



Micro-scale transformations in sustainability practices: Insights from new migrant populations in growing urban settlements

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ABSTRACT

Development that is inclusive and sustainable requires significant social and environmental transformations from current trajectories, building on demographic realities such as changing profiles of populations, and increased levels of mobility. Migration is a major driving force of urbanisation in all global regions, partly facilitated through emerging technologies and declining costs of movement and communication. Social transformations associated with increased migration are highly uneven but include shifts in the location of economic activities, major urban growth, and changing individual incentives and social constraints on sustainability trajectories. Yet, there is limited empirical evidence on how observed population movements can both challenge and promote sustainable transformations. This paper examines how migration transforms places and societies, by providing new evidence on the behaviours and practices of individuals who are part of such transformations as they assimilate, converge or remain distinctive to prior populations. Focusing on individuals in rapidly expanding cities in the Global South, this study uses new biographical life-history survey data from Accra, Ghana, to examine the barriers and enablers of sustainability practices among diverse types of migrants and a sample of non-migrants. The study uses data from 1,163 individuals: international migrants from the West African sub-region (559), internal migrants (299), and non-migrants (305) in Accra. The findings show that sustainability practices established before migration are predictors of current sustainability practices, including proactive recycling, conservation activities, and choice of mode of transportation, but that there is some convergence between behaviours, reflecting assimilation, place attachment and other factors. Internal migrants in Accra exhibit stronger sustainability practices than international migrants. Individual levels of poverty, poor infrastructural development, and perceptions about life satisfaction in the neighbourhood negatively affect sustainability practices among all respondents. These results suggest that poverty and social exclusion are critical to addressing sustainability issues in urban contexts. It is important for policy makers to address issues of urban poverty, cumulative deprivation, and inequality as strong barriers to the adoption of sustainability practices in urban areas.

1. Introduction

The world is gradually recovering from the shock of the COVID-19 pandemic while simultaneously seeking to address the long-term

challenges of climate change as a threat to sustainable development. The United Nations 2030 Agenda for Sustainable Development advocates for development processes that are inclusive and sustainable, which require significant social and environmental transformations from current

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trajectories. Trends towards sustainability, such as reduction in levels of absolute poverty worldwide, have in many cases been facilitated by increased movement and mobility of populations: many millions of people have in effect moved out of poverty. Yet the SDGs are largely silent on the social transformative role of migration, for example in its role in raising millions out of poverty and in driving global urban growth in the past decades (Tacoli, McGranahan and Satterthwaite, 2015). There are few targets or indicators specifically on migration and mobility across the 17 SDGs (Adger et al., 2019). While governments are implementing programmes and actions towards achieving the diverse SDG targets, action on urban sustainability cannot be complete without accounting for population movement and the contributions of migrants themselves as actors in social change (Gavonel et al., 2021).

Even though migration is a major driving force of urbanisation globally, the geopolitics around migration have focussed primarily on international migration from the global South to the global North and the benefits to receiving economies of skilled migration (World Bank, 2023). Much policy attention has been exerted on making migration flows safe and regular as espoused in the UN initiative on the Global Compact on Migration. However, the reality of global migration trends is that there are greater south-south flows than south-north flows (UN DESA, 2017) and domestic migration to urban growth poles remains dominant in the world (FAO, 2018, p. 34). In 2016, south-south migration constituted 90.2 million international migrants compared to 85.3 million south-north migrants (IOM, 2017). Substantial internal and international migration flows within the Global South themselves present opportunities and challenges for those who move and their places of origin and destination.

Migrant populations influence the social transformative processes of both sending and receiving areas in profound ways (De Haas, 2010; Portes, 2010), as evidenced by examples of sustainable practices of migrants, and new forms of multi-cultural social innovation (Agrawal and Gupta, 2018; Elf et al., 2019; Head et al., 2019; MacGregor et al., 2019; Jaeger and Schultz, 2017). Migrants are recognized as agents of social transformation as a key component of larger processes of social development (Castles, 2014). The transformation of economic, social, and political life in the places of origin and destination is largely attributed to the flows of ideas, remittances, and social capital that result from migration. These social transformations are a result of the behaviours that are maintained or changed through migration because people's behaviour is influenced by what others do (Omarova and Jo, 2022). The concept of assimilation, developed in sociological studies of migration, provides insights into potential transformation of behaviour post-migration (Alba and Nee, 1997). But most studies of migration and social integration emphasise the evolution of practices rather than simple assimilation into dominant cultures: migrants either modify their sustainable behaviours or maintain them as a part of their pre-migration identity (Head et al., 2019; MacGregor et al., 2019). Despite constant migration inside and among countries in the Global South, there is only limited evidence on migration and sustainability in such contexts. Moreover, there is limited information on the motivations, trajectories and practices of new populations arriving in urban areas and what motivates or limits these outcomes.

This study addresses three key questions to illuminate the migration-sustainability relationship: i) What are the sustainability practices of migrants and non-migrants in Accra? ii) What are the predictors of sustainability practices in Accra among diverse migrant groups? iii) Do the behaviours before migration increase or decrease sustainability practice after migration, in the context of convergence and assimilation?

This study uses evidence from Accra, the capital city of Ghana, the dominant destination for internal migration within Ghana and with a sizeable international migration flow from other parts of Africa because of its relative high income and stability (Awumbila et al., 2017; Awumbila et al., 2014). We focus on internal migration (migrants from other parts of Ghana to the Greater Accra Metropolitan Area (GAMA) at least one year prior to the survey), international migration (migrants

from across international borders to the GAMA) and non-migrants (individuals who were born in the GAMA and who never migrated or lived outside).

The study employs a cross-sectional survey that incorporated event history techniques to gather retrospective data on migrants' prior and current sustainability practices. As such, the data offers a unique longitudinal insight into the sustainability practices of migrant populations, and on how these practices relate to their migration trajectory. Studies on sustainable behaviour among specific populations variously collect data on stated and revealed behaviour through extensive surveys (Takahashi and Selfa, 2015; Soopramanien et al., 2023) and in-depth ethnographic methods (MacGregor et al., 2019; Head et al., 2021). Here we seek the methodological benefits of survey methods, but augmented through reflective data on past experiences: these are found through life history analysis widely used in migration studies and in studies of mobility and life satisfaction (Coulter et al., 2016; McCollum et al., 2020). The survey method allowed for more representation of the study population and conclusions that can be applied to a larger population to some extent. It was also cost effective, time efficient and safe to collect at a time in Ghana when COVID-19 Pandemic restrictions were being enforced.

The migrants interviewed in this study live in low-income communities and our findings can therefore not be generalised to represent all migrants in Accra. However, the sampled population is a fair representation of migrants that reside in areas with limited infrastructure in the city, which is a major destination for new migrants. Regression models reveal the factors that affect sustainability practices among the study population in Accra. The primary stated motivations for migrating into the city are economic and educational purposes. Like any other city in Africa, Accra has densely populated informal settlements that serve as destinations for new migrants because of easy access to accommodation, proximity to business opportunities and the presence of networks. However, these settlements are vulnerable to floods, poor sanitation, and have high levels of crime as well as issues of social conflict (Abu and Codjoe, 2018). Therefore, understanding the different population groups in the city and their sustainable practices is critical to the development of well-structured and carefully planned urban policies.

2. Transformation and sustainable practices among diverse populations in urban settings

Over half of the global population currently lives in urban areas (Cui et al., 2019). Urbanisation provides opportunities and challenges for urban populations, with implications for sustainability practices. In terms of opportunities, urbanisation creates markets for various economic activities and leads to the provision of infrastructure services such as water, electricity, hospitals and schools. However, many experience urbanisation through high socio-economic inequality and exposure to hazardous environments and social marginalization (Cui et al., 2019). Sub-Saharan Africa has a distinctive migration and urbanisation trajectory with challenges of poverty and weak institutional guidelines to address the challenges of urbanisation (Smit and Parnell, 2012). Also, there is increasing evidence of accelerated migration to cities as agricultural livelihoods are disrupted by climate change and environmental degradation (Borderon et al. 2019; Thalheimer et al. 2021).

Transformations to sustainability suggest radical amendments to social and economic structures, ranging from reforming international trade and comparative advantage to a rapid exit from fossil fuel dependence (Scoones et al., 2020). Yet transformations to sustainability are multi-scaled beyond the structural and political to the personal sphere (O'Brien, 2012). Transformations therefore build on individual action, not as an end in themselves but as an integral component of societal change. Sustainable practices are therefore a central element of transformative change, representing actions, often unconscious or routine, that are core to a perceived dignified life.

Migration is well understood to have transformative potential at

individual and collective levels: including positive economic effects on labour markets, congestion, and overall economic activity (Gavonel et al., 2021; De Haas, 2010). It also results in social remittances or norm transfers (Levitt, 1998) that potentially impact both the individual and family wellbeing. With remittances and other mechanisms, such as knowledge and norm transfers, in-kind transfers, and shifting household dynamics, migrant families can spend more on necessities, services, and investments (Bertoli and Marchetta, 2014). Yet the phenomenon of migration creates its own risks and vulnerabilities, notably for low-income migrants. The conditions in destinations can entrench poverty, including living conditions subject to health risks from poor air and water quality and limited access to services, low wages, and poor working conditions (Hagen-Zanker et al., 2014). Furthermore, migrants may not appropriately use their education and skills as skills recognition processes tend to be lacking, especially with low-and medium-skilled migrants (ILO, 2016). Compared to non-migrants, migrants frequently report lower levels of subjective well-being, in part because they assess their circumstances relative to the status of native urban residents who become their new social reference group rather than in absolute terms (Szaboova et al., 2022; Mulcahy and Kollamparambil, 2016). These challenges associated with the destinations coupled with the conditions of migrants have implications for sustainable practices (Tacoli et al., 2015).

Sub-Saharan Africa is fast urbanising, but there are also challenges related to poverty and weak institutional guidelines to address the challenges of urbanisation (Smit and Parnell, 2012; Zerbo et al. 2020). One effect of urbanisation, a major challenge to city planners in the region, is the development of informal settlements. A large proportion of low-income recently arrived migrants live in slum areas because they provide cheaper housing and good networks. Slums are frequently geographically isolated, not connected to infrastructure, and exposed to hazards such as landslides or being flood-prone (Ajibade et al., 2013). These conditions increase exposure to health risks for hundreds of thousands of people across Sub-Saharan Africa (Zerbo et al., 2020). The urban environment, however, provides a level playing field for both migrants and non-migrants to take advantage of economic opportunities in the city. Migrants generally engage in more economically sustainable activities than non-migrants because most of them are self-employed and are not usually affected by layoffs when employers have difficulties (Borjas, 1986).

Sustainability practices and indeed what are generally perceived to constitute sustainability practices, vary across cultures. Within populations such behaviours also diverge, depending on demographic and socio-economic factors including age, class, gender and ethnicity. In general, research in this area shows that material and structural factors, underlying values, and social context are the major constraints on practices around issues such as waste, use of green space, and energy and transport use that have major implications for air quality (Hargreaves and Middlemiss, 2020). A number of research findings indicate that new migrant populations 'bring with them' practices from their home regions, that are often manifested in lower levels of consumption and thrift, awareness of environmental harms, and retention of practices that alter and energise social norms in the new destinations (Head et al., 2019; MacGregor et al., 2019; Maller and Strengers 2013). The opportunities for sustainable practices are constrained by quality of infrastructural resources such as housing, water and sanitation, roads, transportation systems and options (Elf et al., 2019). In Accra specifically, a significant proportion of the population live in slums (Somanje et al., 2020), and are exposed to environmental hazards and social and economic exclusion including exposure to insecurity and health risks (Abu and Codjoe, 2018; Arimah and Branch, 2011; Oppong et al., 2020). Generally, different populations within various neighbourhoods will most likely exhibit different sustainable behaviours depending on their socio-cultural beliefs and economic activities.

3. Methods

3.1. Source of data and sample

This study uses new bespoke biographic data that was collected in Accra, Ghana from November to December 2020. The total sample for the study is 1,200, which returned 1163 valid responses. The study sample is comprised of international migrants of Nigerian (300) and Nigerian (300) origin, internal Ghanaian migrants (300) in Accra and non-migrants (300) in the communities in Accra where these migrants reside. The determination of the sample size was done purposively to have a statistical representation in each of the study populations. The total response rate is about 97%.

Sampling was done in two stages. First, we used the 2010 Population and Housing Census (PHC) data to identify the country of origin of the majority of international migrants in Accra. We found that most migrants were of Nigerian, Togolese, Burkinabe, Nigerian, Gambian, and Ivorian origins. For this study, we selected migrants from both anglophone (Nigeria) and francophone (Niger) countries that had a significant number of nationals in Accra at the time of the study. Second, we identified leaders of migrant groups and religious denominations of migrants to enable us to identify where most migrants reside in the city. This was because the 2010 PHC data was old, and the location of many migrants might have changed. Specifically, we spoke to leaders of migrant traders and religious leaders to get first-hand information about where the majority of their members reside. We sampled six communities (Madina, Adenta, Accra Central, Accra Circle, Teshie and Ashaiman) which are located in four different administrative districts (Madina/Adenta, AMA, LEKMA and Ashaiman) in the Greater Accra Metropolitan Area because these were the places where the majority of international migrants of interest reside and do business. The areas in which these migrants and non-migrants reside are low-income neighbourhoods with about one-third of housing facilities made of made-shift structures and poor urban services such as water and sanitation (Mansour and Esseku, 2017; Awumbila et al., 2014). There are also disparities in the living arrangements of migrants and non-migrants with non-migrants residing in their own houses and renting unoccupied rooms in their structures to migrants (Awumbila, Teye and Yaro, 2015). Moreover, because these neighbourhoods are located close to major market centres, most of the non-migrants provide store facilities on their land, which they rent out to migrants who engage in trading activities.

We undertook household listing in neighbourhoods close to the market centres in each of the six communities to identify potential participants because most migrants have their businesses in the major market centres in the districts of interest. We obtained the telephone contact details of potential respondents, enabling enumerators to conduct both telephone and in-person interviews as preferred by the respondent. This was necessitated by the restrictions brought about by the COVID-19 pandemic at the time of data collection, though most of the data collection was done in-person. We sampled respondents using a simple random sampling technique based on the list generated from the household listing. However, we used a snowballing method to reach international migrants due to their limited numbers in the study communities. Through our initial respondents we reached additional international migrants of interest in neighbouring communities.

3.2. Dependent variables

The dependent variable, sustainability practices, was computed as a score using multiple survey questions on environmental, economic, and social dimensions of sustainability practices. These three dimensions of sustainability were computed as indices and the scores used to compute the overall sustainability score. Table 1 shows the questions used to compute the various scores. Variables used to create indicator scores were measured on a 5-point Likert scale 'Strongly Disagree' =1, 'Disagree', 'Neither agree nor disagree' 'Agree', and 'Strongly Agree' =5.

Table 1
Description of variables.

Variable	Reference	Label
Sustainability score		A composite score of environmental, social and economic sustainability indicators
Environmental Sustainability Score		
418. How often did you use your own bag when carrying groceries?	MacGregor et al., 2019	1. Never 2. Rarely 3. Sometimes 4. Often5. Always
420. How often did you separate organic waste (coffee grounds, fruit and vegetable peels, garden waste etc.) from the rest of your everyday waste?	MacGregor et al., 2019	
424. How often did you or your household members wear second-hand clothes? (only ask for family members)	Agrawal & Gupta, 2018	
Social Sustainability Score		
422. How often were you volunteering in any organisation aimed at preserving the environment?	Tapia-Fonllem et al., 2013	1. Never 2. Rarely 3. Sometimes 4. Often5. Always
423. How often were you volunteering in any community/national/international organisation aimed at preserving people's rights (e.g. right to equality, health, housing, religion, etc.)?	Tapia-Fonllem et al., 2013	
426. Apart from family members and friends, how often did you help people who were worse off than you, e.g. through giving food, gifts, donations, or money?		
427. How often did you borrow, rent or swap products such as a hammer, a car or a ladder instead of buying them?	Tapia-Fonllem et al., 2013	
Economic Sustainability Score		
416. When you were living in NEIGHBOURHOOD, how often did you move around by foot, bicycle or public/shared transport.	Agrawal & Gupta, 2018	1. Never 2. Rarely 3. Sometimes 4. Often5. Always
417. How often did you grow your own fruit, nuts, vegetables, cereals, or other food and/or keep your own animals (for instance chickens, sheep or pigs)	Schraven & Rademacher-Schulz, 2016	
419. How often did you take care of the common areas near your house (pavement / staircase / green area, etc)	Tapia-Fonllem et al., 2013	
421. How often did you make efforts to save everyday water use (through less number of baths in a week, cleaning and cooking, immediate action to repair leaks in water pipe or tap, ensuring multiple uses of used water etc.)?	MacGregor et al., 2019 Fielmua & Dongzagla, 2020	
425. How often did you choose certain products to consume because the people involved	Mair et al., 2019	

Table 1 (continued)

Variable	Reference	Label
in their production were treated and paid fairly?		
Relative Deprivation and Wellbeing		
410. Compared to other households in NEIGHBOURHOOD, your household was	Schmitt et al., 2018; Navarro et al., 2020	1. Among the poorest 2. Below Average 3. About Average 4. Above Average 5. Among the most richest8. Don't know
411. Compared to other households in that city/town/ village, your household was		
412. All things considered, how satisfied were you life as a whole while living in NEIGHBOURHOOD?		
Place Attachment Score		
429. This neighbourhood was part of my life		1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree5. Strongly agree
430. I wanted my family and friends to live there in the future		
431. I felt like an outsider in this place		
432. I lived there because it was practical		
433. I missed the place when I was not there		
434. My friends and/or family there, were a good support for me		
435. I enjoyed being involved in the neighbourhood activities		
Sustainable attitude Score		
21.1. Looking after the environment is important; to care for nature and save life resources.	Clark et al., 2003; Johnson et al. (2004)	
21.2. It bothers me that the world's natural environment is changing so quickly.		1. Strongly disagree 2. Disagree 3. Neither agree nor disagree 4. Agree5. Strongly agree
21.3. Ordinary people have responsibility to conserve resources for future generations.		
21.4. My individual actions will make a difference regarding global climate change.		
21.5. It is important to me to do something for the good of society		
21.6. It bothers me when people do not care about the wellbeing of others.		
21.7. People should help strangers or people they do not know who need help.		
21.8. My own actions can improve how things work in the community.		
21.9. It is important to restrain ourselves from buying new goods (for example mobile phone, laptop, clothes, shoes, car etc.).		
21.10. It bothers me to see in the market so many one-use plastic products that produce a lot of waste.		
21.11. We all have the responsibility to limit our use of energy resources and cause less pollution.		
Infrastructure Score		

(continued on next page)

Table 1 (continued)

Variable	Reference	Label
Q413. Overall, when you lived in NEIGHBOURHOOD, did you have access to:	Thomas et al., 2018; Abankwa et al., 2009; Amoah & Addoah, 2021; Anarfi et al., 2020; Aryee et al., 2018; Awumbila et al., 2014; Oppong et al., 2020; Owusu et al., 2008	1.Yes2. No
Tap water		
Electricity		
Flushing toilet/Pit latrine// KVIP		
(Kumasi Ventilated Improved Pit)		
Garbage collection Garbage separation bins		
Public transport: near your residence		
Public transport: affordable		
Private car		
Good quality healthcare		
Good quality education (schools, higher education)		
Good quality of housing		
Good quality of support from the local government		
Good quality of support from NGO's and local associations		

Variable items measured in the negative were recoded into opposite values to ensure they contribute equally with the measurement variables in generating the scores. Also, the three dimensions of sustainability scores were treated as dependent variables. The number of variables that constituted each of the dimensions of sustainability are environmental sustainability score (3 variables), social sustainability score (4 variables), and economic sustainability score (5 variables). In constructing sustainability score, weights were applied to individual responses for variables measuring environmental, social and economic sustainability scores. Each of the 3 dimensions carried a weight of 0.333 approximately summing to a total 1. Variables measuring environmental, social and economic sustainability scores were assigned a weight of (1/9th), (1/12), (1/15) each, respectively (Appendix A). The weighted responses were then summed to derive a sustainability index score for each participant. This approach to computing sustainability scores was adopted from the computation of the multidimensional poverty index (Alkire et al., 2017). The multidimensional poverty index uses three primary dimensions that align with the Sustainable Development Goals (SDGs): health, education, and standard of living. Each dimension is given equal weight, which is shared among the variables in each dimension. We applied a similar technique in the computation of the sustainability scores because of the robustness of the method.

3.3. Independent variables

The independent variables considered in the study include individual characteristics and external factors that influence individuals' behaviour (Table 1). Individual characteristics such as age, sex, and level of education influence one's sustainable practices. Again, the number of children and the number of partners an individual has also influence the individual's sustainability practices. Also, factors such as the district of residence and the number of moves that an individual has made influence one's sustainability practices. Other factors that affect sustainability practices are place attachment, sustainable attitudes, access to infrastructure, relative deprivation and subjective wellbeing. These were estimated as mean scores - relative deprivation and subjective wellbeing score (3 variables), place attachment score (7 variables), infrastructure score (13 variables).

Pre-and post-migration practices were identified by accounting for practices of individuals at their place of origin prior to migration, and practices they engaged in at previous and current migration

destinations. Data on the individuals' behaviour pre-and post-migration was collected as part of the event history technique employed during data collection.

3.4. Analytic approach

We employed descriptive statistics and multiple regression analysis to understand the enablers and barriers of sustainability practices among migrants and non-migrants. We first computed the sustainability scores for each of the three domains of sustainability to examine how each of them contributes to overall sustainability practice. We also examined the factors that affect sustainability practices and modelled the predictors of sustainability practices among the study population. In all, four ordinary least square models were fitted, because the dependent variables consisted of sustainability scores. The first model examined the factors related to sustainability practices while controlling for migration status to determine which group was more or less, positively or negatively, engaged in sustainability practices. The second model examined the factors associated with sustainable practices among the non-migrant population. The third and fourth models examined the factors associated with sustainability practices among internal and international migrant populations, respectively, while controlling for sustainability practices prior to migration. The equations for the regression analysis are as follows: $y = B_0 + B_1.X_1 + B_2.X_2 + \dots + B_n.X_n + \epsilon$, where y is sustainability practices, and the X are the explanatory variables. All categorical variables were converted into a series of binary variables where one category is chosen as the reference category and the indicator variables are created for each of the other variables.

To ensure reliability of the results, we tested for multicollinearity by computing the Variance Inflation Factor (VIF) for the independent variables in all the regression models (Appendix B) and observed a low correlation among the variables.

4. Results

4.1. Descriptive statistics

Table 2 presents the descriptive statistics of the study population. A little over two-fifths (43%) of the respondents resided in the Madina/Adenta Municipal Assembly, 31% in the Ashaiman Municipal Assembly, and 21% and 5% in the Accra Metropolitan Area and the Ledzokuku Municipal Assembly, respectively. The Madina/Adenta and the Ashaiman Municipal Assemblies are hubs for migrants in the Accra Metropolitan Area because of their easy access to accommodation and networks that help migrants settle in the city. There are also major market centres in these areas that facilitate the business activities of migrants. The Accra Metropolitan Assembly is the central business area of Accra, and there is limited residential accommodation in this area. Some of the migrants reside in the LEKMA because of its proximity to the market centres in Ashaiman and the Accra Metropolitan area. The mean age of the sampled population is 29 years old, with international migrants having the lowest mean age of 27 years, compared to a mean age of 33 and 31 years for internal migrants and non-migrants, respectively. In all, internal migrants have the highest mean number of partners and children compared to international migrants and non-migrants. More than half (59%) of the internal migrants and 49% of the non-migrants interviewed were females, as compared to only 5% of the international migrants. More than a quarter (30%) of the respondents have attained secondary school education, and less than 10% have attained tertiary level education. The majority of the migrants of Nigerien origin had Koranic education, and that constituted 21% of the level of education among international migrants.

Table 2 shows that non-migrants have a higher sustainability score (2.66) compared to internal (2.61) and international migrants (2.47). Both internal and international migrants had higher sustainability practice scores prior to migrating to Accra. This is an indication of how

Table 2
Descriptive statistics.

Variable	Non-Migrant Mean (SD)	Internal Migrant Mean (SD)	International Migrant Mean (SD)	Total Mean (SD)
District				
Madina/Adenta	35.08	48.83	43.29	42.56
AMA	29.84	18.73	17.17	20.89
LEKMA	7.54	8.03	3.76	5.85
Ashaiman	27.54	24.41	35.78	30.70
Age				
Age	30.29 (11.47)	32.96 (12.22)	26.84 (6.78)	29.32 (10.07)
Sex				
Male	51.15	41.14	94.98	69.62
Female	48.85	58.86	5.02	30.38
Education				
No Formal	4.26	6.69	10.80	8.08
Primary	13.77	19.06	17.07	16.75
JHS	23.61	34.78	12.72	21.17
SHS	39.67	28.43	25.44	29.93
Post-Sec	8.20	5.69	6.62	6.63
Tertiary	9.18	4.01	6.62	6.63
Koranic	1.31	1.34	20.73	10.80
Number of Children	1.11 (1.51)	1.46 (1.70)	0.56 (1.11)	0.95 (1.44)
Number of Partners	0.69 (0.67)	0.88 (0.77)	0.55 (0.63)	0.67 (0.70)
Number of Neighbourhoods Moved to	1.53 (0.85)	2.65 (0.91)	2.36 (0.63)	2.22 (0.88)
Sustainability Score (current)	2.66 (0.36)	2.61 (0.38)	2.47 (0.43)	2.55 (0.41)
Sustainability Score (before)	–	2.77 (0.50)	2.69 (0.50)	2.72 (0.50)
Neighbourhood Status of Household (Current)				
Below Average (ref)	9.87	20.00	33.58	23.67
Average	67.11	65.76	57.22	62.10
Above average	23.03	14.24	9.19	14.22
Neighbourhood Status of Household (Before)				
Below Average (ref)	20.43	24.13	27.85	25.93
Average	67.74	60.14	62.24	62.14
Above average	11.83	15.73	9.91	11.93
City Status of Household (Current)				
Below Average (ref)	18.48	28.47	36.59	29.62
Average	61.72	62.03	53.85	58.09
Above average	19.80	9.49	9.57	12.29
City Status of Household (Before)				
Below Average (ref)	29.03	31.23	36.64	34.17
Average	61.29	55.44	54.02	55.20
Above average	9.68	13.33	9.35	10.62
Satisfaction Living in Neighbourhood (Current)				
Unsatisfied (ref)	11.15	15.44	6.27	9.91
Neutral	7.21	10.07	9.68	9.13
Satisfied	81.64	74.50	84.05	80.96
Satisfaction Living in Neighbourhood (Before)				
Unsatisfied (ref)	12.90	11.58	14.75	13.59
Neutral	6.45	8.07	13.11	10.90
Satisfied	80.65	80.35	72.13	75.51
Place Attachment Score (Current)	3.51 (0.40)	3.41 (0.50)	3.51 (0.45)	3.48 (0.45)
Place Attachment Score (Before)	–	3.49 (0.52)	3.49 (0.45)	3.49 (0.47)
Infrastructure Score (Current)	4.41 (0.82)	4.16 (0.89)	4.26 (0.85)	4.27 (0.86)
Infrastructure Score (Before)	–	4.54 (1.00)	4.34 (1.04)	4.41 (1.03)

Table 2 (continued)

Variable	Non-Migrant Mean (SD)	Internal Migrant Mean (SD)	International Migrant Mean (SD)	Total Mean (SD)
Sustainable Attitude Score	3.95 (0.33)	3.94 (0.36)	3.85 (0.33)	3.9 (0.34)
N	305	299	559	1163

migration influences the sustainable practices of migrants through the process of assimilating into the life conditions in urban areas (Omarova and Jo, 2022). In terms of the sustainable attitude score, non-migrants (3.95) and internal migrants (3.94) have a higher sustainable attitude score compared to international migrants (3.85). The current status of households in neighbourhoods among the study population shows that non-migrants witnessed higher improvements in their lives compared to internal and international migrants. Non-migrants have access to resources such as housing that is rented to migrants for additional income, which adds to the income inequality situation between migrants and non-migrants in low-income urban places (Kessides, 2006). A similar trend is observed in comparing their status in the city. Overall, non-migrants witnessed a higher improvement in their lives compared to internal and international migrants. There are, however, varied responses in relation to satisfaction with life in the current neighbourhood among the study population. While there is a decrease in life satisfaction between current and previous neighbourhoods among non-migrants and internal migrants, international migrants saw an increase in their life satisfaction in the current neighbourhood. Furthermore, internal migrants had a higher place attachment score prior to migration compared with their current place attachment score. International migrants, on the other hand, have a higher place attachment score at their current place of residence compared to their previous place. However, non-migrants (3.51) and international migrants (3.51) have similar place attachment scores at their current place of residence, which is higher than that of internal migrants (3.41). In terms of infrastructure, even though non-migrants have a higher infrastructure score than internal and international migrants, there is a reduction in the current infrastructure score of internal and international migrants compared to their prior migration infrastructure score. Low-income urban areas lack basic infrastructure and migrants that reside in these communities are exposed to lower infrastructure compared to their place of origin (Tacoli et al., 2015).

4.2. Factors associated with sustainability practices

Table 3 presents the predictors of sustainability practices in Accra. The results revealed that overall, international migration decreases an individual’s sustainable practices across the three dimensions of sustainability compared to being a non-migrant. This can be attributed to the fact that migrants need to integrate into their new environment, and this sometimes requires adopting certain behaviours to be able to facilitate such integration. Further, the factors that predict sustainable practices vary across the three dimensions of sustainability. The predictors of environmental sustainability are district of residence, age, sex, education, number of children, status of household in neighbourhood, status of household in the city, current infrastructure score and sustainable attitude, while those of social sustainability are district of residence, age, sex, number of children, number of partners, status of household in neighbourhood, status of household in city, place attachment and infrastructure score. Economic sustainability is predicted by education, number of children, the number of neighbourhoods moved, the neighbourhood status of households, status of household in the city, infrastructure score and sustainable attitude score. District of residence, age, number of children, number of partners, status of household in neighbourhood, status of household in city, current place attachment, and infrastructure are predictors of the overall sustainability score.

Table 3
Factors affecting sustainability practices in Accra.

Variable	Overall Sustainability Score	Environmental Sustainability Score	Social Sustainability score	Economic Sustainability Score
	Coeff. (SE)	Coeff. (SE)	Coeff. (SE)	Coeff. (SE)
Stream of Migrant				
<i>Non-Migrant (ref)</i>				
Internal	-0.055 (0.037)	-0.148** (0.056)	-0.006 (0.057)	-0.013 (0.043)
International	-0.149*** (0.036)	-0.224*** (0.055)	-0.129* (0.055)	-0.095* (0.042)
District				
<i>Madina (ref)</i>				
AMA	0.083* (0.032)	0.137** (0.049)	0.117* (0.050)	-0.005 (0.037)
LEKMA	0.055 (0.051)	0.138 (0.078)	0.025 (0.079)	0.002 (0.059)
Ashaiman	0.107*** (0.029)	0.174*** (0.044)	0.143** (0.044)	0.003 (0.033)
Age				
Age	0.005** (0.002)	0.009*** (0.003)	0.006* (0.003)	0.001 (0.002)
Sex				
<i>Male (ref)</i>				
Female	0.046 (0.030)	0.323*** (0.046)	-0.208*** (0.047)	0.024 (0.035)
Education				
<i>Tertiary (ref)</i>				
No Formal	0.020 (0.065)	0.036 (0.100)	-0.064 (0.101)	0.087 (0.076)
Primary	0.091 (0.056)	0.147 (0.087)	0.036 (0.088)	0.089 (0.066)
Junior High School	0.112* (0.054)	0.151 (0.082)	0.099 (0.083)	0.087 (0.062)
Senior High School	0.105* (0.051)	0.157* (0.078)	0.031 (0.079)	0.126* (0.059)
Post-Secondary	0.064 (0.066)	0.102 (0.102)	-0.014 (0.103)	0.105 (0.077)
Koranic	0.110 (0.062)	0.109 (0.095)	0.057 (0.096)	0.164* (0.072)
Number of Children	-0.039** (0.012)	-0.038* (0.018)	-0.050** (0.018)	-0.028* (0.013)
Number of Partners	0.066** (0.020)	0.041 (0.031)	0.115*** (0.031)	0.042 (0.024)
Number of Neighbourhoods Moved to	0.019 (0.016)	-0.008 (0.024)	0.024 (0.024)	0.041* (0.018)
Neighbourhood Status of Household				
<i>Below Average (ref)</i>				
Average	-0.096** (0.036)	-0.119* (0.055)	-0.223*** (0.055)	0.055 (0.041)
Above average	0.009 (0.056)	0.011 (0.086)	-0.140 (0.087)	0.155* (0.065)
City Status of Household				
<i>Below Average (ref)</i>				
Average	0.162*** (0.033)	0.016 (0.051)	0.364*** (0.051)	0.107** (0.039)
Above average	0.154** (0.056)	-0.175* (0.085)	0.587*** (0.086)	0.051 (0.065)
Satisfaction Living in Neighbourhood				
<i>Unsatisfied (ref)</i>				
Neutral	-0.053 (0.053)	-0.040 (0.081)	-0.041 (0.082)	-0.079 (0.062)
Satisfied	-0.029 (0.043)	-0.119 (0.066)	0.046 (0.066)	-0.014 (0.050)
Place Attachment Score	0.059* (0.028)	0.022 (0.043)	0.160*** (0.043)	-0.006 (0.033)
Infrastructure Score	0.089*** (0.015)	0.109*** (0.024)	0.051* (0.024)	0.105*** (0.018)
Sustainable Attitude Score	-0.005 (0.037)	-0.131* (0.056)	-0.055 (0.057)	0.172*** (0.043)
Constant	01.689*** (0.187)	02.393*** (0.287)	01.344*** (0.290)	01.331*** (0.218)

* p < 0.05; ** p < 0.01; *** p < 0.001

Age appears to be a significant predictor of sustainability practices in the sampled population. A unit increase in one's age increases the overall sustainability score, which also holds for both environmental and social sustainability dimensions, but not a predictor of economic sustainability. This suggests that environmental consciousness increases with age. Furthermore, it appears that household size has negatively influenced the overall sustainability score as well as across all three dimensions of sustainability practices. On the other hand, the number of partners one has positively influences the overall sustainability score and social sustainability score, but not the predictor of environmental and economic sustainability. Another key predictor is the income and the general wellbeing of the population. The neighbourhood status of household has both a negative and positive impacts across the various dimensions of sustainability. Households that rate themselves as average relative to those who are below average negatively impact on environmental and social sustainability, while those who rate themselves above average relative to those who are below average positively impact on economic sustainability. Moreover, the city status of household has both negative and positive impacts across the various dimensions of sustainability. Households who consider themselves above average relative to those below average in the city impact negatively on environmental sustainability, but positively on social sustainability. On the other hand, households in the city that rate themselves average relative to those below average impact positively on social and economic sustainability.

Further, an increase in infrastructure score positively influences the overall sustainability score and all three dimensions of sustainability practices. Place attachment score positively influences the social sustainability score but is not a predictor of environmental and economic sustainability.

The predictors of overall sustainability practices vary among migrants and non-migrants and among internal and international migrants across the various dimensions of sustainability practices. Table 4 shows that among the non-migrant population, the district of residence, age, education, number of partners of the individual, place attachment, and infrastructure indices are significant predictors of overall sustainability practices. There are, however, variations in the predictors of the various dimensions of sustainability practices. While the district of residence, sex of the respondent, status of household in the city and place attachment are significant predictors of environmental and social sustainability practices, age of the respondent, the status of the household in neighbourhood, and infrastructure score are predictors of only environmental sustainability practices among the non-migrant population. Also, the number of partners and number of neighbourhoods moved is a predictor of only social sustainability practices while education level of the respondent and infrastructure score are the predictors of economic sustainability practices among non-migrants. All these variables positively contribute to sustainability practices among non-migrants, except for the sex of the respondent, number of neighbourhoods moved and the

Table 4
Factors affecting sustainability practices among non-migrants in Accra.

Variable	Overall Sustainability Score	Environmental Sustainability Score	Social Sustainability Score	Economic Sustainability Score
	Coeff. (SE)	Coeff. (SE)	Coeff. (SE)	Coeff. (SE)
District				
<i>Madina/Adenta (ref)</i>				
AMA	0.12* (0.05)	0.28** (0.09)	0.07 (0.09)	0.01 (0.07)
LEKMA	0.26** (0.08)	0.31* (0.15)	0.31* (0.14)	0.18 (0.11)
Ashaiman	0.11* (0.05)	0.19* (0.09)	0.13 (0.09)	0.00 (0.07)
Age				
Age	0.01* (0.00)	0.01* (0.00)	0.00 (0.00)	0.00 (0.00)
Sex				
<i>Male (ref)</i>				
Female	0.00 (0.04)	0.34*** (0.07)	-0.30*** (0.07)	-0.04 (0.06)
Education				
<i>Tertiary (ref)</i>				
No Formal	0.21 (0.12)	0.17 (0.21)	0.15 (0.20)	0.30 (0.17)
Primary	0.11 (0.09)	0.23 (0.16)	-0.04 (0.15)	0.15 (0.13)
Junior High School	0.13 (0.08)	0.11 (0.15)	0.11 (0.14)	0.17 (0.11)
Senior High School	0.17* (0.07)	0.18 (0.13)	0.05 (0.12)	0.29** (0.10)
Post-Secondary	0.21* (0.09)	0.26 (0.17)	0.08 (0.16)	0.28* (0.13)
Koranic	0.04 (0.18)	-0.23 (0.32)	0.02 (0.30)	0.33 (0.25)
Number of Children	-0.04 (0.02)	-0.04 (0.03)	-0.04 (0.03)	-0.02 (0.03)
Number of Partners	0.09** (0.03)	0.05 (0.06)	0.14* (0.06)	0.08 (0.05)
Number of Neighbourhoods Moved to	-0.03 (0.02)	-0.06 (0.04)	-0.10* (0.04)	0.06 (0.03)
Neighbourhood Status of Household				
<i>Below Average (ref)</i>				
Average	0.11 (0.08)	0.24 (0.13)	-0.02 (0.13)	0.10 (0.11)
Above average	0.15 (0.10)	0.36* (0.18)	-0.08 (0.17)	0.17 (0.14)
City Status of Household				
<i>Below Average (ref)</i>				
Average	-0.03 (0.06)	-0.30** (0.11)	0.17 (0.10)	0.05 (0.08)
Above average	0.02 (0.09)	-0.37* (0.16)	0.42** (0.15)	0.01 (0.13)
Satisfaction Living in Neighbourhood				
<i>Unsatisfied (ref)</i>				
Neutral	-0.01 (0.09)	-0.03 (0.16)	0.06 (0.15)	-0.07 (0.13)
Satisfied	0.04 (0.07)	-0.13 (0.12)	0.20 (0.11)	0.05 (0.09)
Place Attachment Score	0.15** (0.05)	0.20* (0.10)	0.34*** (0.09)	-0.08 (0.08)
Infrastructure Score	0.10*** (0.03)	0.13** (0.05)	0.07 (0.05)	0.10* (0.04)
Sustainable Attitude Score	-0.06 (0.06)	-0.19 (0.11)	-0.13 (0.11)	0.14 (0.09)
Constant	01.44*** (0.32)	01.79** (0.57)	01.04 (0.53)	01.51** (0.44)

* p < 0.05; ** p < 0.01; *** p < 0.001.

status of the household in the city, which negatively contribute to social and environmental sustainability practices. Households that rate themselves as average or above average compared to other households in the city are as less likely as those households who rate themselves as below average to engage in environmental sustainability practices. A unit increase in place attachment and infrastructure indices increases overall sustainability behaviour among non-migrants. Also, a unit increase in age increases environmental sustainability behaviour among non-migrants.

Among internal migrants, Table 5 shows that the predictors of overall sustainability practices are the district of residence, number of children of the migrant, number of partners, sustainability practices of the individual prior to migration, status of household in the city, satisfaction living in previous neighbourhood, current place attachment and sustainable attitude. Except for the number of children per migrant and satisfaction living in previous neighbourhood all these variables have a positive impact on sustainability practices. A unit increase in the sustainability attitude score leads to a 0.1210 increase in the overall sustainability score among internal migrants. Migrants who consider their households in the city as average or above average compared to other households were more likely to engage in sustainability practices compared to those who considered their families as below average in the city.

Across the various dimensions of sustainability practices, there are also variations in the predictors among internal migrants. While sustainability practice prior to migration is a predictor for all the three dimensions of sustainability among internal migrants, sex of the

respondent is only a predictor for both environmental and social sustainability practices. On the other hand, the district of residence, current and prior status of household in the city, place attachment and sustainable attitude are predictors of social sustainability practice while prior infrastructure score, satisfaction living in previous neighbourhood, prior infrastructure score and sustainable attitude are predictors of economic sustainability practice.

Regarding international migrants, Table 6 shows that the overall sustainability practices are predicted by the sustainability practice score prior to migration, the number of neighbourhoods moved to, the current status of households in the city, the current infrastructure score, and the place attachment score prior to migration. All these variables positively predict overall sustainability practices among international migrants, with the exception of the place attachment score prior to migration. A unit increase in place attachment score prior to migration leads to a 0.084 decrease in overall sustainability practices among international migrants. Also, a unit increase in the prior sustainability score leads to an increase in overall sustainability practices. International migrant households in the city who currently rate themselves as average households are more likely to engage in sustainability practices compared to those who are below average.

The predictors of environmental sustainability practices among international migrants are the district of residence, age, education, number of children, number of partners, number of neighbourhoods moved, current and previous neighbourhood status, current and previous status of household in city, current and previous satisfaction of life in neighbourhood, place attachment score now and prior to migration, current

Table 5
Factors affecting sustainability practices among internal migrants in Accra.

Variable	Overall Sustainability Score Coeff. (SE)	Environmental Sustainability Score Coeff. (SE)	Social Sustainability Score Coeff. (SE)	Economic Sustainability Score Coeff. (SE)
District				
<i>Madina/Adenta (ref)</i>				
AMA	0.106* (0.052)	0.041 (0.089)	0.326** (0.098)	0.074 (0.078)
LEKMA	0.032 (0.071)	0.164 (0.122)	-0.011 (0.136)	-0.042 (0.107)
Ashaiman	0.005 (0.048)	-0.057 (0.082)	0.181* (0.091)	-0.050 (0.072)
Age				
Age	0.002 (0.002)	0.006 (0.004)	0.002 (0.004)	0.002 (0.003)
Sex				
<i>Male (ref)</i>				
Female	0.050 (0.040)	0.239** (0.069)	-0.202** (0.075)	0.107 (0.059)
Education				
<i>Tertiary (ref)</i>				
No Formal	-0.084 (0.129)	0.189 (0.222)	-0.222 (0.246)	-0.158 (0.194)
Primary	-0.196 (0.113)	-0.034 (0.192)	-0.293 (0.213)	-0.124 (0.168)
Junior High School	-0.156 (0.104)	0.027 (0.179)	-0.213 (0.197)	-0.115 (0.156)
Senior High School	-0.181 (0.105)	0.048 (0.180)	-0.365 (0.199)	-0.111 (0.157)
Post-Secondary	-0.205 (0.127)	0.109 (0.218)	-0.397 (0.242)	-0.249 (0.190)
Koranic	-0.271 (0.198)	-0.299 (0.339)	-0.377 (0.376)	-0.070 (0.297)
Number of Children	-0.041** (0.015)	-0.042 (0.026)	-0.049 (0.028)	-0.032 (0.023)
Number of Partners	0.066* (0.029)	0.079 (0.050)	0.081 (0.056)	0.052 (0.044)
Number of Neighbourhoods Moved to Sustainability practice score (before)	0.038 (0.023)	0.060 (0.039)	0.010 (0.043)	-0.002 (0.034)
	04.989*** (0.508)	0.242*** (0.057)	0.454*** (0.078)	0.309*** (0.065)
Neighbourhood Status of Household (Current)				
<i>Below Average (ref)</i>				
Average	-0.089 (0.059)	-0.064 (0.101)	-0.160 (0.111)	-0.085 (0.088)
Above average	0.045 (0.091)	0.027 (0.156)	-0.027 (0.173)	0.085 (0.137)
Neighbourhood Status of Household (Before)				
<i>Below Average (ref)</i>				
Average	0.019 (0.062)	0.123 (0.106)	-0.065 (0.118)	-0.044 (0.093)
Above average	-0.037 (0.085)	0.060 (0.146)	-0.215 (0.162)	-0.005 (0.127)
City Status of Household (Current)				
<i>Below Average (ref)</i>				
Average	0.174** (0.056)	-0.014 (0.097)	0.417*** (0.107)	0.133 (0.085)
Above average	0.226* (0.097)	-0.103 (0.166)	0.616** (0.184)	0.186 (0.147)
City Status of Household (Before)				
<i>Below Average (ref)</i>				
Average	0.005 (0.059)	-0.022 (0.101)	0.125 (0.112)	-0.004 (0.088)
Above average	0.050 (0.084)	0.016 (0.144)	0.368* (0.160)	-0.118 (0.126)
Satisfaction Living in Neighbourhood (Current)				
<i>Unsatisfied (ref)</i>				
Neutral	-0.078 (0.078)	0.060 (0.135)	-0.193 (0.149)	-0.114 (0.117)
Satisfied	0.011 (0.065)	0.141 (0.112)	-0.030 (0.124)	-0.055 (0.098)
Satisfaction Living in Neighbourhood (Before)				
<i>Unsatisfied (ref)</i>				
Neutral	-0.092 (0.088)	0.128 (0.150)	-0.168 (0.167)	-0.278* (0.131)
Satisfied	-0.139* (0.065)	-0.128 (0.112)	-0.151 (0.124)	-0.197* (0.098)
Place Attachment Score (Current)	0.090* (0.043)	-0.076 (0.074)	0.267** (0.083)	0.097 (0.065)
Place Attachment Score (Before)	-0.039 (0.043)	-0.008 (0.073)	-0.026 (0.082)	0.023 (0.063)
Infrastructure Score (Current)	0.005 (0.027)	0.028 (0.046)	-0.009 (0.051)	0.016 (0.040)
Infrastructure Score (Before)	0.021 (0.027)	0.051 (0.047)	-0.057 (0.052)	0.084* (0.041)
Sustainable Attitude Score	0.121* (0.056)	-0.180 (0.096)	0.242* (0.105)	0.329*** (0.085)
Constant	0.641* (0.302)	02.082*** (0.516)	-0.212 (0.580)	-0.118 (0.458)

* p < 0.05; ** p < 0.01; *** p < 0.001.

and previous infrastructure score, and current sustainability attitude score. Apart from age, number of neighbourhoods moved, and current place attachment score, all the other predictors negatively affect environmental sustainability. Conversely, the drivers of the social sustainability score among international migrants are number of neighbourhoods moved, the sustainability score prior to migration, current neighbourhood status of household, the current status of a household in the city and current infrastructure score, while that of the economic sustainability score is the sustainability score prior to migration, current status of household in the city and current infrastructure score of the household.

5. Discussion

The mobility pathways of populations clearly challenge or promote the sustainability practices of those who move. Controlling for migration status, we found that migration negatively affects sustainability practices across all the three measured dimensions. For instance, both internal and international migrants are less likely to engage in environmentally sustainable behaviour as compared to non-migrants, even though the coefficients were higher among international migrants than internal migrants. The estimated sustainability score was higher prior to migration, as compared to the current sustainability score among migrants; an indication of other factors contributing to the negative sustainability practices and not just being a migrant. Relative deprivation and subjective wellbeing played a critical role in people's

Table 6
Factors affecting sustainability practices among International Migrants in Accra.

Variable	Overall Sustainability Score Coeff. (SE)	Environmental Sustainability Score Coeff. (SE)	Social Sustainability Score Coeff. (SE)	Economic Sustainability Score Coeff. (SE)
District				
<i>Madina/Adenta (ref)</i>				
AMA	0.000 (0.046)	0.028*** (0.077)	0.043 (0.075)	-0.086 (0.056)
LEKMA	-0.063 (0.080)	-0.064*** (0.136)	-0.201 (0.132)	-0.094 (0.099)
Ashaiman	0.036 (0.037)	0.145* (0.062)	0.038 (0.061)	0.018 (0.045)
Age				
Age	0.005 (0.003)	0.003*** (0.005)	0.009 (0.005)	0.001 (0.004)
Sex				
<i>Male (ref)</i>				
Female	0.115 (0.070)	0.327 (0.118)	-0.085 (0.115)	-0.046 (0.087)
Education				
<i>Tertiary (ref)</i>				
No Formal	-0.061 (0.085)	-0.145*** (0.143)	0.041 (0.140)	-0.174 (0.105)
Primary	0.031 (0.079)	-0.014*** (0.133)	0.152 (0.130)	-0.126 (0.097)
Junior High School	0.074 (0.078)	0.112*** (0.131)	0.179 (0.128)	-0.138 (0.096)
Senior High School	0.036 (0.070)	0.069*** (0.118)	0.080 (0.115)	-0.106 (0.086)
Post-Secondary	-0.053 (0.094)	-0.243*** (0.158)	0.004 (0.155)	0.000 (0.116)
Koranic	-0.001 (0.080)	-0.102*** (0.134)	0.147 (0.131)	-0.076 (0.098)
Number of Children	-0.014 (0.018)	0.019*** (0.030)	-0.045 (0.029)	-0.024 (0.022)
Number of Partners	-0.006 (0.030)	-0.033*** (0.051)	0.021 (0.050)	0.019 (0.038)
Number of Neighbourhoods Moved to	0.109*** (0.026)	0.119* (0.044)	0.120** (0.043)	0.024 (0.032)
Sustainability practice score (Before)	06.743*** (0.401)	0.405 (0.044)	0.578*** (0.054)	0.302*** (0.044)
Neighbourhood Status of Household (Current)				
<i>Below Average (ref)</i>				
Average	-0.079 (0.044)	-0.197*** (0.074)	-0.216** (0.072)	0.028 (0.054)
Above average	-0.083 (0.078)	-0.234*** (0.131)	-0.205 (0.128)	0.131 (0.097)
Neighbourhood Status of Household (Before)				
<i>Below Average (ref)</i>				
Average	0.012 (0.049)	-0.026*** (0.082)	-0.032 (0.080)	0.113 (0.060)
Above average	-0.008 (0.079)	0.005*** (0.134)	-0.093 (0.130)	0.121 (0.098)
City Status of Household (Current)				
<i>Below Average (ref)</i>				
Average	0.118* (0.046)	0.076*** (0.078)	0.347*** (0.075)	0.114* (0.056)
Above average	0.084 (0.077)	-0.159*** (0.130)	0.507*** (0.126)	0.057 (0.095)
City Status of Household (Before)				
<i>Below Average (ref)</i>				
Average	0.013 (0.047)	0.064*** (0.079)	0.062 (0.077)	-0.008 (0.058)
Above average	-0.027 (0.077)	-0.051*** (0.130)	0.142 (0.126)	-0.056 (0.096)
Satisfaction Living in Neighbourhood (Current)				
<i>Unsatisfied (ref)</i>				
Neutral	-0.034 (0.075)	-0.147*** (0.126)	0.105 (0.124)	-0.045 (0.092)
Satisfied	-0.007 (0.065)	-0.272*** (0.110)	0.147 (0.108)	0.091 (0.081)
Satisfaction Living in Neighbourhood (Before)				
<i>Unsatisfied (ref)</i>				
Neutral	-0.054 (0.057)	-0.028*** (0.095)	-0.091 (0.093)	-0.066 (0.070)
Satisfied	-0.033 (0.052)	-0.090*** (0.087)	-0.057 (0.085)	-0.046 (0.064)
Place Attachment Score (Current)	0.013 (0.038)	0.026*** (0.064)	-0.023 (0.062)	-0.030 (0.046)
Place Attachment Score (Before)	-0.084* (0.040)	-0.015*** (0.068)	-0.048 (0.066)	-0.078 (0.049)
Infrastructure Score (Current)	0.080*** (0.022)	0.074** (0.037)	0.099** (0.035)	0.098*** (0.027)
Infrastructure Score (Before)	-0.011 (0.020)	-0.059*** (0.034)	0.024 (0.032)	0.040 (0.024)
Sustainable Attitude Score	-0.063 (0.051)	-0.166*** (0.086)	-0.131 (0.084)	0.009 (0.063)
Constant	0.755* (0.319)	01.895 (0.527)	0.251 (0.521)	01.336** (0.392)

* p < 0.05; ** p < 0.01; *** p < 0.001.

sustainability practices. Related to this is access to infrastructure, place attachment and poor environmental and social conditions.

Accra, the capital city of Ghana, has been very attractive to both domestic and international migrants over recent decades, especially from neighbouring West African countries, due to political stability and growing economic opportunities (IOM, 2020). It has also attracted migrants from other parts of Ghana who seek to take advantage of available economic opportunities (Awumbila, Teye and Yaro, 2017; Awumbila et al., 2014). Despite the promising opportunities, there are several environmental, social and economic problems confronting the city. The development of informal settlements, increased crime, and conflicts among foreign retail traders and their Ghanaian counterparts have become synonymous with the city over the last three decades. In addition, increased mobility into the city has consequences for sustainability in the city. We examined the predictors of sustainability practices and the predictors of three dimensions (environmental, social, and

economic) of sustainability practices. We discuss these issues under two broad sub-headings: enablers and barriers to overall sustainability practices and enablers and barriers to sustainability practices among migrants and non-migrants.

5.1. Determinants of overall sustainability practices

Overall, controlling for migration status, place attachment is positively associated with sustainability practices. All things being equal, individuals exhibiting higher attachment to place also show higher social sustainability score. This could be explained by the high level of cohesion among people who reside in slums and the kind of support migrants offer one another to navigate difficult situations in the city (Amoah and Addoah, 2021). Similarly, access to infrastructure is positively correlated with sustainability practices, specifically, by positively affecting the environmental, social and economic components of the

sustainability score. This could be explained by the general collective responsibility by households to keep their environment clean (Amoah and Addoah, 2021) and the strong community identity in the study area that brings people together and promotes economic activities in these low-income settings. In addition, those who rate their household's condition as average or above average compared with other households in the city are positively associated with sustainability practices, and positively affecting social and economic dimensions of sustainability indices.

Among the study population, individual factors such as age, sex, number of partners, number of neighbourhoods moved to, and place attachment are significantly associated with sustainability practices, while factors such as relative deprivation, subjective wellbeing, and sustainable attitude equally play a significant role. We found that non-migrants have a higher sustainability score (2.66) compared to internal (2.61) and international migrants (2.47). This is expected because migrants were relatively younger than non-migrants and older adults reported to becoming closer to nature and exhibit positive sustainability practices (Otto and Kaiser, 2014). Also, both internal and international migrants have higher sustainability practice scores prior to migration, an indication of the critical role migration plays in influencing individuals' sustainability behaviour (Gavonel et al., 2021; Adger et al., 2019).

We further observed that in terms of infrastructure, even though non-migrants have a higher infrastructure score than migrants, there is a reduction in the current infrastructure score of sampled internal and international migrants compared to their prior migration infrastructure score. More than half the population in Accra resides in places that have poor infrastructure, and the quality of housing is usually poor. Most migrants reside in these locations because of lower costs, access to job opportunities and the availability of networks. The standard of infrastructure in these areas is usually poor, exposing internal and international migrants to the high inequality situation in these locations, thus potentially limiting their capacity to enact sustainability practices (Elf et al., 2019; Oppong et al., 2020; Somanje et al., 2020).

On the other hand, migration is a barrier to sustainability practice as it is negatively correlated with all the dimensions of sustainability practices. This is because the conditions that migrants are exposed to in the city drive them to change their behaviour towards unsustainable ways to be able to survive. Migrants in low-income areas in Accra are engaged in hazardous environmental, social and economic activities to earn some income (Somanje et al., 2020; Oppong et al., 2020; Aryee et al., 2018).

5.2. Determinants of sustainability practices among non-migrants and migrants

The determinants of sustainability practices vary among migrants and non-migrants and among internal and international migrants across the three dimensions of sustainability practices. For example, place attachment enables sustainability practices among non-migrants and internal migrants. In the case of the former, attachment to place is positively correlated with the environmental and social dimensions of the score, whereas in the latter, it is positively associated with only the social dimension. Non-migrants' own properties in these low-income areas that bring them income and as a result are more concern about the environment and the social relations that exist in the community (Awumbila, Teye and Yaro, 2015). Similarly, access to infrastructure enables sustainability behaviours among non-migrants and international migrants. Among international migrants, access to infrastructure is positively correlated with environmental, social and economic sustainability while among non-migrants, it is positively associated with both the environmental and social dimensions. The availability of the right infrastructure in an urban area will promote positive behaviour among the population (Amin, 2006). Finally, sustainability practices prior to migration are predictive of sustainability behaviours after

migration, both for internal and international migrants. The results revealed that among internal migrants, sustainability practices prior to migration is positively associated with all the three dimensions of sustainability, but only positively associated with social and economic dimensions among international migrants. This is an indication that among these groups of migrants' the assimilation theory does not fully explain their behaviour, because prior sustainability behaviours are maintained especially among internal migrants across all dimensions of sustainability, while international migrants only maintain their social sustainability practices to stay closely with others from their country of origin (Head et al., 2019; MacGregor et al., 2019).

To validate how these results explain the assimilation theory, we used two auxiliary regression models (Appendix C) to test the role of place attachment as a potential mediator of the association between migration status and sustainable behaviours. We found that place attachment predicts sustainability behaviour over and above migration. Given this auxiliary analysis, assimilation may involve other elements that are not captured by place attachment. For example, one could think that assimilation can have temporal and spatial components that can affect sustainable behaviours in opposite directions (Alba and Nee, 1997). On the one hand, the longer a migrant stay at destination, the more likely they are to adopt sustainable behaviours from non-migrants, and as indicated in Table 2, the current sustainability score is higher for non-migrants than for internal and international migrants. On the other hand, the farther the migrant's place of origin relative to the destination, the less likely they will adopt non-migrants' sustainable behaviours as there is a lack of common identity between these subpopulations (Vogiazides, 2018).

One key enabler of sustainability practices among the study population is the community of residence. Because the study population reside in low-income areas in Accra, migrants are exposed to difficult situations that limits their sustainability behaviour compared with non-migrants who have good socio-economic standing in such localities. Also, the current status of households in the city compared to other households enables sustainability practices among internal and international migrants. It is positively correlated with all three dimensions of sustainability among international migrants, and positively correlated only with the social dimension among internal migrants. Thus, improvement in the wellbeing of migrants promotes sustainable practice among the study population (Aryee et al., 2018).

Furthermore, there are also some unique predictors across the different dimensions. For instance, age and sex positively predicts environmental dimension among non-migrants, whereas only sex positively predicts environmental dimension among internal migrants and age positively predicts environmental dimension among international migrants. Also, sex of the respondent negatively predicts social dimensions among internal migrants and non-migrants. Females engage in positive environmental sustainability practices compared to men because of the gender role ascribed to women which brings them closer to nature (Navarro et al., 2020, Eisler et al. 2003). Similarly, cultural norms also expose females to several social activities contributing negatively to their engagement in social sustainability practices. However, contrary to expectations, international migrants with higher sustainable attitude scores have a negative impact on environmental sustainability. This may be explained by the socio-economic differences of the migrants, which have not been explored in this study. For instance, migrants with higher socio-economic status in low-income areas may have a more sustainable attitude but invest in environmentally unsustainable businesses that will enable them to achieve their migration aspirations.

Finally, the study results support findings from other studies that sustainability practices of migrants are explained and shaped by issues such as age, sex, income, place attachment and access to infrastructure (Gavonel et al., 2021; Adger et al., 2019; Awumbila, Teye and Yaro, 2017), in similar ways to resident non-migrant populations. Migrants cannot be classified as a homogenous group because even among the study population who reside in low-income neighbourhoods in Accra,

there are differences among them in terms of income, and level of education. There are also differences in the sustainability practices between internal and international migrants, even though all the migrants in our study have stayed in the study area for not more than five years. The findings here are indicative of processes of sustainability behaviour principally in low-income urban communities, and are likely to be repeated in similar settings of African urbanism. Yet as Coulter et al. (2016) and others point out, there are diverse experiences of migration in cultural contexts, with vastly different trajectories of assimilation, distinctiveness and convergence in all aspects of social life. The analysis here is also limited through not disaggregating the socio-economic differences of migrants or examine this effect on sustainability practices. Further micro-level data, both quantitative and exploratory, could enhance greater understanding of individual drivers and motivations. This is a critical area that future studies can explore among the migrant population in relation to sustainability practices.

6. Conclusions

The evidence presented here shows that sustainability transitions are challenged by the social dynamics of people moving. It is multi-dimensional: migration exposes individuals to environmental, social, and economic conditions that negatively impact their sustainability practices compared to resident populations. Further these practices are likely to evolve over time with processes of assimilation and distinctive practices within clustered communities of migrants. The evidence gathered through life history survey methods here confirm that prior sustainability practices (in previous locations) have an influence on the present sustainability practices: migrants carry practices and knowledge to new places across their lifecourse (Head et al., 2019). And the poor infrastructural and environmental conditions that migrants are exposed to, in effect alter and constraint their current sustainability practices. In Accra, the example of African urbanism studied here, majority of the study population resides in informal settlements lacking basic infrastructure and exposing migrants to some social, economic, health, and environmental vulnerabilities that drive them into unsustainable practices just to survive. The social, economic, and environmental factors in low-income urban areas influence the behaviour of migrants and transform them into actors of sustainable or unsustainable practices, depending on the prevailing conditions of the neighbourhood. This study has focused on migrants in low-income urban areas, and the prevailing socio-economic conditions in the neighbourhood shaped the sustainable practices of both migrants and non-migrants.

The study finds differences in sustainability practices among internal and international migrants, highlighting how transformation processes are not uniform, but driven by underlying economic structures and often deep-seated social attitudes. International migrants in the case of Accra do not enjoy the same social privileges and extensive networks as internal and non-migrants. According to trade regulations in Ghana, foreign traders cannot engage in retail businesses, and it is usually difficult for these migrants to have the capital to engage in business,

often to the detriment of their sense of integration and belonging. International migrants, therefore, take advantage of every opportunity available to them to achieve their migration goals.

Poverty and related social exclusion are critical to addressing sustainability issues in urban contexts. Urban poverty is a major problem in sub-Saharan Africa that requires policy attention to address the situation. The different dimensions of sustainable practices are influenced by different individual and external-level factors that affect the overall sustainability practices of individuals. It is important for policy makers to address issues of urban poverty, cumulative deprivation, and inequality as strong barriers to the adoption of sustainability practices in low-income urban areas.

The poor living conditions in low-income urban places disrupt migrants' sustainable behaviour. This study suggests that prior migration behaviour across the social, economic, and environmental dimensions of sustainability was higher for many sampled populations than current sustainability practices. Living in poor neighbourhoods that are characterized by inequality and low levels of services and infrastructure negatively affects the behavioural outcomes. Low-income neighbourhoods in sub-Saharan African countries lack basic urban services such as water and sanitation, and there has also been very limited government intervention in these areas. Attaining inclusive and sustainable development in sub-Saharan Africa cannot be achieved without policymakers paying critical attention to the provision of basic services in low-income urban settings and other dimensions of urban sustainability for the benefit of all.

Authors Credit

M. A., W.N.A. and S.N.A.C conceived the study, developed the methods, and wrote the original draft. M.A., S. F., D. J., W.N.A., S.N.A.C., R.S.d.C, C.Z and A.F developed the survey and methods. M.A., A. A-C., and M.F.G. conducted the statistical analysis. All authors contributed to the writing of the final version of the manuscript.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Appendix A.: Weights assigned for computation of sustainability scores

Dimension	Indicator	Definition	Weight
Environmental Index	q418	How often did you use your own bag when carrying groceries?	1/9
	q420	How often did you separate organic waste (coffee grounds, fruit and vegetable peels, garden waste etc.) from the rest of your everyday waste?	1/9
Social index	q424	How often did you or your household members wear second-hand clothes? (only ask for family members)	1/9
	q422	How often were you volunteering in any organisation aimed at preserving the environment?	1/12
	q423	How often were you volunteering in any community/national/international organisation aimed at preserving people's rights (e.g. Right to equality, health, housing, religion, etc.)?	1/12
	q426	Apart from family members and friends, how often did you help people who were worse off than you, e.g. through giving food, gifts, donation or money?	1/12

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Dimension	Indicator	Definition	Weight
Economic index	q427	How often did you borrow, rent or swap products such as a hammer, a car or a ladder instead of buying them?	1/12
	q416	When you were living in NEIGHBOURHOOD, how often did you move around by foot, bicycle or public/shared transport	1/15
	q417	How often did you grow your own fruit, nuts, vegetables, cereals, or other food and/or keep your own animals (for instance chickens, sheep or pigs)?	1/15
	q419	How often did you take care of the common areas near your house (pavement / staircase / green area, etc)?	1/15
	q421	How often did you make efforts to save everyday water use (through less number of baths in a week, cleaning and cooking, immediate action to repair leaks in water pipe or tap, ensuring multiple uses of used water etc)?	1/15
	q425	How often did you choose certain products to consume because the people involved in their production were treated and paid fairly?	1/15

Source: Alkire et al. (2017)

Appendix B.: Test for multicollinearity among independent variables

Variable	Table 3		Table 4	
	VIF	1/VIF	VIF	1/VIF
Stream of Migrant (non-migrant)				
Internal	2.01	0.498024		
International	2.46	0.406646		
Locality (Madina)				
AMA	1.29	0.77625	1.61	0.620146
LEKMA	1.12	0.895833	1.25	0.799041
Ashaiman	1.36	0.736739	1.54	0.651258
Age	2.14	0.466884	2.46	0.406184
Sex Female	1.5	0.665906	1.19	0.841235
education (Tertiary)				
No Formal	2.33	0.429879	1.64	0.609523
Primary	3.45	0.289491	2.66	0.376104
JHS	3.79	0.264128	3.42	0.292528
SHS	4.28	0.233509	3.76	0.265864
Post-Sec	1.85	0.541636	1.86	0.53738
Koranic	2.86	0.349164	1.19	0.838269
Number of Children	2.14	0.467533	2.39	0.4182
Number of Partners	1.52	0.658746	1.53	0.653543
Number of Neighbourhoods Moved to	1.46	0.685656	1.15	0.866305
Neighbourhood Status of Household (Below Average)				
Average	2.31	0.433759	3.51	0.285057
Above average	2.95	0.338667	5.03	0.19872
City Status of Household (Below average)				
Average	2.08	0.481737	2.44	0.41064
Above average	2.59	0.386447	3.76	0.26604
Satisfaction Living in Neighbourhood (Unsatisfied)				
Neutral	1.85	0.539739	1.6	0.625749
Satisfied	2.23	0.449437	1.91	0.522716
Place Attachment Score	1.22	0.816721	1.37	0.729766
Infrastructure Score	1.29	0.775672	1.46	0.683715
Sustainable Attitude Score	1.18	0.850107	1.27	0.787905
Mean VIF	2.13		2.17	

Variable	Table 5		Table 6	
	VIF	1/VIF	VIF	1/VIF
Locality (Madina)				
AMA	1.27	0.78826	1.31	0.762804
LEKMA	1.2	0.83481	1.25	0.800958
Ashaiman	1.35	0.741662	1.57	0.638576
Age	2.26	0.441804	2.36	0.423906
Sex Female	1.22	0.817925	1.17	0.856299
education (Tertiary)				
No Formal	3.44	0.290961	3.29	0.304285
Primary	6.22	0.160648	4.44	0.225376
JHS	8.11	0.12333	3.48	0.287149
SHS	7.09	0.141065	4.68	0.213674
Post-Sec	2.67	0.374688	1.86	0.537398
Koranic	1.79	0.557277	5.37	0.186267
Number of Children	2.09	0.478043	1.96	0.509056
Number of Partners	1.67	0.597148	1.78	0.562209
Number of Neighbourhoods Moved to	1.23	0.810507	1.29	0.773952
sustainabi ~ 2	1.33	0.75379	1.25	0.798262
Neighbourhood Status of Household (Current)				
Average	2.52	0.39745	2.33	0.428985
Above average	3.16	0.316513	2.38	0.420041

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Variable	Table 5		Table 6	
	VIF	1/VIF	VIF	1/VIF
Neighbourhood Status of Household (Before)				
Average	2.97	0.336603	2.73	0.366172
Above average	3.05	0.327763	2.62	0.381695
City Status of Household (Current)				
Average	2.4	0.416919	2.58	0.387622
Above average	2.56	0.390069	2.51	0.39878
City Status of Household (Before)				
Average	2.74	0.365247	2.71	0.369402
Above average	2.59	0.386824	2.46	0.406178
Satisfaction Living in Neighbourhood (Current)				
Neutral	1.85	0.540099	2.58	0.386895
Satisfied	2.65	0.377953	3.02	0.3314
Satisfaction Living in Neighbourhood (Before)				
Neutral	1.81	0.552843	1.85	0.540322
Satisfied	2.19	0.45642	2.72	0.36753
Place Attachment Score (Current)	1.53	0.655161	1.33	0.75136
Place Attachment Score (Before)	1.49	0.671197	1.38	0.725838
Infrastructure Score (Current)	1.87	0.535671	1.52	0.657768
Infrastructure Score (Before)	1.93	0.51748	1.77	0.565939
Sustainable Attitude Score	1.29	0.777119	1.33	0.754443
Mean VIF	2.55		2.34	

Appendix C: Place attachment as a potential mediator of the association between migration status and sustainable behaviours.

Variable	Model 1			Model 2	
	Sustainability Score	Environment Score	Social Score	Economic Score	Place Attachment Score
Stream of Migrant					
<i>Non-Migrant (ref)</i>					
Internal	-0.057 (0.037)	-0.148** (0.056)	-0.011 (0.057)	-0.013 (0.043)	-0.030 (0.039)
International	-0.147*** (0.036)	-0.223*** (0.055)	-0.124* (0.056)	-0.095* (0.042)	0.032 (0.038)
Locality					
<i>Madina (ref)</i>					
AMA	0.080* (0.032)	0.136** (0.049)	0.110* (0.050)	-0.005 (0.037)	-0.041 (0.035)
LEKMA	0.051 (0.051)	0.137 (0.078)	0.014 (0.079)	0.003 (0.059)	-0.071 (0.055)
Ashaiman	0.105*** (0.029)	0.174*** (0.044)	0.138** (0.045)	0.003 (0.033)	-0.028 (0.031)
Age					
Age	0.006** (0.002)	0.009*** (0.003)	0.006* (0.003)	0.001 (0.002)	0.004* (0.002)
Sex					
<i>Male (ref)</i>					
Female	0.043 (0.030)	0.321*** (0.046)	-0.217*** (0.047)	0.024 (0.035)	-0.054 (0.032)
Education					
<i>Tertiary (ref)</i>					
No Formal	0.012 (0.065)	0.033 (0.100)	-0.084 (0.101)	0.088 (0.075)	-0.122 (0.070)
Primary	0.086 (0.056)	0.145 (0.086)	0.022 (0.088)	0.090 (0.066)	-0.088 (0.061)
JHS	0.107* (0.054)	0.149 (0.082)	0.086 (0.084)	0.088 (0.062)	-0.085 (0.058)
SHS	0.099 (0.051)	0.154* (0.078)	0.015 (0.079)	0.127* (0.059)	-0.099 (0.055)
Post-Sec	0.058 (0.066)	0.100 (0.102)	-0.031 (0.103)	0.105 (0.077)	-0.104 (0.071)
Koranic	0.108 (0.062)	0.108 (0.095)	0.051 (0.097)	0.164* (0.072)	-0.038 (0.067)
Number of Children					
Number of Children	-0.039** (0.012)	-0.038* (0.018)	-0.052** (0.018)	-0.028* (0.013)	-0.012 (0.012)
Number of Partners					
Number of Partners	0.067** (0.020)	0.041 (0.031)	0.118*** (0.032)	0.042 (0.023)	0.017 (0.022)
Number of Neighbourhoods Moved to					
Neighbourhood Status of Household					
<i>Below Average (ref)</i>					
Average	-0.095** (0.036)	-0.119* (0.055)	-0.221*** (0.056)	0.055 (0.041)	0.016 (0.038)
Above average	0.008 (0.056)	0.011 (0.086)	-0.143 (0.088)	0.155* (0.065)	-0.019 (0.060)
City Status of Household					
<i>Below Average (ref)</i>					
Average	0.165*** (0.033)	0.017 (0.051)	0.370*** (0.052)	0.107** (0.039)	0.039 (0.036)
Above average	0.162** (0.056)	-0.172* (0.085)	0.606*** (0.087)	0.050 (0.065)	0.122* (0.060)
Satisfaction Living in Neighbourhood					
<i>Unsatisfied (ref)</i>					
Neutral	-0.035 (0.052)	-0.033 (0.080)	0.009 (0.082)	-0.080 (0.061)	0.312*** (0.056)
Satisfied	0.000 (0.040)	-0.108 (0.062)	0.124 (0.063)	-0.016 (0.047)	0.487*** (0.044)
Infrastructure score					
Infrastructure score	0.091*** (0.015)	0.110*** (0.023)	0.057* (0.024)	0.105*** (0.018)	0.039* (0.016)
Sustainable Attitude score					
Sustainable Attitude score	-0.003 (0.037)	-0.130* (0.056)	-0.052 (0.057)	0.171*** (0.043)	0.020 (0.039)
Constant	01.857*** (0.169)	02.455*** (0.260)	01.801*** (0.264)	01.315*** (0.197)	02.852*** (0.182)

* p < 0.05; ** p < 0.01; *** p < 0.001.

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