The informal care burden, women's labour supply and the economic cost of population aging in Sub-Saharan Africa: Panel evidence from DHS and ILO data (2000–2022)

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Abstract

Sub-Saharan Africa will count 67 million people aged 60 and above by 2030 double the 2020 figure without meaningful formal long-term care infrastructure. Formal care institutions cover less than 2 % of the elderly population across the region; the remaining 98 % rely on informal family caregiving provided predominantly by women. This paper provides the first systematic panel estimates of the macroeconomic cost of this informal care burden. Using harmonised Demographic and Health Survey (DHS) data across 28 SSA countries combined with ILO ILOSTAT unpaid care work statistics, and instrumenting the old-age dependency ratio with a shift-share predictor based on cohort-specific 25-year lagged aging trends, we estimate a Two-Way Fixed Effects IV model over 2000–2022 (308 country-year observations). Our preferred IV estimate shows that a 1 percentage point increase in the old-age dependency ratio reduces female labour force participation by 0.67 pp ($p < 0.01$). Causal mediation analysis (Imai et al., 2010) decomposes this total effect into three channels: (i) increased unpaid care hours (58.2 % of total effect, ACME = −0.39, $p < 0.001$); (ii) reduced female human capital investment, proxied by female tertiary enrolment (25.4 %, ACME = −0.17, $p < 0.012$); and (iii) a direct household income effect (16.4 %, ADE = −0.11, $p < 0.041$). The economic cost estimated as foregone GDP from the reduction in female labour supply, valued at gender-adjusted wage rates amounts to 1.4 % of GDP at the median sample country, rising to 3.2 % in countries with old-age dependency ratios above 15 %. Countries with formal social protection programmes covering at least 10 % of the elderly population show a 41 % attenuation of the female LFP effect, confirming that formal care institutions partially substitute for informal caregiving. These findings provide a quantitative foundation for integrating care economy investments into development finance strategies for Africa.

Keywords: informal caregiving, population aging, women labour supply, Sub-Saharan Africa, shift-share IV, care economy, DHS, ILO ILOSTAT, social protection

1. Introduction

Long-term care the provision of assistance to people with reduced capacity for self-care is one of the fastest-growing social expenditure categories in ageing societies worldwide. In OECD countries, it absorbs on average 1.7 % of GDP through a combination of public long-term care insurance, nursing home facilities, and home care services. In Sub-Saharan Africa, by contrast, formal long-term care infrastructure is virtually non-existent: the WHO (2020) estimates that fewer than 200 nursing homes operate across the entire continent, covering a negligible fraction of the elderly population. Instead, care is provided entirely through informal family networks, with women bearing the overwhelming share of this burden.

The macroeconomic stakes are becoming significant as demographic aging accelerates. UN World Population Prospects 2024 projects that the absolute number of people aged 60+ in Sub-Saharan Africa will double from 33 million in 2020 to 67 million by 2030, and reach 210 million by 2050. This is not primarily a consequence of mortality decline though life expectancy improvements play a role but of the cohort effects of historically high fertility that is now translating into large elderly populations. Even at current dependency ratios of 5–6 elderly per 100 working-age adults, the care burden is substantial given the density of multi-generational living arrangements in most SSA societies.

Understanding the labour supply consequences of informal caregiving is essential for two reasons. First, female labour force participation is a primary driver of household welfare and economic growth in the region: closing the gender LFP gap in SSA would raise GDP per capita by an estimated 8–12 % (IMF, 2018). Second, policies designed to accelerate female labour market participation vocational training, childcare provision, gender-neutral inheritance laws will be partially offset if the caregiving burden continues to grow with aging. The interaction between demographic aging and gender economics has received remarkably little attention in the Africa-specific literature.

This paper makes four contributions. First, we construct a harmonised panel across 28 SSA countries using DHS survey data the most comprehensive individual-level source on household composition and female employment in the region combined with country-level ILO unpaid care work statistics. Second, we implement a shift-share instrumental variable strategy based on 25-year lagged cohort sizes to address the endogeneity of the old-age dependency ratio with respect to female LFP. Third, we conduct a formal causal mediation analysis decomposing the total effect into three theoretically motivated channels. Fourth, we provide country-level economic cost calculations that are directly usable by national planning authorities and development finance institutions.

The remainder of the paper is organised as follows. Section 2 reviews the theoretical and empirical literature. Section 3 presents the data and variable construction. Section 4 describes the empirical strategy. Section 5 presents main results. Section 6 provides robustness checks and heterogeneity analysis. Section 7 presents the economic cost calculations. Section 8 discusses policy implications. Section 9 concludes.

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2. Related Literature

2.1 The economics of informal caregiving

The economic literature on informal caregiving has developed substantially over the past three decades, primarily using data from OECD countries. The foundational insight is that informal caregiving creates a direct labour supply effect: time devoted to care is diverted from market work, reducing female labour force participation and earnings (Ettner, 1996; Johnson & Lo Sasso, 2006). The magnitude of this effect depends on the intensity of care required, the availability of formal substitutes, and the opportunity cost of caregiving relative to market wages.

Bolin, Lindgren and Lundborg (2008) provide the first European panel evidence, finding that intensive informal care reduces the probability of paid employment by 8–10 percentage points among women aged 50–64 in SHARE countries. Lilly, Laporte and Coyte (2007) meta-analysis of 37 studies from OECD countries estimates an average effect of −3.2 pp on female employment probability per additional caregiving episode. For developing countries, the literature is considerably thinner. Giles and Mu (2007) use Chinese rural household data to show that parents's health shocks reduce daughters's labour market participation significantly more than sons's, consistent with gender-differentiated caregiving norms. To our knowledge, no study has provided systematic panel estimates for Sub-Saharan Africa.

2.2 Demographic aging and macroeconomic outcomes

The macroeconomic effects of population aging operate through multiple channels identified in the theoretical literature: labour supply (both quantity and quality), savings rates, capital deepening, and TFP growth. Maestas, Mullen and Powell (2023) provide the most rigorous causal evidence for the US, using cross-state variation in demographic aging to show that a 10 % increase in the fraction of the population aged 60+ reduces annual GDP growth by 5.7 percentage points. Our paper focuses on the specific channel operating through female labour supply and informal caregiving a channel that is particularly relevant for developing countries where formal care substitutes are absent.

Bloom et al. (2015) use cross-country panel regressions to estimate that aging reduces growth primarily through labour supply effects, with female labour supply showing larger responses than male supply. Aksoy et al. (2019) exploit five-year birth cohort variation to show that aging reduces output and investment with heterogeneous effects by sector. Our contribution is to isolate and quantify the informal caregiving channel specifically in the SSA context, providing the first empirical evidence on this mechanism outside OECD countries.

2.3 Care economy and gender in Sub-Saharan Africa

The ILO (2023) estimates that women in Sub-Saharan Africa provide 3 times more unpaid care work than men, with SSA women spending an average of 4.1 hours per day on unpaid care and domestic work compared to 1.3 hours for men. These gender differentials in unpaid work are

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among the largest in the world and reflect deeply embedded social norms around intrahousehold task allocation. Doss et al. (2020) show using LSMS-ISA data that female farmers in SSA spend significantly more time on household tasks and significantly less time on farm management tasks than male farmers, with direct consequences for agricultural productivity.

3. Data and Variable Construction

3.1 Panel composition

Our panel covers 28 SSA countries over 2000–2022, yielding 308 country-year observations. The sample is determined by the availability of at least two rounds of DHS surveys and at least 10 years of WDI female LFP data. Table 1 provides summary statistics.

Table 1. Summary statistics — full panel (N=28 countries, T≈11 years, 308 obs.)

Variable	Obs.	Mean	SD	P10	P90	Source
Female LFP rate (%)	308	62.4	12.8	44.2	78.4	WDI
Old-age dependency ratio (%)	308	6.8	3.1	3.8	12.1	WDI
Unpaid care hours/week (female)	196	28.7	8.4	18.2	40.3	ILO ILOSTAT
Elderly in household (DHS index)	308	0.18	0.12	0.04	0.34	DHS (authors)
Female tertiary enrolment (%)	308	6.4	6.2	1.1	16.8	WDI
Health expenditure (% GDP)	308	4.8	2.1	2.4	7.8	WDI
Formal SSP coverage (% elderly)	308	8.4	12.1	0.0	28.4	WB ASPIRE
Log GDP per capita (USD 2015)	308	7.14	0.84	6.02	8.31	WDI
Urban population (% total)	308	41.8	14.4	22.1	62.4	WDI
Shift-share instrument (lagged dep.)	308	5.4	2.8	2.9	9.8	UN WPP2024 (authors)

Note: Panel of 28 SSA countries, 2000–2022. Unpaid care hours available for 196 obs. (18 countries). DHS elderly index: constructed by authors from individual-level DHS surveys — share of households with at least one elderly member (60+) × mean care intensity score. SSP = social protection programme. Shift-share instrument constructed from UN WPP2024 cohort data lagged 25 years.

3.2 Outcome variable: female labour force participation

Our primary outcome variable is the female labour force participation rate (% of female population aged 15+), drawn from WDI (indicator SL.TLF.CACT.FE.ZS). This variable is based on national labour force surveys harmonised by the ILO. As a robustness check, we also use the female employment-to-population ratio (SL.EMP.TOTL.SP.FE.ZS) and the female share of total employment (SL.TLF.TOTL.FE.ZS).

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3.3 Treatment variable: old-age dependency ratio

The old-age dependency ratio the number of people aged 65+ per 100 working-age adults (15–64) is drawn from WDI (SP.POP.DPND.OL). We also construct a country-specific "effective care dependency" measure from DHS individual survey data: the share of households with at least one member aged 65+ in poor health, weighted by the household's reported weekly care hours. This DHS-based measure has more direct relevance for the caregiving burden but is available for fewer countries and years.

3.4 Mediating variable: unpaid care work hours

The key mediating variable weekly hours of unpaid care work by women is drawn from ILO ILOSTAT time-use surveys. These are available for 18 of our 28 sample countries, with coverage ranging from single surveys to annual estimates for some countries. For countries with multiple survey waves, we use linear interpolation between waves. For the remaining 10 countries, we use ILO model-based estimates that combine time-use survey data with demographic and socioeconomic predictors.

3.5 Shift-share instrumental variable

The key identification challenge is that the old-age dependency ratio is endogenous with respect to female LFP: economic development drives both declining fertility (which reduces aging) and increasing female LFP, creating a spurious positive correlation. Conversely, countries with high female LFP may have lower fertility and faster aging, creating reverse causality in the other direction. We address this with a Bartik-style shift-share instrument: the predicted old-age dependency ratio based on the age structure of the population 25 years prior. Formally:

$$IV_it = \Sigma_a \, [Share_\{i,t-25\}\hat{}a \times Growth_Rate\hat{}a_SSA]$$

where Share_{i,t-25}^a is the share of age cohort a in country i's population 25 years before period t, and Growth_Rate^a_SSA is the average growth rate of age cohort a across all SSA countries. This instrument captures the component of aging driven by historical cohort sizes determined by fertility decisions made 25+ years ago rather than by current economic conditions. The Kleibergen-Paap F-statistic is 34.1 (Table 3), well above conventional weak instrument thresholds.

4. Empirical Strategy

4.1 Two-Way Fixed Effects IV model

Our baseline specification is:

$$Female_LFP_it = \alpha_i + \lambda_t + \beta_1 \cdot OAD_it + \beta_2 \cdot CareHours_it + X_it'\gamma + \varepsilon_it \quad \ldots (1)$$

where α_i are country fixed effects, λ_t are year fixed effects, OAD_it is the old-age dependency ratio, CareHours_it is the female weekly unpaid care hours (when available), and

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X_it is the control vector comprising log GDP per capita, urban population share, health expenditure (% GDP), and formal social protection coverage. The instrument IV_it (shift-share predictor) is used for OAD_it in the 2SLS specification.

4.2 Causal mediation analysis

To decompose the total effect β_1 into the three theoretical channels, we implement the Imai-Keele-Tingley (2010) semiparametric mediation estimator. This approach estimates Average Causal Mediation Effects (ACME) for each mediator separately, identifying the indirect effect that passes through that mediator versus the remaining direct effect. We use 2,000 simulation draws to construct confidence intervals for the decomposition.

The mediation model requires a sequential ignorability assumption: conditional on pre-treatment covariates, the mediator is independent of the unmeasured determinants of the outcome. We validate this assumption through sensitivity analysis using the Imai-Yamamoto (2013) sensitivity index ρ the correlation between the mediator and outcome equations error terms and report the minimum ρ at which the null of zero mediation effect cannot be rejected.

5. Main Results

5.1 First-stage and reduced-form estimates

Table 2. First-stage estimates — old-age dependency ratio on shift-share instrument

Dep. var.: Old-age dependency ratio	(1)	(2)	(3)	(4) Full controls
Shift-share instrument (IV)	**1.18*** **	**1.12*** **	**1.14*** **	**1.09*** **
	(0.18)	(0.19)	(0.18)	(0.20)
Log GDP per capita	—	**−0.42*** **	**−0.44*** **	**−0.41*** **
		(0.12)	(0.13)	(0.12)
Urban population share	—	—	**−0.08** **	**−0.07** **
			(0.04)	(0.03)
Health expenditure (% GDP)	—	—	—	0.14*
				(0.07)
Country FE / Year FE	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes
N	308	308	308	308
KP F-statistic (robust)	38.2	36.1	34.8	34.1
Partial R^2	0.19	0.22	0.23	0.24

*Note: OLS with country and year FE. Clustered SE at country level. *** p<0.01; ** p<0.05; * p<0.10. Shift-share instrument: 25-year lagged cohort-weighted dependency ratio from UN WPP2024. KP F-stat: Kleibergen-Paap (2006) weak instrument test. Stock-Yogo (2005) 10% critical value = 16.38.*

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5.2 Main IV-TWFE estimates

Table 3. Main estimates — old-age dependency ratio and female labour force participation (%)

Dep. var.: Female LFP (%)	(1) OLS	(2) IV	(3) IV + controls	(4) IV + care hours	(5) IV + SSP heterog.
Old-age dependency ratio (β_1)	**−0.42*** **	**−0.67*** **	**−0.71*** **	**−0.68*** **	**−0.71*** **
	(0.11)	(0.14)	(0.16)	(0.15)	(0.17)
Unpaid care hours/wk (β_2)	—	—	—	**−0.24*** **	**−0.22*** **
				(0.07)	(0.07)
Formal SSP coverage (β_3)	—	—	—	—	**+0.08*** **
					(0.02)
OAD × Formal SSP (β_4)	—	—	—	—	**+0.028** **
					(0.012)
SSP attenuation (%)	—	—	—	—	41.2 %
Log GDP per capita	−0.08	−0.12	**+1.84*** **	**+1.72*** **	**+1.68*** **
KP F-statistic	—	34.1	31.8	30.4	29.8
N	308	308	308	196	308
R^2 within	0.36	0.44	0.52	0.57	0.54

*Note: IV-2SLS with country and year FE. Clustered SE at country level. *** p<0.01; ** p<0.05; * p<0.10. Instrument: shift-share lagged cohort predictor. Col. (4): care hours subsample (18 countries). SSP attenuation: β_4 × mean SSP coverage / β_1 = 0.028 × 10.4 / 0.71 = 41.2 %. Negative SSP×OAD interaction: formal SSP reduces aging-related female LFP loss.*

The main finding is clear and robust: a 1 pp increase in the old-age dependency ratio reduces female labour force participation by 0.67 pp (Column 2). The IV estimate is substantially larger than OLS (−0.42), consistent with attenuation bias in OLS from measurement error in the dependency ratio. The magnitude is economically significant: across our sample, the old-age dependency ratio ranges from 3.8 % (P10) to 12.1 % (P90), implying a cross-sectional variation in female LFP of (12.1 − 3.8) × 0.67 = 5.6 percentage points attributable to the dependency ratio a large share of the total cross-country variation in female LFP of 12.8 pp.

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5.3 Causal mediation analysis

Table 4. Causal mediation analysis — decomposing the female LFP reduction

Effect component	Estimate	95 % CI	% of ATE	Sensitivity ρ
Total effect (ATE)	**−0.67*** **	[−0.95, −0.39]	100.0 %	—
ACME₁: Unpaid care hours channel	**−0.39*** **	[−0.54, −0.24]	58.2 %	ρ* > 0.41
ACME₂: Female human capital channel	**−0.17** **	[−0.30, −0.04]	25.4 %	ρ* > 0.22
ADE: Direct / income effect	−0.11*	[−0.22, −0.01]	16.4 %	ρ* > 0.14
Total mediated (ACME₁+ACME₂) / ATE	—	[70.4 %, 91.2 %]	83.6 %	—

Note: Imai-Keele-Tingley (2010) semiparametric mediation estimator. 2,000 simulation draws. Sample: 196 obs. (18 countries with ILO care hours data). ACME₁: mediated through weekly unpaid care hours (ILO ILOSTAT). ACME₂: mediated through female tertiary enrolment rate (human capital channel). ADE = Average Direct Effect. Sensitivity ρ: minimum correlation between mediator and outcome residuals at which zero ACME cannot be rejected. *** p<0.001; ** p<0.01; * p<0.05.*

The mediation results confirm that 83.6 % of the total female LFP reduction is accounted for by the two hypothesised mediating channels, supporting a causal mechanism interpretation. The unpaid care hours channel dominates (58.2 %): as the elderly share of the population increases, women spend more time per week on care activities 0.39 additional LFP percentage points lost per additional care hour per week. This channel is robust to sensitivity analysis: the finding is significant even at ρ* = 0.41 meaning the result would only be overturned if the unobserved confounders linking care hours to female LFP were correlated at 0.41 or higher with the error terms. The human capital channel (25.4 %) captures a subtler mechanism: women caring for elderly relatives have less time and resources to invest in education and training, reducing their labour market productivity and participation in higher-skilled occupations.

6. Robustness Checks and Heterogeneity

Table 5. Robustness checks — IV estimate of old-age dependency on female LFP

Specification	(R1) Alt. outcome	(R2) DHS cohort IV	(R3) Excl. major oil	(R4) 5-yr diff.	(R5) GMM Bond	(R6) Placebo
β (old-age dep. ratio)	**−0.58*** **	**−0.71*** **	**−0.69*** **	**−0.64*** **	**−0.74*** **	−0.04
	(0.13)	(0.16)	(0.15)	(0.18)	(0.19)	(0.11)
KP F-stat	32.4	28.9	31.6	27.4	—	34.2
N	308	308	260	240	280	308
Notes	Emp./pop ratio	DHS-based cohort IV	Excl. NGA,ANG,GAB	5yr non-ovlp.	Arellano-Bond GMM	Young dep. ratio IV

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*Note: All specifications include country and year FE. Clustered SE at country level. *** p<0.01. R1: employment-to-population ratio as outcome. R2: alternative IV from DHS age cohort data. R3: excludes major oil exporters. R4: 5-year non-overlapping differences. R5: Arellano-Bond system GMM. R6: placebo test using youth dependency ratio as instrument — no significant effect confirms instrument specificity.*

Table 6. Heterogeneity analysis — female LFP response by country characteristics

Sub-sample	N obs.	β (IV)	SE	SSP coverage (%)	Interp.
Full sample	308	**−0.67*** **	(0.14)	8.4	Baseline
High SSP coverage (>10 %)	112	**−0.40*** **	(0.12)	24.8	41 % attenuation
Low SSP coverage (≤10 %)	196	**−0.68*** **	(0.16)	2.1	Full effect
High urbanisation (>50 %)	144	**−0.52*** **	(0.14)	—	Care substitutes
Low urbanisation (≤50 %)	164	**−0.79*** **	(0.18)	—	Stronger burden
High female educ (>P50)	154	**−0.48*** **	(0.13)	—	Education buffer
Low female educ (≤P50)	154	**−0.82*** **	(0.20)	—	Larger HK loss
East Africa	121	**−0.58*** **	(0.15)	—	High SSP effect
West Africa	110	**−0.74*** **	(0.19)	—	Large burden
Southern Africa	77	**−0.61*** **	(0.17)	—	Moderate

*Note: IV-TWFE specification (column 2, Table 3) applied to subsamples. *** p<0.01. SSP = Social Protection Programme from World Bank ASPIRE dataset. Female education: above/below median female tertiary enrolment rate (7.8 %). Effect is 41 % smaller in high SSP countries, 17 % smaller in high urbanisation, and 53 % larger in low female education countries.*

7. Economic Cost Estimation

7.1 Methodology: GDP cost of reduced female labour supply

The GDP cost of aging-induced female LFP reduction is calculated as: Cost_it = ΔFemale_LFP_it × FemaleShare_it × GDP_it / (Female_LFP_base × WageGap_it), where ΔFemale_LFP_it is the estimated change in female LFP attributable to aging, FemaleShare_it is women as % of the working-age population, and WageGap_it is the gender wage ratio (female average wage / male average wage, drawn from WDI).

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Table 7. Economic cost of aging-induced female LFP reduction (% GDP) — selected countries

Country	OAD 2022 (%)	ΔFemale LFP (pp)	GDP cost (% GDP)	OAD 2040 (%)	GDP cost 2040 (%)	SSP coverage (%)
South Africa	8.1	−5.4	1.2 %	14.8	2.2 %	42.1
Kenya	4.8	−3.2	0.7 %	7.2	1.1 %	14.8
Ethiopia	5.1	−3.4	0.8 %	7.8	1.2 %	4.2
Nigeria	4.4	−2.9	0.6 %	6.1	0.9 %	3.8
Tanzania	4.6	−3.1	0.7 %	6.8	1.0 %	8.4
Rwanda	5.2	−3.5	0.8 %	8.4	1.3 %	32.1
Mozambique	6.4	−4.3	1.0 %	10.2	1.9 %	2.4
Zimbabwe	7.8	−5.2	1.2 %	13.1	2.4 %	6.8
SSA median	6.8	−4.6	1.4 %	11.4	2.6 %	8.4
SSA (Q4 aging)	14.2	−9.5	3.2 %	22.8	6.1 %	18.2

Note: ΔFemale LFP = IV estimate × (OAD 2022 − OAD 2000). GDP cost computed as ΔFemale LFP × Female working-age share × Gender wage ratio from WDI. 2040 projection uses UN WPP2024 medium scenario. SSA Q4 = top quartile of aging intensity. SSP coverage from World Bank ASPIRE 2022.

8. Policy Implications

8.1 The care economy as a development priority

Our findings establish a clear economic case for investing in the care economy in Sub-Saharan Africa. The GDP cost of 1.4 % at the median and up to 3.2 % in ageing countries represents a substantial and growing drag on female-driven economic growth. Three policy channels can reduce this cost.

First, formal long-term care infrastructure: publicly subsidised home care workers, community care centres, and residential facilities directly reduce the informal care burden on family members. Our SSP heterogeneity result (Table 6) shows that countries with formal social protection programmes attenuate the female LFP effect by 41 %, providing an implicit return-on-investment benchmark for LTC investments.

Second, conditional cash transfers and caregiver support allowances: even without formal LTC facilities, providing financial compensation to informal caregivers can reduce the labour supply cost by enabling families to hire part-time care support or to reduce care time by purchasing care-related goods and services.

Third, telehealth and technology-enabled care: digital health platforms that enable remote monitoring of elderly parents, medication management apps, and telemedicine consultations can reduce the time intensity of informal caregiving. This channel is particularly relevant in countries with high mobile phone penetration and may provide a cost-effective first step for countries unable to finance formal LTC infrastructure.

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9. Conclusion

This paper provides the first systematic causal evidence on the labour supply cost of informal caregiving in Sub-Saharan Africa. Our shift-share IV estimates confirm that a 1 pp increase in the old-age dependency ratio reduces female LFP by 0.67 pp an effect 59 % larger than OLS estimates, confirming the importance of causal identification. Causal mediation analysis shows that 83.6 % of this effect operates through the unpaid care hours channel (58 %) and the human capital channel (25 %).

The economic cost 1.4 % of GDP at the median and rising to 3.2 % for countries with the oldest age structures is substantial relative to typical development finance investments. Countries with formal social protection programmes covering at least 10 % of the elderly reduce this cost by 41 %, providing quantitative guidance for the economic returns to LTC investment.

These findings have direct implications for development finance institutions: the African Development Bank, IFAD, and bilateral donors should consider integrating formal care economy investments home care worker programmes, community care centres, caregiver cash transfers into their health and social protection portfolios, not merely as social expenditures but as investments in female labour supply and economic growth.

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