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THE PHILIPPINE ECONOMIC ZONES: CATALYSTS FOR SHARED GROWTH?

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ABSTRACT

In this study, our main objective is to develop a performance evaluation methodology which uses government-monitored data on the ecozones. In particular, we examine the use of export value and employment as measures of shared growth performance of the economic zones in the Philippines. Although these variables are commonly used as indicators of how economic zones are generating employment and foreign exchange, we doubt whether these could be conceptually used as shared growth indicators. We propose alternative indicators of shared growth that are conceptually derived from our understanding of the flying geese (or Japan-led) dynamics, which we consider as an important force that could harness the potential of the economic zones to become catalysts of shared growth in the Philippines. These shared growth indicators are net export ratio, export sensitivities to US or Japan GDP, and relative instability of employment. These indicators are subjected to a first-test of efficiency through the use of an export production framework on both ecozone and locator levels. The results indicate that shared growth-oriented management in the economic zones is good for export production efficiency, particularly when it is accompanied by higher net export ratio, higher sensitivity to Japan GDP, and lower relative employment instability.

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The Philippine Economic Zones: Catalysts for Shared Growth?

I. RESEARCH OBJECTIVES

This research basically has the following three objectives:

1. To identify shared growth indicators that could be used, at least from a conceptual level, as indicators of the shared-growth performance of the economic zones (ecozones) and locators
2. To develop an analytical framework that would act as an empirical first test of the identified shared growth indicators, on both ecozone and locator levels.
3. To derive policy implications from the shared growth indicators identified and the analytical framework developed, on both ecozone and locator levels.

An overarching objective of this study is to develop a methodology for collecting and analyzing the data that can be found in the quarterly reports of ecozone locators submitted to the Philippine Economic Zone Authority (PEZA). In so doing, it is hoped that this study will be able to contribute to harnessing the potential of the Philippine ecozones to act as catalysts for the achievement of shared growth in the country.

II. SURVEY OF LITERATURE AND SIGNIFICANCE OF STUDY.

In the East Asian Miracle (EAM) report of the World Bank (1993), the term "shared growth" was used to refer to the peculiar development experience of the Highly Performing (east) Asian Economies (HPAEs), which was marked by rapid income growth and improvements in income distribution. The consequent burst of the bubble economies of the HPAEs and the East Asian crisis that erupted in the 1990s sent Japan, the leading HPAE, reeling into what has been called as its lost decade. These events have put into question the viability as a development paradigm of shared growth as experienced by the HPAEs. [4] Ironically, this pessimism appears to have been particularly severe in Japan, which since the mid-1980s has

[4] To be sure, the World Bank continues to uphold the desirability of shared growth. See World Bank (2004). Japan's role, however, has been largely downgraded relative to that in the 1993 East Asian Miracle Report.

embarked on radical reforms of its economy amidst pressure from inside and outside the country to be more critical in questioning and more drastic in restructuring its economic system including those aspects, which had been thought to be its strong points. Such identity crisis serves only to further undermine the proposition that the shared growth experience of Japan can be a useful model of economic development.

Nevertheless, the fact that good growth and equity performances were observed in a group of economies situated in a relatively tight geographical location truly remains a miracle still worth close investigation. Such a positive relationship between growth and equity is indeed rare considering that the literature on this subject claims, when investigating a much bigger sample of countries, that no systematic relationship exists [Deininger and Squire, 1998], or that there is a negative relationship [Forbes, 2000], or that the world as a whole has become most inequitable now when it has become most affluent [Wade, 2001].

Owing to its lackluster performance in growth and equity in the period studied by the EAM report, the Philippines, although located in East Asia and an early member of the ASEAN, was not included as one of the HPAEs. This study forms part of a research thrust to find ways to remedy this situation and finally launch the Philippine economy towards a shared growth trajectory.

In contrast to the macro approach to shared growth of the EAM report, however, we take a more micro perspective in this study in order to uncover shared growth mechanisms that may be unperceivable on a macro level. We focus on the economic zones (ecozones) in the Philippines as a major candidate to act as catalysts for achieving shared growth in the country. One reason for this approach is that the ecozones form one of the pillars of the government's decentralized industrialization policy. In Republic Act no. 7916, also known as the Special Economic Zone Act of 1995, ecozones are envisioned to be geographically dispersed, decentralized, self-reliant, and self-sustaining agro-industrial, commercial, trading, tourist, investment, and financial communities that will induce and accelerate a sound and balanced industrial, economic, and social development of the country. Another reason is that the largest investors in the ecozones are Japanese firms, which could act as channels for

transmitting the shared growth experience of Japan. Japanese locators account for the biggest share by nationality, amounting to 42% of cumulative investments in dollars from 1995 to 2004.

To be sure, the Philippine government has been actively monitoring the performance of these ecozones. Two of the important performance indicators are exports and employment. In fact, PEZA gives annual awards in appropriate ceremonies to the best exporter and employer in the ecozones. These two indicators provide a good picture of how the ecozones are performing with respect to generating employment and foreign exchange. Although it is clear that these indicators are related to growth per se, the functional approach to growth proposed in the EAM report casts doubt on their use as shared growth indicators. In this study, we identify an alternative set of indicators, which can be used to gauge the shared growth performance of the ecozones.

This set of shared growth indicators, however, raises another question. Given that these indicators measure not only growth but also a sharing aspect, would there be any incentive for locators in the ecozones to perform well in terms of these indicators, and in so doing contribute to harnessing the potential of ecozones to become catalysts of shared growth? As a first step in answering this question, this study will develop a framework by which to evaluate the impact of the shared growth indicators on export production efficiency.

The EAM report cites the use of exports as a performance indicator that the HPAE governments used in promoting shared growth. However, it is doubtful whether this is equivalent to the use of exports by the Philippine government as performance indicators of the ecozones. The basic reason is that the export and employment figures that are used by the Philippine government do not conceptually fall under the selective intervention component of the EAM analytical framework.

The EAM report proposed the functional approach to growth for analyzing the shared growth phenomenon. This approach effectively identifies market fundamentals and selective government intervention as the two types of policies that led to the achievement of shared growth. The implication here is that selective government intervention was virtually

responsible for the sharing aspect of growth, since growth per se could be achieved within the competitive discipline of the market and can be compatible with various degrees of income distribution. The EAM report cites the awarding of subsidies to exporters as an example of selective intervention.

However, in the case of the Philippine ecozones, awarding on the basis of exports (or employment) cannot be considered as selective intervention in the sense of the EAM report. This is not to say that the Philippine government did not practice an EAM-type of selective intervention in the ecozones. The ecozone program itself can be considered as selective intervention since it is being used to divert production resources to these ecozones mainly for the purpose of promoting exports. Locators in the ecozones are rewarded with government incentives. However, awarding on the basis of export (or employment) after a firm has located in the ecozone does not quite fit an EAM-type of selective intervention. At best, such awarding could be considered as post-selective intervention.

Export and employment after locating in the ecozones could be considered more as falling under market fundamentals, given that firms invest in the ecozones in line with the comparative advantage principle based on market signals. The firms see ecozones as a source of cheap labor (employment) that can be utilized to enhance the competitiveness of their products in the international market (exports). This basically agrees with Aoki, Kim, and Okuno-Fujiwara [1998] who argue that major exporting sectors in Japan, for example, were not the object of selective intervention in Japan.

The above considerations suggest that export and employment (another post-selective intervention variable) may not be good indicators for shared growth. Hence, there is a need to look for an alternative set of indicators that could be used to better gauge the shared growth performance of the ecozones.

While critical of the EAM report, Aoki, Kim, and Okuno-Fujiwara [1998] are moving in the same direction as the EAM report in terms of trying to identify non-market mechanisms to explain shared growth. They, however, are more aggressive in departing from the market-only orientation, and identify certain institutional features of the Japanese economy that may have

contributed to Japan's shared growth development experience. In this study, we focus on the role of Japan's peculiar corporate organization.

A related set of literature on the Japanese development experience is the flying geese dynamics. Kaname Akamatsu first proposed the flying geese model in the 1930s[5] to describe the various wavelike patterns of industrial development that he observed first within the local Japanese economy. As documented by Kiyoshi Kojima [2003] the flying geese model consists of three patterns each based on empirical observations regarding the ebb and rise of Japanese industries.[6]

A highly related model to the flying geese model is given by Vernon [1966] wherein the product life cycle model is described. Both models could actually be considered as product cycle models that basically explain the forces underlying the relocation of advanced country firms to the developing economies. However, the flying geese model seems to be rarely known in Western countries.[7] Kojima [1978] has come to refer to the flying geese model as the catching up product cycle, emphasizing that it is originally framed from the perspective of a developing economy.

Below, we turn to related surveys of studies on ecozones, or export processing zones, as these were initially known. These studies show that the analysis of ecozones almost inevitably has to look at shared growth (or the role of non-market forces).

One survey of the export processing zones studies is given by Hooshang Amirahmadi and Weiping Wu (1995) who cite that the failure of EPZ strategy to be conceptualized as an "intersection of three sectoral/spatial policies" (namely, free trade zone, industrial policy, and growth center) is a factor contributing to lower performance in the Asian export processing zones they have surveyed. In short, export processing zone strategies usually display poor performance given the policy focus is simply on promoting manufactured exports. Such policy focus is usually not part of a longer strategy of growth through sustained industrialization and only serves to create isolated enclaves bereft of substantial linkages to

[5] An English presentation of his ideas is given in Akamatsu (1962)
[6] Another authoritative analysis of the Flying Geese model can be found in Yamazawa (1990).
[7] Schröppel and Nakajima (2002), p.204. Further see Korhonen (1994)

the rest of the economy. By implication, an analytical framework that simply views export processing zones as free trade zone strategy and disregards its industrial policy and growth center aspects is bound not to be useful in terms of providing recommendations aimed at improving the performance of the export processing zones.

In our analysis, we will also need a way to empirically evaluate the set of shared growth indicators that we will identify. Given that the set of shared growth indicators, as discussed above, will generally fall under non-market considerations and hence focuses on the shared aspect of shared growth, the burden of proof would be to show that these indicators have a positive effect on efficiency. A more complete analysis would include an investigation of the effect of these shared growth indicators on equity (income distribution), but for this study we just focus on the efficiency impact. Indicators, which cannot pass this first step, need not undergo an equity analysis.

Another export processing zone survey is by Jing-dong Yuan and Lorraine Eden [1992] who point out that the existing literature does not provide a more rigorous analytical framework that would empirically relate zone performance to social, political, and economic factors. This export processing zone survey stresses that such empirical mapping cannot be found in existing studies on export processing zones, which are largely either descriptive surveys or theoretical models. It develops a political economic development model, whereby the impact of three sets of exogenous variables, i.e., international conditions, domestic conditions, and role of the state, on export processing zone performance is derived based on a political analysis of the variables. The framework is then applied to selected EPZ in Taiwan, South Korea, and China.

This study will have a more modest coverage than the above export processing zone survey in terms of country (limited to a sample of ecozones in the Philippines) and discipline (limited to economic variables). However, it will be able to go beyond a qualitative analysis of EPZ performance and its causes by undertaking empirical estimations of the various suggested variables that have an important role in ecozone performance.

For this purpose, this study will utilize an estimation method, which incorporates

management performance indicators into production estimation, such as that used by Mefford [1986]. Using this method, we will be able to easily include the identified shared growth indicators to measure the shared growth orientation of management. Management in this study would refer to the main decision-makers in the ecozones, namely, the managers of the locators and the administrators of the ecozones, which would include the Philippine government.

III. METHODOLOGY AND DATA

OVERALL FRAMEWORK

Figure 1 shows the overall analytical framework that can be derived from the survey of related literature. The overall framework has the following features.

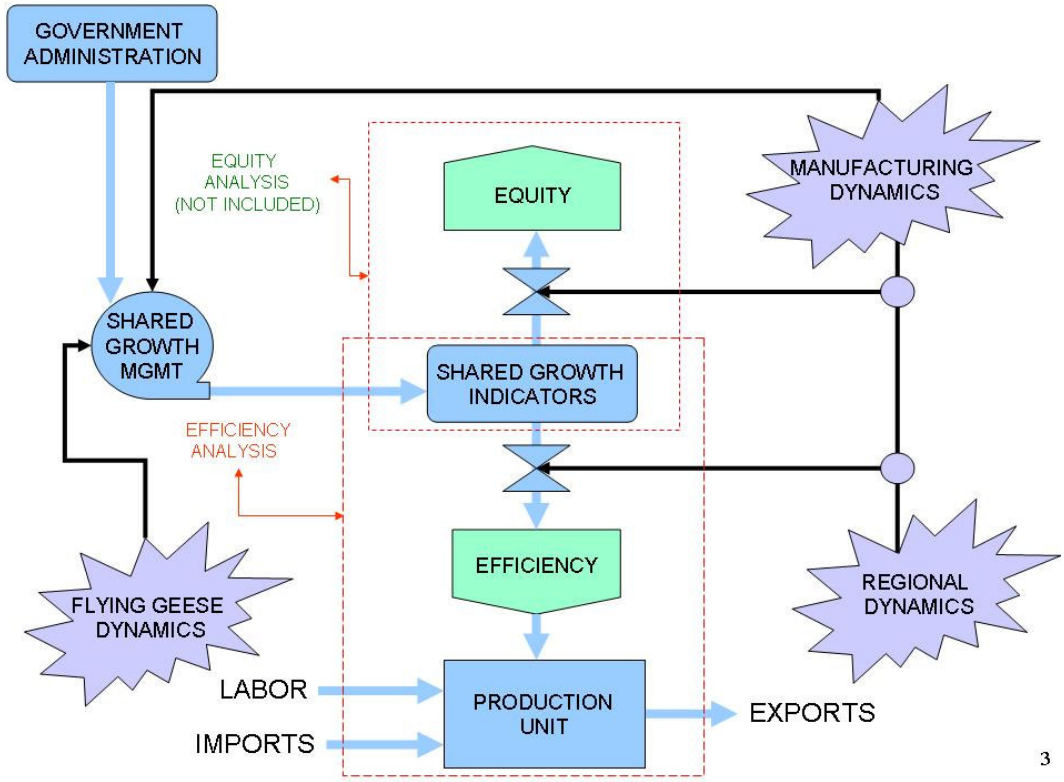

Figure 1. Overall Analytical Framework

1. The flying geese[8] and manufacturing dynamics[9] can influence management so that it is endowed with an orientation towards shared growth. Such orientation or performance can be observed through shared growth indicators, which are collected on a quarterly basis. Effectively, therefore, the shared growth indicators of this study will be derived from a conceptual understanding of the flying geese and manufacturing dynamics.
2. By definition, shared growth indicators have an effect on both efficiency and equity. The conceptual relationship of the shared growth indicators will be clarified. However, for this study, the empirical work will focus only on ascertaining the efficiency effect (efficiency analysis) and relegate the equity analysis to future research.
3. The effect of the shared growth indicators on efficiency is captured through the use of an export production framework. Export production is considered as the output of a production unit (i.e., ecozone or locator), which takes imports and labor as its basic inputs. Shared growth-oriented management is assumed to influence export production efficiency.[10]
4. Together with regional dynamics[11], manufacturing dynamics is considered to have a 2nd-degree effect on efficiency. In other words, these two dynamics influence the effect of the shared growth indicators on production efficiency (as well as equity).
5. Government administration of the ecozones through the Philippine Economic Zone Authority (PEZA) can influence shared-growth management. In particular, PEZA monitors locator export value and employment, which are the basis of performance rewards. For the purpose of deriving policy implications, this study will look into the relationship between such performance indicators and the shared growth indicators.

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[8] This is based on the dominant role of Japanese investment in the Philippine ecozones.
[9] Manufacturing dynamics is suggested by the Comparative Institutional Analysis, which initially started from research on Japan's manufacturing sector. Inclusion of the manufacturing dynamics is also suggested by the overwhelming presence of manufacturing ecozones.
[10] This assumption is based on the successful inclusion of Mefford [1986] of management performance indicators into the production function.
[11] One survey of EPZ stressed the need for considering the EPZ as a growth pole. This also conforms well with the Philippine government's decentralization strategy, which underlies the ecozones.

FLYING GEESE AND MANUFACTURING DYNAMICS

This section identifies the shared growth indicators using the flying geese and manufacturing dynamics. It also clarifies, albeit at a conceptual level, the relationship of the shared growth indicators with efficiency and equity.

One set of shared growth indicators consists of the elasticity of export volume to the incomes of the major trading partners, which in the case of the Philippines are Japan and the US. The first pattern of the flying geese dynamics tells us that the leading country will arrive at a stage of reverse importation wherein the catching up economy will have gained enough

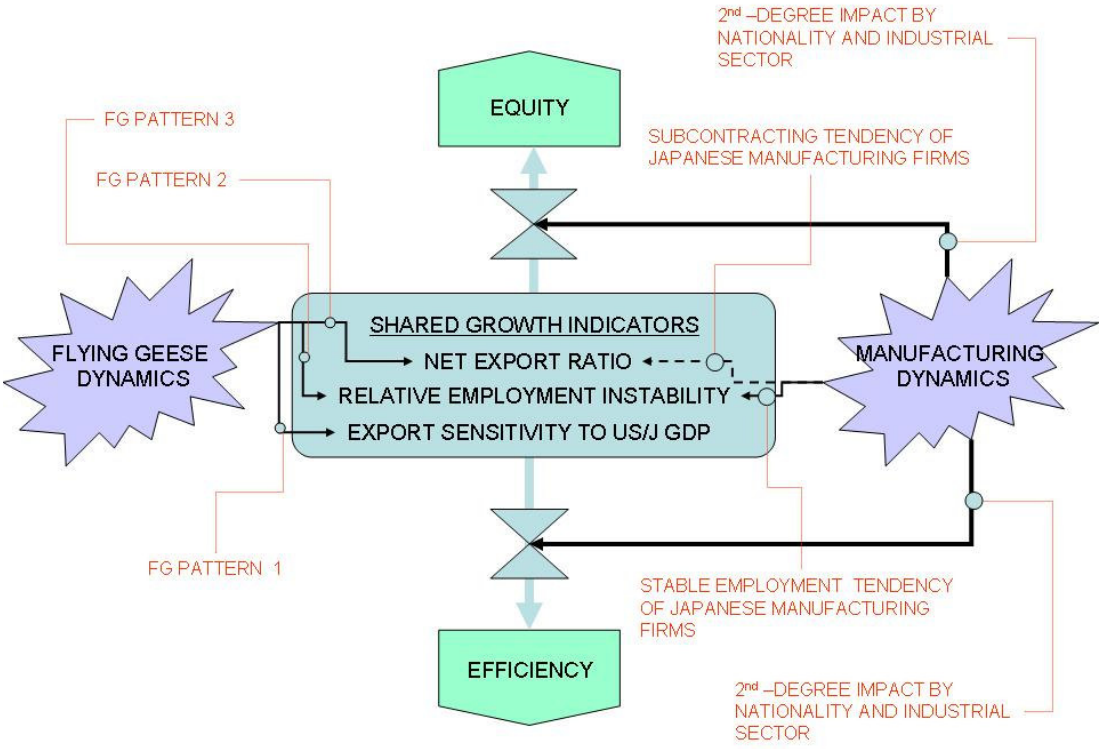

Fig. 2. The links of the flying geese and manufacturing dynamics to the shared growth indicators

competitiveness in an industry recycled from the leading economy so as to be able to export to the leading economy. In the context of our analysis, the leading economy is Japan and the US, while the catching up economy is the Philippines.

A higher elasticity of ecozone export to Japan GDP and/or US GDP is indicative of a

higher integration to the lead goose economy. This implies that the Philippine economy shares from the growth of the Japanese economy.

The income elasticities of export volume for Japan or the US are computed for each period as follows

$$\varepsilon_J = \lambda_J \frac{Y_J}{X} \qquad \varepsilon_{US} = \lambda_{US} \frac{Y_{US}}{X} \tag{1}$$

λ_J, λ_{US} are the changes in export volume per change in income of country in Japan and the US, respectively. Y_J, Y_{US} are the incomes of Japan and the US, respectively. X is the export volume of the ecozone or case-study locator.

The second pattern of the flying geese dynamics suggests another shared growth indicator, namely the net export ratio. A similar ratio is used in sharply defining the state of the second pattern of the flying geese dynamics in a certain economy at any point in time.[12] The basic formula for this ratio is given as follows

$$NX\$ = \frac{X\$ - M\$}{X\$ + M\$} \tag{2}$$

where $NX\$, X\$, M\$ =$ net export ratio, export value, and import value, respectively. The difference of this conventional net export ratio definition with the one used in this paper is that the former is computed on an industry level for a specific product category, while the latter is computed on an ecozone or locator level. An ecozone can usually cover a range of industry product categories, while a locator firm does not usually form the totality of one product category.

Nevertheless, the net export ratio used in this paper can be considered as measure of international competitiveness, and hence, growth of a certain production unit. This conforms to the first pattern of the flying geese dynamics, wherein an industry becomes increasingly efficient as it moves from import substitution (net export ratio is low) to export promotion (net export ratio is high). The higher the net export ratio is the more competitive the

[12] For example, see Hiratsuka (2003)

production unit as it is able to export more relative to its importations. Moreover, the higher this ratio is the more it is possible to earn foreign exchange which could then be used for further importations to support growth.

The net export ratio can also be taken as a measure of sharing growth. This ratio will also tend to increase as import substitution takes place in the exporting country. Increasing import substitution implies an increasing degree of competing local production is taking place. In this sense, an increasing net export ratio can also reflect a higher degree of sharing of any growth within the exporting country.

A final shared growth indicator is the relative volatility of employment. For time T, this is computed as follows

$$\sigma^2 = \frac{(L - \overline{L})^2}{(X - \overline{X})^2} \qquad (3)$$

L, X are employment and export volume, respectively. $\overline{L}, \overline{X}$ are the running average of employment and export volume, respectively, corresponding to the period of the employment and export volume being used.[13]

As can be seen from the formula, this indicator is essentially a ratio of variances: the variance of employment divided by the variance of the export volume. A high value for this indicator means that employment is highly unstable relative to export volume. [14]

The use of this indicator is suggested by the third pattern of the flying geese dynamics, wherein there is a transfer of technology from the waning industry of the leading economy (say Japan) to the catching up economy (Philippines) where this same industry is still at its fledgling state. This process has also been referred to as industrial recycling. This transfer of technology would cover both the hard and soft aspects of technology transfer. The soft portion would naturally include the Japanese management practices or corporate organization structures. One such practice or structure is the stable relationship between the

[13] The running average is computed from the start of the subject data to the present time. This manner of computing variances is taken from techniques used to compute asset volatility at any point in time. For example, see Koop (2000)

[14] Such an indicator has been used to compare the Japanese labor system to that of other advanced industrial countries. For example, see Kotaro (1996)

firm and labor. This stable relationship would suggest that the relative volatility of employment is not high. This mainly arises from the practice of retaining laborers even though the economy and, hence, production is sluggish. Such a stable relationship between the laborer and the firm contributes to the empowerment of labor, which in turn, gives labor a stronger claim on a share in the firm's growth.

Additional insights can be gleaned regarding the above shared growth indicators through a comparison of the flying geese dynamics with the product life cycle of Vernon [1966].

With regards to the income elasticity of export, Vernon's product life cycle would suggest a lower elasticity since it proposes that a good that has become standardized, in both consumption and production senses in a more developed lead country is produced in the less developed countries. The flying geese dynamics is less particular about the type of such goods, and is in fact open to a broader range of goods, for as long as they satisfy the comparative advantage (current or potential) of the developing country. One feature of the standardized good is that it could be produced for inventory without fear of obsolescence"[15]. The presumption of placing goods into inventory implies that production of the good need not be very responsive to income changes in the importing countries.

Standardized goods in Vernon's product life cycle model do not rely on "external economies" in their production process. Such production processes do not "receive significant inputs from the local economy such as skilled labor, repairmen, reliable power, spare parts, industrial materials processed according to exacting specifications…"[16] This implies a lesser reliance on local suppliers, leading to lower net export ratios. On the other hand, the flying geese dynamics emphasizes the formation of backward and forward linkages.

> Moreover, FDI [Foreign Direct Investments] creates substantial spillover effects. Foreign affiliates generate, through backward and forward linkages, supporting industries and employment. They contribute to development of local entrepreneurship and managerial and technical skills. They improve the quality and

[15] Vernon (1966), p.203
[16] Vernon (1966), p. 203

morale of labor through training and educations. Ultimately, FDI induces "reforms in production methods, employments systems, business management, and even laws and political organizations. Such reforms are most needed to climb up the ladder of development stage.[17]

This would tend to raise the net export ratio and also lower the relative volatility employment in the case of the flying geese dynamics. The self-sustaining production processes of standardized goods in Vernon's product life cycle model would not rely too much on skilled labor in the developing countries, suggesting a higher tendency for foreign firms to let go of its labor.

Such a comparison of the two product life cycle models provides us with a priori expectations regarding the contribution of the shared growth indicators to efficiency. A production unit, which is affiliated with foreign direct investment, is considered efficient in the flying geese sense would have a higher income elasticity of export, a higher net export ratio, and a lower relative employment volatility. Diametrically opposite to this would be the efficient foreign-affiliated production unit of Vernon's product life cycle model that would be characterized by lower income elasticity of export, lower net export ratio, and higher relative employment volatility.

The models also imply the possibility of differences attributable to the nationality of the foreign direct investment. The Vernon model is developed based largely on the behavior of US multinational firms, and the flying geese model on Japanese multinational firms. This would suggest that the above differences in the a priori expectations for the shared growth indicators may have a nationality dimension to it.

REGIONAL DYNAMICS

At this point we have been able to identify a set of shared growth indicators based on our understanding of the flying geese and manufacturing dynamics. A common reference for these two dynamics is the Japanese development experience. In contrast, the third dynamics pertaining to regional factors was actually inspired by a more local observation of Philippine economic development. Given data constraints, we could not identify a regional-related

[17] Kojima (2003), pp. 312-313. Schröppel and Nakajima (2002) also cite linkages as an important features which distinguishes the flying geese dynamics (Akamatsu version) from Vernon's product life cycle model.

indicator that would in general vary with ecozone or locator as the previously mentioned shared growth indicators do. Instead, we have identified the regional classification of the ecozone/locator as a regional-related indicator that we can use within the proposed performance impact framework. The Philippine government has classified the Philippines into fifteen regional blocs, which we can use to regionally differentiate ecozones/locators. In effect, the regional-related indicator would act as a determinant of the marginal or second-degree effect of each of the previously mentioned shared growth indicators on production efficiency.

Figure 3 shows a schematic diagram of the regional dynamics as related to the analytical framework used in this research. Three regional shared growth indicators were identified based on several mechanisms linking regional growth and income sharing. We have identified at least three such mechanisms that may be measurable: trickle-down, inter-regional rivalry, and relative income ranking.[18] The concept is that growth in one region may improve the regional distribution of income if: the trickle-down mechanism is strong; or inter-regional rivalry is strong; or the relative ranking income of the growing region is low. For the trickle-down mechanism, a regional diffusion index can be computed that reflects the impact of the growth of income in one region on the income in other regions. This diffusion index can be calculated on a regional basis using the inter-regional linkages captured by the regional input-output tables. The inter-regional rivalry mechanism is a type of keeping-up-with-the-Joneses mechanism that could be computed based on the pair-wise responses of growth. The relative ranking mechanism can be easily calculated by the ranking of value added figures of each of the 15 Philippine regions.

[18] Due to resource limitations, note that only the trickle-down mechanism captured in the regional linkage indicator will be covered in the EADN research project. Study on the other two regional indicators is relegated to future research.

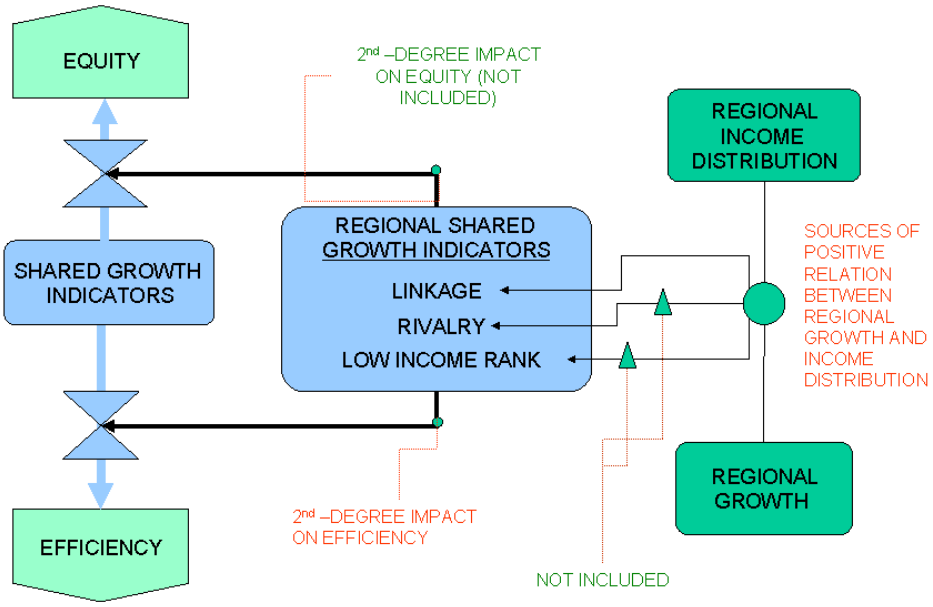

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Fig. 3. An overview of the regional dynamics within the framework.

Unfortunately, these regional shared growth indicators could not be included in the identified set of shared growth indicators since they cannot be computed on an ecozone or locator level. The conceptual proximity of the three regional indicators and the identified set of shared growth indicators, however, presents an analytical framework through which the impact of the identified set of shared growth indicators on regional growth and income sharing. Growth in an ecozone or locator inevitably translates into growth in the region in which it is located. Such growth then is transmitted to income sharing through the three mechanisms.

In investigating the 2nd-degree effects of the regional dynamics, we will try to evaluate whether or not such dynamics enhances the impact of the shared growth indicators on export production efficiency. As in the flying geese and manufacturing dynamics, we are relegating the equity analysis to future research. Moreover, this study will focus only on the linkage regional shared growth indicator. The 2nd-degree effect of this regional shared growth

indicator can be attributed to certain mechanisms as shown in Figure 4.

The regional shared growth indicator "linkage" may indicate the level of local procurement of one region from the other regions. In which case, a region with such a high regional linkage is able to enjoy a competitive procurement of local inputs that makes the production process more conducive to achieving higher efficiencies. Such regional linkage also contributes to the possibility that higher equity in the sense that any growth by one ecozone or locator would likely be shared with other firms located in other regions.

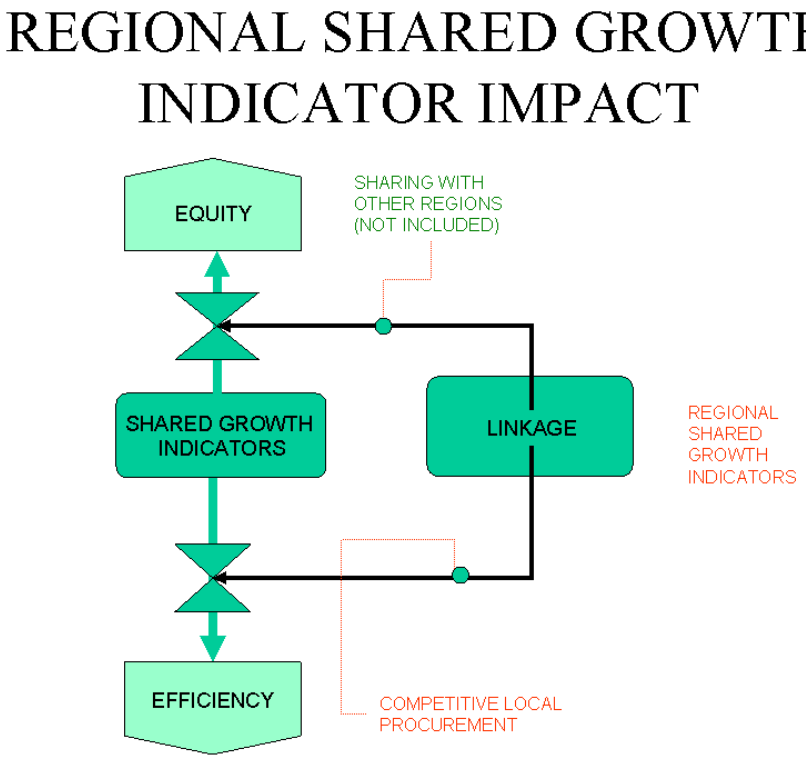

Fig. 4. Possible mechanisms for a positive 2nd-degree contribution of the regional shared growth indicators.

The regional shared growth indicator pertaining to linkage, will be based on a projected 2000 input-output table, regional data on research and development expenditures for various industries, and regional household income.

The 1994 input-output table of the Philippines will be projected to 2000 using the RAS method.[19] The projected table will be used to construct non-survey bi-regional

[19] If the official 2000 input-output table will be released early 2006, the official 2000 table will be

input-output tables, which will serve as basis for the derivation of regional shared growth indicators.[20]

Data on research and development expenditures for various industries will be used to derive research and development coefficients.[21] These coefficients will be transformed into a diagonalized research and development coefficient matrix that will consequently be used to derive technology-related linkages and spillovers across industries and regions.

Household income coefficients will be derived from the Family Income and Expenditure Survey. These coefficients will be transformed into a diagonalized household coefficient matrix and pre-multiplied to the projected non-survey bi-regional input-output table to derive income-related linkages and spillovers across industries and regions.

EXPORT PRODUCTION EFFICIENCY: A FIRST TEST

The above discussions provide us with a set of shared indicators, which can be tested for their applicability in the next section. This test will basically evaluate the impact of the shared growth indicators on export production efficiency.

Admittedly this test will subject the shared growth indicators to a necessary but insufficient evaluation by measuring the shared growth indicator's contribution to (export production) efficiency. In general, the shared growth indicators should have both efficiency and equity aspects. A complete test of these indicators, therefore, requires evaluation on both aspects. In this paper, however, we limit ourselves to a first test of efficiency. The crucial importance of such a test can be appreciated considering that the shared growth indicators have a strong non-market orientation, which conceptually would make these more prone to fail in contributing to efficiency.

One source of such non-market orientation is that the shared growth indicators conceptually have a sharing dimension, as we have discussed above. Conventional treatments of equitable distribution of income tend to raise the possibility of a trade-off in

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used. Otherwise, the study will use the projected 2000 input-output table.

[20] The bi-regional tables are actually non-survey bi-regional impact multiplier matrixes or tables. The two regions that the non-survey bi-regional impact multiplier tables will cover are the region where economic zones are located and the rest of the Philippines.

[21] A careful examination of the data reveals that research and development expenditures are usually highest in industries located in economic zones.

efficiency. This is particularly clear in the EAM analysis where the sharing aspect of growth is implicitly due to non-market fundamentals. Neoclassical economic thought has always upheld the efficiency of the market so that any deviations from it could result in a loss of efficiency.

There is the issue of the absence of capital in the specification of the export production function. The use of imports in the specification can be considered to act as a proxy variable for capital and/or capacity utilization (or actual utilization of capital). As a proxy for capital, import is effectively assumed to have a relatively fixed relationship with capital level. Using imports as proxy for capacity utilization, it is assumed that capital can be assumed to be relatively fixed. This assumption gains validity the shorter the time frame of analysis, as is true when looking at quarterly data. Ultimately, import would be capturing both of these concepts. It is left to the empirical analysis to ascertain the validity of such usage of import in the export production function.

The use of import as a proxy variable is also in line with this study's overarching objective of developing a methodology that would utilize and analyze the information found in the quarterly reports submitted by the locators to PEZA. Capital or capacity utilization are not included in these quarterly submissions, while import figures are. Under such circumstances, using imports as one of the inputs can be considered as a second-best method for extracting capital-related information from the import data.

Our estimation involves the computation of the shared growth indicators and the estimation of the export production functions using these indicators. Table 1 below gives a list of the fifteen Philippine economic zones included in our sample, and some basic features. We shall be calling the ecozones by their listed short names.[22] The fifteen economic zones were chosen simply based on the availability of a sufficiently long data series. The sample contains all of the four government-operated ecozones: Baguio, Bataan, Cavite, and Mactan. The eleven other ecozones are all privately operated although they all report to the Philippine Economic Zone Authority (PEZA), which provided the ecozone-related data used in this

[22] The short name often refers to the locality of the ecozone. In this paper, however, where it is not explicitly used as a name of a locality, the short names refer to the ecozones listed in Table 2.

study.

Short Name	Variable Name	Full Name	Size (hectares)
Baguio	BAG	Baguio City Economic Zone	119.3669
Bataan	BAT	Bataan Economic Zone	1,733.37
Cavite	CAV	Cavite Economic Zone	278.51
Mactan	MAC	Mactan Economic Zone	119.37
Angeles	ANG	Angeles Industrial Park	32
1st Cavite	1STC	First Cavite Industrial Estate	59.78
Gateway	GAT	Gateway Business Park	27.81
LIIP	LAGI	Laguna International Industrial Park	34.8784
Laguna	LTP	Laguna Techno Park	289.76
Luisita	LUI	Luisita Industrial Park	29.40
MEPZ	MEP	Mactan Economic Zone II	63.30
Subic	SUB	Subic Shipyard Special Economic Zone	52
Toyota	TOY	Toyota (Sta. Rosa) Special Economic Zone	29
Victoria	VIC	Victoria Wave Special Zone	50
West Cebu	WCE	West Cebu Industrial Park	50.73

Table 1. List of Ecozones in the Sample
Source: PEZA

Our estimation on the locator level was carried out on a sample of locators from the Baguio City Economic Zone and Cavite Economic Zone, listed in Table 2. Like in the case of the sample of ecozones, the primary basis for this choice is the availability of data for the locators. Based on a survey of the data found at the PEZA headquarters, these ecozones have a significant number of locators with a consistently long data series, which we can use for our estimation.

Locator Name	Product/Activity	Equity Participation
Dae Gu Apparel Corp.	Manufacture of knitted sweaters	99.99% Korean 00.01% Filipino
ITW Ampang Industries, Inc.	Manufacture of unplasticized PVC shipping tubes for use as packaging material for semiconductor industries	100% American
TI (Philippines), Inc	Upgrading of test and quality production processes and production of Quad Flat Pack	100% American
CS Garment, Inc.	Manufacture of men's and boy's woven shirts	70% German 30% Filipino
Furuhashi Knit Glove Philippines, Inc.	Manufacture of knitted working/industrial gloves	100% Japanese
Hitec RCD Philippines, Inc.	Manufacture of radio control systems accessories & parts,	100% Korean
Iriso Electronics Philippines, Inc.	Assembly of various electronic components, parts for hard disk drive	99.99% Japanese 00.01% Filipino
Itabashi Seiki Philippines, Inc.	Manufacture of single & double layer printed wire boards	100% Japanese
Mitsuwa Philippines, Inc.	Various plastic injected parts such as escutcheon assemblies	100% Japanese
Nichivi Philippines Corp.	Manufacture and assembly of window nozzles & control plates; and plastic injection & moldings	99.9% Japanese 00.01% Filipino
Philippine International Manufacturing & Engineering Services	Manufacture of CD ROM, subcompact or passbook printers and their parts and peripherals	99.9% Japanese 00.01% Filipino
Philippine Ichikawa Rubber Corp.	Manufacture of rubber products	99.98% Japanese 00.02% Filipino
Philippine Kohsei Corp.	Manufacture of polypropylene industrial bags and sheets, and polyethylene firm and bags	100% Japanese
Philippine Nakamura Corp.	Manufacture of small mechanical and electrical parts for automobiles	99.96% Japanese 00.04% Filipino
Philippine Sanyu Corp.	Manufacture of hairsprings for automobile and motorcycles, level pressure gauge, voltmeter	99.99% Japanese 00.01% Filipino
Philippine Toei Chemical Corp.	Manufacture of rubber parts to be used in the production of electrical wirings and parts for the automobile industry	99.97% Japanese 00.03% Filipino

Table 2. List of Sample of Locators

As can be noted, this list is much shorter than our original short list, given in

Appendix 1. The latter was based on collection of recent locator data that we conducted at the PEZA earlier this year. We carried out an intense search for further data, often doing a report-by-report inspection at the PEZA headquareters. Locator data was found to be incomplete because of the following reasons: filing of such reports is not obligatory; and reports, if submitted, have been forwarded to staff for analytical purposes, and, hence, not accessible. This has led us not to include in the final analysis a lot of the locators found in our original short list, which had large gaps in their time series.

The shared growth indicators were computed on a quarterly basis[23] from 1997 to 2002 for each of the sample ecozones, and from 2001 to 2004 for each of the sample locators.

The income elasticity of export volume was computed using equation (1) with δ_C being based on an estimation of the following export demand function

$$X = \gamma_1 + \sum_1^n \phi_i D_i + \left(\gamma_2 + \sum_1^n \phi_i D_i\right) P + \left(\gamma_3 + \sum_1^n \phi_i D_i\right) JGDP + \left(\gamma_4 + \sum_1^n \phi_i D_i\right) USGDP \quad (4)$$

where $P =$ export price expressed in Philippine pesos (obtained by multiplying a dollar-based export price index by the peso-dollar rate), $JGDP =$ Japan GDP expressed in Philippine pesos (obtained by multiplying Japan GDP in yen by the peso-yen rate), $USGDP =$ US GDP expressed in Philippine pesos (obtained by multiplying US GDP in dollars by the peso-dollar rate), $X =$ export volume (obtained by dividing export value in dollars by the dollar-based export implicit price index), and $D_i =$ dummy variable for the ith ecozone. Based on equation (4) and (2), we see that the export elasticity values can be computed using $\lambda_J = (\gamma_3 + \phi_i D_i)$ and $\lambda_{US} = (\gamma_4 + \phi_i D_i)$ for each of the ith ecozone. γ and ϕ are the coefficients to be estimated in the regression analysis.

Production functions were estimated using three specifications: Cobb Douglas; constant elasticity of substitution; and trans-logarithmic, given in equations (5), (6), and (7), respectively.

[23] Averaged over each quarter.

$$\ln X = \alpha_1 \ln M + \alpha_2 \ln L + \alpha_0 + \sum_{i=1}^{r} \beta_i Z_i \quad (5)$$

$$\ln X = \alpha_1 \ln M + \alpha_2 \ln L + \alpha_3 [\ln L - \ln M]^2 + \alpha_0 + \sum_{i=1}^{r} \beta_i Z_i \quad (6)$$

$$\ln X = \alpha_1 \ln M + \alpha_2 \ln L + \alpha_3 [\ln M]^2 + \alpha_4 [\ln M \ln L] + \alpha_5 [\ln L]^2 + \alpha_0 + \sum_{i=1}^{r} \beta_i Z_i \quad (7)$$

where α and β are the coefficients to be estimated, X, L, M are export volume, total employment, and import volume, respectively. The last two terms $\alpha_0 + \sum_{i=1}^{r} \beta_i Z_i$ can be considered as the residual measure for total factor productivity (overall efficiency) and is dependent on the zone-specific overall efficiency as well as the shared growth management indicators. Only the results of the translog production function will be reported in this paper. This function is deemed the most general of the three production functions given above.

For ecozone production estimation, $\sum_{i=1}^{r} \beta_i Z_i$ has sixteen terms consisting of twelve dummy variables to represent the sample of thirteen economic zones covered in this study, and the natural logarithm of the four shared-growth indicators. All the dummy variables are zero for the case of Cavite, which is used as the reference ecozone.

DERIVATION OF POLICY IMPLICATION

This study's methodology for deriving policy implications is aimed at comparing the information that could be obtained from two sets of monitoring regarding locator/ecozone performance. One set is the monitoring being carried out by the Philippines, particularly with respect to export values and employment figures. Another set is the monitoring of the shared growth indicators that we have identified. This monitoring can be considered to be not actively being monitored by the government.

For the comparison of the performance indication obtained from both sets of monitoring, this study will use the ranking of performance that could be obtained from each

performance indicator. A simple OLS procedure would then be applied to evaluate whether or not export value and employment could be considered as some weighted average of the four shared growth indicators. In particular, the following specification will be utilized

$$X\$ = \alpha_1 \varepsilon_J + \alpha_2 \varepsilon_{US} + \alpha_3 NX\$ + \alpha_4 \sigma^2 \qquad (8)$$

$$L = \beta_1 \varepsilon_J + \beta_2 \varepsilon_{US} + \beta_3 NX\$ + \beta_4 \sigma^2 \qquad (9)$$

where X$ is export value, and all other variables as defined earlier. If the government-monitored variables (export value and labor) are positively and highly correlated with one or a combination of the shared growth variables, then we can say that the shared growth variable(s) give the same performance signal as the government-monitored variable(s). In which case, we can say that the shared growth variable(s) is (are) redundant in the sense that it does not really provide any additional information to that which can be derived from the government-monitored variables.

IV. ESTIMATION AND RESULTS

The estimation work for the above theoretical framework is carried out on both ecozone and locator levels.

EXPORT DEMAND ESTIMATION

Table 3 shows generally very good estimation results in terms of the statistical measures and the wide range of variables that significantly explain demand for exports of the ecozones.[24] Most of the explanatory variables are statistically significant at the 1% level. It is notable that the export price variable passes the theoretical test in having a negative sign, which helps in identifying the estimated equation as a demand equation.

Only two of the fifteen ecozones display a non-zero export propensity to the US, as measured by the US GDP-related dummy variable coefficients. In contrast, all of the ecozones have non-zero export propensity to Japan. A generally low sensitivity of ecozone exports to US GDP was also observed in similar estimations using quarterly data from 1997 to

[24] The choice of appropriate explanatory variables to include in the estimation was left to the Stepwise algorithm of the SPSS program used for the estimation. The Stepping Method used an entry probability of F value of 0.05 and a removal probability F value of 0.10.

2002. This agrees with the stylized fact that there is increasingly growing economic integration among East Asian countries.

Explanatory Variable	Coefficient Estimate	t-statistic
Constant	4.796446	6.334404*
P	−0.0004	−2.29685**
JGDP	1.42E−05	3.602736*
D_{GAT}	−29.8664	−12.6774*
D_{LTP}	−11.7304	−6.89771*
D_{SUB}	−5.57429	−17.1151*
D_{VIC}	−5.56645	−17.091*
D_{TOY}	−5.43808	−16.6969*
D_{WCE}	−5.2626	−16.1581*
D_{LUI}	−4.94174	−15.1729*
D_{MC2}	−4.92727	−15.1285*
D_{1ST}	−4.75169	−14.5894*
D_{MAC}	−2.23475	−6.86151*
D_{CAV}	−1.42076	−4.36224*
D_{GAT} * JGDP	0.00013	12.49165*
D_{ANG} * JGDP	−2.4E−05	−16.7777*
D_{LII} * JGDP	−2.2E−05	−15.048*
D_{BAT} * USGDP	−8.4E−06	−14.3239*
D_{LTP} * USGDP	3.37E−05	11.06201*

Table 3. Estimation Results of Export Demand Function for Ecozones
Note: The dependent variable is Real Export
Adjusted R^2 = 0.917 F-statistic = 269***
Number of Observations = 312
*Significant at the 1% level
**Significant at the 5% level

On the other hand, a similarly good estimation of the export demand function for the sample locators could not be obtained. This is taken to be an indication that there is no significant difference in the income-elasticities of export demand among the sample of locators. Given this result, we are forced to proceed with the production function estimation for the locators without the income-elasticity export indicators.

The net export ratio was computed using equation (2) based on dollar values for exports and imports obtained from the PEZA. The relative employment of volatility was

computed using equation (3) based on the real export and employment values over the sample period.

EXPORT PRODUCTION EFFICIENCY TEST

Table 4 provides the best panel data estimates obtained for the ecozone production function for each of the three specifications.[25] Of the three production function specifications, the trans-logarithmic specification appears to be the most sensible since it includes a non-negative and significant estimation of the coefficient of the natural logarithm of employment. The estimation results suggest the following results as being robust in the sense that these appeared in earlier estimations for the sample period 1997 to 2002: an ecozone's EPE increases under any one of the following conditions: a) the net export ratio increases; b) export elasticity to Japan's GDP increases; and c) the relative employment instability decreases. Alternatively, the results suggest that ecozones with higher net export ratios produce higher export sensitivity to Japanese GDP, and lower relative employment instability.

Table 5 shows the best panel data estimates obtained for the trans-logarithmic production function for the sample of locators. Despite the absence of the export demand income-elasticity indicator, we were able to obtain estimates with the expected theoretical signs and good adjusted-R^2, t-statistics, and F-statistic. These results basically corroborate that of the ecozone level estimations: low relative employment instability and high net export ratio contribute positively to EPE.

To get an idea of the robustness of the measures, the complete results, which include the other production specifications, are given in Appendix 2.

Moreover, we have included the dummy variables DW and DK. Both variables are 1 if the majority equity participation of the locator is Western and Korean, respectively. The default state, when both DW and DK are zero, refers to a locator with a Japanese majority equity share. The negative coefficient estimate for DW indicates that Japanese-owned locators tend to have a higher efficiency than the Western-owned locators. On the other hand,

[25] The choice of appropriate explanatory variables to include in the estimation was left to the Stepwise algorithm of the SPSS program used for the estimation. The Stepping Method used an entry probability of F value of 0.05 and a removal probability F value of 0.10.

however, the positive coefficient estimate for DK indicates that Japanese-owned locators tend to have a lower efficiency than the Korean-owned locators. These results, though not final, suggest that there may be significant differences in efficiency among different nationalities in the ecozones.

Some observations on Japanese manufacturing operations in the Philippines appear to further validate these results. There is a close correlation of the shared growth indicators with what has been traditionally identified as management practices of Japanese manufacturing firms. Local value added, which is similar to our net export ratio indicator, is being monitored. In fact in a survey of Japanese-affiliated firms operating in Asia [JETRO, 2003], the results showed that increasing local procurement was considered an important way of cutting down costs and increasing efficiency. The word “empowerment of labor” is consistent with Japanese manufacturing firms’ adopted relatively stable employment policy. The management policy of being responsive to customers is consistent with a high income-elasticity of exports.

Table 4 shows the result of production function estimation based on a wider set of ecozones and more recent data than that in our interim report. The results in Table 4 shows that dummy variables for each ecozone are less significant than they were in the interim report calculations. This has forced us not to include the regional dynamics analysis, given that there seems to be less inter-regional factors involved in production efficiency than we first expected. This is deemed to be more or less more consistent with what is happening in the regions of the Philippines, particularly in terms of there being inter-regional production linkages between ecozones found in different regions of the country. We, therefore, would like to leave a more comprehensive study of the regional dynamics to future research.

Trans-Log (Ecozone Level)		
Variable	**Coefficients**	**t-statistic**
Constant	−3.102	−4.324*
lnL	0.148	7.583*
lnM	0.934	47.557*
lnM^2	0.059	21.819*
lnNX$	2.133	27.454*
$ln\varepsilon_J$	0.347	2.719*
$ln\sigma^2$	−0.013	−3.086*
D_{ANG} lnM	0.065	2.530*
D_{CAV} lnM	−0.236	−3.248*
D_{LTP} lnM	−0.184	−5.104*
D_{SUB}	−0.815	−6.502*
D_{VIC}	3.734	5.406*
D_{VIC} lnL	−0.235	−2.841*
D_{VIC} lnM	0.715	12.282*
F-statistic	1091.404*	
Adj. R^2	0.979	

Table 4. Estimation Results of Production Function for Ecozones.
Note: The dependent variable is ln X.
Number of Observations = 299
*Significant at the 1% level
**Significant at the 5% level

Trans-Log (Locator Level)		
Variable	**Coefficients**	**t-statistic**
Constant	4.736	31.173
DW	−0.541	−4.248
DK	0.467	3.323
lnL^2	0.0.19	4.178
lnM^2	0.039	37.147
lnNX$	1.126	31.173
$ln\sigma^2$	−0.028	−3.201
F-statistic	437.753	
Adj. R^2	0.911	

Table 5. Estimation Results of Production Function for Locators.
Note: The dependent variable is ln X.
Number of Observations = 299
t- and F-statistics are significant at the 1% level

V. CONCLUSION AND POLICY IMPLICATIONS

Based on the very encouraging results above, our overall conclusion is that the shared growth indicators identified above may be useful in evaluating the performance of the Philippine ecozones, for now, in terms of their contribution to export production efficiency. Future work on evaluating the impact of these shared growth indicators on equity can move forward, safe in the assumption that these indicators do contribute to export production efficiency.

The export production framework used in this study clarifies the relationship between the commonly used performance indicators, namely ecozone export values and employment, and the shared growth indicators. Our results also give support to the use of this production framework. Together with the shared growth indicators and the production framework, we are able to come up with a methodology that could be used on PEZA-monitored data, as a means to evaluating the performance of ecozones or locators.

This brings us to the policy-related question: how are the shared growth indicators and the production framework different from the traditional measures of performance, namely, export volume and employment? To answer this question, we carried out a comparison of the rankings obtained from using the shared growth cum production framework and the traditional indicators of performance.

We basically find that the two give differing signals of performance. Such discrepancy is evident from Table 4 below, which shows the relative performance rankings for each of the ecozones in the sample. A ranking of one is given to the best performing ecozone with respect to the indicator. The rankings are based on the average of the quarterly rankings, with respect to each indicator, over the sample period (from 1st quarter of 2000 to last quarter of 2004). With the exception of the relative employment volatility, all performance indicators were given higher rankings, the higher the value of that performance indicator. Checking the correlation of the rankings of export value and employment with the rankings of the three shared growth indicators shows that the rankings of net export ratio and relative employment volatility indicators are not significantly correlated to either the export value or employment. Rankings of the export elasticity to Japanese GDP was the only shared growth indicator which showed a significant correlation with both net export value and employment rankings. However, the signs of the coefficient estimates are negative indicating that performance signals given by the rankings of the export elasticity to Japan's GDP is opposite to that of either export value or employment rankings.

These suggest that performance evaluations based on either the export values or employment figures will not be indicative of the shared growth performance of the ecozones.

There is, therefore, a need to review the awarding of performance based on export values and employment, and to investigate further the signals obtained from monitoring the shared growth indicators identified in this study.

Ecozone	Export Value	Employment	Relative Employment Volatility	Net Export Ratio	Export Elasticity to JGDP
Baguio	2	10	1	15	12
Bataan	6	4	11	3	9
Cavite	3	1	10	9	11
Mactan	5	3	9	2	10
Angeles	13	13	3	8	15
1st Cavite	10	6	13	6	6
Gateway	4	5	1	10	5
LIIP	8	9	5	11	14
Laguna	1	2	7	12	13
Luisita	7	8	12	14	8
MEPZ	9	7	6	4	7
Subic	15	15	8	1	1
Toyota	12	14	14	5	3
Victoria	14	11	15	6	2
West Cebu	11	12	4	13	4

Table 4. Relative Rankings of Performance Indicators

Lastly, on the matter of data collection, we would like to say that we benefited a lot from the very good cooperation of PEZA. The results of our study show that such a database is important not only in the way it is now being used but also in terms of further evaluating the performance of ecozones and locators. Together with past research grants from the Sekiguchi Global Research Association, the current grant from EADN has enabled us to preserve whatever data has been left. We, however, would like to recommend that PEZA continue to exert efforts in preserving its database, as well as making it openly accessible to policy-oriented research like this one.

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Appendix 1
Short List of Possible Locators to be included in the Sample for Baguio and Cavite Ecozones
Source: PEZA

Ecozone	Locator	Product/Activity	Equity Participation
Baguio	**Adriste (Philippines), Inc**	Manufacture of high fashion leather gloves.	80% Swiss-Italian 10% Swiss 10% Indian
Baguio	**Bay Sports Mfg., Inc.**	Manufacture of door answering machines, alarm clocks, other security devices & other electronic devices and, and / or parts and components.	90% Filipino 10% German
Baguio	**Dae Gu Apparel Corporation**	Manufacture of knitted sweaters.	99.99% Korean 00.01% Filipino
Baguio	**ITW Ampang Industries, Inc.**	Manufacture of unplasticized PVC shipping tubes for use as packaging material for semiconductor industries.	100% American
Baguio	**MOOG Controls Corporation (Phil. Branch)**	Manufacture / assembly of servo components.	100% American
Baguio	**Tara Designs**	Manufacture of high quality embroidered table linen, bedroom and bedroom linen.	70% Filipino 30% Canadian
Baguio	**The Norwegian Collection, Inc.**	Wood home decors and gift items.	99.85% Norwegian 00.15% Filipino
Baguio	**TI (Philippines), Inc.**	Upgrading of test and quality production processes and production of Quad Flat Pack (QFP).	100% American
Cavite	**Astec Power Phils., Inc.**	Take over of APIPB's operations.	99.96% British 00.03% Filipino 00.01% American
Cavite	**Cavite Apparel Corporation**	Manufacture of garments particularly coats, vets and pants.	100% Filipino
Cavite	**Cavite Manufacturing Co., Inc.**	Manufacture of industrial gloves.	100% Filipino
Cavite	**Chiao Lin Electronics Philippines, Corporation**	Manufacture of wire harnesses and power supply cords.	90% Filipino 10% Singaporean
Cavite	**Chunji International (Philippines), Inc.**	Manufacture of knitted garments	99.98% Korean 00.02% Filipino
Cavite	**CS Garments, Inc.**	Manufacture of men's and boy's woven shirts.	70% German 30% Filipino
Cavite	**Excellent Quality Apparel, Inc.**	Manufacture of garments such as pants, shorts, skirts, jackets, dresses & blouses.	100% Filipino
Cavite	**Furuhashi Knit Glove Philippines, Inc.**	Manufacture of knitted working /industrial gloves.	100% Japanese
Cavite	**Gold & Green Apparel**	Manufacture of ladies' knitted sweaters & other ladies' apparel.	60% Filipino 40% Korean
Cavite	**Heavy Duty Packaging Corporation**	Manufacture of heavy duty cartons.	100% Filipino
Cavite	**Hitec RCD Philippines Inc.**	Manufacture of radio control systems accessories & parts such as transistors, receiver servos, chargers &	100% Korean

		speed controls for use in model hobby related products.	
Cavite	**House Research & Development Pte., Ltd.**	Packaging into one whole & complete export products of various housing components, parts and accessories and provide computer aided designated drafts, technical services.	100% Singaporean
Cavite	**House Technology Industries Pte., Ltd.**	Manufcture of fiber-glasss reinforced plastic bathtubs, bathtub fixtures & other related bathroom products such as tiles & plastic boxes.	100% Singaporean
Cavite	**I.M. Tech Co., Inc.**	Manufacture of injection moulding plastics, particularly plastic casing /housing for remote control units, cordless phones, and similar products; Production of moulds or moulding dies.	100% Korean
Cavite	**Icoast Manufacturing Group, Inc.**	Production of press stamping products particularly metal parts for electronic and non-electronics / semiconductors and related items such as cover, chassis, brackets, plates, heatsinks.	100% Filipino
Cavite	**Insung Philippines Electronics, Inc.**	Manufacture of automatic test equipment (such as battery testers) digital thermometer, multi-testers & other electronics.	60% Filipino 40% Korean
Cavite	**International Precision Assemblies, Inc.**	Manufacture of various electro- mechanical assemblies such as power shield and AC / DC travel power converter.	100% Filipino
Cavite	**Iriso Electronics Philippines, Inc.**	Assembly of various electronic components, parts for hard disk drive (HDDs) namely form head caps pin headds, high print pin heads, socket connectors and pitch sockets.	99.99% Japanese 00.01% Filipino
Cavite	**Itabashi Seiki Philippines, Inc.**	Manufacture of single & double layer printed wire boards.	100% Japanese
Cavite	**Ito Manufacturing (Philippines), Corporation**	Rebuilding of automobile parts & components specifically clutch cover, clutch disk, CV joust & caliper into reusable parts.	99.98% Japanese 00.02% Filipino
Cavite	**Jae Woo Apparel Corp.**	Manufacture of knitted garments and other wearing apparel.	99.97% Korean 00.03% Filipino
Cavite	**Japan Circuit Technology Corporation**	Manufacture of printed circuit boards.	80% Japanese 20% Filipino
Cavite	**Japan Special Glass**	Specialized glass for use in mounting on electronic equipment.	98% Japanese 02% Filipino
Cavite	**J-Film Philippines, Inc.**	Manufacture of various plastic products and films for consumer and industrial application such as plastic bags for shopping, blown film, T-die film, co-extension film, shrink film, stretch film, etc.	99.99% Japanese 00.01% Filipino
Cavite	**KAC Precision Philippines, Inc.**	Manufacture of connectors and connectors with tuner body and other related products.	100% Korean
Cavite	**Kang Nam Packaging House, Inc.**	Plastic bags.	80% Korean 20% Filipino
Cavite	**Kapco Mfg., Inc.**	Manufacture of surface coated hard disc frames and other coated products and electronic parts of similar nature.	99.99% Japanese 00.01% Filipino

Cavite	**Keyrin Electronics (Philippines), Inc.**	Manufacture of micro speakers and receiver units.	99.88% Korean 00.08% Filipiono 00.04% American
Cavite	**KIP Company, Inc.**	Manufacture of shafts, screws & similar metal parts used for Floppy disk drive, hard disk drive, audio visual, office automation.	100% Japanese
Cavite	**Kohzan Cavite, Inc.**	Manufacture of electronic and computer parts such as Head Gimbal Assembly (HGA) and Hub Assembly.	100% Japanese
Cavite	**Koyo Electric Rosario Philippines, Inc.**	Assembly of printed circuit boards (PCB), electronic keycard holder and power supply.	99.99% Japanese 00.01% Filipino
Cavite	**Kyung Won Rubber Cushion Philippines, Inc.**	Manufacture of sponge cushion and rubber pad for electronic parts and components.	99.99% Korean 00.01% Filipino
Cavite	**Latex Products Company, Inc.**	Manufacture of shopping cart rubber tires.	100% Filipino
Cavite	**MEC Electronics, Philippines Corporation**	Manufacture of electronic /electrical products.	90% Filipino 10% Taiwanese
Cavite	**Mega Electronics Enterprise, Inc.**	Manufacture of electronic components such as balun and toroidal transformers, line filter and chock transformer bar antenna, etc.	98% Korean 02% Filipino
Cavite	**Mikuni Electronics Corporation**	Assembly of large automated deposit system units.	99.99% Japanese 00.01% Filipino
Cavite	**Mitsuwa Philippines, Inc.**	Various plastic injected parts such as escutcheon assemblies and parts.	100% Japanese
Cavite	**Nichivi Philippines Corporation**	Manufacture and assembly of Window Nozzles & Control Plates; and Plastic Injection & Moldings.	99.99% Japanese 00.01% Filipino
Cavite	**Pacific Rare Specialty Metals And Chemicals, Inc.**	Manufacture of rare metals such as indium metla, tellurium metal, lead alloy, erro-selenium alloy, barium selenate & zinc selenate.	100% Filipino
Cavite	**Philippine Bobbin Corporation**	Manufacture of tobacco wrappers in bobbins for the cigar industry.	100% Filipino
Cavite	**Philippine International Manufacturing & Engineering Services**	Manufacture of compact disc read only memory drives, (CD ROM) subcompact or passbook printers (SCP), their parts and peripherals.	99.99% Japanese 00.01% Filipino
Cavite	**Park Terminal Precision Philippines, Inc.**	Manufacture of various metal press products such as ballpen hooks, parts for electronic & electrical products & other related products.	100% Korean
Cavite	**Philippine Ichikawa Rubber Corp.**	Manufacture of rubber products namely, rubber chip products (rubber lock base), rubber parts for cars, (rubber packing gaskets), rubber products for construction (buffer rubber & rubber products for industrial use (rubber packing).	99.98% Japanese 00.02% Filipino
Cavite	**Philippine Kohsei Corporation**	Manufacture of polypropylene industrial bags and sheets and polyethylene film and bags & other industrial goods of similar nature.	100% Japanese
Cavite	**Philippine Nakamura Corporation**	Manufacture of small mechanical and electrical parts for automobiles such as but not limited to wiper motor brackets, relay control box brackets, wiper link motion product and starter motor parts.	99.96% Japanese 00.04% Filipino
Cavite	**Philippine Sanyu Corporation**	Manufacture of hairsprings for automobile and motorcycles, level pressure gauge, voltmeter, timer and other indication meters.	99.99% Japanese 00.01% Filipino
Cavite	**Philippine Toei Chemical Corporation**	Manufacture of rubber parts to be used in the production of electrical wirings and parts for the automobile industry.	99.97% Japanese 00.03% Filipino

Cavite	**Philippines-Jeon Garments, Inc.**	Manufacture of garments such as T-Shirts, panties, brief & other underwears.	99% Korean 01% Filipino
Cavite	**Philstar Hosiery, Inc.**	Manufacture of cotton socks for men and children.	100% Korean
Cavite	**Precise Techno Inc.**	Manufactrue of drives for computers such as disk clamps, disk spacers and bases.	99.95% Japanese 00.05% Filipino
Cavite	**Prima Tech Philippines, Inc.**	Manufacture of precision injection molds, precision plastic injection molded components, precision die and mold components, and connector assembly.	94% Korean 06% Filipino
Cavite	**Prime Micro Electronics Philippines, Inc.**	Manufacture /assembly of switches and pilot lamps.	99.98% Korean 00.02% Filipino
Cavite	**Protek Automotive Products, Inc.**	Manufacture /assembly of printed circuit boards (PCB's) and wire harnesses.	100% Filipino
Cavite	**PTON Corporation**	Manufacture of plastic injected products.	99.97% Japanese 00.03% Filipino
Cavite	**Radix Communication, Inc.**	Manurfacture of printed circuit boards and tele- communication equipment such as satellite receiver, radar detectros and cordless telephones and other electronics products.	99.99% Korean 00.01% Filipino
Cavite	**Rosario Fasteners Corporation (Phil. Branch)**	Manufacutre of stainless steel screws and hexagon nuts.	100% Taiwanese
Cavite	**Samma Corporation**	Manufacture of baseball gloves and mitts made of cow hide leather, pigskin and vinyl leather.	99.99% Korean 00.01% Filipino
Cavite	**Sammi Embroidery Co., Inc.**	Engage in automated and /or computerized embroidery.	87.50% Korean 12.50% Filipino
Cavite	**Sankou Seiki Co., Ltd**	Manufacture of top clamp, acoustic cover, acoustic base dumping & tool die.	99.99% Japanese 00.01% Filipino
Cavite	**Scad Services Pte., Ltd.**	Manufacture of various wooden products, such as doors, door frames, window frames, panels, walls, cabinets, shelves, etc.	100% Singaporean
Cavite	**Sepung Industry (Philippines), Inc.**	Manufacture of telephone keypads.	99.91% Korean 00.06% Filipino 00.03% American
Cavite	**Shi Tai Manufacturing, Inc.**	Manufacture of various gifts and novelty items such as statues, ashtrays, jewelry boxes, photo frames, decorative display items, flower pots, candle holders.	75.4% Taiwanese 24.6% Filipino
Cavite	**Shin Heung Electro -Digital, Inc.**	Manufacture of electronic components such as metal stamping, plastic injection, components and other electronic mechanisms.	100% Korean
Cavite	**Star Electronics Parts, Inc.**	Manufacture of coaxial speakers.	99.99% Korean 00.01% Filipino
Cavite	**Star Sound Electronics Philippines, Inc.**	Manufacture of silicon rubber products such as roller with silicon rubber packing (roller for fax machine, copying machine, etc.) key pads for electronics / semiconductors and other related or similar items.	90% Korean 10% Filipino
Cavite	**Subic Glove Mfg., Inc.**	Manufacture of knitted and fabric gloves.	99.5% American 00.5% Filipino
Cavite	**Sunpino Cavite Corp.**	Manufacture of printed circuit board.	50% Japanese 49% Russian 01% Filipino
Cavite	**Tsukuba Philippine Diecasting Corporation**	Manufacture of hard disc frames.	100% Japanese

Cavite	**Wu Kong Singapore Pte., Ltd. (Phil. Branch)**	Manufacture of pre-assembled frames for a complete house and other wooden housing parts.	100% Singaporean
Cavite	**Yonghwa Of Philippines, Inc.**	Manufacture of computer and electronic parts made of brass and other metals, such as DVD, CD,	98.99% Korean 01.00% American
Cavite	**Zentes Unitex Asia, Inc.**	Manufacture of industrial moulds, casings, fittings, plastic coat hangers and other plastic- based materials.	78% German 22% Filipino
Cavite	**ZPI Philippines, Inc**	Manufacture and production of plastic products for copier parts, blister, headphone and speaker; and Cord Assembly.	99.99% Japanese 00.01% Filipino

Appendix 2

Complete Production Function Estimates (Ecozone)

	Cobb-Douglas		**CES**		**Trans-Log**	
Variable	Coefficients	t-statistic	Coefficients	t-statistic	Coefficients	t-statistic
Constant	−1.915	−2.860*	5.375	5.953*	−3.102	−4.324*
lnL			−1.545	−17.843*	0.148	7.583*
lnM	0.902	62.359*	2.009	26.669*	0.934	47.557*
$(lnL-lnM)^2$	---	---	0.069	19.154*	---	---
lnM^2	---	---	---	---	0.059	21.819*
lnNX$	2.086	25.654*	2.119	25.115*	2.133	27.454*
$ln\varepsilon_J$	0.401	3.165*	0.525	4.101*	0.347	2.719*
$ln\sigma^2$	−0.011	−2.358**	−0.015	−3.489*	−0.013	−3.086*
D_{ANG}	---	---	12.577	3.213*	---	---
D_{ANG} lnL	---	---	−2.096	−3.504*	---	---
D_{ANG} lnM	−0.494	−5.098*	---	---	0.065	2.530*
D_{BAT} lnL	---	---	0.060	3.463*	---	---
D_{BAT} lnM	---	---	0.361	2.436**	---	---
D_{CAV} lnL	---	---	0.098	6.970*	---	---
D_{CAV} lnM	---	---	---	---	−0.236	−3.248*
D_{GAT} lnL	---	---	0.072	7.931*	---	---
D_{GAT} lnM	---	---	---	---	---	---
D_{LII}	0.189	2.935*	0.28	3.131*	---	---
D_{LII} lnM	---	---	0.333	4.331*	---	---
D_{LTP}	---	---	−6.163	−2.087**	---	---
D_{LTP} lnL	---	---	0.692	2.507*		
D_{LTP} lnM	---	---	---	---	−0.184	−5.104*
D_{LUI}	−0.231	−3.204*	---	---	---	---
D_{MAC} lnL	---	---	0.086	7.276*	---	---
D_{SUB}	−4.28	−14.199*	−1.468	−6.524*	−0.815	−6.502*
D_{SUB} lnM	−0.821	−17.535*	---	---	---	---
D_{TOY}	−6.069	−3.068*	−7.325	−4.224*	---	---
D_{TOY} lnL	0.686	2.543*	0.87	3.726*	---	---
D_{TOY} lnM	---	---	−0.245	−2.968*	---	---
D_{VIC}	1.792	6.782*	1.297	5.225*	3.734	5.406*
D_{VIC} lnL	---	---	---	---	−0.235	−2.841*
D_{VIC} lnM	0.568	8.839*	0.706	11.504*	0.715	12.282*
D_{WCE}	−0.274	−3.526*	−3.316	−4.389*	---	---
D_{WCE} lnL	---	---	0.363	3.959*	---	---
F-statistic	773.4044*		620.138*		1091.404*	
Adj. R^2	0.973		0.981		0.979	

Table 3. Estimation Results of Production Function for Ecozones.
Note: The dependent variable is ln X.
Number of Observations = 299
*Significant at the 1% level
**Significant at the 5% level