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**Reducing Stunting Through
Trade Reforms:
Analysis of Food Prices and
Stunting Prevalence
in Indonesia**

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GLOSSARY

Malnutrition :	A condition resulting from taking in nutrient components below or above the amount needed by the body, causing health problems.
Undernutrition :	Insufficient intake of nutrients to meet an individual's needs to maintain good health status.
Stunting :	A child younger than five years old whose <u>height-for-age ratio</u> is more than two standard deviations below the WHO Child Growth Standards median, generally as a result of long-term, insufficient nutrient intake and frequent infections.
Wasting :	A child younger than five years old whose <u>weight-for-height ratio</u> is less more than two standard deviations below WHO Child Growth Standards median, generally as a result of long-term insufficient nutrient intake and frequent infections.
Underweight :	A child younger than five years old whose <u>weight-for-age ratio</u> is more than two standard deviations below WHO Child Growth Standards median, generally as a result of long-term insufficient nutrient intake and frequent infections.

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EXECUTIVE SUMMARY

Stunting in Indonesia affected 30.8% of children under five years old – almost eight million children in 2018. This makes it a highly troubling policy issue. The government has designed several central and local government interventions to reduce stunting. For example, some programs aim to create awareness of best practices for feeding children and improving sanitation facilities. While these interventions increase the availability and improve the use of food, they do not adequately address the inaccessibility of food in Indonesia, which is the result of high consumer prices for basic food commodities.

While Indonesia managed to improve its ranking in the Global Food Security Index, moving from 76th place in 2015 to 65th in 2018, Indonesia still scores below the global average on several indicators, including protein quality, micronutrient availability, sufficiency of food supply, and food consumption as a share of household income.

This paper finds a significant correlation between food prices and the incidence of stunting. In order to secure sustainable access to nutritious foods, trade policies that cause higher food prices need to be reviewed because they undermine the effectiveness of the government's efforts to reduce stunting.

First, MOT Regulation 1/2018 Article 16(1) needs to be revised. This regulation grants BULOG a monopoly on rice imports. Allowing other firms to compete with BULOG will make the rice market more efficient and decrease rice prices. Second, MOT should remove the ban on imported, cheaper beef to traditional markets, which is stipulated in MOT 59/2016 Article 19. And then there is also Article 9 limits beef imports to state-owned enterprises, increasing bureaucratic procedures and further reducing access to beef, and so should also be reviewed. Safeguarding food safety should be the responsibility of the technical supervision by the MOA, which is not limited to state-owned firms. Third, MOT Regulation 21/2018 Articles 3(1) and 3(2) which regulate maize imports should be removed as they are causing higher maize prices and consequently higher production costs for the poultry industry, which in turn leads to higher prices for chicken meat and eggs.

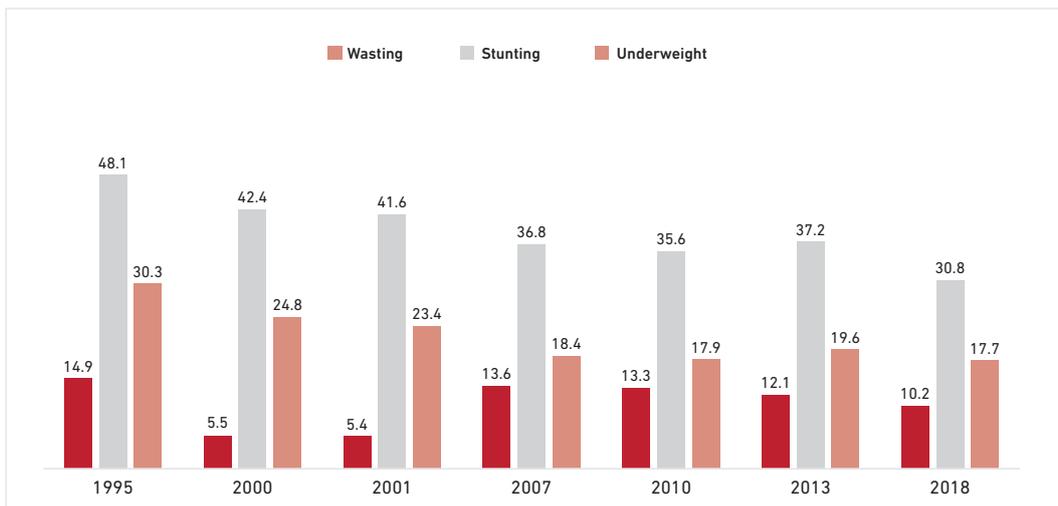
STUNTING IN INDONESIA

The World Health Organization of the United Nations (UN-WHO) estimates that 224 million toddlers are undernourished globally. In response, member states are encouraged to combat undernutrition through effective nutrition interventions and improving universal access to healthy diets in sustainable and resilient food systems (WHO, 2018).

The Ministry of Health reports that Indonesia has the world's fourth highest incidence of stunting (2018).

Indonesia, a member of UN-WHO, faces serious problems of undernutrition. According to the latest National Basic Health Survey (Riset Kesehatan Dasar) conducted by the Ministry of Health in 2018, almost nine million Indonesians under five years old suffer from undernutrition, exhibiting stunting, wasting, and/or being underweight (30.8%, 10.2%, and 17.7% of children respectively (Kementrian Kesehatan RI, 2018)). UN-WHO classified Indonesia's incidence of stunting and wasting as "severe" and underweight as "moderately severe". The Ministry of Health reports that Indonesia has the world's fourth highest incidence of stunting (2018). The Indonesian government has acknowledged this situation as a "crisis" (World Bank 2018). While undernutrition fell between 1995 and 2018 (UN-WHO), the prevalence of stunting remains significantly higher than the other two types of undernutrition (Figure 1).

Figure 1.
Prevalence of Undernourished Toddlers in Indonesia, 1995-2018



Source: UN-WHO Global Database on Child Growth and Malnutrition, Statistics Indonesia (2014), RISKESDAS (2018)

Notes: Measured for Indonesian children younger than five years old. The database is collected by UN-WHO from various surveys conducted by Statistics Indonesia and the Ministry of Health

There are three main factors that contribute to stunted growth and development: (1) poor maternal health and nutrition, specifically maternal nutritional status before, during, and after pregnancy; (2) insufficient feeding practices for infants and young children, including limits to the quantity, quality, and variety of children's complementary feeding; and (3) infection (WHO, 2014). Stunting has not only negative consequences for a child's development, but it also threatens the economic productivity of a nation and it is reducing GNP every year by

11% in Asia and Africa (Horton and Steckel, 2013). For individuals, it causes 20% loss of adult income and increases vulnerability to poverty by 33% (Hoddinott et al., 2013).

Existing Indonesian government programs aim to eradicate stunting through promotive and preventive actions¹. In order to increase nutrition intake, in December 2011 the government joined the UN-initiated “Scaling Up Nutrition” (SUN) movement. SUN is a global movement that seeks to increase the access to basic and nutritious foods for everyone. The Specific Nutrition Intervention (Intervensi Gizi Spesifik) targets children during their first 1,000 days (1000 Hari Pertama Kehidupan/1000 HPK) as well as their mothers.

The Indonesian government has designed stunting intervention frameworks that have translated into policies conducted by line ministries and local governments. Presidential Regulation 42/2013 on the National Movement to Accelerate Nutrition Improvement is one of the earliest of these policies and aims to optimize existing nutrition programs, following the published guidebook by the Ministry of National Development Planning.

Another relevant policy was also issued by the Ministry of Health, which is issued MOH 15/2013, Guidance on Breastfeeding Facilities (Panduan Fasilitas Menyusui). This regulation which requires offices to provide breastfeeding facilities for working mothers with children under six months old. MOH 3/2014 on Community-Led Total Sanitation (Sanitasi Total Berbasis Masyarakat/ STBM) that focuses on improving public hygienic behavior and MOH 23/2014 on Nutrition Improvement Efforts (Upaya Perbaikan Gizi) that focuses on improving access to education and information on nutrition in order to encourage more nutritious consumption patterns and healthier lifestyles. All these interventions, along with other programs such as the Additional Food Distribution (Pemberian Makanan Tambahan / PMT), aim to reduce stunting (Kementerian Kesehatan RI, 2018).

Moreover, there is also Government Regulation 17/2015 on Food Security and Nutrition that regulates establishment of regional and local food reserves in order to ensure the availability of food supplies. This regulation also addresses food diversification, education on balanced nutrition diets, food-crisis mitigation and prevention, and food distribution and trade. All the activities related to this regulation are handled and implemented by local governments at provincial and regency/city levels.

Various policies have been implemented in regions across Indonesia, but with few evaluations report it is hard to analyze how or whether these policies have successfully reduced stunting. Although Presidential Regulation 42/2013 on the National Movement to Accelerate Nutrition Improvement has resulted in the creation of a national task force² that monitors and evaluates stunting reduction efforts by local governments on a semi-annual basis, there are no official figures available about how many offices have implemented MOH 15/2013, Guidance on Breastfeeding Facilities. Studies in Central Java indicate that most government and private sector offices do not yet provide sufficient facilities for breastfeeding mothers (Aisyaroh and

Existing Indonesian government programs aim to eradicate stunting through promotive and preventive actions

¹ Promotive policies help improve the status of individuals' health. MOH 3/2014 and MOH 23/2014 are examples of this type of policy. Preventive policies help prevent individuals from suffering any kind of health issues. MOH 15/2013 and Presidential Regulation 42/2013 can be considered as examples.

² This task force is led by the Coordinating Ministry of Social Welfare, with the Ministry of Health, Ministry of National Development and Planning, Ministry of Social Affairs, Ministry of Home Affairs, Ministry of Agriculture, Ministry of Maritime and Fisheries, Ministry of Industry, Ministry of Trade, Ministry of Religious Affairs, Ministry of Communication and Informatics, Ministry of Women Empowerment and Children Protection, and the Cabinet Secretary as members.

Sutrisminah, 2017, Wijaya and Soesanto, 2017).

MOH 03/2014 on Community-Led Total Sanitation has reportedly accomplished 74% of its objectives, but 16 out of 34 provinces still perform below the average (Kementerian Kesehatan RI, 2018).

Further achievements by local governments executing the programs appear to be hampered by poor program planning and poor assistance at the village level (Davik, 2016). For example, MOH 23/2014 on Nutrition Improvement Efforts, met with challenges in building public awareness caused by a lack of local resources on nutrition (Septianingrum and Tauran, 2016). As of 2016, this program needed an additional 5,990 local nutritionists, as well as to dispatch to more remote areas 2,169 nutritionists who were concentrated in parts of the country (Ministry of Health, 2017).

Besides the abovementioned government programs, an additional and significant factor influencing the nutrition and development of Indonesian children is food prices in Indonesia. The average inflation rate for food commodities remained relatively low at 3.2% annually in 2017 (BPS, 2018) but the average Indonesian still spends the staggeringly high amount of 50% of their monthly income on food (BPS, 2018). Poor Indonesians can pay up to 75% of their income on food, making them highly vulnerable to increases in food price. In order to identify the impact of food prices on nutrition and stunted growth, this paper analyze a food bundles, consisting of rice, beef, egg, chicken meat, and fish.

Rice is a staple food for almost all Indonesians, and malnutrition occurs in regions where rice is the staple food (Potrykus, 2003), making its accessibility an important issue. Rice offers many health benefits to consumers, providing vitamin B and fiber, and is especially useful for its rich carbohydrate content (USDA, 2016), but a rice-based diet needs complementary nutrition from other food types (Dipti et al., 2012). Suitable food items for rice are protein-based food like beef, fish, and chicken meat that provide other nutrients and complement the lack of iron and zinc in rice. While low consumption of beef, fish, and chicken has been linked to stunting in children, the consumption of meat and fish significantly reduces stunting for children aged 12–23 months (Headey, 2017). Another fact is that the nutritional status of children aged 6–23 months also improves with fish consumption and making them less likely to be stunted (Marinda et al., 2018). Another option for protein-based is chicken meat, which is a good source of protein and is healthier than other meats (Dowarah, 2017). Furthermore, eggs also play an important role as a source of nutrients for growth and development. A household's daily consumption of eggs improves children's nutrition (Iannotti et al., 2017).

Food Prices and Stunting Prevalence

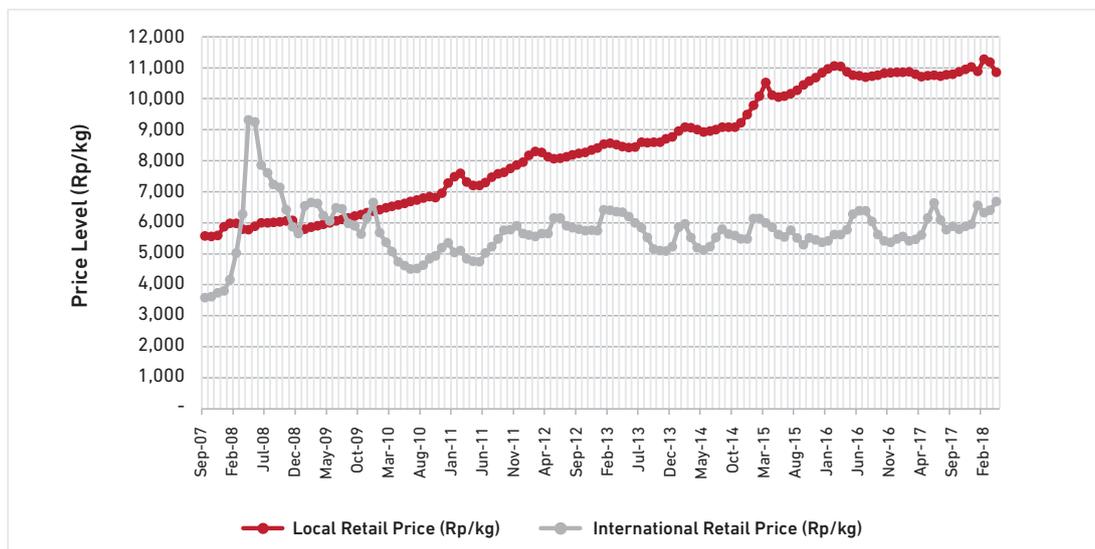
Stunting in Indonesia hits the lowest quintile of poor Indonesians hardest, a group of more than 50 million people (TNP2K, 2017). With low purchasing power, the poor tend to focus on carbohydrates, spend less on high-protein food, and eventually consume insufficient amounts of food (DiSantis et al., 2013).

International experience shows that lower food prices positively affect low-income households, because they spend a greater share of their budgets on food consumption (McGranahan, 2008). Low inflation rates for food products also help improve people's nutritional status (Arndt et al., 2016). By contrast, higher food prices force people to shift their consumption to cheaper foods which tend to be less nutritious and lead to an increased probability of stunting, micronutrient deficiencies, and other poor health outcomes (Meerman and Aphane, 2012).

In Indonesia, existing studies focus less on the role of food prices in stunting prevalence, more on the relationship between food choices and malnutrition (Mahmudiono et al., 2017) and the importance of the number of meals eaten daily and the incidence of stunting (Ramli et al., 2009). It is therefore important to study the impact of food prices on stunting prevalence in Indonesia.

According to the Ministry of Agriculture, Indonesians consumed 114.16 kg of rice in 2017, one of the highest per capita rates of rice consumption in the world (MOA, 2018). Extraordinary levels of rice consumption expose Indonesians to the adverse effects of domestic rice prices that are far higher than rice prices in the world market (Figure 2).

Figure 2.
Rice Price Comparison, 2007-2018

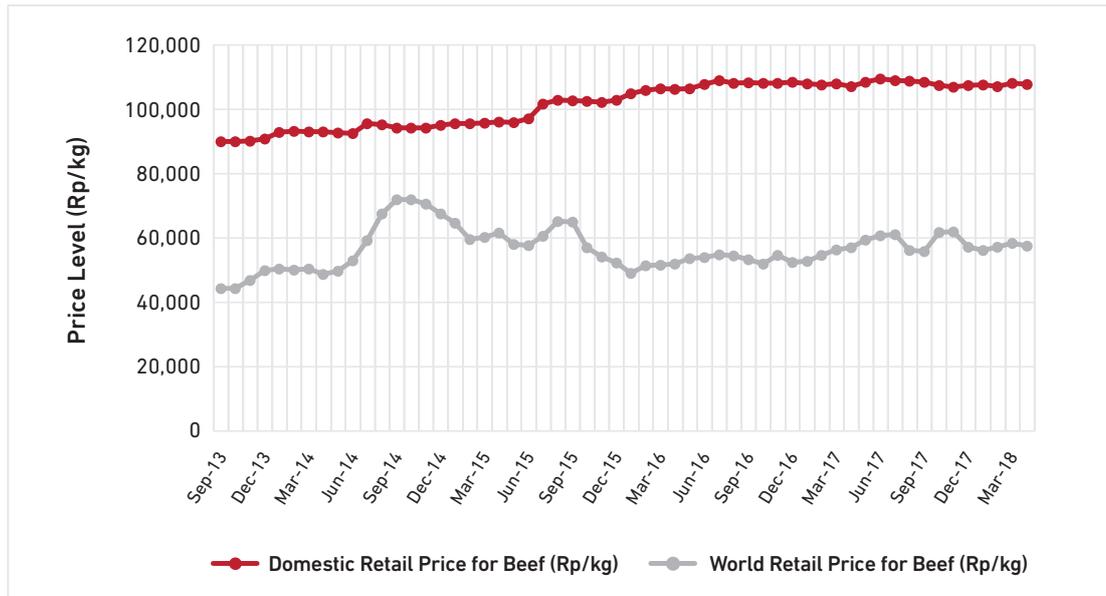


Source: Statistics Indonesia and World Bank's Pink Sheet Commodity Prices, 2018

Notes: Exchange rate for USD to IDR is based on IMF calculations. Local price from January 2009 – August 2010 is interpolated from different figures found in several sources. International rice price observed is based on Thailand's 5% Broken Rice, FOB in Bangkok, and includes Tariffs applied in Indonesia.

In contrast, Indonesians consumed only 2.399 kg of beef per capita in 2017 (MOA, 2018), far less than in neighboring countries, such as Philippines, Malaysia and Vietnam (OECD, 2017). Beef prices in Indonesia are twice as high as in world market's, driving low domestic consumption levels (Respatiadi and Nabila, 2017).

Figure 3.
Beef Price Comparison, 2013-2018

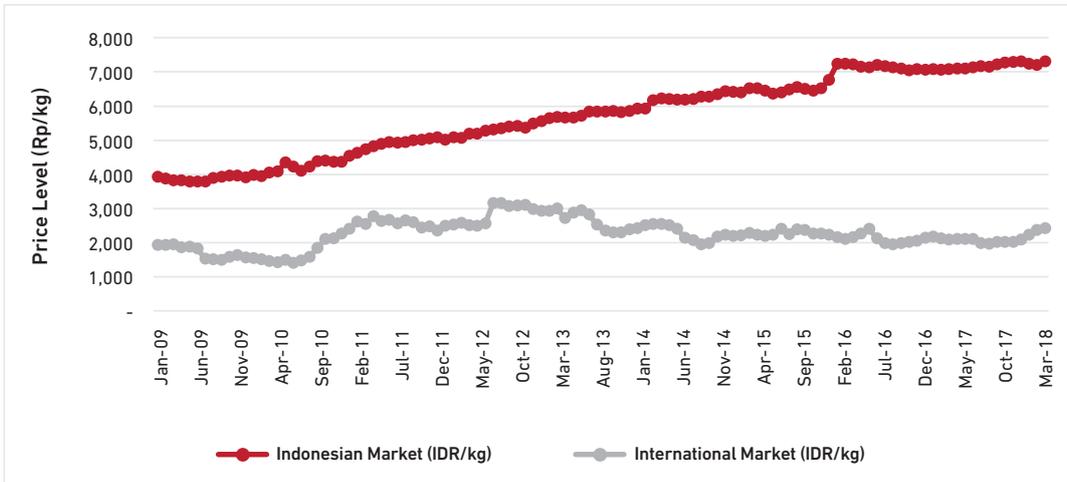


Source: Statistics Indonesia and World Bank, 2018

Notes: Exchange rate USD to IDR is based on IMF calculations. International beef price is based on Australia/NZ beef

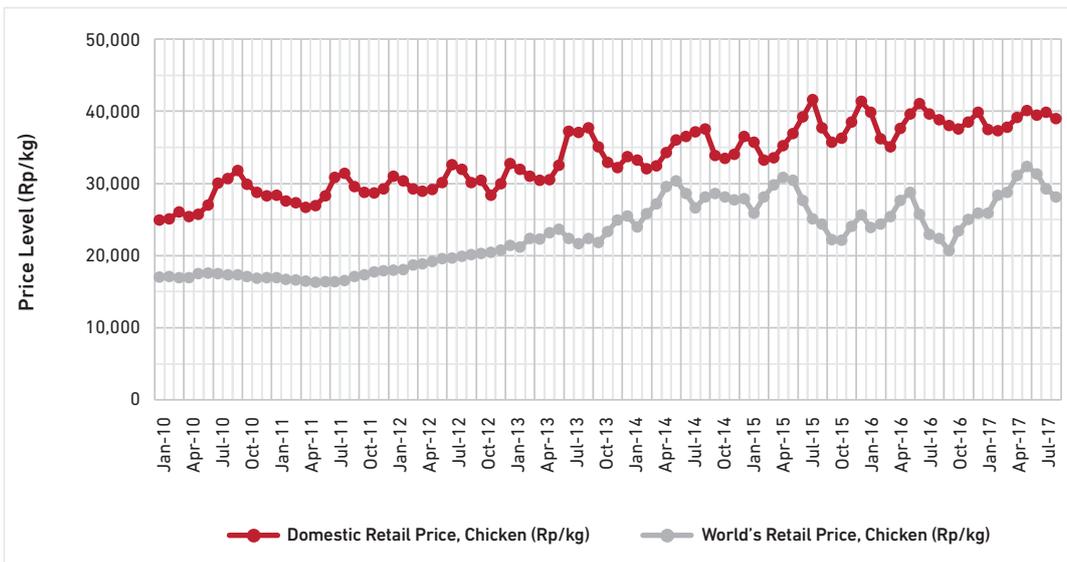
Indonesians consumed 11.5 kg of chicken and 6.63 kg of eggs (around 133 eggs) annually per capita (JPP, 2018), making both important parts of the local diet. Domestic retail prices are, unfortunately, high. This is because maize in Indonesia costs about three times as much as on the world market and maize constitutes 50% of the expenses for chicken feed (USDA, 2018).

Figure 4.
Maize Price Comparison, 2009-2018



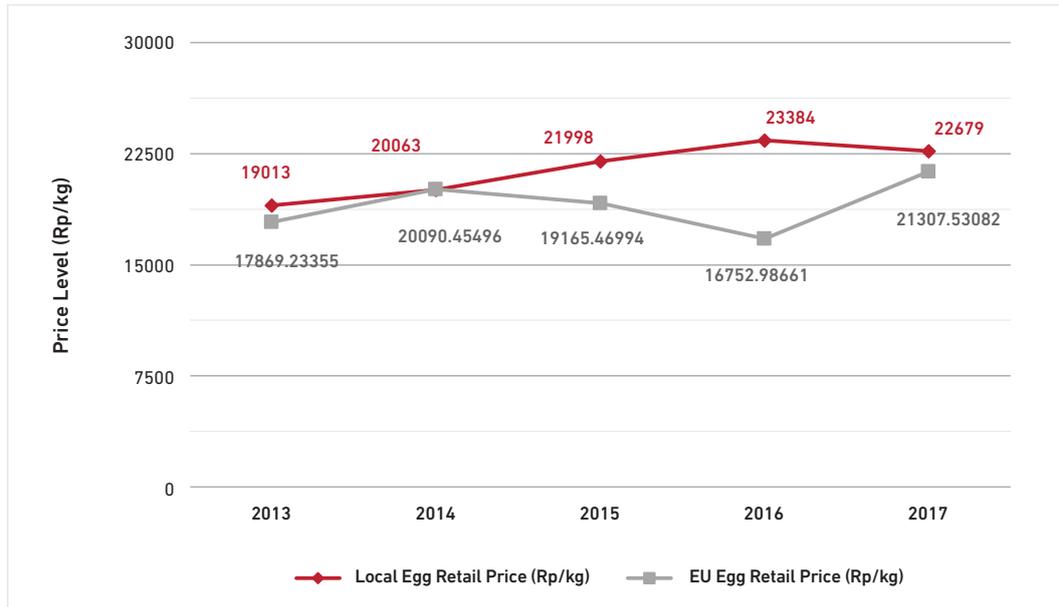
Source: World Bank (2018) and Ministry of Trade (2018), compiled by Freddy et al. (2018)
Notes: Exchange rate USD to IDR is based on x-rates.com. International maize price is based on Maize US No.2 Yellow, F.O.B US Gulf Port

Figure 5.
Chicken Meat Retail Price Comparison, 2010-2017



Source: World Bank and Statistics Indonesia, 2017
Notes: Exchange rate USD to IDR is based on x-rates.com. International chicken meat price is based on US chicken meat.

Figure 6.
Egg Retail Price Comparison, 2013-2017



Source: European Commission (Directorate-General for Agriculture and Rural Development), 2017 Egg Outlook, Ministry of Agriculture, 2017

Notes: Annual Average Currency Exchange, 1 EUR = IDR 13857.5 (2013), IDR 15748.92 (2014), IDR 14870.39 (2015), IDR 14720.83 (2016), IDR 15118.01 (2017). Source: ECB, 2017. The EU was used because it represents the dominant share of world egg commodity exports.

Finally, fish constitutes an important part of the average Indonesian diet with a per capita consumption of 47.12 kg in 2017 (MOMF, 2018).

Table 1 examines the relationship between the prices in the observed food bundle described above (rice, beef, egg, chicken meat, and fish) and the incidence of stunting Indonesia. Because there is no directly observable relationship between prices and stunting, consumption levels are used as intermediaries for prices under the assumption that food prices affect food consumption levels and those, in turn, affect the stunting incidence. Our analysis controls for gender, household income, parents' education and geographical factors³.

³ Our regression model is explained in more detail in Annex III

Table 1
Relationship Estimation between Food Prices and Stunting Incidence

Sample= 8212	Model				
	Rice	Beef	Chicken	Fish	Egg
Variables	Coefficient				
	Correlation (Confidence Level)				
<i>Second-Stage (Stunting Model: Change in stunting prevalence per monthly consumption change)</i>					
Consumption	-0.0363	-1.525	-0.387	-0.0000318	-0.460
	Negative (95%)	Negative (95%)	Negative (99%)	Negative (95%)	Negative (95%)
<i>First-Stage (Consumption Model: Change in consumption per food price change)</i>					
Price	-0.000673	-0.00000115	-0.0000226	-0.538	-0.0000176
	Negative (99%)	Negative (99%)	Negative (99%)	Negative (99%)	Negative (99%)

Source: Authors' calculations

Notes: Detailed tables and explanations for interpretation are available in Annex III. Confidence level is defined as the percentage of all possible samples that can be expected to include the true population parameter. Multiplying coefficients on both stages for every food bundle will attain the final calculation of the impact of price changes in each food type on stunting probability, holding other variables constant.

Our measurement found that higher food prices have a significant negative correlation between food prices and consumption levels of all food types. This means that when food prices increase, people tend to decrease their food consumption. The coefficients from each food type show that the change in price will affect rice consumption levels most. An increase by IDR 1,000 is expected to decrease household rice consumption by as much as 0.67 kg per capita per month.

“ Our measurement found that higher food prices have a significant negative correlation between food prices and consumption levels of all food types. This means that when food prices increase, people tend to decrease their food consumption. ”

Rice prices between April 2017 and April 2018 were on average IDR 5,109.18 higher than world market prices. If Indonesians were to pay world market prices, they could be expected to consume up to 3.43 kg more rice each month during the same period. The effects of prices on consumption levels were significant for all food bundles but, since rice is consumed in extraordinary quantities, the effect of prices on the consumption of the other items in the bundle is expected to have less of an effect.

Moreover, when households consume less of these food, the probability of having stunted children in the household is increases. In particular, the probability of having stunted children is higher when individuals reduce beef consumption. A decrease by 1 kg of monthly annual beef consumption is expected to increase the probability of having stunted children by 1.52%.

If Indonesians were to improve their consumption of beef as much as people in the Philippines (3.25 kg) or in Malaysia (4.8 kg), the probability of having stunted children would fall by 0.41 % and 0.6 % respectively⁴.

Our findings confirm that a decline in food prices would be associated with a decrease in the probability of stunting through a change of consumption patterns, holding other factors constant. Ensuring a policy framework that supports lower food prices is, therefore, required to achieve a lower stunting prevalence.

“Rice prices between April 2017 and April 2018 were on average IDR 5,109.18 higher than world market prices. If Indonesians were to pay world market prices, they could be expected to consume up to 3.43 kg more rice each month during the same period”

⁴ On this example, beef consumption per capita per year were divided by 12 (0.27 for the Philippines and 0.4 for Malaysia) and multiplied by coefficient for beef model (-1.52), resulted in change in stunting probability incidence as much as 0.41% and 0.6% respectively.

Analysis on the Impact of Trade Restrictions on Food Prices in Indonesia

Protectionist trade policies in Indonesia is one of the cause of high food prices and thus lead to a higher prevalence of stunting.

The costs of trade restrictions are paid by Indonesian consumers. The Nominal Rate of Protection (NRP) describes the proportional difference between the domestic and international prices of goods arising from trade policies. Marks (2017) has calculated the nominal rates of protection for internationally traded goods in Indonesia and the data that is relevant to the food bundles in this paper are presented in Table 2.

Table 2
Nominal Rate of Protection (NRP) for Observed Food Bundles

Sector	Commodity	Description	NRP of Overall Trade Policies	NRP of Overall Trade Policies excluded Quantitative Restrictions
(1)	(2)	(3)	(4)	(5)
1	Rice	Field Rice	67.2	8.4
57		Milled, Polished Rice	67.8	8.8
25	Beef	Livestock and Their Products	13.4	0.6
49		Meat and Viscera	37.4	4.8
27	Chicken and Eggs	Poultry and Its Products	6.5	5.0

Source: Marks, 2017

Table 2 illustrates that trade policies imposed by the government have a significant impact on the prices of these food bundles, especially rice, beef, and poultry products. Columns 4 and 5 show the percentage by which trade policies raise the producer price inside the country relative to the border price (Marks, 2017). While column 4 shows the effect of all trade-related policies, column 5 excludes all quantitative restrictions, such as quota, licensing, and bans. That makes it clear that quantitative restrictions have significantly affected rice and beef prices, and to a lesser extent also poultry products. The large cost of these quantitative import restrictions is borne by the Indonesian consumers.

As has been the case in other countries (Lu et al., 2016), promotive and preventive policies have reduced stunting in Indonesia. But these efforts have been undermined by import tariffs and quantitative import barriers that cause higher food prices. The World Bank (2011) has suggested that Indonesia reduce import tariffs on staple foods in order to curb further food price rises as non-tariff measures such as quota, licensing, and seasonal bans also contribute to rising food

prices (Sayaka and Erwidodo, 2013; Cadot and Gourdon, 2012). According to Global Trade Alert, as of November 2018, harmful trade regulations in Indonesia make up of 75.2% of all regulations. This number is higher than in neighboring countries such as Malaysia, where the number is 28%.

The following non-tariff import restrictions are the main cause of rising food prices for rice, beef, chicken meat, and eggs. Article 16(1) of MOT 1/2018 on Rice Exports and Imports grants exclusive import rights for rice to the state-owned logistic agency, BULOG. The monopoly status granted to BULOG is intended to protect domestic producers from foreign competition and was in 2007 by the Coordinating Ministry of Economy (Letter S-96/M.Ekon/08/2007). This regulation has secured BULOG's role as the sole importer of rice for more than a decade. Furthermore, article 16(3) of MOT 1/2018 requires a scheduled coordination meeting between BULOG and related ministries to analyze the rice market and to create BULOG import plan.

Article 9 of MOT 59/2016⁵ regulates beef imports from countries that are not entirely free from animal diseases. The regulation allows only state-owned enterprises to import from these countries, and only after obtaining an official permit from the Minister of State-Owned Enterprises, who is required to hold a coordination meeting with several ministries and to obtain a recommendation from the Ministry of Agriculture. The intent of this regulation is to avoid the exposure of animal diseases into the country, but Article 19 also bans all imported beef from traditional markets, regardless of whether the source country is free from disease. Imported beef is only allowed for sale to industries, supermarkets, hotels, restaurants, and catering services.

Another issue is restrictions of maize imports which have indirect impact on the food prices discussed here because it is an essential ingredient of animal feed in the poultry industry, which produces chicken meat and eggs. Maize-based feed makes up 50–60% of the poultry diet (Utomo, 2012). MOT 21/2018 on maize imports, specifically Articles 3(1) and (2), gives BULOG a monopoly on importing maize for animal feed, which is based on the instruction of the Minister of State-Owned Enterprises and recommendations by the Ministry of Trade. With this regulation, earlier also stipulated in MOT 20/2016 Articles 3, 4(1), and 5, the government intended to enhance the income and welfare of local maize farmers while improving competitiveness and protecting consumer interests.

⁵ This regulation replaced MOT 46/2013 Article 17 to protect the domestic beef industry.

POLICY RECOMMENDATIONS

Consumer interests are satisfied through food security, which rests on four pillars: (i) availability, (ii) access, (iii) utilization, and (iv) stability. Meanwhile, nutrition is considered integral to the concept of food security (UN/FAO, 2009).

Food availability depends on a sufficient supply of food obtained through production, distribution, and exchange. Food access is largely achieved when households have sufficient resources to obtain food at the available prices. Food utilization refers to the knowledge and habits of households when making decisions about nutritious meals in a healthy physical environment with adequate sanitary facilities and storage processes. It also considers the ability of the human body to convert food into energy and other vital resources. Lastly, food stability refers to when food availability, access and utilization have been secured sustainably over time (Ecker and Bresinger, 2012). To reduce malnutrition rates and stunting in Indonesia, all four pillars of food security need to be strengthened, as they will help society to attain its food needs.

Existing government interventions are mostly concerned with ensuring sufficient supplies domestically, but some promote knowledge and habits regarding nutritious meals. Combined, these programs help to ensure food availability and utilization, the first and third pillars of food security. Problems on food access continue to exist as food prices have soared well over world market prices in Indonesia.

An OECD-study calculated that price premiums 'taxed' Indonesian consumers approximately US\$98 billion between 2013 and 2015 (OECD, 2015). As a result, while Indonesia managed to improve its ranking in the Global Food Security Index from 76th in 2015 to 65th in 2018, Indonesia still scores below the global average – on indicators such as protein quality, micronutrient availability, sufficiency of food supply, and food consumption as a share of household income (Global Food Security Index, 2016-2018).

Food prices have a significant effect on nutrition and the reduction of stunting, so affordable prices for all consumers, especially those with low incomes, remain important. Import restrictions and insulation from international markets largely protect Indonesia from transitory food insecurity caused by external influences, but these policies have raised domestic food prices and caused chronic food insecurity in Indonesia (OECD, 2015).

A. Restrictions on Rice Imports

MOT 1/2018 on Rice Exports and Imports has not lowered rice prices. Instead, the disparity between local prices and the world prices has been growing since the World Food Crisis in 2008/09.

BULOG has a monopolistic power on rice imports and the government intervenes through a coordinating meeting to plan imports. These meetings prevent BULOG from making import decisions in accordance with the market situation, occasionally resulting in delays and inflict financial losses for BULOG and Indonesian taxpayers (Respatiadi and Nabila, 2017). The government's attempt to protect local farmers through MOT 1/2018 has resulted in higher rice prices, affecting 90% of Indonesian households. Moreover, an estimated 60 % to 65 % of subsistence farmers are net consumers of food and so may suffer from high food prices without benefitting from higher producer prices (SMERU, 2015).

As rice prices have become more distorted overtime, policies that grant BULOG its monopoly rights and intervene in import decisions have not fulfilled their objectives but have caused higher rice prices that burden consumers. Import decisions based on inter-ministerial coordination meetings while banning private firms from conducting rice imports will continue to negatively affect rice markets.

The government should move to address the lack of competition in rice imports. Actors in the private sector are more likely to swiftly respond to price opportunities on the international market. By allowing private firms to be fully involved in regular rice imports, BULOG can focus on addressing emergency situations such as when rice supplies are critically low due to natural disasters or other external shocks. If the government ensures open competition between different players, it will likely lower rice prices and eventually help increase the consumption of rice. Private firms are already permitted to import rice for industrial purposes. The government should follow this example by extending import licenses to private players for rice meant for human consumption.

B. Restrictions on Beef

MOT 59/2016 Article 19 ban the access of imported beef from traditional markets. Because 70 % of all markets in Indonesia are traditional markets (Muftiadi et al., 2016), this affects beef consumption nationwide. With regulations like MOT 59/2016, the supply of beef in major markets is restricted and as a result, domestic beef prices are 44.17 % higher than those on international markets.

Beef imports are mostly restricted for food safety reasons. Since many imports come from countries that are not entirely free from animal diseases, the government attempts to control the influx of beef by granting import licenses (Kabarbisnis.com, 2016). According to MOT 59/2016 Article 9, only state-owned firms qualify for beef import licenses, equipped with a recommendation letter from the Ministry of Agriculture and the written permission from the Ministry of State-Owned Enterprises, which is given after the approval of an inter-ministerial coordination meeting considering food safety issues.

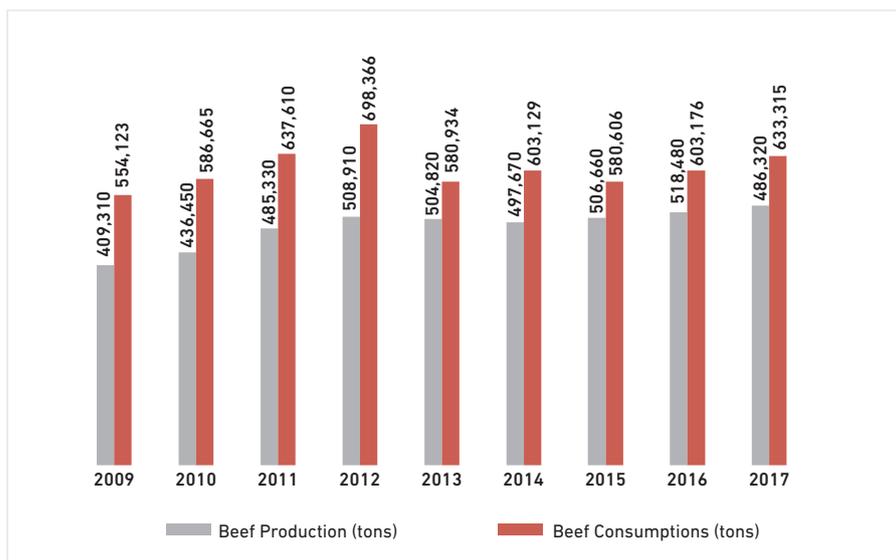
Indonesia needs beef imports because the country has consistently experience a deficit in beef supply from 2009–2017 (Figure 7). Limiting imports to state-owned firms leads to inefficiencies,

instead, allowing private stakeholders to import beef would encourage greater competition and lead to more cost-efficient imports. Transaction costs and bureaucratic processes would also be reduced as the Ministry of State-Owned Enterprises would no longer need to be involved in the licensing process. Moreover, the WTO Agreement on Agriculture and Sanitation states explicitly (Art. 5,6) that assessing the risk of animal health should keep negative trade effects at a minimal level, and shall not be applied in a manner, which would constitute a misguided restriction on international trade (WTO, 1998).

The Ministry of Agriculture already made improvements in regard to issuing import recommendations. The MOA has set the procedure for obtaining recommendations for beef imports in MOA 34/2016 on the importation of carcass, meat, edible offal, and/or processed products to Indonesia. This regulation was later revised to MOA 23/2018 which removed requirements that businesses should prove past realization of granted import quantities and show distribution plans for imported beef in Indonesia.

To overcome the threat of animal diseases, both state-owned and private firms should follow strict food safety procedures for imported beef. The Directorate General of Livestock of the Ministry of Agriculture maintains veterinary resources and facilities that are responsible for safety inspections of imported fresh food. This should include food imports by both state-owned enterprises and private companies.

Figure 7.
Beef Production and Consumption, 2009-2017



Source: Beef Outlook, Ministry of Agriculture, 2017
Notes: Consumption figure is constructed by multiplying consumption per capita with total population.

Consumers pay a high price when they are forced to buy only domestically produced beef. Domestic beef production tends to stagnate at approximately 450,000 tons annually, which is lower than the annual consumption level (Figure 7). Without a significant increase in beef production, imports will remain necessary. Only the reduction of import restrictions will decrease beef prices and cause the reduction of stunting in Indonesia.

C. Restriction on Inputs for Poultry Industry

Despite not being directly subjected to significant trade restrictions, Indonesian chicken meat and egg prices are affected indirectly by trade restrictions on maize, an important input for the poultry industry. Maize is subject to restriction in MOT 21/2018 Articles 3(1) and 3(2).

Feed millers generally prefer to use local maize because local producers provide fresh maize with more pigment content and without being exposed to currency exchange risks (Utomo, 2012). Flint maize, which contains more fat and protein, is produced by local maize farmers and is preferred by Indonesian feed millers (USDA, 2018), but local suppliers have difficulty providing maize of consistent quality. Problems include delayed deliveries, inadequate storage and drying facilities, and inadequate seasonal supplies. Moreover, the price of local maize is higher than that of imported maize, as shown in Figure 4. The Indonesian government is considering building facilities to support the quality and supply domestic maize but imported maize is generally a more consistent and reliable product and is delivered in the desired time and volume (Utomo, 2012).

Despite that, MOT 21/2018 constrains efforts to import maize, resulting in higher input costs for animal feed and eventually raising production costs for the poultry industry. Monopolizing the maize imports under BULOG and subjecting them to an inter-ministerial coordinating meeting likely reduces the flexibility of imports potentially leading to further increases in maize prices. The Indonesian Poultry Breeders Association (GAPPI) has expressed concern about similar regulations introduced in 2016 due to uncertainty in BULOG's supply (Kontan.co.id, beritasatu.com, bisnis.com, 2016). GAPPI stated that the maize price had increased significantly, from IDR 3,000 to IDR 7,000, since the implementation of the policy. The Association of Animal Feed Firms (GPMT) also delivered a complaint to the Ministry of Trade about the inter-ministerial coordinating meetings when they failed to provide a lower price for feed millers (Bisnis.com, Agroindonesia.co.id, 2016; Republika.co.id, 2018).

In short, as a result of the imposed restrictions on maize imports, the local price for chicken and eggs is consistently higher than the international prices (Figure 5). Chicken meat and eggs are even more expensive than in the European Union (Figure 6).

While domestic efforts are needed to improve the local maize supply to feed millers, the restrictions on maize imports have put a burden on feed millers and consequently the poultry industry in Indonesia. This reduces the accessibility of chicken meat and eggs for consumers and may lead to increased stunting and food insecurity, as consumers will be less likely be able to afford these commodities. It is important for the government to extend maize importing rights to private companies both for these reasons: to help distribute the maize in a more cost-efficient way and further reducing prices for feed millers.

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ANNEX

I. Data Characteristics

This study used The Indonesian Family Life Survey (IFLS) dataset. IFLS is a longitudinal survey that represents 83% of Indonesians. We used a pooled cross-section data from IFLS 4 (2007–2008) and IFLS 5 (2014–2015) to get the age expressed in months and body height. This data was later measured in accordance to WHO Z-Score Anthropometry Table to construct the variable for stunting and other variables such as food consumption and expenditure, household variables, and geographical variables (i.e. urban-rural, islands dummies). We also used dataset from The National Socioeconomic Survey (Susenas) 2008 consumption module to get average food price data in province level. Susenas is a nationally representative survey conducted by Indonesian National Bureau of Statistics (BPS). In the consumption module, we obtain the weighted average of food prices from total consumption in kilograms or ounce and in IDR value. After merging the datasets, we dropped outlier observations and kept samples aged below 60 months. Our final set contains 8.212 samples.

Figure 8.
Indonesian Family Life Survey Map 2007-2014



Source: IFLS (2014)

II. Methodology

This study used Instrumental Variable - Probit Regression (IV-Probit) to estimate the association between food price and food consumption level and to estimate the association between consumption level and probability of having stunted children in the household. We used probit regression instead of the Ordinary Least Square (OLS) method because we wanted to use dummy variable (stunted or not stunted) as our dependent variable. The use of an instrumental variable is implemented in food price, which is essential since Vellakkal et al. (2018) stated that nutrition is endogenous to food consumption but food prices are exogenous to child nutrition. The food price is not directly correlated to stunting probability, but rather transmits through consumption intake. We also included socioeconomic variables such as child's age, sex, parents' education, per capita expenditure, and geographical location. The model specification on this research will be as follow:

First stage regression:

$$C_i = \alpha_1 + \alpha_2 P_i + \alpha_3 X_i + \mu_i$$

Second stage regression:

$$S_i = \beta_1 + \beta_2 C_i + \beta_3 X_i + u_i$$

A given child is denoted i , C is the households' per capita food items consumption, P is the items' price, and X is other socioeconomic variables included in the model. The variables description that we use in our estimation is in Table 3 below.

Table 3
Variable Description for Regression Modelling

Variables	Description
Stunting	Dummy variable for stunted children (Stunted child is 1). Stunted children are those whose height-to-age ratio is lower than two standard deviation below WHO's Z-Score (Anthropometry Table)
Rice Consumption	Per capita household's consumption of rice in kg per month.
Beef Consumption	Per capita household's consumption of beef in kg per month
Chicken Consumption	Per capita household's consumption of chicken in kg per month
Egg Consumption	Per capita household's expenditure of egg in IDR per week
Fish Consumption	Per capita household's consumption of fish in kg per month
Rice Price	Average price of rice per kilogram
Beef Price	Average price of beef per kilogram
Chicken Price	Average price of chicken meat per kilogram
Egg Price	Average price of egg per kilogram
Fish Price	Average price of fish per kilogram
Mother's School Years	Mother's total years of schooling
Father's School Years	Father's total years of schooling
Log PCE	Natural log of household per capita expenditure
Urban	1 if observation is living in urban area, 0 if observation is living in rural area
Male	Dummy variable for male; 1 if child is a male, 0 if female
Sumatera	Dummy variable of Sumatera Island; 1 if observation lives in Sumatera
Kalimantan	Dummy variable of Kalimantan Island; 1 if observation lives in Kalimantan
Sulawesi	Dummy variable of Sulawesi Island; 1 if observation lives in Sulawesi

Source: Authors' Measurement

III. Regression Results

Table 4
Regression Result Marginal Effect of Regression Model using IV-Probit Regression

Variables	Rice	Beef	Chicken	Egg	Fish
Second stage – Stunting Model					
<i>Consumption</i>	-0.0363** (-2.90)	-1.525** (-2.78)	-0.387*** (-3.33)	-0.0000318** (-3.26)	-0.460** (-2.79)
<i>Log PCE</i>	-0.151*** (-6.70)	-0.119*** (-4.45)	-0.112*** (-4.34)	-0.104*** (-3.76)	-0.150*** (-6.62)
<i>Male*</i>	0.0668* (2.34)	0.0752** (2.69)	0.0582* (2.05)	0.0620* (2.17)	0.0571* (1.99)
<i>Urban*</i>	-0.139*** (-4.57)	-0.137*** (-4.53)	-0.119*** (-3.96)	-0.131*** (-4.30)	-0.135*** (-4.46)
<i>Age</i>	0.00876 (0.89)	0.00342 (0.35)	0.00486 (0.50)	0.0104 (1.05)	0.00871 (0.89)
<i>Mother School years</i>	-0.0165** (-2.70)	-0.0169** (-2.79)	-0.0168** (-2.85)	-0.0168** (-2.76)	-0.0173** (-2.84)
<i>Father's School years</i>	-0.0169** (-2.68)	-0.0122 (-1.73)	-0.0172** (-2.85)	-0.0179** (-2.89)	-0.0168** (-2.64)
<i>Java</i>	ref	ref	ref	ref	ref
<i>Sumatera*</i>	0.126*** (3.51)	0.0946** (2.85)	0.0849** (2.59)	0.0940** (2.78)	0.146*** (3.76)
<i>Kalimantan*</i>	0.337*** (7.72)	0.356*** (8.20)	0.291*** (6.08)	0.350*** (8.15)	0.346*** (8.07)
<i>Sulawesi*</i>	0.286*** (4.43)	0.293*** (4.57)	0.281*** (4.34)	0.345*** (5.32)	0.348*** (5.48)
First stage – Consumption Model					
Variables	Rice	Beef	Chicken	Egg	Fish
<i>Log PCE</i>	1.117*** (9.72)	0.0433*** (10.65)	0.179*** (7.98)	2922.2*** (13.37)	0.0807*** (6.99)
<i>Male*</i>	0.0466 (0.38)	0.00771* (1.97)	-0.00673 (-0.30)	-96.96 (-0.71)	-0.0167 (-1.41)
<i>Urban*</i>	-0.0716 (-0.54)	-0.00341 (-0.69)	0.0181 (0.89)	93.64 (0.64)	0.00887 (0.78)
<i>Age</i>	0.0340 (0.80)	-0.00270 (-1.65)	-0.00629 (-0.70)	78.84 (1.46)	0.00251 (0.64)
<i>Mother School years</i>	0.0161 (0.54)	-0.000289 (-0.28)	-0.00322 (-0.82)	-8.402 (-0.28)	-0.00138 (-0.45)
<i>Father's School years</i>	0.0432 (1.47)	0.00385** (2.64)	-0.000310 (-0.07)	9.716 (0.33)	0.00315 (0.98)
<i>Java</i>	ref	ref	ref	ref	ref
<i>Sumatera*</i>	1.912*** (10.50)	0.0170*** (4.29)	0.0447 (1.58)	540.0** (3.14)	0.175*** (8.83)
<i>Kalimantan*</i>	0.156 (0.92)	0.0247* (2.39)	0.0120 (0.75)	1242.4*** (6.14)	0.00813 (0.68)
<i>Sulawesi*</i>	-1.416*** (-6.90)	-0.0142 (-1.77)	-0.00929 (-0.23)	1056.3* (2.51)	0.0616** (2.71)
<i>Price</i>	-0.000673*** (-16.10)	-0.00000115*** (-9.60)	-0.0000226*** (-8.49)	-0.538*** (-14.65)	-0.0000176*** (-15.31)
N	8212	8212	8212	8212	8212

(*) dy/dx is for discrete change of dummy variable from 0 to 1
 Source: Authors' Measurement

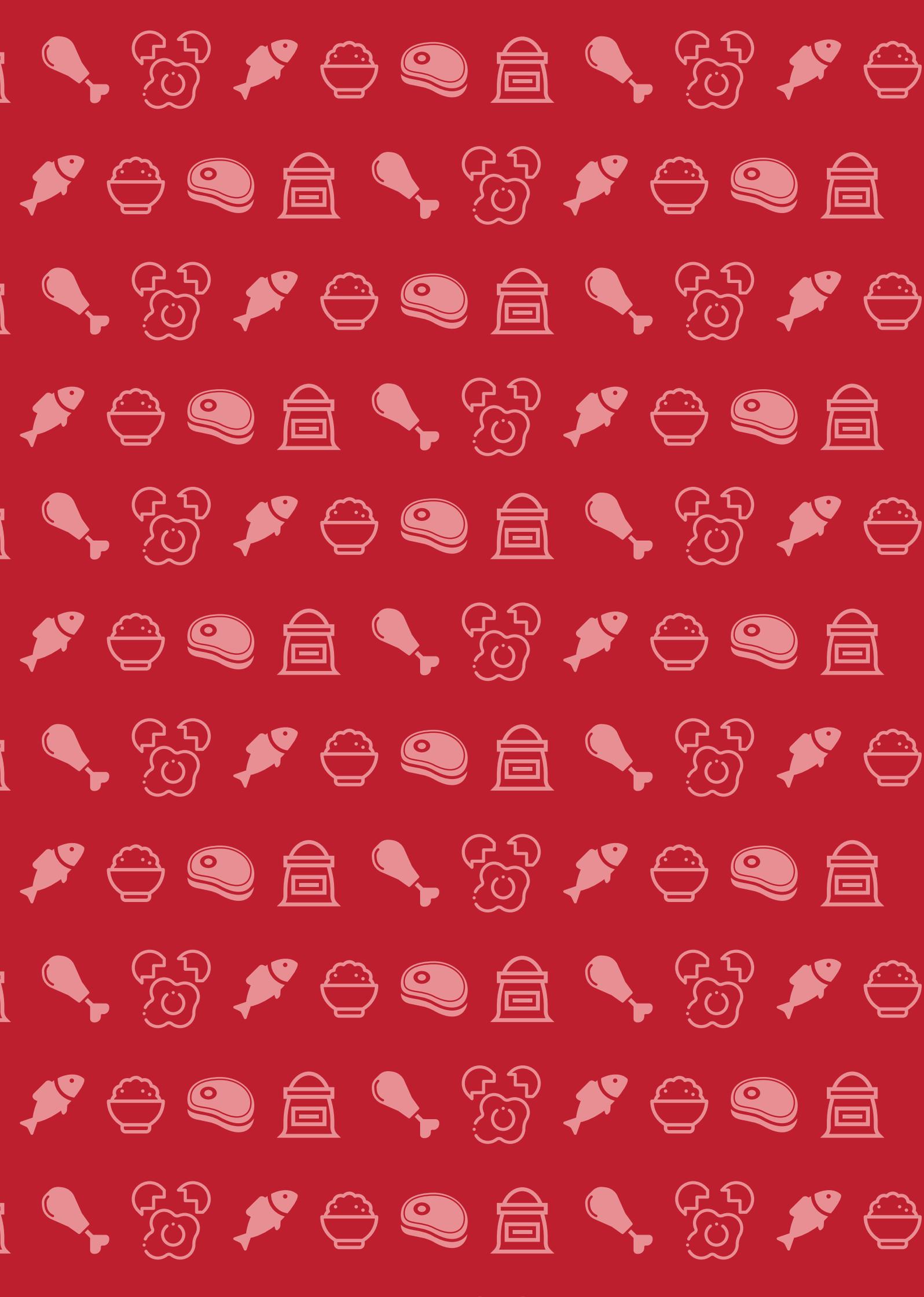
The estimates of marginal effect of price from the first-stage model showed a negative coefficient in every food model. This means an increase in price is significantly associated with a decrease of household's per capita consumption. In the second-stage model, the negative coefficients in consumption variables also indicate that there is a significant and negative association between consumption behavior and probability of stunting. The result was in line with Vellakkal et al. (2018), which found that rising food prices were associated with an increased risk of malnutrition among children in India.

When we take a deeper look at the first model, which measures the relationship between food price and consumption level, we saw that the rising food price has significant but varying effect on consumption levels of respective food types. As the main staple, a IDR 1,000 increase in the price of rice is expected to reduce consumption of rice by 0.673 kg. This interpretation also applies to other foods analyzed. Despite a relatively small marginal changes when we consider only the price variable, it is important to understand other factors that decrease the consumption level such as households' per capita expenditure. There are numerous interesting findings from this result on the first model. Beef consumption, for example, is significantly higher for males compared to females. Furthermore, beef consumption is also higher if the father has higher educational attainment. For all commodities, per capita expenditure is significant to improving the consumption level.

In the second model, which measures the relationship between consumption level and stunting, changes in the consumption level that was modelled and estimated in the first model will be used as coefficient in stunting reduction. For example, a 0.673 kg decrease in annual rice consumption is estimated to increase the probability of a stunted child in the household by 2.44%⁶. Interestingly, parents' education also has a negative and significant coefficient; the better the education of parents, the lower the probability of having stunted children in the household. This condition applies across all food commodities modelled except for the effect of father's school years in the beef model. Male children are more likely to be stunted than female children. Furthermore, a child who lives in urban area is less likely to be stunted than a child who lives in rural area. Log per capita expenditure as a proxy of income showed a negative and significant marginal effect. This means the richer the household gets, the lower the probability of having of having a stunted child. We also found that children living outside Java Island are more likely to be stunted, as is shown by the positive coefficient in Sumatra, Kalimantan and Sulawesi variables. *Ceteris paribus* assumption is applied in all interpretations above.

It is worth noting that consumption and stunting have a long-term rather than a short-term association. In addition, the results are not necessarily representative of the Indonesian population because the lack of nationally representative data in terms of detailed health condition and consumption patterns.

⁶ An increase in the price of rice of IDR 1000 is estimated to decrease the consumption level of rice by 0.673 kg. This decrease, multiplied by the consumption variable coefficient (-0.0363) yields the final result of an estimated increase in the probability of stunting as a result of an IDR 1000 increase in the price of rice of 2.44%.



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