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Working Paper

The Effects of Transactions Costs on Labor Market Participation and Earnings: Evidence from Rural Philippine Markets

Center Discussion Paper, No. 790

Provided in Cooperation with:
Yale University, Economic Growth Center (EGC)

Suggested Citation: Lanzona, Leonardo A.; Evenson, Robert E. (1997) : The Effects of Transactions Costs on Labor Market Participation and Earnings: Evidence from Rural Philippine Markets, Center Discussion Paper, No. 790, Yale University, Economic Growth Center, New Haven, CT

This Version is available at:
https://hdl.handle.net/10419/98370

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CENTER DISCUSSION PAPER NO.790

THE EFFECTS OF TRANSACTION COSTS ON LABOR MARKET PARTICIPATION AND EARNINGS: EVIDENCE FROM RURAL PHILIPPINE MARKETS

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October 1997

Note: Center Discussion Papers are preliminary materials circulated to stimulate discussions and critical comments. Dr. Lanzona was a Postdoctoral Fellow at the Economic Growth Center, Yale University and is an Assistant Professor at Ateneo de Manila University, Philippines.

Financial support was provided by The Rockefeller Foundation.

Comments welcome. Not for quotation.
Working Draft Oct. 15, 1997

The Effects of Transaction Costs on Labor Market Participation and Earnings: Evidence from Rural Philippine Markets

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and
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Abstract

The paper aims to measure transaction costs and its effects on labor market participation and on wage earnings. The observed differences between buying and selling prices of rice across households are used to calculate transaction costs indices for villages which are incorporated into the standard labor market participation and Mincer wage equations. The estimates indicate that transaction costs may be a source of the income differentials between (a) the landed and the landless, (b) the rural and the urban areas, and (c) the males and the females. Furthermore, biases can be noted in the regression coefficients of estimates that do not control for transaction costs.

KEY WORDS: Transaction Costs, Labor Market Participation, Philippines

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I. Introduction

Transaction costs refer to the costs of measuring the valuable attributes of the commodity exchanged and the costs of providing and ensuring the desired attributes (North, 1990). These costs are significant in rural economies where communications and transportation facilities are poor, markets are segmented, and access for market participation is restricted.

In competitive markets, information about the prevailing market prices is available, and a range for possibilities is provided to buyers and sellers to arrive at the best terms. The presence of transaction costs on the other hand suggests that participation in markets does not lead to the best interest of the parties concerned. In the case of a rice market, because of different sources of uncertainty, incomplete information and other marketing costs, a variety of arrangements or governance structures are employed by trading partners mainly as a second-best response to incomplete markets. Such arrangements and structures in turn may lead to inefficiencies in productivity and inequitable income distribution.

In the labor market, information problems have two main consequences on workers' quality and their contribution to total output. First, since employment contracts rarely specify all aspects of the workers' level of effort, employers cannot measure fully the productivity of workers on which their payments are based. If workers decide not to reveal their true productivity and if the workers' efforts are unverifiable, employers face a moral hazard problem in setting out the proper wages. Second, because of worker heterogeneity, their potential productivity is unknown to the employer. Workers can then be misallocated to tasks and sectors. This may lead to adverse selection, if the average wage rates offered drive out the more productive workers. While the moral hazard problem may be solved by adopting piece-rate or share-rate arrangements (Otsuka and Hayami, 1988), employers can only mitigate the second problem by distinguishing the workers through their characteristics. With this process, the workers with more experience and exposure in the market will be preferred. Consequently, the supply of workers who do not have these qualities, such as the women, may be reduced, and their wages may be lower (see Foster and Rosenzweig, 1994).

The purpose of this paper is to provide an empirical framework that can measure the effects of transaction costs on the wage labor market participation and earnings, particularly in a rice economy. One of the main difficulties

in the literature is the estimation of transaction costs.[1] We argue that transaction costs can be measured objectively by means of the wedge between the selling price of the producers and the buying price of consumers for a particular commodity. Since the agricultural household is both a producer and a consumer, the analysis can focus on the prices of products which the farmer sell, and the prices of the same commodity which he purchases in the market.

The basic premise is that this wedge between buying and selling prices, interpreted as the extent of transaction costs, is assumed to be determined by the market conditions and institutions found in the villages. If the proper institutions and conditions have been established in the village, the price wedge would have been reduced to a minimum. Thus, by measuring the effect of village dummies on the observed price wedges, we can derive indices of prevailing transaction costs in the relevant villages. This paper then tries to determine the effects of such indices on labor market participation and on the earnings.

The rest of the paper is divided into the following parts: In the second part, the procedure for measuring transaction costs is discussed, using as background the marketing process in the rice economies in low-income countries. In particular, we consider the formation of buying and selling prices in a rice market, and derive from this a procedure to estimate transaction costs. The third section features the theoretical model used to analyze the presence of transaction costs in labor market decisions. The fourth section discusses the data and empirical strategy for testing the hypotheses provided in the third section. For the estimation of wage labor decisions and wage functions, we employ the standard two-step Heckman (1979) procedure. The fifth section presents the results of the empirical investigation, and the last section provides conclusions and policy implications.

II. Measurement of Transaction Costs: The Case of the Rice Market

Information on markets, such the first date of sale, the proper timing of distribution as well as credit and risk sharing arrangements, may be crucial for production and marketing decisions. In the absence of complete information, specialized agreements and long-term contracts between buyers and sellers are formed. Willamson (1981) identified several important characteristics of these arrangements: (1) a higher level of uncertainty to which the transactions are

[1]Shelanski and Klein (1995) indicated the various problems met in measuring transaction costs. In particular, measurements are usually based on ordinal rankings thereby making it hard to compare them by industry. Studies may contain variables that are similarly labeled, but are really not identical.

subject; (2) a greater frequency with which the transactions recur; and (3) a greater degree of relation-specific investments.

A key feature in rural agricultural markets is the seasonality of production. Certain seasons, such as harvesting periods, can be identified as "peak" in the sense that the produce is abundant. However, throughout most of the year, slack periods when the product is scarce prevail. Thus, there arises a difference between what is produced in the farms (the so-called paddy or unmilled rice) and what is sold (or the milled rice usually consumed in the markets). This difference between harvesting and pre-harvesting periods creates a gap between consumption and production, and aside from the costs of milling and distribution, a wedge between the price of paddy rice and the price of milled rice in the markets is formed.

In this situation, Timmer, et.al. (1983) described three possible ways of marketing rice. First, the agent may simply be engaged in transporting the rough rice to a rice mill and in selling it immediately. Except for the costs of transporting, some risk may be involved since the rice mill may not be willing to pay the price the agent paid the farmers. Second, the agent may himself own a rice mill nearby. If the consumers are willing to pay sufficiently more for the milled rice, the marketing agent can recover the costs from purchasing rough rice, as well as the full costs of processing, plus a return for investment costs and risks. Third, the agent may store the rice in a warehouse, expecting to sell it for a higher price after the harvested supplies have been absorbed. This process entails additional costs for storing the product, e.g., the interest on the money invested in the operation, the transportation costs in and out of the warehouse, the rental costs of the warehouse, and insurance against fire and other losses. When rice is sold in the market at the proper time, the agent expects to sell it at the price enough to more than cover the time, effort and risk involved.

In all cases, the marketing agent is expected to determine the resale prices with a mark-up in order to cover the services he offers. However, in the third case, the resale price will be higher. Clearly, the retail prices depend on the information the trader has concerning the production and consumption decisions of farmers, along with his available resources. The combination of his information and his resources makes the service specific to the buyers in the areas, thereby strengthening the bargaining power of the trader.

In the above marketing systems, the type of relations found in the market depends heavily on the institutional and the physical attributes of the farms. Institutions refer to any hierarchy of rules--arising from the production and

distribution conditions in the areas--that coordinate consumption with production (North, 1990). If production and processing facilities are not remote and access to other markets is inexpensive, the extent with which the marketing agent can exert any influence on the price is limited. The farmers' access to working capital, or to price data and information of production conditions can also dissolve the control of marketing agents. Hence, the prevailing market conditions and the institutions in the area determine the exchange between farmers and marketing agents. How well these institutions work will in turn depend on the motivation of buyers and sellers, the complexity of the environment and the ability to enforce contracts (or property rights) relating to these transactions.

Formally, the rice demand and paddy supply functions for the household residing in location i at a particular point in time are written, respectively, as:

$$Q^{d_i} = D\,(P^{b_i}, X^{d_i}; \mu_i) \qquad \textbf{(1)}$$

$$Q^{s_i} = S\,(P^{s_i}, X^{s_i})$$

where P^b_i is the net market price of rice or net resale value of milled rice at location i, ^s_iP is the price of rice that producers equate with their marginal costs; X^d_i refers to a vector of factors (e.g., wealth, prices of other goods) which influence household demand, and X^s_i refers to factors influencing supply (e.g., availability of resources, prices of inputs). The term μ_i is defined as the likelihood that the supplier will provide the necessary goods with the desired attributes at a critical period in location i. The variability in the required attributes will adversely affect the demand for its product. Marketing agents who can guarantee constant quality will then be preferred.

Assuming monotonicity and using the inverse function theorem, this gap between the buying and selling price can be written as:

$$T_i = P^{b_i} - P^{S_i} = D^{-1}\,(X^{d_i}; \mu_i) - S^{-1}(X^{s_i}) \qquad \textbf{(2)}$$

The assumption behind this equation is that the μ_i is exogenous. The difference P^b_i between P^s_i and is then viewed to reflect the costs of transactions, T_i, prevailing in location i. The price wedge is defined by the difference between the value placed by the household on the desired commodity (D^{-1}) and the value placed by the same household which supplies it (S^{-1}). To a large extent, this discrepancy determines the mark-up that the agent obtains.

In a model with perfect information, buyers and sellers can verify the value of all attributes. There will be no transaction costs, and the intersection of the demand and supply functions determines the price of the good. Similarly, in standard agricultural household models, the assumption of homogeneous commodities allows a single price to be imputed to a commodity in the household whether it is a net seller of these units or not. Such imputation is doubtful, however, if attributes of output commodities are not perfectly observed. Because such attributes are presumed to be observable in the standard neoclassical model, the smaller the price wedge from the idealized model, the more efficient the market.

What distinguishes equation (2) from the standard neoclassical paradigm is the inclusion of μ_i in the demand equation. Without this uncertainty, the wedge will not be observed. Nevertheless, if the institutions are expected to minimize the costs of transacting, then these institutions determine the level of μ_i. The price wedge will be greater if the institutional structure allows marketing agencies to influence of the uncertainty of attributes that are in the utility of the buyer. Hence, we can alternatively define and specify the wedge between the selling and buying prices as:

$$T_i = P^{b_i} - P^{s_i} = F(I_i) = \alpha + \sum \beta_i I_i \qquad \textbf{(3)}$$

where I_i refers to the institutions or the markets found in each village i.

In this framework, the coefficient β_i, measures the degree with which these institutions are able to affect the price wedge. Higher β_i 's imply the institution's limited scope in minimizing transaction costs, and lower or negative β_i's suggest the efficiency of the institution in reducing such costs.

These coefficients (β_i) can be used as indices for transaction costs for each village in the labor supply and wage analysis. The institutional structures that affect the rice market are the same structures that determine the exchanges in the labor market. In this sense, these institutions perform the same role in both markets, i.e., reducing or increasing the degree of uncertainty in production that results in transaction costs.

III. Transaction Costs, Labor Market Participation and Earnings

Because of worker heterogeneity, uncertainties in production and high costs of supervision, a wedge can exist between the hiring out and hiring in wages in the labor market. As in the rice market, this wedge breaks the

separability of consumption and production decisions for the household. In a separable model, the assumption of labor homogeneity allows market wages to be imputed to all workers in the household whether it is a net seller of labor units or not. Because of this, production decisions, such as labor demand, are made independently of consumption and leisure decisions. However, such imputation is not valid in a model with transaction costs since hired and household labor are not perfectly substitutable. Hence, the factors affecting leisure and other consumption decisions also determine production.

Labor heterogeneity may be due to technical differences in marginal productivity among different types of labor. For instance, Rosenzweig and Wolpin (1985) argue that experience in farming a particular household plot has productivity payoffs given variations in micro production environments, but there may be no such returns to experience in the labor market. Thus, on-farm labor is perceived to be more productive than hired labor.

Even without differences in labor qualities, hired and household labor are imperfectly substitutable because of higher costs of supervising hired labor, associated with the incentive problems in fixed wage contracts. Eswaran and Kotwal (1985) observe that the tasks given to the hired and household workers are not necessarily the same. Household and permanent laborers are assigned important tasks that involve considerable care and judgment, and do not lend itself to easy supervision.[2] On the other hand, hired casual workers are allocated to tasks that are routine and menial. Since they involve little discretion, productivity can be gauged from the extent of the worker's physical activity. The moral hazard problems in the exchange of labor then give rise to imperfect substitutability between household and hired labor.

Labor heterogeneity then leads to nonseparability if markets are unable to distinguish differences in worker productivity, making it difficult to establish individual wages for each worker. Thus, a necessary assumption for nonseparability is the presence of market imperfections (Singh, Squire and Strauss, 1986; Binswanger and Rosenzweig, 1986). As Strauss (1986) and Jacoby (1993) noted, households may supply all of their labor requirements, and no hired labor is used. If no market for hired labor exists, the equilibrium household labor demand

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[2]Although permanent labor arrangements are found in the Philippines, these are seldom employed, except perhaps in areas where the land reform program is strictly enforced (see Hayami and Otsuka, 1989) . Along with benefits such as free board and lodging, permanent laborers are paid a fixed sum or share of output or a combination of both. In most cases, these permanent laborers would be relatives of employers and be usually identified as househol d members.

is determined by the equality of the marginal revenue product of labor and the household's marginal rate of substitution between leisure and income. In effect, production decisions are no longer independent of consumption decisions.

However, even if markets for different types of labor are present, households may still be constrained from participating in the labor market. This can be due to transaction costs which here refer simply to difficulties in seeking and observing working quality as well as enforcement costs encountered in wage labor contracts.[3] Such transaction costs give rise to long-term, and usually share-rate, contracts or greater employment of household labor that seek to ensure efficient employment.[4]

Adopting from the model due to Evenson and Roumasset (1986), Figure 1 depicts the wedge between hiring wage (W_h) and selling wage (W_s) owing to transaction costs in the labor market. Because of transaction costs, the effective price of labor is bounded by how much the household must pay to hire and monitor labor (its hiring wage) and how much it can earn outside the labor markets (its selling wage). If training, monitoring, supervision and transportation costs are considered, the deviation between the hiring and selling wages can indeed be large.

In this setting, the equilibrium for household labor, L^*, is determined at the point where household labor supply, which is determined by the household's marginal rate of substitution between labor and income (MRS_{ly}), intersects the household labor demand schedule which is measured by the marginal revenue product of labor (MRP_l). Note that given high transaction costs, the household will not value its household labor equal to the market wage. The household will find it too costly to sell or buy labor, and at the equilibrium, will be self-sufficient in labor.

If the MRS_{ly} is shifted to MRS', as in the case of a household with large landholdings, the household will hire labor at the wage W_h. This is because the self-sufficient shadow wage is greater than the prevailing buying price of labor, W_h. However, if the MRS_{ly} is shifted rightward to MRS", as in the case of families with small landholdings,

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[3]There are two other cases of transaction costs that are not considered here. The first possibility pointed out by Sicular (1986) is presence of institutional constraints imposed by the government. The second refers to situations in completely subsistent agriculture where households produce goods entirely consumed by themselves (the Z goods), resulting to a corner solution or a separation between household and hired labor. Lopez (1986) provides a more general shadow wage model where the household has different utility preferences between household and hired labor.

[4]In this paper, we only consider pure labor contracts. Several studies have indicated that contracts that involve both land and labor are common in agricultural contracts. While the issues here may be relevant to these labor arrangements interlinked with other factors, we limit our discussion to the labor issues (See Bardhan, 1984, for a discussion on interlocking contracts).

the household supplies labor services to the market and receives W_s. The self-sufficient shadow wage is less than the net selling price for labor services, W_s.

The above analysis leads to several implications. First, even if there is no inherent advantage in household labor in terms of productivity relative to hired labor, high transaction costs will induce farms towards self-sufficiency. The reason is that the costs of hiring a family worker will exclude the transaction costs of seeking and maintaining workers in a non-household job.[5] When transaction costs rise, the wedge gets larger and the probability of self-sufficiency rises.

Second, labor in high transaction costs and poor areas will be supplied usually at the lower wage bound, W_s. Given imperfect information of the hired worker's quality, labor contracts may be incomplete and subject to continuous renegotiation. Any party is reluctant to invest in the contract for fear that the other party is going renege on its obligations and expropriate any residual returns from the arrangement. Hired labor will then consists mostly of workers who have a lower opportunity cost of time or reservation wages (represented by MRS"). Demand is limited only to workers who accept lower wage for every level of labor and are assigned mostly to menial and low productive jobs. Those with higher reservation wages will usually be employed as household or permanent workers who are given the more difficult but more lucrative jobs. However, even for permanent laborers, there may be difficulty in evaluating and disciplining these workers. Hence, labor productivity and wages may be lower in these high transaction costs areas, regardless of the type of labor.[6]

Finally, in cases where a number of relation-specific arrangements exist due to transaction costs and incomes are low, gender differences may be relevant in determining wages. Foster and Rosenzweig (1994) showed evidence

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[5] Ben-Porath (1980,p. 3) sees the employment of household labor as a possible response to difficulties or transaction costs found in the labor market. Given significant transaction costs, a shift from participation in the labor market to household enterprise leads to a reduction in the expense of writing a contract and the expense of executing it effectively. Household structures can thus supplant the wage market in situations when the identity of the worker is unknown. The choice between the modes of transacting is part of the optimization problem.

Pollak (1985) also suggests that transaction costs may be minimized by household extra-economic relationships. He notes that the advantages of a household organization are magnified in more traditional societies. In pre-modern sectors where non-household members are not expected to perform reliably and where technology is fairly easy to master, household governance are expected to predominate. In household relationships, problems of negotiating, monitoring and enforcing contracts are thus mitigated.

[6]Contractual incompleteness sets the stage for performance problems that may arise even in cost-minimizing arrangements. Asymmetric information about the inputs and outputs between workers and employers may exists, leading to principal-agent problems when it is costly to verify the state of nature and the performance of parties in a contractual relationship.

that in the absence of information concerning the worker's quality, employment will be based on what employers perceive to be valuable characteristics, making the wages subject to "taste discrimination". For example, the males with more exposure may often be assigned to higher wage contracts since employers may have preference for their abilities, given information problems. One can expect females with lesser labor market experience either to be rationed out of these labor markets, causing lesser market participation, or more likely to be engaged in lower wage activities.

Moreover, given the females' limited exposure in the labor market, information about their productivity will be less precise. Employers will place a higher premium on individuals with more experience. This makes it difficult for the less experienced to obtain the full returns from the human capital investments.

IV. Data and Empirical Strategy

This study uses the Bicol Survey (BMS) conducted in 1994. The survey covers several economic and geographic units in Camarines Sur, the main province of the Bicol Region of the Philippines, regarded as the poorest region in the country. In 1994, while economic conditions in the country have somehow improved, Bicol continued to have the lowest per capita Gross Domestic Product and the highest poverty incidence in the country. A number of the villages in the region are situated in the Bicol River Basin, where adequate water supply is available throughout the year. However, most of the terrain is mountainous, with a limited amount of irrigation. These areas are generally inaccessible and isolated.

The survey contains information on household assets, individual and community variables. The sample consists of 59 villages (or *barangays*) comprising of 691 households. Of the sample village clusters, 40 are located in rural areas, nine are in towns and 10 are in cities. In contrast to rural areas and cities, towns are semi-urban places, because mainly of its proximity to a key market or commercial center, or the so-called *poblacion*.

The crucial task is to derive a transaction costs index for each barangay as shown in equation (3). To do this, we pooled a subsample of households who reported different buying and selling prices for rice. This is fairly common in the rural areas and towns where households are engaged in rice farming and at the same time procure rice in village markets. The common practice in these areas is to produce rice and sell to millers or marketing agents.[7] The data will

[7]In some cases, households will store part of their produce that they will later sell to millers. In fewer cases, using crude technology, some households mill their own rice for their own consumption.

thus be restricted to the either rural areas or towns since households in cities, even if they own farms, are not directly involved in farming.

Since institutions, as defined, are unobservable, what is proposed is to use village dummies as instruments. To the extent that the village characteristics determine the institutions, these dummy variables will be correlated with the prevailing institutions in the areas. To test whether these variables represent the general characteristics of the villages, instead of any other particular household or distinctive village feature that affect production and demand, we shall perform regressions of the same price wedges using specific household and village variables. A comparison of the results will indicate whether village dummies are capturing the effects of general village characteristics and not any particular feature of the village or the households.

If valid, the resulting coefficients in the previous regression with village dummies will then be used as transaction costs indices, and incorporate them in analyzing labor decisions and wages. For this purpose, we use the two-stage Heckman (1979) procedure that is standard in labor supply and earnings analyses. Based on this framework, the reduced-form wage labor participation probability and (logarithmic) wage equations to be estimated are respectively as follows:

Prob(Y=wage earner)=f(Human Capital, Household Assets, Distance, Transaction Costs Index)

Log (Wage) = g(Experience, Experience Squared, Schooling, Selectivity term, **(4)**

Transaction Cost Index, Worker Origin)

Given the available data, the above variables are defined as follows:

1. Human Capital. Human capital refers to education and potential experience measured by age. Higher education is expected to result in higher rewards for the worker, leading to a greater propensity to participate in the wage labor market (Becker, 1993). Education is defined as the number of completed schooling years. These are assumed to capture the skills the individual may bring to a given job in the wage market. Greater experience, indicated by age, is expected to result in a greater tendency to participate, but older persons are less likely to work in the wage market because of diminishing returns of experience. To control for these effects, dummy variables are included for persons with ages between 10 and 19, between 20 to 29 years, and between 30 to 39.

2. Household Assets. Studies (e.g., Evenson and Binswanger, 1984) have shown that agricultural household assets and resources lead to greater demand for household labor. The effects of ownership of productive assets, such

as land and the amount of irrigated land, on wage labor participation are expected to be negative as demand for household labor increases.

Labor participation can be determined by the market value of the house and the household's nonwage income. These variables indicate the household's relative wealth that positively affects higher reservation wages and may lead to lower participation in the labor market. Further, because of possible interactions between household assets and education, interaction terms between schooling and these assets are also included in the regression.

3. Distances and Worker Residence. Household distances from key markets capture the opportunities available to a worker. The variables included here are the distance of the house from the poblacion and the worker's residence. Residing in rural areas and living in areas away from markets can indicate perhaps lower level of wage opportunities and less employment in hired labor markets. On the other hand, residing close to urban, commercial areas may imply substantial income effects, thereby also leading to more leisure and less participation in wage market activities.

4. Transactions Cost Index. This refers to the coefficients derived from the price wedge regressions. Conditional on the worker’s reservation wages, greater transaction costs should imply lesser participation in the wage labor market since individual members are induced to work in their own farms, work in domestic household activities or even stay unemployed.

For the wage equation, the independent variables include the standard Mincerian wage function variables, i.e., potential labor market experience, and years of schooling for education (see Willis, 1986, for a survey). Potential experience is measured by the difference of the worker's working age and the age of school completion. In addition, the transaction costs index will be incorporated since these measure differences in social investments that affect worker quality across villages. As hypothesized above, workers employed in high transaction costs environments are allocated in lower paying jobs, requiring less supervision and monitoring. Moreover, because of the wedge between hiring and selling wages, only workers with lower opportunity cots of time would be willing to work in these high transaction costs conditions.

A further insight can also be gained by comparing estimates with and without transaction costs. If differences are observed between these two estimates, one can determine how much transaction costs affect the returns to either experience and schooling. In particular, if experience is given a higher premium than education in higher transaction costs areas, one will expect a positive covariance between experience and transaction costs for data with reported

wages. This results in a higher return for experience in the estimates without transaction costs. On the other hand, assuming that experience is less preferred than education, then a negative covariance between education and transactions costs will be present, making the returns to education lower in estimates omitting transaction costs.

A sample selection term based on the labor participation estimates is included in order to correct for possible sample selection biases (Heckman, 1979). This variable is determined by the probability that the person will enter the market and subsequently the types of abilities and motivation he or she brings into the wage job. A statistically significant positive selectivity term indicates that the worker has comparative advantage in these wage activities, thereby resulting in greater productivity and earnings.[8]

Worker origin, that is, whether he originates from the rural or the urban areas, is included since these may also be indicators of worker quality. Moreover, the interaction of worker origin and transaction costs can be determined with the inclusion of the former.

V. Results of the Econometric Analysis

Table 1 shows the results of the price wedge estimates using village dummy variables as regressors. In order to provide structure to the analysis, we arranged the villages by their integrated development area (IDA) numbers. In 1972, in course of a comprehensive regional project, the government divided the region into several integrated development areas. These areas which exhibit similar characteristics and conditions were assigned the same number. The lower numbered areas are in the Bicol River Basin, and are generally those areas where the development projects were mostly implemented. As the IDA number increases, the areas become less accessible, more mountainous and less developed.

The results show that the first three IDAs all have negative coefficients, indicating lower transaction costs relative to the other villages. As we move along to the higher numbered areas, positive coefficients and relatively higher transaction costs become evident. In particular, the most significantly positive coefficients are found for Sabang, del Gallego and Liboro, Ragay which are located in the northwestern part of the region and are believed to be hardly accessible. Furthermore, it can be noted that not all towns (indicated as "Pob.") have negative coefficients.

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[8]A previous study on the same data set has shown that migration decisions introduce significant sample selection bias on the wage estimates (see Lanzona, 1997). However, because information on the transaction costs index is tested only for 1994, we limit our analysis only to those who have remained in the village in this particular year. Hence, th e results will apply to those who have remained in the particular villages, and not to the population born in these areas.

Nevertheless, the significant coefficients for these towns are seen to be negative (i.e., San Roque, Calabanga, and Del Pilar, San Fernando).

These results suggest that the more accessible and urbanized areas, identified with greater water supply and more modern technology, tend to have lesser transaction costs. Also, in areas where substantial government projects are concentrated and markets are generally active, the costs of engaging in markets are seen to be lower.

In Table 2, we regress the same price wedge variable on specific household and village variables to determine if the previous estimates are capturing general village features, and not particular characteristics of the household and villages. Note that the results here show that only total land area has a significantly robust sign in the equations suggesting that households with greater land ownership have greater transaction costs. This finding is actually surprising because the households with more land are expected to have enough resources to minimize transaction costs. In this case, owning land may be correlated with some factor that increases transactions as well as the costs of minimizing them. In any case, whatever the reasons may be, the results show that the price wedges cannot be attributed to particular village or household characteristic but to the general village conditions, as instrumented by the village dummies.

Table 3 provides the means and standard deviation of the variables that will be used in analyzing the effects of transaction costs on the labor market supply, subdivided into rural and poblacion areas. The following points are noteworthy: First, while the overall wage market participation rates are similar for the two areas, the men in the towns seem to be less engaged in wage activities than those in the rural areas while the opposite is true for the women. In rural areas, 14 percent of the sample women is engaged in wage work, while only 16 percent is recorded for towns. Second, wages in the towns are also substantially higher than in the rural areas. Relative to the men, the wages for women are also observed to be lower in both areas. Third, the sample in the rural areas tends to be younger and have lesser education than the towns. Women are also noted to have higher education than the men. Fourth, as expected, the rural areas have lower nonwage income and market value of houses. Moreover, while the amount of owned land is roughly the same for each area, the percentage of irrigated land is also higher for those residing in the towns. Finally, as expected, the distance from the poblacion is smaller in the towns than in the rural areas. More importantly, the average level of transaction costs is lower in the towns than in the rural areas.

Table 4 presents the probit estimates of labor participation with and without the transaction costs index. The coefficients measure the effects of each independent variable on the probability of participating in the wage labor market. The results all support the expected signs based on labor supply theory. That is, higher education, greater experience, higher household assets, and proximity to markets lead to greater wage labor market participation. The men in towns are also observed to engage less in wage activities due perhaps to income effects from residing close to markets and commercial centers.

The important result in this table is the observed effect of transaction costs. Greater transaction costs lead to lower participation in the wage labor market. The magnitude of the effects is also observed to be larger than the effect of land area owned. Considering that land ownership is found to be a crucial factor of wage labor participation in most studies, this finding denotes the importance of transaction costs in labor supply decisions. Moreover, with higher transaction costs, the decrease in the probability to engage in labor markets is slightly higher for females than for males, implying that females have slightly lesser propensity to participate in wage activities in high transaction costs environments.

Comparing the sets of estimates with and without transaction costs, three points are noteworthy. First, individuals with ages between 21 to 29 are shown to have a higher probability of reporting a wage when the transaction costs index is omitted. This is perhaps due to negative covariance between experience and transaction costs which in turn results to a greater labor market participation of this age group in the areas with high transaction costs. Second, for women, owning more irrigated areas lead to a lower probability to work in the market in the estimates with the index. This suggests that higher irrigation is negatively related to transactions costs, causing the women to more engaged in the labor market in these conditions. Finally, men residing farther from poblacions and originating in rural areas are observed to have lower probability to work in the estimates without transaction costs. These findings further support the hypothesis that transaction costs tend to be greater in the rural areas and those far from the poblacion.

Tables 5A and 5B feature the wage estimates for men and women, respectively. Three specifications are presented: the first is the standard Mincer equation with the sample selectivity control term; the second has the transaction costs index; and the third incorporates the worker origin.

For both males and females, education and experience have significant positive returns. Sample selection bias is also not observed, given an insignificant selectivity control term. The key result here is again the inclusion of

transaction costs index in the model. As expected, wages in high transaction cost areas are lower than the population mean, conditional on the observables and the selectivity term. This measures the inefficiencies resulting from worker heterogeneity and information problems as workers may be misallocated to tasks and sectors. Note that the effect of transaction costs is seen to be as much twice the effect of education on the estimates for women. For the males, however, the effect of transaction costs is taken away with the inclusion of worker origin. This suggests that a substantial and significant covariance exist between rural areas and transactions costs.

The effect of transaction costs environments is greater and more robust for women. This is consistent with the hypothesis that women may be less preferred by employers in high transaction costs areas and hence assigned to lower earning activities. In high transaction costs environments, females may be perceived to have lesser productivity than males, conditional on the characteristics observed by employers.

Furthermore, biases can be noted in the estimated returns to education and experience for both males and females. In estimates without the transaction costs index, returns to experience for women tend to be higher, but education is lower than those found in the estimates with the index. While no substantial difference is found in the returns to experience for the males, a higher return to education is found in the estimate without the transaction costs index. These findings suggest that women's experience is given a high premium in the high transaction costs areas. More importantly, in environments with greater transaction costs, males tend to overcompensated for their education, while educated women do not capture the full returns of their schooling investments.

VI. Conclusion

The empirical results provide evidence that transaction costs have significant adverse effects on labor productivity and wages. Using price wedges in the buying and selling of rice, transaction costs indices were estimated for each village in the data. As measured by these indices, transaction costs are then observed to reduce substantially wage labor market participation and earnings in the areas considered.

The presence of transaction costs has several consequences to income distribution. First, because household labor is not affected by high transaction costs, only the hired laborers receive lower earnings as a result of these problems. The continued presence of these transaction costs and its consequences on incentives will keep these hired workers at their lower income status. While economic progress is expected to improve the welfare of everyone, growth that is capital- or land-based may not necessarily benefit landless households which comprise the majority of

hired workers. Hence, unless output is stabilized and information problems resolved, changes resulting from technical innovations, say, modern varieties and mechanization, may only affect the households with land, thereby further aggravating the income inequality. Second, the rural areas, given its significant correlation to high transactions costs, will most likely experience lower incomes than the other villages. This interregional inequality will prevail as long as transaction costs exist. Third, income distribution across gender is also seen to be aggravated by transaction costs. Because of their limited exposure to labor markets, women are (mis)allocated to lower earning jobs and sectors.

Policies can serve to reduce the transaction costs particularly in the labor market in two ways. The government can directly change existing institutions by allowing for an environment that allows easier access to greater market activities. This will include improvement in infrastructure and providing valuable information on prices and wages to farmers. Encouraging greater worker mobility between villages through better transportation and information will also limit the hiring costs of employers and increase the number of workers that can be hired.

The government can simultaneously promote a technology that leads to better monitoring and supervision of workers. One way of doing this is to adopt techniques that can reduce uncertainty in production, e.g., improved water control or adequate supply of chemical inputs. The institution of research centers in strategic areas can be an important policy in stabilizing production. Once output stability is achieved, the individual productivities may be easily inferred.

Nevertheless, it has to be pointed out that information problems can only be reduced and not totally expunged. Eventually, a country's economic development that emphasizes formal schooling, that in turn leads to longer-term labor contracts, can be the most important policy towards mitigating information problems. In the meantime, however, certain interventions for the purpose of equity, e.g., agrarian reform and schooling subsidies, can be justified, in the light of these information problems, as a way of overcoming the inefficiencies brought about by transaction costs.

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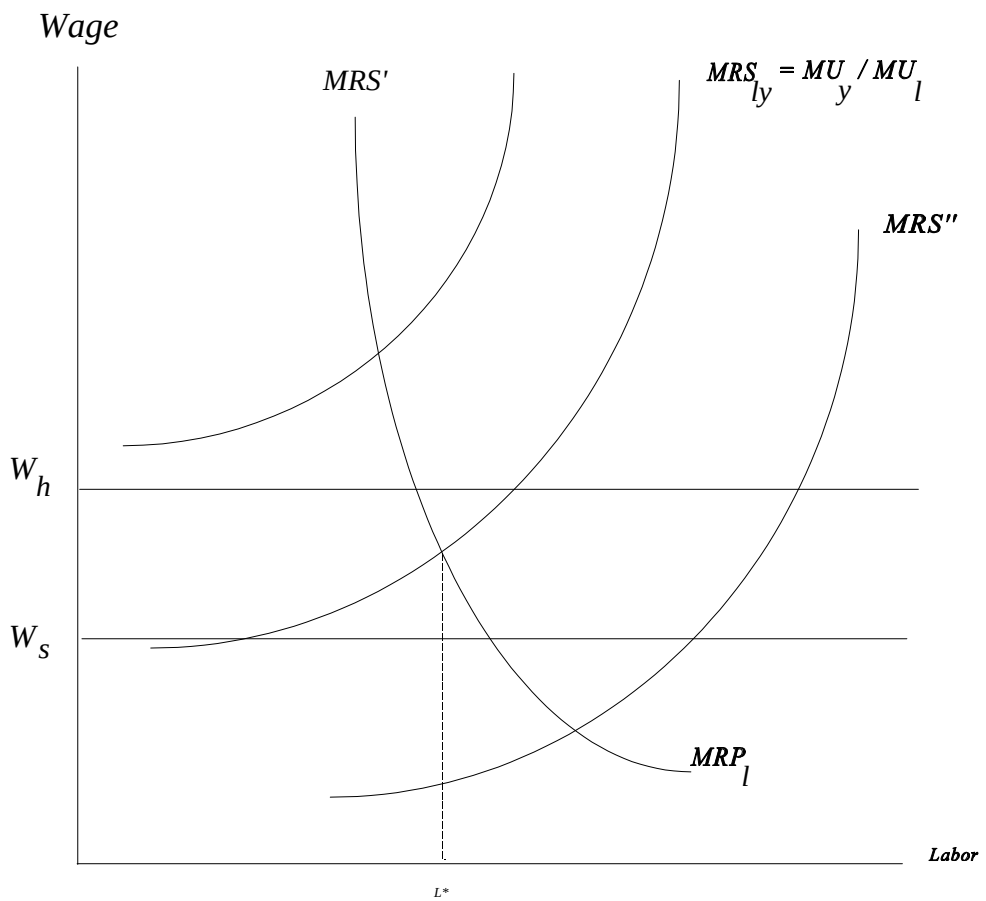

Figure 1. Transaction Costs and Labor Employment

Table 1. Price Wedge Estimates, Using Barangay Dummies

Intercept	8.1765**
	(35.62)
IDA no. 10	
Bigajo Norte, Libmanan	-.0098
	(0.02)
Handong, Libmanan	-0.2181
	(0.49)
Libod #2, Libmanan (Pob.)	-0.1765
	(0.25)
Barcelonita, Cabusao	-0.6765
	(0.70)
IDA no. 21	
San Ramon, Bula	-0.7452*
	(1.84)
Baliuag Viejo, Minalabac	-1.3556**
	(3.80)
Sagrada Familia, Minalabac	-1.1681**
	(2.60)
San Jose, Minalabac	-0.5401
	(1.48)
IDA no. 22	
Sto. Nino, Pili	-0.8265
	(1.57)
Sagrada, Pili	-0.7015*
	(1.73)
San Agustin, Pili	-1.0015**
	(2.81)
Hanawan, Ocampo	-0.5765
	(1.36)
IDA no. 30	
Salvacion, Bato	-0.0765
	(0.16)
Buluang, Bato	0.1569
	(0.27)
San Cayetano, Agdangan, Baao	-0.3431
	(0.76)
Sagrada, Baao	-0.7527*
	(1.77)
IDA no. 41	
Palo, Canaman	0.7535
	(1.57)
San Juan, Canaman	0.0506
	(0.14)
San Roque, Camaligan	-0.2765
	(0.28)
San Roque, Clabanga (Pob.)	-1.0365**
	(2.15)
San Roque, Bonbon	-0.1765
	(0.3)

(Cont.)	
IDA no. 42	
Balombon, Calabanga	0.1235
	(0.28)
Antipolo, Tinambac	-0.2565
	(0.68)
Magsaysay Complex, Tinambac	0.8235
	(0.85)
IDA no. 51	
Flordeliz, Milaor	-1.3665**
	(3.62)
Cagbunga, Gainza	-0.4479
	(1.05)
Duang Niog, Libmanan	0.5435
	(1.13)
San Isidro, Libmanan	-1.2365**
	(2.57)
Del Rosario, Pamplona	-0.4154
	(1.07)
Del Pilar, San Fernando (Pob.)	-0.7598*
	(1.69)
IDA no. 52	
Bagolatao, Minalabac	-0.1765
	(0.25)
Odicon, Pasacao	-0.1765
	(0.25)
Sta. Rosa del Norte, Pasacao (Pob.)	-1.1765
	(1.21)
IDA no. 80	
Sabang, Del Gallego	1.3902**
	(2.35)
Liboro, Ragay	1.2235*
	(1.73)
IDA no. 90	
Mabca, Sangay	-0.7723**
	(2.16)
Del Carmen, Sangay (Pob.)	0.2735
	(0.39)
Calalahan, San Jose	-0.5765
	(1.36)

Mean of Dependent Variable: 7.711
Adj. R-Square 0.17
F-test 2.29
No. of Observations 233
Notes: The figures in parenteses are t-statistics. **, * refer to 5% and 10% levels of significance, respectively.

Table 2. Price Wedge Estimates, Using Household and Village Variables

	(1)	(2)	(3)
Intercept	7.6417**	7.8290**	7.6634**
	(46.04)	(21.96)	(19.02)
Household Variables			
Total Land Area Owned	0.0715**		0.0506**
	(3.02)		(2.00)
Irrigated Land	-0.1463**		-0.0813
	(2.48)		(1.31)
Non-wage income	-0.3700		-0.3236
	(0.53)		(0.45)
Remittances	-0.3537		-0.3600
	(0.91)		(0.92)
Education of Father	-0.0164		-0.0284
	(0.53)		(0.91)
Education of Mother	0.0270		0.0405
	(0.88)		(1.30)
Village Variables			
Total Irrigated Area in Village		-0.0011	-0.0011
		(1.02)	(1.00)
Total Rice Area in Village		-0.0007	-0.0005
		(0.68)	(0.54)
Distance from Poblacion		0.0213*	0.0143
		(1.70)	(1.10)
Modern Varieties		-0.1113	-0.0957
		(0.62)	(0.53)
Availability of Agricultural Extension		-0.0943	-0.0392
		(0.51)	(0.21)
Price of Fertilizer		0.0003	0.0006
		(0.13)	(0.32)
Mean of Dependent Variable: 7.711			
Adj. R-square	0.03	0.05	0.05
F-test	2.14	2.85	1.99
Number of Observations	233	233	233

See notes in Table 1.

Table 3: Means and Standard Deviations of Variables

	Rural		Towns	
	Males	Females	Males	Females
Labor Participation	0.2548	0.1406	0.2069	0.1613
	(0.44)	(0.35)	(0.41)	(0.37)
Reported Daily Wage Rate	82.33	74.85	164.71	122.15
	(51.14)	(95.24)	(130.83)	(120.30)
Age dummies:				
Between 10 to 19	0.1821	0.1596	0.0690	0.1290
	(0.39)	(0.37)	(0.25)	(0.34)
Between 20 to 29	0.2040	0.1948	0.1552	0.1694
	(0.40)	(0.40)	(0.36)	(0.38)
Between 30 to 39	0.1270	0.1235	0.1552	0.1290
	(0.33)	(0.33)	(0.36)	(0.34)
Years of Schooling	5.5324	5.7108	6.9655	7.3387
	(3.57)	(3.90)	(4.26)	(4.27)
Non-wage Income / 10,000	0.1074	0.1198	0.6983	0.8623
	(0.60)	(0.71)	(1.61)	(1.90)
Schooling*Nonwage Income/10,000	0.7533	0.8825	6.9438	7.7696
	(5.33)	(6.18)	(17.48)	(19.35)
Value of the house / 10,000	3.5266	3.5977	7.2009	9.6149
	(9.59)	(9.37)	(9.92)	(12.71)
Land Area Owned	1.4013	1.4719	1.3888	1.6185
	(2.62)	(2.88)	(2.70)	(2.57)
Land Area Irrigated	0.3690	0.3700	0.4552	0.8645
	(0.88)	(0.89)	(1.28)	(1.89)
Distance from Poblacion	5.9232	6.1736	2.0523	1.8058
	(6.61)	(6.98)	(6.69)	(6.44)
Transaction Costs Index	-0.2868	-0.3147	-0.6244	-0.5740
	(0.71)	(0.67)	(0.49)	(0.50)
N	1142	996	116	124

Note: Figures in parentheses are standard deviations.

Table 4: Wage Labor Participation: Probit Estimates

	Estimates without Transaction Costs		Estimates with Transaction Costs	
	Males	Females	Males	Females
Constant	-1.3670**	-1.4378**	-1.4404**	-1.5293**
	(7.96)	(7.73)	(8.18)	(7.91)
Human Capital				
Age dummies:				
Between 10 to 19	0.2188**	0.0542	0.2112*	0.0281
	(1.98)	(0.37)	(1.90)	(0.19)
Between 20 to 29	0.2788**	0.2617**	0.2683**	0.2423*
	(2.64)	(2.05)	(2.53)	(1.88)
Between 30 to 39	0.0949	-0.0092	0.0933	-0.0117
	(0.74)	(0.06)	(0.72)	(0.08)
Years of Schooling	0.0902**	0.0856**	0.0905**	0.0868**
	(7.32)	(6.12)	(7.33)	(6.17)
Household Assets and Interactions				
Non-wage Income / 10,000	-0.5038*	-0.6037*	-0.5110*	-0.5792
	(1.89)	(1.69)	(1.88)	(1.62)
Schooling*Nonwage Income	0.0570**	0.0573**	0.0577**	0.0556**
	(2.58)	(2.07)	(2.57)	(2.00)
Value of the house / 10,000	-0.0166**	-0.0235**	-0.0172**	-0.0236**
	(2.59)	(2.31)	(2.68)	(2.32)
Land Area Owned	-0.1050**	-0.0309	-0.1055**	-0.0297
	(3.91)	(1.31)	(3.89)	(1.25)
Land Area Irrigated	-0.0682	-0.1011	-0.0924	-0.1224*
	(1.22)	(1.59)	(1.60)	(1.86)
Distance and Worker Origin				
Distance from Poblacion	-0.0146**	-0.0124	-0.0132*	-0.0094
	(2.03)	(1.51)	(1.80)	(1.11)
Worker Origin, rural=1	0.3339**	-0.0430	0.3724**	-0.0155
	(2.17)	(0.27)	(2.40)	(0.10)
Transaction Costs Index	-	-	-0.1226**	-0.1496*
			(2.01)	(1.80)
Log-Likelihood	-642.49	-418.13	-640.45	-416.47
Restricted (Slopes=0) Log-L.	-707.97	-459.33	-707.97	-459.33
Chi-Squared (11)	130.95	82.39	135.03	85.72
Significance Level	0.00	0.00	0.00	0.00
N	1258	1120	1258	1120

See notes in Table 1.

Table 5A. Wage Estimates for Males

	(1)	(2)	(3)
Constant	3.2595**	3.2408**	3.7997**
	(13.16)	(13.16)	(13.11)
Experience	0.0308**	0.0305**	0.0311**
	(5.32)	(5.32)	(5.54)
Experience Squared/100	-0.0450**	-0.0446**	-0.0464**
	(4.66)	(4.63)	(4.90)
Years of Schooling	0.0823**	0.0821**	0.0704**
	(6.07)	(6.18)	(5.24)
Lambda	0.1191	0.1129	0.0033
	(0.75)	(0.73)	(0.02)
Transaction Costs Index	-	-0.0745*	-0.0487
		(1.68)	(1.14)
Rural	-	-	-0.3683**
			(3.15)
Adjusted R-sq	0.1867	0.1905	0.2119
F-test	19.31	16.02	15.30
N	320		

Table 5B. Wage Estimates for Females

	(1)	(2)	(3)
Constant	2.2194**	2.0081**	2.0904**
	(4.06)	(3.44)	(3.58)
Experience	0.0440**	0.0435**	0.0434**
	(4.06)	(4.04)	(3.96)
Experience Squared/100	-0.0666**	-0.0644**	-0.0655**
	(3.35)	(3.27)	(3.30)
Years of Schooling	0.1379**	0.1441**	0.1447**
	(5.98)	(6.09)	(6.00)
Lambda	0.1895	0.2268	0.2789
	(0.67)	(0.78)	(0.94)
Transaction Costs Index	-	-0.2303**	-0.1916**
		(2.20)	(2.05)
Rural	-	-	-0.1554
			(0.91)
Adjusted R-sq	0.3043	0.3208	0.3209
F-test	19.25	16.78	14.15
N	168		

See notes in Table 1.