

Trade and Workers: Evidence from the Philippines

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This paper combines labor force survey data with trade and production data from 1988 to 1997 to examine the impact of trade on wages and employment in the Philippines's manufacturing sector. In contrast to findings typically reported for Latin American countries, data indicate that wage inequality in the manufacturing sector declined over a period in which trade liberalization was undertaken. This was despite the fact that reductions in tariff rates were largest in less skill-intensive manufacturing industries. There was also an absence of any secular rise in returns to higher education. Tariff reductions were associated with declines in industry wage premiums in capital-intensive industries. Moreover, these declines were largest for skilled workers. Tariff reductions have had an insignificant effect on both employment as well as average hours of work of full-time employees across industries. These findings are consistent with a scenario where workers in capital-intensive industries, especially the more skilled ones, earned rents prior to trade liberalization, which may have eroded these.

I. INTRODUCTION

Over the last two decades, scores of developing countries have moved to liberalize their trade regimes. How have these episodes of liberalization affected workers? In view of the importance of this question for public policy there have been a number of recent papers that examine various dimensions of this issue. Prominent examples include the work of Currie and Harrison (1997), Ravenga (1997), Hanson and Harrison (1999), Robbins and Gindling (1999), Feliciano (2001), and Goldberg and Pavcnik (2001). By and large, much of this work has been based on the experience of various Latin American countries, with a few contributions considering cases from Africa. Recent evidence from liberalizing

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Asian countries is much more limited.¹ This gap in the regional coverage of the existing literature is particularly glaring given Asia's abundance of labor (in both absolute as well as relative terms). This paper takes some steps toward filling this gap by analyzing trade-labor linkages in the Philippines, a country that has embarked on a program of trade liberalization since the mid-1980s and for which fairly good data are available.

This paper examines the impact of trade on relative industry wages and employment in the manufacturing sector from 1988 to 1997. As in the work of Gaston and Trefler (1994) for the United States (US) and Feliciano (2001) and Goldberg and Pavcnik (2001) mentioned above, industry wage premiums are estimated using labor force survey data. These are subsequently related to measures of trade policy, trade flows, and industry characteristics. Since the wage premiums are based on earnings functions that include controls for various observable worker characteristics including age, sex, and educational attainment, they represent the portion of wages that are purged of workers' observable characteristics and accrue to workers' industry of employment. Working with industry wage premiums can therefore alleviate aggregation biases that may result from working with average industry- or plant-level wages. For example, suppose that import-competing industries employ a larger share of skilled and thus higher paid workers, as is the case for the Philippines. Import-competing industries would then have higher average wages. Ignoring the composition of worker characteristics across industries may lead a researcher to take the positive correlation between imports and average wages as evidence that import competition is beneficial for wages (working through the effect of import competition on innovation and productivity, for instance).

The panel nature of the study's estimated industry wage premiums and access to production data at the industry level allows for addressing another potential complication in estimating the impact of trade on relative wages. As Gaston and Trefler (1994) point out, policymakers may set trade policy considering the composition of workers across industries (for example, average education, average age, average level of skills, etc.). Since worker composition may also affect wage premiums—US data suggest that industries with larger shares of skilled workers tend to have higher wage premiums, something also found with the Philippines data—ignoring the endogeneity of protection will lead ordinary least squares (OLS) estimates of the impact of protection on wage premiums to be inconsistent. To alleviate endogeneity concerns, industry characteristics are controlled in estimation. Since the data contain very limited

¹Exceptions include the work of Suryahadi (1999 and 2003) for Indonesia; and Kambhupati, Krishna, and Mitra (1997) for India. The former examines the links between trade and premium to skills/education while the latter focus on the effects of liberalization on employment in five import-competing industries.

information on pertinent industry characteristics—only capital–labor ratios across industries are available—the paper makes intensive use of industry fixed effects in estimation. The latter can make up for the limited data on industry characteristics. For example, information on unionization is not available by manufacturing industry. If unionization varies across industries and has important effects on how labor markets adjust to trade liberalization—as Gaston and Trefler (1995) find to be the case for the US—the analysis would miss out on these effects. To the extent that unionization and the structure of bargaining between workers and firms is slow to change, introducing industry fixed effects can be useful for alleviating omitted variable bias.

The paper also examines other dimensions of trade–labor linkages. Much of the recent work on trade and wages has focused on the effects of trade on economywide returns to education. While an analysis of the role of trade in driving changes in returns to education is beyond the scope of this paper (Chu, Hasan, and Lee 2002 focus on this issue), the earnings function estimates shed light on the behavior of returns to education over the period of trade reform in the Philippines. Finally, available industry-level information on employment as well as average hours worked assess how trade has impacted employment in terms of both employee counts as well as hours of work across manufacturing industries.

The remainder of the paper is organized as follows. Section II discusses some conceptual issues related to trade and labor market linkages and also provides a description of the trade policy framework in the Philippines. Section III describes the data and presents summary statistics and trends pertaining to trade and relevant worker characteristics. Section IV describes the results and Section V concludes.

II. TRADE AND LABOR LINKAGES

A. Conceptual Issues

One of the most convenient starting points for thinking about trade and labor linkages is the Heckscher-Ohlin (HO) model of trade. In its simplest version, where trade takes place between two countries of the world endowed with two factors of production in different proportions, the model predicts that a reduction in trade barriers will raise the demand for and returns to the abundant factor in each of the two regions. If the two factors are skilled and unskilled labor, trade liberalization in the unskilled abundant country should lead to a decrease in wage inequality between skilled and unskilled labor as the demand for unskilled workers increases. The opposite should take place in the skill-abundant country.

The HO model's assumption of perfect factor mobility implies that returns to factors are equal across sectors. Since in reality factors may take considerable time to reallocate across sectors, the HO model is often thought to describe the

long-run effects of trade. For the short to medium run, a better guide to the labor market effects of trade may be provided by the specific factors model. For example, trade liberalization focused on one sector will depress wages in that sector if labor is immobile. This happens as increased imports in the liberalized sector shift the industry demand for labor downward. The inability of workers to move to other sectors breaks the link between their wages and those elsewhere. As Goldberg and Pavcnik (2001) point out, the widely held belief that trade hurts workers is consistent with the specific factors model.

Allowing for imperfections in product and factor markets introduces a far richer variety of possibilities than the general equilibrium HO and specific factors models allow, however. If domestic firms have monopoly power, for example, trade liberalization may have a “pro-competitive effect” on workers as import competition makes the product demand curve more elastic and forces firms to reduce markups. Under certain conditions, the reduction in markups will lead to an increase in the demand for labor, a proposition for which Kambhupati, Krishna, and Mitra (1997) present evidence using plant-level data for five import-competing industries from India. Firms may also react to import competition by investing in improvements in productivity. The latter would raise the demand for labor, *ceteris paribus*. Currie and Harrison (1997) find evidence that firms in some sectors in Morocco did respond to trade liberalization in this manner.

How changes in labor demand impact workers depends also on the nature of competition in labor markets. When they are competitive, industry elasticities of labor demand and supply determine the extent of movement in employment and wages. On the other hand, labor market imperfections introduce yet another layer of complexity. When workers have bargaining power, for example, it is quite likely that they will use this to share in the rents created by protection.² Trade liberalization may then be expected to especially hurt workers in those industries where they have bargaining power as rents decline. But the actual responses will depend on specific circumstances. Workers with bargaining power may choose to maintain employment and accept lower wages. But the opposite may also take place as when lay-off rules benefit senior workers so that senior workers push for higher wages at the expense of unemployment of junior workers (Grossman 1984).

As the foregoing discussion indicates, there are a number of factors that influence trade–labor linkages. Empirical evidence is ultimately needed to determine which channels are, or at least appear to be, the more relevant ones.

²As is explained later, data on unionization is not available by two digit industries. Capital intensity of an industry is used as a proxy for bargaining power. For a variety of reasons it is likely that workers are better organized in capital-intensive industries. See Section IVB for more details.

B. Trade Liberalization in the Philippines³

Like many other developing countries, the Philippines pursued protectionist policies from the 1950s to the 1970s. Although there were some attempts at liberalizing trade in the 1960s and 1970s, it was only in the early 1980s that a serious effort at liberalization was initiated. Two key aspects of the liberalization package were a Tariff Reform Program (TRP) that entailed compression of the tariff rate structure from a 0–100 percent range to a 10–50 percent range from 1981 to 1985, and an Import Liberalization Program (ILP) for lifting quantitative restrictions on imports. The latter was abandoned, however, in 1983 due to a balance-of-payment crisis. It was resumed when the Aquino government came to power in 1986 where it achieved far more success. While 34 percent of the total number of Philippines Standard Commodity Classification lines was regulated in 1985 (only two percentage points less than that in 1980), this was down to 12 percent by 1988 (Medalla 1990).

In 1991 the government enacted a second tariff reform program (the so-called TRP II) whereby tariff rates would be further compressed to a 10–30 percent range. However, there were a number of exceptions granted so that about 10 percent of commodity lines in 1995 were still subject to tariff rates below 10 percent, or between 30 and 50 percent. There was also a liberalization of quantitative restrictions in 1992 for a variety of imported agricultural and manufacturing goods. In a number of cases, the tariff rates on the liberalized goods were set fairly high with a built-in 5-year phasedown of these tariff rates. The tariffification process saw some reversal, however, with the re-imposition of quantitative restrictions in 1993 on various items, largely concentrated among agricultural goods. The result was that while only 164 commodities were subject to quantitative restriction by the end of 1992, the number had increased to 257 by 1993.

A third wave of trade reforms took place in the mid-1990s (TRP III). Measures included a reduction of tariff rates on a variety of manufacturing items including capital equipment and machinery, textiles, garments, and chemical inputs among others. There was also some reduction of tariffs on “non-sensitive” agricultural goods. Overall, the TRP III was aimed at developing a four-tier tariff schedule: 10 or 3 percent for raw materials and capital equipment depending on whether these were available locally or not; 20 percent for intermediate goods; and 30 percent for finished goods. There was also a liberalization of all import restrictions as a result of the need to comply with WTO commitments; some products were however allowed to have tariff rates above the ceiling of 30 percent.

³This section follows Chu et al. (2002). A detailed discussion of trade policy reforms in the Philippines may be found in Manasan and Querubin (1997).

The result of the various trade liberalization measures has made the Philippines a far more open economy, especially insofar as the manufacturing sector is concerned. Calculations by Manasan and Querubin (1997) and Manasan and Pineda (1999) reveal that effective rates of protection were reduced overall by half (29.4 percent in 1990 versus 14.4 percent in 2000). Even larger declines in protection took place in manufacturing (31 percent in 1990 versus 14.5 percent in 2000). Greater openness is also seen in expanding trade flows. While total exports had grown at an annual average rate of 4 percent in the 1980s, they grew at about 16 percent in 1990–1998. The result of this export boom has been to double the Philippines’s export share in world markets from around 0.3 percent in 1985 to 0.6 percent in 1998. Manufacturing has been the main contributor to this export boom (World Bank 2000).

III. DATA AND TRENDS

The analysis of trade–labor linkages makes use of three data sets: trade-related data that allow patterns of protection and trade flows across industries to be quantified; production data that provide us an important industry-specific characteristic, namely the capital–labor ratio; and finally the Philippines Labor Force Survey (LFS) data, which provides information on workers.

The trade-related data consists of a measure of average tariff rates and trade flows (imports and exports) for roughly 28 three-digit ISIC (International Standard Industrial Classification) manufacturing industries and comes from the Trade and Production database developed by Nicita and Olarreaga (2001).⁴ The original source of the tariff data is the TRAINS database maintained by the United Nations Conference on Trade and Development (UNCTAD). Because tariffs are reported in terms of the six-digit HS classification, Nicita and Olarreaga use a one-to-one concordance table to arrive at tariff rates in terms of the three-digit ISIC classification.⁵ They report the tariff as most-favored-nation simple averages at the 3-digit level of the ISIC. Table 1 reports the average tariff rates for the available years.⁶ The table confirms two aspects of the trends in protection

⁴While average tariff rates are imperfect measures of protection, they are used here because of the lack of availability of other measures, such as effective rates of protection, at sufficiently high levels of disaggregation.

⁵UNCTAD calculates the simple averages using as the denominator only the actual number of dutiable lines.

⁶One drawback of the tariff data is that tariff rates for 1991 and 1997 are missing. As noted below, industry wage premiums are based on LFS data from 1988, 1991, 1994, and 1997. Thus tariff rates for 1991 and 1997 must be obtained in some way. Using the available tariff information from 1988 to 1998, simple interpolation is used to get tariff estimates for these two years. Interpolation for 1991 should not entail much error. As Table 1 shows, tariff rates between 1990 and 1992 were fairly similar. Moreover, the literature on trade policy in the Philippines does not give any reason to believe that there was a spike in tariff rates between

described in the previous subsection: the broad-based reduction in protection in manufacturing over the 1990s plus the tendency for tariff rates to increase just after the “tariffication” of quantitative restrictions in 1992.

Table 1. Average Tariff Rates in the Philippines, 1988–1998

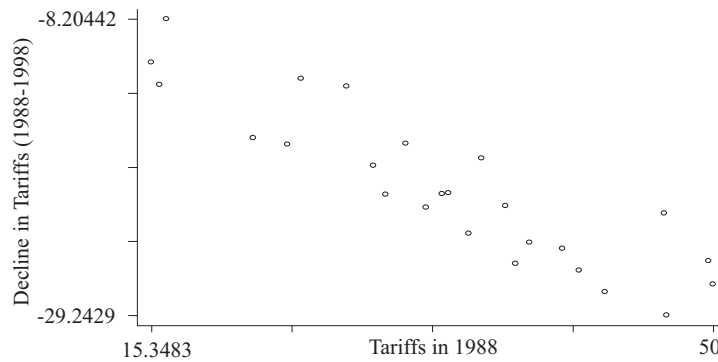
| Industry | 1988 | 1989 | 1990 | 1992 | 1993 | 1994 | 1995 | 1998 |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Food Products | 35.74 | 35.56 | 25.52 | 25.54 | 32.35 | 30.34 | 28.37 | 17.64 |
| Beverages | 47.14 | 47.14 | 29.05 | 29.05 | 43.81 | 42.14 | 40.48 | 17.90 |
| Tobacco | 43.33 | 45.00 | 27.50 | 27.50 | 42.50 | 42.50 | 42.50 | 15.75 |
| Textiles | 38.68 | 38.68 | 26.07 | 26.07 | 29.32 | 29.29 | 26.79 | 14.60 |
| Apparel | 49.73 | 49.73 | 29.88 | 29.88 | 49.16 | 48.91 | 30.51 | 24.34 |
| Leather Products | 33.30 | 33.30 | 23.26 | 23.26 | 32.32 | 32.21 | 30.72 | 12.66 |
| Footwear | 47.00 | 47.00 | 30.00 | 30.00 | 48.00 | 48.00 | 48.00 | 25.00 |
| Wood Products | 37.21 | 37.21 | 24.89 | 24.89 | 27.98 | 27.77 | 27.55 | 15.72 |
| Furniture | 50.00 | 50.00 | 29.13 | 29.13 | 40.00 | 34.57 | 29.13 | 22.96 |
| Paper and Products | 32.31 | 32.39 | 19.75 | 19.76 | 22.73 | 21.41 | 19.21 | 10.73 |
| Printing and Publishing | 27.41 | 27.41 | 20.00 | 20.00 | 22.04 | 21.02 | 20.00 | 14.43 |
| Industrial Chemicals | 15.35 | 15.39 | 11.73 | 11.71 | 11.39 | 11.36 | 11.34 | 4.07 |
| Other Chemicals | 23.75 | 23.70 | 16.19 | 16.22 | 17.96 | 17.81 | 17.46 | 6.64 |
| Petroleum Refineries | 15.87 | 15.87 | 11.88 | 11.88 | 7.78 | 7.74 | 7.74 | 3.00 |
| Miscellaneous | | | | | | | | |
| Petroleum and | | | | | | | | |
| Coal Products | 20.00 | 20.00 | 19.13 | 19.13 | 17.88 | 17.88 | 17.88 | 7.25 |
| Rubber Products | 29.05 | 29.15 | 22.93 | 22.93 | 24.23 | 23.77 | 23.32 | 10.43 |
| Plastic Products | 41.75 | 41.75 | 27.06 | 27.06 | 33.66 | 31.52 | 29.41 | 15.68 |
| Pottery, China, | | | | | | | | |
| Earthenware | 40.71 | 40.71 | 26.43 | 26.43 | 36.07 | 34.82 | 33.57 | 16.21 |
| Glass and Products | 34.94 | 35.27 | 21.20 | 21.20 | 25.92 | 22.94 | 20.93 | 11.50 |
| Other Nonmetallic | | | | | | | | |
| Mineral Products | 33.69 | 33.69 | 23.42 | 23.42 | 29.60 | 26.91 | 27.03 | 13.13 |
| Iron and Steel | 16.29 | 16.23 | 14.34 | 14.34 | 15.53 | 15.00 | 14.88 | 8.09 |
| Nonferrous Metals | 20.63 | 20.66 | 16.21 | 16.21 | 12.92 | 12.72 | 15.29 | 4.48 |
| Metal Products | 31.05 | 31.01 | 24.77 | 24.79 | 27.18 | 25.86 | 25.07 | 14.01 |
| Nonelectrical | | | | | | | | |
| Machinery | 21.65 | 21.64 | 12.97 | 12.97 | 13.32 | 12.97 | 12.56 | 4.99 |
| Electrical Machinery | 29.81 | 29.81 | 19.27 | 19.31 | 20.06 | 18.97 | 17.93 | 9.15 |
| Transport Equipment | 24.59 | 24.83 | 17.68 | 17.63 | 17.58 | 17.22 | 15.30 | 12.16 |
| Professional and | | | | | | | | |
| Scientific Equipment | 20.03 | 20.03 | 17.09 | 17.09 | 16.94 | 16.90 | 16.86 | 7.03 |
| Other Manufactured | | | | | | | | |
| Products | 37.83 | 38.06 | 25.59 | 25.59 | 30.09 | 27.41 | 25.83 | 12.24 |

Source: Nicita & Olarreaga (2001).

these years. The situation for 1997 is a little different since tariffs had changed between 1995 and 1998 and interpolation may not capture the actual year-by-year changes well. However, that actual tariff rates declined between 1994 and 1997 for the more aggregated industry groups reported in Manasan and Querubin, and that tariff rates for 1994 (actual) and 1997 (interpolated) are qualitatively similar, provide confidence.

Interestingly, the data also indicate a tendency for protection to be higher in industries generally thought to be more labor-intensive, a pattern similar to that found in a number of other developing countries (Harrison and Hanson 1999). Thus in 1988 tariff rates in industries such as electrical and nonelectrical machinery, transportation equipment, and chemicals were often more than 20 percentage points lower than those in industries such as apparel and footwear. Given this initial pattern of protection, the move to harmonize tariff rates at lower levels meant that previously protected labor-intensive industries saw large declines in protection (Figure 1). At the same time, while absolute differences in tariff rates across industries came down by 1998, the relative structure of protection appears not to have changed dramatically so that relatively protected sectors in 1988 tended to remain protected in 1998 (Figure 2).⁷

Figure 1. **Tariff Rates in 1988 and the Reduction in Tariff Rates between 1988 and 1998**



Trade flow data is also used in the analysis.⁸ Table 2 describes three statistics based on trade flow data by industry for the two end-points of the period under analysis: exports as a share of total exports, imports as a share of total imports, and finally net exports as a proportion of total industry trade, or the net trade ratio, $([X_i - M_i] / [X_i + M_i])$.⁹ The pattern of net trade ratios tends to conform to expectations: industries generally considered to be labor-intensive are the ones with relatively high values of net trade ratio (for example, apparel and footwear). However, the comparison of export and import shares over time also shows that

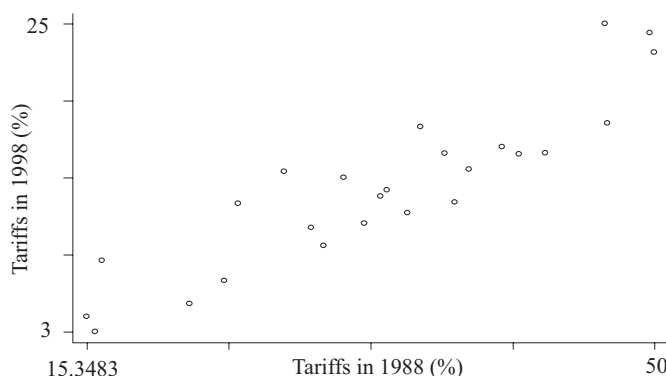
⁷Spearman correlations between tariff rates in 1988 and 1998 were as high as 0.91.

⁸The trade flow data reported by Nicita and Olarreaga are based on the COMTRADE database. Because the COMTRADE data are presented in terms of the SITC rev. 2 classification, Nicita and Olarreaga use concordance filters developed by the OECD to convert them into ISIC classification.

⁹When a group of products is imported but not exported, the value of the net trade ratio is -1. On the other hand, when a group of products is exported but not imported, the net trade ratio is 1.

there has been a remarkable expansion of trade in nontraditional exports. Thus, while apparel—the industry with the highest net trade ratio—had a virtually unchanged export share in 1988 and 1997, electrical machinery—an industry with a negative net trade ratio—has seen a larger than four-fold increase in its export share over time so that by 1997 almost half of all manufacturing exports were accounted for by this industry.¹⁰

Figure 2. **Tariff Rates, 1988 and 1998**



The production-related variables contained in Nicita and Olarreaga (2001) are drawn from UNIDO's *International Yearbook of Industrial Statistics* and include at the 3-digit ISIC level, total output, total employment, and gross fixed capital formation. Data on output are used in conjunction with trade data to compute export and import ratios while the gross fixed capital series are used to construct measures of the capital stock in each industry.¹¹ Dividing capital stocks by total employees gives a measure of the capital intensity of each industry, a variable used in the analysis below.

The LFS data cover four years: 1988, 1991, 1994, and 1997. The data provide demographic and work ("job" or "business") related details including age, gender, highest grade achieved, salary/wages and net receipts from employment, and hours worked.¹² The reference period of work-related information is the

¹⁰The rapid increase in these exports can be traced to an increase in investments by multinational corporations in the sector, especially semiconductors, and the rapid increase in world trade in this sector (World Bank 2000).

¹¹First, the capital formation series is expressed in 1997 US dollars. Then the current year plus four previous years' real investment expenditures are summed to arrive at a measure of capital stock. A 10 percent depreciation is allowed in the capital stock each year.

¹²While the LFS is a quarterly survey, only the survey for the third quarter asks information on wages. The sample size of these LFS surveys is quite large and can cover about 100,000 individuals per year.

quarter from July 1 to September 30 and is available for a respondent's "primary" job as well as a "secondary" job if applicable.

Table 2. Net Trade and Export and Import Shares

| Industry | 1988 | | | 1997 | | |
|--|-----------------|-----------------------|-----------------------|-----------------|-----------------------|-----------------------|
| | Net Trade Ratio | Share of Total Export | Share of Total Import | Net Trade Ratio | Share of Total Export | Share of Total Import |
| Food | 0.25 | 0.25 | 0.10 | -0.09 | 0.06 | 0.05 |
| Beverage | -0.76 | 0.00 | 0.01 | -0.76 | 0.00 | 0.00 |
| Tobacco | -0.55 | 0.01 | 0.01 | -0.63 | 0.00 | 0.00 |
| Textiles | -0.25 | 0.06 | 0.07 | -0.27 | 0.03 | 0.04 |
| Apparel | 0.97 | 0.07 | 0.00 | 0.93 | 0.08 | 0.00 |
| Leather | 0.20 | 0.01 | 0.00 | 0.30 | 0.01 | 0.00 |
| Footwear | 0.82 | 0.01 | 0.00 | 0.51 | 0.01 | 0.00 |
| Wood Products | 0.98 | 0.12 | 0.00 | 0.17 | 0.01 | 0.01 |
| Furniture | 0.98 | 0.03 | 0.00 | 0.65 | 0.01 | 0.00 |
| Paper and Products | -0.76 | 0.01 | 0.03 | -0.69 | 0.00 | 0.01 |
| Printing and Publishing | -0.94 | 0.00 | 0.01 | -0.87 | 0.00 | 0.00 |
| Industrial Chemicals | -0.62 | 0.06 | 0.18 | -0.79 | 0.01 | 0.07 |
| Other Chemicals | -0.77 | 0.01 | 0.05 | -0.74 | 0.01 | 0.03 |
| Petroleum Refineries | -0.04 | 0.03 | 0.02 | -0.33 | 0.01 | 0.01 |
| Miscellaneous Petroleum and Coal Products | -0.48 | 0.00 | 0.00 | -0.95 | 0.00 | 0.00 |
| Rubber Products | -0.74 | 0.00 | 0.01 | -0.72 | 0.00 | 0.01 |
| Plastic Products | 0.41 | 0.02 | 0.01 | -0.36 | 0.01 | 0.01 |
| Pottery, China, Earthenware | 0.75 | 0.00 | 0.00 | 0.28 | 0.00 | 0.00 |
| Glass and Products | -0.39 | 0.00 | 0.01 | -0.62 | 0.00 | 0.01 |
| Other Nonmetallic Mineral Products | -0.67 | 0.00 | 0.01 | -0.90 | 0.00 | 0.01 |
| Iron and Steel | -0.78 | 0.02 | 0.09 | -0.93 | 0.00 | 0.04 |
| Nonferrous Metals | 0.40 | 0.08 | 0.02 | -0.01 | 0.02 | 0.01 |
| Metal Products | -0.51 | 0.01 | 0.03 | -0.53 | 0.01 | 0.03 |
| Nonelectrical Machinery | -0.88 | 0.01 | 0.12 | -0.15 | 0.18 | 0.17 |
| Electrical Machinery | -0.01 | 0.16 | 0.12 | -0.04 | 0.47 | 0.36 |
| Transport Equipment | -0.91 | 0.00 | 0.07 | -0.66 | 0.02 | 0.08 |
| Professional and Scientific Equipment | -0.81 | 0.00 | 0.01 | -0.27 | 0.02 | 0.02 |
| Other Manufactured Products | 0.43 | 0.02 | 0.01 | 0.28 | 0.01 | 0.01 |

The analysis is restricted to individuals who were 15 years or older, worked in the reference quarter, and whose primary job entailed wage or salaried work of at least 35 hours per week on average over the quarter. Total wage and salary earnings on the primary job for the quarter are divided by the total number of hours worked on the primary job in order to arrive at the individual's hourly wage

rate^{13, 14} Deflating these hourly earnings by the national CPI gives real wages in 1997 pesos. Table 3 presents summary statistics of the sample of these wage and salary workers.¹⁵ Real wages in the sample have grown by around 1.2 percent per annum over the 9-year period covered. The average age of workers has been around 33–34 years with around 61–62 percent being male. The average years of education, which increased from 10.06 years in 1988 to 10.50 years in 1997, is fairly high by developing country standards. The increase in years of education is reflected in a decrease in the percentage of workers with “only primary education or less” and an increase in the percentage of workers with a “high school degree” or more. Around 17–19 percent of wage and salary workers in the sample belong to the manufacturing sector.

Table 4 presents summary statistics for the manufacturing sample and separate data for the nontradeables sample (construction, utilities, and services). It also presents some measures of dispersion for real wages. Importantly, wage inequality, which tends to be lower in the manufacturing sector, has declined in the manufacturing sector in terms of a number of measures of dispersion. Wage inequality has also declined in the nontradeable sector, but often only marginally. Consider the difference between the 90th percentile and 10th percentile wages over the 1988 and 1997 period. These decreased by 0.066 log wage points in the manufacturing sector while the corresponding figure in the nontradeables sector was a decline of 0.005. In similar fashion, while the Gini coefficient on wages declined from 0.358 in 1988 to 0.321 in 1997 in the manufacturing sector, the corresponding figures for the nontradeables sector were a decline from 0.419 to 0.409.

What appears to be driving these results is the fact that wage growth was almost equally high at the low (10th percentile) and high (90th percentile) ends of the wage distribution in the nontradeables sector. In the manufacturing sector, however, they were almost twice as high in the low end of the wage distribution as compared to the high end. These statistics reveal a pattern of wage adjustments over a period of liberalization that are very much at odds with those typically found for previous studies from Latin American countries. For example, Feliciano (2001) reports increasing inequality in the tradeables sector in Mexico driven by

¹³It may be noted that only about 2.15 percent of the workers with a wage/salaried primary job also reported a wage/salaried secondary job. For the “full time” workers this is naturally much lower, less than 1 percent.

¹⁴An examination of the reported earnings and hours worked suggested the need for some data-cleaning procedures. Observations that yielded hourly wage rates below P1 and above P500 were deleted. In addition, a small number of observations that reported normal working hours per day in excess of 24 hours were also deleted. Finally, individuals reporting between 16 and 24 hours of work were recoded to 16 hours.

¹⁵The available LFS data did not include a consistently defined set of sample weights across years. Thus sample weights could not be used in the analysis.

rapid growth of the highest wage earners and declines in wage growth of the lowest wage earners.

Table 3. **Summary Statistics for Full-time Workers**

| Variable | 1988 | 1991 | 1994 | 1997 |
|--|------------------|------------------|------------------|------------------|
| Average Hourly Wages, 1997 Pesos (standard deviation) | 18.83 (20.20) | 20.55 (19.98) | 20.98 (21.02) | 23.98 (20.91) |
| Male (percent) | 62 | 61 | 61 | 62 |
| Average Age (standard deviation) | 33.19 (11.75) | 33.64 (11.83) | 33.95 (11.96) | 34.25 (11.91) |
| Average Years of Education (standard deviation) | 10.06 (4.19) | 10.20 (4.16) | 10.28 (4.04) | 10.50 (4.01) |
| Education Distribution (percent) | | | | |
| Below Primary Education | 11.33 | 10.18 | 9.40 | 8.84 |
| Primary Graduate | 17.48 | 16.99 | 15.64 | 14.09 |
| Some High School | 10.99 | 11.36 | 11.07 | 11.06 |
| High School Graduate | 23.17 | 23.32 | 25.71 | 25.05 |
| Some College | 13.55 | 13.79 | 14.83 | 16.19 |
| College Graduate | 23.48 | 24.35 | 23.34 | 24.76 |
| Married (percent) | 57 | 58 | 56 | 59 |
| Employment by Sector (percent) | | | | |
| Agriculture | 11.12 | 9.72 | 9.06 | 7.00 |
| Mining | 1.07 | 0.80 | 0.57 | 0.79 |
| Manufacture | 17.54 | 19.34 | 18.92 | 16.80 |
| Utility | 1.16 | 0.97 | 0.97 | 1.17 |
| Construction | 7.13 | 8.43 | 8.46 | 10.69 |
| Government | 10.78 | 11.39 | 11.13 | 12.29 |
| Services | 51.20 | 49.35 | 50.90 | 51.27 |
| Observations | 14,647 | 18,826 | 19,005 | 29,611 |

Table 4. Worker Characteristics by Industry Type

| Worker Characteristic | Nontradeables | | | | Manufacturing | | | |
|--|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| | 1988 | 1991 | 1994 | 1997 | 1988 | 1991 | 1994 | 1997 |
| Average Hourly Wages (standard deviation) | 19.54 (21.22) | 21.26 (19.91) | 21.73 (22.27) | 25.14 (21.66) | 19.92 (19.28) | 22.57 (22.97) | 22.68 (19.41) | 23.36 (19.06) |
| Average Age (standard deviation) | 33.59 (11.83) | 34.08 (11.96) | 34.43 (12.07) | 34.84 (12.08) | 31.32 (10.45) | 32.05 (10.76) | 31.79 (10.87) | 31.31 (10.39) |
| Male (percent) | 57 | 57 | 58 | 60 | 63 | 60 | 61 | 61 |
| Average Years of Education (standard deviation) | 10.77 (4.14) | 10.87 (4.15) | 10.84 (4.04) | 10.99 (4.01) | 9.59 (3.50) | 9.81 (3.41) | 10.05 (3.31) | 9.97 (3.18) |
| Education (% of workers in each sector) | | | | | | | | |
| Below Primary Education | 7.87 | 7.38 | 7.10 | 7.16 | 8.10 | 6.78 | 5.59 | 5.63 |
| Primary Graduate | 15.17 | 14.87 | 14.09 | 12.79 | 19.31 | 17.47 | 14.88 | 13.89 |
| Some High School | 10.32 | 10.91 | 10.71 | 10.66 | 12.96 | 11.84 | 11.38 | 11.50 |
| High School Graduate | 22.77 | 21.64 | 24.09 | 22.70 | 31.34 | 34.99 | 37.11 | 39.75 |
| Some College | 14.44 | 14.67 | 15.46 | 17.00 | 15.34 | 15.52 | 17.27 | 17.10 |
| College Graduate | 29.44 | 30.52 | 28.55 | 29.70 | 12.96 | 13.40 | 13.77 | 12.14 |
| Dispersion of Real Wages | | | | | | | | |
| Standard deviation of log wages | 0.89 | 0.89 | 0.84 | 0.87 | 0.67 | 0.66 | 0.64 | 0.62 |
| Gini coefficient | 0.42 | 0.40 | 0.41 | 0.41 | 0.36 | 0.32 | 0.33 | 0.32 |
| 10th Percentile | 3.44 | 3.79 | 4.5 | 4.92 | 6.53 | 7.84 | 8.15 | 8.65 |
| 90th Percentile | 34.16 | 37.21 | 36.52 | 48.3 | 32.93 | 33.49 | 35.5 | 37.5 |
| Observations | 10,292 | 13,204 | 13,581 | 22,330 | 2,569 | 3,641 | 3,595 | 4,976 |

Turning to sample worker characteristics across industries within manufacturing, industry-level trade data are matched with workers' industry of employment. Table 5 presents various summary statistics by level of protection in 1988. Industries with the lowest tariff rates (33 percentile or less of the tariff distribution) on average paid the highest wages, had the highest share of educated workers, but accounted for the lowest share of employment.¹⁶ In contrast, sample industries with tariff rates in the highest one third of the distribution on average paid the lowest wages, employed the largest share of females, and had the lowest share of workers with more than a high school education. Thus, protection as captured by average tariff rates tended to be lower for relatively skill-intensive industries. If trade liberalization were aimed at reducing both average tariff levels and the variance in tariff rates across industries, relatively less skill-intensive industries would be subject to the largest declines in protection. Columns 3–6 of Table 5, which present sample worker characteristics by degree of reduction in average tariff rates between 1988 and 1997, shows that is this precisely what

¹⁶This is the case regardless whether employment is defined on the basis of the LFS surveys, or figures on employment reported in the industrial production database are used.

happened. Thus, industries in the upper third of the tariff reduction distribution had on average in 1988, the lowest wage rates and the lowest share of workers with more than a high school degree (and largest share of females).

Table 5. **Worker Characteristics in 1988 by Tariffs and Tariff Reductions**

| Worker Characteristic | Rank of Tariff in 1988 | | | Rank of Tariff Reduction: 1997–1988 | | |
|--|------------------------|------------------|------------------|-------------------------------------|------------------|------------------|
| | Lowest | Middle | Highest | Lowest | Middle | Highest |
| Average Hourly Wages, in 1997 Pesos (standard deviation) | 27.33 (24.35) | 19.39 (17.64) | 17.63 (17.78) | 26.98 (26.71) | 20 (19.97) | 17.56 (14.91) |
| Male (percent) | 70 | 79 | 47 | 80 | 73 | 49 |
| Average Age (standard deviation) | 31.66 (9.56) | 31.88 (11.02) | 30.76 (10.28) | 32.91 (10.07) | 31.78 (10.88) | 30.47 (10.15) |
| Average Years of Education (standard deviation) | 11.48 (3.28) | 9.19 (3.61) | 9.22 (3.27) | 11.02 (3.54) | 9.25 (3.62) | 9.41 (3.28) |
| Education Level (percent) | | | | | | |
| Below Primary Education | 2.66 | 10.64 | 8.07 | 4.93 | 10.73 | 7.01 |
| Primary Graduate | 7.51 | 21.81 | 21.61 | 10.68 | 20.85 | 20.87 |
| Some High School | 8.47 | 15.38 | 12.70 | 9.32 | 15.18 | 12.35 |
| High School Graduate | 29.78 | 27.19 | 35.16 | 27.95 | 26.82 | 36.06 |
| Some College | 26.88 | 12.43 | 13.46 | 24.66 | 13.87 | 13.52 |
| College Graduate | 24.7 | 12.54 | 9.00 | 22.47 | 12.55 | 10.18 |
| Observations | 413 | 949 | 1,189 | 365 | 988 | 1,198 |

IV. ECONOMETRIC ANALYSIS

The fact that relatively less skill-intensive industries faced large declines in tariffs suggests that all else being the same, trade liberalization should have affected less skilled workers more adversely than others. The econometric analysis below sheds light on whether this was the case.¹⁷

The impact of trade liberalization on relative industry wages is examined using a two-step procedure as in Gaston and Trefler (1994), Feliciano (2001), and Goldberg and Pavcnik (2001). In the first stage, a commonly used variant of the Mincerian earnings equation is used for each year of data:

¹⁷Three industries are dropped from the econometric analysis because they have less than 10 observations in any of the four LFS years (miscellaneous petroleum products; nonferrous metals; and professional and scientific equipment). The estimated industry wage premiums for these industries could be more susceptible to biases on account of outliers.

$$\log(w_{ijt}) = \alpha + \beta_t \cdot X_{ijt} + \gamma_{jt} \sum_j Ind_{ijt} + \varepsilon_{it} \quad (1)$$

where i , j , and t index individuals, industry of employment, and time; w represents real hourly wages; and X represents a vector of individual characteristics that include age, age squared, five education dummies, and dummies for male, marriage status, and household head. Also included in X are a dummy for whether a worker deems his/her job to be “permanent” (i.e., work that had lasted or expected to last for 1 year or longer) so as to capture some element of job informality, and region dummies to control for region-specific factors influencing wages, including variations in cost of living.

Industry dummies (Ind) are included to capture industry wage premiums. In order to facilitate interpretation in the subsequent analysis of industry wage premiums, no industry is omitted in the estimation of equation 1. The dummy variable “trap” is instead avoided by estimating equation 1 by imposing the constraint, $\theta_t \gamma_t = 0$, where θ_t represents the vector of share of employment by industry and γ_t represents the vector of coefficients on the industry dummies (or industry wage premiums). The industry wage premiums so computed have the property that they now represent deviations from the average wage across all industries rather than the usual differential wage with respect to the omitted industry.

In the second stage, the estimated industry wage premiums (γ^*) are pooled across years and combined with trade and industry data in order to estimate the impact of trade on wages:

$$\gamma_{jt}^* = \pi_1 P_{jt} + \eta_1 T_{jt-1} + \kappa_1 Z_{jt} + \delta_1 Y_t + \phi_1 I_j + e_{jt} \quad (2)$$

P_{jt} represents trade policy and is captured by average tariff rates while T_{jt-1} represents measures of imports and exports (lagged in order to alleviate endogeneity concerns). The latter are included, following Goldberg and Pavcnik (2001), in order to control for factors that may affect both wages and trade policy. Since such factors may well affect trade flows, including measures of these as regressors presents a way to check the robustness of the estimated relationship between trade policy and industry wage premiums. Z_{jt} represents observable industry level characteristics such as the capital–labor ratio. Year dummies Y_t capture macroeconomic shocks that may independently influence wage premiums and right hand side variables such as tariff rates. Industry dummies I_j are included to control for unobservable time-invariant, industry-specific characteristics and thereby explore the relationships in the “within” dimension. In order to account for the fact that the dependent variable has been estimated, equation 2 is estimated using the inverse of the estimated variance of industry wage premiums as weights.

In determining the impact of trade on employment across industries, a similar approach is followed to estimate the following employment equation:

$$\ln(L_{jt}) = \pi_2 P_{jt} + \eta_2 T_{jt-1} + \kappa_2 Z_{jt} + \delta_2 Y_t + \phi_2 I_j + \xi_{jt}, \quad (3)$$

where L_{jt} represents employment in industry j and year t . Year dummies capture the effects of economywide demand and supply shifters while industry dummies control for unobservable industry characteristics as in equation 2 above. To examine whether trade has affected average hours of work instead, employment is substituted with average hours worked over the reference quarter of the LFS.

A. Earnings Function Estimates

Table 6 describes the estimates of earnings functions (equation 1) for the four years for which LFS data are available. As is typically found in studies of this type, age (the proxy for experience) enters positively while its square enters negatively; men earn more than women, although this effect tends to decline over time; heads of households and married individuals earn more; and those in jobs expected to last a year or longer earn more.

The estimated coefficients on the education dummies indicate substantial returns to college education. This can be seen in terms of Figure 3, which plots the estimated percentage differential between a given level of education and the omitted or reference educational category, those who have not completed primary education.¹⁸ The vertical distance between any two adjacent levels of education also gives a sense of the marginal value associated with the higher of the two levels of education. For all but the highest level of education, these vary between around 0.10 to 0.25. For the highest level of education, they are much larger (between 0.75 and 0.95). Admittedly, it is possible that unobservable worker characteristics such as natural ability or family background lead the estimates of returns to education to be biased. Thus, for example, a finding of high returns to higher education may reflect the selection of high-ability individuals into college thereby overstating the true gains from higher education. However, the paper's interest is not so much in the returns to education itself but in how the returns to education have evolved over the period of the Philippines's reforms. As long as economic reforms did not affect the selection criteria used by individuals in deciding the level of desired educational attainment, it is possible to get a sense of

¹⁸The estimated coefficients on the education dummies are converted into the percentage differential in earnings relative to the reference group (those who have not completed primary education) as: $\left[e^{b_{vt}} - 1 \right]$ for the various education levels v .

the true evolution of returns to education by comparing the wage differentials associated with the various levels of education over time.

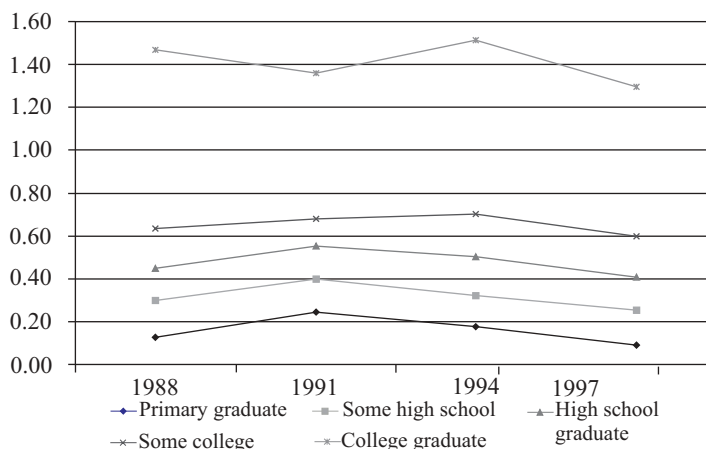
Table 6. Estimates of Earnings Function
(dependent variable=log(real hourly wage))

| Dependent Variable | 1988 | 1991 | 1994 | 1997 |
|----------------------|-----------------------|----------------------|-----------------------|-----------------------|
| Age | 0.035*** (5.66) | 0.016*** (3.16) | 0.023*** (5.13) | 0.035*** (8.06) |
| Age Square | -4.0E-04*** (5.05) | -1.2E-04** (1.97) | -2.0E-04*** (3.52) | -4.0E-04*** (6.90) |
| Primary Graduate | 0.120*** (2.71) | 0.218*** (5.48) | 0.163*** (3.85) | 0.089*** (2.52) |
| Some High School | 0.261*** (5.43) | 0.335*** (7.86) | 0.278*** (6.29) | 0.225*** (6.18) |
| High School Graduate | 0.370*** (8.49) | 0.441*** (11.50) | 0.409*** (10.26) | 0.343*** (10.51) |
| Some College | 0.491*** (10.22) | 0.520*** (12.41) | 0.532*** (12.51) | 0.468*** (13.31) |
| College Graduate | 0.903*** (18.15) | 0.859*** (19.75) | 0.922*** (20.75) | 0.831*** (22.22) |
| Male | 0.165*** (5.81) | 0.096*** (4.16) | 0.054*** (2.50) | 0.062*** (3.38) |
| Head of Household | 0.181*** (5.61) | 0.181*** (6.90) | 0.123*** (4.73) | 0.168*** (8.09) |
| Married | 0.050* (1.74) | 0.030 (1.30) | 0.085*** (3.72) | 0.053*** (2.84) |
| Permanent Job | 0.193*** (5.90) | 0.208*** (7.45) | 0.144*** (5.69) | 0.088*** (4.33) |
| Constant | 1.445*** (12.65) | 1.937*** (20.61) | 1.884*** (21.36) | 1.908*** (23.85) |
| R-Square | 0.40 | 0.39 | 0.40 | 0.38 |
| Observations | 2551 | 3629 | 3565 | 4903 |

Note: Absolute t-statistics in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.

The estimated returns to the various levels of education do not show a clear trend over time. Returns to the highest level of education decline between 1988 and 1991, spike up in 1994, and then decline once again in 1997. For all but the highest level of education, returns first increase mildly between 1988 and 1991 (1994 in the case of the second highest level of education), then they decline.

Figure 3. **Percentage Differential Returns to Education, 1988–1997**
(versus some or no primary education)



The absence of a secular increase in returns to education is quite different from what is typically reported for Latin American countries. While the studies covering the latter find large increases in the returns to higher education over the periods in which trade liberalization was undertaken, no trend toward this effect is seen from the data. Indeed, focusing on the longer 1988 and 1997 comparison, returns to college education have declined relative to every other educational category. Of course, without further analysis it is not possible to say that it was trade per se that led to this. Nevertheless, this finding is highlighted because it is one that contrasts with patterns observed elsewhere.

B. Industry Wage Premiums and Trade

As noted above, the coefficients on the industry dummies obtained from equation 1 are estimates of industry wage premiums.¹⁹ The wage premiums are found to be generally low in apparel, footwear, food, leather, and wood products—all labor-intensive industries (see Table 7a). They tend to be high in petroleum refining, industrial chemicals, electrical machinery, and transport equipment—all capital-intensive industries. This can formally be seen from Table 7b, which presents simple correlations between estimated wage premiums

¹⁹The correlations of these premiums across the four sample years are typically fairly high (between 0.81 and 0.84) for 1988, 1994, and 1997. The correlation between premiums in 1991 and each of the other three years is lower (between 0.38 and 0.55). This is partly driven by a premium for petroleum refining, which is relatively low in 1991 as compared to the other years. Excluding this industry from the analysis did not change results in any significant way, however.

and various industry level characteristics, including capital–labor ratios and tariff rates, for 1988. The correlation between wage premiums and the log of the capital–labor ratio is 0.80 or higher.²⁰ Similarly, industries with a higher share of skilled workers (i.e., with some college education or more) tend to have higher wage premiums. These correlations are consistent with findings for other countries whereby capital/skill-intensive industries have the highest wage premiums (see, for example, Dickens and Katz 1987 for the US; and Moll 1993 for South Africa).

Table 7a. **Industry Wage Premiums (1988 and 1997)**

| Industry | 1988 | 1997 |
|------------------------------------|-------------|-------------|
| Food | -0.02 | -0.12 |
| Beverage | 0.31 | 0.15 |
| Tobacco | 0.18 | 0.16 |
| Textiles | 0.01 | 0.02 |
| Apparel | -0.09 | -0.07 |
| Leather | -0.13 | -0.13 |
| Footwear | -0.05 | -0.32 |
| Wood Products | 0.02 | -0.09 |
| Furniture | -0.14 | -0.02 |
| Paper and Products | -0.11 | 0.13 |
| Printing and Publishing | 0.00 | -0.01 |
| Industrial Chemicals | 0.27 | 0.22 |
| Other Chemicals | 0.11 | 0.14 |
| Petroleum Refineries | 0.86 | 0.54 |
| Rubber Products | 0.08 | 0.07 |
| Plastic Products | 0.04 | 0.04 |
| Pottery, China, Earthenware | -0.06 | -0.07 |
| Glass and Products | 0.06 | 0.05 |
| Other Nonmetallic Mineral Products | -0.16 | -0.02 |
| Iron and Steel | 0.32 | 0.17 |
| Metal Products | -0.02 | 0.07 |
| Nonelectrical Machinery | -0.12 | 0.12 |
| Electrical Machinery | 0.25 | 0.17 |
| Transport Equipment | 0.23 | 0.11 |
| Other Manufactured Products | -0.08 | -0.07 |

²⁰The correlations for other years are similar and not reported.

Table 7b. Correlation Matrix for Selected Variables, 1988

| | Wage Premium | Log K/L | Skill/ Less Skilled | Tariff Rate | Net Trade | Export Ratio | Import Ratio | Log Employment |
|--------------------|-------------------|-------------------|------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Wage Premium | 1 | | | | | | | |
| Log K/L | 0.840 (0.000) | 1 | | | | | | |
| Skill/Less Skilled | 0.567 (0.003) | 0.671 (0.000) | 1 | | | | | |
| Tariff Rate | -0.498 (0.011) | -0.694 (0.000) | -0.685 (0.000) | 1 | | | | |
| Net Trade | -0.261 (0.208) | -0.466 (0.019) | -0.620 (0.001) | 0.618 (0.001) | 1 | | | |
| Export Ratio | -0.360 (0.077) | -0.511 (0.009) | -0.634 (0.001) | 0.380 (0.061) | 0.772 (0.000) | 1 | | |
| Import Ratio | -0.091 (0.665) | 0.016 (0.940) | 0.203 (0.330) | -0.450 (0.024) | -0.361 (0.077) | -0.029 (0.893) | 1 | |
| Log Employment | -0.334 (0.103) | -0.312 (0.129) | -0.364 (0.073) | 0.350 (0.086) | 0.179 (0.392) | 0.055 (0.793) | -0.082 (0.697) | 1 |

Note: Number in parenthesis is the associated correlation coefficient's P-value.

As in the case of the US, wage premiums are inversely correlated with tariff rates so that trade protection is higher in lower wage industries (Gaston and Trefler 1994 and 1995). But unlike the US, greater export orientation in terms of higher export ratios and net trade ratios are associated with lower wage premiums (significantly so in some cases). Thus as the analysis of Section III using industry-level data alone indicated, protection seems to have been larger in industries in which the Philippines would have been expected to have a comparative advantage, i.e., in the less capital/skill-intensive industries. The positive correlation between employment levels and tariff rates (last row) may suggest why this was so. Policymakers may have been trying to protect industries with the largest levels of employment.

How did the removal of protection affect workers? The estimates of equation 2, described in Table 8, shed light on this. In a model without industry fixed effects or industry characteristics, the coefficient on tariffs is negative and statistically significant (column 1). The estimated coefficient on tariffs implies that a 1 percentage point decline in tariffs is associated with a 0.9 percentage point increase in the industry wage premium. A 20 percentage point decline in tariffs—the difference between some of the highest and lowest tariff rates across industries—would then be associated with a 18 percentage point gain in the industry wage premium.

Table 8. **Relative Wages and Trade Protection I**
(dependent variable=estimated industry wage differentials)

| Independent Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|------------------------|---------------------|--------------------|---------------------|-------------------|--------------------|--------------------|------------------------------|------------------------------|------------------------------|
| Tariff Rate | -0.009*** (5.51) | -0.006** (1.97) | -0.008*** (3.59) | -0.004 (1.42) | -0.004 (1.43) | -0.002 (0.80) | 0.000 ^a (0.04) | 0.000 ^a (0.24) | 0.000 ^a (0.27) |
| Log Lagged Real Import | | 0.016 (1.50) | | | -0.006 (0.63) | | | 0.003 (0.21) | |
| Log Lagged Real Export | | -0.019* (1.73) | | | -0.006 (0.56) | | | 0.015 (0.85) | |
| Lagged Import Ratio | | | 0.020 (1.04) | | | 0.013 (0.92) | | | -0.023 (0.68) |
| Lagged Export Ratio | | | -0.025 (0.67) | | | 0.033 (1.05) | | | 0.027 (1.14) |
| Log K/L | | | | 0.048** (2.40) | 0.053*** (2.81) | 0.061*** (3.16) | | | |
| Industry Dummies | No | No | No | No | No | No | Yes | Yes | Yes |
| R-Square | 0.293 | 0.339 | 0.303 | 0.388 | 0.404 | 0.415 | 0.823 | 0.825 | 0.825 |
| Observations | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

^a Absolute value of the estimated parameter is zero to the third decimal place.

Note: All regressions include year dummies. Absolute, robust t-statistics in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%.

Adding regressors that relate to trade flows does not change the relationship between tariffs and industry wage premiums (columns 2 and 3). The estimated coefficients on the import and export terms, introduced with a one-period lag to alleviate endogeneity concerns, are consistent with the bivariate correlations so that more export-oriented industries tend to have lower wage premiums and vice versa (though only one of the estimated coefficients relating to the various import and export terms is significant at the 10 percent level).

The negative relationship between tariffs and wage premiums should not be taken to indicate that trade liberalization will lead to higher wages. After all tariff rates are not set randomly across industries and thus the estimates just presented are potentially biased. Consider, for example, a situation where political economy considerations drive policymakers to consider industry characteristics in setting tariff rates. Policymakers may aim to protect labor-intensive industries and/or industries with large levels of employment as noted above. Since such industries also have low wage premiums, tariffs would enter the wage premium equation with a negative coefficient, but this coefficient would suffer from omitted variable bias.²¹ There are two ways of dealing with this bias. One is to include the

²¹ Interestingly, the negative effect of tariffs on wage premiums would have been larger (almost twice as large) had wage premiums been estimated based on a first-stage regression of log wages on industry dummies alone. Thus as pointed out by Gaston and Trefler, ignoring

pertinent industry characteristics as regressors and/or include industry fixed effects in estimation in case the included industry characteristics may not capture the key (time-invariant) factors that determine trade policy. The latter strategy would be important if, for example, unionization of a sector (which the present study has no information on) is a slow-to-change characteristic of industries and an important determinant of both wage premiums and trade policy.

Controlling for industry characteristics in estimation makes the coefficient on tariff rates smaller in absolute size; it also makes the coefficient statistically insignificant at the 10 percent level. This is shown in columns 4–6 where the log of the capital–labor ratio is included as an additional regressor. The various trade-related variables also lose whatever significance they had. Switching to industry fixed effects has an even more dramatic effect (columns 7–9). The coefficient on tariffs becomes positive in every specification so that a lowering of tariff rates is associated with a decline in wage premiums. But the effects have very small *t*-statistics. Taken together, the estimates of columns 4–9 suggest that the estimates of columns 1–3 suffer from omitted variable bias and that trade liberalization in fact had little impact on wage premiums across industries.

It is fairly common to find that trade liberalization has had only modest effects on wages (see, for example, the survey by Harrison and Hanson 1999). The results above appear to be in line with these other studies.²² At the same time, however, reductions in protection may have more of an impact on wages of certain types of workers or industries even if their effects are limited on average.

First, trade liberalization may have affected wage premiums differently for various types of labor. For example, trade liberalization may have altered production methods thereby affecting the relative demand for skilled and less skilled workers. Indeed, results from trade-labor studies of Latin American countries have typically stressed the role of trade liberalization in raising the relative demand for skilled workers by introducing skill-intensive methods of production. Alternatively, as Feliciano (2001) notes it is possible that the bargaining power of workers varies by skill level. Thus Table 9 presents results of wage premium equations for two groups of workers, skilled workers (those with more than a high school degree) and less skilled workers (those with a high school

worker characteristics in an analysis of industrial wages and trade can exaggerate the relationship between trade and labor market outcomes, because to some extent workers are sorted across industries on the basis of such observable characteristics as education, age, and occupation. Since trade and trade policy are not uniform across industries, there is potential for some endogeneity between worker characteristics and trade.

²²Due to the unavailability of information on nontariff barriers to trade their impact cannot be assessed directly. But in view of the fact that nontariff barriers and changes therein may well be reflected in terms of imports and exports, the insensitivity of wage premiums to the various trade-related variables suggests that trade liberalization in general did not impact wage premiums significantly.

degree at most).²³ Industry dummies are always included in estimation. None of the estimates on tariff rates are significant in either equation. If anything, the fact that all the tariff coefficients for the skilled workers' equation are positive while those for less skilled are essentially zero or even slightly negative is suggestive of the possibility that trade liberalization in the Philippines, unlike that in Latin American countries, exerted some pressure on skilled workers' wages.

Table 9. **Relative Wages and Trade Protection II**
(dependent variable=estimated industry wage differentials)

| Independent Variable | Skilled Workers | | | Less Skilled Workers | | |
|------------------------|-----------------|------------------|------------------|----------------------|------------------------------|------------------------------|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Tariff Rate | 0.003 (0.86) | 0.003 (0.95) | 0.004 (0.98) | -0.001 (0.26) | 0.000 ^a (0.06) | 0.000 ^a (0.01) |
| Log Lagged Real Import | | -0.023 (1.16) | | | 0.012 (0.61) | |
| Log Lagged Real Export | | 0.041* (1.88) | | | 0.004 (0.20) | |
| Lagged Import Ratio | | | -0.029 (0.56) | | | -0.032 (0.82) |
| Lagged Export Ratio | | | 0.046* (1.90) | | | 0.024 (0.73) |
| R-Square | 0.705 | 0.719 | 0.711 | 0.796 | 0.798 | 0.798 |
| Observations | 100 | 100 | 100 | 100 | 100 | 100 |

^aAbsolute value of the estimated parameter is zero to the third decimal place.

Note: All regressions include year and industry dummies. Absolute, robust t-statistics in parenthesis. *significant at 10%; **significant at 5%; ***significant at 1%.

Second, the effects of trade liberalization on wage premiums may be influenced by broad industry characteristics such as capital intensity. For example, it is likely that workers are better organized/have greater bargaining power in capital-intensive industries. Firms tend to be larger in capital-intensive industries and workers are likely to be better organized in large firms. Additionally, unionization is typically less effective the more competitive an industry. Since barriers to entry are likely to be higher in capital-intensive industries, especially in a developing country, these may be the ones with a more inelastic product demand curve and hence a more inelastic labor demand curve. The latter enables unions to be more effective in winning wage increases without exacerbating employment losses, thereby encouraging union activity. The reduction of trade protection may therefore adversely affect workers in capital-intensive industries since these are the industries in which workers would have been able to enjoy a portion of protection-related rents.²⁴

²³The two sets of wage premiums are based on separate earnings functions.

²⁴Although data on unionization by 3- (or even 2-) digit industry is unavailable, Dejillas's (1994) study of trade union behavior in the Philippines and discussion of the membership profile of the Federation of Filipino Workers, one of the largest trade unions in the Philippines,

To examine whether there is any evidence for workers in capital-intensive industries to be affected adversely by declines in trade protection, tariff rates are interacted with the log of the capital–labor ratio in estimating the wage premium equations. Table 10 presents the results. The interaction term is positive and significant at the 10 percent level in columns 1 and 2 and marginally so in column 3. This indicates that in the more capital-intensive industries, trade liberalization

Table 10. **Relative Wages and Trade Protection with Interaction Effects**
(dependent variable=estimated industry wage differentials)

| | All Workers | | | Skilled Workers | | | Less Skilled Workers | | |
|---------------------------|------------------|------------------|------------------|-----------------|-------------------|------------------|----------------------|------------------|------------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Tariff Rate | 0.002 (1.09) | 0.002 (1.20) | 0.003 (1.25) | 0.005 (1.38) | 0.005 (1.60) | 0.005 (1.52) | 0.002 (0.73) | 0.002 (0.71) | 0.002 (0.82) |
| Tariff Rate* | | | | | | | | | |
| Log K/L | 0.002* (1.78) | 0.002* (1.73) | 0.002 (1.61) | 0.002 (1.30) | 0.002 (1.60) | 0.001 (1.19) | 0.002 (1.58) | 0.002 (1.57) | 0.002 (1.39) |
| Log K/L | 0.026 (0.77) | 0.029 (0.77) | 0.033 (0.92) | 0.054 (0.89) | 0.035 (0.53) | 0.060 (0.98) | -0.007 (0.17) | -0.005 (0.12) | -0.001 (0.03) |
| Log Lagged Real Import | | -0.004 (0.28) | | | -0.031 (1.29) | | | -0.000 (0.01) | |
| Log Lagged Real Export | | 0.018 (1.15) | | | 0.045** (2.03) | | | 0.004 (0.21) | |
| Lagged Import Ratio | | | -0.005 (0.17) | | | -0.014 (0.28) | | | -0.008 (0.20) |
| Lagged Export Ratio | | | 0.024 (1.09) | | | 0.041* (1.68) | | | 0.016 (0.49) |
| P value of F Test | 0.11 | 0.10* | 0.10* | 0.13 | 0.07* | 0.12 | 0.19 | 0.19 | 0.20 |
| R-squared | 0.84 | 0.84 | 0.84 | 0.72 | 0.74 | 0.73 | 0.81 | 0.81 | 0.81 |
| Observations | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

Note: All regressions include year and industry dummies. Absolute, robust t-statistics in parenthesis. *significant at 10%; **significant at 5%; ***significant at 1%. F test pertains to the null hypothesis that the marginal effect of tariff rates is zero. The marginal effect is evaluated at the 75th percentile value of the capital–labor ratio.

did lead to declines in wage premiums. At the 75th percentile value of the capital–labor ratio (2.40), for example, a 1 percentage point decline in tariffs is associated with a 0.61 percentage point decline in the wage premium in terms of the estimates of column 2 ($100 \cdot d\gamma/d[\text{tariffs}] = 100 \cdot [0.0022 + 0.0016 \cdot 2.40]$).²⁵ The associated F-test is significant at the 10 percent level. Estimating wage premiums for skilled and less skilled workers separately and repeating the analysis reveals that the decline in wage premiums as a result of tariff reductions is

suggests that workers in more capital-intensive industries may have been more organized in the 1980s.

²⁵The estimated coefficients are rounded to the third decimal place in the tables.

stronger among skilled workers. For example, evaluated at the 75th percentile value of the capital–labor ratio, the marginal effect of tariffs ($dy/d[\text{tariffs}]$) on wage premiums is 0.0084 (and significant at the 10 percent level) in column 5 versus 0.0063 (and insignificant) in column 7.²⁶ This suggests that skilled workers in capital-intensive industries faced greater downward pressure on their wages as a result of trade liberalization.

C. Employment and Trade

The relationship between employment and trade is examined by regressing employment by industry on tariff rates and various trade flow measures as in equation 3. Without the inclusion of industry effects, tariff reductions are found to be associated with reductions in employment (not reported due to space limitations). However, since this result may be driven by the fact that tariff rates have been higher in industries with larger employment (see the relevant correlation in Table 7b), industry effects are introduced to check whether the relationship between tariffs and employment remains positive in the “within” direction. Table 11 describes the results when both industry effects as well as an interaction term between tariff rates and the capital–labor ratio are included in estimation.²⁷ Although the interaction term between tariff rates and the capital–labor ratio are negative and significant in columns 1–3 (driven by the case of skilled workers as columns 4–6 reveal), the P-values relating to the marginal effect of tariffs indicate that in all cases tariff reductions are found to affect employment only weakly. Moreover, to the extent that there is a marginally significant relationship (columns 5 and 6), tariff reductions in relatively capital-intensive industries are associated with slight increases in employment of skilled workers.²⁸ In addition, increases in imports, whether in terms of levels or as proportion of domestic output, are also associated with increases in the employment of skilled workers. These findings therefore suggest that trade did not adversely affect employment.

²⁶A similar pattern emerged when the capital–labor ratio was interacted by imports in levels. Thus, higher imports put downward pressure on wage premiums, especially among the higher skilled.

²⁷It may be noted that tariffs have an insignificant effect on employment (for all, skilled, and less skilled workers) in specifications without the interaction term between tariffs and the capital–labor ratio.

²⁸The reported P-values are based on the 75th percentile value of the capital–labor ratio.

Table 11. Employment and Trade Protection
(dependent variable=log(employment))

| | All Workers | | | Skilled Workers | | | Less Skilled Workers | | |
|---------------------------|---------------------|---------------------|--------------------|-------------------|--------------------|-------------------|----------------------|------------------|------------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Tariff Rate | 0.009 (0.87) | 0.01 (1.16) | 0.006 (0.64) | -0.005 (0.37) | 0.002 (0.16) | -0.009 (0.71) | 0.020 (1.36) | 0.022 (1.50) | 0.018 (1.23) |
| Tariff Rate* | | | | | | | | | |
| Log K/L | -0.008*** (2.76) | -0.011*** (3.10) | -0.008** (2.65) | -0.008* (1.90) | -0.012** (2.65) | -0.007* (1.69) | -0.006 (1.19) | -0.008 (1.24) | -0.006 (1.13) |
| Log K/L | 0.268** (2.19) | 0.287** (2.39) | 0.257** (2.01) | 0.292* (1.85) | 0.340** (2.16) | 0.277* (1.68) | 0.230 (1.31) | 0.231 (1.24) | 0.221 (1.24) |
| Log Lagged Real Import | | 0.127 (1.31) | | | 0.239** (2.02) | | | 0.053 (0.46) | |
| Log Lagged Real Export | | 0.137 (1.23) | | | 0.102 (1.03) | | | 0.164 (1.19) | |
| Lagged Import Ratio | | | 0.196 (1.28) | | | 0.363* (1.72) | | | 0.108 (0.72) |
| Lagged Export Ratio | | | -0.127 (1.19) | | | -0.147 (0.96) | | | -0.126 (1.09) |
| P value of F Test | 0.45 | 0.36 | 0.41 | 0.20 | 0.12 | 0.16 | 0.86 | 0.90 | 0.88 |
| R-squared | 0.94 | 0.95 | 0.95 | 0.91 | 0.92 | 0.92 | 0.93 | 0.93 | 0.93 |
| Observations | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

Note: Regressions include year and industry dummies. Absolute, robust t-statistics in parenthesis. *significant at 10%; **significant at 5%; ***significant at 1%. F test pertains to the null hypothesis that the marginal effect of tariff rates is zero. The marginal effect is evaluated at the 75th percentile value of the capital-labor ratio.

It is possible that trade affected employment not so much in terms of employee counts but rather in terms of the amount of hours worked. To examine this possibility, LFS data and average hours worked (for those working at least 35 hours a week on average over the reference quarter) are used in place of employee counts in equation 3. Table 12 describes the results for specifications in which industry fixed effects and an interaction term between tariff rates and the capital-labor ratio are included in estimation.²⁹ The P-values relating to the marginal effect of tariffs indicate that tariff reductions had no significant impact on average hours worked. This is true for all workers taken together (columns 1-3) as well as for skilled and less skilled workers considered separately (columns 4-6 and 7-9, respectively).^{30, 31}

²⁹As with employment, tariffs have an insignificant effect on average hours worked (for all, skilled, and less skilled workers) in specifications without the interaction term between tariffs and the capital-labor ratio.

³⁰For less skilled worker reductions, the interaction term between tariffs and the capital-labor ratio is negative and significant indicating that a reduction in tariffs put upward

V. CONCLUDING REMARKS

The analysis of this paper suggests that trade liberalization has had fairly modest effects on both relative industry wages as well as employment. In particular, declines in average tariff rates have on average tended to leave industry wage premiums and employment roughly unchanged. Nevertheless, not all groups of workers have been unaffected by liberalization. Workers in capital-intensive industries, especially skilled ones, saw their wages come under pressure from tariff reductions.

The fact that less skilled workers more generally did not experience negative outcomes from tariff reductions is surprising because labor/less-skill intensive industries were the ones that started out with the highest tariff rates and where tariff reductions over the period under consideration tended to be the largest. Less skilled workers would be expected to face the brunt of liberalization in terms of the predictions of either the standard Heckscher-Ohlin model (via lower relative prices of labor-intensive goods due to relatively larger tariff reductions in labor-intensive industries) or the specific-factors model (via greater import competition in labor-intensive industries).

That it was the skilled workers in capital-intensive industries whose wages were adversely affected by trade liberalization suggests that influences other than ones emphasized by traditional trade models may have been at work. For example, it is possible that reductions in tariffs of labor-intensive industries did not hurt workers in these industries because firms were able to raise their productivity more easily. The initial gap between international and domestic productivity may have been least in labor-intensive industries and/or it may have been easiest to bridge. Alternatively, workers in capital-intensive industries may have been better organized prior to liberalization—something for which there seems to be some (indirect) support. Thus under a protected trade regime they may have been able to extract better wages from their employers; trade liberalization would have put pressure on this rent-related component of wages.

Of course, it remains possible that the average tariff rates used in this study as the measure of trade policy is more imperfect than assumed. One focus of future research should be on obtaining other measures of trade policy, including more direct measures of nontariff barriers. This way, the robustness of the present

pressure on hours of work in capital-intensive industries (columns 7 and 8). As noted however the full effect of tariffs on hours worked (i.e., taking into account the direct tariff term as well as the interaction term) fails to be significant at conventional levels.

³¹The estimates of Table 12 also indicate that increases in imports (exports) were associated with greater (less) hours worked for skilled workers. The finding is not very robust, however, since import and export ratios—measures of trade that are less susceptible to endogeneity concerns—display little meaningful association with hours worked.

results can be tested. Future research should also consider obtaining data on union activities across industries and other factors that can raise the bargaining power of workers, such as the presence of public sector enterprises. Finally, an interesting feature of the earnings functions estimates is that of stable/declining returns to higher education. While it represents another and more broad-based way that skilled workers were hurt during the period under consideration, it remains to be seen whether trade liberalization was a driving force. Extending the data set developed in this paper to incorporate these industry-specific characteristics and updating the labor force information from more recent rounds of the labor force survey should certainly enable research to shed more light on what is a very important development issue.

REFERENCES

- Chu, T., R. Hasan, and S. Lee, 2002. The Impact of Trade on Workers: Evidence from the Philippines. Working Paper Series No. 17, International Center for the Study of East Asian Development, Japan.
- Currie, J., and A. Harrison, 1997. "Sharing the Costs: The Impact of Trade Reform on Capital and Labor in Morocco." *Journal of Labor Economics* 15:44-71.
- Dejillas, L. J., 1994. Trade Union Behavior in the Philippines 1946-1990. Manila: Ateneo de Manila University Press.
- Dickens, W. T., and L.F. Katz, 1987. "Inter-industry Wage Differences." In K. Lang and J. S. Leonard, eds., *Unemployment and the Structure of Labor Markets*. New York: Basil Blackwell.
- Feliciano, Z. M., 2001. "Workers and Trade Liberalization: The Impact of Trade Reforms in Mexico on Wages and Employment." *Industrial and Labor Relations Review* 55:95-115.
- Gaston, N., and D. Trefler, 1994. "Protection, Trade, and Wages: Evidence from U.S. Manufacturing." *Industrial and Labor Relations Review* 47:574-93.
- , 1995. "Union Wage Sensitivity to Trade and Protection: Theory and Evidence." *Journal of International Economics* 39:1-25.
- Goldberg, P. K., and N. Pavcnik, 2001. Trade Protection and Wages: Evidence from the Colombian Trade Reform. NBER Working Paper 8575, National Bureau of Economic Research, Cambridge, Massachusetts.
- Grossman, G. M., 1984. "International Competition and the Unionized Sector." *Canadian Journal of Economics* 17:541-56.
- Harrison, A., and G. Hanson, 1999. "Who Gains from Trade Reform?—Some Remaining Puzzles." *Journal of Development Economics* 59:125-54.
- Kambhupati, U., P. Krishna, and D. Mitra, 1997. "The Effect of Trade Policy Reforms on Labour Markets: Evidence from India." *Journal of International Trade and Economic Development* 6:287-97.
- Manasan, R. G., and V. S. Pineda, 1999. *Assessment of Philippine Tariff Reform: A 1998 Update*. Philippine Institute for Development Studies, Manila, Philippines.
- Manasan, R. G., and R. G. Querubin, 1997. Assessment of Tariff Reform in the 1990s. Discussion Paper Series 97-10, Philippine Institute for Development Studies, Manila, Philippines.

- Medalla, E. M., 1990. An Assessment of Trade and Industrial Policy, 1986-1988. PIDS Working Paper 90-07, Philippine Institute for Development Studies, Manila, Philippines.
- Moll, P. G., 1993. "Industry Wage Differentials and Efficiency Wages." *Journal of Development Economics* 41: 213-46.
- Nicita, A., and M. Olarreaga, 2001. *Trade and Production Database*. World Bank, Washington, DC.
- Ravenga, A., 1997. "Employment and Wage Effects of Trade Liberalization: The Case of Mexican Manufacturing." *Journal of Labor Economics* 15(3, July):S20-43.
- Robbins, D., and T. H. Gindling, 1999. "Trade Liberalization and the Relative Wages for More-Skilled Workers in Costa Rica." *Review of Development Economics* 3:140-54.
- Suryahadi, A., 1999. "Wage Inequality between Skilled and Unskilled Labor in Indonesian Manufacturing." *Economics and Finance in Indonesia* 47:271-88.
- , 2003. "International Economic Integration and Labor Markets: The Case of Indonesia." In R. Hasan and D. Mitra, eds., *The Impact of Trade on Labor: Issues, Perspectives, and Experiences from Developing Asia*. Amsterdam: Elsevier.
- World Bank, 2000. *Philippines Growth with Equity: The Remaining Agenda*. World Bank, Washington, DC.