



POLICY BRIEF

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Switching to Natural Gas: Evidence from Philippine Manufacturing Firms

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Since March 2020, the country and the rest of the world have been hit by the unprecedented COVID-19 pandemic. The lower economic growth trajectory (ADB, 2020; World Bank, 2020) means that electricity demand targets are reduced. The outlook for new investments in generation is especially bleak given the current excess capacity (Ravago and Roumasset, 2020). If and when the economy picks-up, the country may again face a problem of attracting sufficient investment in generation.

Addressing the recovery of energy demand becomes more challenging as production levels from Malampaya gas field, the country's indigenous natural gas field, are expected to decline starting 2022.

Without a replacement energy source, a looming energy crisis is foreseen as the Philippines stands to lose over 3,400 MW from existing gas plants, responsible for about 29% of Luzon's power generation (DOE, 2020). Importing liquefied natural gas (LNG) is seen as the immediate solution to prepare for the eventual depletion of Malampaya.

One sizable group of energy users is the collection of firms in the Special Economic Zones (SEZs). Due to its specialized facilities and technology, energy demand and intensity of firms in SEZs are recognizably greater than firms in non-SEZs. Despite this, most SEZs rely on grid electricity. In a JICA study (2011), grid electricity accounted for almost 83% of total fuel used among 82 establishments surveyed along the Batangas-Manila (BatMan 1) gas pipeline. Majority of the establishments preferred sourcing their power from Meralco (largest distribution utility in the country) because it is reliable and it provides special discounted rates to big users of electricity.

The production process in many of the firms in the SEZs includes heating, which currently uses more expensive and less environment-friendly diesel or liquefied petroleum gas (LPG) as fuel. **Thus, LNG is a potential cost-competitive and cleaner substitute for energy sources used in both heating process and electricity requirements of firms in SEZs.**

With the foregoing, our objective is to determine the likelihood of firms to switch to natural gas and determine the profile of power and fuel use among firms in manufacturing and agro-industrial SEZs.

There are a number of studies on interfuel substitution discussing the factors that influence likelihood of

switching to another lower carbon energy source. Serletis et al. (2009) showed that high-income countries have larger interfuel substitution potential compared to middle- and low-income economies. At the same time, they highlighted that much of interfuel substitution depends on the structure of economy than the level of economic development. Compared to residential and electricity generation sectors, the industrial and transportation sectors exhibited a higher potential of substitution between energy inputs. There is likewise a need for a higher change in relative prices to encourage switching toward a lower carbon alternative.

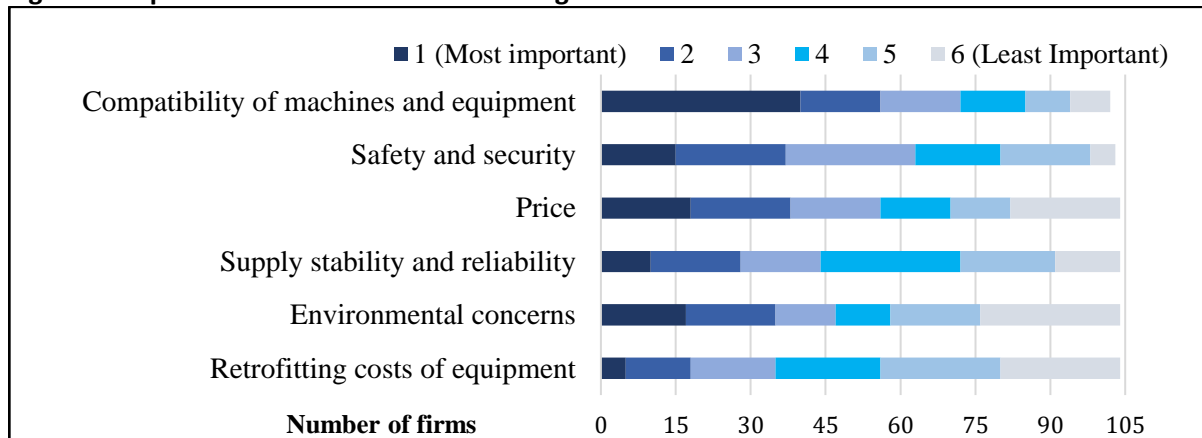
Survey among SEZs. We conducted a primary survey among SEZ manufacturing and agro-industrial firms located in Luzon and Visayas. Given the importance of manufacturing in the structural transformation of an economy, it is vital to determine systems and practices that improve productivity and efficiency. Our survey was sent to 61 manufacturing and agro-industrial SEZs with a total of 1,613 operating firms as of February 2018. We obtained a total of 115 firm-respondents. These firms are from 24 SEZs out of the 61 SEZ we targeted. Out of the 115 firm-respondents, a considerable number are from SEZs located in Laguna at 64%, followed by firm-respondents in Batangas at 10%. The rest are from Cavite, Cebu, Pampanga, Benguet, Bulacan, and Metro Manila.

METHOD OF ANALYSIS. We employed *t*-tests, linear probability model, and logistical regression or *logit* model to determine which firm characteristics increase the likelihood of firms to switch to natural gas.

RESULTS. Our survey results show that crucial to increasing the probability of switching to natural gas as a primary fuel are the following: (i) the extent of knowledge about natural gas; (ii) its cost competitiveness vis-à-vis alternatives; (iii) whether firms use energy-intensive activities in its production process (particularly, heating), , (iv) the type of ecozone firms are in, and (v) the firm's current electricity provider. In summary, **energy-intensive manufacturing firms with more expensive fuel sources are more likely to switch.**

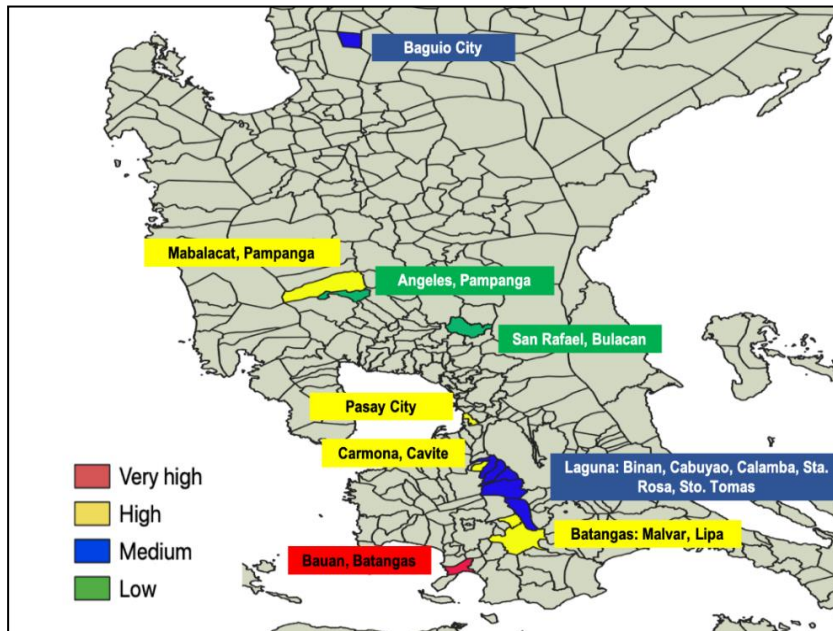
Compatibility of machines and equipment emerged as the top consideration for economic zone firms to switch to natural gas (Figure 1). Naturally, firms take into account the upfront capital cost of switching including the stranding cost of replaced equipment. This gives us an indicator that the use of natural gas is more feasible among firms that operate boilers and other heating equipment in their production process. Firms which mainly depend on electricity for their operations are unlikely to shift to natural gas.

Figure 1. Top considerations for fuel switching



Price, supply stability and reliability, and environmental concerns are also among the top considerations for firms who show willingness to switch to natural gas. Price offered to the end-user would be influenced by several factors including the LNG virtual pipeline delivery system; the capital and operating expenditures of satellite or the small-scale LNG storage and regasification terminals to be located inside the SEZs; among others.

Figure 2. Likelihood to switch to natural gas, Luzon



Note: Probability of switching by city or municipality categorized by “very high,” “high,” “medium,” and “low” in Luzon islands.

When ranked according to probability of switching by city or municipality (Figure 2), SEZs in Bauan, Batangas are very highly likely (red) to consider natural gas as fuel followed by highly-likely-to-switch (yellow) in Malvar and Lipa, Batangas. Pasay; Carmona, Cavite; and Mabalacat, Pampanga SEZs are also highly likely to switch to natural gas. SEZs in Angeles, Pampanga, and San Rafael, Bulacan on average, consider natural gas as a feasible fuel but at a low likelihood (green).

Taking the role as a bridge fuel, natural gas can help facilitate the efficient transition to cleaner energy.

Pollutants from dirtier fossil fuels not only harm the environment but also cause serious respiratory health problems. The estimated monetary cost of all damages emanating from local pollutants can be substantial, insofar as these induce respiratory problems including coughing, wheezing, etc. (Jandoc et al., 2018). There are several ways in which natural gas reduces damages: First, if the firm uses diesel in the production process and switches to natural gas, there is a reduction in harm. Second, if natural gas can

be used as fuel in generating electricity inside the SEZs, damage cost associated with the use of diesel, oil, and coal in generating electricity could potentially be avoided. Switching to electricity generation using natural gas is possible, especially if the natural gas power plant is located inside the SEZ and is able to offer a lower rate than their current electricity distribution utility outside of the SEZs.

POLICY IMPLICATION. The study revealed that the potential use of LNG is greatest among firms that require intense heat for their production such as boilers, which is generated by burning less environmentally friendly fuels (e.g. diesel or coal) other than natural gas. We confirm that switching is least likely among firms whose power needs are supplied by electric utilities.

While the study covers only manufacturing and agro-industrial firms in ecozones, **the results provide an indication that markets for natural gas outside of electricity generation exist.** It also provides a gauge of the minimum size of the market and illustrates a greater market potential given the number of manufacturing and agro-industrial firms outside of ecozones. Our survey and methodology offer potential to scale the size of data collection to include other firms outside the special economic zones.

From a policy point of view, the results of our study suggest a **potential growing market for LNG in the Philippines** in addition to the requirement to fill the need due to the depletion of Malampaya gas field. The LNG industry is responding to these market signals, but **its development should be nurtured by appropriate regulation and market-creating activities such as investment coordination.** There will also be a need for more intense information drive on the minutiae of switching if and when natural gas becomes available.

References

- Asian Development Bank, 2020. Asian Development Outlook Supplement June 2020: Manila, Philippines. <https://doi.org/10.22617/FLS200180-3>
- Department of Energy, 2020. 2019 Power Statistics [WWW Document]. URL https://www.doe.gov.ph/sites/default/files/pdf/energy_statistics/2019_power_statistic_02_installed_and_dependable_capacity_per_plant_type_per_grid.pdf
- Jandoc, K.R., Roumasset, J., Ravago, M.-L., Espinoza, K., 2018. Chapter 4: The Simple Economics of Optimal Electricity Generation, Transmission, and Use, in: Ravago, M.-L. V, Roumasset, J.A., Danao, R.A. (Eds.), Powering the Philippine Economy: Electricity Economics and Policy. University of the Philippines Press, Quezon City, pp. 89–134.
- Japan International Cooperation Agency, 2011. Natural Gas Energy Demand Survey - Final Report. Japan International Cooperation Agency.
- Ravago, M.-L. V, Roumasset, J.A., 2020. COVID-19, Coal, and the Energy Transition in the Philippines, Department of Economics, Ateneo de Manila University, Working Paper Series. Department of Economics, Ateneo de Manila University.
- Serletis, A., Timilsina, G., Vasetsky, O., 2009. On interfuel substitution : some international evidence, Policy Research Working Paper Series. The World Bank.
- World Bank, 2020. Philippines Economic Update, June 2020 : Braving the New Normal. Washington, DC.

This policy brief is based on the Working Paper of the same title. For any questions, comments, and suggestions, please contact Dr. Majah Ravago, Associate Professor, Dept of Economics, ADMU thru email: mravago@ateneo.edu

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