

Impact of social protection programs on multidimensional poverty: Morocco case

T. ABDELKHALEK and D. BOCCANFUSO

MPI capacity building workshop - Amman (Jordan)

9 - 11 December 2021



Background

- Since the advent 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.)
 - In the MENA region : Ministerial Forum Declaration "*The future of Social Protection in the Arab Region : Building a vision for a post-COVID-19 reality*"
Adopted 30 November 2021
 - In Morocco : The King's Discourse, the New Development Model, the Government Program, Finance Law 2022

Background - Cont.

The Throne Speech to the Nation of His Majesty King Mohammed VI - July 2020

Our priority aspiration is to ensure social protection for all Moroccans. And Our determination is that, in the long run, all segments of society should benefit from it. In the 2018 Speech of the Throne, I already called for a prompt overhaul of the social protection system, which is still marked by a scattering of interventions and by a low rate of coverage and efficiency. We also consider that the time has come to launch, over the next five years, the process of generalizing social coverage for the benefit of all Moroccans.

Background - Cont.

- Several approaches to assessing impacts
 - Monetary poverty : classical tools (FGT, Gini, ...) *via* variations in household income / expenditures (FGT, Gini, ...)
- 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

Background - Cont.

- Different dimensions are considered in the MPI and its components (OPHI)
- 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]

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 deprive to non-deprive) following a social protection measure based on their probability of benefiting from it (or lowest probability of being deprive)
- For details see [Abdelkhalek and Boccanfuso, 2021]

Contributions

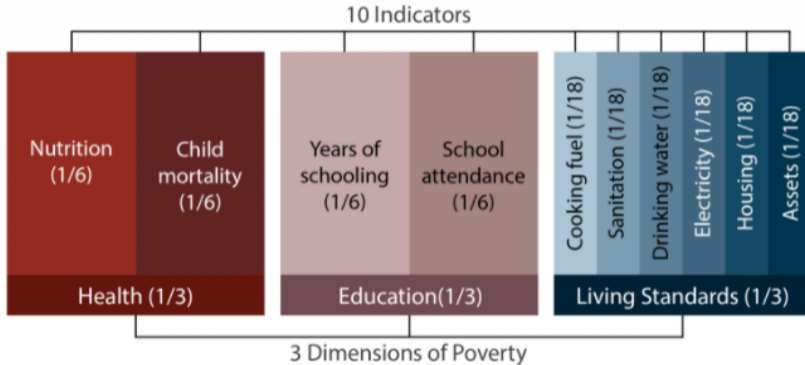
- Methodological : innovative approaches in the context of impact evaluation of social protection programs on multidimensional poverty
- Comparison of approaches based on point estimates, confidence intervals (bootstrap and MC) and distributional analysis (density, stochastic dominance and incidence curves)
- Relevance of approaches to establish and assess the link between social protection programs and multidimensional poverty

The Multidimensional Poverty Index - MPI

- To approach and measure poverty on non-monetary foundations, [Alkire and Foster, 2007] and [Alkire and Foster, 2011] have proposed a multidimensional method
- MPI : Index used since 2010 by UNDP to track and quantify household deprivation annually in over 100 developing countries

Dimensions and indicators - MPI

- Three (3) dimensions : health, education and standard of living
- Ten (10) indicators supposed to describe the situation of poor households and individuals
- Characteristics observed at the household level are considered to be valid for all members of that household



© Oxford Poverty and Human Development Initiative (OPHI)

Revised MPI of ESCWA and Morocco

- Same dimensions but fourteen (14) indicators (school attendance, educational attainment and age schooling gap)
- Morocco : 13 indicators (no age schooling gap)

Theoretical background of the MPI

- MPI obtained by counting and weighting the deprivations suffered by individuals on the basis of these indicators
- Let be a population of size n and let $d \geq 2$ be the number of considered indicators
- Let $y = [y_{ij}]$, the matrix $(n \times d)$ of baseline data such that $y_{ij} \geq 0$ is the observation of individual i ($i = 1, 2, \dots, n$) for indicator j ($j = 1, 2, \dots, d$)
- Let z_j be the threshold below which a person will be considered deprivate according to indicator j

Theoretical background of the MPI - Cont.

- Based on the d cutoffs, we can construct the deprivation matrix g^0 such that $g^0 = [g_{ij}^0]$ with dimension $(n \times d)$ such that $g_{ij}^0 = 1$ when $y_{ij} < z_j \Rightarrow i$ is deprived according to indicator j and $g_{ij}^0 = 0$ when $y_{ij} \geq z_j$
- Let w_j be the weight associated with the indicator j such that $0 \leq w_j \leq 1$ and $\sum_{j=1}^d w_j = 1$
- Let c be the vector of dimension $(n \times 1)$ of the deprivation scores obtained from the matrix g^0 and the weights w_j such that

$$c_i = \sum_{j=1}^d w_j g_{ij}^0 \quad \forall i = 1, 2, \dots, n. \quad (1)$$

Theoretical background of the MPI - Cont.

- The individual i is multidimensionally poor when the sum of weights of the indicators in which he is deprived is higher than or equal to k , a cutoff point chosen by the researcher or decision maker such that $c_i \geq k$ and not poor when $c_i < k$
- Measures of poverty :
 - ① The incidence of multidimensional poverty, H
 - ② The poverty gap or poverty intensity, A
 - ③ Adjusted incidence or MPI, M

Theoretical background of the MPI - Cont.

- Poverty incidence measures the proportion of individuals in multidimensional poverty equal to $H = \frac{q}{n} = \frac{1}{n} \sum_{i=1}^n q_i$
- Poverty intensity is the mean of the weighted deprivations of multidimensionally poor individuals such as $A = \sum_{i=1}^q \frac{c_i}{q}$
- The adjusted incidence (MPI), M , is a combination of the incidence and intensity of multidimensional poverty as $M = H \times A$

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

Social protection

- Social protection is a broad concept, including all government interventions that provide support or services to people [Boccanfuso et al., 2018]
- Two logics : assistance and insurance
- Social protection systems cover a multitude of fields of action (children, households, maternity, unemployment, sickness, retirement, disability, ...) either through contributory schemes (social insurance) or through non-contributory and tax-funded benefits (social assistance) [OIT, 2017]

Multidimensional poverty and social protection intersection

- Whatever their design, social protection measures aim to have an impact on poor and vulnerable populations
 - *Via* cash transfer and additional income or expenses
 - In nature (food vouchers, school canteens, ...)
- For [ESCWA, 2017], 8 of the 17 MDGs overlap with the MPI indicators and require the implementation of a social coverage system
 - *"Establish nationally appropriate social protection systems and measures for all, including social protection floors, and ensure that by 2030 a significant proportion of the poor and vulnerable benefit from them"* (ODD 1.3)

Social protection in Morocco

- Morocco has a social protection system of the insurance or contributory and assistance type initiated in 1942
- 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
- Exhaustive inventory of measures and programs in [MAGG, 2018] : social protection accounts for just under 30% of the Moroccan state budget
- Observation : need to revise the social protection system and acceleration with the advent of the Covid-19 pandemic

Social protection in Morocco - Cont.

- The generalization of social protection is a national priority and is organized around 4 axes
 - ① Protect against the dangers of illness : generalization of the compulsory health insurance (AMO)
 - ② Protecting from the dangers related to childhood : lump-sum compensation in the form of family allowances
 - ③ Protecting against hazards related to old age : expanding the membership base of pension schemes
 - ④ Protecting against the dangers of job loss : redesigning and generalizing the job loss benefit
- Adoption and implementation of a single social register (RSU) for a better targeting of the categories of the population eligible for aid

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

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

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

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]

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
 - $\Phi(\cdot)$, 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

Targeting by objective identification - Formalization

- The generalized residuals for this model are :

$$\tilde{e}_{ij}(\hat{\beta}_j) = \frac{\phi(x'_{ij}\hat{\beta}_j)}{\Phi(x'_{ij}\hat{\beta}_j)[1 - \Phi(x'_{ij}\hat{\beta}_j)]} [y_{ij} - \Phi(x'_{ij}\hat{\beta}_j)] \quad (2)$$

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

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 .

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 dwelling	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

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

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

Implementation of the scenarios

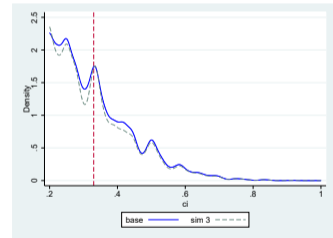
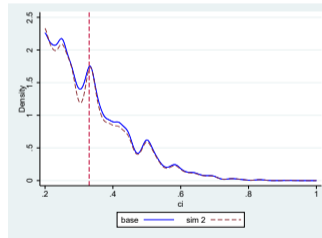
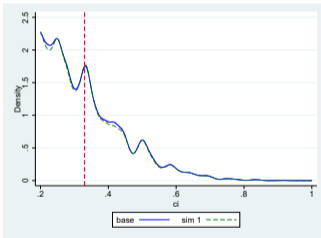
- Infant mortality indicator : given the low level of deprivation, we consider only the approach with random selection of beneficiary households by area of residence (urban and rural)
 - Modeling a discrete choice variable (being deprivated) produces unreliable results for predicted probabilities when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

Ponctual analysis

		H			A			M			
		Inf	Value	Sup	Inf	Value	Sup	Inf	Value	Sup	
Targeting by random selection	Baseline - Survey	-	0.1930	-	-	0.4267	-	-	0.0824	-	
	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%	-	
Targeting by objective identification	Baseline - bootstrap	0.1325	0.1993	0.2660	0.4253	0.4268	0.4283	0.0565	0.0850	0.1135	
	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%	-	

Stochastic dominance results

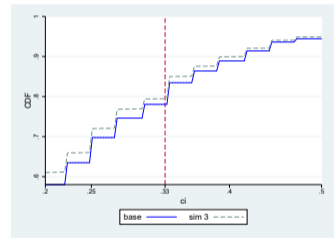
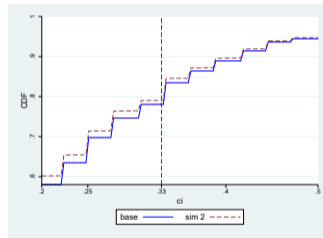
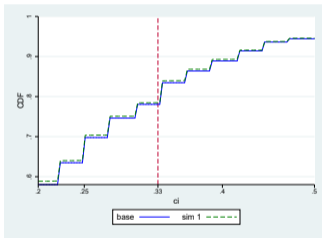
Figure – Density curves of c_i^*



Source : Authors based on ENPSF data - 2018

*Focus is on $c_i > 0.2$ for clarity.

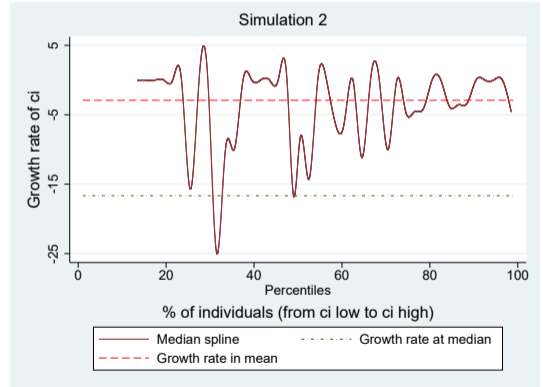
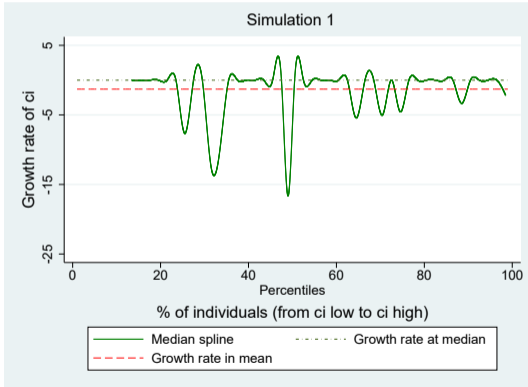
Figure – Stochastic dominance curves - Order 1*



Source : Authors based on ENPSF data - 2018

*Focus is on the $0.2 < c_i < 0.5$ for clarity.

Figure – Incidence curves



Source : Authors based on ENPSF data - 2018

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




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


Conclusion - Cont.

- 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



References I

-  Abdelkhalek, T. and Boccanfuso, D. (2021).
Impact de programmes de protection sociale sur la pauvreté multidimensionnelle : Nouvelles approches et application au cas du maroc. Technical report.
-  Alkire, S. and Foster, J. (2007).
Counting and multidimensional poverty.
-  Alkire, S. and Foster, J. (2011).
Counting and multidimensional poverty measurement.
Journal of public economics, 95(7-8) :476–487.



References II

-  Boccanfuso, D., Cousineau, J.-M., and Fonseca, R. (2018).
Le Revenu Minimum Garanti : Une Utopie? Une Inspiration pour le
Québec, rapport final du comité d'experts sur le revenu minimum garanti,
Québec, vol. 3 : Les simulations effectuées, 161 pages, Québec, Juin.
https://www.mtess.gouv.qc.ca/grands-dossiers/revenu_min_garanti.asp.

References III

-  Coady, D., Grosh, M., and Hoddinott, J. (2004).
Targeting of transfers in developing countries : Review of lessons and experience.
The World Bank.
-  ESCWA (2017).
Arab multidimensional poverty report.
Technical report, ESCWA.

References IV

-  Gourieroux, C., Monfort, A., Renault, E., and Trognon, A. (1987).
Generalised residuals.
Journal of econometrics, 34(1-2) :5–32.
-  Hoddinott, J. (1999).
Targeting : Principles and practice.
Technical Guide, 9 :70–75.

References V

-  MAGG (2018).
Les premières assises nationales de la protection sociale sous le thème "ensemble pour un système de protection sociale intégré et pérenne".
Technical report, UNICEF, Union Européenne.
-  OIT (2017).
World social protection report 2017-19 : Universal social protection to achieve the sustainable development goals.
Technical report, International Labour Organization.

References VI

-  Seth, S., Tutor, M. V., et al. (2019).
*Evaluation of Anti-poverty Programs' Impact on Joint Disadvantages :
Insights from the Philippine Experience.*
Oxford Poverty & Human Development Initiative.