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Geography and the evolution of rural nonfarm sector in the Philippines, 1988-2006

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This paper aims to assess the changing impact of distance on the development of rural nonfarm sector by exploring the changing allocation of rural labor force between the farm and nonfarm sectors in the Philippines using provincial-level data from 1988 to 2006. The impact of distance of a province from a major city on the growth of its rural nonfarm sector did not change over time because of the concentration of infrastructure developments in provinces located near the major cities. A well-developed infrastructure system and the availability of an educated labor force appear to be the most potent stimuli in the transformation of the rural economies as these two factors have simultaneously induced the reallocation of rural labor force away from the farm toward the non-tradable sectors such as construction, trade, and transport. The labor absorption capacity of the rural tradable sector (e.g., manufacturing) has been critically affected by the improvements in electricity and concrete roads, not by the quality of human capital, as this sector continues to employ unskilled labor.

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1. Introduction

Rural areas in many developing countries, including the Philippines, have been experiencing high rates of increases in labor force far exceeding the increases in farmland available for cultivation. The strong population pressure on closed land frontier has resulted in smaller farm sizes and a high incidence of landlessness. Given the increasing scarcity of farmland, rural poverty is expected to increase inasmuch as farmland is a major source of income of rural households in the early stage of development [Hazell and Haggblade 1990; Estudillo and Otsuka 1999; Hayami and Kikuchi 2000; Lanjouw 2007]. Indeed, the incidence of poverty is observed to be higher among the land-poor and landless households than among the farmer households in many developing countries [World Bank 2008; Estudillo, Sawada, and Otsuka 2008; Hossain, Mahfuzur Rahman, and Estudillo 2009].

Contrary to expectations, we observe a clear and remarkable movement of rural households out of poverty in Southeast Asia in the midst of the unfavorable scenario of increasing scarcity of farmland and declining labor employment opportunities in the farm sector. According to the Asian Development Bank (ADB) [2008], the proportion of population living on less than the Asian poverty line of US$ 1.35 per day declined by 5.9 percentage points in the Philippines, 7.8 percentage points in Thailand, 21.4 percentage points in Indonesia, and 47.7 percentage points in Vietnam from the early 1990s to the mid-2000s.

Traditionally, the farm sector and the nonfarm sector consisting of rural industries and the service sector are the major depositories of labor in rural areas. An important strategy to increase the labor absorption capacity of agriculture is to develop labor-intensive, land-saving technology as exemplified by the Green Revolution in rice in Asia. Yet its impact on employment opportunities for the poor agricultural landless and near-landless population seems to be modest and weakened by mechanization and the wider adoption of labor-saving direct seeding method that replaced the labor-intensive transplanting [Lipton and Longhurst 1989; Otsuka, Asano, and Gascon 1994]. It is well known that the major contribution of Green Revolution comes mainly through reduced rice price, attributable to yield increase, shorter growing period, and increased double cropping of rice that led to an increase in production [Barker, Herdt, and Rose 1985; David and Otsuka 1994]. Thus, it is sensible to develop the rural nonfarm sector to provide employment opportunities to the rural population to avoid poverty.

In the past, the rural nonfarm sector is considered a traditional low-productivity sector producing low-quality goods and serving as a secondary employment during slack farm season such as the months between planting and

harvesting [Hymer and Resnick 1969]. On the contrary, many recent studies have shown that the expansion of the rural nonfarm sector is the major driver of rural poverty reduction in the developing world as rural households increasingly derive their income from the nonfarm sector [Lanjouw and Lanjouw 2001; de Janvry and Sadoulet 2001; de Janvry, Sadoulet, and Zhu 2005; Lanjouw 2007; Estudillo, Sawada, and Otsuka 2009].[1] According to Haggblade, Hazell, and Reardon [forthcoming], manufacturing typically accounts for 20-25 percent of rural nonfarm employment, whereas services (e.g., trade, transportation, and construction) account for 75-80 percent. The shift of rural household income away from farm income toward nonfarm income could have been a consequence of the Green Revolution, which led to higher farm income, a major portion of which was subsequently invested in the human capital of the younger generation, who later migrated to cities and abroad [Otsuka, Estudillo, and Sawada 2009].[2]

Nonfarm employment opportunities could also effectively decrease household income inequality. Following the classic Barro and Sala-i-Martin [1995] model, for example, Balisacan and Fuwa [2004] examined the differential growth rates of household income across provinces in the Philippines and found a convergence of household incomes across provinces. In a separate study using household-level panel data sets in selected rice-growing villages in the Philippines, Estudillo, Sawada, and Otsuka [2008] found that the growth of nonfarm income is the major factor behind the convergence of household income between favorable (irrigated or favorably rainfed) and unfavorable (poorly rainfed) villages and the reduction in poverty. Despite its importance, solid research on the determinants of geography of nonfarm sector development in rural areas remains scanty.

This study aims to assess the changing impacts of distance on rural labor absorption by examining the relative distribution of rural labor force in agriculture, industry, and services and their corresponding subsectors. We examine the impacts of distance from the center of the province to a major city along with the impacts of government initiatives in the rural economy through infrastructure development such as electrification, roads, education, and irrigation as well as the diffusion of modern varieties (MVs) of rice.

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[1]Hayami [1998] highlighted the roles played by rural communities and local institutions in the development of rural industries that relied heavily on the so-called relational contracting. Sonobe and Otsuka [2006], on the other hand, argued for the formation of industrial clusters, which enjoy the benefit of agglomeration economies arising from the geographical concentration of a large number of enterprises producing similar and related products in a small area [Marshall 1920].

[2]The high level of quality human capital could have been the most important input for economic growth as was evidenced by the high-performing economies in East Asia [Hayami and Godo 2005].

This paper has five remaining sections. Section 2 gives an overview of the development of the rural nonfarm sector in the Philippines. Section 3 presents the conceptual framework and testable hypotheses. Section 4 describes the regression model and discusses the results of the regression runs. Finally, Section 5 presents the summary and conclusion.

2. The rural nonfarm sector

2.1. Economic importance

Nonfarm activities comprise all economic activities in the rural areas except agriculture, forestry, fishing, and hunting. Rural nonfarm activities account for a substantial portion of labor employment and household income in many developing countries, and the number of these activities has been growing over time [Haggblade, Hazell, and Reardon 2007]. Lanjouw and Lanjouw [2001] believe that participation in the rural nonfarm activities remains underestimated because these activities are undertaken during slack season as secondary employment and are mostly unremunerated, particularly those undertaken by women. The economic importance of the nonfarm sector lies in its capacity to absorb rural labor force so as to provide income-earning opportunities to the rural population.

In the Philippines, there was a shift in the allocation of labor force away from the farm as the share of labor force in agriculture declined from 50 percent in 1970 to 37 percent in 2006. The share of industry remained about the same, while the share of the service sector increased from 34 percent to 48 percent (Table 1). Clearly, the labor force in the Philippines, in the aggregate, has been shifting to the service sector. This is not the case in the neighboring Thailand, Indonesia, and Vietnam where the industry sector has been absorbing an increasing share of the labor force.

Females in the Philippines are largely employed in the service sector (i.e., 55 percent of the female labor force in the early 1990s) and increasingly so in more recent years (i.e., 64 percent in the mid-2000s) while the males remain largely in agriculture [ADB 2008].[3] According to Momsen [2004] females in the world at large have been moving out of agriculture faster than men to the industry sector, initially from the 1960s to the 1980s, and, finally, to the service sector from the 1990s. Increased involvement of Filipino females in the industry in the 1980s coincides with the movement of the production base of labor-

[3]Filipino females have higher propensities to join the nonfarm sector while rural Filipino males tend to remain in farming. Traditionally, the male heirs receive the farmland as inheritance, while the female heirs are given schooling [Quisumbing, Estudillo, and Otsuka 2004]. Females commonly join the nonfarm sector after school where they can obtain the maximum returns to their schooling.

intensive, low-technology products away from Taiwan, Korea, and Hong Kong to Southeast Asia, when these East Asian countries had shifted in a major way to the more sophisticated manufacturing sectors corresponding to their sharp wage increases in the late 1970s to the early 1980s.

The reallocation of the labor force was accompanied by an increase in per capita gross domestic product by 57 percent from US$ 733 to US$ 1,155. Correspondingly, there was a shift in the composition of the GDP away from agriculture to the service sector; the GDP share of agriculture declined from 30 percent in 1970 to 14 percent in 2006, while the share of the service sector rose from 39 percent to 54 percent (Table 1). Similarly, the share of rural household income coming from nonfarm sources rose gradually from 41 percent in 1988 to 46 percent in 2006 (Table 2). Households in Ilocos, Central Luzon, Southern Tagalog, and Central Visayas derived the highest proportion of total income from nonfarm sources. Coincidentally, in the Philippines as a whole, the incidence of poverty declined by six percentage points from 33 percent in 1994 to 27 percent in 2006 based on the Asian poverty line, which is the 2005 purchasing power parity based on consumption [ADB 2008].

On the whole, we have seen the increasing importance of the rural nonfarm sector in terms of sources of employment and household income, which consequently led to an income increase. It is therefore critically important to identify the factors responsible for the reallocation of labor and other resources away from the farm to the nonfarm sector.

2.2. Geography of industrial development

In the early 1900s, rural industries in the Philippines consisted of traditional household industries such as basket making and textile weaving and metal casting (the so-called traditional Z-goods of the Hymer and Resnick [1969] paradigm) in addition to modern agro-processing industries and mining. The production of the Z-goods, however, declined because the American colonial government encouraged the production of agro-based export-oriented products such as sugarcane, copra, tobacco, pineapples, timber, and gold, which were the main Philippine exports to the United States at the time.

The production of Z-goods also declined because of the accelerated introduction of imported consumer goods from the United States that tended to substitute for the locally produced goods. Modern rural industrialization did not take place during the American colonial period because of the neglect of the food-producing sector, as manifested in investments in rural infrastructure tailored to benefit the cash-crop sector, and because of the limited support for primary, secondary, and technical training schools, which are necessary for the development of rural industries [Ranis and Stewart 1993]. But rural

industrialization did not take place even in the postcolonial period because of the import-substitution regime, which worsened the agricultural terms of trade and encouraged the use of large-scale, capital-intensive, urban-based industries, and the continued inadequacy of rural infrastructure, most importantly, electricity, and rural roads.

The promotion of small- and medium-scale industries in rural areas became a primary aim of the Philippine government beginning in the 1970s, inspired by the increased foreign demand for labor-intensive, low-technology products such as ready-to-wear garments; metal craft; and plastic, paper, and wood craft. Despite the inadequate infrastructure, this government initiative had somehow stimulated a labor-intensive rural industrialization between the late 1970s and early 1980s, which was facilitated by the emergence of a subcontracting arrangement between the rural entrepreneurs and urban traders. Subcontracting is a decentralized system of production in which a principal export contractor jobs out different stages of the production process to independent subcontractors.

Initially, before the wave of foreign demand reached the Philippines, orders from foreign buyers were filled in the factories of the principal export contractors in Manila. Since the 1990s, export contractors have filled in orders by contracting out jobs to subcontractors located in the suburban and rural areas, particularly in the garment industry [Kikuchi 1998; Sonobe and Briones 2001]. Since the garment industry is the second-largest industry next to food products, subcontracting appears to have facilitated a decentralization of the overall industrial structure in the Philippines.

According to Estudillo, Sonobe, and Otsuka [2007], there was a movement of workers and firms away from Metro Manila from 1983 to 2000, as shown by the decline in the values of regional-level Herfindahl index, a popular measure of the extent of regional industrial concentration. This movement occurred in the seven largest manufacturing industries: food products, textiles, garments, wood products, furniture and fixtures, metal craft, and electrical machinery. The decline in the Herfindahl index is much more pronounced in terms of the number of workers implying that the relocation of industrial production away from Manila had a positive impact on employment opportunities in the outskirts. Importantly, firms in the garments and metal craft industries had experienced a greater degree of mobility out of Metro Manila. The tendency of these firms to locate in the outskirts could be pro-poor inasmuch as their production technologies are fairly labor intensive and standardized, which, on the aggregate, can employ a large number of low-skilled workers. Unfortunately, the dispersion of firms away from Metro Manila tends to favor a few adjacent regions that have relatively better stocks of infrastructure, namely, Central

Luzon, Southern Tagalog, and Central Visayas. The ban on firms locating within the 50 km radius of Metro Manila, promulgated in 1973, also makes these three regions an attractive venue for relocation.

There had been an increase in the number of firms located in the special economic zones from 410 in 1995 to 1,430 in 2006. Special economic zones are composed of industrial estates, export processing zones, free trade zones, and tourist and recreational centers. Enterprises located in the economic zones are engaged in the manufacturing of garments, machinery and car parts, electronics, precision instruments, computer products, plastic products, woods and crafts, and medical instruments. The Philippine government established the Philippine Economic Zone Authority in 1995, which is responsible for promoting export-oriented investments in the country. Yet, it is important to mention that the firms in the special economic zones use the most modern production technology and expensive imported equipments, which could mean that technology transfer from firms in the special economic zones to local firms could be limited.

In 2006, 64 percent of the firms in the special economic zones are located in CALABARZON (provinces of Cavite, Laguna, Batangas, Rizal, and Quezon), south of Metro Manila, while Metro Manila hosts about 15 percent of the economic zones and Central Luzon about 15 percent. The location of the special economic zones appears to be dictated by promixity to markets and the availability of a well-developed infrastructure and well-educated young labor force. It is interesting to observe that the number of firms in the special economic zones in Metro Manila rose from 101 to 202 for barely a three-year period from 2003 to 2006. This spurt could have occurred because of the increase in the number of information technology parks and buildings, which partly house the fast-growing business venture of communication outsourcing enterprises in the country.

2.3. The service sector and overseas work

Rural labor force is employed in the following major occupational categories: (1) professional, technical, and managerial; (2) clerical, sales, and service; (3) production and related works; and (4) agricultural. Within each occupation the worker can belong either to the formal sector, consisting of salaried and wage workers and employers, or to the informal sector, consisting mainly of unpaid family workers and the self-employed. Interestingly, when the proportion of workers in the agricultural sector, which is predominantly informal, declined considerably from 51 percent in 1983 to 25 percent in 2003, the proportion in production and related workers belonging to the formal sector increased from 11 percent to 25 percent, indicating that the production activities in the rural

areas have been increasingly more oriented toward salaried employment. Most female workers belong to the formal occupations in the professional, technical, and managerial as well as clerical, sales, and service categories, as they are more educated than their male counterparts. Females may therefore benefit more from the increasing development of the formal sector.

The Philippines experienced a doubling of the number of overseas Filipino workers (OFWs) from about half a million in 1989 to more than one million in 2006 (Figure 1). Corresponding to this is the increase in the amount of overseas remittances from about US$ 1 billion to US$ 13 billion within the same period. The Philippines is the fourth-largest recipient of foreign remittances, receiving about 20 percent of the total remittances in the world behind India, China, and Mexico. The most common country destinations are Saudi Arabia, Japan, and Taipei (China) for males, and Hong Kong, Singapore, Japan, and Saudi Arabia for females [NSCB 2006]. A substantial portion of overseas remittances comes from Filipino permanent migrants in the United States consisting of about 60 percent of the total remittances, followed by Saudi Arabia, United Kingdom, and Italy. Emigrants in the United States are the well-educated group of the Filipino immigrants.

Our calculations from the Family Income and Expenditure Surveys (FIES) show that about 5 percent of the total household income comes from overseas remittances and about 4 percent from domestic remittances. According to Sawada and Estudillo [2008], overseas emigration could effectively reduce poverty through transfer income from abroad, even though the amount of transfer income varies widely across households, and tends to be concentrated in the upper income and the more educated group. An important question is how households are able to finance overseas migration, which entails a large amount of fixed costs consisting of job placement fees and miscellaneous expenses. Yet, according to Estudillo, Sawada, and Otsuka [2009], placement fees for overseas jobs could have gone down considerably over time because of increasing competition among overseas placement companies.

Credit availability is a key deciding factor for a household to invest in emigration. Credit availability tends to increase with land ownership and access to usufruct rights because land is a major form of loan collateral in the rural Philippines. The implementation of land reform program may affect household decision to invest in emigration, and therefore, the amount of transfer income received by the households. According to Estudillo, Sawada, and Otsuka [2009], rural households are increasingly engaged in pawning transactions—giving up the cultivation right of their lands to get cash revenues to be used as placement fees for overseas work. In fact, the regression results of Sawada and Estudillo [2008] show that the effect of land reform was not positive in inducing

remittance income from abroad in the 1980s, but the inducement effect had been enhanced significantly in the 1990s, possibly because pawning revenues had gradually become an important source of funds to finance overseas emigration. Thus, there is evidence that the development of informal land market in the rural Philippines enhances international emigration that eventually results in a higher remittance income from overseas.

Overall, this section shows that there has been a clear evolution toward the establishment of the larger formal rural labor market and an increasing number of overseas workers implying that the local rural labor markets are becoming more integrated with the domestic urban and world labor markets.

3. Conceptual framework and testable hypotheses

Economic geography is concerned with the spatial distribution of different economic activities across space and time [Henderson 1974; Sonobe and Otsuka 2006; Haggblade, Hazell, and Reardon 2007]. Pioneering work on spatial economic modeling predicts that the type of crops grown in specific locations is dictated by the amount of land rent—crops with highest value are produced near the towns and cities, where land rents are higher, while those with lower values are grown farther off [Renkow 2007; Haggblade, Hazell, and Reardon 2007]. With economic transformation, the economic geography has focused on exploring the choice of location of nonfarm activities between the rural and urban areas. The traditional paradigm of economic development, advocated by Karl Marx and Arthur Lewis, is to locate nonfarm activities to urban areas by moving the surplus labor away from the rural to urban areas, while the rural sector specializes in the production of food and other crops. But this development model has become problematic in more recent years because it leads to a high concentration of income among urban households and environmental and congestion problems in the cities.

An alternative paradigm advocated by Hayami [1998] is to move the modern production base to rural towns to exploit the physical labor and entrepreneurial ability of the rural population and to develop commerce, transport, and other service sectors as well as the industries in the rural areas. Indeed, such model has been consistent with economic transformation of moving labor away from the farm sector to the rural nonfarm sector.[4] Empirical studies show that rural households have become more involved in nonfarm activities as their income

[4]Location of industrial clusters in developing economies is the subject of intense research inquiry inasmuch as the industry sector is the depository of unskilled labor [Sonobe and Otsuka 2006]. Industries tend to cluster because they benefit from agglomeration economies—information spillovers, specialization of labor, and access to skilled labor [Marshall 1920]. Access to a diversified labor force and varied goods and services in a cluster could facilitate the development of newer types of industries, particularly in the cities [Jacobs 1969].

sources have been much more diversified and increasingly coming from nonfarm activities [Estudillo and Otsuka 1999; Lanjouw 2007]. But to what extent rural households obtain the benefits of rural economic transformation may depend on their distance from major towns and cities. We hereby present Hypothesis 1 on the relationship between distance and labor force allocation.

Hypothesis 1: The rural nonfarm sector tends to develop in areas near the urban centers because of proximity to large markets where the demand for nonfarm activities is high. Therefore, rural areas in close proximity to the cities tend to allocate a larger proportion of their labor force in the nonfarm sector while the more remote areas tend to allocate a larger proportion of their labor force in farming.

One important factor for the formation of new firms outside Metro Manila is the access to cheap labor, which encourages newer firms to locate in suburban and rural areas where wages are lower and government wage regulations weaker. Push factors such as high land prices and living costs in urban areas also induce firms to locate outside the capital. In the Philippines, the dispersion of firms away from Metro Manila tends to favor regions with relatively better infrastructures that help reduce the transaction costs of connecting sellers and buyers. The Philippines is well endowed with a relatively high-quality labor force owing to its long history of extensive public primary schools since the American colonial period in 1900-1950, free secondary schools since 1986, and technical education in more recent years. We can therefore expect the growth of nonfarm sector on the back of a well-educated rural labor force that has facilitated the structural transformation of high-performing East Asian economies. We hereby present Hypothesis 2 on the relationship between infrastructure and human capital, and the allocation of rural labor force.

Hypothesis 2: As the economy develops, rural infrastructure and public education expand, serving as important stimuli that integrate distant rural villages to rural towns and urban centers leading to the development of the nonfarm sector in the more distant rural areas.

4. The distribution of rural labor force and its determinants

4.1. Allocation by sector

Rural labor force in the Philippines remains largely in agriculture even though the share of rural labor in agriculture declined from 59 percent in 1988 to 51 percent in 2006 (Table 3). Industry share of the labor force is around 7 percent—the largest sector of which is manufacturing. The share of the service

sector in the rural labor force increased from 26 percent to 34 percent, with a large majority of rural labor going to wholesale and retail, and transportation, communications, and storage. Rural unemployment has been on the rise since 2000 following the Asian financial crisis in 1997. An important task is to identify the determinants of rural labor force allocation as the proportion of rural labor force shifts away from farm to the nonfarm sector.

4.2. Determinants of rural labor force share by sectors

This section discusses the factors affecting the transformation of rural economies in the Philippines by exploring the changes in the provincial allocation of rural labor force through regression analysis. Five sets of explanatory variables could explain the proportion of rural labor force allocated to different sectors: (a) infrastructure systems represented by the proportion of households with access to electricity, road density represented by the ratio of road in kilometer (km) to the provincial land area in hectare (ha) (subsequently referred to as road density), and proportion of concrete road (i.e., concrete road); (b) modern agricultural technology represented by the interaction term between the proportion of area planted with modern varieties (MVs) of rice and proportion of area with irrigation (i.e., MV-irrigation); (c) land reform implementation represented by the change in cumulative accomplishment of the agrarian reform program (i.e., land reform); (d) land resources represented by the ratio of rice area harvested to agricultural labor force (i.e., land area for agriculture); (e) quantity and quality characteristics of the labor force represented by the proportion of female workers; proportion of workers belonging to various age groups; and proportion of workers with some primary, secondary, and tertiary schooling using the proportion of workers with no schooling as the control; (f) geographic variables such as distance represented by the road distance in km from the provincial capital to Metro Manila for provinces in Luzon, Cebu City for provinces in the Visayas, and Cagayan de Oro City for provinces in Mindanao; proportion of urban households; island dummies for Luzon and the Visayas using Mindanao as the control; dummy for island province, which takes the value of unity, if the province is an island, and zero if otherwise; and year dummies for 1991, 1994, 1997, 2000, 2003, and 2006 using 1988 as the control. We have a total of 485 provinces in seven years, i.e., 72 provinces in 1988, and 73 provinces each in the FIES survey round from 1991 to 2006.

We estimated regression functions using provincial data on the determinants of labor force shares by different categories as follows: (a) major industry group (i.e., agriculture, industry, and service) (Table 4), (b) subsector in

industry (i.e., manufacturing) and service sector (i.e., construction, wholesale and retail; transportation, communications and storage; education, health, social, community, and personal) (Table 5), and (c) subsectors in manufacturing (i.e., food, beverages and tobacco; textile, wearing apparel and leather; wood and furniture; paper and printing; chemicals; and metals) (Table 6). In our discussion below, we refer to wholesale and retail as "trade"; transportation, communications and storage as "transport"; education, health, social, community, and personal as "education and health"; food, beverages, and tobacco as "food"; textile, wearing apparel and leather as "textile"; and paper and printing as "paper". We refer to manufacturing as "tradable sector" and service sector as "nontradable sector".

There appears to be a reallocation of the rural labor force away from agriculture to industry and service sectors with improvements in infrastructure system rendering support to Hypothesis 2, as shown by the positive and significant signs of electricity and concrete road in the rural labor force share of industry and service, and its negative sign in agriculture (Table 4). Employment opportunities in manufacturing (i.e., textile, chemicals, and metals), trade, and transport have increased significantly vis-à-vis other sectors (Tables 5 and 6), indicating that improvement in infrastructure system is a necessary precondition for the growth of the nonfarm sector, including both tradable and nontradable sectors. Calculations on data from 73 provinces show that the average proportion of rural households with electricity rose from 42 percent in 1988 to 71 percent in 2006, the average provincial road density rising from around 2,200 to 2,700 km, and the average proportion of concrete roads rising from 6 percent to 14 percent.

Contrary to expectations, road density and concrete road have decreased the labor share in education and health (Table 5) perhaps because this category includes those workers engaged in domestic work, which has become less attractive when the more lucrative job opportunities proliferate even in rural areas with the integration of rural economies with the broader economy at large. It is interesting to find that road density does not significantly affect the allocation of rural labor force to the service sector, which is the more mobile sector. The service sector can absorb rural labor even in the absence of adequate road system perhaps because of the local nature of the demand and supply of non-tradable services, which can give employment even to the unskilled labor. In brief, it is clear that a well-developed infrastructure is an effective stimulus in the expansion of industry and service sector, thereby rendering support to our Hypothesis 2.

The coefficient of MV-irrigation is negative and not significant in the labor share of industry (Table 4), which seems to imply that the growth linkage between farm and nonfarm sectors may not necessarily work locally. The growth linkage between farm and nonfarm sectors comes mainly through the so-called consumption linkages, i.e., as farm income increases, owing to the improvement in agricultural technology, a large portion of incremental income is spent on locally produced consumer goods and services [Haggblade, Hazell, and Dorosh 2007]. And yet, much of the rural labor force has shifted to the service sector in areas where MV-irrigation expanded rapidly, which means that the growth linkages could have worked effectively on the nontradable sectors. Increased demand for tradable commodities may instead facilitate the development of urban sectors, particularly in industrial clusters, where agglomeration economies lead to cost and production advantages [Sonobe and Otsuka 2006]. On the contrary, Hayami, Kikuchi, and Marciano [1998] argue that agricultural growth may not dictate the choice of firm location in the Philippines, after having found that rural manufacturing firms grew substantially in suburban areas of Metro Manila not because of agricultural growth, but because these urban firms were searching for lower wages and lower rents.

Land reform has the effect of decreasing the share of rural labor force in industry, specifically in chemicals (Table 6), presumably because income is higher in agriculture than industry in land reform communities. Indeed, according to Otsuka [1991], land reform was implemented most successfully in irrigated and favorably rainfed areas in the Philippines, where MV adoption rates were high. Provinces with larger areas devoted to agriculture have a significantly higher proportion of the rural labor force in transport and textile, and a lower proportion in metals.

As expected, the quality characteristics of labor force in terms of gender, age, and schooling appear to be important determinants of rural labor force allocation. Female labor has significantly increased the allocation of rural labor in the industries. This is consistent with the earlier findings of Quisumbing, Estudillo, and Otsuka [2004] that the comparative advantage of female labor in the Philippines lies in nonfarm activities including services. Female labor is employed in light manufacturing such as textile, garments, food processing, chemicals, rubber, plastics, electronics, and precision instruments.

The Philippine experience appears to be contrary to the recent experience of many developing countries, where the so-called feminization of agriculture has already started to take place. According to Lastarria-Cornhiel [2006], there has been an increasing trend in women's participation in agriculture either as agricultural wage labor force in packaging and processing in agribusiness

firms or as principal farmer in smallholder agriculture. Female labor has been increasingly an important input in the nontraditional or high-value agricultural exports (e.g., vegetables, fruits, and flowers) dominated by agribusiness and export firms.[5] Women are increasingly becoming the principal farmers in smallholder agriculture because their spouses migrate outside the village in search of off-farm employment elsewhere, or they were abandoned by their husbands, or their husbands died.

On the whole, the age composition of labor force affects the distribution of rural labor in favor of services, specifically in trade, where business experience could be more valuable (Table 5). The proportion of labor force with primary, secondary, and tertiary schooling significantly decreases the rural labor force share of agriculture and increases the share of the service sector as a whole, implying that the returns to schooling in the service sector are higher (Table 4) [Psacharapoulos and Patrinos 2004].[6] The coefficient of tertiary schooling is higher for services, implying that the more educated segment of the rural labor force chooses to join the service sector. The positive impact of schooling on the labor absorption of the service sector is particularly more pronounced in trade, transport, education, and health, while in industry it is more pronounced in food and chemicals. The share of rural labor allocated to textile goes down significantly with the increase in educational attainment of the labor force, which could imply that this sector largely employs uneducated labor force.

It is important to recognize that secondary schooling has a negative impact on the rural labor force share of the manufacturing sector as a whole (Table 5), which is consistent with the earlier findings of Fabella [1985: Table 3] that education has a negative impact on the labor-absorption capacity of the manufacturing sector in 1975. This may imply that a large portion of the manufacturing sector in the Philippines continues to produce standardized labor-intensive products using unskilled labor. This could be considered pro-poor as the major asset of the poor is unskilled labor.

In brief, our regression results on the impacts of education on rural labor-force absorption support the widely held belief that education facilitates the

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[5]Women earn lower wages than men (who occupy permanent positions) and are more likely to be paid at piece rate.

[6]An important question is whether schooling improves farm productivity. Lockheed, Jamison, and Lau [1982] did a literature review on this issue and found that 31 out of 37 sets of farm data from 18 studies show that the effect of education on production was positive and statistically significant, particularly under modernizing conditions. Overall, the results show that farm productivity increases by 7.4 percent if the farmer completed four years of additional primary schooling compared to none. Philips [1987] argues that the impacts of education on farm productivity vary substantially across regions and are not necessarily found in Latin America and Africa. In the Philippines, David and Otsuka [1994] found that the level of farmers' education does not affect rice technology adoption in the late 1980s in Asia.

structural transformation of the rural economy from the farm to nonfarm sector. Our findings from the provincial data support the findings using data from household surveys. For example, Estudillo and Otsuka [1999], using data from rice-growing households in Central Luzon in the Philippines from 1966 to 1994, found a shift of household income away from farm to nonfarm sources and one of the most important factors for the transformation is the higher educational attainment of the younger generation. Fafchamps and Quisumbing [1999] found that households with better-educated males earn higher off-farm income and divert labor resources away from farm activities toward nonfarm work while education has no significant effect on productivity in crop and livestock production in rural Pakistan. Jolliffe [1998] found that returns to education are much higher in off-farm work than in farm work and affects the labor allocation decisions of Ghanaian farm households. Accordingly, Yang [1997], using Chinese data set, found that better-educated household members participate in off-farm wage activities while at the same time contribute to farm-management decision making.

In accordance with our Hypothesis 1, our regression results show a positive and significant coefficient of distance on the share of rural labor force in agriculture and negative signs on the industry and service sectors (Table 4). Clearly, provinces located at some distance from the main cities tend to have a higher proportion of their rural labor force engaged in farming. The major question is whether the impact of distance on rural labor force allocation has decreased over time because provinces far from the major cities have experienced an expansion of the nonfarm sector because of the improvements in infrastructure systems. We ran our models in Tables 4-6 anew by including the interaction variable between distance and time dummies and found that the coefficients of this variable are largely not statistically significant. This indicates that the negative impact of distance on the growth of rural nonfarm sector has not decreased over time perhaps because much of the infrastructure developments are concentrated in a few suburban areas. Indeed, Llanto [2007] reported that provinces near major urban centers such as Metro Manila and Metro Cebu have relatively better infrastructure because these areas are the focus of much of government projects. This seems to be a rational government decision because the Philippines has 73 provinces located in 7,100 islands; a dispersed infrastructure development could turn out to be less profitable because of the high cost of construction and low streams of economic benefits.

While we believe that the proportion of urban households (subsequently referred to as urbanization) is endogenous, we included this variable in the regression model because we could not identify a single instrumental variable

that affects urbanization but not the sectoral distribution of rural labor. The positive sign of urbanization in the labor share of industry and service sectors supports the widely held belief that urban centers act as generative centers by increasing the labor-force absorption in the industry and services sectors. The negative sign of urbanization variable in the labor share function of agriculture, on the other hand, could be interpreted as a response to the increasing opportunity cost of labor in this sector given the increasing availability of nonfarm jobs brought about by the integration of the rural with the urban and international labor markets. Urbanization has a more pronounced positive effect on the labor share of manufacturing (i.e., textile), construction, and transport sectors (Tables 5 and 6), which produce goods with high-income elasticities, i.e., the demand for these goods tends to increase with the rise in the proportion of high-income urban population.

The coefficients of island dummies for Luzon and Visayas show that the shares of rural labor in industry (i.e., manufacturing) and service (construction, transport, and education and health) sectors are higher in the more developed islands of Luzon and Visayas than in Mindanao. The dummy for island province shows similar signs as that of the dummies for Luzon and Visayas, indicating that landlocked island provinces have experienced the growth of the nonfarm sector. Time dummies show positive coefficients in the service sectors (i.e., construction and transport), after controlling for the effects of infrastructure, human quality, and geographic variables, indicating that the share of rural labor force in these sectors has increased secularly over time.

Although not shown in the tables, we did separate estimations of the labor-force absorption using the same set of explanatory variables for groups of provinces located in Luzon, Visayas, and Mindanao, the three major islands in the Philippines. In Luzon, road density and concrete road positively affect the labor absorption in industry and service sectors. The island of Luzon, as a whole, is landlocked, where the benefits of economies of scale associated with the development of infrastructure system could be more fully realized. In Mindanao, the land area devoted for agriculture significantly increases the rural labor-force share of agriculture because this island is characterized by a huge land area available for cultivation, and where man-land ratio remains low. For the three islands, all the schooling variables significantly affect the allocation of labor between agriculture, industry, and services.

To summarize, our regression results point to the important role of a well-developed infrastructure system and a well-educated labor force in facilitating the shift of rural labor away from agriculture to the industry and service sectors, more specifically toward the construction, trade, and transport sectors whose

products are characterized by high-income elasticities of demand. Distance from a major city remains a major impediment in the expansion of the nonfarm sector and such effect has not diminished over time because infrastructure developments in the country are concentrated in a few provinces near Metro Manila and Cebu City.

5. Summary and conclusions

The classic Hymer and Resnick [1969] model predicts the shrinkage of the rural nonfarm sector in the course of economic development. The goods and services produced by the sector are characterized by low-quality and low-income elasticities so that the demand for these products is bound to decline with income growth. The Hymer-Resnick prediction has proved to be dismal in light of the recent experiences of many developing economies, wherein the rural nonfarm sector grew vibrantly and became the major source of employment and household income, and a driver of rural poverty reduction. Yet, despite the critically important role of the rural nonfarm sector in poverty reduction, only a few studies have identified the factors responsible for the growth of nonfarm sector [Haggblade, Hazell, and Reardon 2007].

In this paper, we explored the development of rural nonfarm sector in the Philippines using provincial-level data set from 1988 to 2006 by identifying the determinants of the changing allocation of rural labor force between the farm and rural nonfarm sectors. We found a movement of rural labor force away from agriculture to the nonfarm sector in the service sector such as trade, transport, and construction. Such movement has been facilitated by the expansion in electricity and the density and quality of road network as well as by the improvements in the quality of human capital measured by educational attainment. The labor absorption capacity of the manufacturing sector, the most important in the tradable sector, has been largely affected by the improvements in the quality of infrastructure (i.e., electricity and concrete roads). Distance from a major city decreased the share of rural labor allocated to the nonfarm sector, and such impact did not diminish much from 1988 to 2006 because infrastructure developments in the country have focused mainly on provinces near Metro Manila and Metro Cebu.

Overall, our results give evidence for the importance of investments in infrastructure and human capital in facilitating the transformation of rural economies away from the farm to the nonfarm sector—an important pathway out of poverty. The findings of our research call for greater public investments in electricity and transportation and communication systems, and the expansion

of public primary and secondary schools as well as vocational and technical schools. The current government's rural electrification program seems to be a move in the right direction, but the quality of electricity service to rural households is far from satisfactory. The quality of roads needs to be improved further as the proportion of concrete road remains very low at 14 percent of the total road length in the provinces in 2006, which may not be sufficient to rapidly transform the rural economies in the Philippines.

Table 1. Indicators of economic transformation in the Philippines, 1970-2006

Description	1970	1980	1990	2000	2006
Gross domestic product per capita (PPP US$)	733	989	918	996	1155
% Agriculture	30	25	22	16	14
% Industry	32	39	34	32	32
% Service	39	36	44	52	54
% Total	100	100	100	100	100
Total labor force ('000)	12,543	17,861	23,520	30,831	371,981[1]
% Agriculture	50	52	45	37	37
% Industry	16	15	15	16	15
% Service	34	33	40	47	48
% Total	100	100	100	100	100

Source: International Labor Organization online database, World Bank [2008].

[1]Refers to 2005.

Table 2. Proportion of rural household income derived from nonfarm sources in the Philippines, 1988-2006

Sector	1988	1991	1994	1997	2000	2003	2006
Philippines	41	40	42	46	48	47	46
Ilocos	40	39	40	45	48	48	44
Cagayan Valley	39	37	34	40	43	37	36
Central Luzon	47	49	49	56	59	58	52
Southern Tagalog	49	48	52	54	57	55	53
Bicol	42	39	47	47	46	44	43
Western Visayas	32	32	34	34	40	42	42
Central Visayas	43	46	43	47	49	52	49
Eastern Visayas	37	33	38	40	47	45	46
Western Mindanao	38	34	42	46	49	49	45
Northern Mindanao	47	44	42	44	46	47	49
Southern Mindanao	33	37	39	44	43	45	47
Central Mindanao	39	40	41	46	43	36	39
Cordillera Autonomous Region	44	42	39	44	44	43	42
Autonomous Region of Muslim Mindanao	na	22	25	34	36	35	33
Caraga	na	na	na	40	39	52	54

Source: Authors' calculations from the Family Income and Expenditure Surveys, 1988, 1991, 1994, 1997, 2000, 2003, 2006.

Note: Income excludes the imputed rental value of owner-occupied dwelling unit for income.

Table 3. Distribution of rural labor force in the Philippines, 1988-2006

Sector	1988	1991	1994	1997	2000	2003	2006
Rural labor force ('000)	14,300	12,700	13,900	14,800	16,100	18,100	18,300
Agriculture (%)	59	61	59	57	53	52	51
Agriculture, fishing and forestry (%)	52	54	53	52	48	46	46
Fishing (%)	7	7	6	5	5	6	5
Industry (%)	9	8	8	7	7	6	6
Mining and quarrying (%)	1	1	0	0	0	0	1
Manufacturing (%)	7	7	6	6	6	5	5
Other industry	1	0	2	1	1	1	0
Services (%)	26	25	27	29	32	33	34
Construction (%)	3	3	3	4	4	4	3
Wholesale and retail trade (%)	9	9	10	10	11	12	13
Transportation, communication, storage (%)	3	3	4	4	5	5	5
Hotels and restaurant (%)	1	1	1	1	1	1	1
Education (%)	2	2	2	2	2	2	2
Health, social, community and personal services (%)	5	5	5	5	5	5	5
Public administration, defense and extraterritorial (%)	2	2	3	3	3	3	3
Other services	0	0	1	0	1	1	1
Not elsewhere classified and the unemployed (%)	6	6	6	6	8	10	8
Total (%)	100	100	100	100	100	100	100

Source: Authors' calculations from the Labor Force Surveys, 1988, 1991, 1994, 1997, 2000, 2003, 2006.

Table 4. Determinants of the share of labor force by sector in the Philippines, 1988-2006 (Ordinary least squares)

Determinants	*Agriculture*	*Industry*	*Service*
Access to electricity (% households)	-0.23***	0.11***	0.10***
	(-5.95)	(5.25)	(4.68)
Ratio of road (km) to provincial land area (ha)	0.02	0.00	0.00
	(1.04)	(-0.18)	(-0.31)
Concrete road (%)	-0.32***	0.13***	0.15***
	(-5.66)	(4.3)	(4.64)
Area with modern variety (%) × area with irrigation (%)	0.00	-0.01	0.01
	(-0.20)	(-0.88)	(0.53)
Change in cumulative accomplishment of the agrarian reform program (%)	0.01	-0.04**	0.02
	(0.31)	(-2.02)	(0.93)
Ratio of area harvested (ha) to agricultural labor force	-0.04*	0.01	0.02*
	(-1.77)	(0.41)	(1.75)
PROPORTION OF LABOR FORCE:			
Female	-0.01	0.07*	-0.03
	(-0.17)	(1.86)	(-0.65)
Between 15–25 years old	-0.24	0.09	0.16**
	(-1.52)	(1.12)	(1.99)
Between 26–35 years old	-0.28	0.08	0.18*
	(-1.64)	(0.81)	(1.87)

Table 4. Determinants of the share of labor force by sector in the Philippines, 1988-2006 (Ordinary least squares) (continued)

Determinants	*Agriculture*	*Industry*	*Service*
PROPORTION OF LABOR FORCE:			
Between 36–45 years old	-0.32*	0.13	0.26**
	(-1.73)	(1.46)	(2.56)
Between 46–59 years old	-0.37*	0.01	0.29**
	(-1.73)	(0.08)	(2.42)
Completed some years in primary school	-0.22**	0.06	0.16***
	(-2.55)	(1.33)	(2.86)
Completed some years in secondary school	-0.30***	-0.02	0.19***
	(-3.04)	(-0.32)	(3.25)
Completed some years in tertiary school	-0.80***	0.10	0.65***
	(-6.22)	(1.39)	(8.10)
Distance (km)	0.00***	-0.00***	-0.00**
	(4.71)	(-5.40)	(-2.52)
Urban households (%)	-0.18***	0.10***	0.05**
	(-6.19)	(6.33)	(2.49)
Dummy for Luzon*Distance	0.00	0.00***	0.00
	(-0.44)	(3.23)	(-1.44)
Dummy for Visayas*Distance	0.00	0.00**	0.00
	(-1.58)	(2.01)	(0.20)

Table 4. Determinants of the share of labor force by sector in the Philippines, 1988-2006 (Ordinary least squares) (continued)

Determinants	*Agriculture*	*Industry*	*Service*
Island Province Dummy	-0.09***	0.04***	0.04***
	(-6.65)	(6.00)	(5.01)
Dummy for 1991	0.03	0.01	-0.03*
	(0.78)	(0.46)	(-1.67)
Dummy for 1994	0.04**	-0.02**	-0.01
	(2.25)	(-2.25)	(-1.38)
Dummy for 1997	0.04**	-0.02**	-0.01
	(2.09)	(-2.01)	(-0.55)
Dummy for 2000	0.05***	-0.04***	-0.01
	(2.91)	(-4.27)	(-1.16)
Dummy for 2003	0.04**	-0.06***	0.00
	(2.56)	(-5.89)	(-0.39)
Dummy for 2006	0.07***	-0.07***	0.00
	(3.93)	(-7.06)	(0.17)
Constant	1.30***	-0.08	-0.23**
	(7.77)	(-0.93)	(-2.45)
Observations	492	492	492
R-squared	0.70	0.55	0.68

Source: Authors' calculations.
Note: Numbers in parentheses are robust t-values.
***Significant at 1 percent level; **significant at 5 percent level; *significant at 10 percent level.

Table 5. Determinants of the share of labor force in industry and services by sector in the Philippines, 1988-2006 (Ordinary least squares)

	Industry subsector	*Service subsector*			
Determinants	*Manufacturing*	*Construction*	*Wholesale and retail*	*Transport, communications and storage*	*Education, health, social, community and personal*
Access to electricity (% households)	0.07***	0.03***	0.04***	0.02***	0.03***
	(3.90)	(3.39)	(2.70)	(2.84)	(2.64)
Ratio of road (km) to provincial land area (ha)	0.00	0.00	0.01	0.01	-0.02***
	(0.14)	(1.12)	(1.43)	(1.44)	(-3.05)
Concrete road (%)	0.14***	0.02	0.14***	0.04***	-0.03*
	(5.13)	(1.37)	(6.88)	(2.86)	(-1.85)
Area with modern variety (%) × area with irrigation (%)	0.00	0.01	0.00	0.00	0.01
	(-0.36)	(1.51)	(0.40)	(-0.92)	(0.83)
Change in cumulative accomplishment of the agrarian reform program (%)	-0.02	0.00	0.01	0.01	0.00
	(-1.57)	(0.37)	(0.43)	(1.42)	(0.24)
Ratio of area harvested (ha) to agricultural labor force	0.02**	0.00	0.01	0.01***	0.00
	(2.38)	(-0.47)	(0.71)	(3.03)	(0.44)

Table 5. Determinants of the share of labor force in industry and services by sector in the Philippines, 1988-2006 (Ordinary least squares) (continued)

	Industry subsector	*Service subsector*			
Determinants	*Manufacturing*	*Construction*	*Wholesale and retail*	*Transport, communications and storage*	*Education, health, social, community and personal*
PROPORTION OF LABOR FORCE:					
Female	0.07**	0.01	0.03	-0.05***	-0.02
	(2.19)	(0.34)	(1.12)	(-2.83)	(-0.57)
Between 15–25 years old	0.06	0.06	0.15***	0.02	-0.03
	(0.97)	(1.37)	(2.62)	(0.75)	(-0.51)
Between 26–35 years old	-0.08	0.05	0.12*	0.04	-0.02
	(-0.93)	(1.09)	(1.79)	(1.21)	(-0.29)
Between 36–45 years old	0.08	0.01	0.18***	0.02	0.05
	(1.29)	(0.13)	(2.70)	(0.55)	(0.71)
Between 46–59 years old	-0.03	0.06	0.20**	0.01	0.04
	(-0.27)	(1.13)	(2.55)	(0.36)	(0.51)
Completed some years in primary school	-0.04	0.01	0.12***	0.02	0.00
	(-0.97)	(0.56)	(3.53)	(1.43)	(0.10)
Completed some years in secondary school	-0.11***	0.03	0.15***	0.03	0.01
	(-2.86)	(1.58)	(4.27)	(1.34)	(0.21)

Table 5. Determinants of the share of labor force in industry and services by sector in the Philippines, 1988-2006 (Ordinary least squares) (continued)

	Industry subsector	*Service subsector*			
Determinants	*Manufacturing*	*Construction*	*Wholesale and retail*	*Transport, communications and storage*	*Education, health, social, community and personal*
PROPORTION OF LABOR FORCE:					
Completed some years in tertiary school	0.01	0.00	0.14***	0.06*	0.42***
	(0.19)	(0.03)	(2.71)	(1.95)	(7.46)
Distance (km)	-0.00***	-0.00***	0.00	-0.00***	-0.00***
	(-4.63)	(-4.07)	(0.23)	(-2.65)	(-2.92)
Urban households (%)	0.07***	0.02**	0.01	0.03***	0.00
	(5.00)	(2.06)	(0.78)	(4.47)	(0.10)
Dummy for Luzon*Distance	0.00**	0.00***	-0.00***	0.00	0.00
	(2.18)	(3.31)	(-3.98)	(1.45)	(0.90)
Dummy for Visayas*Distance	0.00	0.00***	-0.00**	0.00	0.00**
	(0.55)	(3.06)	(-2.39)	(0.96)	(2.06)
Island Province Dummy	0.02***	0.02***	0.02***	0.00**	0.01***
	(3.79)	(5.18)	(3.55)	(2.15)	(3.23)
Dummy for 1991	0.00	0.00	-0.01	-0.01**	0.00
	(0.19)	(-0.30)	(-1.19)	(-2.21)	(-0.41)

Table 5. Determinants of the share of labor force in industry and services by sector in the Philippines, 1988-2006 (Ordinary least squares) (continued)

	Industry Subsector	*Service Subsector*			
Determinants	*Manufacturing*	*Construction*	*Wholesale and retail*	*Transport, communications and storage*	*Education, health, social, community and personal*
Dummy for 1994	-0.02*	0.00	-0.01	0.00	0.00
	(-1.82)	(-0.32)	(-1.53)	(-1.27)	(-0.30)
Dummy for 1997	-0.02***	0.01***	0.00	0.00	-0.01
	(-2.71)	(2.78)	(-0.24)	(1.17)	(-1.38)
Dummy for 2000	-0.04***	0.00	0.00	0.00	-0.01**
	(-4.73)	(0.97)	(-0.21)	(0.94)	(-2.02)
Dummy for 2003	-0.04***	0.00	0.00	0.01**	-0.01**
	(-5.72)	(-0.64)	(0.05)	(2.27)	(-2.03)
Dummy for 2006	-0.05***	-0.01**	0.01	0.01**	-0.01
	(-6.75)	(-2.41)	(0.83)	(2.05)	(-1.64)
Constant	0.04	-0.05	-0.21***	-0.03	0.05
	(0.50)	(-1.12)	(-3.48)	(-0.82)	(0.64)
Observations	492	492	492	492	492
R-squared	0.48	0.41	0.54	0.54	0.44

***Significant at 1 percent level; **significant at 5 percent level; *significant at 10 percent level.
Note: Numbers in parentheses are robust t-values.
Source: Authors' calculations.

Table 6. Determinants of the share of labor force in manufacturing subsector in the Philippines, 1988-2006 (Tobit)

Determinants	*Food, beverages and tobacco*	*Textile, wearing apparel and leather*	*Wood and furniture*	*Paper and printing*	*Chemicals*	*Metals*
Access to electricity (% households)	-0.18*	0.28***	-0.12	0.17	0.08	0.15*
	(-1.83)	(2.61)	(-0.95)	(1.63)	(1.28)	(1.82)
Ratio of road (km) to provincial land area (ha)	0.02	0.11**	-0.11*	0.04	0.05	-0.02
	(0.37)	(2.10)	(-1.86)	(0.85)	(1.59)	(-0.56)
Concrete road (%)	-0.31**	0.05	0.09	0.15	0.18*	-0.01
	(-2.06)	(0.31)	(0.45)	(1.06)	(1.96)	(-0.06)
Area with modern variety (%) × area with irrigation (%)	0.08	0.00	-0.08	-0.04	0.05	0.01
	(1.36)	(0.08)	(-1.12)	(-0.71)	(1.48)	(0.31)
Change in cumulative accomplishment of the agrarian reform program (%)	0.04	0.08	-0.19	-0.09	-0.21***	-0.04
	(0.38)	(0.61)	(-1.29)	(-0.73)	(-2.81)	(-0.42)
Ratio of area harvested (ha) to agricultural labor force	-0.12**	0.11*	0.08	0.04	0.04	-0.06
	(-2.10)	(1.81)	(1.09)	(0.69)	(1.18)	(-1.22)

Table 6. Determinants of the share of labor force in manufacturing subsector in the Philippines, 1988-2006 (Tobit) (continued)

Determinants	*Food, beverages and tobacco*	*Textile, wearing apparel and leather*	*Wood and furniture*	*Paper and printing*	*Chemicals*	*Metals*
PROPORTION OF LABOR FORCE:						
Female	-0.16	-0.12	0.43	-0.23	0.03	-0.06
	(-0.70)	(-0.50)	(1.46)	(-0.91)	(0.20)	(-0.31)
Between 15–25 years old	1.26***	0.02	-1.59***	1.23**	0.23	0.73*
	(2.95)	(0.04)	(-3.02)	(2.47)	(0.81)	(1.96)
Between 26–35 years old	1.02**	0.11	-1.24**	0.83	0.85***	0.15
	(2.13)	(0.21)	(-2.07)	(1.51)	(2.67)	(0.35)
Between 36–45 years old	0.71	-1.20**	-0.45	0.94*	0.87***	-0.18
	(1.49)	(-2.33)	(-0.77)	(1.69)	(2.77)	(-0.43)
Between 46–59 years old	0.85	0.58	-1.87***	0.87	0.52	0.44
	(1.54)	(0.97)	(-2.72)	(1.33)	(1.43)	(0.91)
Completed some years in primary school	1.57***	-0.89***	-0.09	0.00	0.80***	0.33
	(6.04)	(-3.40)	(-0.30)	(0.00)	(3.72)	(1.39)
Completed some years in secondary school	1.50***	-1.43***	-0.01	-0.23	0.49**	0.35
	(5.55)	(-5.16)	(-0.02)	(-0.84)	(2.32)	(1.45)
Completed some years in tertiary school	1.44***	-0.46	-0.74	0.19	0.45	0.50
	(3.57)	(-1.10)	(-1.48)	(0.47)	(1.53)	(1.42)

Table 6. Determinants of the share of labor force in manufacturing subsector in the Philippines, 1988-2006 (Tobit) (continued)

Determinants	*Food, beverages and tobacco*	*Textile, wearing apparel and leather*	*Wood and furniture*	*Paper and printing*	*Chemicals*	*Metals*
Distance (km)	0.00***	0.00	-0.00**	0.00*	0.00	0.00
	(3.02)	(0.27)	(-2.30)	(1.95)	(-1.43)	(-0.73)
Urban households (%)	-0.02	0.24***	-0.36***	0.09	-0.03	0.1
	(-0.26)	(2.72)	(-3.40)	(1.14)	(-0.66)	(1.44)
Dummy for Luzon*Distance	-0.00***	0.00	0.00**	-0.00*	0.00	0.00
	(-2.90)	(0.09)	(2.13)	(-1.79)	(-1.20)	(0.34)
Dummy for Visayas*Distance	0.00	0.00	0.00	0.00	0.00	0.00
	(-0.98)	(1.08)	(0.40)	(-1.11)	(-0.80)	(-1.38)
Island Province Dummy	-0.07*	-0.02	0.00	0.01	0.05**	0.02
	(-1.96)	(-0.59)	(0.00)	(0.23)	(2.00)	(0.73)
Dummy for 1991	0.01	-0.09	0.05	0.09	0.20***	0.03
	(0.16)	(-0.94)	(0.43)	(0.98)	(3.44)	(0.45)
Dummy for 1994	0.11**	-0.03	-0.06	0.08	0.06*	0.02
	(2.20)	(-0.56)	(-1.01)	(1.48)	(1.73)	(0.46)
Dummy for 1997	0.12***	-0.08*	-0.08	0.04	0.10***	0.07*
	(2.66)	(-1.66)	(-1.42)	(0.87)	(3.32)	(1.84)

Table 6. Determinants of the share of labor force in manufacturing subsector in the Philippines, 1988-2006 (Tobit) (continued)

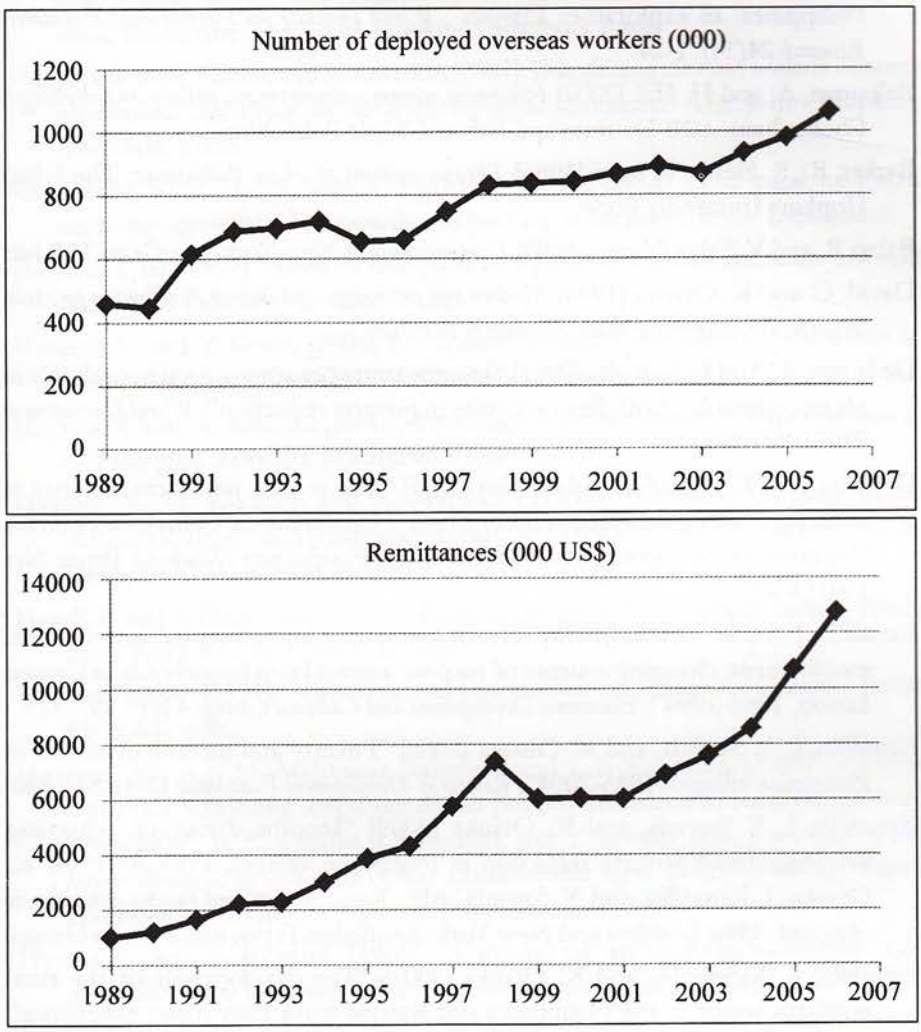
Determinants	*Food, beverages and tobacco*	*Textile, wearing apparel and leather*	*Wood and furniture*	*Paper and printing*	*Chemicals*	*Metals*
Dummy for 2000	0.15***	-0.11**	-0.04	0.10*	0.04	0.13***
	(3.33)	(-2.23)	(-0.62)	(1.96)	(1.32)	(3.24)
Dummy for 2003	0.14***	-0.09*	-0.04	0.06	0.06**	0.11***
	(3.15)	(-1.82)	(-0.63)	(1.17)	(2.17)	(2.91)
Dummy for 2006	0.15***	-0.14***	0.02	0.07	0.04	0.07*
	(3.11)	(-2.62)	(0.41)	(1.48)	(1.26)	(1.81)
Constant	-2.03***	1.04**	1.77***	-1.16**	-1.30***	-0.67*
	(-4.40)	(2.13)	(3.17)	(-2.12)	(-3.98)	(-1.67)
Number of observations	485	485	485	485	485	485
Log likelihood	-50.9	-90.26	-167.89	-73.96	14.84	-41.54

***Significant at 1 percent level; **significant at 5 percent level; *significant at 10percent level.

Note: Numbers in parentheses are t-values.

Source: Authors' calculations.

Figure 1. Number of deployed overseas Filipino workers and overseas remittances, 1989-2006



Source: Data on number of deployed overseas workers were drawn from the database of the Philippine Overseas Employment Administration while data on remittances were drawn from the Central Bank of the Philippines online database.

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