

How to reduce the depth of poverty through a regionally sectoral output approach?

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ABSTRACT

With the limit of poverty Head Count Index (HCI) measured the proportion of population living under the proposed poverty line, Total Poverty Gap (TPG) is clearly able to demonstrate a better picture of the destitute in society. The purposes of this study are to stress the significance of economic linkages represented by Social Accounting Matrix (SAM) multiplier on poverty reduction in various regions through mathematical simulation method, and propose the specific policy to reduce poverty in each region. The findings reveal that household income and government subsidy play a vital role to eliminate the depth of poverty. Additionally, with an aim at efficiently improving the living standard among people working in the different sectors in economy, government of North America; Latin America; and EU should strongly support the production of the meat sector while the government of Oceania; Southeastern Asia; and Southern Asia should encourage the production of the processed food sector. Also, the government of Eastern Asia and sub-Saharan Africa should promote the production of the light manufacturing sector while the government of Middle East and Northern Africa can effectively reduce its poverty through endorsing the production of heavy manufacturing sector.

Keywords: Poverty, Economic Growth, Total Poverty Gap, Social Accounting Matrix, Government subsidy

JEL Classification: I32, O21, O57

1. Introduction

In spite of the rapid economic growth around the world in the 20 years, the problem of extreme poverty still exists in many regions, especially among the underdeveloped and developing countries. Additionally, under the concept of income inequality, two digits growth rate occurred cannot be accurately referred to an improved quality of life of the poor because those prosperity is concentrated to merely the richest people. (Myint, 1980; Todaro and Smith, 2011).

Poverty comprises many features including low incomes, inability to derive the basic goods and services, low level of health and education, malnutrition, inadequate clear water, poor sanitation, pollution, insecurity, powerlessness, low productivity, small saving, and also not having access to credit. The widely accepted benchmark in assessing poverty is poverty Head Count Index (HCI) which captures the proportion of population whose consumption is less than the proposed level, namely poverty line. There are two types of poverty line including the international poverty line (Using the same minimum income to measure poverty around the world) and the national poverty line (The average of income in each country which is issued by the national statistic organization). Thus, poverty level varies upon poverty line (United Nations, 1998).

Even though international poverty line is more preferable due to comparability, the problem still arises because the criteria is considered to be low for some advanced countries so that the poverty rate is close to zero in the U.S. or Australia which is contrary to the fact that both countries still have the poor. For national poverty line, the problem is that it is incapable to compare poverty in one country with other. Using its own poverty line, poverty rate in Norway may be close to Nepal but the well-being among the poor is entirely different. In addition, a different currency is able to generate an unclear picture as to convert the local currency to an international currency - the U.S. dollar - generates the bias in selecting the period (balance of payment equilibrium). Also, the quality of statistics in the less-developed countries (LDCs) is typically less reliable which leads to the difficulty of international comparison.

The concept of vicious cycle leads to the chronic poverty in the third world. Hence, there is a remarkable progress in elimination of poverty in some countries while it is more difficult in some regions to improve the living standards of the poor. Besides national attempt to reduce poverty, there are many international organizations trying to put this problem as priority. In 2000, world's leaders actively set an ambitious agenda - the Millennium Development Goals (MGDs) - to develop global economy and improve human well-being. There are eight goals including eradicating extreme poverty and hunger, achieving universal and primary education, promoting gender equality and empowering women, reducing child mortality, improving maternal health, combating HIV/AIDs, Malaria and other disease, ensuring environmental sustainability, and strengthening global partnership for development. The results of MDGs are impressive because these goals can life millions of people out of poverty, improve the status of women and girls, and provide better health and education system. About poverty, the number of the poor living on less than \$1.25 a day worldwide has significantly declined by more than half which decreases from 1.9 billion in 1990 to just 836 million in 2015. Poverty rate measured by the international poverty line is shown in table 1.

TABLE 1. Regional poverty rate at \$1.25 a day in 1990 and 2015 (Percentage)

Regions	1990	2015	Change
Eastern Asia	61	4	-93.44
Latin America and Caribbean	13	4	-69.23
Southern Asia	52	17	-67.31
South-Eastern Asia	46	7	-84.78
Sub-Saharan Africa	57	41	-28.07
Developing regions	47	14	-70.21
World	36	12	-66.67

Source: United Nations Development Programme (2015)

According to the table 1, the proportion of people living on less than \$1.25 a day globally declined by 66.67 percent from 36 per cent in 1990 to 12 per cent in 2015. In the developing regions, poverty rate has dropped more than two third, from 47 per cent in 1990 to 14 per cent in 2015. About the result in each region, by 2015, all developing regions except sub-Saharan achieve the target of halving the proportion of the poor. For Eastern Asia, poverty rate has dropped from 61 per cent in 1990 to just 4 per cent in 2015 due to an impressive development in China. Latin America and Caribbean's progress is great as its poverty rate has decreased from 13 per cent in 1990 to 4 per cent in 2015. Also, a reduction from 52 per cent to 17 per cent for the same period makes the result of Southern Asia outstanding. Moreover, the growth of ASEAN has contributed to the better living standards among Southeastern Asia countries as poverty rate has fallen from 46 per cent in 1990 to just 7 per cent in 2015, a huge decrease of 85 per cent. However, the situation of sub-Saharan is likely to be different. Poverty rate has just start declining in 2002. In 2015, 41 per cent of the population in this region is still the poor which is higher than global poverty rate, on average, in 25 years ago.

As mentioned, poverty rate describes the situation of poverty through the proportion of population living under the minimum income but it does not inform about the different quality of life among the poor. Also, it cannot be referred to the amount of income necessary to life people out of poverty. Even though Eastern Asian and Latin America and Caribbean have the same poverty rate, the standard of livings among the poor in these two regions is absolutely different. Unfortunately, there is no more room for policymakers to implement the detailed picture of this problem. In handling poverty, it requires the different efforts from government or local agencies among countries but poverty HCI does not provide the information properly. So, poverty ratio is less informative to understand how the poor live under the destitute-stricken condition.

Sen (1976) proposed the new idea attempting to understand the depth of poverty which was further named as Total Poverty GAP (TPG). TPG demonstrates the amount of money required to get the poor out of poverty, the difference between the defined minimum income level (Poverty line) and the actual income. In addition, it can be referred to the proper amount of in-cash subsidy from government. It shows how far the poor is from the proposed poverty line. TPG is able to be expressed as the percentage of poverty line. TPG index in each region is shown in table 2.

TABLE 2. TPG index at \$1.25 poverty line in 1990 and 2011 (Percentage of poverty line)

Regions	1990	2011	Change
Eastern Asia and Pacific	19.46	1.56	-91.98
Europe and Central Asia	0.41	0.14	-65.85
Latin America and Caribbean	4	2.17	-45.75
Middle East and Northern Africa	1.07	0.35	-67.29
Southern Asia	16.28	5.16	-68.30
Sub-Saharan Africa	25.47	19.18	-24.70

Source: The World Bank (2015)

Note: Global TPG is not available.

From the table 2, TPG has fallen in all regions between 1990 and 2011. Eastern Asia is the most successful region in reducing TPG, followed by Southern Asia and Middle East and Northern Africa, respectively. By 2011, sub-Saharan Africa has highest TPG, around 19.18 percent of poverty line which means that the poor in this region requires an additional income by 20 per cent of poverty line to become the normal people, not the poor. Thus, TPG is clearly beneficial for policymakers because it comprehensibly signifies the required efforts of government in each country to design and implement its own national development plan.

The objectives of this study are to estimate the impacts of an expansion of output in the selected sectors due to policy shocks on the depth of poverty, and to propose the specific policies in each region aimed at reducing the depth of poverty.

2. Literature review

Nowadays, the number of people living in extreme poverty is around 836 million. The widely realized strategy of poverty reduction is an economic growth because it is directly associated with an increase in per capita income. The common idea of growth as a tool in eradication of poverty is named the economic growth elasticity of poverty (GEP). It refers to the sensitivity of poverty when income changes (Squire, 1993; Ravallion and Chen, 1997; Kalwij and Verschoor, 2004; Perrotta, 2007; Takeda, 2009).

Besides economic growth, the study through an economy-wide analysis using the concept of Social Accounting Matrix (SAM) is well developed to analyze the impact of policy as an exogenous demanded shock. The effects of shock are divided into direct and indirect effect which displays the total impact of economy (Round, 2003; Miller and Blair, 2009). A derivation of SAM multiplier is used to refer to the possible impact from a change in export or government subsidy in one specific sector to market or economy overall. Higher SAM multiplier promises higher return to total output (Thaiprasert, 2006). Corresponding to the concept of poverty, a change in given sectoral output due to an implemented policy can be, directly and indirectly, referred to a change in the income level among people working in other sector. Thus, poverty can be efficiently alleviated, more or less, through an increase in final demand and government subsidy (Thorbecke and Jung, 1996; Klan, 1999; Essama-Nssah, 2005; Civardi and Lenti, 2008; Durongkaveroj and Osathanunkul, 2013).

3. Methods

According to SAM multiplier's (Pyatt and Round, 1979),

$$dy = mdx \quad (1)$$

Where dy is a change in household income, m is SAM Multiplier, and dx is the amount of exogenous macroeconomic shock (in-cash subsidy or export support). This equation explains that a change in income relies mainly on two factors including SAM multiplier representing economic linkages and the number of government policy.

For the idea of a change in income,

$$\Delta y = Y_1 - Y_0$$

Where Δy is a change in income, Y_1 is new level of income, and Y_0 is an initial level of income. Then, supposed Δy is given to be equal to dy ,

$$dy = Y_1 - Y_0$$

Rearrange,

$$dy + Y_0 = Y_1 \quad (2)$$

Then, substitute dy in (1) in (2),

$$mdx + Y_0 = Y_1 \quad (3)$$

Equation (3) explains that a new level of income depends on three main factors including an initial level of income, SAM multiplier, and government subsidy.

From TPG (Sen, 1976) for regional level,

$$TPG_{community} = \sum_{i=1}^n (Y_p - Y_i) \quad (4)$$

Where $TPG_{community}$ is TPG of given community, Y_p is poverty line and Y_i is income level.

In this case, TPG is referred to the amount of money required to add for getting out of poverty. Thus, a change in regional TPG with a constant measurement,

$$\Delta TPG_{community} = \sum_{i=1}^n (Y_p - \Delta Y_i) \quad (5)$$

In term of individual TPG,

$$TPG_x = Y_p - Y_x \quad (6)$$

Where Y_x is the income level of X (Individually). Then, a change in individual TPG can be written as,

$$\Delta TPG_x = Y_p - \Delta Y_x \quad (7)$$

Substitute (3) in (7),

$$\Delta TPG_x = Y_p - \Delta(mdx + Y_{0x}) \quad (8)$$

Where Y_{0x} is an initial income level of X. For equation (8), it is indicated that the depth of poverty or the gap between individual income and poverty line can be narrowed by three forces, holding poverty line unchanged, including a change in SAM multiplier, an action from government (exogenous demanded shock), and income level.

In calculating SAM multiplier in each region, the technique is derived from Leontief (1986). For the scope of this study, there are ten regions including *Oceania* (Australia, New Zealand, and Rest of Oceania); *Eastern Asia* (Hong Kong, China, Japan, Korea, Mongolia, Taiwan,

and Rest of Eastern Asia); *South Eastern Asia* (Cambodia, Indonesia, Lao, Malaysia, Philippines, Singapore, Thailand, Vietnam, and Rest of South Eastern Asia); *Southern Asia* (Bangladesh, India, Nepal, Pakistan, Sri Lanka, and Rest of Southern Asia); *North America* (Canada, U.S., Mexico, and Rest of North America); *Latin America* (Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela, Rest of South America, Costa Rica, Guatemala, Honduras, Nicaragua, Panama, El Salvador, and Rest of Central America, Caribbean); *Europe25* (Australia, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, and United Kingdom); *Middle East and Northern Africa* (Egypt, Morocco, Tunisia, Rest of Western Asia, and Rest of Northern Africa); *Sub-Saharan Africa* (Benin, Burkina Faso, Cameroon, C d'Ivoire, Ghana, Guinea, Nigeria, Senegal, Togo, Rest of Western Africa, Central Africa, South Central Africa, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Rwanda, Tanzania, Uganda, Zambia, Zimbabwe, Rest of Eastern Africa, Botswana, Namibia, South Africa, and Rest of South African Customs); and *Rest of the World* (Switzerland, Norway, Rest of EFTA, Albania, Bulgaria, Belarus, Croatia, Romania, Russian Federation, Ukraine, Rest of Eastern Europe, Kazakhstan, Kyrgyzstan, Rest of Former Soviet Union, Armenia, Azerbaijan, Georgia, Bahrain, Iran, Israel, Kuwait, Omar, Qatar, Saudi Arabia, Turkey, and United Arab Emirates).

For economic sector, all sectors are aggregated into ten sectors including *grain* (Grains and crops), *meat* (Livestock and meat products), *extract* (Mining and extraction), *processed foods* (Processed foods), *textile* (Textile and clothing), *light manufacturing* (Light manufacturing), *heavy manufacturing* (Heavy manufacturing), *utilities* (Utilities and construction), *transportation* (Transports and communication), and *other services* (Other services).

4. Results

There are three types of SAM multipliers including output multiplier, GDP multiplier, and income multiplier. In this study, only output multiplier is reported. It combines all direct and indirect effects in gross output of all productions in economy. When production in one sector increases due to an increased demand, economy is encouraged though the production in other sector. The higher multiplier refers to the stronger economic linkages (Domestic multiplier effects) to all sectors. The size of multiplier relies on the structural characteristics of economy which the core is the consumer's behavior in consuming either domestic or imported products. Output multiplier in all regions is shown in table 3.

TABLE 3. Output multipliers in all regions

Region	Highest Multiplier Sector	Lowest Multiplier Sector
OCN	Processed food (4.63)	Extraction (3.16)
EA	Light manufacturing (5.11)	Others (3.36)
SEA	Processed food (4.08)	Extraction (2.52)
SA	Processed food (4.45)	Others (2.61)
NA	Meat (4.93)	Extraction (2.93)
LA	Meat (4.42)	Others (2.85)
EU25	Meat (3.90)	Grain (2.88)
MENA	Heavy manufacturing (3.94)	Extraction (2.70)
SSA	Light manufacturing (4.09)	Grain (2.64)
ROW	Meat (4.08)	Extraction (2.51)

Source: Author's own calculation

Notes: OCN is Oceania, EA is Eastern Asia, SEA is Southeastern Asia, SA is Southern Asia, NA is North America, LA is Latin America, EU25 is European Union (25 countries), MENA is Middle East and Northern Africa, SSA is Sub-Saharan Africa, and ROW is Rest of the World.

According to the table 3, the higher multiplier indicates to the higher return to economy. The highest output multiplier in Oceania is processed foods sector (4.63) which means that raising export demand in processed foods sector by 1 million dollar leads to 4.63 million dollar increase in national output, vice versa. However, its lowest output multiplier is extraction sector (3.16). For Eastern Asia, the highest multiplier is light manufacturing sector (5.11) while the lowest output multiplier sector is other sector (3.36). For Southeastern Asia, the highest output multiplier is processed food sector (4.08) while the lowest output multiplier is extraction sector (2.52). Moreover, the highest output multiplier of Southern Asia is processed food sector (4.45) while the lowest output multiplier is other sector (2.61). For North America, the highest output multiplier is meat sector (4.93) while the lowest output multiplier is extraction sector (2.93). For Latin America, the highest output multiplier is meat sector (4.42) while the lowest output multiplier is other sector (2.85).

Additionally, Europe's highest output multiplier is meat sector (3.90) while the lowest output multiplier is grain sector (2.88). For Middle East and Northern Africa, highest output multiplier is heavy manufacturing sector (3.94) while the lowest output multiplier is

extraction sector (2.70). For sub-Saharan Africa, the highest output multiplier is light manufacturing sector (4.09) while the lowest output multiplier is grain sector (2.64). Lastly, the highest output multiplier of rest of the world is meat sector (4.08) while the lowest output multiplier is extraction sector (2.51).

For impact on the depth of poverty, SAM multiplier is used to simulate the effects on poverty through the equation (8). An increase in export is assumed to be identical to all sectors which is equal to 1. An initial income of all individuals is 100 in order to figure out the sensible changes on TPG. The result is shown in table 4.

TABLE 4. A change in regional TPG

	Grain	Meat	Extr	Pro.fd	Text	L.mfg	H.mfg	U.con	Tran.c	Other	
Initial TPG	50	50	50	50	50	50	50	50	50	50	
New TPG	OCN	46.37	45.71	46.84	45.37	45.76	46.09	45.83	45.62	46.23	46.72
	EA	46.43	45.46	46.22	45.46	44.93	44.89	45.36	45.54	46.35	46.64
	SEA	46.89	45.95	47.48	45.92	46.48	46.54	46.68	46.32	46.71	46.98
	SA	46.61	46.75	47.22	45.55	45.70	46.06	46.21	46.29	46.89	47.39
	NA	46.60	45.07	47.07	45.81	45.97	46.15	46.21	46.46	46.74	47.00
	LA	46.67	45.58	46.94	45.61	46.26	46.12	46.02	46.64	46.75	47.15
	EU25	47.12	46.10	47.02	46.17	46.55	46.45	46.65	46.55	46.45	47.00
	MENA	47.07	46.46	47.30	46.43	46.61	46.60	46.06	46.44	47.02	47.05
	SSA	47.36	46.24	47.31	46.01	46.06	45.91	46.14	46.33	46.79	46.93
	ROW	47.04	45.92	47.49	46.07	46.67	46.63	46.38	46.51	46.86	47.17

Source: Author's own calculation

Notes: 1) OCN is Oceania, EA is Eastern Asia, SEA is Southeastern Asia, SA is Southern Asia, NA is Northern America, LA is Latin America, EU25 is European Union (25 countries), MENA is Middle East and Northern Africa, SSA is Sub-Saharan Africa, and ROW is Rest of the World. 2) Grain is grains, Meat is meats, Extr is extraction, Pro.fd is processed food, Text is textile, L.mfg is light manufacturing, H.mfg is heavy manufacturing, Uti is utilities, Trans is transportation, and Other is other services.

According to the table 4, an initial income level, poverty line, and an initial TPG index are assumed to be the same for all regions in order to compare the impacts on TPG. In this case, TPG is equal to \$50 (Calculate from a difference between poverty line (\$150) and an initial income (\$100)) which means that there should be at least \$50 to add to the pocket to the poor aimed at raising their status. Thus, the lowest amount of TPG after implementing shocks is the most desirable outcome. The results reveal that an increase in the production of meat sector is the best strategy to reduce the depth of poverty in Northern America, Latin America, EU25, and Rest of the World because their TPG significantly falls compared other sectors. Thus, these regions should increasingly encourage production in this sector.

Also, an increase in the production of processed foods can be most efficient tool to reduce poverty in Oceania, Southern Asia, and Southeastern Asia. Additionally, the products from light manufacturing should be strongly promoted in Eastern Asia and sub-Saharan Africa in helping raising citizen's income. Lastly, Middle East and Northern Africa should export more in heavy manufacturing product to lift the poor out of the indigence. For this recommendation, each government is attempting to eliminate poverty using the information on economic structure.

Nevertheless, an improper economic policy is able to be less functional. It may help increase national output overall but not alleviate poverty. Due to the small linkage to economy, an expansion in some sectors does not impressively improve overall citizen's living standard. For the goal of solving poverty, government in Oceania, Southeastern Asia, Northern America, Middle East and Northern Africa, and Rest of the world should not much support extraction sector through populism policy or market intervention. Due partly to an artificial incentive among people in this sector, an increase in the production of this sector does not yield much positive effect on poverty reduction. Also, other sector should not be encouraged too much in Eastern Asia, Southern Asia, and Latin America and Caribbean. Finally, the product from grain sector should not be highly supported for exporting in the EU and sub-Saharan Africa. As a result, each region has its own proper strategy to reduce poverty. What should be subsidized depends on the magnitude of SAM multiplier representing the linkages throughout the economy.

5. Conclusions

One of the undesirable socio-economic problems in every country is poverty. The symptom of it is expressed to person individually but the medicine should be provided by its own government, agencies, as well as international organizations. Vicious cycle is not naturally destroyed but it requires intervention to tackle. As an elimination of poverty is the first and foremost goal of MDGs, this scheme is responsible for all United Nations' member to solve it. It is realized that economic growth is the solution of poverty. However, world population are living under the umbrella of globally economic interdependence which an international trade is inevitable in either underdeveloped or developing countries. Export as the component of national prosperity is proved to play a vital role in the path of economic development in many countries, especially China, Singapore, Taiwan, and South Korea. Thus, the main objectives of this study are to find the proper solution of poverty through this global trend in each region and to propose the specific policies aimed at reducing poverty.

Apart from the resolute belief of Classical economics towards price mechanism and invisible hand, an appropriate government intervention is, in this study, proposed to help breaking the vicious cycle. Even though intervention is a kind of market failure itself but sometimes it, in the proper direction, speed, and magnitude, is able to bring economy back to equilibrium. As

suggested to government subsidy in the production of specific sector in different regions targeting at reducing poverty, the scheme should be deliberately concerned about the side-effects because the subsidy, in general, distorts the price mechanism both in domestic and international markets and leads to overproduction. Also, subsidy in specific sectors should be related to its own resource endowment which is able to let country enjoy the advantages of specialization. For other important things, due to the different level of living standard and severity of poverty among people living and working in various sectors, production subsidy should be implemented thoroughly but unequally. Priority should be set to the highest promising sector, followed by other sectors, and the administrative management should be systematically set to support this package.

For future study, it is mainly about SAM. In order to support poverty analysis, SAM should be disaggregated to many level of household, factors of production, and commodities in order that it is able to figure out the change in an expected income and its distribution after implementing shocks. Also, the analysis should be extended to single country so as to suggest more specific policy. Moreover, other poverty measurements may be assessed, for example, Foster-Greer-Thorbecke indices which reveals the better picture of poverty. Lastly, as the limit of this study focusing only poverty, the scope should be expanded to other targets of economic development, for example, income inequality and human capital.

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