Economic and Social Upgrading in Global Value Chains: Insights from Philippine Manufacturing Firms

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Abstract

This study explores results of the 2012 Survey on Adjustments of Establishments to Globalization (SAEG) to analyze the economic and social upgrading experience of Philippine manufacturers within global value chains (GVCs). Three broad patterns emerge from the data. First, firms with stronger GVC linkages tend to have better labor indicators than purely domestic producers. Second, the majority of manufacturers either experienced or missed economic and social upgrading simultaneously. Lastly, almost all social upgrading is accompanied by economic upgrading but economic upgrading may take place without a social component. Against this background, this study uses bivariate probit regression to model the joint determination of the two separate but interconnected upgrading outcomes. The results indicate that the covariates in the model can be categorized based on their statistical significance: purely economic (i.e., employment size, unit labor cost, high skill intensity, and the Kaitz dummy), purely social (i.e., training, female intensity, and foreign equity), and both (i.e., contractualization, and process and product innovations).

These results have several important implications. First, GVC firms' notion of social upgrading is closer to the softer components of working conditions than to traditional measurable indicators such as employment, wages, and efficiency.

Second, the results suggest direct and indirect channels through which technological upgrading may generate desirable social outcomes: the direct channel highlights that innovation should be accompanied by skills development to sustain higher value creation while the indirect channel underlines the potential of innovation to create upward spirals in output, productivity, and, ultimately, labor conditions. Lastly, there are some indications that the social benefits of economic upgrading may not be evenly distributed among different types of employment. Overall, the results emphasize the need for a holistic upgrading experience that shifts the country's comparative advantage from cheap labor to innovative local industries and highly skilled workers.

Keywords

global value chains, globalization, economic upgrading, social upgrading, labor conditions, Philippine manufacturing

Introduction

Over the past three decades, manufacturing has been increasingly organized within global value chains (GVCs) where final goods are produced by firms that are geographically scattered but virtually connected by technological and trade linkages. This is evident in the rising importance of intermediate inputs, semiprocessed goods, and auxiliary services in international trade transactions (World Trade Organization 2014). For instance, Cheng, Seneviratne, and Zhang (2015) observe that trade in intermediate inputs grew faster than trade in final goods between 1996 and 2013 (four and three times, respectively). The emergence of GVCs as the defining feature of 21st century globalization is often viewed by developing countries as a window of opportunity to expand trade and improve growth performance. In fact, recent studies suggest that economies that chose to integrate into GVCs instead of pursuing domestic-oriented industrialization experienced better growth outcomes (International Monetary Fund 2013; World Trade Organization 2014; Cheng, Seneviratne, and Zhang 2015). In addition, the United Nations Conference on Trade and Development (UNCTAD) (2013) reports that developing countries with the highest increase in GVC participation from 1990 to 2010 also experienced faster gross domestic product (GDP) per capita growth. One explanation is that the easier access to GVCs provided an alternative industrialization route for

developing countries without having to go through the long and costly process of capital accumulation as in the cases of Japan, South Korea, and Taiwan (Baldwin 2014; World Trade Organization 2014). Since the distribution of functions is now governed by comparative advantage at the input level, firms can specialize in particular production stages instead of developing capabilities to build fully integrated domestic supply chains (Baldwin 2014). In this vein, emerging economies such as the Philippines have increased their GVC participation both as lower-tier suppliers in relatively labor-intensive manufacturing and hosts of multinational affiliates and foreign subsidiaries. This reflects the general increase in the developing world's GVC participation index from 40.5 in 1995 to 50.9 in 2009 (World Trade Organization 2014). For many newly industrializing countries, especially in Asia, this is driven by a stronger presence in global manufacturing networks (see Figure 1).

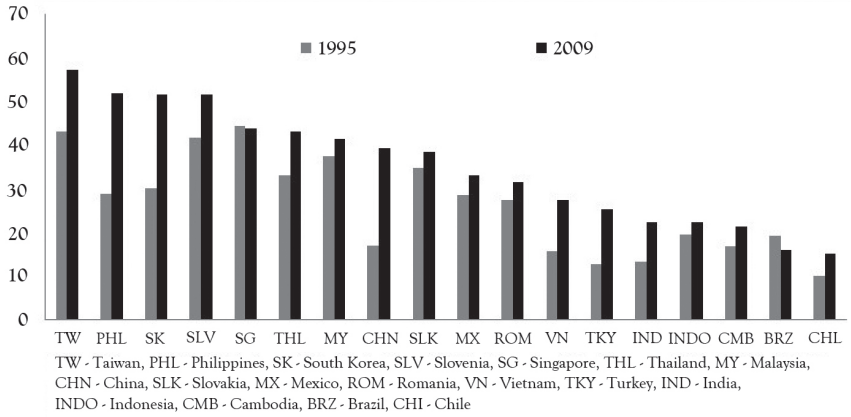

Figure 1. GVC Participation Index in Manufacturing, 1995 vs. 2009
Source: Organization for Economic Development GVC Indicators 2013b

From the lens of standard trade models, firms are expected to benefit from GVC participation through the usual scale and competition effects of foreign operations. In addition, access to multinationals' large network of suppliers opens various opportunities for learning through capability-building, knowledge transfers, and information spillovers. Indeed, for small manufacturers in developing countries, the conventional belief is that GVCs provide greater access to key insights about new technologies, product blueprints, consumer

preferences, and competitive strategies in global markets (Pietrobelli and Rabelloti 2011; Giuliani, De Marchi, and Rabellotti 2017). To the extent that these potential gains actually translate to a permanent increase in productivity, firms inside global production networks can ultimately take advantage of their unique position by upgrading to functions where both value addition and bargaining power are higher. However, investments in new skills and knowledge are necessary to build stronger capabilities and move up the value ladder (Morrison, Pietrobelli, and Rabellotti 2008). This partly explains why some producers (e.g., in high-tech sectors in East Asia) have successfully migrated from original equipment manufacturing (OEM) to original design manufacturing (ODM) and original brand manufacturing (OBM) while less innovative suppliers (e.g., in Africa and South America) stagnated in labor-intensive GVC segments with low value creation (Giuliani, De Marchi, and Rabellotti 2017). This implies that a country cannot expect to fully capture the long-term growth effects of global integration by specializing in less sophisticated stages that offer limited innovation and upgrading opportunities (Hausmann, Hwang, and Rodrik 2007).

While the upgrading trajectory of firms inside global production networks has been the subject of many case studies and macro level analyses, the social dimension of GVC participation has admittedly received lesser attention in the existing literature (see Amador and Cabral 2016; Giuliani, De Marchi, and Rabellotti 2017 for recent surveys). In particular, only few firm-level studies have explored the mechanisms through which innovation and upgrading may ultimately improve the welfare and competitiveness of workers in GVC-oriented industries. Yet, this is a central issue in many developing countries since their GVC participation relies heavily on their comparative advantage in labor-intensive activities. Although the international fragmentation of production has become an important source of employment worldwide, the heterogeneous nature and quality of jobs inside production networks suggest that the benefits from economic upgrading will also be distributed unevenly among workers (Taglioni and Winkler 2014). Most likely, those in less skills-intensive and low value-adding activities will only capture a small portion of these gains (Nadvi 2004).[1] In particular, since headquarter firms often keep the most valuable tasks, small-scale upgrading can only generate modest effects on workers in firms that perform auxiliary activities.

Against this background, it is imperative to ask: under what conditions, if any, does economic upgrading lead to social

improvements? In other words, do workers benefit when their employers upgrade? From a macro view, Flanagan and Khor (2012) find cross-country evidence that trade openness indirectly improves labor condition through the potential wage effect of higher productivity. From a micro perspective, Kummritz, Taglioni, and Winkler (2017) suggest that GVCs benefit labor markets through higher demand for skilled workers, additional trainings, and knowledge diffusion through turnovers and informal networks. Barrientos, Gereffi, and Rossi (2011) argue that GVC upgrading can improve labor conditions when they generate quality employment that does not only pay decent wages but also protects the rights of workers. Milberg and Winkler (2011) also highlight the role of regulation and monitoring in achieving social upgrading. Other results from the existing literature suggest that the linkages between economic and social upgrading are rather complex. While a number of studies find that social upgrading automatically follows from economic upgrading through higher wages and better labor standards (Nadvi 2004; Knorringa and Pegler 2007), other researches show that this causal relationship is not automatic. For instance, Fernandez-Stark, Frederick, and Gereffi (2011) stress the role of regulation, suggesting that outside pressure from governments and international buyers may be necessary to force the suppliers in the apparel GVC to provide formal trainings. Milberg and Winkler (2011) argue the possibility of a low-road growth path wherein economic upgrading is achieved by cutting wages. In a study of the apparel, mobile phones, agrofoods, and tourism GVCs, Bernhardt and Milberg (2011, 2) conclude that "economic upgrading is often not associated with social upgrading, but social upgrading occurs almost always when economic upgrading is also observed." Rossi (2013) also derives similar findings from her study of the Moroccan garment industry. In relation to Bernhardt and Milberg (2011), Rossi's (2013) findings imply that while economic upgrading provides important prerequisites that can potentially generate desirable social outcomes, minimal improvements in firm-level performance cannot create a significant dent on labor conditions.

In the Philippines, studies on the social upgrading of suppliers inside GVCs are rare and inconclusive. For instance, Bernhardt and Milberg (2011) observe that while the country has a considerable economic upgrading in the mobile telecommunications sector (i.e., in terms of export market share and unit value increase) between 2000 and 2009, there has been an observable decline in employment and real wages over the same period—35 percent and 69 percent drops,

respectively. This is in contrast to de Vries et al.'s (2016) macro level analysis which finds that all categories of skilled labor experienced double-digit growth between 2000 and 2011, although the majority of manufacturing GVC workers are still low- and medium-skilled. In another study, Tejani and Milberg (2010) detect a "defeminization" of manufacturing when there is industrial upgrading, although female intensity in the Philippines remained relatively flat between 1985 and 2007 at around 46 percent. In addition to the aforementioned studies, some papers also discussed the general impacts of globalization on local labor conditions. For instance, Aldaba (2013) finds that labor outcomes vary depending on how firms respond to greater trade openness. In particular, lower tariffs reduce the wage premium in firms that rely on low value adding processes and low skilled workers. On the other hand, the wage premium increased in producers that reallocate resources toward skills-intensive exports. However, Lanzona (2000) argues that skills upgrading in manufacturing may exacerbate the economy-wide wage inequality when there are no parallel technological improvements in agriculture. Looking beyond wages and employment, Sibal, Amante, and Tolentino (2006) find that micro, small, and medium enterprises (MSMEs) generally lag behind larger establishments in terms of providing decent work through compliance with local and international labor standards. Although data from the Philippine Statistics Authority (2017) show a gradual decline in the share of establishments violating labor regulations, from 57.9 percent in 1991 to 47.7 percent in 2011, the pattern is again on an uptrend through 2016. However, Sicat (2004a) argues that industrial relations and labor costing in the Philippines are actually overregulated, with labor violations leading to more restrictive regulations. Ultimately, these interventions helped erode the country's competitive advantage in labor-intensive exports. Sicat (2004b) cites that the major success stories in employment and income creation (e.g., export processing zones and business process outsourcing) have at least two things in common: first, they involve efforts to reduce the negative impact of complicated labor policies on cost and productivity; and second, they involve employment of foreign capital.

This study adds to the social upgrading literature by analyzing the GVC experience of manufacturing firms in the Philippines. In particular, this research deviates from the usual case study approach by applying more formal analyses to the results of the 2012 Survey on Adjustments of Establishments to Globalization (SAEG) commissioned

by the Escaping the Middle-Income Country Trap (EMIT) Research Programme (2012). The SAEG collected data on the characteristics, performance indicators, international linkages, and innovative activities of an original sample of 450 Philippine establishments. This current research complements the existing literature by applying the analytic tools of economic theory and econometrics to establish empirical regularities that are hard to detect using the case study approach. In addition, this article contributes to the better understanding of social upgrading through a more systematic measurement and evaluation of labor conditions within GVCs. Lastly, the empirical results are analyzed in relation to Philippine labor market developments and the bigger global context. Given the country's erratic growth performance and its history of high unemployment (Asian Development Bank 2007), a positive analysis of firms' upgrading trajectories will hopefully help identify important channels through which GVCs may contribute to broad-based industrial development, job creation, and income and productivity growth.

The rest of this article is organized as follows: Section 2 analyzes the relevant SAEG data to measure the differences in the labor conditions of firms with and without GVC linkages; Section 3 unpacks the underlying relationship between economic performance and labor improvement in the context of GVCs; and finally, Section 4 concludes with a synthesis and some policy implications.

A Portrait of GVC Workers in Philippine Manufacturing: Some Stylized Facts

Social upgrading is commonly defined as the process of improving the quality of employment through enhanced labor conditions and protection of rights, ultimately leading to the overall well-being of workers (Barrientos, Gereffi, and Rossi 2011). This definition puts a strong emphasis on workers as social actors with rights and entitlements instead of factor inputs that simply complement capital in the firm's production function (Sen 2000; Rossi 2013). Social upgrading is closely related to the International Labour Organization's notion of decent work which is often quantified in terms of quality of employment (e.g., pay, working hours, workplace safety, work-life balance), social protection, workers' rights, and labor relations (Anker et al. 2003; Milberg and Winkler 2011). Meanwhile, Barrientos and Smith (2007) conceptualize social upgrading in two major dimensions.

First, measurable standards are easily quantifiable indicators of labor conditions such as employment demographics, working hours, physical well-being, working environment, wage rate, and other employee benefits. Second, enabling rights, or what Milberg and Winkler (2011) call *informalities*, include less quantifiable entitlements such as the right to collective bargaining, freedom of association, and nondiscrimination, among others. However, Barrientos, Gereffi, and Rossi (2011) suggest that the two are not mutually exclusive since measurable standards are often the result of properly placed enabling rights.

Guided by the preceding definitions, this section explores relevant SAEG indicators to provide a general description of GVC workers in Philippine manufacturing. For comparison, the characteristics of the workforce "outside" GVCs are also summarized to test for any statistically significant differences across firm categories. Lastly, the survey results are used to analyze the social upgrading experience of GVC firms. At the onset, it should be noted that although almost all domestic manufacturers are remotely connected to a GVC, firms that simultaneously export and import tend to have the strongest international linkages (Baldwin and Yan 2017). Since cross-border trade of parts and components is the norm in production networks, it is not surprising for suppliers to import intermediate inputs and subsequently export the semifinished output for further processing. Based on this definition, the sampled manufacturers can be grouped according to a proposed intensity of GVC operations: Type 1 firms that have purely domestic-oriented production; Type 2 firms that only import; Type 3 firms that only export; and Type 4 manufacturers that have both import and export transactions. This study argues that Type 1 and Type 4 producers have the weakest and strongest GVC linkages, respectively, while Types 2 and 3 are moderate cases.[2]

Using the above definition, Table 1 summarizes the conditional distribution of the remaining 326 manufacturers according to their respective types and broad industrial classifications. Initial inspection of the data shows that the majority of firms in the sample have weak GVC connections. In particular, 121 manufacturers or 37.12 percent have purely domestic operations while 106 firms or 32.32 percent either import or export but not both. Only 99 firms or 30.37 percent are engaged in a two-way trade. More formally, a simple GVC linkage score is calculated using the following formula:

$$g_j = \sum_{t=1}^{4} tp_{t|j}$$

where t is firm type and $P_{t|j}$ is the conditional probability of type t in industry j. A sector's GVC linkages is tagged as mostly weak when $1 \leq g_j < 2$, mostly moderate when $2 \leq g_j < 3$ and mostly strong when $g_j \geq 3$.

Table 1. Conditional Distribution of Manufacturers by Industry, 2011

Industry	No. of Firms	Conditional Distribution				GVC Linkages
		Type 1	Type 2	Type 3	Type 4	
Food, Beverages, and Tobacco	68	57.35	16.18	17.65	8.82	Mostly Weak
Textile, Apparel, and Leather	45	44.44	11.11	17.78	26.67	Mostly Moderate
Wood and Furniture	31	25.81	9.68	32.26	32.26	Mostly Moderate
Paper Products	10	50.00	20.00	-	30.00	Mostly Moderate
Chemicals and Pharmaceuticals	27	37.04	40.74	-	22.22	Mostly Moderate
Rubber and Plastics	27	44.44	22.22	3.70	29.63	Mostly Moderate
Metals and Minerals	55	34.55	21.82	5.45	38.18	Mostly Moderate
Electronic and Electrical Equipment	29	3.45	10.34	317.24	68.97	Mostly Strong
Machinery and Transport Equipment	23	30.43	30.43	17.39	21.74	Mostly Moderate
Others*	11	-	9.09	18.18	72.73	Mostly Strong
All Sectors	326	37.12	18.71	13.80	30.37	Mostly Moderate

Source: SAEG 2012
*Includes seven manufacturers of jewelry, fashion, and sporting goods which fall either in the Type 3 or Type 4 categories; hence, the mostly strong GVC linkages.

The results summarized in Table 1 show that in general, GVC linkages in many manufacturing sectors in the Philippines are mostly moderate, even in industries such as garments and machinery and transport equipment that are extensively organized inside global production networks. In textile and apparel, Sicat (2004a) suggests that an "unintended alliance" between protective industrial and labor policies was detrimental to the sector's global competitiveness, ultimately losing its potential to generate large exports and employment. In particular, the decades of protection enjoyed by the industry throughout the 1980s encouraged the proliferation of manufacturers that were running on outdated technologies, low-skilled labor, and high production costs. Efforts to increase the technical capacity of both firms and workers were deemed too little too late by the time the World Trade Organization (WTO) took effect. As a result, the liberalization of the domestic textile and garments sector starting the 1990s, even at a gradual rate, resulted in the downsizing or ultimate closure of some 352 firms between 1998 to 2003 (Antonio and Rodolfo 2006). In the automotive industry, Aldaba (2013) notes that the Philippines' GVC participation is confined in assembly and distribution of mostly imported parts. In contrast to these moderate cases, Table 1 identifies two extreme industries. In particular, GVC operations seem prevalent in electronics and electrical equipment (E&E) with 68.97 percent of the surveyed firms falling in the Type 4 category and another 27.58 percent having backward or forward trade linkages. Nevertheless, Aldaba (2015) observes that the Philippine electronics sector is dominated by foreign-subsidized manufacturers that perform back-end activities (e.g., integrated device manufacturing, semiconductor assembly and testing) for their multinational parents. Frederick and Gereffi (2016) also note that Philippine E&E exhibits limited presence in design, research and development, sourcing, and marketing due to a number of factors such as low investments in innovation and relatively low supply of industry-specific technicians and engineers needed in new functions, product areas, and end markets. At the other extreme, food, beverages, and tobacco (FBT) is mostly populated by Filipino-owned firms with weak GVC connections. In fact, only 8.82 percent of the sampled firms in the sector are involved in a two-way trade while 57.35 percent have purely domestic operations.

In general, the data suggests that a good portion of the country's GVC participation is driven by multinationals partly due to the failure of traditional labor-intensive sectors to upgrade and establish a strong international presence. This may be traced back to the postwar decades in which intensive protectionism, import substitution policies, and foreign exchange controls led to a domestic market largely captured by highly inefficient industries.[3] The minimal competitive pressures and knowledge spillovers from abroad did not provide the necessary stimulus to force the government and the private sector to invest in human capital development and technological innovation. Consequently, Philippine manufacturers entered the second wave of globalization in the 1970s with relatively weak capabilities to secure their shares in local markets and capture high value-adding functions in expanding American and Japanese production networks. As indicated in Table 1, this trend would persist through the 1990s and 2000s, with domestic industries becoming specialized in the production of traditional goods or in labor-intensive segments of high-tech value chains. Nevertheless, a more optimistic take on these historical trends is that Philippine manufacturing may still have many untapped upgrading opportunities inside GVCs. However, harnessing these gains would require large-scale and purposeful efforts to adapt and innovate, given the fast-increasing complexity of global manufacturing.

Table 2 describes the major characteristics of the workers in different firm categories.[4] Using Type 1 firms as the reference group, Pearson's test for equality of medians was implemented to formally check whether manufacturers with foreign linkages are significantly different from firms with domestic operations only. In general, the variables summarized below suggest that workers in firms with international transactions tend to enjoy better labor conditions compared to employees of purely domestic producers. Further, the median tests for Type 4 firms are statistically significant in almost all indicators, suggesting that they are the most distinct category from Type 1 manufacturers. This also confirms the earlier proposition that the two groups broadly correspond to the least and most extreme cases of GVC participation, respectively.

Table 2. Median Labor Indicators, 2011

Indicator	Unit	Type 1	Type 2	Type 3	Type 4
Employment	Persons	39.50	72.00*** (11.21)	101.00*** (11.94)	152.50*** (42.40)
Wages	'000 Pesos/ Person	59.57	102.01*** (11.19)	79.95** (5.36)	121.93*** (42.40)
Kaitz Index	Ratio	0.95	0.45*** (12.63)	0.59* (3.50)	0.41*** (35.62)
Social Security Benefits	'000 Pesos/ Person	4.88	7.86*** (17.48)	5.58 (0.50)	7.76*** (24.40)
Production Workers	Share	85.30	73.85** (6.30)	80.42 (0.68)	76.77* (3.61)
Female Workers	Share	28.87	22.22 (1.85)	38.23 (1.98)	42.08** (6.57)
Labor Productivity	'000 Pesos	51.84	116.77*** (15.41)	82.29** (5.15)	163.78*** (43.35)
Unit Labor Cost	Pesos	0.25	0.14** (5.29)	0.28 (0.05)	0.16** (3.87)
Low-skilled Turnover	Share	10.00	5.00 (1.40)	10.00 (0.00)	6.00 (0.03)
High-skilled Turnover	Share	5.00	5.00 (0.50)	5.00 (0.73)	2.00** (3.86)

*p<0.10, **p<0.05, ***p<0.001

Source: SAEG 2012

Note: Amounts are expressed in constant 2000 prices using a manufacturing-specific deflator. Numbers in parentheses are Pearson chi-squared statistics for the nonparametric test of equality of medians.

Looking at individual indicators, Table 2 shows that all firm types with imports and/or exports generate more employment than Type 1 manufacturers. This is not surprising since access to foreign markets, especially to the large consumer base of multinational-led GVCs, produce a well-known scale effect on the firms' production. In addition, manufacturers with international transactions tend to pay significantly higher wages to their employees. In particular, the median wage of two-way traders is twice as large as the median compensation in domestic-oriented firms. The reversed pattern is observed for the Kaitz index or the ratio of production workers to total employment multiplied by the ratio of legal minimum wage (LMW) to average daily wage. Intuitively, firms with low Kaitz values tend to employ more skilled labor who are paid higher than the minimum wage. Consistent with the above results, this implies that large GVC suppliers are expected to be less sensitive to upward adjustments in the LMW. In contrast, the "bite" of a minimum wage increase will be felt more by smaller domestic-oriented producers. On the other hand, the median social security and health contributions by Types 2 and 4 manufacturers are also significantly higher than what Type 1 firms normally provide. One possible explanation suggested by Lipsey and Sjoholm (2004) is that globally oriented firms offer better wages and benefits to keep their highly trained workers and attract new good ones. Accordingly, employees of manufacturers in the exporting and/or importing businesses seem more productive. Most notably, the median labor productivity (i.e., value added per employee) of Type 4 traders is thrice as large as that of Type 1 firms. In other words, a unit of labor in the former produces much higher value added than a unit of labor in the latter. Consequently, the median unit labor costs (ULCs) of Types 2 and 4 manufacturers are significantly lower compared to Type 1 firms, suggesting that the effective wage spending requirement to create a unit of output is significantly higher for purely-domestic producers. In short, Type 1 firms are less efficient. Additionally, the lower share of production workers in firms with trade transactions imply a higher portion of the workforce involved in managerial and research and development (R&D) positions. However, R&D workers in Philippine GVC firms are still low by international standards, suggesting that the country is still specialized in relatively low-skilled intensive GVC functions. In terms of achieving gender-neutral manufacturing, only Type 4 firms seem to be making a significant progress in closing the gap, with a median female share in total employment of nearly one-

half. This echoes Farole's (2016) conclusion that GVCs have more inclusive employment demographics and is also consistent with Flanagan and Khor's (2012) findings that export processing zones have a high proportion of female workers. Finally, the results indicate no significant differences in the turnover of low-skilled workers while the attrition of high-skilled labor is significantly lower in Type 4 firms, possibly due to the apparent, better employment conditions. Kummritz, Taglioni, and Winkler (2017) note that firms normally keep high-skilled workers in order to recover their investments in trainings and minimize the leakage of internal knowledge to their competitors.

In order to formally measure the social premium of GVC participation, this study adopts the approach of Bernard and Jensen (1999) and Kasahara and Lapham (2013) by estimating the following regression equation for each variable in Table 2:

$$\ln Y_i = \beta_o + \beta_1(1-X_i)M_i + \beta_2(1-M_i)X_i + \beta_3 M_i X_i + Z_i'\delta + \varepsilon_i$$

where Y_i is a particular attribute of firm i ; M_i and X_i are dummy variables equal to 1 when firm i import or export, respectively; Z_i' is a vector of control variables such as size, industry and location, δ is the vector of parameters corresponding to Z_i', and ε_i is the stochastic error term. The parameters β_1, β_2, and β_3 measure the respective social premia of Types 2, 3, and 4 firms over Type 1 manufacturers. The signs, magnitudes, and statistical significance of the estimated economic and social premia in Table 3 are broadly consistent with Table 2. Most notably, Type 4 firms, where "purely" GVC transactions most probably take place, generate relatively bigger social gains compared to the other groups. Labor productivity produces the largest premium at 1.37 (i.e., the workforce in Type 4 firms are, on the average, 137 percent more productive than in Type 1 manufacturers). Large differentials are also found in ULCs, wages, Kaitz index, and social security benefits.

Table 3. Estimated Premium of GVC Participation, 2011

Dependent Variable	$\hat{\beta}_1$	$\hat{\beta}_2$	$\hat{\beta}_3$
Wages	0.48***	0.43***	0.72***
	(0.15)	(0.16)	(0.13)
Social Security Benefits	0.49***	0.15	0.69***
	(0.15)	(0.20)	(0.15)
Kaitz Index	-0.69***	-0.54***	-0.77***
	(0.18)	(0.20)	(0.15)
Share of Production Workers	-0.14***	-0.07	-0.07**
	(0.04)	(0.04)	(0.03)
Share of Female Workers	-0.04	0.06*	0.08**
	(0.03)	(0.04)	(0.03)
Labor Productivity	0.86***	0.96***	1.43***
	(0.20)	(0.22)	(0.18)
Unit Labor Cost	-0.49***	-0.55**	-0.73***
	(0.17)	(0.22)	(.018)
Low-skilled Turnover	-0.04	-0.04	-0.07*
	(0.05)	(0.05)	(0.04)
High-skilled Turnover	-0.03	-0.07*	-0.06
	(0.04)	(0.04)	(0.04)

*p<0.10, **p<0.05, ***p<0.001

Source: Author's calculations using the SAEG 2012
Note: Only monetary variables are expressed in natural logarithms. Controls include employment size (in natural logarithm), industry, and region. Numbers in parentheses are robust standard errors.

In general, the picture depicted by the results is one where a better working environment is more common in firms with stronger GVC linkages. This is consistent with some macro level evidence showing that trade openness indirectly contributes to better labor conditions (Flanagan and Khor 2012). However, whether this is merely coincidental with or a direct effect of GVC participation is not clear at this point since no causal relationships can be established from the contemporaneous nature of the regressions. Succeeding discussions will explore how positive economic performance may reinforce social

upgrading or how good labor conditions may contribute to labor productivity, and ultimately to economic upgrading. On the one hand, entry into value chains may lead to expanded production and more employment opportunities. In addition, since large multinationals adhere to strict product and labor standards to protect the quality and integrity of their brands, noncompliant local suppliers may be sanctioned to observe labor laws and provide trainings not only to improve competitiveness but also to maintain goodwill. This is especially true for reputation-sensitive firms that operate in sectors where government and special-advocacy groups push for stricter implementation of labor codes and human rights (Organization for Economic Development 2013a). In addition, large firms are more integrated into the formal economy, hence, are legally constrained to strictly observe labor regulations. Further, the so-called learning effects of importing and exporting may also produce positive spillovers on labor productivity through access to better technologies from abroad (Greenaway and Kneller 2007; Kiriyama 2012).

On the other hand, the more empirically supported view in the literature is that better firms self-select into foreign markets. In the presence of huge entry costs accrued from foreign operations, only sufficiently large and efficient manufacturers will be able to participate in global markets (Bernard and Jensen 1999; Melitz 2003). In other words, firms that are internationalized are already outstanding before they started exporting or importing. In the context of GVCs, participation of aspiring suppliers is often constrained by the requirements to adopt industry-best practices in terms of process and product quality standards as well as labor relations and environmental responsibility. This implies that forming a productive workforce may be part of firms "dressing up" for foreign markets. Therefore, when fostering acceptable labor conditions requires nontrivial costs, the self-selection view suggests that the social premium observed in firms inside production networks cannot be entirely attributed to their post-GVC entry. In other words, the manufacturers most capable of social upgrading are also the ones more likely to join GVCs on account of their above-average capabilities. Since they are larger, more profitable, and more established, they are also in a better financial position to provide for the well-being of their employees. An interesting implication of this view is that economic and social upgrading will most likely coexist.

Table 4. Some Indicators of Labor Relations, 2011

Share of firms with	Type 1	Type 2	Type 3	Type 4
Recognized Trade Union	7.38	16.95**	9.09	14.29**
		(-1.97)	(-0.36)	(1.66)
Contractualization	21.31	36.07**	20.00	33.33**
		(-2.14)	(0.18)	(2.01)
Regular Trainings	44.92	70.00***	61.36**	72.16***
		(-3.17)	(-1.86)	(-4.02)

*p<0.10, **p<0.05, ***p<0.001
Source: Author's calculations using the SAEG 2012
Note: Numbers in parentheses are *z* statistics.

In addition to the measurable standards of social upgrading analyzed in Table 3, the SAEG also contains information related to the softer components of labor conditions. Table 4 reports the share of firms that practice contractualization, have recognized labor unions, and provide regular trainings. Tests of proportions are also performed to identify any statistically significant differences between firm types. The results suggest that firms actually practice labor policies that may produce mixed social outcomes. For instance, the share of firms with organized unions is twice as high in Types 2 and 4 than in Type 1. However, despite the legally guaranteed freedom of association and rights to collective bargaining, the actual union membership across firm types are generally low. Serrano (2016) reports that union density declined from 30.5 percent in 1995 to 8.5 percent in 2012. In the SAEG sample, the average unionization rate in Types 2 to 4 manufacturers is only 8.29 percent. One possibility is that the stricter implementation of government regulations diminishes the role of unions in bargaining for better labor conditions. However, Sicat (2004a) suggests that the prevalence of "standardized" government intervention in firm-specific labor issues such as compensation, benefits, and tenure undermine the potential of management-union negotiations in achieving more efficient outcomes. Another possible reason for low unionization is the presence of employee associations, labor management committees, and cooperatives that provide alternative venues for social dialogue and consultation (Sibal, Amante, and Tolentino 2006). In addition, an Asian Development Bank (2013) study partially traced the low unionization rate to the significant share of small and informal sector employers where trade unions may be unnecessary and the

widespread practice of hiring precarious (i.e., short-term, seasonal, casual, and probationary) employees that are not qualified to join unions. Incidentally, a higher fraction of Types 2 and 4 firms employ contractual labor. In the entire manufacturing sector, the Philippine Statistics Authority (2017) reports that around 30 percent of total employment in 2012 are nonregular workers. While this may be consistent with the firm's profit maximizing objective, widespread contractualization is often criticized by special advocacy groups due to the perceived negative effect on workers' welfare, particularly in terms of differential access to social security benefits. Nadvi (2004) also argues that contract employment is vulnerable to adverse demand and supply shocks. Nevertheless, there can be circumstances when contractualization is not completely inconsistent with social upgrading. For instance, flexibility in employing contractual labor in some aspects of operations may improve the firm's cost efficiency, competitiveness, and profitability which may ultimately generate higher production and more demand for skilled labor. On the other hand, Suresh (2010) suggests the possibility of a segmented social upgrading wherein permanent workers consistently enjoy good labor conditions while irregular employees "buffering" role in manufacturing do not allow them to benefit as much since they can be hired in peaks and fired in slumps. (ILO 2014 in Lee 2016, 5)

In terms of trainings, data from the SAEG suggests that the proportions of Types 2 to 4 firms that support regular skills upgrading are significantly higher than Type 1 manufacturers. This may not be surprising since competitive pressures and constantly evolving tastes and technology in global markets force GVC-oriented producers to continuously update their own competencies and consequently, the quality of their workforce. Yet, trainings enhance not only the workers' contribution to the production process but also their role as productive social actors (Barrientos, Gereffi, and Rossi 2011). This highlights the dual nature of skills development as an intersection of economic and social upgrading. On the one hand, strict processes and product specifications in GVCs rationalize the need for regular training programs. When assimilated properly, this ensures that workers will be able to perform their functions with minimal error. On the other hand, the accumulation of skills may support an upward spiral of better tasks, healthier working environment, higher-paying positions, and even more skills. In addition, trainings may also result in industry-wide spillovers when labor is sufficiently mobile across manufacturers and skills are not very firm-specific.

Table 5. Joint Distribution of Economic and Social Upgrading among Types 2, 3, and 4 Manufacturers

Economic Upgrading	Social Upgrading		
	No	Yes	Total
No	31.39	4.04	35.43
Yes	24.66	39.91	64.57
Total	56.05	43.95	100.00
Pearson's χ^2: 52.632***			
Goodman & Kruskal's γ: 0.853***			

*p<0.10, **p<0.05, ***p<0.001
Source: Author's calculations using the SAEG 2012

Finally, Table 5 summarizes the joint distribution of 223 firms of Types 2 to 4 based on self-reported economic and social upgrading.[5] The data suggests that the majority of manufacturers with potential GVC linkages believe to have experienced (or missed) economic and social upgrading simultaneously. In particular, 31.39 percent of the surveyed firms do not report any upgrading while another 39.91 percent perceive improvements in both economic and social aspects (i.e., the high-road path). Although this may be subject to reporting bias since the SAEG question captures what firms think rather than what employees experience, the pattern is broadly consistent with the preceding analyses, showing a strong correlation between the two forms of upgrading. However, nearly a quarter of manufacturers in the sample undergo economic upgrading without social improvements (i.e., the low-road path). Table 5 also supports Bernhardt and Milberg's (2011) findings that social upgrading without economic gains is very rare. In fact, the data shows that almost all social upgrading is accompanied by economic upgrading but economic upgrading may take place without a social component. Two interesting questions arise from the preceding observations. First, what mechanism connects the two forms of upgrading? That is, what factors can potentially explain the joint distribution in Table 5? Second, what distinguishes firms in the high-road and low-road upgrading paths? The next section attempts to answer these questions by exploring the underlying relationship between economic performance and labor improvement in the context of GVCs.

The Link Between Economic and Social Upgrading

The idea that economic and social upgrading are not necessarily competing corporate objectives is consistent with recent initiatives to refocus business practices from purely profit-driven activities to socially inclusive entrepreneurship. For instance, Poblador (2017) argues that the so-called inclusive business models should be integrated into firms' strategic agenda because of their potential contribution to long-term viability. In this framework, communities, especially their poorest members, are seen as important business partners whose sustainability has a direct impact on the firms' operations. In particular, when the host communities are a nontrivial source of labor and raw materials, it will always be in the strategic interest of business to participate in community-building efforts by providing training and skills development, technical assistance, and access to financing (Poblador 2017). In other words, firms are essentially investing in their future growth by nurturing a stable and mutually beneficial relationship with its potential employees, suppliers, and customers. However, given that a socially inclusive business often requires huge financial resources, organizational capital, and extensive networking, the challenge for firms is how to align the interests of stakeholders without compromising financial sustainability.

In general, a successful economic upgrading depends on a firm's ability to generate higher value added by implementing faster and more effective innovations than its competitors. Using the typology proposed by Kaplinsky and Morris (2001) and Humphrey and Schmitz (2002), this study defines economic upgrading as having successfully implemented either process, product, or functional upgrading. First, process upgrading is the increase in efficiency following the adoption of new production techniques. Second, product upgrading creates higher value added by introducing new products or improving existing ones. Lastly, functional upgrading results from the firm's (upward) movement to more sophisticated tasks inside the value chain (e.g., from OEM to ODM and OBM). Higher forms of upgrading are excluded in this study since they are generally unobserved in the sample. Table 6 summarizes the share per type of firms that reported to have undergone economic upgrading. The data suggests that a large proportion of firms with potential GVC connections did not experience any economic upgrading. This figure is highest for Type 2 manufacturers at 51.11 percent. On the other hand, process upgrading is the most common

form of upgrading achieved by firms. This may be partially traced to the fact that introducing new production technology is relatively faster and cheaper than launching new products or migrating to entirely new value chain functions. While higher forms of upgrading usually require intensive innovation projects, more efficient processes can easily result from the purchase of new machines or simple ergonomic changes in factories (Rossi 2013). Overall, 12.56 percent of GVC traders benefitted from better production efficiency due to pure process improvements while an additional 36.32 percent combined process upgrading with product or functional upgrading or both. Another interesting pattern suggested by Table 6 is that many firms seem to have achieved higher value creation as a result of simultaneous efforts to pursue strategies that require all forms of upgrading. This is highly likely in a scenario where a shift to more complicated functions requires capabilities to supply more sophisticated inputs and integrate new technologies into the existing production process.

Table 6. Forms of Economic Upgrading among Types 2 to 4 Manufacturers

Upgrading	Types 2-4	Type 2	Type 3	Type 4
None	35.43	27.87	51.11	29.29
Process only	12.56	19.67	6.67	12.12
Product only	7.17	6.56	4.44	10.1
Functional only	4.93	9.84	4.44	8.08
Process + Product	8.07	6.56	8.89	7.07
Process + Functional	6.73	4.92	2.22	8.08
Product + Functional	3.59	24.59	4.44	3.03
All	21.52	27.87	17.78	22.22

Source: Author's calculations using the SAEG 2012

According to Barrientos, Gereffi, and Rossi (2011), each form of economic upgrading embodies a capital dimension (i.e., new technology) and a labor dimension (i.e., skills development). Therefore, when improvements in the quality of workers are necessary to achieve better firm performance, we can generally expect social and economic upgrading to intertwine. This means that moving up (or down) the value ladder will have a direct consequence on labor conditions. For instance, adopting labor-enhancing technologies may increase the

firm's overall productivity (i.e., output per worker) while at the same time reducing errors, accidents, health hazards, and overtime work (Rossi 2013). In addition, both firms and workers gain from product and functional upgrading when creating more value requires more complex skills and scaled up operations. In some instances, forward-looking manufacturers preparing to upgrade would offer better compensation packages in order to attract high-skilled workers. However, one possible caveat is that economic upgrading may benefit employees differently depending on their relative contributions to the production process. Likewise, there are growing concerns that more advanced innovations may trivialize the role of labor in different industries.

In standard economic analysis, the relationship between economic and social upgrading can be depicted as a strong positive relationship between wage and productivity growth (Milberg and Winkler 2011). This means that higher efficiency and value creation due to technology upgrading and skills development should be accompanied by a proportional increase in the value of labor, other things being equal. In short, better firm performance should lead to better labor outcomes. On a macro level, this means that sustained growth is expected to create more jobs, decrease unemployment, increase productivity, and raise living standards. As illustrated in Figure 2, labor productivity and real wage (both in natural logarithmic scale) show a strong positive correlation across firm types. That is, more productive workers also receive higher wages. However, a common criticism about this narrow view is that wage growth may not adequately capture the social dimension of labor conditions. In particular, aggregate productivity growth will benefit workers differently depending on their role in the production process. This is especially relevant in GVCs where efforts to strike a balance between quality and competitiveness force firms to focus on their core competencies, possibly leading to wage cuts or temporary loss of jobs for noncore employees (Barrientos, Gereffi, and Rossi 2011). In this case, social protection, enabling rights, and regulatory constraints may be necessary to preserve the overall well-being of workers.

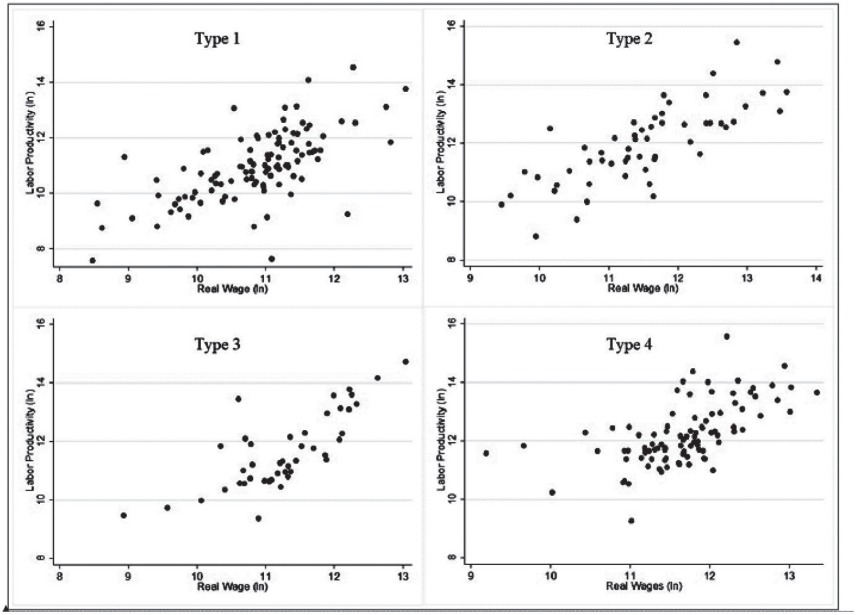

Figure 2. Scatterplots of Real Wage and Labor Productivity Across Firm Types

Source: Author's calculations using the SAEG 2012

In light of the foregoing discussion, the rest of this section formally analyzes the mechanism connecting economic and social upgrading in GVCs, with the assumption that the two outcomes are the result of separate but correlated decision-making processes. This is not an unreasonable assumption based on the chi-squared test of Table 5 which does not support the hypothesis that the two forms of upgrading are independent. In fact, the estimated gamma statistic is very high at 0.853, suggesting a very strong tendency to observe economic and social upgrading simultaneously. The preceding survey of existing evidence also points to a close relationship between the two upgrading outcomes. According to Greene (2012), failure to account for this correlation is a potential source of bias. Against this background, the following two-equation bivariate probit regression model is used to jointly estimate the latent variables underlying the two forms of upgrading:

$$\begin{cases} E_i = \alpha_E + Y'_i\,\theta_E + Z'_i\,\gamma_E + \in_{E_i} \\ S_i = \alpha_S + Y'_i\,\theta_S + Z'_i\,\gamma_S + \in_{S_i} \end{cases}$$

where E_i is a binary variable equal to 1 if a particular firm reported to have experienced process, product, or functional upgrading; S_i is a binary variable equal to 1 if a firm claimed to have enhanced both the quality of work and the capabilities of its workers; Y_i is a vector of the hypothesized activities that contribute to the upgrading process; Z_i is a vector of industry and regional controls; the α's, θ's, and γ's are model parameters; and the $\in$'s are error terms assumed to be bivariate standard normal with correlation ρ.[6] For vector Y_i, the hypothesized firm-level attributes associated with upgrading include internal capabilities, labor conditions, and external linkages. First, larger, more efficient, and more innovative manufacturers are also more likely to capture sophisticated tasks that require better skills and generate higher value added. Second, foreign exposure, especially through GVC participation, may lead to economic and social upgrading through competitive pressures, knowledge spillovers, or simply, participation requirements that prescribe specific standards (e.g., process and product specification, and labor and environment regulations). Lastly, fostering healthy working conditions through skill upgrading and enabling rights may create a stimulating environment where labor is both productive and dignified.

The econometric results for the joint determination of economic and social upgrading are summarized in Table 7. However, caution must be exercised when ascribing causal effects from the explanatory into the dependent variables due to the contemporaneous specification of the model. At the onset, it is worth highlighting that the model performed fairly well in fitting the data, with the average predicted probabilities close to the actual joint distribution in Table 5. The goodness-of-fit test based on Murphy (2007) also failed to invalidate the assumption that $\in_{E_i}$ and $\in_{S_i}$ are bivariate normal. In addition, the model's estimated partial correlation $\hat{\rho}$ is significantly different from zero; in fact, it is very high at 0.82. These provide justifications for the use of bivariate probit regression to jointly model the two upgrading outcomes. However, since the dependent variables used are based on firms' subjective self-evaluation, part of the close association may be explained by difficulties in properly attributing internal changes

to better economic performance, on the one hand, and improved labor conditions, on the other. Nevertheless, this result is still broadly consistent with the narrow view that economic (i.e., productivity growth) and social (i.e., wage growth) upgrading are interconnected.

Table 7. Bivariate Probit Model for the Joint Determination of Economic and Social Upgrading of Types 2 to 4 Manufacturers

Dependent Variable	**Economic Upgrading**	**Social Upgrading**
Employment Size (ln)	0.21**	0.03
	(0.09)	(0.09)
Unit Labor Cost	-1.21**	0.17
	(0.45)	(0.32)
Kaitz Index ≥ 1 (Dummy)	-0.65**	0.32
	(0.28)	(0.29)
High-skilled Labor (Dummy)	0.61**	0.06
	(0.26)	(0.23)
Number of Process Innovations	0.73***	1.08***
	(0.20)	(0.22)
Number of Product Innovations	1.00***	0.37**
	(0.23)	(0.18)
Contractualization (Dummy)	0.65**	1.15***
	(0.29)	(0.30)
Union (Dummy)	-0.08	0.20
	(0.35)	(0.31)
Regular Training (Dummy)	-0.07	0.64**
	(0.25)	(0.26)
Share of Female Workers	0.15	-1.37***
	(0.53)	(0.50)
Foreign Equity Share	-0.04	0.61**
	(0.29)	(0.29)
Intercept	-1.19**	-2.09***
	(0.54)	(0.62)

Table 7. Bivariate Probit Model for the Joint Determination (*cont.*)

Dependent Variable	**Economic Upgrading**	**Social Upgrading**
Industry Control	Yes	Yes
Region Control	Yes	Yes
n	209	
Wald χ^2	159.67	
$\hat{\rho}$	0.82*** (0.07)	
Model fit:		
Murphy's χ^2	8.90	
P (*Economic*=0, *Social*=0)	33.22	
P (*Economic*=0, *Social*=1)	4.18	
P (*Economic*=1, *Social*=0)	23.55	
P (*Economic*=1, *Social*=1)	39.05	

*p<0.10, **p<0.05, ***p<0.001
Source: Author's calculations using the SAEG 2012
Note: Numbers in parentheses are robust standard errors.

The initial expectation is that the two dimensions of upgrading will be linked to a similar set of factors given their high correlation. However, the resulting pattern suggests that the explanatory variables can be grouped into three based on their statistical significance: purely economic, purely social, and both. In particular, employment size, unit labor cost, high skill intensity, and the Kaitz dummy are significantly associated to economic upgrading only. On the other hand, training, female intensity, and foreign equity share are statistically relevant to social upgrading only. Lastly, contractualization, and process and product innovations are significant in both dimensions. Notwithstanding the subjective definition of the dependent variables, the estimates reveal that manufacturers' view of economic and social upgrading are broadly consistent with more objective indicators; that is, the former is mostly associated with better internal capabilities while the latter is identified with the softer components of working

conditions. Interestingly, this tells us that the firms' notion of social upgrading goes beyond the traditional labor indicators such as employment, wages, and efficiency.

Let us now look at the individual covariates that are significantly associated with the upgrading process. In general, the results for purely economic factors are consistent with what self-selection predicts; that is, larger, more efficient (i.e., lower unit labor cost) and more high-skilled intensive firms are intuitively better able to pursue activities that support economic upgrading. On the other hand, the negative coefficients of the Kaitz dummy provide some evidence that legal minimum wage may be more detrimental to small than large manufacturers. Understandably, bigger and high-skilled intensive firms tend to employ more productive workers that command wages way above the legally set rate. On the other hand, Lanzona (2014) argues that smaller enterprises, especially those in low-skilled and low-wage sectors, are more vulnerable to the adverse employment effect of higher legal minimum wage. These results point to a possibly regressive wage setting policy that constrains both the financial viability of small manufacturers and their ability to create jobs for low-skilled labor. Therefore, raising the minimum wage can actually be welfare-reducing to the labor segments that the minimum wage laws intend to protect (Paqueo, Orbeta, and Lanzona 2016). For instance, the World Bank (2013) estimates a -0.82 percent elasticity of formal manufacturing employment to minimum wage in the Philippines. The World Bank also cites that firms in the garments sector, whose total employment decreased by at least 50 percent over the last two decades, identify high minimum wages, in addition to technological backwardness, as a major contributor to the decline of the industry.

The results for purely social factors also merit further elaboration. In particular, the negative contribution of a more "feminine" workforce is inconsistent with government and industry policies that aim to achieve gender-inclusive labor outcomes by promoting nondiscriminatory access to employment. According to the World Bank (2012), removing gender barriers is "smart economics" since it does not only generate broad productivity gains but also enhances the role of women in household and social decision-making. However, although globalization has opened up job opportunities for women, Milberg and Winkler (2011) observe that many female workers are still hired as irregular employees that perform low value-adding tasks and earn low wages. In the Philippines, the Asian Development Bank

(2013) cites a similar trend of rising precarious female employment in export processing zones. This mirrors general Philippine labor market indicators showing that women are more common in vulnerable, low-skilled, and low-wage employment (Asian Development Bank 2013). Therefore, simply increasing the share of women in total employment without providing fairer access to human capital development, quality jobs, and social protection may not generate an inclusive social upgrading.

On the other hand, foreign ownership has a positive and significant contribution to social upgrading only. In light of previous discussions pointing to moderate GVC linkages in many low-skilled sectors, this result suggests that stronger foreign participation in domestic-oriented sectors may generate positive labor outcomes either by creating more employment or offering a social premium. In fact, Sibal, Amante, and Tolentino (2006) also documented that the proportion of nonagricultural establishments that provided nonmonetary benefits in 2004 (e.g., work and family programs, parental and sick leaves, and reproductive health programs) is higher among firms with foreign equity than among Filipino-owned businesses. In addition, the majority of employers in their study, especially foreign-owned, claimed to have a good or very good labor-management relations. One argument is that foreign-owned or subsidized firms have to compete with local employers for high-quality workers. Another possible explanation is that suppliers with international connections, especially with big multinationals, are more likely to follow labor regulations due to reputational reasons. Despite the generally weak evidence in support of "anti-sweatshop" campaigns (Brown, Deardorff, and Stern 2004), many GVCs still responded to the growing pressure against global brands with unacceptable labor practices (e.g., forced labor and hazardous jobs) by implementing stricter internal codes of conduct in the workplace (Organization for Economic Development 2013a). Private-led and multilateral efforts such as the Fairtrade movement, the Social Accountability 8000 certification, the International Labour Organization's Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy (MNE Declaration), and the European Union's (EU) Generalized Scheme of Preference (GSP+) have also contributed to the mainstreaming of international enterprises in global movements for social progress.

The dual role of contractualization underlines a seeming paradox. How can employing irregular labor contribute to both

economic and social upgrading? On the one hand, globally fragmented production is premised on the efficiency effects of outsourcing noncore activities to low-cost suppliers. As part of their competitive strategy, suppliers would normally employ contractual labor to further reduce production costs. By outsourcing noncore functions, this may improve economic performance as long as the firm's overall productivity is not compromised. Yet, the acceptability of this labor practice is a perennial issue in academic and policy debates. According to Barrientos, Gereffi, and Rossi (2011), the negative connotation attached to contractualization may be traced to the stark contrast between the labor conditions of regular and irregular workers. In particular, irregular workers are more vulnerable to demand and technological shocks due to the low-skilled nature of their employment. In addition, their temporary status often prevents contractual workers from enjoying the same rights and benefits as permanent employees. Against this background, the empirical paradox above tells something about the quality of upgrading among GVC firms; that is, the social benefits of contractualization may not be evenly distributed between regular and contractual employees. Nevertheless, the fact that efficiency gains allow firms to provide jobs to otherwise unemployed labor shows a particular instance where contractualization can benefit both firms and workers. Sicat (2004a) also suggests that contractualization may actually be a symptom of the overregulation in Philippine labor markets, with cost-minimizing firms naturally exploring possibilities to reduce the legal rigidities of hiring (and terminating) regular workers. The World Bank (2013) also finds that restrictive labor regulations appear to be a greater obstacle among foreign-owned or subsidized firms, especially micro, small, and medium enterprises, than among Filipino-owned establishments. In this light, Sicat (2004a) suggests that instead of maintaining "pro-employed" programs, the government should promote "pro-employment" policies where labor standards do not distort the allocation of skills across industries and where firms have enough flexibility to pursue upgrading activities that enhance productivity and generate employment.

Finally, the econometric results also highlight the dual role of process and product innovations as factors relevant to both economic and social upgrading. As with size, efficiency, and high-skill intensity, the positive contribution of innovation to economic upgrading is intuitive. In fact, this is an explicit expression of Kaplinsky and Morris's (2001) definition; that is, economic upgrading is the result of innovation. In the context of GVC operations, the mechanism is pretty

straightforward: firms should expectedly generate more value from new technologies that improve the efficiency of production or new products that embody better quality standards and more sophisticated skills. In terms of social impact, the results do not support the conventional pessimism about innovation, making labor redundant or obsolete in the workplace. In fact, the dual role of innovation reveals two major channels through which technological development may influence labor conditions. The direct channel suggests that process and product innovation should be accompanied by productivity improvements in order to generate and sustain positive economic results. For example, the pursuit of functional upgrading may urge firms to increase benefits and regularly provide trainings in order to retain high-skilled workers. The indirect channel suggests that better performance accruing from innovation may lead to upward spirals in output and productivity, and ultimately better labor outcomes (e.g., higher employment, better wages, and a safer and more efficient workplace).

The results also suggest that firms in the low-road and high-road upgrading paths are mainly distinguished by their innovative activities, with product and process improvements being more prevalent in the latter. Interestingly, the majority (61.11 percent) of upgraders on the low road are mainly Filipino-owned producers in low-tech and labor-intensive sectors such as FBT, garments, wood and furniture, and paper products. In contrast, 61.36 percent of firms on the high road are majority foreign-owned manufacturers in medium- to high-tech and relatively capital-intensive industries like chemicals and pharmaceuticals, plastics, metals and minerals, electronics, and automotives. In addition, the data shows that it is more common for high-road firms to provide regular trainings to their employees. This is in line with Kaplinsky and Morris's (2001) argument that the key difference between producers in the two upgrading trajectories is actually the capability (i.e., technology and skills) to implement and sustain process and product improvements. Accordingly, it is not unreasonable to expect a long run divergence in the two groups' growth patterns, owing to the positive impact of innovation on both firms' and workers' productivity. In fact, high-road upgrading inside GVCs can be consistently interpreted as a micro view of Hidalgo et al.'s (2007) proposition that economy-wide upgrading requires increased diversification and complexity of the mix of goods being produced and exported. As indicated by the preceding observations, upgrading via the high-road path is more likely among technology-intensive and

globally engaged manufacturers. Usui (2012) argues that this transition into high-productivity, high-skills intensive, and sophisticated products was the main driving force behind the manufacturing and export success of many East Asian economies in the past two decades. However, such transformation also required coordinated investments in physical, institutional, and human assets like infrastructure, modern logistics, property rights, and skills formation (Hausmann and Klinger 2006). In this light, Pietrobelli and Rabellotti (2011) suggest that the institutional backbone should be anchored on a national innovation system that will facilitate R&D collaborations and knowledge exchanges between firms and public and private research institutions. In addition, Patalinghug (2003) argues that an effective innovation system must have the effort and commitment to introduce new knowledge to both firms and workers. For the government, this may require additional reforms in the educational and training system to be able to produce a large mass of quality scientists, engineers, and other technical specialists. However, one implication of the innovation-led upgrading is that long-term growth at the firm and national levels will be largely determined by the dynamic relationship between the supply of talents and the adequate private sector demand to absorb it. Therefore, the innovation system should be synced with industrial and investment policy to ensure that the local supply of high-skilled labor attracts new local and foreign jobs in higher value adding activities. In the long run, the goal of a coordinated innovation-industry network should be two-pronged: first, graduate high-road firms to better GVC functions; and second, help low-road producers develop new competitive advantages and link to more sophisticated value chains. In both objectives, equipping the domestic workforce with the appropriate skills is an important ingredient for success.

The economic and social risks of staying on the low road can have serious long-run consequences. Following the argument of Hidalgo et al. (2007), the upgrading trajectory of firms with passive efforts to innovate and build new capabilities is headed toward nearby basic and less sophisticated goods with similar skills and technological requirements. This implies that manufacturers producing unsophisticated goods using unsophisticated capabilities will most likely connect to low-technology value chains (e.g., textiles and food processing rather than complex electronics and car production). Although not impossible, a structural leap into skills- and technology-intensive manufacturing and exporting will be difficult without purposeful efforts to improve

existing capabilities and develop new core competencies. In other words, swerving from the low road to the high road will require investments in new technological facilities accompanied by more specialized trainings. However, Patalinghug (2003) observes that unlike multinational companies, Philippine companies only provide the minimum trainings required in order to reduce their potential losses in case these workers transfer to new employers. Given the public good nature of knowledge and general purpose skills, firms are often reluctant to invest in people if they cannot fully appropriate the returns. This myopic attitude reflects the overall unattractiveness of innovative undertakings in the country due to a number of constraints such as limited domestic demand, high risks of failure, property rights issues, and better government incentives in non-R&D activities (Patalinghug 2003). Again, this underlines the importance of a national innovation policy that will lay out well-coordinated public support for research and training programs in strategic sectors. A recent example is the creation of new research facilities, namely the Advanced Device and Materials Testing Laboratory and the Electronics Product Development Center that provides state-of-the-art laboratories for integrated circuit (IC) design and materials testing (Aldaba 2015). This was matched by a partnership of the Technical Education and Skills Development Authority with the electronics sector to keep over 9,000 workers geared up for the industry's planned expansion to higher productivity segments (Technical Education and Skills Development Authority 2011). In addition, the Department of Science and Technology established the Philippine Institute for Integrated Circuits in order to support the advanced training requirements of local companies in IC design. Accordingly, the accumulation of highly specialized skills and the resulting increase in labor productivity should encourage firms to provide better compensation packages and reduce reliance on contractual employment.

Concluding Remarks

The general picture emerging from this study is that manufacturers with stronger GVC linkages foster better labor conditions. Further, the econometric results confirm that social and economic upgrading are often complementary, especially when the former is driven by technological innovation. This highlights the potential of GVCs in generating economic and social gains given the

right preconditions. However, there are some indications that the social benefits of economic upgrading may not be evenly distributed. These findings suggest that academic and policy discourse should now focus on more important questions. First, what are the major mechanisms through which the social gains from GVC upgrading can be maximized? Second, who actually benefits from economic upgrading? Lastly, what is the role of policy in promoting an inclusive upgrading experience?

The answer to the first question has been partially explored in this article where the results highlight innovation as an important business and policy tool to facilitate an upgrading process that benefits both the firm and its workers. Frederick and Gereffi's (2016, 36) observation for Philippine electronics and electrical equipment firms is actually relevant to the entire manufacturing sector: "upgrading requires acquiring new technology and knowledge-intensive capabilities and thus represents a more sustainable competitive edge than advantages related to low labor costs..." To the extent that moving up the value chain requires a nontrivial skills development component, the value-added captured by labor should generally increase when firms upgrade to more sophisticated processes, products, and functions. This should also increase their value, both as assets of the firm and as productive social actors. However, policy support may be needed to promote an innovative culture in local industries especially when firms can easily be tempted to pursue upgrading strategies that do not necessarily generate social benefits (e.g., organizational restructuring and functional downgrading to simpler but more profitable tasks). Notwithstanding, a more tragic scenario ensues when firms stagnate in a particular GVC niche where their contribution to both employment creation and industrial growth is compromised. In global production networks where products, technology, and skills are fast evolving, failure to adapt is always a step back. Some studies suggest that this may be a contributing factor to the middle-income trap phenomenon since the inability to upgrade at the firm level eventually culminates in lackluster growth performance at the aggregate level (Hidalgo et al. 2007). This requires further investigation in future studies.

The second and third questions are concerned with promoting economic upgrading that generates more equitable social outcomes. In general, the controversy surrounding the uneven social impact of GVC participation reminds us that the efficiency gains from more open trade may come with unwanted distributional consequences. Although

this is a well-known result in trade theory, the manifestations become more concrete in the age of globally fragmented manufacturing where the heterogeneous productivity and costs of labor figure prominently in the allocation of tasks, and therefore, welfare. This implies that technological upgrading leading to higher export production will expectedly benefit workers in high-skilled intensive GVC activities more than unskilled labor in more routine tasks. In addition to this purely economic reason, differential labor conditions along the value chain may also influence the inclusiveness of social upgrading. This emphasizes the role of labor standards and regulations in GVC stages that are more vulnerable to both technological shocks and unacceptable labor practices. However, against the background of potentially regressive policies in an already overregulated labor market, the government should refocus its efforts toward reforms that bring broad-based improvements in living standards. The way forward should be guided by a national and firm-level upgrading strategy where the economic and social dimensions are seen as complementary sides of the same objective rather than two conflicting end goals. The World Bank (2013) agrees that workers have valid concerns about decent wages, good working conditions, and job security. However, instead of creating labor laws that seemingly transfer the state's social protection responsibility to private employers (Lanzona 2014), government intervention should focus on enabling policies (e.g., reducing cost of doing business, infrastructure support, access to finance, and rule of law) that improve the manufacturing sector's coverage and productivity, and therefore, its capability to generate quality employment. A closely related policy suggested by the above findings is a holistic upgrading experience through a shift in the country's comparative advantage from cheap labor to highly skilled and productive workers. This requires complementing the innovative culture in domestic industries by a stronger focus on science and technology education and technical trainings. Toward this end, a well-coordinated innovation-industry network is necessary to forge strong linkages between the business, labor, education, and R&D sectors. This is probably where government intervention is more relevant given the public good nature of knowledge produced by research and innovation.

Acknowledgment

The author thanks the editor and three anonymous reviewers whose insightful comments helped improve the final version of this article.

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Notes

1. See for instance Dedrick, Kraemer, and Linden's (2009) iPod example.

2. Firms with insufficient information or those which are not in manufacturing are removed from the original sample.

3. See for instance Intal and Basilio (1998), Aldaba (2005), and Williamson and de Dios (2014) for a more extensive historical accounting.

4. Note that median values for the indicators are used to reduce the distortions from extreme observations.

5. Type 1 manufacturers are excluded from the analysis to better capture the producers with actual GVC transactions.

6. Note that the above specification uses the same set of explanatory variables to model the respective latent variables underlying E_i and S_i.

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