

SUSTAINABLE DEVELOPMENT GOALS 8: THE IMPACT OF NUTRITIONAL DEFICIENCIES ON ECONOMIC PRODUCTIVITY IN MEMBER COUNTRIES OF THE ORGANIZATION OF ISLAMIC COOPERATION

Faishol Luthfi
Universitas Tanjungpura
Email: faishol.luthfi@ekonomi.untan.ac.id

Abstrak

Tujuan Pembangunan Berkelanjutan (SDGs) merupakan isu kontemporer yang menjadi perhatian global, dan eksplorasi terhadapnya sangat dibutuhkan di era saat ini. Oleh karena itu, penelitian ini bertujuan untuk menganalisis SDGs dengan berfokus pada analisis pengaruh malnutrisi terhadap produktivitas ekonomi di negara-negara anggota Organisasi Kerjasama Islam (OKI). Metode yang digunakan dalam penelitian ini adalah Fully Modified Ordinary Least Square (FMOLS) dan Dynamic Ordinary Least Square (DOLS). Hal ini digunakan untuk menganalisis seberapa besar pengaruh jangka panjang yang terbentuk. Data yang digunakan adalah data panel 35 negara anggota OKI dari tahun 2001 sampai dengan 2022 dan dibagi menjadi beberapa kategori model, yaitu model negara berpendapatan rendah, berpendapatan menengah ke bawah, berpendapatan menengah ke atas, dan berpendapatan tinggi. Hasil penelitian menunjukkan bahwa dalam jangka panjang, malnutrisi berpengaruh negatif signifikan terhadap produktivitas ekonomi dan pengaruh terbesar terjadi pada negara dengan kategori lower middle income.

Kata kunci: SDGs, FMOLS, DOLS, OKI

Abstract

The Sustainable Development Goals (SDGs) are a contemporary issue of global concern, and an exploration of them is urgently needed in the current era. Therefore, this study aims to analyze the SDGs by focusing on analyzing the effect of malnutrition on economic productivity in the Organization of Islamic Cooperation (OIC) member countries. The methods used in this study are Fully Modified Ordinary Least Square (FMOLS) and Dynamic Ordinary Least Square (DOLS). This is used to analyze how much long-term influence is formed. The data used is panel data of 35 OIC member countries from 2001 to 2022 and is divided into several model categories, namely low income, lower middle income, upper middle-income and high income countries models. The results show that in the long run, malnutrition has a significant negative effect on economic productivity and the largest effect is on countries in the lower middle-income category.

Keywords: SDGs, FMOLS, DOLS, Organization of Islamic Cooperation

Introduction

Sustainable Development Goals (SDGs) are a contemporary issue of global concern and exploration of this issue is urgently needed in the current era. The

SDGs are global and national commitments in an effort to improve the welfare of society through 17 global goals and targets. This commitment was declared by both developed and developing countries at the UN General Assembly in September 2015 and will end in 2030. These programs or commitments include: (1) No Poverty; (2) Zero Hunger; (3) Good Health and Well-being; (4) Quality Education; (5) Gender Equality; (6) Clean Water and Sanitation; (7) Affordable and Clean Energy; (8) Decent Work and Economic Growth; (9) Industry, Innovation and Infrastructure; (10) Reduced Inequalities; (11) Sustainable Cities and Communities; (12) Responsible Consumption and Production; (13) Climate Action; (14) Life Below Water; (15) Life on Land; (16) Peace, Justice and Strong Institutions; (17) Partnerships for the Goals (Sekretariat Nasional SDGs, n.d.).

Economic growth through increasing GDP per capita is one of the goals of the SDGs, namely the eighth SDG. In the eighth SDGs, GDP per capita and its growth rate are the top indicators (Batrancea et al., 2023; Sekretariat Nasional SDGs, n.d.). Economic growth is an important part of a country's development (Costanza et al., 2009). In economics, economic growth refers to the increase in Gross Domestic Product (GDP) over time (Corbin et al., 2021). GDP also represents the economic productivity of a country. In a more micro concept, GDP can be divided by population to produce GDP per capita. This approach can illustrate the productivity of a country's population. Economic growth is influenced by a number of external and internal factors. Internal factors include government policies, availability of natural resources and infrastructure, as well as people's living patterns and culture. External factors include exchange rates, international trade (imports and exports), and investment inflows and outflows (Abbott et al., 2016; Pusat Kebijakan APBN, 2011)

Economic productivity is a function of capital and labor. Capital refers to all physical and financial forms used to produce goods or services such as equipment and financing. Labor refers to the education, skills and health of people (labor) which will also affect total productivity. This study identifies malnutrition as a factor that affects labor productivity and this in turn affects the economic productivity of a country. Several previous studies have shown that undernutrition is important because it is related to the economy (Büttner et al., 2023; Hoddinott, 2016; Soriano & Garrido, 2016).

This study tries to re-explore the effect of malnutrition on economic productivity in member countries of the Organization of Islamic Cooperation (OIC) as a novelty. This is done because the OIC member countries are predominantly Muslim populations, which have a more in-depth view of Islamic economics. In Islamic economics, there are *maqashid sharia* principles that are also in accordance with the big goals of the SDGs. The effect of malnutrition on economic productivity can be described by *maqashid sharia*, more specifically in the parts of *hifdz nafs*, *hifdz aql* and *hifdz maal*

Literature Review

Theoretically, there is an influence between the level of nutrition and economic productivity. This direct effect is found in many empirical studies and econometric results from the existing literature. Some of them are Leibenstein, (1957) Popkin (1976), Bliss & Stern (1978), Dasgupta & Ray (1986), and Lambson,

(1992) which links better nutrition with higher labor productivity. Evidence at the micro-economic level has been plentiful although some show different results.

Baldwin & Weisbrod (1974) explain that sickness and mortality factors affect labor supply at all wage levels. This is explained in the following figure:

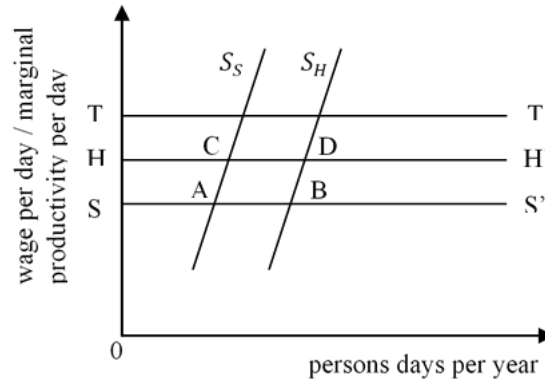


Figure 1. Labor Supply and Demand Functions for a Sick and Health Worker

In Figure 1, there are two labor supply curves for sick workers (S_S) and healthy workers (S_H). At a wage rate of OS , sick people work SA days per year and healthy people SB days per year (Heywood, 1974). In addition, nutritional status is an important factor to determine human reaction to disease (Scrimshaw et al., 1965). Based on these arguments, the curves S_S and S_H can reflect the labor supply curves for people with poor and good nutritional status.

The intensity of work during a given period will also affect productivity. This is an important link in the wage-productivity argument developed by Leibenstein and other economists to explain the existence of high wage levels during labor surplus conditions. Leibenstein argues that if the *marginal productivity* of labor is a function of *work effort*, then *work effort* is a function of nutritional status. It may be profitable to pay labor at a wage rate greater than the value of the marginal product of labor under conditions of labor surplus. In Figure 1, SS' and HH' are the marginal productivity curves for sick and healthy workers.

Poor nutrition can lead to poor judgment, irritability, bad mood and inattention. Such behavioral changes can affect one's receptivity to new ideas. Hunger is caused by insufficient food intake to meet one's immediate energy needs (Read, 1973). It is for this reason that poor nutritional status will affect one's ability to learn. Educational status has also been shown to have a direct impact on one's efficiency in combining available inputs and ability to reallocate available resources (Popkin, 1976). Therefore, malnutrition is considered to affect the level of economic productivity.

Methods

This study uses a quantitative approach to analyze the influence between variables (Mohajan, 2020). An in-depth analysis will be conducted on the effect of malnutrition on economic productivity. The operational definitions of the variables are explained as follows:

Table 1. Operational Definition of Variables

Variables	Proxy	Unit	Definition	Data Source
-----------	-------	------	------------	-------------



Economic Productivity (Y) GDP per capita USD GDP per capita is the sum of the gross value added by all producers living in the economy plus product taxes (minus subsidies) not included in the valuation of output, divided by the mid-year population. GDP per capita provides a basic measure of the value of output per person, which is an indirect indicator of per capita income. GDP and GDP per capita growth are considered broad measures of economic growth (Worldbank). SESRIC

Nutritional Deficiencies (X) Number of undernourished people Million people Undernutrition means that a person cannot obtain enough food to meet the daily minimum dietary energy requirement, for one year. Undernutrition is used to measure hunger in relation to the SDGs (FAO). SESRIC

This study chooses to use panel data available for all countries that are members of the OIC membership. This study will analyze data from 57 countries with a period from 2001-2021. The OIC member countries consist of Afghanistan, Albania, Azerbaijan, Bahrain, Bangladesh, Benin, United Arab Emirates (UAE), Brunei Darussalam, Burkina Faso, Algeria, Djibouti, Chad, Indonesia, Morocco, Ivory Coast, Palestine, Gabon, Gambia, Guinea, Guinea Bissau, Guyana, Iraq, Iran, Cameroon, Qatar, Kazakhstan, Kyrgyzstan, Comoros, Kuwait, Libya, Lebanon, Maldives, Malaysia, Mali, Egypt, Mauritania, Mozambique, Niger, Nigeria, Uzbekistan, Pakistan, Senegal, Sierra Leone, Somalia, Sudan, Suriname, Syria, Saudi Arabia, Tajikistan, Togo, Tunisia, Turkey, Turkmenistan, Uganda, Oman, Jordan, Yemen.

Due to the lack of data availability, filtering is necessary which results in the elimination of some countries. This brings the total sample to 35 countries and this number is considered sufficient for the study and represents all OIC members with various income characteristics. In more detail, the sample is analyzed into several groups in certain models as follows:

Table 2. Research Model

Model (Group)	Observation
Model I: Low Income Countries (Afghanistan, Burkina Faso, Chad, Gambia, Mali, Mozambique, Niger, Sierra Leone, Syria, Togo, Uganda, Yemen)	N=12, T=21 N*T = 252
Model II: Lower Middle-income Countries (Bangladesh, Benin, Cameroon, Cote d'Ivoire, Djibouti, Egypt, Guinea, Kyrgyz Republic, Mauritania, Morocco, Pakistan, Senegal, Tajikistan, Tunisia)	N = 14, T = 21 N*T = 294
Model III: Upper Middle-income Countries (Albania, Gabon, Indonesia, Iran, Iraq, Libya)	N=6, T=21 N*T = 126
Model IV: High Income Countries (Oman, Saudi Arabia, United Arab Emirates)	N=3, T=21 N*T = 63

This study uses two methods of analysis, namely Fully Modified Ordinary Least Square (FMOLS) and Dynamic Ordinary Least Square (DOLS). Traditional OLS estimation approaches (such as pooled OLS, fixed effects, and dynamic panel models) tend to produce inconsistent and biased results if the time series process is non-stationary and the variables are cointegrated. Therefore, after completing the unit root test and determining cointegration, this study proceeds by using FMOLS and DOLS as estimation approaches (Amin et al., 2020; Angrist, 2001; Faliva & Zoia, 1994; Kurantin & Osei-Hwedie, 2019; Longbottom & Holly, 1985; Rafi et al., 2024; Salma & Khan, 2023; Singh & Stakić, 2020). In addition, many studies have used the FMOLS and DOLS approach to estimate how much the long-run effect (Ngoma & Yang, 2024). And then a wald test is conducted to see that the model is a late fit.

The last step to add validation to the estimation in the study is Robustness Checking, by taking a sample of four countries estimated simultaneously where each country represents each model (low income, lower middle income, upper middle income, high income) and analyzing it with the same method (FMOLS and DOLS).

Result and Discussion

This section fully discusses the results and discussion of the research conducted.

Table 3. Descriptive Statistics

	Mean	Max	Min	Std. Dev.
Y	4321.626	55059.20	248.0500	8645.179
X	4.679610	48.80000	0.100000	7.697213

Notes: *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Source: The results of the author's data processing

Table 3 shows a summary of the descriptive statistics of the variables in the study. Variable Y has an average value of 4321.626 or an average GDP per capita of 4321.36 USD while for variable X it is 4.679 or an average number of malnourished people of 4.7 million people. The lowest value of GDP per capita is 248.05 USD and the highest is 55059 USD. The lowest value of malnourished population is 0.10 million people with the highest number of 48.8 million people.

Table 4. Unit Root Test

Variables	Model I	Model II	Model III	Model IV	Remarks
Im, Pesaran and Shin W-stat					
ΔLogY	-9.28611*** (0.0000)	-6.31502*** (0.0000)	-10.1320*** (0.0000)	-2.38886*** (0.0085)	I(1)
ΔLogX	-2.32629*** (0.0100)	-4.88438*** (0.0000)	-3.82894*** (0.0001)	-3.61670*** (0.0001)	I(1)
Variables	Model I	Model II	Model III	Model IV	
ADF - Fisher Chi-square					
ΔLogY	114.731*** (0.0000)	87.8755*** (0.0000)	69.6817*** (0.0000)	15.8951** (0.0143)	I(1)
ΔLogX	38.6551** (0.0297)	72.0673*** (0.0000)	38.3816*** (0.0001)	17.8620*** (0.0013)	I(1)
Variables	Model I	Model II	Model III	Model IV	
PP - Fisher Chi-square					
ΔLogY	219.283*** (0.0000)	111.317*** (0.0000)	100.305*** (0.0000)	29.6593*** (0.0000)	I(1)
ΔLogX	47.8361*** (0.0026)	75.4744*** (0.0000)	196.097*** (0.0000)	10.4635* (0.0333)	I(1)

Notes: *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Source: The results of the author's data processing

Table 4 above shows that all variables are at the *first difference* stationarity level so that the next stage can be carried out, namely the cointegration panel test. In this study using the Johansen Fisher cointegration panel test. The results of the cointegration panel test can be explained in the following table:

Table 5. Cointegration Test

Hypothesized No. of CE(s)	Fisher Stat.* (from max-eigen test)	Prob.
Model I		
None	49.01	0.0019***
At most 1	40.34	0.0197**
Model II		
None	68.84	0.0000***
At most 1	56.98	0.0010***
Model III		
None	22.16	0.0358**
At most 1	20.54	0.0575*
Model IV		
None	12.47	0.0523*
At most 1	19.84	0.0030***

Notes: *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Source: The results of the author's data processing

Table 5 describes the results of the Johansen Fisher cointegration panel test in which all models are significant at the 1%, 5% and 10% levels, which means that there is a long-run effect. These results only explain the presence or absence of long-run effects but do not estimate in detail the magnitude of long-run effects on the models formed. Therefore, it is necessary to estimate the long-run effect using the FMOLS and DOLS approaches.

Table 6. FMOLS and DOLS

FMOLS								
Variables	Model I		Model II		Model III		Model IV	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
ΔLogX	-0.3138*** (0.0000)	0.0723	-0.3575*** (0.0000)	0.0719	-0.3191*** (0.0000)	0.0658	-0.1182*** (0.0047)	0.0402

DOLS								
Variables	Model I		Model II		Model III		Model IV	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
ΔLogX	-0.3568*** (0.0002)	0.0930	-0.4192*** (0.0000)	0.0822	-0.3398*** (0.0000)	0.0692	-0.0481 (0.3793)	0.0542

Notes: *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Source: The results of the author's data processing

The estimation results of the FMOLS and DOLS models show the same results where variable X has a negative effect on Y. In addition, for estimation using FMOLS, all models show significance for the effect of variable X on Y while estimation using DOLS all models show a significant effect between variable X on Y except in model IV.

With the FMOLS approach, in the long run, when variable X increases by one million people, variable Y decreases by 0.3138 USD (Model I Low Income), 0.3575 USD (Model II Lower Middle Income), 0.3191 USD (Model III Middle Upper Income), 0.1182 USD (Model IV High Income). With the DOLS approach, in the long run, when variable X increases by one unit, variable Y decreases by 0.3568 USD (Model I Low Income), 0.4192 USD (Model II Lower Middle Income), 0.3398 USD (Model III Middle Upper Income), 0.0481 USD (Model IV High Income).

The next step is to test the validation of the estimate with the Wald test described in Table 7.

Table 7. Wald Test

Null hypothesis	Wald Test (t statistic)	
	FMOLS	DOLS
C(1)=0 (X) (Model I Low Income)	-4.3374*** (0.0000)	-3.8346*** (0.0002)
C(1)=0 (X) (Model II Lower Middle Income)	-4.6214*** (0.0000)	-5.0975*** (0.0000)
C(1)=0 (X) (Model III Upper Middle Income)	-4.8434*** (0.0000)	-4.9056*** (0.0000)
C(1)=0 (X) (Model IV High Income)	-2.9381*** (0.0047)	-0.8881 (0.3793)

The Wald test estimation results show significant results, which means that all models, including the low income, lower middle income, upper middle income, and high income countries models, are valid in FMOLS as well as in DOLS, where almost all models are valid except for the high income countries model.

Undernutrition has a significant effect on economic productivity. This effect occurs in the long term since "undernutrition" is a condition in which the population in an area consumes food below the energy adequacy standard for a healthy, active and productive life. This results in a decrease in *human capital* both in quality and quantity. Declining *human capital* will also reduce labor productivity. In the long run, the accumulation of these events will lead to lower economic productivity. Malnutrition is proven to have a significant negative effect, which means that as the number of malnourished people increases, economic productivity proxied by GDP per capita decreases. This is consistent with the theoretical approach to the relationship between nutrition and productivity. This result is also consistent with previous studies from (Büttner et al., 2023; Hoddinott, 2016; Soriano & Garrido, 2016). The results of this study can be generalized considering that the effect occurs in OIC countries with various income levels ranging from *low income* to *high income* categories. In addition, the statistical results show that the greatest influence occurs in OIC member countries with *lower middle-income* status. For this reason, policies related to improving and developing an economy based on improving health, especially through reducing the number of malnourished people, can be implemented and started in countries in the *lower middle-income* category.

Conclusion:

In the long term, malnutrition has an effect on economic productivity. The more malnutrition increases, the more economic productivity decreases. The results show that the greatest influence is on countries with the lower middle-income category so that policies related to increasing economic productivity through fulfilling nutritional needs can be started from these category countries.

Referensi

- Abbott, P., Wallace, C., & Sapsford, R. (2016). Socially Inclusive Development: The Foundations for Decent Societies in East and Southern Africa. *Applied Research in Quality of Life*, 12(4). <https://doi.org/10.1007/s11482-016-9491-6>
- Amin, S. Bin, Kabir, F. Al, Nihad, A., & Khan, F. (2020). An Empirical Investigation between Foreign Direct Investment (FDI) and Tourism in Bangladesh. *Journal of Tourism Management Research*, 7(1), 110–121. <https://doi.org/10.18488/journal.31.2020.71.110.121>
- Angrist, J. D. (2001). Estimation of Limited Dependent Variable Models With Dummy Endogenous Regressors. *Taylor & Francis*, 19(1), 2–28. <https://doi.org/10.1198/07350010152472571>
- Baldwin, R. E., & Weisbrod, B. A. (1974). Disease and Labor Productivity. *Economic Development and Cultural Change*, 414–435.
- Batrancea, L. M., Nichita, A., Balci, M. A., & Akgüller, Ö. (2023). Empirical investigation on how wellbeing-related infrastructure shapes economic growth: Evidence from the European Union regions. *PLoS ONE*, 18(4).

<https://doi.org/10.1371/journal.pone.0283277>

- Bliss, C., & Stern, N. (1978). Productivity, Wages, and Nutrition (Part I: The theory). *Journal of Development Economics*, 5, 331–362.
- Büttner, N., Heemann, M., Neve, J. De, Verguet, S., Vollmer, S., & Harttgen, K. (2023). Economic Growth and Childhood Malnutrition in Low- and Middle-Income Countries. *JAMA Network Open*, 6(11), 1–13.
<https://doi.org/10.1001/jamanetworkopen.2023.42654>
- Corbin, J. H., Abdelaziz, F. Ben, Sørensen, K., Kökény, M., & Krech, R. (2021). Wellbeing as a policy framework for health promotion and sustainable development. *Health Promotion International*, 36.
<https://doi.org/10.1093/heapro/daab066>
- Costanza, R., Hart, M., Posner, S., & Talberth, J. (2009). *Beyond GDP: The Need for New Measures of Progress*. <https://open.bu.edu/bitstream/2144/22665/1/PP-004-GDP.pdf>
- Dasgupta, P., & Ray, D. (1986). Inequality as a determinant of malnutrition and employment Theory. *Economic Journal*, 96, 1011–1034.
- Faliva, M., & Zoia, M. G. (1994). Detecting and testing causality in linear econometric models. *Springer Science+Business Media*, 3(1), 61–76.
<https://doi.org/10.1007/bf02589041>
- Heywood, P. F. (1974). *Malnutrition and Productivity in Jamaican Sugar Cane Cutters*. Cornell University.
- Hoddinott, J. (2016). *The economics of reducing malnutrition in Sub-Saharan Africa* (Global Panel on Agriculture and Food Systems for Nutrition Working Paper).
- Kurantın, N., & Osei-Hwedie, B. Z. (2019). *Digital Financial Integration, Investment, Economic Growth, Development and Poverty Reduction*. Emerald.
<https://doi.org/10.1108/978-1-78973-999-220191015>
- Lambson, V. E. (1992). Nutrition, unemployment and international trade. *Journal of Development Economics*, 37, 111–125.
- Leibenstein, H. (1957). The Theory of Underemployment in Backward Economies. *Journal of Political Economy*, 65(2), 91–103.
- Longbottom, J. A., & Holly, S. (1985). The role of time series analysis in the evaluation of econometric models. *Wiley*, 4(1), 75–87.
<https://doi.org/10.1002/for.3980040111>
- Mohajan, H. (2020). Quantitative Research: A Successful Investigation in Natural and Social Sciences. *Journal of Economic Development Environment and People*, 9(4). <https://doi.org/10.26458/jedep.v9i4.679>
- Ngoma, J. B., & Yang, L. (2024). Forest Policy and Economics Does economic performance matter for forest conversion in Congo Basin tropical forests ? FMOLS-DOLS approaches. *Forest Policy and Economics*, 162(May 2023), 103199. <https://doi.org/10.1016/j.forpol.2024.103199>
- Popkin, B. M. (1976). Human Resource Development And productivity: The Role of

Nutrition. *EKI*, 24, 275–291.

- Pusat Kebijakan APBN. (2011). *Model Makro APBN: Dampak Kebijakan APBN terhadap Beberapa Indikator utama Pembangunan*. Fiskal.Kemenkeu.Go.Id. <https://fiskal.kemenkeu.go.id/kajian/2011/02/25/193155012907276-model-makro-apbn-dampak-kebijakan-apbn-terhadap-beberapa-indikator-utama-pembangunan>
- Rafi, A. H., Chowdhury, A. A., Sultana, A., & Noman, A. Al. (2024). Unveiling the Role of Artificial Intelligence and Stock Market Growth in Achieving Carbon Neutrality in the United States: An ARDL Model Analysis. *Global Society of Scientific Research and Researchers*, 130–155. <https://doi.org/10.56556/jescae.v3i4.1073>
- Read, M. S. (1973). Malnutrition, Hunger, and Behavior. *Journal of The American Dietetic Association*, 63, 386–391.
- Salma, U., & Khan, M. F. H. (2023). The Connection Between Political Stability and Inflation: Insights from Four South Asian Nations. *Cornell University*. <https://doi.org/10.48550/arxiv.2310.08415>
- Scrimshaw, N. S., Taylor, C. E., & Gordon, J. E. (1965). *Interactions of Nutrition and Infection* (57; Geneva: World Health Organization Monograph Series).
- Sekretariat Nasional SDGs. (n.d.). *SDGs Metadata*. <https://Sdgs.Bappenas.Go.Id/>. <https://sdgs.bappenas.go.id/metadata-indikator-sdgs/>
- Singh, D., & Stakić, N. (2020). Financial inclusion and economic growth nexus: Evidence from SAARC countries. *SAGE Publishing*, 41(2), 238–258. <https://doi.org/10.1177/0262728020964605>
- Soriano, B., & Garrido, A. (2016). How important is economic growth for reducing undernourishment in developing countries? *Food Policy*, 63, 87–101. <https://www.sciencedirect.com/science/article/pii/S0306919216301841>