Impact of social protection programs on multidimensional poverty: Morocco case

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Context, objectives and contribution
Multidimensional Poverty Measure - MPI
Social protection and multidimensional poverty
Methodology
Data, scenarios and results
Conclusion

Background of the study
Objectives and contribution

Background

- Since the establishment of the SDGs, many countries have reviewed their social protection systems
- Strong interest in social protection reform $\Rightarrow$ Worldwide phenomenon (retirement, health, guaranteed minimum income, etc.)
- Several approaches to assessing impacts
  - Monetary poverty : classical tools (FGT, Gini, ...)*via* variations in household income / expenditures (FGT, Gini, ...)

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Background - Cont.

- However, social protection programs mainly target non-monetary
  dimensions (access to basic services - health and education) with short
  and long run effects

- The poverty measures to be considered to approach the impact of reforms
  on other dimensions of poverty should also be non-monetary

- The link between social protection reforms and multidimensional poverty
  measures has not been addressed in the literature

- Little evidence on the impact of these programs, and very little on their
  effects on multidimensional poverty [Seth et al., 2019]

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Objectives

- Development of two original approaches *ex ante* and microsimulated
- Difference : the principle of targeting individuals to benefit from programs
  - Random selection of beneficiaries among those initially deprived according to one or more indicators of interest
  - Identification of individuals changing status (from deprivate to non-deprivate) following a social protection measure based on their probability of benefiting from it (or lowest probability of being deprivate)
- For details see [Abdelkhalek and Boccanfuso, 2021]

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Contributions

- Methodological : innovative approaches in the context of impact evaluation of social protection programs on multidimensional poverty

- Comparison of approaches based on point estimates, confidence intervals (bootstrap and MC) and distributional analysis (density, stochastic dominance and incidence curves)

- Relevance of approaches to establish and assess the link between social protection programs and multidimensional poverty

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Dimensions and indicators - MPI

Revised MPI of ESCWA and Morocco

- Three (3) dimensions : health, education and standard of living
- Fourteen (14) indicators (school attendance, educational attainment and age schooling gap)
- Morocco : 13 indicators (no age schooling gap)

Pillar and weight assigned	Dimension	Indicator and weight within Dimension	Original Weight	Morocco 2011 & 2018
Social or capability well-being (weight=50%)	**Health & Nutrition (weight =50/2 = 25%)**	Child mortality (weight=1/3)	25/3	25/3
		Child nutrition (weight=1/3)	25/3	25/3
		Early pregnancy (weight=1/3)	25/3	25/3
	Education (weight =25%)	School attendance (weight=1/3)	25/3	**2***25/3 = 50%/3
		Age schooling gap (weight=1/3)	25/3	**0**
		Educational attainment −18+ (weight=1/3)	25/3	25/3
Living standards or material well-being (weight= 50%)	**Housing (weight = 50/3 = 16.67%)**	Overcrowding (weight=1/2)	16.67/2 = 25/3	25/3
		Type of dwelling (weight=1/2)	16.67/2 = 25/3	25/3
	Access to services (weight =16.67%)	Improved drinking water (weight=1/3)	16.67/3 = 50/9	50/9
		Improved sanitation (weight=1/3)	16.67/3 = 50/9	50/9
		Electricity (weight=1/3)	16.67/3 = 50/9	50/9
	Assets (weight =16.67%)	Communication assets (weight=1/3)	16.67/3 = 50/9	50/9
		Mobility assets (weight=1/3)	16.67/3 = 50/9	50/9
		Livelihood assets (weight=1/3)	16.67/3 = 50/9	50/9

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Crossing dimensions of multidimensional poverty and social protection

Multidimensional poverty and social protection intersection

- Whatever their design, social protection measures aim to have an impact on poor and vulnerable populations
- Morocco has a social protection system of the insurance or contributory and assistance type initiated in 1942 $\Rightarrow$ under 30% of the Moroccan state budget [MAGG, 2018]
- Many complements have been implemented, such as the Medical Assistance Regime for the Economically Deprived (RAMED), which was initiated in 2008 and generalized in 2017
- Need to revise the social protection system and acceleration with the advent of the Covid-19 pandemic

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Methodological issues
Targeting by random sampling
Targeting by objective identification

Problematic

- Targeting : how to identify who should or should not benefit from the measure
- A first problem associated with targeting in terms of impact on multidimensional poverty : some individuals i deprived according to indicator j benefiting from the program are not necessarily poor in multidimensional terms
  - Even when targeting is perfect for an MPI indicator $\nRightarrow$ MPI changes

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Problematic - Cont.

- If some individuals receiving the social protection program are deprived on the indicator j and also poor in the multidimensional way
  - g_{ij}^0 can go from 1 to 0 after the policy and c_i decreases $\Rightarrow$ individuals remain poor in a multidimensional sense i.e. $c_i \geq k$ since the sum of the weights of the other deprivations remains high even after having benefited from the program targeting the indicator j

- Development of two impact analysis methods to measure the impact of social protection programs on the MPI

- Construction of confidence intervals to verify whether the difference between the initial and simulated measures is statistically significant

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Targeting by random sampling

- Randomly select households (individuals) from among those initially deprived on one or more of the indicators who, because of the measurement, are no longer in a situation of deprivation for this or these indicators [Hoddinott, 1999], [Coady et al., 2004]
- Construction of the new deprivation matrix $g^{0s} = [g_{ij}^{0s}]$
- Robust comparisons against the baseline with Monte Carlo simulations and construction of CIs to test the statistical significance of the observed change for A, H and M

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Targeting by objective identification

- Identification of households that change status (from deprivate to non-deprivate) following the implementation of a social protection measure among those with the highest probability of receiving it
- The estimation of the probability at the base of the identification is done from a discrete choice model (probit) taking into consideration the generalized residuals [Gourieroux et al., 1987]

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Targeting by objective identification - Formalization

- Let $p_{ij} = P(y_{ij} = 1) = \Phi(x'_{ij}\beta_j)$ the probability that household i is deprivate on MPI indicator j
  - with x_{ij} a vector of K characteristics
  - β_j, a K parameter vector and
  - $\Phi(.)$, the $N(0,1)$ distribution function
- Let the linear model with latent variables, $y^*_{ij} = x'_{ij}\beta_j + e_{ij}$
- Let the estimated probabilities $\hat{p}_{ij} = \hat{P}(y_{ij} = 1) = \Phi(x'_{ij}\hat{\beta}_j)$ inferred for each household i deprivate or not, according to indicator j

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- The generalized residuals for this model are :

$$\tilde{e}_{ij}(\hat{\beta}_j) = \frac{\phi(x'_{ij}\hat{\beta}_j)}{\Phi(x'_{ij}\hat{\beta}_j)[1 - \Phi(x'_{ij}\hat{\beta}_j)]}[y_{ij} - \Phi(x'_{ij}\hat{\beta}_j)] \qquad (1)$$

- The adjusted probabilities based on the household ranking are given by
$\tilde{p}_{ij} = \tilde{P}(y_{ij} = 1) = \Phi(x'_{ij}\hat{\beta}_j + \tilde{e}_{ij}(\hat{\beta}_j))$

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Targeting by objective identification - Formalization

- On the axis representing the vector $\tilde{p}_j$, are the percentiles determining the share of deprivate households at baseline and those remaining at baseline after the implementation of the social protection measure

- Construction of simulated CIs at measures A, H and M by bootstrapping

- Distributional analysis on the vectors of bootstrapped deprivation scores, after simulation, c^s and the baseline c
  - Density functions
  - Distribution functions (first order stochastic dominance)
  - Incidence curves

- Information on improvement in terms of deprivation regardless of k.

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Moroccan MPI data and measurement in 2018
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Moroccan MPI Data and Measurement

- *Enquête Nationale sur la Population et la Santé Familiale* (ENPSF) for 2018
- 15,022 households, including 8,788 in urban areas and 6,234 in rural areas, i.e. 67,795 people surveyed
- Multidimensional poverty in Morocco in 2018

	Poverty incidence (H)	Intensity (A)	Multidimensional poverty index (M)
Morocco 2018	0,1930	0,4267	0,0824

Source : Authors based on ENPSF - 2018

Dimensions	Indicators	Percentage rate
Health and nutrition	Child mortality	1.06
	Early pregnancy	0.97
	Child Nutrition	7.94
Education	School attendance	14.62
	Age schooling gap	-
	Educational attainment	56.02
Housing	Overcrowding	20.19
	Type of dwilling	18.60
Access to services	Improved drinking water	29.22
	Improved sanitation	33.91
	Electricity	2.66
Assets	Communication assets	0.82
	Mobility assets	61.57
	Livelihood assets	5.83

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3 scenarios

- Under the new strategy, health and education should be the MPI dimensions impacted
- Three indicators considered in the scenarios : infant mortality, malnutrition of children under 5 years of age and school enrolment of children aged 6 to 17 years

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3 scenarios - Cont.

- Three scenarios
  1. Reduced the infant mortality deprivation rate by 50% from its 2018 level (from 1.06% to 0.53%) and the malnutrition deprivation rate from its 2018 level (from 7.94% to 3.97%)
  2. Reduced by 50% the rate of deprivation in terms of schooling of children between 6 and 17 years old from its level in 2018 of 14.62% to 7.31%
  3. A combined scenario of 1 and 2

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Moroccan MPI data and measurement in 2018
Simulation scenarios
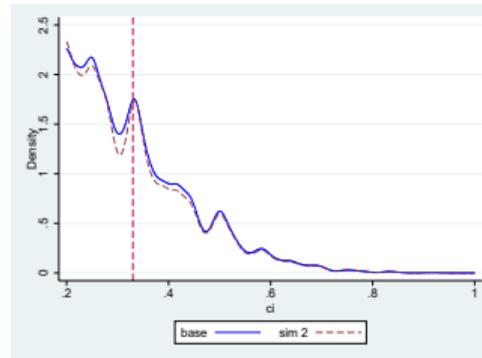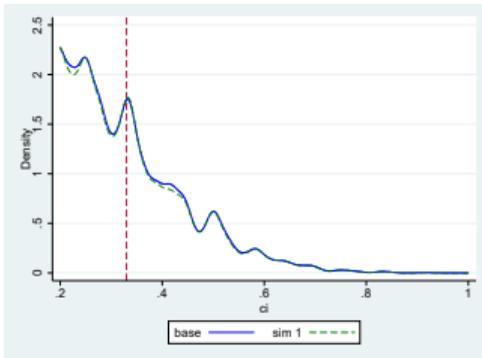Results

Implementation of the scenarios

- Infant mortality indicator : given the low level of deprivation, we consider only the approach with random selection of beneficiary households by area of residence (urban and rural)
  - Modeling a discrete choice variable (being deprivate) produces unreliable results for predicted probabilities when samples are highly unbalanced

- Indicators on malnutrition and schooling of children aged 6 to 17 : 1- random selection of beneficiary households ; 2- estimation of the probability of being deprived (probit)

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Ponctual analysis

				H			A			M	
			Inf	Value	Sup	Inf	Value	Sup	Inf	Value	Sup
	Baseline - Survey		-	0.1930	-	-	0.4267	-	-	0.0824	-
Targeting by random selection	Simulation 1	Ponctual values	0.1843	0.1859	0.1874	0.4221	0.4231	0.4241	0.0781	0.0786	0.0792
		Variation %	-	*-3.71%*	-	-	*-0.86%*	-	-	*-4.53%*	-
	Simulation 2	Ponctual values	0.1626	0.1649	0.1671	0.4068	0.4089	0.4110	0.0666	0.0674	0.0682
		Variation %	-	*-14.57%*	-	-	*-4.19%*	-	-	*-18.14%*	-
	Simulation 3	Ponctual values	0.1545	0.1572	0.1599	0.4027	0.4050	0.4072	0.0627	0.0637	0.0646
		Variation %	-	*-18.56%*	-	-	*-5.10%*	-	-	*-22.72%*	-
	Baseline - bootstrap		0.1325	0.1993	0.2660	0.4253	0.4268	0.4283	0.0565	0.0850	0.1135
Targeting by objective identification	Simulation 1	Ponctual values	0.1300	0.1956	0.2611	0.4241	0.4257	0.4272	0.0553	0.0832	0.1112
		Variation %	-	*-1.86%*	-	-	*-0.27%*	-	-	*-2.12%*	-
	Simulation 2	Ponctual values	0.1261	0.1896	0.2530	0.4243	0.4259	0.4275	0.0537	0.0807	0.1078
		Variation %	-	*-4.85%*	-	-	*-0.22%*	-	-	*-5.06%*	-
	Simulation 3	Ponctual values	0.1237	0.1860	0.2482	0.4231	0.4247	0.4263	0.0525	0.0790	0.1054
		Variation %	-	*-6.68%*	-	-	*-0.50%*	-	-	*-7.14%*	-

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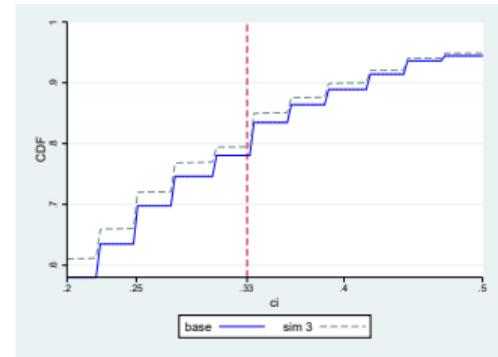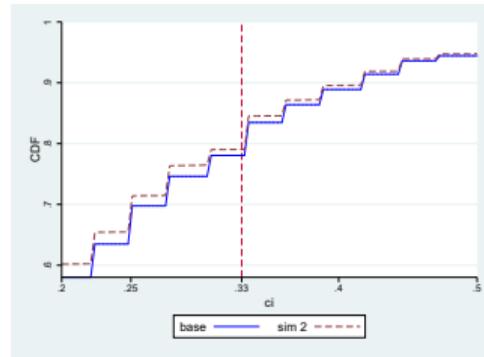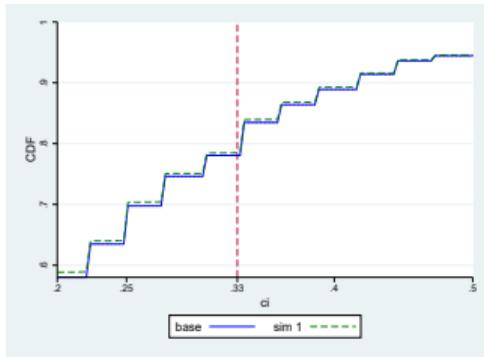Simulation scenarios
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Stochastic dominance results

Figure – Density curves of c_i*
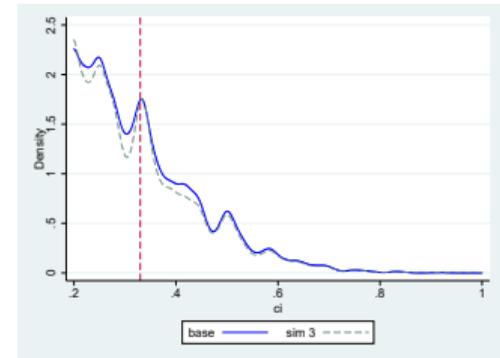
Source : Authors based on ENPSF data - 2018
*Focus is on $c_i > 0.2$ for clarity.

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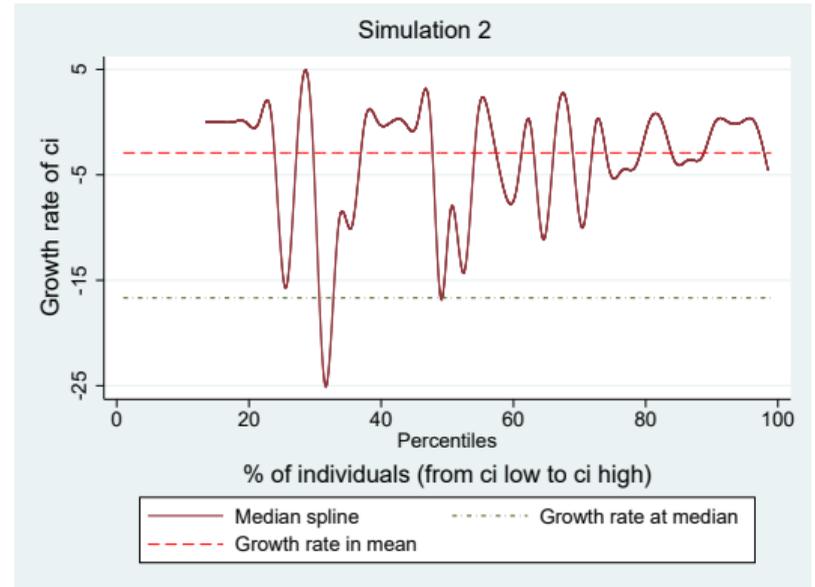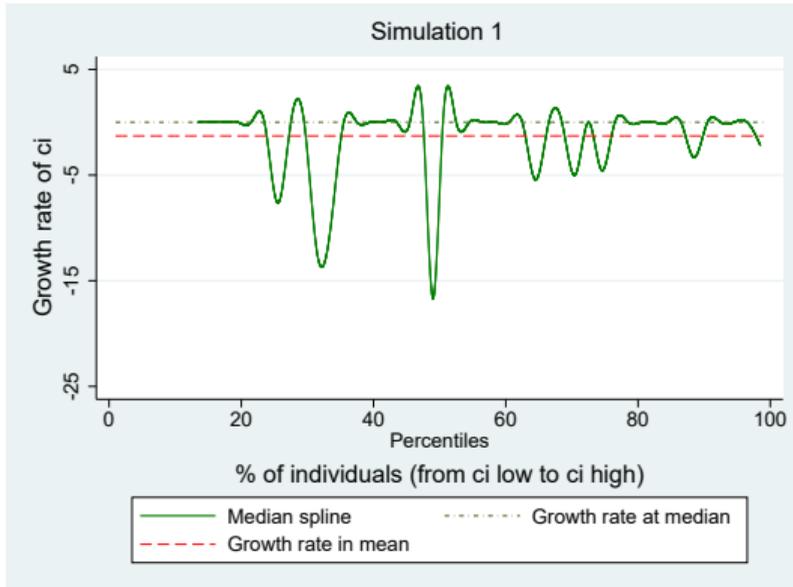Moroccan MPI data and measurement in 2018
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Figure – Stochastic dominance curves - Order 1*

Source : Authors based on ENPSF data - 2018
*Focus is on the $0.2 < c_i < 0.5$ for clarity.

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Figure – Incidence curves

Source : Authors based on ENPSF data - 2018

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Conclusion

- Development of two innovative approaches to assess the impact of the reform of the social protection system in Morocco on multidimensional poverty as measured by the MPI
- Differences in approaches : mechanism for targeting individuals to benefit from reforms
  - Identification of beneficiaries on a random selection among deprivate households (and therefore individuals) on each of the indicators considered
  - More objective identification *a priori* using a probabilistic model (probit) to identify households whose status changes from deprivate to non-deprivate on a given indicator
- Combination of point and simulated confidence interval analysis (Monte Carlo and bootstrap) and distributional analysis

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Conclusion - Cont.

- Targeting by objective identification does not necessarily dominate random targeting for the conducted simulations
  - Imbalanced sample
  - Using the objective identification targeting approach, only deprivate households on the indicator under consideration can have their status on that indicator changed from 1 to 0 whether or not they are poor in the multidimensional sense
  - The people who are targeted in the randomized approach could be homogeneous i.e. have similar poverty profiles

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- Interesting finding : when social protection reforms are implemented, deprivations according to the targeted indicators may decrease for some households (A is impacted) but leave the incidence of multidimensional poverty (H) unchanged
- Reminder : the assumption of independence of the effects on the indicators is postulated in this article
  - Correlations between indicators could exist
  - Adjustment needed to incorporate the latter in order to refine the assessment of the impact of welfare reform, which would be greater

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