors are clustered at the investor ethnicity $\times$ CEO ethnicity level. The dataset spans January 2006-December 2010. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

TABLE B3: INVESTOR-FIRM COETHNICITY AND SHORT-RUN RETURNS: ONE DAY AND FIVE DAY

	(1) Return_1day	(2) Return_1day	(3) Return_1day	(4) Return_1day
CoethnicCEO	0.000198			
	(0.000257)			
CEOCoethnicityIndex		-0.0000294		
		(0.000320)		
CoethnicBoard			-0.00162***	
			(0.000325)	
BoardCoethnicityIndex				-0.000849
				(0.00110)
Value Controls	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
CEO Ethnicity FE	Yes	Yes	Yes	Yes
Mean of Dep. Var.	0.00137	0.00100	0.00165	0.000954
R2	0.375	0.370	0.396	0.359
N	363851	523631	245584	558158

	(1) Return_5day	(2) Return_5day	(3) Return_5day	(4) Return_5day
CoethnicCEO	0.0000273			
	(0.000407)			
CEOCoethnicityIndex		0.000330		
		(0.000516)		
CoethnicBoard			0.000401	
			(0.000579)	
BoardCoethnicityIndex				0.000545
				(0.00148)
Value Controls	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
CEO Ethnicity FE	Yes	Yes	Yes	Yes
Mean of Dep. Var.	0.00241	0.00165	0.00202	0.00158
R2	0.370	0.367	0.402	0.356
N	259731	375811	173719	400434

The specifications are estimated on investor-firm-month-transaction level data. We calculate Returns_1day using the price of the ticker 1 day from the transaction date divided by the price of the buying transaction, and Returns_5day using the price of the ticker 5 days from the transaction date divided by the price of the buying transaction. The sample consists of all transactions initiated during the period. The month indicates origination of the transaction. Any investor may have multiple transactions for a given firms stock in a given month, if there are different shares bought are sold in multiple different future months and thus may result in varying returns. The sample includes both transactions that were closed (sold in full) during the period, as well as those open at the end of the period. For those open at the end of the period, we assume the transactions were closed in the last month. Specifications in both Panel A and Panel B include investor, firm, month, and CEO ethnicity fixed effect. We control for the value control return on equity (ROE) in the prior 12 month period in both panels. Standard errors are clustered at the investor ethnicity $\times$ CEO ethnicity level. The dataset spans January 2006-December 2010. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

TABLE B4: INVESTOR-FIRM COETHNICITY AND RETURNS: ALPHA

	(1) Risk-adjusted Returns	(2) Risk-adjusted Returns	(3) Risk-adjusted Returns	(4) Risk-adjusted Returns
CoethnicCEO	-0.00109			
	(0.000870)			
CEOCoethnicityIndex		-0.00145		
		(0.00103)		
CoethnicBoard			-0.0147***	
			(0.00211)	
BoardCoethnicityIndex				-0.0190***
				(0.00344)
Value Controls	Yes	Yes	Yes	Yes
Investor FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
CEO Ethnicity FE	Yes	Yes	Yes	Yes
Mean of Dep. Var.	0.00256	0.00312	0.00998	0.00310
R2	0.607	0.618	0.673	0.619
N	216228	318295	150788	342721

The specifications are estimated on investor-firm-month-transaction level data. Risk-adjusted returns is abnormal return (alpha) based on CAPM, where the risk-free return is defined as the treasury bill rates in Kenya and the market return is defined as NSE20 (the Nairobi Securities Exchange 20 Share Index). The sample consists of all transactions initiated during the period. The month indicates origination of the transaction. All specifications include investor, firm, month, and CEO ethnicity fixed effects. We control for the value control return on equity (ROE) in the prior 12 month period in both panels. Standard errors are clustered at the investor ethnicity $\times$ CEO ethnicity level. The dataset spans January 2006-December 2010. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

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