INFORMALITY AND PRODUCTIVITY
IN THE LABOR MARKET: PERU 1986–2001

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JULY 2007

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Abstract[1]

Peru has one of the highest informality rates in Latin America, with almost 60 percent of the urban labor force working at the margins of labor market legislation or in microenterprises that lack basic labor market standards (Marcouiller, Ruiz de Castilla, and Woodruff, 1997). This paper identifies two factors that can explain the variation in informality rates in the 1990s. First, Peru experienced a steady increase in employment allocation in traditionally "informal" sectors—in particular, retail trade and transport. Second, there was a sharp increase in non-wage labor costs, despite a reduction in the average productivity of the economy. In addition, the paper illustrates the negative correlation between productivity and informality by evaluating the impacts of the PROJOVEN youth training program.

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1. Introduction

A unique aspect of the analysis of labor markets in developing countries is the impact of the informal sector on the structure and dynamics of employment and earnings. Peru in particular has one of the highest informality rates in the region, with almost 60 percent of the urban labor force working at the margins of labor market legislation or in microenterprises that lack basic labor market standards (Marcouiller, Ruiz de Castilla, and Woodruff, 1997).

Peru is one of several Latin American countries that drastically changed its labor market institutions during the 1990s as part of a process of reducing the role of the state in determining relative prices and the allocation of resources. A new employment law, enacted in 1991, called for radical measures to eliminate labor-market rigidities. In practice, the elimination of both job-stability laws and cumbersome dismissal procedures, along with the introduction of flexible contracting mechanisms, made Peru's legislation one of the most flexible in the region (Cox Edwards, 1997; Lora and Pagés, 1996).

A standard prediction is that the deregulation of the labor market would increase the benefits of staying in the formal sector and would also increase the relative costs of entering or staying in the informal sector, mainly because of the reduction in hiring and dismissal costs in the formal sector of the economy. What the data show, however, is not only that has Peru maintained one of the highest informality rates in the region, but also that the share of informal employment has grown consistently in the last 15 years, regardless of the criteria used to define informality.

In this paper we explore the different factors that may explain the variation in the informality rates. First, we analyze the evolution of informality in the labor markets between 1986 and 2001 in terms of both income levels and growth rates and growth rates for different demographic groups and economic sectors. Then, we decompose the growth of informality in its between and within components to analyze whether changes in the informality rates are due to changes in labor allocation between sectors or due to variation in the proportion of informal employment within each sector. In fact, Peru experienced a steady increase in employment allocation in two key sectors: retail trade and transportation, which together explained about 55 percent of the overall informality rate in 2000.

We also explore the possible role of labor legislation and non-wage labor costs. The sharp increase in non-wage labor costs despite a reduction in the average productivity of the economy is striking. By 2000, these labor costs reached 40 percent, far above the regional average. The magnitude of these labor costs may affect firms' and workers' preferences for demanding and offering employment in the formal labor market. Firms will be willing to incur these costs if they are able to transfer at least part of them to workers in the form of lower salaries, or if they perceive that providing the benefits will increase productivity. Similarly, workers will accept lower current earnings only if they value the benefits that they receive more than the cost they paid to cover them, which is difficult particularly for low-productivity workers for whom the discount rates are very high.

Finally, we illustrate the negative relationship between productivity and informality by evaluating the impact of the PROJOVEN Youth Training program, which offers training to disadvantaged young individuals aged 16 to 24 through job-specific training in blue-collar occupations. PROJOVEN shows that incremental increases in individuals' productivity lead to lower rates of informality.

The paper is organized as follows. Section 2 discusses the evolution of informality rates in Peru in the past 15 years and documents the extent of this problem with respect to other Latin American countries. Section 3 examines the impact of labor costs and sector-allocation employment on the growth of informality. Section 4 presents econometric estimates. Section 5 illustrates the relationship between informality and productivity through an evaluation of the effect of PROJOVEN on the informal/formal outcomes for participants. Section 6 concludes.

2. Informality in Peru: Overview 1986-2001

One of the most distinctive features of the Peruvian labor market is the size of the informal sector. By 2000, the percentage of the employed labor force without access to any social benefits was significantly higher than in other Latin American countries. Indeed, as Table 1 reports, Latin America already has one of the world's highest informality rates, just below that of Sub-Saharan Africa. Whereas average informality in Latin America reaches 51 percent, the rate of informal employment in Peru reaches 60 percent. If rural areas are taken into account, informal employment rates at the national level enter the 70-percent range.

During the 1990s, Peru and several Latin American countries experienced an increasing trend in informality rates despite the fact that the benefits as well as the costs of formality increased because of macroeconomic stabilization and the flexibilization of labor legislation. As Figure 1 indicates, the share of jobs in the informal sector clearly increased in Argentina, Brazil, Colombia, Mexico, Peru, Uruguay, and Venezuela. Chile was the only exception. In addition, the percentage of wage earners without any access to social security—either health or pension benefits—increased in most countries, with the exception of Colombia, Mexico, and Uruguay.

This increasing trend in the share of informal jobs is steeper in the case of Peru. Figure 2 shows a steady increase in the rate of informality from the late 1980s—regardless of how one defines informality. Whether using a "legal" definition (workers who do not receive social security coverage or pay social security taxes as a condition of employment) or a "traditional" one (workers who operate or are employed in firms with five or fewer employers, nonprofessional self-employed persons, and domestic and unpaid family workers) the share of informal jobs significantly increased by about 10 percentage points between 1996 and 2000. Furthermore, the Peruvian data show a weak correlation between economic growth and informality rates as shown by the lack of any countercyclical pattern in the informality rates profiles. This suggests that increments in the average productivity of the economy do not translate into more high-productivity jobs despite the rate of labor-force participation (LFP) having behaved pro-cyclically with respect to the GDP during the period of analysis.[2]

Changes in the share of informal jobs do not affect every worker or every sector to the same degree. For instance, the empirical literature suggests that job-security provisions, a potential determinant of informality, decrease the employment prospects of young, female, and unskilled workers (Heckman and Pagés, 2001). Thus, the identification of "winners" and "losers" is informative because it allows for a better understanding of the mechanisms behind the changes in the share of informal employment. In fact, the data reveal substantial heterogeneity in the growth of informality across gender, age, schooling, and sector of economic activity in the past 15 years.

Figure 3 reports the informality rates for males and females between 1986 and 2001. Using the "legal" definition, we observe a sharp inequality in the informality rates across gender

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[2] In the period of economic downturn between 1986 and 1992, the GDP fell at a rate of 3.9 percent per year while the LFP declined at a rate of 1.0 percent per year. In the period of economic recovery from 1992 to 1997, the GDP grew at an annual average rate of 7.2 percent and the LFP grew by 2.3 percent per year.

during the 1980s. The difference in the informality rates between males and females reached almost 20 percentage points in 1986 (47 versus 65 percent). Interestingly, this large inequality in the labor market disappeared during the 1990s, with the share of informal employment in 2001 being the same for males and females. One potential explanation for this closing gap would be the increasing levels of schooling attained by the female population, which may serve to increase the number of females in high-productivity jobs. A more detailed analysis of the data, however, shows a different story. The seemingly decreasing inequality gap was fundamentally driven by large increases in male informality rates rather than by reductions in female ones. In fact, the rate of informality for males rose from 47 to 61 percent between 1996 and 2001. For the same period, the female rate of informality decreased by about 5 percentage points (65 to 60 percent).

We observe somewhat similar patters using the "traditional" criterion. Whereas the share of informal employment increased by 18 percentage points for males between 1986 and 2001, females showed a modest increase of only 3 percentage points for the same reference period. Unlike the "legal" criterion, the "traditional" one still shows a modest but positive gap in the informality rates between males and females in the early 2000s, which sharply decreased from 24 percentage points in 1986 to 9 percentage points in 2001.

Figure 4 presents informality profiles across different age groups. In particular, three cohorts of individuals are considered: young workers (16-24 years of age), prime-age workers (25-45 years), and senior workers (46+ years). Using the "legal" definition of informality, three patterns emerge. First, young workers are more likely to be in the informal sector. Their average informality rate for the period of analysis was 20 percentage points above the rate for prime-age workers (70 versus 50 percent). This feature is not surprising given the large literature that documents particularly poor labor-market outcomes for young workers (Marcouiller, Ruiz de Castilla, and Woodruff, 1997; Nickell, 1997; Addison and Texeira, 2001; Montenegro and Pagés, 2003).

Second, all age groups exhibited an upward trend in the share of informal employment in the past 15 years. However, the growth of informality was not similar across age groups. Prime-age and senior workers exhibited steeper growth in informality rates. In fact, between 1986 and 2001, both prime-age and older workers experienced an increase of about 10 percentage points in the share of informal employment, whereas the youngsters reported an increase of half that. These asymmetric tendencies are even more pronounced if the analysis is based on the

"traditional" approach. Here older workers (46+) showed higher levels of informality than younger workers in the early 2000s, while the gap between younger and prime-age workers almost disappeared.

Thus, it seems that the increase in the average informality of the Peruvian labor market is more related to the evolution of informality among prime-age and older workers rather than to the performance of younger workers. The older workers lost inefficient but high-quality jobs as part of the new orientation of the economy in the 1990s. Profits fell in many oligopolistic sectors, and soft-budget-constraint public enterprises and institutions disappeared or were downsized. As such, sectors that were inefficient but that maintained high-quality jobs financed by those rents shrank or disappeared, and many formal-sector wage jobs were lost as part of the process. Indeed, the deregulation of the labor market allowed firms to replace expensive older workers with more educated younger workers willing to accept lower wages.

Figure 5 shows large differences in the share of informal employment across levels of schooling. Four educational groups were used: less than or equal to 6 years of primary school; secondary school (7 to 12 years of schooling); non-university postsecondary education; and university education. In general, there is a negative correlation between informality and schooling attainment, which is a standard finding in the literature (see Saavedra and Chong, 1999). More interesting patterns emerge when we analyze the evolution of informality across these educational groups in the past 15 years. The data reveal that the changes in the orientation of the economy have largely favored individuals with university education. Under the "legal" criterion, we observe a sharp decline in the rates of informality for this group starting in 1994, which is consistent with the patterns of the returns to education in Peru (see Saavedra, 1997; Díaz, 1999.)[3]

On the other hand, informality among individuals with primary and secondary education has notably increased by 8 and 12 percentage points in the past 15 years, respectively, which may explain the large drop in relative earnings for these two groups during the mid-1990s. Interestingly, the highest increase in the share of informal employment is among individuals with post-secondary non-university education. This educational group, whose labor outcomes were

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[3] According to Saavedra (1997) and Díaz (1999), the upward trends in relative earnings for the more skilled workers between the mid-1980s and mid-1990s can be explained by an increase in the relative demand that was biased toward women and high-skilled workers, which more than compensated for the increase in the relative supply of these groups.

comparable or even better than individuals with university education in the 1980s, experienced the largest increase in informality during the 1990s. In fact, under the "legal" criterion, informality increased by more than 15 percentage points between 1986 and 2001. Using the "traditional" criterion, the informality growth for this group reached 20 percentage points.

3. Understanding Informality Growth

3.1 Institutional Reforms and Non-Wage Labor Costs

Peru is one of several Latin American countries that substantially reduced labor-market rigidities in the 1990s in the course of reducing the state's role in determining relative prices and the allocation of resources (see Saavedra and Maruyama, 2000; and Saavedra and Chong, 1999, for an extensive analysis of the labor reforms). The deregulation of labor institutions, mainly the consequence of the *Ley de Fomento del Empleo No. 728,* included a new array of fixed-term and atypical contract regimes such as subcontracting through employment cooperatives and flexible training contracts for younger workers. It also raised the probationary period for employment from three months to between six and 12 months, simplified previous cumbersome dismissal procedures, and allowed firms to lay off workers when downsizing was required.

In addition, the Peruvian labor market was also deregulated as the capability and willingness of the authorities to enforce regulations decreased. The budget for inspections fell dramatically, so inspections were usually limited to large firms. Also, there was a change in the behavior of labor courts, which became much less pro-labor than before. Union bargaining power also fell dramatically, partly due to changes in labor legislation such as imposing fewer restrictions on organizing unions in small firms, allowing more than one union within a firm, decentralizing the collective bargaining process, and reducing red tape in the use of temporary contracts.[4]

Both theory and applied work suggest there is a strong relationship between rigidities in labor institutions and the performance of labor markets (Lazear, 1990; Djankov et al., 2002; Heckman and Pagés, 2001). In particular, it is expected that the deregulation of labor-market institutions—accompanied by a healthy macroeconomic recovery and the simplification of tax rules and administrative procedures—would increase both the benefits of formality and the costs

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[4] By law, temporary workers may belong to a union, but firms implicitly threatened workers who registered in a union by not renewing the contract.

of entering or staying in the informal sector.[5] As shown by Saavedra and Torero (2003), high expected severance payments have a negative impact on formal labor demand, so this labor-market flexibilization should have led to an increase in the proportion of formality among wage earners.

The evolution of the informality profile, however, exhibited a different pattern during the 1990s. One explanation for part of the variation in the share of informal employment is the erratic behavior of certain labor costs, which increased sharply despite a fall in the average productivity of the economy. In particular, the gap between the gross wages paid by employers and the net wages received by the workers in the formal sector, known as non-wage labor costs, sharply increased in the last decade. By 1998, Peru had the highest non-wage labor costs among a sample of Latin American countries, exceeding Chile by 27 percentage points and Mexico and Argentina by 20 percentage points (Tokman and Martinez, 1999).

Figure 6 shows the evolution of non-wage labor costs between 1987 and 2002. We observe that the non-wage labor costs paid by workers increased from 3.5 percent in 1987 to almost 12 percent in 2002, whereas the employer share increased from 42 to 47 percent for the same period. These increments were not smooth, but erratic and contradictory during the period of analysis. For instance, the non-wage labor costs paid by workers increased from 4 percent in December 1992 to 25 percent in January 1993, fell to 20 percent in December 1993, and then fell again to around 11 percent in August 1995. Likewise, employer contributions vary even more erratically: they increased from 43 percent in December 1988 to 47 in May 1990 to 55 percent in May 1991, then fell to 41 percent in January 1993, rose again to 47 percent in November 1993, increased to 53 percent in August 1995, and finally fell to 47 percent in September 2001.

In this context, a firm thinking about creating a formal job must take into account specific labor costs: taxes, non-wage costs, and administrative procedures. The firm will be willing to incur these costs if it is able to transfer at least part of them to workers in the form of lower salaries, or if it perceives that providing the benefits will increase productivity. A firm might not be able to pass these costs on to workers if the labor market is tight, if there is a minimum wage, or if workers do not value the resulting benefits. Therefore, it is not unusual for small firms to

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[5] Deep institutional changes in the tax-collection system were implemented in 1991, and were aimed at modernizing and strengthening the institution. The tax code was streamlined, with a reduction in the number and dispersion of rates and a reduction of exemptions and loopholes. As a consequence, the number of contributors—both individuals and firms—increased steadily, as did the ratio of taxes to GDP.

opt for informal employment relationships, both because their productivity is too low to be able to finance the mandated social benefits and because workers in the relevant market are not willing to receive lower salaries to cover these costs. It is also possible that successive and disorganized changes in labor-market legislation affected the confidence of large firms as well, leading them to demand employment without the social benefits mandated by law.[6] By 2000, only 33 percent of private wage earners received mandatory health and pension benefits, far behind most countries in the region.

From the workers' point of view, it is plausible to expect that the dramatic changes in their contributions to the non-wage labor costs affected their valuation of the benefits and costs of working in the formal sector, particularly for workers in the bottom quintiles of the earnings distribution, who prefer current rather than future consumption. In 2001, of every S/1,000 soles paid by the employer as gross wages, only about S/600 soles ended up in the worker's pocket, representing a 40 percent non-wage labor cost. It is likely that some workers do not value the 40 percent of their salary in benefits that they would receive (such as CTS, health benefits) and would prefer to stay in or move to the informal sector on the basis of cost-benefit evaluations. For instance, the willingness to save for an old-age pension is low because these workers view all or part of these payments as taxes. Something similar applies to health benefits, in which these workers prefer to run the risk of not receiving medical care rather than paying the health premiums.

Yamada (1996) and Saavedra and Chong (1999), for instance, document that a large percentage of urban self-employed individuals decide voluntarily to work in the informal sector because the earnings they receive are superior to the earnings they would obtain had they worked in the formal sector.[7] This finding is consistent with the efficient market hypothesis that suggests that individuals rationally choose to be in the informal sector based on the valuation of the earnings they would make in the formal and informal sectors, their preferences, the constraints they face given their endowment of human capital, and the level of formal-sector labor productivity in the country (Maloney, 1999).

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6 One illustrative example about the ambiguous way in which the laws were changed is the evolution of the contribution to FONAVI: the law changed seven times between 1988 and 1997.

[7] It does not mean that informal workers are not living in poverty, only that they would not be better off in the formal sector given their endowment of human capital.

In summary, the costs of formality are still too high compared with the perceived value of the benefits, given productivity. If a formal job comes with benefits that the workers do not value, or that the firm's productivity is not high enough to pay for, then formal jobs will not be created. If benefits such as vacations and dismissal costs are too generous given productivity levels, only a small number of workers will end up enjoying them. As long as workers are not willing to accept lower wages to pay for fringe benefits, or firms are not willing and able to finance them, they will find ways to avoid paying such benefits.

3.2 Changes in the Productive Matrix

The process of job creation and job destruction has been particularly vigorous in Peru during the past 20 years because of the macroeconomic volatility of the 1980s and the turbulent structural reforms of the 1990s. This has had a direct impact on the evolution of informality because the process of job creation can accelerate employment allocation in some traditional "informal" sectors. For instance, between 1992 and 1998, employment grew at a rate of 5.3 percent per year; mainly concentrated in retail trade, transportation, and financial and business services. As depicted in Table 2, the allocation of employment in these three sectors increased by 12 percent between 1986 and 2001, while employment dropped in manufacturing and public-sector employment for the same period.

We decomposed changes in informality between and within sectors to measure whether changes in informality have been induced by reallocation of employment in traditional informal sectors or changes in the informality within each sector. Let L denotes total employment, L_j employment in the sector j, and $\tilde{L}_j$ informal employment in the sector j where $j=1,...,J$. The informality rate can be represented

$$\frac{\tilde{L}}{L} = \sum_{j=1}^{J} a_j \frac{\tilde{L}_j}{L} \qquad (1)$$

where $a_j = \frac{L_j}{L}$ represents the share of employment in the j sector. Thus, changes in the informality rate between period t and $t+1$ can be expressed as

$$\frac{\tilde{L}_t - \tilde{L}_{t+1}}{L_t} = \Delta \frac{\tilde{L}}{L} = \sum_{j=1}^{J} \Delta \left(a_j \frac{\tilde{L}_j}{L} \right)$$

$$= \sum_{j=1}^{J} \left(\left(\Delta a_j \frac{\tilde{L}_j}{L} \right) + \left(a_j \Delta \frac{\tilde{L}_j}{L} \right) + \varepsilon \right)$$

(2)

where the first term in brackets represents the within effects, the second term the between effects, and ε is a residual term representing the interaction of the within and between effects. The within effects measure changes in the share of the informal employment rate due to variations in the proportion of informal employment within each sector, fixing the proportion of total employment allocated in each category. In the same way, the between effects measure changes in the share of informal employment due to changes in labor allocations between sectors, fixing informality rates in each sector.

We consider four different year combinations: 1995–1987, 1995–1989, 2000–1987 and 2000-1989, which allows us to compare the evolution of both within and between effects before and after the structural reforms, with each year combination corresponding to different economic states (growth/growth, growth/recession, recession/growth, and recession/recession), and different time spans to control for potential effects of the economic cycle.

Four basic patterns emerge from Table 3. First, the aggregated within and between effects are positive for all year combinations, reflecting a positive upward trend in informality rates independent of the economic cycle. Second, three economic sectors emerge as net contributors to informality growth in all time periods: (i) retail trade, restaurant, and hotels, (ii) transport and communications, and (iii) finance, insurance, and business. In particular, the retail trade, restaurant, and hotels sector is the largest contributor to the growth of informality in all periods. Third, a careful analysis of each of these three sectors reveals that the between effects tend to dominate the within ones. Put differently, the growth in informal employment is fundamentally due to the growth of labor allocation in these traditionally informal sectors and is to a lesser extent due to the growth of informality within these sectors. Fourth, manufacturing, construction, and other services are weak contributors to the informality growth fundamentally because of the decrease in the allocation of labor in these sectors. Thus, the observed growth in informality in these economic sectors is basically driven by the within component. In particular, the manufacturing sector, which traditionally has been considered a "formal" sector, has

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simultaneously decreased its participation in the share of total employment and increased its share of informal employment. The drop in manufacturing employment is explained in part by the disappearance of many manufacturing industries and the transformation of others into firms that import the products they had produced before the trade liberalization of the early 1990s.

In summary, the observed upward trend in the rate of informality in the Peruvian labor market in the past 15 years may be explained by a perverse combination of increasing labor allocation in traditionally informal sectors (such as retail trade) and decreasing labor allocation in traditionally formal sectors (such as manufacturing), along with growth in informal employment within all economic sectors. The emerging new productive matrix seems to be the result of structural changes in the orientation of the economy triggered by simultaneous trade liberalization, fiscal reform, deregulation of the goods markets, extensive privatization processes, and labor market reforms, which generated an increase in productivity that was concentrated in just a few specific sectors where new employment creation was meager. In the rest of the economy, there was employment creation but in low-productivity jobs.

4. Econometric Analysis

In this section we empirically model the selection into the formal/informal sectors. We estimate maximum likelihood probit models for three different samples: 1986–1991 (before the reforms), 1991–2001 (after the reforms), and the full sample set using the Annual Household Surveys (ENAHO) for Metropolitan Lima. We posit the following model for the individual *"i"* in year *"j"*:

$$\Pr(I_{ij} = 1) = f(X_{ij}, S_{ij}, NWLC_{j-1}) \qquad (3)$$

where I_{ij} is an indicator variable that takes 1 if the individual i in year j works in the informal sector, X_{ij} is a set of control covariates including variables related to human capital (education, training and experience), and variables that may determine the preferences and tastes of workers (gender, marital status, and age). S_{ij} is a set of dummy variables for economic sectors. $NWLC_{j-1}$ are the annual average non-wage labor costs that varies across time but not across individuals. The shares of both firms and workers are lagged one period and are included separately. Because we do not observe much variation in the non-wage labor costs before the reforms, we include them only when estimating the full sample.

Table 4 reports marginal effects and its respective standard errors for two different operational definitions (legal and traditional) of the informal sector. Independently of the criterion used, we observe a strong relationship between variables related to human-capital and formality before and after the reforms. Education significantly reduces the likelihood of being informal. Overall it is clear that workers with more human capital are more likely to be able to afford to pay for the benefits associated with formality.

The most interesting results, however, are the profiles of individuals with university and non-university tertiary education. Having a university education reduces the probability of being in the informal sector by 20 percent before the reforms. It increases in absolute value to 28 percent after the labor reforms. On the other had, having non-university tertiary education reduces the likelihood of being in the informal sector by 25 percent before the reforms, but decreases in absolute value to 24 percent after the reforms. It is noteworthy that these education-informality profiles follow patterns similar to those observed in the returns to education in the 1990s that showed an increase in the market value of a college degree and a reduction in the market value of non-university tertiary education following Peru's structural reforms (Saavedra, 1997). Using the "traditional" criterion does not change these patterns, although somewhat different point estimates are generated.

Similarly, the likelihood of being in the informal sector decreases with training, independently of the definition used. There is a huge gap, however, depending on the type of training received. On average, workers receiving on-the-job training reduce their probability of being in the informal sector by 14 and 27 percent before and after the reforms, respectively. On the other hand, workers receiving outside training reduce this probability by only 4 and 8 percent, respectively. In both cases, it is interesting to note that the value of the training significantly increased after the deregulation of the labor institutions. No qualitative changes occur using the "traditional" criterion. Tenure also affects the likelihood of being in the informal sector. On average, one extra year in the same job reduced the probability of holding an informal job by 2 percent before the labor reforms. The evidence suggests the value of tenure decreased after the reforms.

Several demographic variables may also explain the likelihood of informality. By looking at the "traditional" criterion and the pooled sample, we observe that males are 7 percent less likely to work in the informal sector. In addition, the point estimates do not show a reduction in

the gender gap after the reforms, contrary to what we observe in Figure 3. Indeed, the gender-informality relationship tends to be fuzzy in our estimation, since the "legal" definition shows positive but not statistically significant point estimates. To reconcile this seemingly confusing result, a finer approach involves modeling the selection into four different job categories—informal wage earners, informal self-employed, formal wage earners, and formal self-employed—using a multinomial logit model.[8] The results indicate that males are less likely to work as informal self-employed but more likely to work as informal wage earners. Furthermore, the probability of working as an informal wage earner for males increased from 4 to 8 percent between 1986 and 1994, which explains the reduction in the gender gap experienced after the reforms.

Married workers may be more willing to accept a lower wage in order to receive social benefits and may also be more willing to pay them themselves. There is no clear pattern, however, regarding the marginal effects for this variable. It depends on the informality criterion and the sample set used. By looking at the pooled sample, we observe that married individuals are less likely to work in the informal sector (-6 percentage points) under the "legal" criterion. On the other hand, they are more likely to work in the informal sector (5 percentage points) under the "traditional" approach. One plausible explanation is that being married reduces the likelihood of working as an informal wage earner, but it has a reverse effect on the likelihood of working informally as a self-employed person. In fact, the multinomial model shows that married workers are more likely to work as informal self-employed but less likely to work as informal wage earners both before and after the reforms.

Age also increases the likelihood of formality under both the "legal" and "traditional" criteria. Before the reforms, one extra year increased the likelihood of working in the formal sector by 3 percent, whereas this number dropped to 0.7 percent after the reforms. This finding reveals that during the 1990s and particularly at the end of the decade, age was less important in determining the likelihood of working formally. This is also consistent with a reduction in the relative earnings of older workers, a reduction in the returns to experience, and the flat employment/population ratios observed for older workers reported elsewhere (Saavedra and Maruyama, 2000). Indeed, the implied reduction in the demand for older workers was related to changes in legislation and technological changes. Many older workers who lost their jobs as a

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[8] The estimates are available upon request.

consequence of public downsizing, privatization, and the contraction of formerly protected manufacturing industries were unable to find formal jobs—or any jobs at all. On the other hand, the introduction of technological changes as a consequence of a reduction in the relative prices of capital and an increase in investment in new modern service sectors due to the opening of the economy increased the relative demand of younger workers.

How workers sort themselves—or are sorted—between sectors significantly affects the likelihood of holding informal jobs mainly because of productivity differences across sectors. Using the "traditional" approach, we observe that working in construction, retail trade, and transportation increases the probability of being informal by 20, 38, and 26 percent, respectively. Thus, it is clear that the growth of labor allocation in these sectors as a result of Peru's structural reforms can explain an important part of the variation in the informality rates in the 1990s. Before the reforms, for example, working in the transportation sector was associated with a 10-percent increase in the probability of being informal. This jumped by almost three-fold after the reforms. Though the point estimates using the "legal" criterion are somewhat different, the qualitative results do not change.

Finally, we observe for the pooled data that variations in non-wage labor costs significantly affect the likelihood of working in the informal sector. Under the "traditional" criterion, an increase of 10 percentage points in the non-wage costs paid for the employer is associated with an increase of 6 percentage points in the likelihood of holding an informal job, whereas an increase of 10 percentage points in the non-wage costs paid for the worker is associated with an increase of 1 percentage point. Because we are using household data, these results are consistent with the idea that workers make cost-benefit evaluations as the result of changes in labor costs that may affect their preferences and the profitability of entering or staying in the informal sector. This is particularly relevant for workers with low levels of productivity who have less preference for social benefits because at low levels of income the discount rates are so high that the perceived benefits do not match the costs of giving up actual levels of consumption.[9] It does not mean that informal workers are not living in poverty, only that they would not be better off in the formal sector given their current levels of productivity.

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[9] Jaramillo (2004), for instance, reports asymmetric distribution of social benefits by percentiles of income: as of 2000, 10 percent of workers in the bottom quintile and 32 percent of workers in the top quintile had health benefits.

5. Do Increments in Productivity Lead to Less Informality? A Case Study

During the 1990s, several countries, including Peru, launched labor-market initiatives in the form of training programs that sought to increase the productivity of targeted disadvantaged individuals who graduated from isolated public schools. An examination of the impacts of these types of programs allows us to evaluate whether increments in productivity are associated with higher levels of formality in the labor market. The implicit hypothesis is that better-educated individuals are more productive and therefore are more willing to pay for the benefits (such as health insurance and old-age pensions) associated with high-quality jobs.

5.1 The PROJOVEN Program

The Youth Training Program PROJOVEN was implemented in Lima in 1995 with the goal of increasing the employability and productivity of disadvantaged young individuals aged 16 to 24 through job-specific training in blue-collar occupations.[10] The treatment consists of a mix of formal and on-the-job training organized into two sequential phases. The first stage consists of 300 hours of classes at training-center locations—roughly five hours per day for three months. In the second phase, the training institutions must place trainees into paid, on-the-job training in private manufacturing firms for an additional period of three months.

The most distinctive element differentiating this training program from previous public-sponsored initiatives was the decentralization of the training services through market mechanisms in which public and private training institutions compete for public funds (see Chong and Galdo, 2006). The assignment of government funds to any training institution, private or public, is similar in spirit to the school vouchers approach, which is motivated by the idea that competition will be translated into expanded access and enhanced service quality, and will therefore improve labor market outcomes.

The selection of the training courses relies on bidding processes that target the relatively best training courses at the best competing prices. Thus, private and public training institutions that operate for profit compete for limited public funding following standard processes and strict timetables. To ensure the relevance of the training courses, the program relies on a demand-driven mechanism that stipulates that all training centers must present, as part of their offers,

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[10] These occupations include, for example, maintenance mechanics, electricians, janitors and building cleaners, cashiers, receptionist clerks, construction laborers, plumbers, pipefitters, maintenance and repair workers, sewing machine operators, textile operators and tenders, and computer operators.

formal agreements with private manufacturing firms that guarantee paid, on-the-job training for each beneficiary. This program design requires a strong match between the content of the training courses and the firm's labor skill requirements and thus a strict coordination between the training institutions and the manufacturing firms in designing and implementing the training courses. As a result, the coverage of this training program is limited because of its costly design and relatively intense package of services.

If the firms receive unproductive workers, they are entitled by law to drop their labor contracts at any time. Responsibility for the completion of both phases of training falls solely on the training institutions. A system of conditional payments based on the training centers' effectiveness in successfully completing the six-month course provides incentives to train only for those individuals in occupations with assured labor demand.[11]

5.2 Data and Treatment Impacts

From 1996 to 2003, the period for which there is data, the PROJOVEN evaluation datasets consist of 10 different subsamples associated with five different cohorts of beneficiaries receiving treatment in Lima, and five corresponding comparison group samples. The beneficiary subsamples are selected from a stratified random sample of the population of participants corresponding to the first, second, fourth, sixth, and eighth rounds of the programs.[12] Individuals in the corresponding comparison subsamples are selected from a random sample of "nearest-neighbor" households located in the same neighborhood as those participants included in the evaluation sample. The program operator builds the comparison samples by using the same eligibility instruments applied to the treatment sample and by pairing each beneficiary to a random neighbor who has the same sex, age, schooling, labor market status, and poverty status. The neighborhood dimension may have the ability to control for some unobservables, including geographic segregation, transportation costs, and firms' location, which may affect the propensity to work and the potential outcomes.

For each treated and untreated cohort combination, we have panel data collected in four rounds, including a baseline survey and three follow-up surveys taken 6, 12, and 18 months after

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[11] Payments are structured in per capita terms according to the following scheme: 100, 80, 60, and 30 percent if completing both phases of the program, at least one month of on-the-job training, only formal training, and at least a month of formal training, respectively.

[12] The total number of participants in these program rounds is 1507, 1812, 2274, 2583, and 3114, respectively. The corresponding number of treated individuals in the random sample is 299, 321, 343, 405, and 421.

the program. The baseline survey provides rich information for all variables that define the eligibility status. It also contains demographics and labor-market information. In fact, relevant factors affecting both the propensity to participate in the program and labor market outcomes are available. There is information, for example, on education attainment, marital status, number of children, parents' schooling, and participation in welfare programs. The labor-market module includes information about labor force participation, experience, monthly earnings, working hours, occupation, firm's size, and participation in previous training courses. At the household level, there is information about family size, family income, and household's density rate. In addition, the datasets provide detailed information on dwelling characteristics, including source of drinking water, toilet facilities, and house infrastructure (type of materials used in the floor, ceiling, and walls), which can be used to measure the poverty status. Moreover, the follow-up surveys provide detailed labor-market information for both treated and comparison groups, using the same definitions and variables as the baseline instruments, which minimize potential biases due to misalignment in the measurement of variables.

The baseline datasets show the program participants to be a homogenous population in terms of several socioeconomic and labor-market characteristics including sex, age, schooling, parents' education, type of work, previous training, and family size. On the other hand, the data also reveal some significant differences in variables such as marital status, presence of children, monthly earnings, family income, and some dwelling characteristics, which would play an important role in any econometric strategy intended to eliminate selection bias.

The outcomes of interest are employment and the quality of the employment. We use five proxies for quality of employment: size of the firm, health benefits, accident insurance, social security, and formal labor contracts. We implement local polynomial matching methods (Heckman, Ichimura, and Todd, 1997) to estimate the counterfactual outcome for program participants by taking weighted averages over the outcomes of observationally similar untreated individuals. We proceed under the assumption that the distribution of unobservables varies across treatment and comparison groups but not over time within groups, which is the standard assumption of difference-in-differences models.

Four patterns emerge in Table 5. First, PROJOVEN's overall effect on employment is positive but small (5 percent). This positive number is driven by females' outcomes, which show large treatment impacts (10 percentage points). On the other hand, males' outcomes show no

impact on employment. Second, there are strong and significant impacts on all employment-quality variables for both males and females. Thus, PROJOVEN strongly affects the likelihood of obtaining high-quality jobs rather than mere labor force participation. This result is important because it clearly illustrates the link between productivity and informality and shows that active labor-market policies can reduce labor-market informality. Third, PROJOVEN's impacts on job quality are not steady over time. Short-run treatment impacts are larger than medium-term impacts, calling into question the sustainability of the treatment impacts across time. Finally, it is important to note that general equilibrium effects on the Peruvian labor market are negligible given the limited coverage of this training program.

6. Final Remarks

The most distinctive characteristic of the Peruvian labor market is its high share of informal employment, which is above the average for Latin America. By 2000, 60 percent of the labor force worked at the margin of labor-market legislation. Contrary to what one would expect, the rate of informality increased steadily during the 1990s despite the fact that the benefits of formality and the costs of informality increased as a result of the deregulation of the labor markets, a healthy macroeconomic recovery, and tighter tax codes and regulation.

A cross-sectional analysis of the data indicates there is a familiar face to informality: most informal workers are young, female, and unskilled. A time-series analysis, however, reveals that the growth in the share of informal employment was steeper for males, prime-age, and older workers, as well as for individuals with post-school non-university education. Overall, these patterns correspond to changes in the orientation of the economy along with technological changes as a consequence of the reduction of the relative price of capital due to the opening of the economy, which increased the relative demand of younger workers. Many older workers, who lost their jobs as a consequence of public downsizing, privatization, and the contraction of formerly protected manufacturing industries, were unable to find formal jobs.

Two factors can explain the variation in the informality rates in the 1990s. First, Peru experienced a steady increase in the employment allocation in traditionally "informal" sectors. In particular, retail trade and transport, which together account for about 55 percent of the overall informality rate in 2000, increased their share in total employment by 10 percent between 1990 and 2000. Second, there was a sharp increase in non-wage labor costs—despite a reduction in the

average productivity of the economy. A firm would be willing to incur these costs if it is able to transfer at least part of them to its workers in the form of lower salaries, or if it perceives that providing the benefits will increase productivity. Similarly, workers will accept lower current earnings if they value the benefits that they receive more than the cost they pay to cover them. Therefore, it is not strange that several small firms choose to have informal employment relationships, both because their productivity is too low to be able to finance the mandated benefits and also because their workers are not willing to receive lower salaries to cover these costs.

We illustrate the negative correlation between productivity and informality by evaluating the impacts of the Young Training PROJOVEN program, which offers training to disadvantaged young individuals aged 16 to 24 through job-specific training in blue-collar occupations. We find significant impacts on all employment-quality variables for both males and females. In fact, the PROJOVEN study shows that increments in individuals' productivity lead to lower levels of informality rates among the treated population.

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Figure 1. Informal Employment in Latin America
(in percent)

	1990	2000
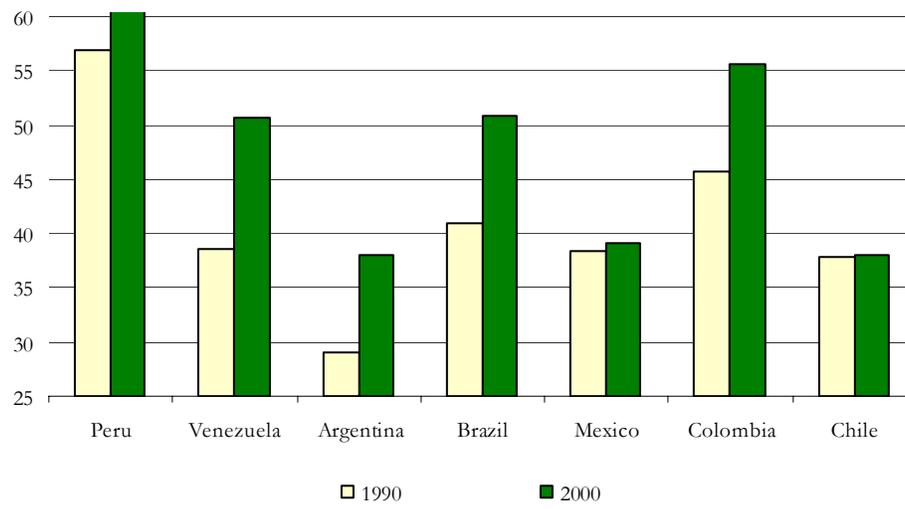
Source: Saavedra (2003a).

Figure 2. Informal Employment, 1986-2001

(*% of total employment*)
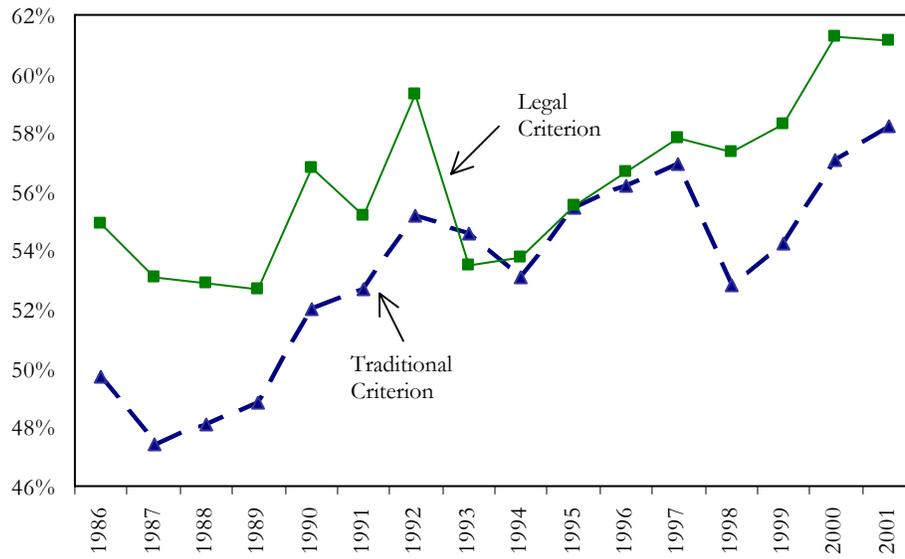
Source: National Household Survey: 1986, 1987, 1989-1995, 1997-2001. Includes Metropolitan Lima only.

Figure 3. Informality by Gender: 1986-2001
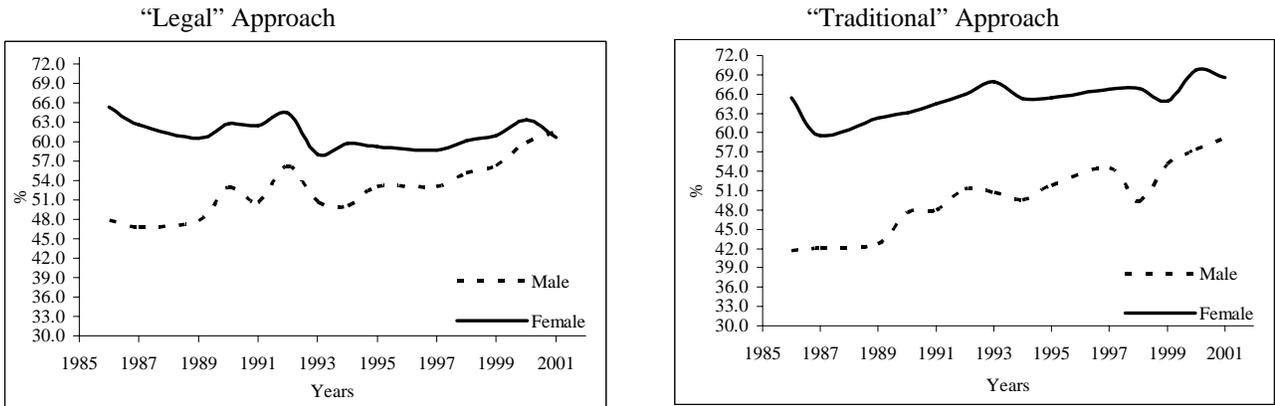
"Legal" Approach

"Traditional" Approach

Source: National Household Survey: 1986, 1987, 1989-1995, 1997-2001. Includes Metropolitan Lima only.

Figure 4. Informality by Age: 1986-2001
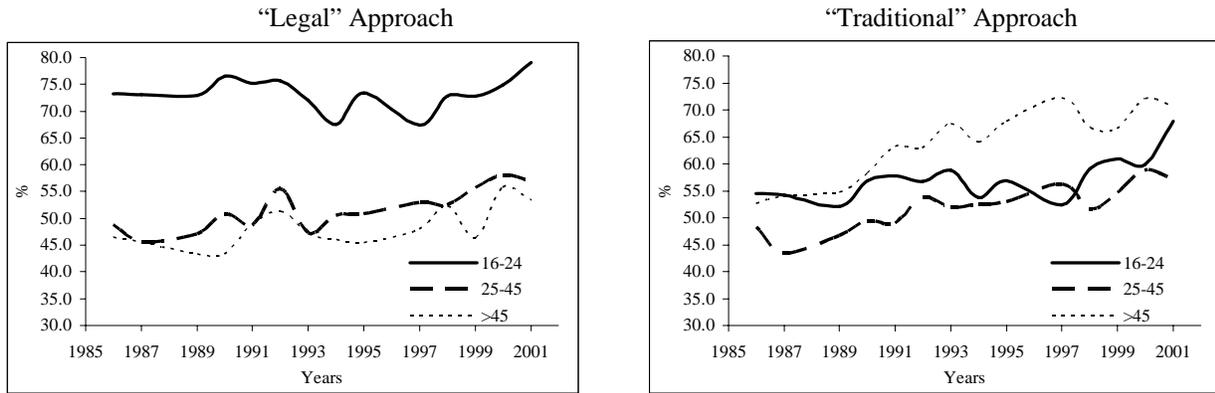
"Legal" Approach

"Traditional" Approach

Source: National Household Survey: 1986, 1987, 1989-1995, 1997-2001. Includes Metropolitan Lima only.

Figure 5. Informality by Schooling Attainment: 1986-2001
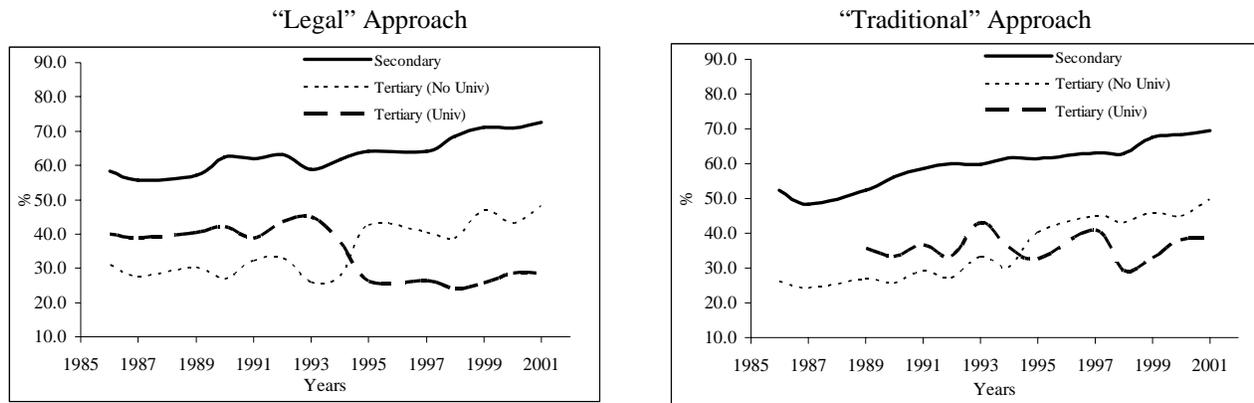
"Legal" Approach

"Traditional" Approach

Source: National Household Survey: 1986, 1987, 1989-1995, 1997-2001. Includes Metropolitan Lima only.

Figure 6. Non-Wage Labor Costs: 1986-2001
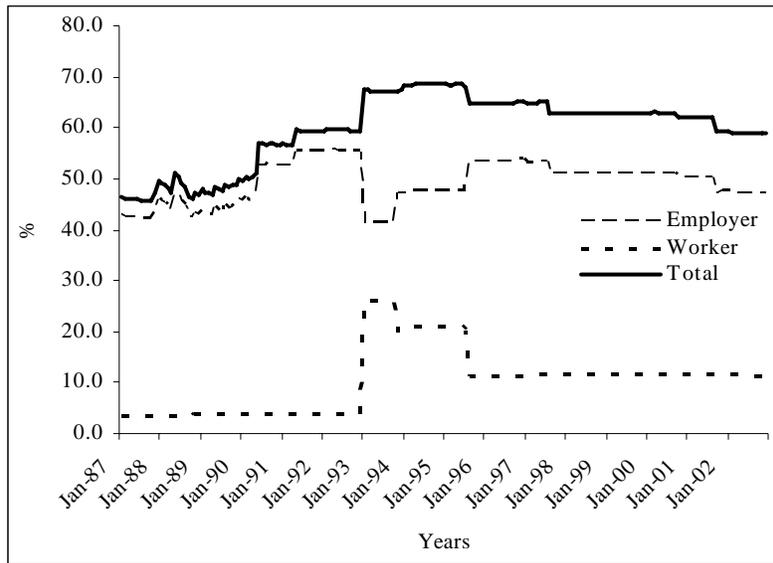
Note: Non-wage costs are presented as a percentage of wages in December of each year.
Sources: Saavedra and Maruyama (2000), Peruvian Central Bank (BCRP), and National Tax Office (SUNAT).

Table 1. Informal Sector Employment by Geographic Region and Income Bracket

	Mean informal employment	Std. Dev. informal employment	Observations
Geographic region			
Middle East & North Africa	60.65	5.02	2
Sub-Saharan Africa	53.30	13.33	12
Latin America & Caribbean	51.39	5.86	7
South Asia	47.23	14.61	3
East Europe & Central Asia	43.59	14.12	9
East Asia & Pacific	25.35	11.20	4
OECD	17.10	10.48	9
Income Bracket			
High income	18.49	10.82	10
Upper middle income	53.07	15.37	3
Lower middle income	47.39	12.93	14
Low income	47.49	15.86	19
Total	41.52	18.31	46.00

*Notes:* Informal-sector employment is reported as the share of the labor force in the unofficial economy in the capital city of each country as a percentage of the total employment. Income brackets are defined following the World Bank's classification. A detailed list of countries in each category is included in Appendix 1.
Source: Botero et al. (2002).

Table 2. Employment Shares across Economic Sectors: 1986-2001
(*in percent*)

	Manufacture	Public Adm.	Construction	Trade	Transportation	Finance
1986	23.29	6.31	5.55	28.09	6.89	4.59
1987	22.03	6.64	5.87	29.84	6.46	4.79
1989	19.90	6.65	4.80	31.49	6.38	5.60
1990	21.16	6.65	5.00	31.21	5.75	5.02
1991	19.04	6.42	4.69	32.66	6.43	5.76
1992	17.26	5.35	5.71	33.80	6.97	6.07
1993	17.86	5.80	5.69	36.31	7.78	7.14
1994	19.21	5.21	6.19	35.40	7.43	8.68
1995	19.69	4.59	5.17	34.11	7.46	9.00
1996	16.74	4.11	6.62	32.85	9.49	9.53
1997	15.06	4.77	5.43	35.74	9.74	8.47
1999	14.47	5.51	5.84	32.62	9.84	9.47
2000	16.04	5.19	4.30	34.78	9.82	9.40
2001	14.19	4.63	4.81	35.28	9.90	6.83

Source: National Household Survey: 1986, 1987, 1989-1995, 1997-2001. Includes Metropolitan Lima only.

Table 3. Decomposing the Informality Rates in Between and Within Changes
(*using "legal" definition*)

1995-1987	between	within	total
primary activities	-0.03	0.30	0.27
manufacturing	-1.24	1.16	-0.09
public administration	-0.01	0.03	0.02
construction	-0.45	0.32	-0.13
trade, restaurant, and hotels	3.01	-1.43	**1.58**
transport and communications	0.67	1.68	**2.35**
finance, insurance, and business	1.45	0.79	**2.24**
other services	-2.05	-1.24	-3.29
Total	1.33	1.61	2.95

1995-1989	between	within	total
primary activities	-0.42	0.02	-0.40
manufacturing	-0.11	0.95	0.84
public administration	-0.01	0.01	-0.01
construction	0.24	0.64	0.88
trade, restaurant, and hotels	1.85	-0.79	**1.06**
transport and communications	0.72	1.18	**1.90**
finance, insurance, and business	1.17	0.36	**1.53**
other services	-2.11	-0.48	-2.59
Total	1.33	1.88	3.21

2000-1987	between	within	total
primary activities	-0.16	-0.03	-0.19
manufacturing	-3.88	2.82	-1.07
public administration	-0.05	0.17	0.13
construction	-1.11	0.53	-0.58
trade, restaurant, and hotels	3.84	1.07	**4.92**
transport and communications	2.45	2.81	**5.26**
finance, insurance, and business	1.32	0.28	**1.61**
other services	-1.84	0.06	-1.78
Total	0.57	7.72	8.28

2000-1989	between	within	total
primary activities	-0.37	-0.23	-0.60
manufacturing	-2.50	2.64	0.14
public administration	-0.05	0.15	0.10
construction	-0.35	0.80	0.45
trade, restaurant, and hotels	2.56	1.73	**4.28**
transport and communications	2.51	2.14	**4.65**
finance, insurance, and business	1.09	-0.16	**0.93**
other services	-1.90	0.85	-1.05
Total	0.97	7.93	8.90

Source: National Household Survey: 1986, 1987, 1989-1995, 1997-2001.
Includes Metropolitan Lima only.

Table 4 Probit Marginal Effects for Informal/Formal Employment
National Household Survey, Lima 1986-2001

	1986-1991		1991-2001		Pooled Sample	
	Legal	Traditional	Legal	Traditional	Legal	Traditional
Age	-0.029*	-0.017**	-0.007**	-0.005**	-0.009**	-0.006**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Age squared	0.000**	0.000**	0.000	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Male	0.013	-0.049**	0.001	-0.076**	0.001	-0.070**
	(0.016)	(0.015)	(0.011)	(0.010)	(0.010)	(0.009)
Married	0.036**	0.054**	-0.069**	0.052**	-0.060**	0.052**
	(0.017)	(0.018)	(0.011)	(0.012)	(0.010)	(0.011)
Married male	-0.074**	-0.093**	0.037**	-0.077**	0.028**	-0.080**
	(0.021)	(0.021)	(0.014)	(0.014)	(0.013)	(0.013)
No schooling	0.296**	0.242**	0.241**	0.240**	0.245**	0.228**
	(0.028)	(0.038)	(0.022)	(0.029)	(0.020)	(0.026)
Primary	0.189**	0.209**	0.137**	0.145**	0.138**	0.151**
	(0.013)	(0.013)	(0.010)	(0.010)	(0.009)	(0.009)
Tertiary educ (non university)	-0.254**	-0.267**	-0.244**	-0.216**	-0.247**	-0.226**
	(0.013)	(0.012)	(0.010)	(0.010)	(0.009)	(0.009)
Tertiary educ (university)	-0.198**	-0.193**	-0.283**	-0.229**	-0.272**	-0.226**
	(0.020)	(0.019)	(0.009)	(0.010)	(0.008)	(0.009)
Tenure	-0.021**	-0.009**	-0.015**	-0.007**	-0.016**	-0.008**
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Tenure squared	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
On the job training	-0.135**	-0.160**	-0.275**	-0.269**	-0.244**	-0.225**
	(0.015)	(0.015)	(0.019)	(0.020)	(0.016)	(0.017)
Training (IST, CEO)	-0.042**	-0.011**	-0.076**	-0.048**	-0.081**	-0.051**
	(0.012)	(0.012)	(0.008)	(0.008)	(0.007)	(0.007)
Agriculture/Mining	-0.023	-0.013	0.025	-0.004	0.026	0.000
	(0.040)	(0.041)	(0.033)	(0.033)	(0.029)	(0.029)
Public Sector	-0.570**	-0.531**	-0.580**	-0.582**	-0.578**	-0.579**
	(0.009)	(0.011)	(0.007)	(0.013)	(0.007)	(0.011)
Construction	0.105**	0.227**	0.124**	0.194**	0.133**	0.204**
	(0.022)	(0.019)	(0.015)	(0.012)	(0.013)	(0.011)
Retail Trade, Hotels, and	0.253**	0.405**	0.206**	0.373**	0.214**	0.380**
	(0.013)	(0.011)	(0.009)	(0.008)	(0.008)	(0.007)
Transportation and Communications	0.034	0.095**	0.157**	0.282**	0.150**	0.266**
	(0.021)	(0.020)	(0.012)	(0.009)	(0.011)	(0.009)
Finance	-0.088**	-0.016	-0.139**	0.046**	-0.130**	0.039**
	(0.024)	(0.024)	(0.014)	(0.013)	(0.013)	(0.012)
Other Services	0.056**	0.190**	0.003	0.130**	0.013	0.141**
	(0.014)	(0.014)	(0.011)	(0.010)	(0.010)	(0.009)
Non-wage Labor Cost (firms)					0.003**	0.006**
					(0.001)	(0.001)
Non-wage Labor Cost (workers)					-0.001	0.001**
					(0.010)	(0.001)
N	12894	12894	25942	25942	32077	32077

**significant at the 5-percent level,*significant at the 10-percent level

Standard errors in parentheses

**Table 5. Impacts of PROJOVEN on Quality of Employment,
Lima 1996-2003**

	6 months after program		12 months after program	
	Male	Female	Male	Female
Employment	0.001	0.082	-0.035	0.086
	(0.045)	(0.066)	(0.043)	(0.063)
Quality of Employment				
Labor contract	0.134**	0.188**	0.126**	0.132**
	(0.026)	(0.017)	(0.049)	(0.015)
Firm's size >100	0.109**	0.176**	0.109**	0.176**
	(0.015)	(0.017)	(0.015)	(0.016)
Health insurance	0.089**	0.095**	0.070**	0.112**
	(0.015)	(0.014)	(0.017)	(0.015)
Accident insurance	0.135**	0.122**	0.094**	0.111**
	(0.016)	(0.016)	(0.017)	(0.018)
Social security	0.083**	0.078**	0.057**	0.098**
	(0.015)	(0.014)	(0.015)	(0.014)

**Significant at 5 percent.