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Role of Subjective Perceptions and Migration Culture in the Formation of Migration Intentions: Evidence from a Rural Village in the Philippines

Aubrey D. Tabuga¹

ABSTRACT

This paper analyzes intention formation as an important part of migration decisionmaking process among prospective migrants. Bringing out the nuances and examining factors that facilitate premigration decisionmaking process may be useful in designing efforts to anticipate or even influence migration flows. Using primary data, this study analyzes the role of individuals' perceptions of their households' wellbeing and the prevailing political and economic environment in their area. The results show that their migration intentions are nuanced. While some respondents formed more decisive intentions to migrate, others indicated weak desire to seek opportunities abroad in the future. This study finds that having a more decisive migration plan is correlated with age, being male, having prior migration experience, existing household migration culture, and low level of satisfaction with the welfare of one's household.

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INTRODUCTION

International migration is such a complex phenomenon that those who desire to participate in it often go through elaborate planning and decisionmaking. Analyses of the migration decisionmaking process, however, are rare. Most of the existing studies on the subject seem to treat migration decisionmaking as a stay-or-leave dichotomy rather than one that varies in decisiveness or maturity. This is partially due to lack of data on the nuances of migration decisionmaking. While it is important to understand the characteristics of people who stay in their country vis-à-vis those who leave, it is also useful to understand the process that they go through, prior to their actual movements. Policywise, knowledge from such analyses can help improve measures that seek to influence the migration aspirations and behaviors of people, and, consequently, the migration outflow. This paper focuses on a particular case in the Philippines. It aims to contribute to the existing literature that sheds light on the planning process behind international labor migration by unbundling how migration intentions are formed and examining forces that influence this process. As such, this study utilizes a set of original data collected from residents in a migrant-sending rural village in Central Luzon.

The Philippines has remained one of the top-growing economies in Asia (World Bank 2019) and is also a key migrant-sending country with more than 2 million migrants deployed in 2017 alone (POEA 2017). While the Philippines' foreign currency earnings from remittances are partly to be credited for its robust economic growth in recent years, the country is also faced with challenges in labor migration, such as the threat of brain drain in some sectors and cases of abuse involving low-skilled workers. Numerous studies were done to examine the consequences of international migration among Filipino workers. However, there is much to learn about the process that leads Filipino workers to either remain in the country or leave in search for greener pastures abroad.

Thus, this study aims to examine the following research questions: What are the factors that influence one's intention to migrate in the future? How do psychosocial factors like one's perception of his wellbeing and the country's broader political and economic landscape influence his migration intentions? What is the role of household migration culture in the formation of such intentions?

REVIEW OF LITERATURE

Migration intentions

In the context of migration, analyzing the process of intention formation is vital in understanding the act of migration. This is because intentions are the primary determinant of behavior, according to the theory of planned behavior (Ajzen 1991; Kley 2011). This theory notes that "favorable attitudes, subjective norms, and perceived ease of acting lead to intentions to act, eventually materializing into observed actions, provided the availability of resources and opportunities" (Kaplan et al. 2016, p.62). It is therefore important to examine factors that influence the formation of such intentions.

The recent body of literature deals with migration intention by focusing on the role of expectations, human agency, and noneconomic dimensions. In these studies, perceptions, norms, and attitudes were incorporated into the analysis. This is because of the nature of migration wherein people's motives are hardly singular and decisionmaking process is complex (Balaz et al. 2014). It is proposed that factors like perceived opportunity differentials between the origin and destination (De Jong et al. 1985; De Jong 2000; Kley 2013; Kaplan et al. 2016) and anticipated job benefits and career aspirations (Hoppe and Fujishiro 2015) play a role in the formation of migration intention, which in turn, determines migration behavior.

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It is noted that prospective migrants go through an elaborate process of intention formation, which consists of weighing options, costs, and expectations, as well as planning and undertaking preparations before deciding to emigrate.² Outright analysis of migration behavior without looking into this elaborate process may therefore neglect the complexity of migration decisionmaking process. The significance of migration intentions in predicting actual behavior was shown by De Jong (2000), Kley (2013), Van Dalen and Henkens (2013), and Hoppe and Fujishiro (2015).³

Notably, the more advanced phases of decisionmaking process (i.e., exploring and planning behaviors and undertaking concrete actions) are a strong predictor of actual migration (Hoppe and Fujishiro 2015). The earlier stage where intentions are only beginning to form is not predictive of actual movement. This strongly suggests that using a dichotomous measure of intention like having or not having the desire to migrate does not fully exploit the complexity of migration decisionmaking process. Therefore, there is a need for a more elaborate distinction among the various stages of decisionmaking. This is because "differentiating between three phases of migration decision-making (as opposed to intentions and behaviors only) leads to a better understanding of who migrates and who does not. Also, identifying predictors for each phase provides insight into reasons for migrating" (Hoppe and Fujishiro 2015, p.25).

Operationalizing these stages is crucial. In the empirical literature on the intentions of prospective migrants to migrate, the intention is an arbitrary and subjective concept that is akin to desire or wish. One of the earliest analyses of migration intention was done by De Jong et al. (1985) on the Philippines' case whereby the intent to move was simply operationalized as a dichotomous response to the location-specific question: "Do you intend to move away from the village within the next two years?" In a study of Taiwan and Pennsylvania data, Liao (2001) used a "yes or no" dummy variable to signify migration intention—that is, whether the respondent at the time was likely to move to another community in the next two years. More recent works on migration intentions rather used arbitrary measures to discern the maturity of the intentions of prospective migrants.⁴

There were several attempts to capture the subjective rankings of migration intentions, such as by ranking them into very low, low, high, and very high intent (Hyll and Schneider 2014) and having no firm plans, having firm plans, and having neither wishes nor plans (Agadjanian et al. 2008). Those measures are largely subjective and do not delineate the difference between a wish and a decisive intent. As such, they do not capture the firmness of response and fail to discuss it more concretely. Recent works also relied on the arbitrary and subjective measures of intentions like asking if the person looks forward to working abroad within a specified timeline, with responses usually ranked by a set of categories (Van Dalen and Henkens 2012). Others simply asked location-specific questions to respondents, such as where they want to reside, say, five years from the time they were asked the question (Kaplan et al. 2016).

The body of literature that clearly differentiates among various phases of migration decisionmaking process is a rather new branch in migration scholarship. Kley (2013) adopted the Rubicon model within a three-phase model of migration. It consists of (1) predecisional or the considering phase where migration and its aspects are considered but no concrete actions are made yet; (2) preactional phase or planning stage where concrete plans and preparatory works are undertaken; and (3) actional phase, which they refer to as realizing stage or the act of moving or migrating and

²See Kley (2013) and Hoppe and Fujishiro (2015)

³ To cite an example, a study on the Netherlands' case shows that over a third of those who had stated their intentions to emigrate actually migrated within the five-year follow-up period (Van Dalen and Henkens 2013).

⁴ See Mara and Landesmann (2013), Chindarkar (2014), Otrachshenko et al. (2014), and Ivlevs (2015)

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manifesting migration behavior. Aside from Kley (2013), Hoppe and Fujishiro (2015) also employed the three-stage migration decisionmaking process. These studies contributed significantly to the scholarship of migration intentions, except that they heavily concentrated on intraregional movements, particularly the European Union (EU) context. Moreover, most of the recent literature on migration decisionmaking focused greatly on cases of highly skilled or highly educated individuals from highincome countries. Thus, the literature is deficient in understanding the intentions of people who have varying levels of skills and are involved in a different type of migration (e.g., cross-country as opposed to intraregional). Such is the case of migrant workers from the Philippines.

Factors that influence migration intentions

Recent literature on migration intention shows that factors like age, sex, marital status, dependents, and migration experience are associated with migration intentions. Having the desire to migrate is more likely for the young (Van Dalen and Henkens 2012; Kley 2013), such as the migration of highly educated individuals (Hoppe and Fujishiro 2015) and the rural to urban migration in the Philippines (De Jong et al. 1985). The influence of gender on migration intention is mixed. Agadjanian et al. (2008) found very little variation in the tendency to migrate based on gender while De Jong (2000) found considerable gender effects in his analysis of Thai internal migration intentions. For instance, gender mediates the effects of several key explanatory variables. Migration experience has a positive influence on the migration intentions of women. On the other hand, migrant networks tend to influence the migration intentions of men but not those of women. While lower-income expectancies for remaining in the local village and urban locations encourage women to migrate, this is not the case for men. Having dependents was found to have gendered effects on the intentions of men to migrate based on the same Thai internal migration data. It encourages men to move for jobs in the future and dampens the desire of women to do the same (De Jong 2000). This reflects traditional delineations in gender roles.

There is also mixed empirical evidence on marriage and migration intention. Being single encourages international migration among Filipinos (De Jong et al. 1985). This is consistent with the Thai data (De Jong 2000) but in contrary to evidence found in the Kyrgyzstan data—at least for those who have European ethnicity (Agadjanian et al. 2008). It was also found that childbearing was likely to discourage migration among women.

The odds of considering migration was lower among those who had lower levels of educational attainment based on European context evidence (Agadjanian et al. 2008; Kley 2013). Evidence from a developing country, meanwhile, showed that there was a negative relationship between years of schooling and international migration intentions (De Jong et al. 1985). In the Taiwan case, educational level was found to positively and significantly enhance the likelihood to migrate (Liao 2001). Based on Mexican data, McKenzie and Rapoport (2007) found that the influence of education depended on migration prevalence in a community, such that negative educational selection was observed in areas with large migration networks. Hence, they noted that analyzing education influence on migration behavior must account for the variations in the prevalence of migration across the communities of origin.

The role of migration experience was examined in past studies with findings that varied based on the type of migration. In the context of migration between highly skilled workers and high-income countries, migration experience (i.e., having lived abroad previously) was associated with neither migration intention nor actual migration behavior (Hoppe and Fujishiro 2015). In contrast, migration experience, whether internal or international, was a consistently significant predictor of migration intentions and behavior among people from low-income to high-income areas (De Jong et al. 1985;

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De Jong 2000; Agadjanian et al. 2008). It is interesting to note that the more migration experience a person has, the less migration information he or she seeks (Balaz et al. 2014). "Migrants already possess some tacit knowledge about migration and deal with information overload more efficiently than non-migrants: they seek less information as they probably know which information is important to them" (Balaz et al. 2014, p.51).

The abovementioned findings illustrate the selectivity of migration—that is, the highly skilled need not have that much experience to move from one labor market to another. Meanwhile, those from low-income origins who may have a relatively lower level or quality of skills must have greater experience to penetrate markets in high-income economies.

Circumstances surrounding an individual deciding to migrate also matter. Wealth, whether in absolute or relative terms, was argued to influence one's intentions to migrate. Having the money to move is crucial because migration is a costly endeavor. However, the findings are mixed and seem to vary depending on contextual factors. The availability of resources to finance international move was found to enhance migration intention among prospective migrants in a rural village in the Philippines (De Jong et al. 1985). Evidence from rural Taiwan showed that with lower income, people were less likely to form intentions to move (Liao 2001). The author attributed this to "affordable housing or the availability of family-owned homes that is common in rural Taiwan" (Liao 2001, p.452). On the contrary, the same constraints did not seem to influence internal emigration intention in the Thai rural case (De Jong 2000) and the actual emigration of rural Bangladeshis (Mendola 2008) because internal emigration was far less costly than international migration. Meanwhile, resources proxied by car ownership did not explain variations in the intentions of young people in Kyrgyzstan to migrate internationally (Agadjanian et al. 2008).

Under the tenets of the New Economics of Labor Migration (NELM), a household experiencing a greater level of relative deprivation than the reference group is more likely to engage in migration. Hyll and Schneider (2014, p.337) analyzed the intention to leave East Germany under the relative deprivation framework and found that "unfavorable income comparisons affect preferences" and that policies affecting income distribution might also affect propensity to migrate.⁵ Meanwhile, wealth must not be viewed in a simplistic manner (Dustmann and Okatenko 2014). Using multicountry data from the Gallup World Poll, Dustmann and Okatenko (2014) contended that intentions responded to individual wealth but depended on migration costs and where one was in the wealth distribution. In relatively poorer regions (e.g., sub-Saharan Africa and Asia) where wealth constraints are binding, the intentions of individuals to migrate become more compelling along with the increase in wealth distribution. In relatively richer regions (e.g., Latin America), however, wealth constraints are not binding and the similar influence of wealth on migration intentions is not seen. The role of wealth is therefore nonlinear. It depends on where one is situated in wealth distribution. Where migration is costly, wealth alleviates budget constraints and enhances intention to migrate. As one goes up in the distribution, wealth discourages his intention to migrate because the gains from migration relative to his current wealth also become lower. The dual role of wealth in migration is consistent with the proposition of mobility transition hypothesis. It proposes that at low levels of income, rising income is associated with rising emigration rates. After some turning point, a further increase in income is accompanied by declining emigration rates (Clemens 2014).

But then again, demographics and economic factors alone do not adequately explain variations in migration tendencies. For instance, despite the persistence of wealth inequality, we do not see a mass exodus of those at the bottom of the socioeconomic classes. Hence, examining factors like

⁵ See also Quinn (2006) although this study examines determinants of actual migration rather than intentions.

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migration intentions and perceptions is important. In the theory of planned behavior by Ajzen (1991), intentions as a primary determinant of behavior are considered a product of perceptions of the behavior and expectations of what one will achieve as an outcome of his behavior—in this case, migration or mobility.

Hoppe and Fujishiro (2015) found that anticipated job benefits and career aspirations were associated with all phases of the migration decisionmaking process. Likewise, looking at the case of emigration intentions from the Netherlands, "the perceived labor market opportunities are central to understanding why workers are not oriented much at working abroad, even for a couple of years. In other words, the central tenet of the basic economic models of international migration—driven by net wage gains—does not seem to apply to the Netherlands" (Van Dalen and Henkens 2012, p.41).

Aside from the expectations and attitude of individuals, social norms also affect their intentions because it provides intangible support to their migration decision (Kaplan et al. 2016). Norms are operationalized as the perceptions of one's inner circle concerning his or her migration (De Jong 2000; Van Dalen and Henkens 2012), one's perception of whether people from his community help each other out, and whether there is improvement in his community or it is likely to progress from political factors such as the national elections (Agadjanian et al. 2008). The findings, however, are quite mixed. Using the Thai internal migration data, De Jong (2000) found that the perception of one's inner circle concerning his or her migration is not significant in explaining intentions but it is so in the Netherland's case. In particular, "partners who oppose migration are among the main barriers for international mobility" (Van Dalen and Henkens 2012, p.42). Some factors matter like the perceptions of improvement in the living conditions of people while other factors, such as the perceptions of progress brought about by the elections or people in the community helping each other, do not (Agadjanian et al. 2008). Van Dalen and Henkens (2013) looked at the effects of people's satisfaction with the living conditions in their origin country (i.e., the Netherlands) and found that people's discontent with the quality of public domain was a strong driving force to their emigration behavior. They likewise found that public gains were linked to moving abroad and weighed heavily in the decisionmaking process. This was corroborated by Dustmann and Okatenko (2014), who found that contentment with local amenities like security and public services had influenced migration intentions, more so in the poorest areas. In addition to attributes of local amenities, community attachment, in general, was found to have significantly reduced migration intention in the Taiwan case (Liao 2001). This was consistent with the findings of Kley (2013) on local embeddedness.

Several studies also examined the effects of people's life satisfaction on their intentions to migrate. Applying the case of 27 European countries, Otrachshenko and Popova (2014) found that life dissatisfaction strongly predicted the intentions of people to migrate. It was consistent with the findings of Chindarkar (2014), who found that controlling for relative deprivation and place utility factors, life satisfaction was negatively correlated with the intentions to migrate abroad among Latin Americans. This is especially true for those who are highly educated. Interestingly, Ivlevs (2015) found a U-shaped relationship between life satisfaction and emigration intentions; people who were either very satisfied or very unsatisfied were the most likely to report having the intention to move abroad. Meanwhile, those in the middle of the distribution in terms of life satisfaction were the least likely to do so.

Migration decisions are jointly made by individuals and households and influenced by community-level factors that are part of the broader social, political, and economic structures in the country and at the global level (Massey 1990). Migrant networks are part of the social structures.

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The presence of kinship in migration destinations of individuals increases the likelihood that they will move because the provision of information and other resources reduces the cost of migration (De Jong et al. 1986; Massey et al. 1993). In the analysis of premigration stages, social networks are found to significantly influence intentions to stay or move (Hoppe and Fujishiro 2015; Kaplan et al. 2016). Some found the significance of social networks in the formation of migration intentions but not in the actual migration behavior (De Jong 2000; Hoppe and Fujishiro 2015). This is perhaps because the movement within a country (such as in the data by De Jong 2000) or within a bloc like Europe or the EU (Hoppe and Fujishiro 2015) does not necessarily entail that much risks and monetary and nonmonetary costs. These are factors known in the literature to be mediated by social ties (Mckenzie and Rapoport 2007).

Other migration intention studies found that the local social networks of individuals deter outmigration from their place of residence (Kley 2013). This is because those who are more socially embedded (i.e., have a larger number of close friends living nearby, have a strong feeling of closeness to their place of residence [Kley 2013, p.111], born in their actual place of residence [Kley 2013, p.114], or have a longer duration of residence in their local community) are less likely to move out. The feelings of being rooted in the area discourage outmigration among other individuals. Such is the case of those unemployed and are living in more economically deprived regions (Kley 2013) and technical workers (Dahl and Sorenson 2010). In fact, for technical workers, such as the typical Danish scientists and engineers, social factors swamp economic considerations in their choices of work locations (Dahl and Sorenson 2010). These findings, however, must be put into context. Both studies pertain to cases of people from high-income economies, with the latter focusing on technical workers. In the permanent migration of highly skilled workers who originated from high-income countries, one may view social ties to be a deterrent. There is not much need to move and seek opportunities elsewhere, unlike in a developing country setting where the need for better opportunities may outweigh other considerations. Analyzing the intentions of people from less developed settings, therefore, augments the understanding of the role of social factors in the formation of migration intentions.

Literature gap, research questions, and hypotheses

Most recent works on migration intentions that provide nuances in the intention variable have focused on either internal or intraregional permanent movements of highly skilled workers. This paper augments the scholarship by examining the intentions of migrant workers from the Philippines, a developing country that supplies a significant number of labor migrants to various countries. By focusing on the Philippines' case, we gain insights on factors that shape the migration aspirations of persons with varying levels of skills but are mostly low-skilled. Understandably, the circumstances they faced vary greatly from the highly skilled ones who: (1) do not experience many barriers in their movement and participation in the labor market when compared with low-skilled workers; and (2) may be granted rights and welfare benefits compared with those deployed to the native population in their host country, owing to their skills. This study lends insights from the Philippines, a country known for engaging largely in temporary, contract-based migration but receives less attention in migration research. The research questions this study aims to examine are: How is one's intention to migrate influenced by his perception of his own wellbeing and the wider political environment in his country? What is the role of the migration culture of his household in the formation of his migration intentions?

Owing to the importance of individuals' human capital, demographics, and perceptions, the study's unit of analysis is at the individual level. Nevertheless, this study does not assume that decisionmaking is made purely at the individual level. It is possible that the individual is acting or

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behaving based on household decisions. Analyzing at this level allows the inclusion of human capital and human agency without overlooking the roles of household characteristics and the broader social and developmental factors that are often mediated by public policies. The context under which the hypotheses of this analysis are formulated is likely to be characterized by high migration cost (i.e., the costs are binding), coupled with income and credit constraints. This is because the study area is rural and many households rely on fishing for their livelihoods.

Drawing insights from the literature, this study posits and tests the following hypotheses:

a. When wealth and networks are held constant, the more satisfied one gets with the wellbeing of his household, the less likely that he or she will seek better opportunities abroad;

b. The more positive one's outlook becomes in terms of a wider political and economic environment, the lower the likelihood that he or she will formulate a more decisive intention to move for jobs; and

c. Holding subjective perceptions and demographic and economic characteristics constant, the more a person gets exposed to the migration behavior of the members of his household, the more likely that he or she will formulate migration intentions.

DATA AND METHODOLOGY

Data used in analyzing migration intentions were gathered from the Orion Migration Survey, a semistructured survey conducted in a high-migration rural village in the municipality of Orion, Bataan. The village's migration incidence based on its 2012 Community-Based Monitoring System (CBMS) was at about 30 percent, making it a good candidate to analyze and understand migration intentions and activities. The CBMS is a system owned and used by local governments.

Among the most popular destinations for migrants in the said village were countries in the Middle East, particularly Saudi Arabia and the United Arab Emirates. The survey questionnaire of the Orion Migration Survey was administered in 2016 through face-to-face interviews with all 365 households in the village. Data collected include the individual characteristics of respondents, such as their sex, age, educational attainment, occupation, marital status, and individual perceptions of the national government's performance and the economic condition of their households. With regards to migration, among data collected during the survey were the future migration intentions of respondents as well as the migration history of their migrant networks and members of their households. Primary data were complemented with the households' socioeconomic information from the village's 2012 CBMS database. The information collected from the CBMS was mainly assets that served as additional explanatory variables in the analysis of the respondents' migration intentions. Since the analysis focused on future migration intentions, the sample was truncated to include only one individual per household aged 18 to 59 at the time. This brought the total sample to only 223 as households without 2012 CBMS data were dropped from the analysis. Although this sample was small, it accounted for 61 percent of all households in the village under study.

Migration intention is often operationalized as an ordinal variable that reflects the initial phases of premigration decisionmaking. Note that this does not involve the actual migration behavior of individuals but rather their decisions prior to migration or nonmigration. These phases, therefore, reflect the degrees of maturity in their intentions. The study adopts the rubicon model of migration decision phases (Kley 2013; Hoppe and Fujishiro 2015) but with some alterations to reflect the Philippines' context and the limitation on data collected for this study. The dependent variable has values 0 to 2, corresponding to levels of decisiveness to migrate. The absence of desire to emigrate

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is represented by a value of 0. Having the desire to emigrate is assigned a value of 1, herein referred to as preactional phase. These are participants who responded "absolutely yes" or "probably" to the survey question: "Do you wish to migrate abroad to either work or settle anytime in the future?" The last stage in this analysis is called the preactional phase and is assigned a value of 2. In the preactional phase, the migration plans of an individual have become more decisive, as he or she is already carrying out actions. The minimum criterion for which is possessing a valid passport. In most rural villages in the Philippines like the village under study, people having a valid passport is not customary because it signifies having a serious plan to work overseas in the near future. However, the actional stage where individuals have already migrated is not observed in this study. Hence, this analysis is only up to the preactional phase. Unlike the dichotomous and arbitrary measure of migration intentions used in the past (i.e., having or not having desire to migrate), this analysis utilized one that was measured with less subjectivity and arbitrariness, as it provides the level of the decisiveness of the intentions.

The decisiveness of migration intentions being ordinal was estimated via ordered logit regression or proportional odds model. The dependent variable migration intention stage has ordered categories = 0,1,2 (i.e., 0 – not considering; 1 – predecisional; 2 – preactional). However, the potential problem with ordered logistic regressions is its parallel regression assumption— wherein the influence of an explanatory variable is constrained to be similar through all categories of the outcome variable—which may not always be the case. It is possible that the influence of the explanatory variable, measured by β , is not constant through different values of the dependent variable. One factor may have greater weight in the latter stage of the intention formation process but lesser in the initial stage. Note that it is essential to examine any variations on the influence in factors being examined because of its importance in predicting future migration behavior. To examine any variation, Williams (2006) proposed the generalized ordered logit, an alternative model that allows the β to vary as the value of dependent variable changes. The Brant test of parallel regression assumption. A significant test result after conducting ordered logit showed that it violated the parallel assumption and that the generalized ordered logit model was more appropriate.

The regression analysis controls for economic and demographic factors including migration culture and experience. Economic affluence was measured by an asset index created through principal components analysis (PCA) where the chosen component reflected a variation in ownership of status symbol assets like an air-conditioning unit, computer, refrigerator, and internet connection. Having those home appliances indicates that a household can afford and maintain them. The asset index was used instead of per capita income because it contained relatively less noise in the data. Under a developing country setting, it is expected that the higher the asset level, the greater the capacity of the people to migrate. Hence, the more likely that they will form decisive migration intentions, ceteris paribus.

This study controls not only for the asset level but the respondents' years of formal schooling (including technical and vocational education) and age as a proxy for the level of skills and overall experience, respectively. With higher education, expected returns to migration become higher, hence, the more likely one forms migration aspirations. Age may have a nonlinear relationship with migration intention such that age is initially positively correlated with migration desires. At some point, less desire and eligibility for migration can be noted in older people. They are also said to be more rooted to their origin and therefore have weaker desire to leave.

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One under-researched factor that may also influence intentions to migrate internationally was the propensity to engage in internal migration. This study includes a dummy variable for having a value of 1 if the person answers "absolutely yes" or "probably" to the question: "Do you wish to move to another part of the country to either work or settle anytime in the future", and 0, otherwise. This variable controls for the person's tendency to be mobile and take risks. People who are more willing to take risks are found to be more likely to migrate (Jaeger et al. 2007).

Prior migration experience is expected to play a role in the formation of migration intention as well. Former migrants who experienced the benefits of international migration and are familiar with migration processes and strategies are likely to migrate again. This paper primarily operationalizes migration experience as years spent in prior overseas contracts. But it can also be portrayed as a dummy variable where the value 1 is assigned to having ever experienced international migration and 0, otherwise. In addition to individual migration experience, a household's migration culture may affect the migration plans of an individual. In the analysis, this was operationalized as the number of household co-members who have ever migrated. Such members could be an important source of not only migration-related information (e.g., strategies for an overseas job application and knowledge on migration processes) but more importantly, financial resources. Migrant networks from outside a person's household may matter. Hence, this paper examines the influence of the individual's other migrant networks. It refers to the total number of kin and friends of the individual's household who are current migrants. Other demographic variables like sex and household size were also included in the model as control variables.

This study focuses on the influence of subjective perceptions on the decisiveness of individuals' intentions to migrate. Even people with the same economic stature may have different perceptions on matters that have a direct influence on their wellbeing. To determine the individual's level of satisfaction with the living condition in their households, the following questions were asked: (1) Do you believe or perceive that your household's economic situation has improved in the last five years? (2) How satisfied are you with the overall living conditions of your household? (3) How satisfied are you with the current earnings of your household? Likewise, to obtain respondents' perceptions of the performance of the national government on job creation and their expectations from new political leadership, the questions used in the survey are: (1) How satisfied are you with the national government's initiative to create or provide jobs for the people? (2) Do you believe or perceive that the country's economic situation will improve after the presidential elections in May 2016? (3) Do you believe or perceive that the economic situation of your locality (municipality of Orion) will improve after the local elections in May 2016? The survey was conducted in February 2016, three months before the May 2016 presidential elections in the Philippines.

Respondents were asked to provide Likert scale-type response to each of the abovementioned questions with 5 as having a firm, positive response, and 1 as a negative response. Meanwhile, the middle point, 3, denotes neutrality. The responses to these questions were pooled into two perception indices (satisfaction index and perception index for the political environment) that served as explanatory variables in the econometric analysis. The hypotheses to be tested are: (1) The more satisfied one is with his household's economic condition, the less likely that he or she forms more decisive migration intentions; and (2) The more satisfied people are with the government's performance in creating jobs, or the more optimistic they are about the ability of incoming national and local government officials, the less likely they are to move out to seek better opportunities elsewhere. The indices were developed using PCA. The distribution of responses to the satisfaction index questions suggests that there is enough variation in those responses, which is essential in creating an index through PCA.

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Moreover, the correlation coefficients among these variables are as low as 0.3944 and as high as 0.6091. It indicates that the variables are highly correlated with one another. Since the loadings show a strong correlation between the first component and the three satisfaction variables (correlation coefficient ranges from 0.52 to 61), this paper used the first component as its life satisfaction index. This is also the case for the respondents' perception of the country's political environment. The first component is highly correlated with the three perception questions, which range from 0.52 to 0.61. The first component was therefore selected as the political perception index.

The summary statistics of the variables used in the estimation is shown in Table 1. Six in 10 respondents (58%) did not have the desire to engage in international migration. Those who expressed any desire or were assigned to the predecisional stage comprised 24.3 percent of the 255 observations while some 18 percent have had more decisive intentions (in preactional phase). The typical respondent is roughly 42 years of age with 10.3 years of education and 1.6 years of prior migration experience. One-third of them are male. The average number of dependents is about two. Six in 10 respondents have at least one household co-member who has migration experience. On average, each respondent is relative to three migrant workers (outside his or her household).

Variable	Obs	Mean	SD	Min	Max		
<u>Dependent variable</u>							
Decisiveness of intentions for international migration	255	0.6039	0.7761	0.0	2.0		
Individual-level characteristics							
Age, years	255	41.8314	10.5023	19.0	59.0		
Age, years (squared)	255	1859.7290	863.7290	361.0	3481.0		
Education, years	254	10.3150	2.7105	3.0	15.0		
Education, years (squared)	254	113.7165	54.6293	9.0	225.0		
Male dummy	255	0.3216	0.4680	0.0	1.0		
Household-level characteristics							
Number of dependents in the household	255	1.6078	1.2082	0.0	7.0		
Household asset index	223	-0.0617	2.2521	-3.2	5.8		
Perceptions							
Satisfaction index	255	0.0304	1.4358	-3.0	2.0		
Political perception index	255	-0.3002	1.3085	-3.3	2.2		
Migration variables							
Desire to migrate internally	255	0.2706	0.4451	0.0	1.0		
Migration experience, years	255	1.5686	4.2780	0.0	27.0		
Number of household co-members who ever migrated	255	0.8235	0.8489	0.0	4.0		
Migrant network, total	255	3.2510	2.5733	0.0	15.0		

Table 1. Summary statistics of variables

Note: Obs = observations; SD = standard deviation; Min = minimum; Max = maximum Source: Orion Migration Survey

RESULTS AND DISCUSSION

The results of ordered logit regression are shown in Table 2. Some estimations were conducted without the variables of interest—perception indices and migration variables (see Models 1 and 2)—to show how the model's statistics improve with the addition of these variables. The full model in Table 2 contains the demographic and household characteristics, migration-related factors, and perception indices. Its robustness was tested using different iterations with results shown in Appendix 1 where models 3, 4, and 5 are versions of the full model. In Model 3, the satisfaction index is dropped from the model while Model 4 does not contain intentions to migrate internally. Model 5 is another version of the full model but without the satisfaction and political perception indices. The *lrtest* command (Likelihood-ratio test) in Stata is used to test the nestedness of these modifications. All test results show significant results, which means that Models 3, 4, and 5 are all nested within the full model (see Appendix 2).

However, it is important to examine whether or not the full model violates the parallel odds assumption. For this, the study used the *oparallel* command in Stata. It provides the results of several tests including the Brant test (Table 3). The highly significant Brant test shows that the ordered logit regression in the full model violates the parallel odds assumption, which provides a good reason for doing the generalized ordered logit regression. The results of the generalized ordered logit are shown as odds ratios in Table 4 and are discussed for this study.

Variable	Model 1	Model 2	Full model
Decisiveness of intentions			
for international migration			
Individual-level characteristics			
Age, years	0.0139	0.0897	0.1306
Age, years (squared)	-0.0010	-0.0020	-0.0026*
Education, years	0.2865	0.4425	0.5714
Education, years (squared)	-0.0050	-0.0128	-0.0186
Male dummy	1.2390***	1.3186***	1.2663***
Household-level characteristics			
Number of dependents in the household	0.1987	0.2442*	0.1475
Household asset index	-0.0506	-0.0734	-0.0064
Migration variables			
Desire to migrate internally		1.2429***	1.2340***
Migration experience, years		0.0634	0.0538
Number of household co-members		0.3952	0.4180*
who ever migrated			
Migrant network, total		0.0006	0.0104
Perceptions			
Satisfaction index			-0.3224***
Political perception index			-0.0787
/cut1	2.2834	5.1848**	6.3695**
/cut2	3.6953	6.7157832**	7.9492***

Table 2. Results of the ordered logit regressions

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	Variable	Model 1	Model 2	Full model
Statistics				
chi2		46.8584	52.8335	62.1979
Pseudo-R2		0.1207	0.171	0.1895
Ν		223	223	223

* p<.1; ** p<.05; *** p<.01

Source: Author's calculations

Table 3. Results of 'oparallel' tests

	Chi2	df	P>Chi2
Wolfe Gould	48.85	13	0.000
Brant	176.00	13	0.000
Score	60.17	13	0.000
Likelihood ratio	60.16	13	0.000
Wald	41.64	13	0.000

df = degrees of freedom

Source: Author's calculations

Table 4. Results of the generalized ordered logit regressions, odds ratios

Decisiveness of intentions for international migration	Odds ratio	Robust SE	Z	P>z	[95% Con	f. interval]
Having no desire (0) versus bein	g in predecisio	onal (1) and	preactional (2)		
Age, years	0.7478	0.1071	-2.0300	0.0420	0.5648	0.9902
Age, years (squared)	1.0025	0.0018	1.4000	0.1630	0.9990	1.0060
Education, years	1.5943	0.8837	0.8400	0.4000	0.5380	4.7247
Education, years (squared)	0.9906	0.0263	-0.3600	0.7210	0.9404	1.0435
Male dummy	2.8744	1.2043	2.5200	0.0120	1.2645	6.5340
Number of dependents in the household	1.6101	0.2765	2.7700	0.0060	1.1498	2.2545
Household asset index	0.9727	0.0983	-0.2700	0.7840	0.7979	1.1858
Desire to migrate internally	5.6157	2.4502	3.9500	0.0000	2.3879	13.2065
Migration experience, years	1.0367	0.0481	0.7800	0.4370	0.9466	1.1354
Number of household co- members who ever migrated	0.7996	0.2167	-0.8300	0.4090	0.4701	1.3600
Migrant network, total	1.0688	0.0690	1.0300	0.3030	0.9417	1.2131
Satisfaction index	0.7801	0.1008	-1.9200	0.0550	0.6055	1.0050
Political perception index	0.9325	0.1258	-0.5200	0.6040	0.7158	1.2147
Constant	4.7101	16.5010	0.4400	0.6580	0.0049	4519.2510

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Decisiveness of intentions for international migration	Odds ratio	Robust SE	Z	P>z	[95% Co	nf. interval]
Having no desire (0) and being i	n predecisiona	l (1) versus p	preactional (2	2)		
Age, years	1.7164	0.3404	2.72	0.0060	1.1635	2.5319
Age, years (squared)	0.9926	0.0027	-2.76	0.0060	0.9873	0.9978
Education, years	1.5543	1.0426	0.66	0.5110	0.4174	5.7874
Education, years (squared)	0.9803	0.0329	-0.59	0.5540	0.9179	1.0471
Male dummy	9.0790	5.2419	3.82	0.0000	2.9281	28.1508
Number of dependents in the household	0.6374	0.1762	-1.63	0.1030	0.3708	1.0958
Household asset index	1.1509	0.2184	0.74	0.4590	0.7935	1.6694
Desire to migrate internally	1.8578	1.0520	1.09	0.2740	0.6123	5.6364
Migration experience, years	1.0355	0.0997	0.36	0.7170	0.8574	1.2506
Number of household co- members who ever migrated	3.7694	1.6873	2.96	0.0030	1.5677	9.0636
Migrant network, total	0.9658	0.1133	-0.3	0.7670	0.7674	1.2155
Satisfaction index	0.5472	0.1363	-2.42	0.0150	0.3359	0.8915
Political perception index	0.8016	0.1894	-0.94	0.3490	0.5045	1.2737
Constant	0.0000	0.0000	-3.29	0.0010	0.0000	0.0031

Table 4. (continuation)

SE = standard error; Conf. interval = confidence interval

Source: Author's calculations

The results in Table 4 indicate that various factors influence migration intentions depending on where one is in the process of intention formation. Being in the predecisional (intention=1) and preactional (intention=2) versus having no desire at all (intention=0) is correlated with being young, male, having more dependents, and having desire to migrate to other places in the country. A year increase in age decreases the odds of being in predecisional and preactional stages by 25 percent. The relationship between migration intention levels and age appears to exhibit a U-shaped relationship although the square of age is not significant. The odds of forming intention for men are 2.87 times bigger than for women. Also, an increase in the number of dependents increases the odds by 61 percent. Similarly, those with higher propensity to take risks as indicated by their desire to migrate internally (within the country) have odds for migration intentions that are 5.6 greater. The rest of the variables including the migration-related ones and the perceptions of individuals are not significant in the earlier stage of the migration intention process.

The literature noted that it is the more advanced phase of intention formation that can better predict migration behavior. This study, therefore, focused on this phase for a more detailed discussion. The significant variables in being in the preactional phase versus the earlier phases are age and its square, male dummy, number of household co-members who ever migrated, and the satisfaction index. In contrast to the earlier phase, age and migration intentions in the latter stage seem to form an inverse U-shaped relationship. For the increase in age in each year, the odds of being in the preactional stage versus the combined predecisional (1) and no intention phase (0) are 1.71 times greater, with all else being held equal. Although very minimally,

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the odds decrease among relatively older individuals. The square of age in the estimation has an odds ratio of 0.9926.

It indicates that beyond the calculated inflection point of 36.5 years old, a unit increase in age decreases the odds of forming more advanced migration intention by only 0.7 percent. This result appears consistent with the profile of current Filipino labor migrants. Based on 2018 data from the Philippine Statistics Authority, 8 out of 10 labor migrants were aged 15 to 44. Meanwhile, about 20 percent were aged 45 and over. It means that a non-negligible number of Filipino migrant workers either extend their contracts or engaged in new ones beyond prime ages. The result of this study on the influence of age indicates that the trend is likely to continue in the future.

The gender dimension of migration intentions is evident in the latter phase as it is in earlier phases. The odds of becoming more decisive is nine times more for men than for women, with all things being equal. This reflects the need for men to seek job opportunities abroad than settle with what is locally available.

As for the number of dependents, the results show that the more dependents there are in the respondent's household, the more likely that he or she will move for overseas work in the future. This variable, however, is significant only in the earlier stage of intention formation.

It is surprising that in the formation of the individuals' intention to migrate, neither education nor economic condition, as measured by asset index, is significant. This suggests that people form their aspirations regardless of economic stature or educational attainment. In an earlier study of the Philippines case, the years of schooling was found to have a negative correlation with the international migration intentions of individuals (De Jong et al. 1986) although it was in the context of the Philippines-Hawaii migration stream. As such, it was quite different from the labor migration type carried out by people from the village studied in this paper.

The migration experience of individuals (i.e., in years) was also shown to be insignificant in forming intentions. The latter is in contrast with the results drawn by De Jong (2000) and Agadjanian et al. (2008), where prior migration experience is correlated with people's migration plans—that is, the longer they are exposed to international migration, the stronger their decisiveness to migrate again becomes. A slight modification of the full model where migration experience was portrayed as a dummy variable, instead of length in years, was estimated to deeply examine this relationship. Indeed, Appendix 3 shows that having prior migration experience is associated with a higher likelihood to form a more advanced migration intention. Those who experienced international migration in the past, regardless of the length, have odds of formulating more decisive migration intentions eight times more than those who have no migration experience.

Interestingly, migrant networks from outside the person's immediate household are not consistently significant in explaining variations in migration intentions. In contrast, migrant network within the household herein termed as "migration culture" is operationalized as the number of comembers with migration experience, the analyses show that it is positively related with migration intentions but only in the latter stage. For every member increase in household co-members who have ever migrated, the odds of being in preactional stage are 3.77 times greater than those in the predecisional stage (1) and having-no-intention phase (0), ceteris paribus. This result suggests that the intrahousehold migrant network of the person may exert normative influence on him or her and/or is likely to provide resources necessary for migration like information and finances—both of which can make the person more decisive in his or her plans.

While the objective measure of economic status does not seem to influence migration intentions, this study found strong evidence that people's view of their circumstances correlates greatly with their migration plans. Meanwhile, people's perceptions, particularly of their living conditions, matter

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significantly in forming a more decisive intention to migrate internationally. For each unit increase in the satisfaction index, the odds of being in preactional stage (dependent variable=2) versus the predecisional (1) and having no intention phase (0) are lower by 45 percent, ceteris paribus. Individuals who believe that they have not been making enough progress in their living conditions are more likely to form a more decisive intention to migrate. In contrast, a more objective measure of economic wellbeing, asset index, does not significantly explain the variation in people's migration intentions. One can speculate that even those who may have the same economic stature based on their assets can have varying calculations and aspirations that can lead to differences in migration intentions. The differences in subjective perceptions perhaps explain why many people who have supposedly similar propensity to migrate based on their economic status do not end up migrating. This study offers an argument analogous to NELM's relative deprivation, only that the comparison is not with other members of the origin community but with their economic status and overall living conditions during a specified period.

Meanwhile, it is interesting that expectations from wider political and economic conditions do not associate with migration intentions at all, based on this study. This may reflect that wider political context does not easily or readily translate into visible and immediate gains or losses for communities, which can be felt at the grassroots level. Even when people feel optimistic about the outcome of local and national elections, they do not seem to be motivated to formulate plans based on just optimism or perception. This is in contrast with the influence of their perception of their living conditions, which was also tested in this study. It must be noted that the questions used in ascertaining people's perceptions of their country's political landscape pertain to the likely direction, as opposed to what had been done during the past performance of government officials. This is an interesting aspect for further research.

The influence of the variables of interest examined in this study may or may not vary in the analysis of actual migration behavior, which is beyond the scope of this study. The findings provide useful insights to understanding and formulating policies aimed at shaping migration behavior in the future.

CONCLUSION

This paper contributes to the literature that sheds light on the decisionmaking process behind international migration. Using original survey data from individuals from a migrant-sending village in Bataan, Philippines, this paper illustrates that people's migration intentions are nuanced. While some individuals have a more decisive migration plan, others indicated weak desire to seek opportunities abroad in the future. What influences people to form a more mature intention is important to understand migration intention policy-wise. This study found that having more decisive intentions is correlated with age (although nonlinearly), being male, having prior migration experience, presence of household migration culture, and having a low level of satisfaction in the welfare of one's household at the origin. These findings can help support interventions that seek to understand, anticipate, or even shape future migration outflows in the Philippines.

Given the current deployment level of Filipino migrant workers, one can anticipate that the volume of migration outflow in the country will not subside anytime soon. This is because those who have migration experience are likely to continue their migration activities. About half a million newly hired Filipino workers and more than 900,000 re-hires were deployed overseas in 2015 based on Philippine Overseas Employment Agency data (POEA 2015). A great proportion of the people

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comprising this number will likely continue working overseas and influence potential migrants (e.g., their immediate kin) to follow their lead. Despite the feminization of international migration observed in other studies, this study shows that men are more likely to formulate plans of leaving the country for greener pastures abroad. This reflects the need for more decent jobs for men since they have a higher underemployment rate than women, based on national estimates (PSA 2017). This is consistent with the findings of this paper on the influence of the individuals' subjective perceptions. Controlling for human capital and economic wellbeing of the household, how one assesses his or her wellbeing correlates strongly with his decisiveness to migrate. Those who perceive their living conditions as dismal, where there have not been improvements in recent years, are more likely to form intentions and undertake concrete actions toward international migration. In contrast, those who feel more satisfied with their living conditions are less likely to form mature migration intentions.

These results suggest that effective interventions for social inclusion are likely to deter migration intentions at least for people from rural areas like the village of interest. Improving and increasing opportunities that male individuals can take on may prevent them from planning to migrate internationally to look for jobs. If the Philippine government chooses to reduce the flow of labor migration among Filipino workers, it needs to implement or enhance policies and programs that can help produce better economic opportunities especially in rural areas. These efforts must be effective enough to be felt at the grassroots level and visible enough to influence Filipinos' aspirations.

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APPENDICES

		e git i e gi essi e i i		
Variable	Full model	Model 3	Model 4	Model 5
Decisiveness of intentions for international migration				
Individual-level characteristics				
Age, years	0.1306	0.0948	0.1067	0.0897
Age, years (squared)	-0.0026*	-0.0021	-0.0024*	-0.0020
Education, years	0.5714	0.4921	0.4328	0.4425
Education, years (squared)	-0.0186	-0.0153	-0.0122	-0.0128
Male dummy	1.2663***	1.3093***	1.1080***	1.3186***
Household-level characteristics				
Number of dependents in the household	0.1475	0.2292	0.0967	0.2442*
Household asset index	-0.0064	-0.0682	-0.0312	-0.0734
Migration variables				
Desire to migrate internally	1.2340***	1.2465***	-	1.2429***
Migration experience, years	0.0538	0.0624	0.0563	0.0634
Number of household co-members who ever migrated	.41801572*	0.3837	0.3535	0.3952
Migrant network, total	0.0104	0.0010	0.0334	0.0006
<u>Perceptions</u>				
Satisfaction index	-0.3224***	-	-0.3297***	-
Political perception index	-0.0787	-0.1011	-0.0711	-
/cut1	6.3695**	5.5051**	4.4991*	5.1848**
/cut2	7.9493***	7.0405***	5.9967**	6.7158**
Statistics				
chi2	62.1979	52.7241	50.6364	52.8335
Pseudo-R2	0.1895	0.1727	0.1564	0.171
Ν	223	223	223	223

Appendix 1. Robustness check results for ordered logit regressions

Source: Author's calculations

Appendix 2. Results of likelihood-ratio tests

Likelihood-ratio test	LR chi2(1)	Prob>chi2
Model 3 nested within full model	7.03	0.008
Model 4 nested within full model	13.87	0.0002
Model 5 nested within full model	7.77	0.0206

Source: Author's calculations

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Decisiveness of intentions	Odds ratio	P>z				
for international migration						
Having no desire (0) versus being in predecisional (1) and preactional (2)						
Age, years	0.7160	0.0210				
Age, years (squared)	1.0030	0.0990				
Education, years	1.6868	0.3520				
Education, years (squared)	0.9876	0.6400				
Male dummy	2.5032	0.0300				
Number of dependents in the household	1.6329	0.0050				
Household asset index	0.9819	0.8570				
Satisfaction index	0.7814	0.0540				
Political perception index	0.9433	0.6560				
Desire to migrate internally	5.6825	0.0000				
Migration experience, dummy	2.1621	0.1340				
Number of household co-members	0.7242	0.2550				
who ever migrated						
Migrant network, total	1.0784	0.2460				
Constant	9.0328	0.5400				
Having no desire (0) and being in predecisional (1) vers	sus preactional (2)					
Age, years	1.7630	0.0050				
Age, years (squared)	0.9918	0.0030				
Education, years	0.9883	0.9840				
Education, years (squared)	1.0079	0.8040				
Male dummy	8.4267	0.0000				
Number of dependents in the household	0.7105	0.2160				
Household asset index	1.1359	0.5050				
Satisfaction index	0.4905	0.0160				
Political perception index	0.7100	0.1260				
Desire to migrate internally	1.7830	0.3020				
Migration experience, dummy	8.0576	0.0420				
Number of household co-members	2.7981	0.0270				
who ever migrated						
Migrant network, total	0.9063	0.5310				
Constant	0.0000	0.0030				
Pseudo R2	0.35	37				

Appendix 3. Robustness check results for generalized ordered logit regression

Source: Author's calculations



Effect of Supply Chain Integration on Business Performance and Competitiveness of Philippine SMEs

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ABSTRACT

This study aims to determine the relationship of supply chain integration with the performance and competitiveness of small and medium enterprises (SMEs) in the Philippines. A survey of 384 companies was conducted to measure the customer integration, supplier integration, and internal integration of SMEs. Structural equation modelling was used to test the hypotheses. The results show that the internal integration of SMEs strongly influences their business performance or growth and competitiveness. Customer integration directly and indirectly (through internal integration) influences the business performance and competitiveness of SMEs. Accordingly, the effect of supplier integration on business performance (growth) and competitiveness of companies is fully mediated by internal integration.

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INTRODUCTION

In 2016, leaders of the Asia-Pacific Economic Cooperation (APEC) acknowledged the need to create a "development path for APEC technical assistance and capacity building activities that build towards an equitable and inclusive APEC region" (APEC 2016, p.1). To this end, the Small and Medium Enterprises Working Group (SMEWG) laid down its strategic plan for 2017 to 2020. The SMEWG was first established by APEC in 1995 to "encourage the development of small and medium enterprises (SMEs) and to build their capacity to engage in international trade". As such, the trajectory of SMEWG was aimed at enabling SMEs to become more competitive and successful in the global value chain. Committed to promoting "competitive, balanced, inclusive, sustainable, innovative, and secure growth" in the Asia Pacific region, SMEWG identified as its priorities the areas of entrepreneurship, innovation, and the internet and digital economy; financing for business expansion and capability development; inclusive business ecosystem that supports SME growth; and market access for SMEs (APEC 2016, p.2).

The establishment of the ASEAN (Association of Southeast Asian Nations) Economic Community in 2015, however, led to trade liberalization and purportedly made local micro, small, and medium enterprises (MSMEs) more vulnerable to the arrival of new competitors.

In 2018, Philippine MSMEs accounted for 99.52 percent of the total 1,003,111 business enterprises in the country. Of this number, 0.49 percent are medium enterprises, 10.58 percent are small enterprises, and 88.45 percent are microenterprises (DTI 2018a).

To this day, a great number of Philippine MSMEs that export commodities from other regions experience various challenges (International Trade Centre 2016). According to a survey conducted by the International Trade Centre (2016), Philippine MSMEs experience obstacles in the exportation of their products, such as conforming to their partner's regulations (i.e., technical requirements and conformity assessment), complying with government regulations (i.e., export technical measures and export quantity control), and meeting private standards (i.e., certification and other related requirements). Such barriers that often hinder the growth of MSMEs can be addressed by enhancing the organizational resources of businesses and integrating them into the whole supply chain. It is imperative to identify factors of supply chain integration that can contribute to the competitiveness of local firms for them to adapt and flourish in the current business environment.

Supply chain management enhances the competitiveness of companies by integrating their internal functions and linkages with the external operations of their customers, suppliers, and other stakeholders. This can lead to better performance in terms of cost, time, flexibility, and quality (Kim 2009). Integration includes material and product flow from suppliers to consumers. As such, it requires an intra and intercompany integration across the chain for businesses to perform as a single unit (Alfalla-Luque and Medina-Lopez 2009) that is driven by the demand of customers (Farhoomad 2005).

Past studies (Frohlich and Westbrook 2001; Vickery et al. 2003; Moyano-Fuentes 2012) have shown that having a higher level of supply chain integration helps businesses achieve better organizational performance. A study on Vietnam's manufacturers found that supply chain integration positively affected the competitive advantage of companies (Nguyen and Nguyen 2017).

Moreover, supply chain integration among Japanese and Korean firms showed positive effects on their performance (Narasimhan and Kim 2002). According to Sofyalioğlu and Öztürk (2012), however, there were fewer studies that tested the direct relationship between supply chain integration and the performance of businesses.

This study attempts to address gaps in the supply chain integration of SMEs, particularly in the case of the Philippines. It aims to: (1) determine supply chain integration factors that can enhance

the performance and competitiveness of SMEs in the country; (2) show possible impacts of supply chain integration on the performance and competitiveness of SMEs; and (3) aid policymakers in crafting support interventions to help Philippine SMEs compete amid challenges brought by the ASEAN economic integration.

This paper aims to help entrepreneurs and managers improve the utilization of their strategic resources, thereby increasing their level of competitiveness. This study is significant for entrepreneurship education, entrepreneurial support, and entrepreneurship growth of SMEs through supply chain integration as a source of competitive advantage. It contributes to the collective knowledge on resource-based theory and the impact of supply chain integration as a valuable, distinctive, and induplicable resource for firms. Moreover, research emphasis on business competitiveness augmented by supply internal integration, supplier integration, and customer integration is limited. In the case of Philippine SMEs, no empirical study on the said factors has been done yet.

REVIEW OF RELATED LITERATURE AND HYPOTHESIS DEVELOPMENT

Supply chain integration, according to Flynn et al. (2010), is the degree to which firms strategically collaborate with their chain partners and manage inter- and intra-organizational processes. It aims to "achieve effective and efficient flow of services, information, products, money, and decisions in order to offer maximum value to customers" (Flynn et al. 2010, p.59). This leads to reductions in the firms' purchases and distributions or even minimal inventory turnover efficiencies (Christopher 1993). Better customer value is a result of improvements in the strategic performance of companies because supply chain integration allows them to provide their supply chain members with customized products or services that satisfy their needs. Moreover, supply chain partners purchase a higher volume of goods from firms that offer higher customer value (Chen and Dubinsky 2003).

Thus, supply chain integration can help increase a company's sales and market share. Several studies (Ragatz et al. 1997; Frohlich and Westbrook 2001; Lee 2004) emphasized that integration with the downstream customers and upstream suppliers could be advantageous for firms.

Likewise, Flynn et al. (2010) identified internal integration, customer integration, and supplier integration as the three main dimensions of supply chain integration. Often termed as external integration, customer and supplier integration is the degree to which firms collaborate with the external chain to structure their processes, practices, and organizational strategies (Stank et al. 2001).

On the other hand, internal integration focuses on the activities of firms and is the degree to which they structure their processes, practices, and organizational strategies to meet customer requirements (Kingman-Brundage et al. 1995; Cespedes 1996). The structural contingency theory suggests that firms' fit with the external environment leads to consistency in their structure and strategies (Burns and Stalker 1961; Lawrence and Lorsch 1967). As the external environment changes, such as the characteristics of the suppliers and customer, firms should be able to respond by implementing strategies that maintain their fit with the external environment (Hambrick 1983; Kotha and Nair 1995). According to Ketchen and Hult (2007), the best value supply chains are considered an inimitable resource. As a strategic resource, supply chain integration equips firms to be more competitive and attain better organizational performance (Barney 1991). It allows them to excel in their value-added activities while relying on their supply chain partners, which may complement capabilities that they lack (Dyer and Singh 1998; Fawcett et al. 2007; Jin et al. 2013).

Customer integration occurs when firms collaborate with customers to administer downstream organizational activities through joint decisionmaking, information sharing, and collaborative planning.

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It allows firms to integrate information and resources from customers with their decisions and other processes (Vargo 2008). A close relationship with customers enables firms to get accurate demand information, which can help them avoid obsolescence or failure in production planning and product design. It also allows firms to gather data on market needs to have a better design for their goods and services, leading to a higher level of customer acceptability (Griffin and Hauser 1996).

Moreover, it allows firms to build a common understanding with customers and achieve process flexibility (Ettlie and Reza 1992; Scannell et al. 2000; Frohlich and Westbrook 2001; Wong et al. 2011). Customer integration offers an opportunity to leverage on information embedded in the collaboration process, thereby enabling firms to reduce costs, detect demand changes, create more value, and have better operational performance (Scannell et al. 2000; Rosenzweig et al. 2003; Wong et al. 2011). According to Homburg and Stock (2004), customer integration is directly related to customer satisfaction. Thus, it is hypothesized that:

H1.1: Customer integration positively affects the business performance of SMEs.

H1.2: Customer integration positively affects the competitiveness of SMEs.

Supplier integration is the partnership and collaboration of firms with suppliers to manage upstream organizational activities through collaborative planning, information sharing, and joint decisionmaking (Petersen et al. 2003; He et al. 2014). It allows firms to have access to resources from outside the organization in an attempt to decrease transaction costs. It facilitates mutual understanding between suppliers and firms themselves (Petersen et al. 2003).

Sharing information with suppliers empowers firms to have better operational performance and offer customers with products or services that have better quality, becoming more reliable and flexible (Ettlie and Reza 1992; Frohlich and Westbrook 2001; Rosenzweig et al. 2003; Wong et al. 2011; Huo 2012; Prajogo et al. 2012; Ataseven and Nair 2017). According to Flynn et al. (2010), a stronger and more strategic partnership between firms and suppliers help anticipate the needs of the latter and can help both meet their changing requirements. The exchange of information on processes, capabilities, products, and schedule between firms and suppliers can help them improve their delivery performance. Based on the study by Koufteros et al. (2007), supplier integration positively affects the product development of firms as well as their communication with stakeholders and overall performance. Thus, it is hypothesized that:

H2.1: Supplier integration positively affects the business performance of SMEs.

H2.2: Supplier integration positively affects the competitiveness of SMEs.

Internal integration includes joint decisionmaking, collaboration, and information sharing across internal functions, which can lead to streamlined workflows and collaborative decisions among companies (Lau et al. 2010; Wong et al. 2011). Thus, internal integration disrupts functional barriers and allows cooperation among the internal departments of firms to meet customer requirements (Kingman-Brundage et al. 1995; Flynn et al. 2010). It also allows sharing of knowledge across the functional teams of firms (Roth 1996; Caridi et al. 2012), which improve their capability to utilize their internal resources. Study by Saeed et al. (2005) noted the positive relationship between internal integration and process efficiency of firms. Past studies showed that internal integration had a positive effect on the performance and operational outcomes of firms, such as process flexibility, quality, and delivery performance (Narasimhan and Kim 2002; Swink et al. 2007; Lai et al. 2008; Narasimhan et al. 2010; Wong et al. 2011). Thus, it is hypothesized that:

H3.1: Internal integration positively affects the business performance of SMEs.

H3.2: Internal integration positively affects the competitiveness of SMEs.

Moreover, internal integration mediates the effect of external integration on the performance of firms (Sanders and Premus 2005). Study by Stank et al. (2001) showed that the external focus of firms on information, risk collaboration, measurement, and reward had affected their logistical performance through internal collaboration. Firms need to improve business performance by integrating their internal processes with suppliers and customers. Thus, it is hypothesized that:

H4.1: Internal integration mediates the relationship between customer integration and business performance of SMEs.

H4.2: Internal integration mediates the relationship between customer integration and competitiveness of SMEs.

H4.3: Internal integration mediates the relationship between supplier integration and business performance of SMEs.

H4.4: Internal integration mediates the relationship between supplier integration and competitiveness of SMEs.

METHODOLOGY

Sources of data

Snowball and convenience sampling of 1,900 SMEs (upstream and downstream) from various cities and provinces in the Philippines (i.e., Pangasinan, Nueva Vizcaya, Bulacan, Pampanga, National Capital Region [NCR], Rizal, Camarines Sur, Catanduanes, Sorsogon, Aklan, Iloilo, Cebu, Leyte, Davao City, Cotabato City, and General Santos) were conducted. Supply chain managers, directors, business owners, and chief executive officers or presidents were targeted as key informants. The survey questionnaire was distributed to key informants personally and through email. In-person interviews and self-administration were also conducted. Follow-up with key informants through telephone calls and email was done to improve response rate. Meanwhile, 384 out of the 535 responses received were used in this study.

Research instrument

This study utilized subjective evaluation to measure the constructs. The questionnaire was divided into four parts. The first part contains the demographic information of respondents while the second part contains items to measure business performance and competitiveness. Business performance (growth) was measured using Likert scale anchored by much worse (1) to much better (7). On the other hand, competitiveness was measured using Likert scale anchored on strongly disagree (1) to strongly agree (7). The third part contains a set of items that measure customer integration, supplier integration, and internal integration. Likert scales anchored by strongly disagree to strongly agree were used. The fourth part consists of questions on the characteristics of firms such as their age and size based on the number of employees.

Dependent variables

The dependent variables are the perceptual and objective measures of business performance (growth) and competitiveness. In terms of business performance, the respondents were asked to rate from much worse to much better than last year the following items: (1) growth in sales, (2) return on

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sales, (3) growth in return on sales, (4) growth in profit, (5) growth in market share, (6) return on investment, and (7) growth in return on investment (Venkatraman 1989). Competitiveness of firms was assessed using a subjective rating relative to the major industry competitors on a seven-point scale. The items include: (1) in relation to my competitors, my company has higher sales; (2) in relation to my competitors, my company has a larger market share; (3) in relation to my competitors, my company gets a higher level of benefits; (4) in relation to my competitors, my company gets a higher return; (5) in relation to my competitors, customer satisfaction in my company is higher; (6) in relation to my competitors, my company is higher; and (7) in relation to my competitors, my company is technologically superior (Jorge et al. 2015).

Independent variables

Customer integration

Customer integration involves dealing with customers and understanding their needs in the business processes of firms (Thun 2010). It was measured using modified versions of the questions developed by Speakman et al. (1998), Gimenez and Ventura (2005), Flynn et al. (2010), and Alfalla-Luque et al. (2015). The respondents were asked to rate from strongly disagree to strongly agree with the following statements: (1) We are frequently in close contact with our customers; (2) Our customers give us feedback on our quality and delivery performance; (3) Our customers are actively involved in our product design process; (4) We strive to be highly responsive to our customers' needs; (5) Our customers involve us in their quality improvement efforts; (6) We work as a partner with our customers; and (7) We have a quick ordering system with our customers. A seven-point Likert scale was used.

Supplier integration

Supplier integration is defined as having close cooperation with the suppliers of firms (Thun 2010). Given this, the respondents were asked to rate from strongly disagree to strongly agree 17 statements that were modified from Speakman et al. (1998), Ellinger et al. (2000), Gimenez and Ventura (2005), Alfalla-Luque et al. (2015), and Flynn et al. (2016). Among these statements are: (1) We actively engage suppliers in our quality improvement efforts; (2) We maintain cooperative relationships with our suppliers; (3) We help our suppliers improve their quality; (4) Our key suppliers provide input into our product development projects; and (5) We maintain close communications with suppliers about quality considerations and design changes. A seven-point Likert scale was used.

Internal integration

Internal integration was referred to by Kingman-Brundage et al. (1995) and Cespedes (1996) as the degree to which firms structure their own processes, practices, and organizational strategies to meet customer requirements. It was measured using a seven-item scale modified from Speakman et al. (1998), Ellinger et al. (2000), Gimenez and Ventura (2005), Alfalla-Luque et al. (2015), and Flynn et al. (2016) to assess cooperation, information sharing, and joint planning among functional teams of firms. The respondents were asked to rate from strongly disagree to strongly agree the following sample statements: (1) The functions in our company are well integrated; (2) Problems between functions are solved easily in our company; (3) Functional coordination works well in our company; (4) The functions in our company cooperate to solve conflicts between them when they arise; and (5) Our company's departments coordinate for their activities.

As shown in Table 1, all instruments used have reliabilities of greater than 0.70. SME classification or the size of firms served as a control variable to remove confounding effects due to firm size.

Variable	Number of items	Format	Cronbach's Alpha
Growth	7	Likert-type response scales	0.977
Competitiveness	7	Likert-type response scales	0.931
Customer integration	7	Likert-type response scales	0.897
Supplier integration	5	Likert-type response scales	0.872
Internal integration	17	Likert-type response scales	0.969

Table 1. Predictor measures

Source: Authors' calculations

Data analysis

Descriptive data were generated to obtain the general characteristics of respondents. Common method bias was assessed through exploratory factor analysis using principal axis factoring with varimax rotation. Structural equation modelling (SEM) was used to test the hypotheses. SEM estimates interrelated and multiple dependence relationships and can represent unobserved concepts while accounting for measurement error (Hair et al. 2010). The fit of the model was assessed using the Normed Chinormed chi-square (CMIN/df), root mean square error of approximation (RMSEA), and comparative fit index (CFI).

Results

Table 2 summarizes the demographic characteristics of respondents in this study. Firm age ranges from 0.2 years to 88 years old while the number of employees ranges from 1 to 1,000. Female managers or owners comprise 58 percent of the respondents (n=384). The majority of respondents are from the NCR (38.3%) followed by Pampanga (12.2%), Aklan (8.6%), and Cotabato City (8.1%). In terms of business registration status, 45.1 percent are sole proprietorship, 33.1 percent are corporations, and 19 percent are partnerships. In terms of industry classification, 52.6 percent are restaurants, 18.2 percent are engaged in wholesale and retail operations while 11.7 percent are manufacturing.

Demographic information	Minimum	Maximum	Mean
Firm age (years)	0.2	88	14
Number of employees	1	1,000	33
Characteristics	Frequency	Percent	
Gender of owner/manager			
Male	162	42	
Female	222	58	
Location			
Aklan	33	8.6	
Bulacan	2	0.5	
Camarines Sur	27	7.0	

Table 2. Respondent profile (n=384)

Characteristics	Frequency	Percent	
Catanduanes	20	5.2	
Cebu	1	0.3	
Cotabato City	31	8.1	
Davao City	6	1.6	
General Santos	6	1.6	
Iloilo	10	2.6	
Leyte	28	7.3	
National Capital Region	149	38.8	
Nueva Vizcaya	1	0.3	
Pampanga	47	12.2	
Pangasinan	1	0.3	
Rizal	21	5.5	
Sorsogon	1	0.3	
Business Registration Status			
Corporation	127	33.1	
Partnership	73	19.0	
Sole proprietorship	173	45.1	
Others	2	0.5	
Undeclared	9	2.3	
Industry Classification			
Agriculture	1	0.3	
Education	5	1.3	
Electricity/gas/water supply	2	0.5	
Finance	2	0.5	
Fishing	1	0.3	
Health and social work	2	0.5	
Hotel	16	4.2	
Hotel/restaurant	17	4.4	
Manufacturing	45	11.7	
Others	14	3.6	
Real estate	1	0.3	
Restaurant	202	52.6	
Transport, storage, communication	4	1.0	
Wholesale and retail trade	70	18.2	

Table 2. (continuation)

Source: Authors' compilation

Harman's one-factor test shows that the factor with the highest variance (37.82%) does not account for the majority of the variance, and, therefore, a general factor is absent. The variances due to the measurement method do not affect the validity of the results of this study. Multicollinearity is absent

as all variance inflation factors are below 10 (Hair et al. 2010). Discriminant validity, which indicates whether a construct was unrelated with another construct (Hair et al. 2010), was established since the average variance extracted estimates (Table 3) of the constructs were greater than the square of the interconstruct correlations (Table 4).

Construct	Average variance extracted estimate
Growth	0.855
Competitiveness	0.66
Internal integration	0.62
Supplier integration	0.59
Customer integration	0.56

Table 3. Average variance extracted estimates

Source: Authors' calculations

Table 4. Squared interconstruct correlation

	Growth	Competitiveness	Internal integration	Supplier integration	Customer integration
Growth	1				
Competitiveness	0.36	1			
Internal integration			1		
Supplier integration			0.398161	1	
Customer integration			0.465124	0.332929	1

Source: Authors' calculations

The values of the fit indices (Table 5) of the measurement model show a good fit {CFI > 0.90; RMSEA <0.08; CMIN/df < 2.0}. CFI implies how well the estimated model fits compared with alternative baseline model while RMSEA and CMIN/df tell how the theory fits well with the sample data (Hair et al. 2010). All factor loadings of items associated with the constructs have values of at least 0.70 and are significant. Therefore, convergent validity was established. The Cronbach Alphas are over 0.70 and thus construct reliability was successfully verified.

Table 5. Fit indices

	Original	Modified	Structural
CMIN/DF	4.763	1.849	1.922
CFI	0.717	0.960	0.957
RMSEA	0.099 (.097101)	0.047(.04305)	0.049(.045053)
X ²	7835.643	1514.097	1577.911
df	1645	819	821
p	0.000	0.000	0.000

CMIN/DF = minimum discrepancy divided by the degrees of freedom; df = degrees of freedom; CFI = comparative fit index; RMSEA = root mean square error of approximation Source: Authors' calculations

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Model equivalents to confirmatory factor analysis (CFA) models were developed to examine the relationships of the competitiveness and growth of firms with customer integration, supplier integration, and internal integration. Fit statistics of the structural regression model did not differ significantly. Standardized factor loadings were almost the same. Therefore, model equivalence was verified and the measured indicator variables were stable. These support the model validity of the CFA (Hair et al. 2010).

Table 6 shows the standardized structural path estimates. Two structural path estimates are significant at p<0.05 and four structural path estimates are significant at p<0.001 and are in the expected direction. Moreover, internal integration mediates the effects of supplier integration and customer integration on the business performance and competitiveness of firms. The solution of the model produced an acceptable fit.

	Standardized regression Weights-without mediation	Standardized regression Weights-with mediation
Business performance <customer integration<="" td=""><td>0.288**</td><td>0.237*</td></customer>	0.288**	0.237*
Business performance < Supplier integration	-0.061	-0.055
Business performance < Internal integration	0.328**	0.325**
Competitiveness < Customer integration	0.215*	0.160
Competitiveness < Supplier integration	0.000	-0.016
Competitiveness < Internal integration	0.480**	0.484**
Internal integration < Supplier integration		0.372**
Internal integration < Customer integration		0.531**

Table 6. Standardized structural path estimates

* significant at p<0.05

** significant at p<0.001

Source: Authors' calculations

DISCUSSION

The results of this study suggest that internal integration strongly influences business performance (growth, β =0.328, p<0.001) and competitiveness (β =0.480, p<0.001) of SMEs. Moreover, customer integration influences business performance (growth, β =0.215, p<0.05), but not the competitiveness of firms.

However, the effect of supplier integration on the business performance (growth) and competitiveness of companies is fully mediated by internal integration (β =0.372, p<0.001). Meanwhile, the effect of customer integration on business performance (growth) and competitiveness is partially mediated by internal integration (β =0.531, p <0.001). Full mediation implies that supplier integration strongly influences business performance and competitiveness of respondents through its effect on internal integration. On the other hand, partial mediation implies that customer integration directly and indirectly (through internal integration) influences business performance and competitiveness of firms because of internal integration and some other factors not considered in the study.

Customer integration predicts positive (p<0.05) business performance (growth) of SMEs because it allows firms to conduct collaborative planning, information sharing, and joint decisionmaking (Vargo 2008). These integrations enable firms to get accurate demand information from customers and prevent them from failing in production planning and product design.

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Moreover, customer integration allows firms to leverage on the information embedded in collaboration processes, thereby enabling them to reduce costs, create more value for customers, and have better performance (Scannell et al. 2000; Rosenzweig et al. 2003; Wong et al. 2011).

Supplier integration is supposed to induce positive effects on business performance (growth) and competitiveness of firms such as reliable delivery, better product quality, and flexibility (Ettlie and Reza 1992; Frohlich and Westbrook 2001; Rosenzweig et al. 2003; Wong et al. 2011). This study noted the absence of a direct association between supplier integration and business performance (growth) and the competitiveness of firms. While similar studies (Stank et al. 2001; Flynn et al. 2010) showed the same results, this paper has gone further by testing the mediation effect of internal integration on supplier integration and showed that the effect of supplier integration is recognized through internal integration.

Internal integration positively affects the (p<0.001) business performance (growth) and competitiveness of SMEs and this supports other studies conducted by Narasimhan and Kim (2002), Lai et al. (2008), Swink et al. (2007), Narasimhan et al. (2010), and Wong et al. (2011). Internal integration allows cooperation among the internal departments of firms and helps decrease functional barriers (Kingman-Brundage et al. 1995; Flynn et al. 2010), thereby sustain process efficiency (Saeed et al. 2005). Internal integration also mediates the relationship between external integration (suppliers and customers) and the business performance (growth) and competitiveness of SMEs.

CONCLUSION AND POLICY RECOMMENDATIONS

This study was designed to determine the effect of supply chain integration on the growth and competitiveness of Philippine SMEs on a resource-based theory. The majority of the respondents in this study are located in the NCR and are from the foodservice industry, particularly the restaurant sector. The conclusion of this study, therefore, is industry and geography-specific. Moreover, the study used subjective measures on the endogenous and exogenous variables. The empirical findings show that customer integration positively affects the business performance (growth) of firms while internal integration positively affects both the business performance (growth) and competitiveness of the SMEs. While other studies (Huo 2012; Prajogo et al. 2012; Ataseven and Nair 2017) showed a direct relationship between supplier integration and business performance (growth) and competitiveness, this study reveals that the effect of supply chain integration on two variables is realized through the effectiveness of internal integration.

This paper supports the resource-based theory in explaining the business performance (growth) and competitiveness of SMEs in the country that do not have enough resources to be fully integrated into the whole supply chain and thus conceive and implement strategies according to what they think is effective (Miller 1987).

This study found that internal integration significantly affects business performance (growth) and competitiveness. It suggests that firms should structure their internal organizational processes and strategies to meet customer requirements. They should promote collaboration and cooperation across their internal processes to perform better and be more competitive as companies.

Firms can attain internal integration by ensuring functional coordination among their departments, integrating their internal functions and communications, and generating effective operational and production plans.

Moreover, firms should be integrated with their customers to achieve downstream organizational activities, such as information sharing, collaborative planning, and joint decisionmaking.

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Customer integration can be accomplished by getting feedback from the customers on the quality and delivery performance of a firm, involving the customers in the product or service design process, sharing production plans with customers, and making joint decisions with key customers.

This study further implies that all kinds of integration are important but managers should pay attention to internal integration because the effectiveness of customer and supplier integration works through internal integration of firms.

The government can help strengthen the internal integration of SMEs by supporting them in enhancing the application of their management skills such as generating effective operational and production plans. SMEs should be encouraged to use information systems that can fast-track the integration of their internal processes. The government can invest in technologies like enterprise application integration to help firms integrate their processes through sharing of information (Charles et al. 2001; Chen et al. 2011).

Mechanisms for information technology adoptions among businesses should be promoted. The government should have more initiatives to help SMEs catch up with rapid advances in technology. For instance, the government of Taiwan built a national information and communications infrastructure that serves as a platform for information sharing across the supply chain (Wang 1999; Lee and Kim 2007; Chen et al. 2011). The government can also assist in improving the technological know-how and business-to-business digital e-commerce experience of SMEs to augment their international competencies and promote more efficient business transactions and communications in the country (Chen et al. 2011). The Department of Trade and Industry has included in its Micro, Small and Medium Enterprise Development Plan 2017–2022 the promotion of the digital and internet economy under cross-cutting strategies. The plan "welcomes different developments to further pursue its goals by leveraging technological improvements and extending it to all MSMEs" (DTI 2018b, p.35). Moreover, the government should be able to set up an effective mechanism to unify all regulatory bodies in the country and reduce redundancies and excess costs that affect the supply chain performance of firms.

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Possible Effects of China's Belt and Road Initiative on Philippine Trade and Investments

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ABSTRACT

China's "One Belt, One Road" (OBOR) initiative aims to foster connectivity and cooperation among 65 nations. Together, these countries account for about 60 percent of the world's total population and 30 percent of the world's gross domestic product. OBOR, also called the "21st Century Maritime Silk Road", has two main channels that will then connect each other to Europe. These are the land-based Silk Road Economic Belt (One Belt), which connects Xi'an, China, to Rotterdam, Netherlands, and the sea-based Maritime Silk Road (One Road), which connects Venice, Italy, to Fuzhou, China, through the Suez Canal and the Indian Ocean. For countries that have officially signed to participate in OBOR and are located on these channels, the proposed priority areas for cooperation include infrastructure development and connectivity, policy dialogues, unimpeded trade, financial support, and people-to-people exchanges. Using a vector autoregression model, this paper estimates the likely effects of OBOR on Philippine trade and investments.

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INTRODUCTION

In 2013, Chinese President Xi Jinping announced a major policy of the People's Republic of China to build the Silk Road Economic Belt and the 21st Century Maritime Silk Road, referred to as "One Belt, One Road Initiative" (OBOR). The OBOR was renamed as the "Belt and Road Initiative" (BRI) and officially launched in 2015. It primarily aims to develop infrastructures that will link China to more than 60 countries across Asia, Europe, and Africa through two channels: the westward land route through Central Asia to Europe and the southern maritime routes through Southeast Asia to South Asia, Africa, and Europe. The BRI, which covers about 65 countries, is estimated to require a total of USD 5 trillion for infrastructure and investments (Leer and Yau 2016).

The land-based Silk Road Economic Belt (SREB or One Belt) will connect China to Europe (the Baltic Sea) through Central Asia and Russia, to the Persian Gulf and the Mediterranean Sea through Central Asia and Western Asia, and to Southeast Asia, South Asia, and ports in the Indian Ocean. It connects Xi'an, China, to Rotterdam, Netherlands, by building a new Eurasian land bridge and developing the China-Mongolia-Russia, China-Central-West-Asia, and China-Indochina Peninsula economic corridors (Salazar 2016).

The sea-based Maritime Silk Road (MSR or One Road), on the other hand, will link China's coast to Europe through the South China Sea and the Indian Ocean in one route, and from China's coast through the South China Sea to the South Pacific in the other route. It connects Venice, Italy, to Fuzhou, China, through the Suez Canal and the Indian Ocean. Figure 1 shows the map of OBOR.

Historically, the Silk Road and the MSR consisted of a network of maritime and terrestrial trade routes that linked the major civilizations of Asia, Europe, and Africa. These routes were collectively called the "Silk Road" by later generations. The BRI project aims to "enhance connectivity in Asia, Europe, and Africa; facilitate trade flows; and improve regional economic growth and development" (Estrada 2017, p.1).

There are five components of the BRI, namely: (a) policy coordination, (b) facilities connectivity, (c) unimpeded trade, (d) financial integration, and (e) people-to-people exchanges.



Figure 1. The map of One Belt, One Road

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In a bilateral meeting with then Philippine Foreign Affairs Secretary Alan Peter Cayetano in Manila on July 25, 2017, Chinese Foreign Minister Wang Li affirmed the Philippines' participation in China's 21st Century Maritime Silk Road. He noted that the Philippines was historically the first stop of Chinese commercial ships from Fujian province. As such, under the BRI framework, China will help the Philippines build roads and bridges to facilitate better connectivity in the region. Corollary, the Philippines became a full member of the China-led Asian Infrastructure Investment Bank (AIIB), the financial conduit to China's massive infrastructure project. In November 2018, the Philippines and China formally signed a memorandum of understanding on the BRI cooperation (Ranada 2018).

The question, however, is: Will the Philippines benefit from China's OBOR initiative? It is in this context that the paper was conducted. The main purpose of the study is to determine the likely effects of China's OBOR initiative on Philippine economic growth, specifically on the country's trade prospects.

REVIEW OF LITERATURE

The trade engine theory by Arthur Lewis (1980) states that trade is the engine of growth in developing countries where export growth is dependent on income growth. Lewis excluded price competition in his assumption and argued that: "The main linkage between more developed countries (MDC) and less developed economies (LDC) has been MDC demand for LDC primary commodities. This has been a link in terms of physical volume, not much affected by price" (Lewis 1980, p.559).

Traditional trade theories used the notion of comparative advantage by David Ricardo, which was later modified by Heckscher and Ohlin's factor endowments theory (Appleyard et al. 2017), rather than of competitive advantage or competitiveness. However, new trade economists argued that comparative advantage based on factors of production or endowments was insufficient to explain a country's patterns of trade. In particular, Michael Porter (1992) proposed the national competitive advantage theory, pointing out that "competitiveness is a function of dynamic progressiveness, innovation, and an ability to change and improve" (Porter 1992, p.40). For Porter, the most important concept of competitiveness is productivity, in which each nation's resources are employed.

Similarly, Krugman (1990) argued that competitiveness was simply productivity. "Productivity isn't everything, but in the long run, it is almost everything. A country's ability to improve in the standard of living over time depends almost entirely in its ability to raise its output per worker" (Krugman 1990, p.9).

Porter's approach to productivity was simplified in his argument, "Competitive advantage is created and sustained through a highly localized process" (Porter 2008, p.171).

Under the BRI framework, unimpeded trade is one component seen to stimulate economic growth through the connectivity of countries and regions along the Belt and Road. A key factor in achieving connectivity and growth is the construction of international trade pivot cities along the Belt and Road. These cities will be built based on stages of development, resources, and social institutions (RDCY 2016).

The construction of international trade pivot cities was anchored on the theory of regional (and urban) competitiveness by Michael Storper (1997). He defined "place competitiveness" as: "The ability of an (urban) economy to attract and maintain firms with stable or rising market share in an activity while maintaining or increasing standards of living for those who participate in it" (Storper 1997, p.20).

In his book, *The competitive advantage of the inner city*, Porter's theory of cities (Porter 1995) was formulated as follows: Cities are the best place to generate clusters. Porter (1998, p.78) defines clusters as "geographic concentrations of interconnected companies and institutions in a particular field".

Clusters increase competitiveness through higher productivity, innovation, and establishment of new businesses in cities. Porter also cited the relative importance of national governments and interest groups.

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In this sense, the Belt and Road can only be an effective and efficient road when each international trade pivot city is competitive.

Harry Grosveld (2002) cited the determinants of "citymakers" as trade and traffic, production and services, international organization, transnational corporations, and finances, among others. Similarly, the Chinese government used five key indicators in its selection of international trade pivot cities, namely: the annual amount of financing, annual average gross domestic product (GDP), port handling capacity, daily trading volume in exchange markets, and value of foreign transit trade.

The endogenous growth model by Romer (1986) and Lucas (1988) posits that economic growth is generated by factors affecting technology and capital stock. Hence, technology and knowledge spillovers are key mechanisms that link international trade and endogenous growth. Grossman and Helpman (1991) argued that trade can boost a country's research and development by transmitting technological information, increasing competition and entrepreneurial effort, and expanding the market size in which innovative firms can operate.

Trade transactions oftentimes lead to transnational investments, specifically those where parent companies are located. The efforts of China in building the BRI with other countries have stimulated new trends in international investment on infrastructures and those investments driven to build international trade pivot cities. The foreign direct investment (FDI) development cycle theory argues that the orientation of FDI is determined by the development cycle of the host or recipient country and its ownership, internationalization, and regional advantages.

Villafuerte et al. (2016) made one of the first quantitative studies to estimate the potential impact of the OBOR initiative on trade and growth using the global trade analysis project model. Using the assumptions of weighted 25-percent reduction in land transport margin and weighted 5-percent reduction in sea transport margin, the empirical results indicate small GDP impact ranging from 0.19-percent increase in GDP growth in Mongolia to 0.01-percent increase in China and Central Asia. Southeast Asia recorded a 0.01-percent growth in GDP. Improving the transport network and trade facilitation in countries along the OBOR route could lead to an increase in welfare from about USD 6 billion to about USD 100 billion. Total exports could increase USD 5 billion to USD 135 billion.

There are limited articles (both qualitative and quantitative) on the possible effect of China's OBOR on Philippine trade and most of which are very descriptive in nature. As an example, Estrada (2018, p.7) wrote about the implications of OBOR for the Philippines but only generally concluded that the MSR will have more impact on the Philippines as it "deals with port network development project". Rabena (2018, p.683), meanwhile, noted that since BRI "came into being, most analyses have largely focused on infrastructure development", emphasizing limited studies on the matter. It is emphasized in the existing studies that there are no estimates of how much the Philippines will gain in terms of trade and investments as a result of its OBOR participation.

RESULTS AND ANALYSIS

To explain how the Philippine GDP, capital stock, FDI, and trade openness affect each other, we estimated a vector autoregressive (VAR) model using the autoregressive distributed lag (ARDL) cointegration technique with an augmented Cobb-Douglas production function as a theoretical basis.³

³ In the presence of cointegration, an error-correction term needs to be introduced to estimate a vector error correction model (VECM). Estimating an ARDL and an error correction model (ECM) requires that no series is integrated of order 2 or higher to avoid spurious results. For purposes of this paper, the Pesaran et al. (2001) ARDL bounds testing approach for cointegration was applied as it accommodates combinations of *I*(0) and *I*(1) variables in the test. These tests are discussed in detail in Appendices 2 and 3. Appendix 4 discusses the VECM used in this paper.

The full static regression model used in this paper is given by the following equation:

$$GDP_t = AK_t^{\alpha} FDI_t^{\beta} TRADE_t^{1-\alpha-\beta},$$

where *GDP* denotes per-employee output, *K* total capital per employee, *FDI* foreign direct investments per employee, and *TRADE* trade openness (sum of imports and exports divided by output). *t* is the index corresponding to time $t = \{1, 2, \dots, T\}$. Here, we assume constant returns to scale.

For countries that have officially signed to participate in OBOR and are located on these channels, the following proposed priority areas for cooperation are expected to improve: infrastructure development, policy dialogue, infrastructure connectivity, unimpeded trade, financial support, and people-to-people exchanges. Because of the Philippines' geographical location (no common border with any country), there is little incentive for any economic agent to facilitate funding for the country's infrastructure development and connectivity (possible channels through which capital could be increased). Furthermore, in our production function, financial support could loosely be associated with *FDI*, while policy dialogue, unimpeded trade, and people-to-people exchanges could have positive effects with *TRADE*.

Taking the natural logarithms, we estimate the regression model by

$$\ln GDP_t = \hat{\beta}_0 + \hat{\beta}_1 \ln K_t + \hat{\beta}_2 \ln FDI_t + \hat{\beta}_3 \ln TRADE_t + \varepsilon_t$$

where $\hat{\beta}_1$, $\hat{\beta}_2$, $\hat{\beta}_3$ are elasticities, and ε_t is normally distributed error term with mean and variance σ^2 .

To run the models, annual Philippine time-series data from years 1981 to 2014 were used. GDP per worker (*GDP*), capital stock per worker (*K*), and foreign direct investment—net inflows per worker (*FDI*) are in constant 2011 USD, while trade openness (*TRADE*) is expressed as a percentage of real *GDP*. *GDP*, *K*, and employment data were from the Penn World Table 9.0 while *FDI*, imports, and exports data were taken from the World Bank's World Development Indicators.

Due to the presence of cointegration (as shown in Appendix 4), we used vector error correction models (VECMs) in our analysis. These are given by the following specifications:

$$\Delta \ln GDP_{t} = \beta_{1}ECT_{t-1} + \alpha_{01} + \sum_{i=1}^{q_{11}} \alpha_{11i} \Delta \ln GDP_{t-i} + \sum_{i=0}^{q_{21}} \alpha_{21i} \Delta \ln K_{t-i} + \sum_{i=0}^{q_{31}} \alpha_{31i} \Delta \ln FDI_{t-i} + \sum_{i=0}^{q_{41}} \alpha_{41i} \Delta TRADE_{t-i} + \varepsilon_{1t}$$
(1)

$$\Delta \ln K_t = \alpha_{02} + \sum_{\substack{i=0\\q_{42}\\q_{42}}}^{q_{12}} \alpha_{12i} \Delta \ln GDP_{t-i} + \sum_{\substack{i=1\\i=1}}^{q_{22}} \alpha_{22i} \Delta \ln K_{t-i} + \sum_{\substack{i=0\\i=0}}^{q_{32}} \alpha_{32i} \Delta \ln FDI_{t-i} + \sum_{\substack{i=0\\i=0}}^{q_{42}} \alpha_{42i} \Delta TRADE_{t-i} + \varepsilon_{2t}$$

(2)

$$\Delta \ln FDI_{t} = \beta_{2}ECT_{t-1} + \alpha_{03} + \sum_{i=0}^{q_{13}} \alpha_{13i} \Delta \ln GDP_{t-i} + \sum_{i=0}^{q_{23}} \alpha_{23i} \Delta \ln K_{t-i} + \sum_{i=1}^{q_{33}} \alpha_{33i} \Delta \ln FDI_{t-i} + \sum_{i=0}^{q_{43}} \alpha_{43i} \Delta TRADE_{t-i} + \varepsilon_{3t}$$
(3)

$$\Delta TRADE_{t} = \alpha_{04} + \sum_{i=0}^{q_{14}} \alpha_{14i} \Delta \ln GDP_{t-i} + \sum_{i=0}^{q_{24}} \alpha_{24i} \Delta \ln K_{t-i} + \sum_{i=0}^{q_{34}} \alpha_{34i} \Delta \ln FDI_{t-i} + \sum_{i=1}^{q_{44}} \alpha_{44i} \Delta TRADE_{t-i} + \varepsilon_{4t}$$
(4)

Table 1 presents estimates for these models. The equations for capital and trade openness have F values of more than 10 percent. This means that the null hypothesis wherein all coefficients are jointly equal to 0 cannot be rejected, leading us to exclude the equations for capital and trade openness in our analysis. For estimates of equation 1, we can see that capital stock, FDI, and trade openness have significant positive effects on GDP.

Table 1. Estimates of equations 1 to 4

	$y = \Delta \ln GDP_t$ (Eq. 1)	$y = \Delta \ln K_t$ (Eq. 2)	$y = \Delta \ln FDI_t$ (Eq. 3)	$y = \Delta TRADE_t$ (Eq. 4)
ECT_{t-1}	-0.2658***	-	-0.8105***	-
	(0.0618)		(0.2212)	
$\Delta \ln GDP_t$	-	0.2147**	12.5582***	19.5400*
		(0.0952)	(2.9993)	(10.4770)
$\Delta \ln GDP_{t-1}$	0.3929***	-	-	-14.5176
	(0.1321)			(9.2248)
$\Delta \ln K_t$	0.7323***	-	-5.8069	-0.4988
	(0.2237)		(5.4091)	(16.3135)
$\Delta \ln K_{t-1}$	-	-0.1952	-	-
		(0.2278)		
$\Delta \ln FDI_t$	0.0295***	-0.0074	-	-0.5767
	(0.0070)	(0.0064)		(0.5008)
$\Delta \ln FDI_{t-1}$	-	-	-0.0575	-
			(0.1714)	
$\Delta TRADE_t$	0.0065**	0.0002	-0.0409	-
	(0.0029)	(0.0027)	(0.0662)	
$\Delta TRADE_{t-1}$	-	-	-	-0.0682
				(0.1963)

	$y = \Delta \ln GDP_t$	$y = \Delta \ln K_t$	$y = \Delta \ln F D I_t$	$y = \Delta TRADE_t$
	(Eq. 1)	(Eq. 2)	(Eq. 3)	(Eq. 4)
Constant	-3.2569	0.0101	63.3190	0.4896
F	0.0000	0.1198	0.0034	0.2651
R^2	0.7518	0.2379	0.5913	0.2164
DW Stat	1.5715	1.7569	1.7434	1.7838

Table 1. (continuation)

Note: *** p < 0.01; ** p < 0.05; * p < 0.10

GDP = gross domestic product; FDI = foreign direct investment; TRADE = trade openness;

K = capital stock; ECT = Error Correction Term

Source: Authors' calculations

Thus, GDP can be modeled by the following equation:

$$\begin{split} \Delta \ln GDP_t &= -0.2658ECT_{t-t} + 0.3929 \Delta \ln GDP_{t-1} + 0.7323 \Delta \ln K_t + 0.0295 \Delta FDI_t \\ &+ 0.0065 \Delta \text{TRADE}_t - 3.2569 \end{split}$$

Table 2 presents the diagnostic results for equation 1. We can see that equation 1 is well-specified as we have ruled out the presence of heteroscedasticity, autocorrelation, and non-normal residuals. Furthermore, Figures 2 and 3 show that the coefficients of equation 1 are stable at the 5-percent level, with the CUSUM and CUSUMSQ plots falling inside the 5-percent confidence band. It is worth noting that sometime 2005–2006 in Figure 2, the plot slightly went beyond the band. However, with distance this small, it is safe to assume that the plot is still stable within the 10-percent interval.

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Test		<i>p</i> -value fo		
	Equation 1	Equation 2	Equation 3	Equation 4
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity	0.3728	0.6528	0.0283	0.9655
Breusch-Godfrey LM test for autocorrelation	0.2913	0.6319	0.4368	0.3355
Jarque-Bera normality test	0.3394	0.2650	0.9173	0.0000

Table 2. Results of diagnostic tests for detection of heteroskedasticity, serial correlation, incorrect functional form, and omitted variable for equations 1 to 4

Source: Authors' calculations





Source: Authors' calculations

Figure 3. CUSUMSQ test on Equation 1



Source: Authors' calculations

However, to correctly interpret the elasticities with respect to each explanatory variable, we have to take into account the value of the error correction term, which, in this case, is -0.2658. These elasticities are presented in Table 3.

Variable	Short-run elasticity	Interpretation	Long-run elasticity	Interpretation
Capital (K)	0.7323%	Inelastic	7.5843%	Elastic
FDI	0.0285%	Inelastic	0.4187%	Inelastic
Trade openness	0.0065%	Inelastic	-0.0542%	Inelastic

Table 3. Short- and long-run elasticities of output

FDI = foreign direct investment; K = capital stock

Source: Authors' calculations

As expected, capital stock, which includes transport, energy, and information and communications technology infrastructure, has the biggest effect on GDP. In the short run, a 1-percent increase in total capital stock could lead to a 0.7323-percent increase in output, while in the long run, a 1-percent increase in total capital stock could lead to a 7.5843-percent increase in output. On the other hand, a 1-percent increase in FDI only leads to a 0.0285-percent increase in GDP in the short run, and 0.4187-percent in the long run. Finally, TRADE, the sum of imports and exports relative to GDP, has a short-run elasticity of 0.0065 percent and a long-run elasticity of -0.0542 percent. We note that the long-run elasticities are significant at the 1-percent level for both total capital stock and FDI while the long-run elasticity for trade openness is significant only at the 10-percent level. Capital and trade openness, on the other hand, have no effect on FDI as seen from the estimates of equation 4.

CONCLUSION AND POLICY IMPLICATIONS

Villafuerte et al. (2016) explained that participating in OBOR results to (1) a 5-percent reduction in international road transport margin, plus (2) improvements in trade facilitation. On top of this, there is an expected increase in infrastructure spending since it is consistent with the Philippine government's infrastructure development plan (Estrada 2017). This leads the researchers to assume that there would be an increase in capital, FDI, and trade. Since the (positive) GDP elasticity with respect to capital and FDI outweigh the (negative) GDP elasticity with respect to trade, there would be expected net gains from the country's OBOR participation.

China was the third major export market of the Philippines, according to the Philippine Statistics Authority (PSA 2018). In October 2018, the Philippines exported 13.2 percent of its total exports to China valued at USD 804.53 million. Hence, the government should maximize the Philippines' potential benefits from the BRI by giving incentives to investors in the local manufacturing sector, specifically to its relative comparative advantage good to China—machineries and electronics—which comprised 51 percent of the country's total exports to China in 2018 (World Bank 2020). Fiscal incentives can include income tax holiday, tax credit on raw materials, supplies and semi-manufactured goods, and duty-free importation of capital equipment, spare parts, and accessories. The government should also improve its trade facilitation measures particularly in infrastructure (i.e., land, sea, and air) to help develop the supply value chain between the Philippines and China including other countries in Asia involved in the global supply network. Furthermore, should the Philippine government want to have positive trade impacts, then it must develop the country's port network infrastructures to better facilitate trade flows.

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APPENDICES

Appendix 1. Unit root test

To check for stationarity of the series in the model, both the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) Tests are used. The ADF test equation is of the form

$$\Delta Y_t = \alpha + \phi t + \psi Y_{t-1} + \sum_{i=1}^{\kappa} \gamma_i \Delta Y_{t-i} + e_t$$

where *Y* is the dependent variable, *t* is a linear time trend, Δ is the first difference operator, and e_t is a white noise error term (Alam 2012; Tam 2013; Hasanov et al. 2016). A unit root exists when the null hypothesis $H_0: \psi = 0$ is rejected. The PP test equation, on the other hand, is very similar to the ADF, and the "only difference in the PP test to the ADF test is that it uses non-parametric statistical methods, rather than lags of the dependent variable to correct for the serial correlation problem in the residuals" (Hasanov et al. 2016, p.11). Appendices 2 and 3 present the results. It can be seen that all series are I(1).

Appendix 2. t-stat and critical values using the ADF test

Variable	Level		First difference (ΔX_i)	
(X_i)	<i>t</i> -stat	CV	<i>t</i> -stat	CV
ln GDP	-1.141ª	-3.568 ^b	-3.477ª	-3.223 ^c
ln K	-1.392ª	-3.568 ^b	-6.957ª	-3.572 ^b
ln <i>FDI</i>	-3.288ª	-3.568 ^b	-8.474ª	-3.572 ^b
TRADE	-1.874ª	-3.568 ^b	-6.849ª	-3.572 ^b

 $^{\rm a}$ Test equation with constant and trend, $^{\rm b}{\rm CV}$ at 5%, $^{\rm c}{\rm CV}$ at 10%.

AFD = Augmented Dickey Fuller; CV = critical values; GDP = gross domestic product; K = capital stock; FDI = foreign direct investment; TRADE = trade openness

Source: Authors' calculations

	Appendix 3.	t-stat and	and critical	values u	ising the	PP test
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Variable	Level		First difference $(\Delta \ln X_i)$	
(X_i)	<i>t</i> -stat	CV at 5%	<i>t</i> -stat	CV at 5%
ln GDP	-1.706	-3.568 ^b	-3.461	-3.223°
ln K	-1.313	-3.568 ^b	-7.219	-3.572 ^b
ln FDI	-3.466	-3.568 ^b	-9.062	-3.572 ^b
TRADE	-1.951	-3.568 ^b	-6.880	-3.572 ^b

^a Test equation with constant and trend, ^b CV at 5%, ^c CV at 10%.

PP = Phillips-Perron; CV = critical values; GDP = gross domestic product; K = capital stock;

FDI = foreign direct investment; TRADE = trade openness

Source: Authors' calculations

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Appendix 4. ARDL Bounds Testing Approach to Cointegration

As all variables have been shown to be I(1), the following ARDL models of order $(q_{1j'}q_{2j'}q_{3j'}q_{4j})$, j=1,2,3,4, will be used, following Belloumi (2014):

$$\Delta \ln GDP_{t} = \beta_{01} + \beta_{11} \ln GDP_{t-1} + \beta_{21} \ln K_{t-1} + \beta_{31} \ln FDI_{t-1} + \beta_{41}TRADE_{t-1} + \sum_{\substack{i=1\\q_{41}\\q_{41}}}^{q_{11}} \alpha_{11i} \Delta \ln GDP_{t-i} + \sum_{\substack{i=0\\i=0}}^{q_{21}} \alpha_{21i} \Delta \ln K_{t-i} + \sum_{\substack{i=0\\i=0}}^{q_{31}} \alpha_{31i} \Delta \ln FDI_{t-i} + \sum_{\substack{i=0\\i=0}}^{q_{41}} \alpha_{41i} \Delta TRADE_{t-i} + \varepsilon_{1t}$$

$$\Delta \ln K_{t} = \beta_{02} + \beta_{12} \ln GDP_{t-1} + \beta_{22} \ln K_{t-1} + \beta_{32} \ln FDI_{t-1} + \beta_{42}TRADE_{t-1} + \sum_{\substack{i=0\\i=0}}^{q_{12}} \alpha_{12i} \Delta \ln GDP_{t-i}$$
(A1)

$$+ \sum_{i=1}^{q_{22}} \alpha_{22i} \Delta \ln K_{t-i} + \sum_{i=0}^{q_{32}} \alpha_{32i} \Delta \ln FDI_{t-i} + \sum_{i=0}^{q_{42}} \alpha_{42i} \Delta TRADE_{t-i} + \varepsilon_{2t}$$
(A2)

$$\Delta \ln FDI_{t} = \beta_{03} + \beta_{13} \ln GDP_{t-1} + \beta_{23} \ln K_{t-1} + \beta_{33} \ln FDI_{t-1} + \beta_{43} TRADE_{t-1} + \sum_{i=0}^{q_{13}} \alpha_{13i} \Delta \ln GDP_{t-i} + \sum_{i=0}^{q_{23}} \alpha_{23i} \Delta \ln K_{t-i} + \sum_{i=1}^{q_{33}} \alpha_{33i} \Delta \ln FDI_{t-i} + \sum_{i=0}^{q_{43}} \alpha_{43i} \Delta TRADE_{t-i} + \varepsilon_{3t}$$
(A3)

$$\Delta TRADE_{t} = \beta_{04} + \beta_{14} \ln GDP_{t-1} + \beta_{24} \ln K_{t-1} + \beta_{34} \ln FDI_{t-1} + \beta_{44} TRADE_{t-1} + \sum_{\substack{i=0\\q_{44}}}^{q_{14}} \alpha_{14i} \Delta \ln GDP_{t-i} + \sum_{\substack{i=0\\i=0}}^{q_{24}} \alpha_{24i} \Delta \ln K_{t-i} + \sum_{\substack{i=0\\i=0}}^{q_{34}} \alpha_{34i} \Delta \ln FDI_{t-i} + \sum_{\substack{i=1\\i=1}}^{q} \alpha_{44i} \Delta TRADE_{t-i} + \varepsilon_{4t}$$
(A4)

where $\ln(\cdot)$ is the natural logarithm operator, β 's and α 's are parameters, and ε are normally distributed error terms with mean 0 and variance σ_{ε}^2 . The values for the lags $q_{1j}, q_{2j}, q_{3j}, q_{4j}$ were chosen by using the Akaike information criteria (AIC).

The terms with the β_{lj} (l, j = 1,2,3,4,5) coefficients give us the long-run relationship between the variables, while the terms with the α_{lj} 's represent the short-run relationship. For each of equations A1 to A4, the null hypothesis H_0 : $\beta_{l1} = \beta_{l2} = \beta_{l3} = \beta_{l4} = 0$ will be tested against the alternative hypothesis H_1 : $\beta_{l1} \neq 0$ or $\beta_{l2} \neq 0$ or $\beta_{l3} \neq 0$ or $\beta_{l4} \neq 0$ using the *F*-test whose critical values (CV_F) are provided by Pesaran et al. (2001). Failure to reject the null hypothesis (*F*-stat less than CV_F) would mean that there is no cointegration among the variables. For k = l = j, the β_{kk} coefficients are interpreted as the *speed of adjustment* (speed at which the dependent variables return to equilibrium after a shock in the explanatory variables). For the model to converge in the long-run, these β_{lj} 's have to be significantly different from 0 (*t*-stat less than CV_t) and are in the set (-1,0). The critical values (CV_t) also provided by Pesaran et al. (2001) should be used in determining the significance of the speed of adjustment.

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Appendix 5 presents the critical values from Pesaran et al. (2001), where the *F*-stat and *t*-stat of the estimated ARDL $(q_{1j}, q_{2j}, q_{3j}, q_{4j})$ for equations A1 to A4 will be tested against. Appendix 6 presents the results of the ARDL bounds test for cointegration. For equations that showed no cointegration, we may use an ARDL model with no long-run component in our analysis.

Appendix 5. Critical values at different levels of significance						
Test	Critical values					
	10%	5%	1%			
F	3.77	4.35	5.61			
t	-2.57	-2.86	-3.43			

Appendix 5. Critical values at different levels of significance

Source: Authors' calculations

Appendix 6. Results of the bounds test

Dep. var	$ARDL(\boldsymbol{q}_{1i}, \boldsymbol{q}_{2i}, \boldsymbol{q}_{3i}, \boldsymbol{q}_{4i})$	F-stat	t-stat	Findings
∆ ln <i>GDP</i>	ARDL(2,2,0,1)	5.895	-3.748	Reject null hypothesis (i.e., there is cointegration)
∆ ln K	ARDL(2,1,0,0)	2.393	-1.719	Fail to reject null hypothesis (i.e., there is no cointegration)
Δ ln <i>FDI</i>	ARDL(1,0,1,1)	7.603	-5.226	Reject null hypothesis (i.e., there is cointegration)
TRADE	ARDL(2,0,1,1)	1.655	-0.683	Fail to reject null hypothesis (i.e., there is no cointegration)

Dep. var = Dependent variable; ARDL = autoregressive distributed lag; GDP = gross domestic product; K = capital stock; FDI = foreign direct investment; TRADE = trade openness Source: Authors' calculations



Enhancing the Philippine Legal, Regulatory, and Policy Framework for Distributed Energy Resources

Luther D. Ramos¹

ABSTRACT

This paper provides recommendations to shape suitable and appropriate legal, regulatory, and policy responses to emerging trends in the global electricity sector characterized by high levels of distributed energy resources (DERs).

In particular, it seeks to address the question: "How can the existing Philippine legal and regulatory framework be enhanced to prepare for an electricity future driven by decentralization, electrification, and digitization, and particularly characterized by high levels of DERs?"

This paper reviews the existing Philippine legal and regulatory framework relating to DERs especially for distributed generation, micro or minigrid systems, and energy storage. It aims to determine if the country's current regulatory framework can promote innovation and adequately support the integration of DERs by optimizing its benefits and minimizing potential disruptions in its deployment.

Existing literature on international responses to advancements in the deployment of DERs were examined to identify risks and mistakes, lessons learned, and best practices to adapt to emerging trends in the sector. Based on the analysis, this paper formulates guiding principles and legal, regulatory, and policy responses to foster an environment where the potentials of DERs are maximized.

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INTRODUCTION

Energy transition and related legal and regulatory issues

Fostering energy transition

The World Economic Forum (WEF)² publication titled "Fostering Effective Energy Transition" sums up the current state of the world's energy systems, which says: "Globally, energy systems are experiencing unprecedented change, driven by a blend of technological innovation, changes in supply dynamics, consumption patterns and policy shifts" (WEF 2018, p.8).³

This change, referred to as energy transition, is further described by the International Renewable Energy Agency (IRENA), as a "pathway toward transformation of the global energy sector from fossil-based to zero-carbon by the second half of the century" (IRENA 2020, Overview). Given the unprecedented changes in the energy sector, it is important to accelerate improvements in the country's energy systems and seize opportunities from energy transition. Thus, this research paper seeks to respond to the question: "What measures can enhance the existing Philippine legal and regulatory framework to prepare for an electricity future driven by decentralization, electrification, and digitization, particularly characterized by high levels of distributed energy resources (DERs)?"

This paper reviews the existing Philippine legal and regulatory framework and provides recommendations to shape suitable and appropriate responses to emerging energy trends on decentralization, electrification, and digitization of electricity system best exemplified by DERs. It focuses on enhancements required in the Philippine legal and regulatory framework for the following DER systems: (1) distributed generation, (2) micro or minigrids, and (3) energy storage. This paper does not cover energy efficiency and demand response—two other types of DERs that merit separate research considering their broader scope and complexity. The recommended enhancements aim to provide consistent and stable regulatory treatment for prospective DER providers while ensuring that system costs, including stranded costs, are fairly addressed, creating an enabling regulatory environment that adequately supports the integration of DERs and innovation in the electrical system.

Related legal and regulatory issues

A decentralized energy system seeks to locate power sources closer to the site of energy consumption (UNESCAP n.d.). As such, it offers an alternative to the traditional grid-to-deliver power system and is relevant in providing energy access in remote locations (WEF 2018). Electrification, on the other hand, is essential for long-term carbon reduction goals aimed at achieving international commitments such as the Paris Agreement,⁴ which set out a global response to reduce greenhouse gas emissions. The challenges brought about by decentralization and electrification, particularly

²The WEF is an international organization that "engages the foremost political, business, cultural and other leaders of society to shape global, regional and industry agendas" (https://www.weforum.org/about/world-economic-forum).

³ Energy systems refer to diverse stakeholders, various energy sources, and all energy-consuming sectors that support society in the three dimensions of the energy triangle, namely: "(1) inclusive economic development; (2) environmental sustainability; and (3) secure and reliable access to energy" (WEF 2018, p.9).

⁴ The Paris Agreement is a landmark agreement by the parties to the United Nations Framework Convention on Climate Change to "strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius" (https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement).

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the handling of new demands and the increasing number of generators, can be managed through digitalization, which offers solutions in a smart way (IRENA 2020). Digitalization allows for open, real-time, automated communication and operation of a more efficient energy system (WEF 2018).

These emerging energy trends are exemplified by the increasing deployment of DER systems. While there are several definitions of DER, this paper adopts the definition of DER by the National Association of Regulatory Utility Commissioners (NARUC)⁵ of the United States, as a "resource sited close to customers that can provide all or some of their immediate electric and power needs and can also be used by the system to either reduce demand (such as energy efficiency) or provide supply to satisfy the energy, capacity, or ancillary service needs of the distribution grid. The resources, if providing electricity or thermal energy, are small in scale, connected to the distribution system, and close to load" (NARUC 2016, p.45).

DERs, therefore, include: (1) distributed generation (including solar photovoltaic [PV] and wind), (2) energy storage, (3) demand response, (4) energy efficiency, and (5) microgrids. While the deployment of DERs offers enormous advantages to the electricity system, it can cause significant issues for traditional ratemaking, utility models, and the delivery of electricity (NARUC 2016). Among other concerns in deploying DERs are the following:

1. Cost-shifting – to cover the consequential loss in system revenue, utilities may shift some costs to customers who are not able to install DERs;

2. Added requirement for physical and technical costs to the system – more resources connected to the grid, particularly renewable energy sources, may require utilities to invest in new infrastructures for system reinforcement, resulting in increased costs for all consumers; and

3. Stranding of existing assets – DERs may render parts of the existing energy system not necessary in the future and may be retired early. Regulators need to ensure the recovery of the costs associated with these stranded assets (Sommerville et al. 2016).

Addressing these issues and responding to the changes represented by DERs require enhancing existing utility regulation (NARUC 2016). The Philippines has to fast-track the enhancement and revision of its existing legal, regulatory, and policy framework to achieve the full benefits of DERs for electricity end-users and utilities alike.

Enhancements to the legal and regulatory framework

Considering the innovative advancements in the electricity sector and the changes in consumption patterns, supply dynamics, and policy shifts, much work needs to be done to enhance the Philippine electricity regulatory framework during possible energy transition. For this purpose, Philippine regulators like the Department of Energy (DOE) and the Energy Regulatory Commission (ERC) must take stock and gain valuable insights from the experience of other jurisdictions and the current international efforts in regulating energy systems related to DERs.

Calibrating a proper response to energy transition is a challenging task, particularly for a country like the Philippines, whose archipelagic geography consists of 7,641 islands including remote island communities (NAMRIA 2017). This raises "unique challenges in terms of energy access and electrification" for the country because extending the power grid to remote areas is often unviable (IRENA 2017).

The deployment of DERs seems a viable solution to these challenges. The costs of renewable energy resources, which can power distributed generation, have dramatically fallen in recent years

⁵ NARUC represents the State public service commissions that regulate utilities such as energy, telecommunications, power, water, and transportation (NARUC n.d.).

and continue to decline today. The cost of battery energy storage systems has likewise lowered while necessary technologies are improving (IRENA 2017).

Distributed generation

Distributed generation (DG) refers to a variety of technologies that generate electricity at or near where it will be used (US EPA 2018). As such, DG may serve a single structure, or as part of a microgrid, e.g., a military base, a large college campus, or a major industrial facility (US EPA 2018).

In the Philippine context, DG refers to a "system of small generation entities supplying directly to the distribution grid, any one of which shall not exceed 100 kilowatts (kW) in capacity" (Republic Act [RA] 9513). It allows customers to (1) generate electricity primarily for their own use, (2) sell or feed any excess power generation to the distribution system, and (3) draw power from the distribution system when the onsite facility does not fully meet their needs. Consequently, DG helps end-user save on electricity costs and earn additional revenue for any excess power injected into the grid. Moreover, DG can help deliver clean and reliable power while reducing electricity losses along transmission and distribution lines when connected to the utility's lines (US EPA 2018). As a decentralized power source, it offers a viable alternative to the current grid-to-deliver power system (WEF 2018). DG is particularly relevant to the Philippines because it helps provide energy supply to remote locations currently not served by the national grid.

The following sections discuss issues affecting the deployment of DG and recommendations to address them by enhancing the existing Philippine legal and regulatory framework.

1. Net metering and compensating the net energy exchange

Countries have adopted policies to enable and govern DG. One of these is net metering (NM), which enables onsite generators to "receive credit for an excess onsite generation that could be applied to future billing periods" (Jacobs et al. 2016, p.34). NM allows end-users to become "prosumers".⁶ As such, consumers generate electricity for their own use through DG and at the same time consume electricity from the grid, which their DG system is unable to produce. For any excess power generation, NM allows consumers to sell or feed the excess to the distribution system for which they may receive compensation.

DG policies on NM can be distinguished in two major ways. One of these is the compensation level where electricity is exported to the grid (Jacobs et al. 2016). Experience varies across jurisdictions, with some pegging the rate to the retail electricity rate (e.g., NM in the US) while others pay (or credit) a premium rate (e.g., feed-in tariffs in Germany and Canada). Others set the rate below the retail rate to generators (Jacobs et al. 2016). The NM rules in the Philippines, meanwhile, contemplate an energy exchange with exported energy and imported energy offsetting each other. The Renewable Energy Act of 2008 defines NM as: "[A] system appropriate for distributed generation, in which a distribution grid-user has a two-way connection to the grid and is only charged for his [net electricity consumption and is credited for any overall contribution to the electricity grid]" (RA 9513).

A Philippine distribution utility should only charge NM consumers with the difference between what they draw from imported energy and what they export to the grid, which is the net of energy exchange. However, this is not how distribution utilities charge or pay NM consumers in the Philippines. According to the DOE, the distribution utility first applies a much lower generation

⁶ Prosumers are consumers who use different onsite generators to produce their own power (e.g., diesel generators, wind turbines, and solar PV systems) (Rickerson et al. 2014).

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charge (equivalent to the distribution utility's blended generation cost) to calculate the credits due to NM customers. The distribution utility offsets this amount with the imported energy, which is calculated based on a much higher retail price (higher because this retail price consists of distribution rate, generation charges, transmission charges, and supply charges, among others) (DOE n.d.). It bears that there is nothing in the law or its implementing rules on NM that allows distribution utilities to charge NM consumers based on the existing practice.

One way to address this is to issue a clarification through the ERC for the guidance of distribution utilities and NM consumers on the proper pricing methodology applicable for NM. It should be based on what the Renewable Energy Act of 2008 provides—that is, NM consumers should only be charged with the difference between what they draw from imported energy and what they export to the grid.

Another critical issue is how to value the net of energy exchange. In October 2019, the ERC issued a resolution amending the NM rules. It maintained the distribution utility's blended generation cost, exclusive of other generation adjustments, as the basis to compensate such energy exchange, instead of the utility's retail rate (Saulon 2019). The DOE subsequently posted its version of draft net metering rules, to which the ERC expressed concern because the DOE circular proposed to use the retail rate as a compensation mechanism, "as opposed to the blended generation cost that the ERC adopted" (Rivera 2019). The DOE and ERC should discuss this concern and take into account economic studies and the result of public consultations conducted to resolve the issue. If they are unable to do so, the ERC remains the agency mandated to determine the pricing methodology to ensure the success of the NM program. The ERC should also be in consultation with the National Renewable Energy Board and electric power industry participants (DOE 2019a).

2. Cross-subsidization

One of the most common regulatory concerns about NM is its potential for cross-subsidization. NM customers pay for the distribution utility's retail rate when they consume electricity. It consists of generation, transmission, distribution, and other charges. When NM consumers enjoy a reduced electric bill resulting from deploying DG systems, they also avoid paying fixed costs, such as transmission and distribution costs associated with reduced consumption, while enjoying the benefits of accessing the grid to supplement their generation. Cross-subsidization may occur as the utility must recover fixed costs from other ratepayers especially from non-NM customers (Navigant Consulting, Ltd. 2014).

Under its rulemaking powers and by its rules of practice and procedure, the ERC should review the existing pricing methodology for NM to adequately respond and minimize the possibility of cross-subsidization (ERC 2006a).

3. Erosion of revenues

Another issue closely related to cross-subsidization is revenue erosion. The Mowatt Center, citing Kind (2013), explained the growing concern of utilities regarding the erosion of their sales revenues as a result of the increasing deployment of DGs. The deployment of DGs reduces the ability of utilities to recover fixed costs of transmission and distribution system investments (Jacobs et al. 2016). When NM consumers reduce their consumption from the grid, they also avoid paying associated fixed costs while still accessing the grid to supplement their generation.

Utilities in the Philippines can experience a similar concern once the deployment of DG surges. To respond to this, the ERC should revisit retail electricity rate designs to allow the recovery of electricity system costs without unnecessarily constraining the growth of DG. For instance, the

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ERC, either *motu proprio* or upon initiation by an electric power industry participant following its rulemaking procedures, can propose a pricing methodology that either increase nonvolumetric charges or introduce such charges. These measures tend to reduce the economic returns and make the ownership of DG system less competitive but ensure recovery of fixed costs (Jacobs et al. 2016). The ERC, however, should be wary that this can lead to a possible increase in grid defection. The additional fixed charges for the administrative handling of NM, network usage, or other system-related costs may constrain prosumers to eventually disconnect from the grid (Jacobs et al. 2016).

As part of its mandate, the ERC can subject to in-depth economic analysis and public consultations the various approaches to impose nonvolumetric charges to arrive at an appropriate balancing between the compensation due to an onsite DG and allowing utilities to recover their fixed costs.

4. Expanding NM to off-grid areas

Aside from the foregoing issues, the existing NM rules in the Philippines apply only to on-grid systems⁷ or electrical systems conveying bulk power on the Philippine grid (RA 9513) and not to offgrid systems (ERC 2013). This severely hinders the deployment of DG in areas that are not presently integrated to the main transmission system but are otherwise connected to a distribution system.

The DOE and the ERC should draft an NM framework to facilitate the deployment of DGs in off-grid areas. Without rules that govern NM in an off-grid system, there is no incentive for consumers to invest in DG in off-grid areas, given the regulatory uncertainty in installing a DG system. Moreover, the absence of NM rules in off-grid areas gives rise to uncertainty of the treatment of any excess electricity generated and exported by a consumer to the distribution system and the technical standards and requirements for the installation of DGs.

Decentralized systems

From 2000 to 2016, the International Energy Agency (IEA)'s analysis revealed that those who gained access to electricity worldwide did so predominantly through new grid connections, mostly from fossil fuels (IEA 2017). However, over the last five years, renewables, off-grid, and minigrid systems have started to rise. The IEA expects this shift to accelerate (IEA 2017). The IEA refers to both off-grid and minigrid systems as "decentralized systems". This paper adopted the same meaning for decentralized systems.

According to IEA, there is now a wide array of pathways available to attain electricity access off-grid, minigrid, and on-grid solutions—with decentralized systems complementing grid expansion efforts to provide access to electricity.⁸ Decentralized systems serve to fill the energy access gap in remote areas that are too expensive to be connected to the grid by providing backup in urban areas to ensure reliable grid supply (IEA 2017).

A decentralized system (minigrid and off-grid) is particularly helpful to provide power supply in a country like the Philippines, which has numerous off-grid areas and remote communities. It also ensures reliable electricity in urban centers experiencing extreme weather

⁷ An on-grid system refers to the electrical system composed of interconnected transmission lines, distribution lines, substations, and related facilities for the conveyance of bulk power on the grid of the Philippines while off-grid system refers to those not connected to the wires and related facilities of the on-grid systems of the country (RA 9513).

⁸The IEA refers to an on-grid solution if electricity access is provided to a household through a local network or grid extension linked to a transmission network. Minigrids, meanwhile, are an option to provide electricity access in areas not served by main grids, characterized by localized power networks, and without the infrastructure to transmit electricity beyond their service area (IEA 2017). They can connect to the main grid or operate independently as autonomous minigrids (MCG 2017). Off-grid systems are stand-alone systems. They are not connected to a grid and typically power single households with diesel generators and solar PV systems (solar home systems) that dominate the market (IEA 2017).

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conditions (e.g., typhoons, flooding, and tsunamis) and potentially generates cleaner power than the main electric grid. In the Philippines, the DOE and ERC both perform regulatory functions in the development of decentralized systems.⁹

Presently, there are two major programs implemented by the DOE and regulated by the ERC for the provision of power supply in off-grid areas. One is the Qualified Third Party (QTP) program. This program opens to the private sector the provision of electric service in unviable or unserved and underserved areas (QTP service area)¹⁰ that a franchised distribution utility is unable to serve. Essentially, a QTP provider delivers integrated power generation and distribution services within a QTP service area (DOE 2019b). The second is the missionary electrification in identified Small Power Utilities Group (SPUG) areas, which entails the provision of power generation and its associated power delivery systems in areas that are not connected to the transmission system and cannot be served by distribution utilities and other QTPs (EPIRA IRR, Rule 13, Section 1).

Recently, the Philippine Congress passed RA 11357, which granted a franchise to the Solar *Para sa Bayan* Corporation to construct, install, establish, operate, and maintain DERs and microgrids in remote and unviable or unserved or underserved areas in selected Philippine provinces. Under this franchise, the DOE and ERC continue to regulate the operations of the corporation.

When developing a regulatory regime for minigrids and off-grids, the "Practical Guide to the Regulatory Treatment of Mini-Grids" or simply, the Practical Guide, identifies the lack of enabling regulatory regime as one of the main obstacles to minigrid development (MCG 2017). This is because the absence of an enabling regulatory regime exposes developers to significant political, investment, construction completion, and operational risks (MCG 2017).

The Practical Guide has likewise identified three pillars of regulation for consideration, namely: (1) policy and planning, (2) retail service regulation, and (3) technical standards including interconnection, technology, power quality and service quality standards (MCG 2017). Thus, to overcome barriers in minigrid and off-grid electrification and expanding access to sustainable, affordable, and reliable electricity using clean energy based decentralized systems, this paper reviews the existing Philippine legal and regulatory framework related to the three pillars of regulation identified in the Practical Guide.

1. Policy and planning: Issues and enhancements to the regulatory framework

The Practical Guide emphasized the importance of a "sound policy and planning framework", which serves as the "backbone" of a country's minigrid and off-grid development and influences many decisions in the two other pillars of the regulation (MCG 2017). Given the increasing worldwide trend toward decarbonization—enabled by international commitments like the Paris Agreement and technological innovations resulting in a significant reduction in the prices of solar panels, other renewables, battery energy storage systems, and other components—it is an opportune time for regulators and policymakers to revisit the existing policies and rules on decentralized systems.

⁹ DOE enters into a service contract with a developer to explore and develop such a resource in an area. The ERC, meanwhile, performs ratesetting function and ensures that the power project is compliant with technical requirements. ¹⁰ An "unviable area" refers to "a geographical area within the Franchise Area of a Distribution Utility where immediate extension of the distribution line is not feasible" (EPIRA IRR, Part I, Rule No. 4). An "unserved area" refers to "an area with no electricity access, no distribution system lines, individual home system, or connection to any microgrid system" (DOE 2019e). An "underserved area" refers to "an area where electricity services are less than 24 hours daily, which is currently served by the individual solar home system, microgrid system or distribution utilities because of non-implementation of capital expense projects, noncompliance with the service parameters of the Philippine Distribution Code, or any other reason resulting to an overall failing mark based on the latest annual technical evaluation of the performance of distribution system with ERC's imposed targets" (DOE 2019e).

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Among the concerns that should be addressed in the Philippine legal and regulatory framework are the following:

Clarifying the definition of a minigrid and a microgrid. A clear definition of the term "minigrid" or "microgrid" would provide developers with greater certainty on the regulation of a minigrid or microgrid project (MCG 2017). The definition of "microgrid" provided in RA 11357 would be a good start.¹¹ It defines microgrid as "a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity for the grid. A microgrid can connect from the grid to enable it to operate in both grid-connected or island mode".

RA 11357, however, does not provide categories of decentralized systems (e.g., microgrid and minigrid systems) because it only defines for "microgrid" (RA 11357). In practice, however, the DOE distinguishes microgrid and minigrid systems based on geographic coverage, with a microgrid system defined as serving only a single *barangay* (village) and minigrids as serving two or more barangays (IRENA 2017).

There should be a better way of classifying these systems other than the geographic area served (IRENA 2017). It would be appropriate for DOE and ERC to clarify in their circulars and resolutions a distinction between minigrid and microgrid systems based on a parameter like the size or capacity of the system. For instance, while the definition of microgrid above can be retained to refer to both micro and minigrid systems, the definition can further be elaborated to provide a distinction between a microgrid system as having an installed generating capacity of, for instance, 500 kW and below, and the minigrid system as having an installed generating capacity above 500 kW. Based on this categorization, the DOE and ERC can then prescribe the appropriate legal and regulatory framework for the two systems.

Developing classes of minigrids for permitting and licensing. The Practical Guide highlights the importance of developing categories of decentralized systems. This ensures the proper matching between the level of regulation and the scale and technology for the project (MCG 2017). Based on the Practical Guide's review of international trends, regulators structure the approval processes and procedures around classes or categories of decentralized systems (MCG 2017). The DOE and ERC can gain lessons from this trend and develop similar categories for decentralized systems and then match or structure the regulations around them.

DOE awarding of renewable energy service contracts. In terms of permitting requirements for the development of renewable energy projects that can form part of a micro or minigrid system, there is no distinction between a small capacity project (say 100-kW project) to a 5-megawatt (MW) power project. Under DOE Circular No. DC 2019-10-0013 (DOE 2019d), which governs the awarding of renewable energy service or operating contracts, the same requirements and processes apply without regard to the size or scale of the project. As such, investors in renewable energy projects need to comply with the same rigorous legal, technical, and financial requirements outlined in the circular, regardless of whether the project has a 100-kW or a 5-MW generating capacity.¹² A review identified that 156 signatures were required for a renewable energy service contract to be approved. This applies even to small-scale renewable energy projects in off-grid areas (IRENA 2017).

¹¹ The ERC likewise released the Draft Licensing Rules for Distributed Energy Resources and Microgrid Systems (Draft Rules). Senate Bill (SB) 2218 and the Draft Rules provided the same definition for a microgrid.

¹² The rules allow only for a simplified process and requirements for projects involving own-use and/or noncommercial operations (DC 2019-10-0013, Chapter IX, Sections 33 and 34).

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ERC issuance of Certificates of Compliance (COC). Even the ERC rules governing the issuance of COC¹³ do not make any distinction based on the scale or capacity of power generation projects. Running these projects, regardless of technology and scale, involves the submission of the same requirements and undergoing the same application process set forth in ERC Resolution No. 16 Series of 2014 before they can secure their COCs (ERC 2014).¹⁴

Streamlining the permitting process. An onerous, complicated, and lengthy permitting and licensing approval process could entail high development costs and risks and become a barrier to the market entry of developers (MCG 2017). As such, the DOE and ERC should establish an approval process that is clear, straightforward, and efficient by making distinctions on requirements and processes based on the scale and technology of the decentralized system, or the power generation system that forms part of it.

For instance, in awarding service contracts for renewable energy projects, the DOE should simplify the approval process for projects that form part of a decentralized system based on the scale of the project and have those with smaller capacities subjected to less rigorous requirements. This would mean adopting a checklist system similar to a more simplified process for own-use renewable energy projects and/or noncommercial operations. It does not require compliance with strict financial requirements like the submission of proof of the applicant's ability to cover 100 percent of the required minimum working capital for the proposed initial year of the work program or a guaranty from the parent company (DOE 2019d). These can be challenging especially for newly established developers who are not yet in the position to comply with financial requirements.

A streamlined process will certainly limit the number of requirements involved such as the signatures required and the timeline for each step of the process. This process should be consistent with the policy enshrined under RA No. 11234 or the Energy Virtual One-Stop Shop Act, which seeks to "streamline the permitting process of power generation, transmission, and distribution projects".

Similarly, in issuing COCs, the ERC should establish a separate set of requirements and approval process based on the scale and technology utilized by the power project. The ERC should also consider whether all minigrid or microgrid projects require a COC. In the Philippines, since the micro or minigrid system is still in its infancy, it is appropriate for the ERC to adopt a simplified licensing process for decentralized systems based on their capacity. In this manner, the ERC would still be able to fulfill its mandate to protect end-users from predatory practices (EPIRA, Section 2 [f]) while encouraging developers to invest in decentralized systems.

2. Tariff regulation for minigrid development in off-grid areas: Issues and enhancements to the legal and regulatory framework

The second pillar of regulation involves the regulation of retail service. In this respect, regulators have two primary duties in overseeing tariffs in micro or minigrids, namely: (1) ensuring minigrids can earn a reasonable rate of return and recover costs to invest and maintain projects; and (2) ensuring customers rates are just and reasonable (MCG 2017).

a. Streamlining the tariff approval process. In the Philippines, the closest to a micro or minigrid tariff regulation is the ERC's direct regulation of the rates charged by QTP developers.

¹³ A COC refers to a license issued by the ERC in favor of an entity to operate a power plant or other facilities used in the generation of electricity (EPIRA, Section 6 and EPIRA IRR, Section 4).

¹⁴ The ERC rules make a distinction on the requirements and processes for securing COCs based on the intended use of the power generation facility whether as a generation company for commercial use, qualified end-user, or self-generation.

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However, as described below, the approval entails a complicated and lengthy regulatory process. Accordingly, the ERC, motu proprio, or upon initiation by an electric power industry participant following its rulemaking procedures, should revise and streamline the rate approval process.

ERC Resolution No. 22 Series of 2006 governs the review of QTP tariffs. Notably, the approval of a QTP tariff undergoes the same review process as the review of power supply agreements and the tariffs of distribution utilities in the main grid (ERC 2006b). Under the existing rules, a QTP provider submits an application to the ERC for authorization to provide electricity service in a specific declared unviable area (ERC 2006b). In the same application, the QTP provider proposes a tariff, its full cost recovery rate (FCRR) calculated based on generation technology, project capacity, economic variables, and other factors, and submit the tariff to the ERC for approval. The ERC then subjects the application to a series of public hearings, mostly in the area where the customers are located, before resolving the application. Even though a QTP has limited service coverage, the process can be lengthy, tedious, and burdensome for a QTP provider.¹⁵ Thus, the ERC should streamline the process and prescribe an expedited hearing and shorter approval timelines for QTP projects.

b. Benchmarking the QTP FCRR. The existing rules allow a QTP provider to recover its full capital and operating costs and earn a reasonable return. Thus, a QTP provider is allowed to charge the Subsidized Approved Retail Rate (SARR) to its end-users, a rate determined by the ERC based on the ability to pay of end-users in an unviable area. As the SARR is often lower than the QTP provider's FCRR, the rules entitle the QTP provider to recover the difference between its FCRR and SARR through the universal charge-missionary electrification (UC-ME) subsidy (ERC Resolution No. 22 Series of 2006).¹⁶ The UC-ME is a form of a cross-subsidy scheme imposed as a uniform tariff upon all national grid users with the revenues used to subsidize the cost of operating in unviable areas. The rules, however, do not provide for an automatic availment by the QTP provider of the UC-ME. The National Power Corporation-Small Power Utilities Group (NPC-SPUG) has to separately file an application with the ERC for the approval of the SARR and the UC-ME while the QTP files a separate application for the approval of the FCRR. A QTP provider's tariff has three components to it that require three separate applications and approval process: one by the QTP provider and two by the NPC-SPUG.¹⁷

A possible solution to address this regulatory barrier is for the ERC to set a benchmark FCRR for certain categories of QTP projects (IRENA 2017). Rather than evaluating each application on a return-on-rate base methodology (ERC Resolution No. 22 Series of 2006), which is onerous, time-consuming, and requires significant regulatory resources, the predetermined FCRR would serve as a benchmark rate applicable to all QTP providers within the same project category, thereby eliminating the tedious hearing process involved in a QTP rate application. The ERC has the requisite expertise in setting the benchmark FCRR as the methodology should be substantially similar to its ratesetting methodology in other rate applications (e.g., fixing of feed-in tariff rates). A predetermined FCRR for a particular geographical location, based on a particular technology and scale or size, could greatly assist an investor in deciding whether to engage as a QTP provider in a particular location.

To minimize the risks of overlooking the differences in the cost-recovery requirements for projects within the same class, once the ERC sets the FCRR, the DOE, pursuant to its mandate, can set the appropriate selection process for the delivery of QTP services in an area. The rigorous competitive

¹⁵ Only under limited circumstances when a QTP provider qualifies can act as such without going through the approval process described above. Nevertheless, the QTP has to meet all the criteria set in ERC Resolution No. 22, Series of 2006, Section 6.

¹⁶ The FCRR refers to "the rate expressed in peso-per-kilowatt-hour that recovers the full efficient costs of providing electricity service sufficient to enable the Qualified Third Party to operate viably" (ERC 2006b).

¹⁷ All three applications go through a separate but similar process of a prefiling conference, publication and posting, jurisdictional hearing, pretrial conference, evidentiary hearing, and then evaluation by the ERC.

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selection process currently set by the DOE is unnecessary given the difficulty of attracting investments in off-grid areas. Instead, the IRENA recommends benchmarking to compare proposals submitted by prospective QTP providers (IRENA 2017).¹⁸

With this benchmarking, the DOE can easily determine and declare the investor that complies with legal, technical, and financial requirements, and offers the lowest FCRR—possibly lower than the predetermined FCRR in the area as the QTP provider. The ERC should then approve the FCRR resulting from the bid as it is and not subject it anymore to the normal and otherwise rigorous approval process. Since the ERC has already set the SARR and UC-ME subsidy separately through their own application processes, the determination of the FCRR in this manner will certainly save time for investors and even the regulator and encourage the entry of more QTP service providers.

3. Technical standards

The third pillar of regulating minigrids and off-grids involves the setting of technical standards. Since the Philippine government is promoting the use of renewable energy technologies, the DOE, in furtherance of the objectives of the Renewable Energy Act of 2008, can restrict the development of decentralized systems to a specific set of technologies by pursuing the development of renewable energy-powered micro or minigrids. The current NM rules, for instance, apply only to the deployment of renewable energy. Among the common technologies deployed in micro and minigrids are solar-powered systems paired with a backup power supply such as an energy storage system or a diesel generator (MCG 2017).

Once the DOE sets this policy, the ERC must prescribe technical standards for the operation of the decentralized system. The regulator may allow flexible requirements for micro or minigrids in off-grid areas but may require decentralized systems to comply with the national grid technical requirements for those that connect to the main grid (MCG 2017). For micro or minigrid systems in the main grid, standards are critical to ensure the technical ability of the decentralized systems to "physically interconnect and operate with the utility distribution grid, as well as ensuring that all system components use the same set of interfaces" (Villareal et al. 2014, p.22). Since the distribution utility has ownership and control of the existing distribution infrastructure, the ERC should help address the integration of the micro or minigrid into the system through the adoption and implementation of engineering specifications (e.g., specific technical standards), communication requirements (i.e., protocols for communications and the information that needs to be exchanged between them), and additional control, monitoring, and telemetry requirements (Villareal et al. 2014).

In the setting of the technical standards, as the Practical Guide recommends, the DOE and the ERC should avoid imposing burdensome standards such as immediately requiring micro or minigrid systems in off-grid areas to adhere to technical requirements for grid interconnection. Otherwise, the technical standards may become prohibitively expensive and deter the entry of private investors. This will curtail the development of decentralized systems or hinder innovation in the sector (MCG 2017).

Micro or minigrid systems connected to the main grid

SB 2218 and the ERC Draft Rules, which proposed to govern the licensing of generation companies intending to own and commercially operate microgrid systems, would have provided a framework for the development of micro or minigrid systems integrated to the transmission or distribution system that directly supply the requirements of consumers in the main grid.

¹⁸ The IRENA suggested the use of NPC-SPUG's current power generation costs and level of service coverage as a benchmark upper limit. This paper recommends the ERC to set a benchmark FCRR as the upper limit.

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While there exists a framework that supports the deployment of DG and self-generation (e.g., regulatory framework for NM), there is no established legal framework to support the establishment of a micro or minigrid system connected to the main grid yet. This is a challenge in the main grid because the franchise granted to a distribution utility is exclusive (i.e., only the distribution utility has the privilege to deliver electric service within its franchise area) and it is unlikely that a distribution utility will easily waive its privilege in favor of micro or minigrid developers since this can result in the erosion of its revenues. Thus, the DOE and ERC need to address the issue that micro or minigrids interfere with the existing distribution utility's exclusive franchise.¹⁹

One option is through a legislative amendment of the Electric Power Industry Reform Act (EPIRA) to remove the requirement of obtaining a waiver from incumbent distribution utilities before micro or minigrid systems can operate in a utility's franchise, which SB 2218 sought to address. Notably, the franchise granted to the Solar Para sa Bayan Corporation specifically eliminated this requirement when it operates DERs or microgrids in remote and unviable, unserved, or underserved areas identified in the law. An amendment allowing the establishment of micro or minigrid systems, providing both generation and distribution services in the main grid, could prevent any legal impediment to the establishment of a regulatory framework for decentralized systems connected to the main grid in the Philippines. However, the legislative process may take time.

Another option that may not require a legislative amendment involves the grant by the distribution utility which has a franchise over a particular geographical area of a concession to another private entity that will then have the right to build, operate, and maintain assets for the generation, distribution, and sale of electricity to end-users within specific service areas originally served by a distribution utility. The participation of the franchised utility as the grantor of concession minimizes the legal challenge in the validity of opening a utility franchise area for the development of a micro or minigrid system.²⁰

Energy storage technologies

1. Benefits and advantages of energy storage

The IEA describes energy storage technologies as those that "absorb energy and store it for a period of time before releasing it to supply energy or power services" (IEA 2014). Several applications have been identified for energy storage in the Philippines. With the increasing utilization of renewable energy in the Philippine energy mix, energy storage "promises grid operators the important ability to manage variable generation" (Ahmed et al. 2017, p.4). Moreover, energy storage in off-grid areas can significantly reduce diesel consumption in those areas.

Recognizing that the integration of renewable energy resources may cause significant degradation of system performance due to the variability of their output, the ERC classified battery energy storage systems as a new source of frequency control ancillary services, particularly for contingency reserve and frequency regulation (ERC 2015).

2. Enhancements to the legal and regulatory framework

As observed by the IEA, energy storage technologies "do not fit naturally into existing regulatory frameworks" (IEA 2014, p.46), such as in the Philippines, which has unbundled its electricity system into generation, transmission, supply, and distribution. The IEA emphasized that achieving widespread

¹⁹ In QTP areas, the distribution utility signs a waiver allowing the QTP provider to deliver electric service in an unviable area within its franchise area.

²⁰ The ERC should likewise address the question of who is responsible for standby charges. If a micro or minigrid island can but remain connected to the grid, standby charges may apply.

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deployment of energy storage requires "enabling compensation for the multiple services performed by energy storage across the system" or allowing reliable cost-recovery mechanisms (IEA 2014, p.46).

This is because energy storage provides "value across different portions of the market (i.e., a single technology supports both the supply and demand sides, or transmission and distribution)" (IEA 2014, p.46). Hence, energy storage would need to be compensated for the multiple services it offers, with compensation determined as a function of the service provided by the energy storage, such as payment for power quality, reliability, efficiency gains, and energy security (IEA 2014).

The DOE has recently released a framework for energy storage system in the country. The department recognizes various applications and benefits of energy storage system, which may include providing ancillary service and energy and mitigating the intermittent generation of variable renewable energy, supply auxiliary loads, mitigate transmission congestion, among others (DOE 2019c). At the moment, however, the regulatory framework developed by the ERC only captures the function of energy storage as a new source of frequency control ancillary services but not the other services it can offer. As such, the compensation for energy storage may only be limited to this service. The ERC, either motu proprio or upon initiation by an electric power industry participant following its rulemaking procedures, should set additional regulations governing the use of energy storage, whether for grid support or allowing DG to use batteries to maximize onsite savings (Jacobs et al. 2016). The DOE circular directs the ERC to issue appropriate and applicable cost-recovery mechanism and pricing structure including for power delivery charges, considering the reduction in the investment attributed to deferred generation, transmission, and distribution capacities as a result of deploying energy storage systems (DOE 2019c).

CONCLUSION

This paper suggests that while the existing regulatory framework in the Philippines has created a pathway toward an electricity future characterized by the widespread deployment of DERs, the DOE and the ERC need to enhance the country's existing legal, regulatory, and policy framework. These regulations need to foster an environment that will optimize the benefits of DERs and minimize potential disruptions in its deployment. Regulatory and policy enhancements are needed to effectively address these challenges and take advantage of the opportunities offered by the ongoing energy transition. These enhancements include:

1. Distributed generation and net metering

a. The ERC should immediately clarify the proper pricing methodology applicable for NM. It should be consistent with the provisions of the law—that is, the NM consumers should only be charged with the difference between what they draw from imported energy and what they export to the grid, which is the net of energy exchange.

b. In the short term, the DOE and ERC should determine how to properly compensate NM consumers who are net electricity exporters to the grid.

c. In the medium term, the ERC should review various approaches to imposing nonvolumetric charges to arrive at an appropriate balancing between the compensation due to an onsite DG and allowing a utility to recover its fixed costs.

d. In the long term, the DOE and ERC should consider expanding the NM rules to facilitate the deployment of DGs in off-grid areas.

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2. Decentralized systems

a. In the short term, the DOE and ERC should develop categories of decentralized systems and prescribe the appropriate permitting and licensing regulations for each system to match the level of regulation with the scale of project.

b. In the short term, the DOE should simplify and streamline the accreditation of private sector providers offering decentralized systems. Similarly, the ERC should undertake a streamlining of its requirements in the issuance of COCs for these projects.

c. In the short term, the ERC should streamline the tariff approval process of decentralized systems and set a benchmark FCRR for certain categories of QTP projects.

d. In the medium term, the DOE and ERC should avoid imposing burdensome requirements for the operation of decentralized systems.

e. In the medium term, the DOE should propose an amendment of the EPIRA to remove the requirement of obtaining a waiver from incumbent distribution utilities before decentralized systems can operate in a utility's franchise, or, in the meantime, allow the existing utility to grant a concession to a private entity to operate decentralized systems within the utility's franchise area.

3. Energy storage

In the medium term, the ERC should draft an appropriate and applicable cost-recovery mechanism and pricing structure to properly compensate the various applications and benefits of energy storage in the electricity system.

In crafting these policies and regulations, the DOE and the ERC need to engage with all of their stakeholders in the electric power industry including end-users, utilities, the academe, legislators, and nongovernment organizations. Effective collaboration among all stakeholders will ensure the crafting of a regulatory framework that is responsive to the challenges of the energy transition and prepared for an electricity future characterized by widespread deployment of DERs.

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