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# Poverty index vs richness index: a new way to analyze the determinants of poverty

Poverty index  
vs richness  
index

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## Abstract

**Purpose** – The analysis of poverty is fundamentally focused on examining the well-being condition of the poor. We usually neglect the information provided by the rich. Nevertheless, perhaps the non-considered information indicating the determinants of non-poverty is also useful for fighting against poverty. The purpose of this paper is to analyze poverty under a new angle i.e. focusing on the information provided by the non-poor instead of the poor. For that a richness index is calculated in order to estimate econometric models regressing both indices i.e. poverty and richness indices on same selected characteristics. Thus, the comparison of the determinants of poverty and non-poverty for Tunisian case have allowed the classification of the selected explanatory variables with significant effect into four categories: the variables having significant effect on both sides (permanent effect), the variables having significant effect on the poor but not on the non-poor (transitory effect), the variables having significant effect on the non-poor but not on the poor (insurance effect) and the variables without any effect on both cases (neutral effect). This procedure is thus important given that it provides additional information and new way to enhance the targeting efficiency of the poor and fighting against poverty.

**Design/methodology/approach** – Using Tunisian data, an original procedure is proposed for calculating a richness index, defined based on the common formula of calculating the poverty index. Next econometric models are estimated regressing both the indices i.e. poverty and richness index on same selected characteristics.

**Findings** – The comparison of the determinants of poverty and non-poverty have allowed the classification of the selected explanatory variables with significant effect into four categories: the variables having significant effect on both sides (permanent effect), the variables having significant effect on the poor but not on the non-poor (transitory effect), the variables having significant effect on the non-poor but not on the poor (insurance effect) and the variables without any effect on both cases (neutral effect).

**Originality/value** – The analysis and the classification of the determinants of poverty according to the determinants of non-poverty is never made before in the literature. This procedure is important given that it provides additional information and a new way to enhance the efficiency of targeting the poor and fighting against poverty.

**Keywords** Tunisia, Comparison, Classification, Poverty, Richness

**Paper type** Research paper

## 1. Introduction

The fight against poverty is an indisputable priority for enhancing the well-being of individuals and reaching a real socio-economic development, particularly in developing countries. Nevertheless, the effectiveness of any anti-poverty policy depends on the good comprehension of the phenomenon and the way to operationalize the identification of the poor. However in practice, the complexity of the phenomenon makes the poverty targeting rather complicated.

Numerous methods have been presented in the literature for analyzing poverty. Despite this, the situation of the poor doesn't seem to become better, particularly in developing countries. This may indicate that there is a real problem of effectiveness and it is essential to find alternative tools making it possible to refine the targeting of the poor in order to enhance the effectiveness of poverty alleviation policies.



In addition, all proposed methods in the literature for analyzing poverty are only focused on the information provided by poor people and neglect the other side of the rich. Nevertheless, perhaps the neglected information indicating the determinants of non-poverty may help to understand the favorable factors for escaping from poverty and remaining non-poor and thus enhancing the efficiency of the fight against poverty.

At the end, this paper aims to present an alternative method for refining the analysis of the determinants of poverty. The proposed method is based on analyzing poverty by a new angle, i.e., focusing on the information provided by the non-poor instead of the poor.

This paper is organized as follows. In Section 2, we review the economic literature on poverty analysis. In Section 3, we describe the proposed methodology for analyzing the determinants of poverty vs the determinants of non-poverty. Then, an empirical validation for the Tunisian case is presented in Section 4. Section 5 concludes the study.

## 2. Literature review

In reviewing the history of thought on poverty, we can remark that the mainstream thinking has significantly changed over the last decades. Indeed, early studies were purely based on physiological criteria, which depend solely on the level of food consumption required for biological survival. Then, the analysis of poverty became progressively more complicated as new factors and characteristics were taken into account under a more global vision, given that individuals do not depend solely on the level of food consumption; they also depend on the power of integration into society and access to different moral and social needs (Razafindrakoto and Roubaud, 2005).

Thus, several methodological issues are discussed in the literature in order to take into consideration the different aspect of poverty known as: monetary vs non-monetary, objective vs subjective and absolute vs relative (Sen, 1976; Ravallion, 1992, 1996; Dercon and Krishnan, 2000; Dercon and Calvo, 2007; Razafindrakoto and Roubaud, 2005; Van Praag, 1987; Kakwani, 1993).

The standard method for analyzing poverty consists of its measurement based on poverty indices such as the FGT indices (the Headcount, the Poverty Gap (PG) and the Squared Poverty Gap (SPG)) (Foster *et al.*, 1984), the Watts index (Watts, 1968), the Sen index (Sen, 1976), Takayama index (Takayama, 1979), the Kakwani index (Kakwani, 1980), etc.

These poverty indices can be used for analyzing the determinants of poverty by using econometric methods, which is our first concern in this paper. A classic example of this context is presented by Ravallion (1996), which consists of the regression of poverty index on explanatory variables indicating the various possible determinants of poverty. Thus, the econometric model to be estimated is as follows:

$$P_i = X_i' \beta + u_i, \quad (1)$$

where  $P_i$  is the poverty index of household  $i$ ,  $X$  is a vector of observed explanatory variables;  $\beta$  is a vector of unknown parameters and  $u_i$  are the model residuals.

Poverty is also multi-dimensional. That's why many approaches have been developed in the literature in order to take into consideration the non-monetary indicators in poverty measurement, such as the human poverty index (HPI) (UNDP, 1997) and the global multi-dimensional poverty index (MPI) (the Oxford Poverty & Human Development Initiative (OPHI) and UNDP, 2010), which complement traditional income-based poverty measures by capturing the severe deprivations that each person faces at the same time with respect to education, health and living standards. The multi-dimensional poverty can also be measured in the context of the axiomatic approach (Bourguignon and Chakravaty, 2003;

Tsui, 2002; Duclos *et al.*, 2006; Kacem, 2013) or using the fuzzy logic approach (Cerioli and Zani, 1990; Siani, 2015; Dagum, 2002; Costa and De Angelis, 2008; Ayadi *et al.*, 2005).

In parallel, many researchers have extensively studied the dynamics of poverty using panel data. These studies are oriented along two main axes: the first is called descriptive, given that it considers poverty as a discrete state, such as the tabulation approach (Coe, 1978; Duncan *et al.*, 1984; Rainwater, 1981) and the duration approach (Bane and Ellwood, 1986; Ruggles and Williams, 1989). The second is analytical, which consists of the decomposition of poverty index into two components, called chronic and transitory (Jalan and Ravallion, 2000).

Jalan and Ravallion (2000) have defined the transitory component of poverty as the contribution of the change in consumption over time in poverty measure, while the chronic component is the remaining part of poverty index.

Thus, the chronic component of poverty ( $C_i$ ) for household  $i$  is considered as constant over time and it is calculated based on the arithmetic mean of the household's consumption ( $y_{it}$ ):

$$C_i = \frac{(z - E(y_{it}))^2}{z} \quad (2)$$

While the transitory component ( $T$ ) is defined as the remaining part of poverty:

$$T_i = P_i - C_i \quad (3)$$

Thus, Jalan and Ravallion (2000) have studied the determinants of chronic and transitory poverty based on econometric estimations, using the SPG of the FGT class as poverty index, given that it satisfies the axiom of transfer, a necessary condition to be decomposable.

The analysis of the determinant of chronic poverty is based on the estimation of the following econometric model:

$$C_i = \begin{cases} C_i^* & \text{if } C_i^* > 0 \\ 0 & \text{otherwise} \end{cases} \quad (4a)$$

where  $C_i^*$  is a latent variable which takes the following form:

$$C_i^* = X_i \beta + u_i \quad (4b)$$

where  $X_i$  ( $i = 1 \dots N$ ) is a matrix of selected household characteristics,  $\beta$  is a vector of unknown parameters and  $u_i$  are the model residuals.

The same specification is used in order to analyze the determinant of transitory poverty.

Despite all these proposed methods in the literature for analyzing poverty, the situation of the poor in the world doesn't seem to become better. For this reason, we think that nowadays it is no longer sufficient to simply study poverty. It becomes essential to focus on the efficiency of the used methods and the planned anti-poverty policies.

### 3. Methodology

All proposed methods in the literature for analyzing poverty; particularly those which use econometric modeling, are commonly focused on the research of the characteristics of the poor and neglect the other side of the rich. Indeed, when we measure poverty index for measuring poverty, we generally consider a right censored data, i.e., the poverty index is observed only if the living standard of individuals is less than the poverty line and equal to zero for all non-poor people whatever their degree of richness (non-poor) be. Thus, we think that we lose considerable amount of information provided by the non-poor and for analyzing

the determinant of poverty, it is in addition useful to know the reason of remaining non-poor. Indeed, perhaps the non-considered information indicating the determinants of non-poverty are also useful for fighting against poverty.

First, for measuring the poverty, we use the PG index of the FGT class (Foster *et al.*, 1984), which indicates the incidence of poverty:

$$PG_i = \begin{cases} \frac{(z-y_i)}{z} & \text{if } y_i < z \\ 0 & \text{otherwise} \end{cases}, \quad (5)$$

where  $z$  is the poverty line and  $y_i$  is the per capita expenditure of household  $i$ .

Thus, the determinants of poverty can be studied based on the estimation of the econometric model (6), which follows the Tobit specification, given that the poverty index is censored:

$$P_i = \begin{cases} P_i^* & \text{if } P_i^* > 0 \\ 0 & \text{otherwise} \end{cases}, \quad (6a)$$

where  $P$  is a latent variable which takes the following form:

$$P_i^* = X_i\beta + u_i, \quad (6b)$$

where  $X_i$  ( $i = 1 \dots N$ ) is a matrix of selected household characteristics,  $\beta$  is a vector of unknown parameters and  $u_i$  are the model residuals.

Next, we define the richness index (RI) by using the same formula of the PG index, but considering a left censored data instead of the right one. Thus, the RI is positive for non-poor people and equal to zero for all poor people. We define the RI as follows:

$$RI_i = \begin{cases} \frac{(y_i-z)}{z} & \text{if } y_i > z \\ 0 & \text{otherwise} \end{cases}, \quad (7)$$

where  $z$  is the poverty line and  $y_i$  is the per capita expenditure of household  $i$ .

Note that the PG's value is always between 0 and 1. However the  $RI$  value can exceed 1 if the per capita expenditure exceeds  $2 \times Z$  ( $0 \leq RI \leq \infty$ ).

Using the same procedure of analyzing the determinants of poverty, we use Tobit specification for analyzing the determinant of non-poverty considering the RI as a dependent variable. Thus, the model to be estimated is as follows:

$$RI_i = \begin{cases} RI_i^* & \text{if } RI_i^* > 0 \\ 0 & \text{otherwise} \end{cases}, \quad (8a)$$

where  $RI$  is a latent variable which takes the following form:

$$RI_i^* = X_i\beta + u_i, \quad (8b)$$

where  $X_i$  ( $i = 1 \dots N$ ) is a matrix of selected household characteristics,  $\beta$  is a vector of unknown parameters and  $u_i$  are the model residuals.

Note that the estimation of the proposed econometric models for analyzing the determinants of static poverty and richness as defined in this paper in a unique date doesn't engender any technical problem and restriction about the proprieties of the used index. However, if the procedure is used for analyzing the dynamics of poverty and richness or for

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decomposing aim, there is a need to take into consideration some specific proprieties such as the transfer axiom (Jalan and Ravallion, 2000; Kacem, 2015).

Thus, the comparison of the determinants of poverty and non-poverty allows the classification of the selected explanatory variables with significant effect into four categories: the variables having significant effect on both sides (permanent effect), the variables having significant effect on the poor but not on the non-poor (transitory effect), the variables having significant effect on the non-poor but not on the poor (insurance effect) and the variables without any effect on both cases. This classification is important and may be very useful for policymakers in fighting against poverty. Indeed, the additional information on the impact of each variable on poverty and non-poverty may give additional choice for limiting the action plan while remaining efficient, according to the policymakers' priorities and available resources.

#### 4. Empirical validation

We use empirical validation data from the 2010 Tunisian consumption survey collected by the National Statistical Institute of Tunisia. The survey provides information on expenditure of around 13,400 households, as well as other useful information on geographic residence, demographic, education, etc.

In order to analyze the determinants of richness and to compare them to the determinants of poverty, several households' characteristics are selected and included as explanatory variables in the models (6) and (8). The selected characteristics are: the household's size, the education level of household's head, the gender of household's head (1 if male and zero otherwise), the age of household's head, the number of adults in the household (human capital) and the zone of residence (geographic characteristic).

Table I presents the headcount ratio (proportion of poor), the PG and the RI, according to the selected characteristics. The table shows a clear difference between the statistics of the poor compared to the non-poor. Indeed, for example, for households with big size ( $> 6$ ), the proportion of households (headcount) in extreme poverty is equal to 0.33, the PG is in order of 0.09 and the RI is equal to 0.68, against 0.12, 0.03 and 1.59 respectively for the others households.

Also, note that the table reveals an important gap between the different zones of residence. This indicates that there is a real problem of geographic inequality in the well-being of households in Tunisia, particularly in the center. Indeed, the statistics show that the poorest zone is the center-west and the richest zone is the center-east.

Then, we have estimated the models (6) and (8) regressing the PG and the RI respectively on the same explanatory variables and using the Tobit as an estimation technique. Results are presented in the Table (II). Note that the sign of coefficients corresponding to the same explanatory variable in the two models are expected to be opposite. Indeed, any variable that affects the poverty positively will affect the richness negatively and reciprocally.

Thus, according to Table (II), the determinants of poverty and richness are not the same. Indeed, for example, the variables which do not affect the PG significantly are the age of household head, living in the north-east and the south-east of Tunisia, while the variables which don't generate any significant effect on the richness are the sex of households head and living in the south-east.

Similarly, the comparison of the determinant of poverty and non-poverty allows the classification of the selected explanatory variables with significant effect into four categories:

- (1) Category 1: the variables having significant effect on both sides, which may be considered as the variables with permanent effect. These variables are thus the most important characteristics which have to be considered for fighting against poverty.

## AJEMS

Variable	Headcount (vulnerable)	PG	RI
<i>HH size</i>			
≤6	0.12	0.03	1.59
> 6	0.33	0.09	0.68
<i>Gender of HH head</i>			
Male	0.14	0.03	1.44
Female	0.15	0.04	1.66
<i>Age of HH head</i>			
≤60	0.16	0.04	1.37
> 60	0.11	0.03	1.70
<i>HH head education</i>			
Illiterate or Primary	0.18	0.04	1.14
Secondary	0.07	0.01	1.86
High level	0.007	0.001	3.47
<i>Number of adults</i>			
≤1	0.15	0.04	2.26
> 1	0.14	0.03	1.43
<i>Zone of residence</i>			
District of Tunis	0.08	0.014	1.98
North-East	0.10	0.02	1.28
North-West	0.21	0.05	1.03
Center-East	0.07	0.01	2.00
Center-West	0.28	0.08	0.94
South-East	0.14	0.03	1.55
South-West	0.17	0.04	1.71

**Table I.**  
The poverty and richness indices according to the selected characteristics

Variables	PG	Model	RI
HH size	0.116 <sup>a</sup> (24.18)		-0.516 <sup>a</sup> (-32.32)
Gender of HH head	-0.052 <sup>a</sup> (-3.05)		-0.030 (-0.55)
Age of HH head	-0.0002 (-0.33)		0.006 <sup>a</sup> (-3.81)
<i>HH head education</i>			
Analphabel or Primary	0.658 <sup>a</sup> (8.29)		-2.461 <sup>a</sup> (-32.85)
Secondary	0.426 <sup>a</sup> (5.33)		-1.541 <sup>a</sup> (-19.67)
<i>Number of adults</i>	-0.083 <sup>a</sup> (-14.48)		0.296 <sup>a</sup> (15.18)
<i>Zone of residence</i>			
North-East	-0.027 (-1.10)		-0.404 <sup>a</sup> (-6.11)
North-West	0.173 <sup>a</sup> (7.85)		-0.776 <sup>a</sup> (-11.59)
Center-East	-0.117 <sup>a</sup> (-4.78)		0.335 <sup>a</sup> (5.53)
Center-West	0.215 <sup>a</sup> (10.10)		-0.759 <sup>a</sup> (-11.47)
South-East	0.009 (0.36)		-0.006 (-0.09)
South-West	0.091 <sup>a</sup> (3.79)		-0.408 <sup>a</sup> (-5.65)
Pseudo R <sup>2</sup>	0.23		0.08

**Table II.**  
Results of estimation of the models (6) and (8) (Tobit)

**Notes:** Values between parentheses are *t*-statistics. <sup>a</sup>Indicates that the coefficient is statistically significant

These characteristics are: the household's size, the education level of the household's head, the number of adults in the households, living in north-west, center-east, center-west and south-east.

- (2) Category 2: the variables having significant effect on the poor but not on the non-poor, which may be considered as characteristics with transitory effect. These variables do not guarantee remaining non-poor and thus households are the most vulnerable. Estimation results show that for the Tunisian case, the sex of households head is a determinant of vulnerability in our sense.
- (3) Category 3: the variables having significant effect on the non-poor but not on the poor, which may be considered as characteristics of insurance against poverty. This kind of variables are not habitually shown or considered in a usual analysis of poverty. Estimation results show that the variables generating this effect are the age of household's head and living in the north-east of Tunisia.
- (4) Category 4: the variables without any effect on both sides, which may be considered as variables with neutral effect. Thus, according to the estimation results, only the fact of living in the south-east doesn't engender any significant effect on poverty and richness in Tunisia.

## 5. Conclusion

This paper aimed to contribute to the extensive literature on the analysis of poverty by the proposition of a new angle of view, i.e., focusing on information provided by the non-poor instead of the poor. For that, an RI is calculated based on the common formula of calculating the poverty index. Then, econometric models are estimated, regressing both indexes on the same selected characteristics.

The comparison of the determinants of poverty and richness gave interesting results. First, we found that the determinants of poverty and non-poverty are not necessarily the same. There are some variables which affect both dependent variables significantly but others affect only one significantly.

Second, the comparison of the determinants of poverty and non-poverty was useful and important. Indeed, it allowed the classification of selected explanatory variables with significant effects into four categories: the variables having significant effect on both sides (permanent effect), the variables having significant effect on the poor but not on the non-poor (transitory effect), the variables having significant effect on the non-poor but not on the poor (insurance effect) and the variables without any effect on both cases (neutral effect).

This classification may be very useful for policymaker in the fighting against poverty. Indeed, additional information on the impact of each variable on poverty and non-poverty give additional choice for limiting the action plan while remaining efficient, according to policymakers' priorities and available resources.

We conclude that the proposed procedure is important given that it provides additional information and a new way to enhance the efficiency of targeting the poor and fighting against poverty. Also, it will be interesting if this procedure is applied to different kinds of poverty indices or for analyzing the dynamics of poverty.

## References

- Ayadi, M., Chtioui, N. and Lahga, A. (2005), "Analyse Multidimensionnelle de la Pauvreté en Tunisie entre 1988 et 2001 par une Approche non Monétaire", The 4th PEP Research Network General Meeting, Colombo, June-13-17.
- Bane and Ellwood (1986), "Slipping into and out of poverty: the dynamics of spells", *Journal of Human Resources*, Vol. 21 No. 1, pp. 1-23.



- Bourguignon, F. and Chakravaty (2003), "The measurement of multidimensional poverty", *Journal of Economic Inequality*, Vol. 1 No. 1, pp. 1-25.
- Cerioli, A. and Zani, S. (1990), "A fuzzy approach to the measurement of poverty", in Dagum, C. and Zenga, M. (Eds), *Income and Wealth Distribution, Inequality and Poverty. Studies in Contemporary Economics*, Springer Verlag, Berlin, pp. 272-284.
- Coe, R. (1978), "Dependency and poverty in the short and long run", in Duncan, G.J. and Morgan, J.N. (Eds), *Thousand American Families: Patterns of Economic Progress*, Vol. 6, Institute for Social Research, Ann Arbor, MI, pp. 273-296.
- Costa, M. and De Angelis, L. (2008), "The multidimensional measurement of poverty: a fuzzy set approach", *Statistica*, Vol. 69 No. 3, pp. 303-319.
- Dagum, C. (2002), "Analysis and measurement of poverty and social exclusion using fuzzy set theory', application and policy implication", in Dagum, C. and Ferrari, G. (Eds), *Household Behaviour, Equivalence Scales, Welfare and Poverty. Contributions to Statistics*, Physica, Heidelberg, pp. 221-271.
- Dercon, S. and Calvo, C. (2007), "Vulnerability to poverty", *Center for the Studies of African Economies (CSAE), University of Oxford*, Working Paper No. 2007, No. 3, pp. 1-24.
- Dercon, S. and Krishnan, P. (2000), "Vulnerability, seasonality and poverty in ethiopia", *Journal of Development Studies*, Vol. 36 No. 6, pp. 82-100.
- Duclos, J.-Y., Sahn, D. and Younger, S. (2006), "Robust multidimensional poverty comparisons", *Economic Journal*, Vol. 116 No. 514, pp. 943-968.
- Duncan, G.J., Coe, R., Corcoran, M., Hill, M., Hoffman, S. and Morgan, J. (1984), "The dynamics of poverty", in Duncan, G.J. et al. (Eds), *Chapter 2 in Years of Poverty. Years of Plenty*, Institute for Social Research, Ann Arbor, MI.
- Foster, J., Green, J. and Thorbecke, E. (1984), "A class of decomposable poverty measure", *Econometrica*, Vol. 52 No. 3, pp. 761-765.
- Jalan, J. and Ravallion, M. (2000), "Is transient poverty different ? Evidence for rural China", *Journal of Development Studies*, Vol. 36 No. 6, pp. 82-99.
- Kacem, R.B.H. (2013), "Monetary versus non-monetary pro-poor growth: evidence from rural ethiopia between 2004 and 2009", *Economics: The Open-Access, Open-Assessment E-Journal*, Vol. 7 Nos 2013-2026, pp. 1-23.
- Kacem, R.B.H. (2015), "Sensitivity of pro-poor growth measurement to survey period", *International Journal of Statistics & Economics (formerly known as the "Bulletin of Statistics & Economics)*, Vol. 16 No. 1, pp. 20-31.
- Kakwani, N. (1993), "Statistical inference in the measurement of poverty", *The Review of Economics and Statistics*, Vol. 75 No. 4, pp. 632-639.
- Kakwani, N.C. (1980), "On a class of poverty measures", *Econometrica*, Vol. 48 No. 2, pp. 437-446.
- Rainwater, L. (1981), "Persistent and transitory poverty: a new look", Working Paper No. 70, Joint Center for Urban Studies of the Massachusetts Institute of Technology and Harvard University, Cambridge.
- Ravallion, M. (1992), "Poverty comparison: a guide to concepts and methods", LSMS Working Paper No 88, World Bank, Washington, DC.
- Ravallion, M. (1996), "Issues in measuring and modeling poverty", *Economic Journal*, Vol. 106 No. 1, pp. 1328-1343.
- Razafindrakoto, M. and Roubaud, F. (2005), "The multiples facets of poverty in a developing country: the case of Madagascar capital city", *Economie et Statistique*, Vol. 383 No. 1, pp. 131-155.
- Ruggles, P. and Williams, R. (1989), "Longitudinal measures of poverty: accounting for income and assets over time", *Review of Income and Wealth*, Vol. 35 No. 3, pp. 225-243.
- Sen, K.A. (1976), "Poverty: an ordinal approach to measurement", *Econometrica*, Vol. 44 No. 2, pp. 219-231.

- Siani, J. (2015), "A multidimensional analysis of poverty using the fuzzy set approach. Evidence from Cameroonian data", *Economics Bulletin*, Vol. 35 No. 3, pp. 2012-2025.
- Takayama, N. (1979), "Poverty, income inequality, and their measures: Professor Sen's axiomatic approach reconsidered", *Econometrica*, Vol. 47 No. 3, pp. 747-759.
- Tsui, K.Y. (2002), "Multidimensional poverty indices", *Social Choice and Welfare*, Vol. 19 No. 1, pp. 69-93.
- UNDP (1997), "Human development report: human development to eradicate poverty", United Nations Development Programme, New York, NY.
- UNDP (2010), "Human development report: the Real Wealth of Nations: pathways to human development", United Nations Development Programme, New York, NY.
- Van Praag, B.M.S. (1987), "The notion of population economics", *Journal of Population Economics*, Vol. 1 No. 1, pp. 5-16.
- Watts, H.W. (1968), "An economic definition of poverty", in Moynihan, D.P. (Ed.), *On Understanding Poverty*, Basic Book, New York, NY, pp. 316-329.

### Further reading

- Gazouani, S. and Goaied, M. (2001), "The determinants of urban and rural poverty in Tunisia", ERF Working Paper Series No. 0126.

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