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THE EFFECT OF CREDIT ON OUTPUT: ARE THERE SECTORAL DIFFERENCES?

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Abstract

The urban bias in Philippine development policies is posited to have penalized the growth of rural manufacturing enterprises. On the other hand, trading and service activities have been driving the development process in rural areas, given that agriculture's performance has been less than desirable during the past decade. Under this scenario, there appears to be reasonable grounds for questioning the continued bias of formal financial institutions toward the manufacturing sector. This paper investigates the existence of sectoral differences in the effect of borrowing by rural manufacturing and nonmanufacturing enterprises in the Visayas Region of the Philippines.

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I. Introduction

Rural nonfarm enterprises and their role in development have been gaining attention among development practitioners. The emergence of the educated unemployed, the increase in unemployment in urban areas, and the structural imbalance in growth and incomes between rural and urban areas are contributing to a new interest in rural nonfarm activities. It is widely believed that rural nonfarm enterprises can play a major role in shaping an alternative development strategy with more desirable employment and distributive consequences than concentrated industrialization and modern agriculture can offer [CIDA 1989)]. Ranis and Stewart (1990) show that linkages between the farm and nonfarm sectors can potentially generate balanced growth in rural areas to complement efficient urban industrialization. Empirical evidence from East Asia [Ranis and Stewart (1990), Ho (1980)] and Africa [Helmsing and Kolstee (1993)] strongly support this view. The recognition of the importance of these linkages is particularly significant in developing economies where unemployment is high, and where urban-rural migration occurs as a response to disparities in income-earning opportunities. From 30 to 50 percent of the rural labor force is engaged in nonfarm activities in most developing countries, making the sector a significant employer of labor in the rural areas [for example, see Islam (1987) for empirical studies on Asia].

The recognition of the potential role of rural nonfarm enterprises in development and the perception that they experience great problems accessing credit markets have led to the proliferation of special credit programs to support the development of the sector [Liedholm and Mead (1987), Boomgard (1989), Levitsky (1989), Otero (1989), and Webster (1989)]. The underlying rationale for the use of credit policy to promote the sector is based on the belief that greater accessibility to finance will allow rural entrepreneurs to more fully exploit market opportunities, to improve productive efficiency through the use of optimal input combinations, and to increase output. The added liquidity obtained from credit may also allow these entrepreneurs to purchase a new technological package, thereby shifting their production frontier to a higher level. The availability of credit may contribute to greater consumption, and, simultaneous with greater purchased input use, may increase welfare [Feder et al. (1990)].

Donor-financed credit programs for rural nonfarm enterprises have traditionally focused on the manufacturing sector, with less emphasis placed on trading and service activities. For example, the enterprise credit projects supported by the United States Agency for International Development (USAID) have serviced mostly enterprises engaged in manufacturing activities [Liedholm and Mead (1987)]. Among World Bank financed projects in Asia, Latin America, and

Africa, a majority of the recipients of the funds disbursed were enterprises engaged in metal products, food processing, and textiles and garments [Webster (1989)]. A review of the European Investment Bank's lending programs for small enterprises also revealed a bias toward the manufacturing sector [Carter et al. (1989)]. Only very recently has the donor community recognized the value of including non-manufacturing activities in their list of projects eligible for funding [Meyer (1991)].[1]

This traditional bias of donor credit programs towards rural nonfarm manufacturing enterprises can be traced in part to the influence of the East Asian, and especially the Taiwanese, experience of rural-based industrialization characterized by the preponderance of small-scale, labor-intensive factories in rural areas. Rural industries were significant participants in Taiwan's export-led growth that exported manufactured products with a high unskilled-labor content during the initial years, and subsequently shifted toward more skill- and capital-intensive products with the accumulation of human and physical capital [Bautista (1991)]. The growth of rural industry that spurred Taiwan's economic development has also been accompanied by an improvement in income distribution, as evidenced by the declining Gini coefficient estimates.[2]

The remarkable performance of Taiwan and other East Asian economies can be attributed to one common characteristic: economic growth is a consequence of the agriculture-led, labor-intensive, and decentralized development process that was greatly facilitated by the growth of rural manufacturing enterprises [Bautista (1991)]. This presents a strong case for promoting the growth of manufacturing activities among rural nonfarm enterprises. Note, however, that the precondition of a decentralized development process requires a more equitable distribution of income gains from growth and a spread of economic activity as a result of a more egalitarian set of policies. Without these conditions, the role of manufacturing enterprises in promoting rural development and sustained economic growth may become less important. Indeed, this is clearly evident in the experience of the Philippines. Manufacturing has continually accounted for a small share of rural employment (see Table 1). Moreover, employment in rural manufacturing has also grown less relative to urban manufacturing. Employment growth in rural manufacturing during the periods 1967-75 and 1975-88 was 0.57 and 2.03, respectively, compared to 1.42 and 4.01 during the same period, respectively, for urban manufacturing [Bautista (1991)]. On the other hand, the share of trading and services in rural employment has been increasing (see Table 1). These activities have been driving the development process in rural areas, given that agriculture's performance has been less than desirable during the past decade.

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[1] Surprisingly, many microenterprise finance projects such as the Grameen Bank have supported small-scale and petty trading activities with good results. See, for example, Hossain, M. "Credit for Alleviation of Rural Poverty: The Grameen Bank in Bangladesh," Research Report 65. Washington, D. C.: International Food Policy Research Institute, 1988.

[2] Kou (1983) estimated that the Gini coefficient decreased from 0.558 in 1953 to 0.460 in 1964, and from 0.318 in 1972 to 0.303 in 1980.

With manufacturing performing poorly and trading and services playing a major role in providing employment, there appears to be good reasons to question the continued bias of formal financial institutions toward the manufacturing sector. If government policies are not conducive to the growth of the manufacturing sector, then credit policies designed to promote this sector may have little impact. This is also true for other sectors that may be directly or indirectly harmed by governmental development policies. The relevant question is: given the inhospitable policy environment, which of the sectors have been making the most rewarding adjustment? In terms of credit market policies, there is a need to know whether there are sectoral differences in the effect of credit made available, and if so, whether these differences matter. For example, a study of small enterprises in Ecuador [Sotomayor et al. (1994)] showed that enterprises respond differently to the relaxation of binding liquidity constraints depending on the type of activity in which they are engaged. The study found that it is important to consider the sectoral effects when analyzing the results of relaxing the liquidity constraints through borrowing. An interesting issue for the present study is to look at how the manufacturing sector compares with the trading and services sector in terms of the impact of credit on their performance. These are important issues because if credit has differential effects by sector, then there may be reasons to support programs that are focused on sectors with the potential for realizing large credit effects.

This paper addresses reports on research that compared credit effects between the manufacturing sector and the trading and service sectors to determine if sectoral differences exist. For purposes of analysis, trading and services are grouped into the non-manufacturing sector to differentiate it from the manufacturing sector. Credit effects are estimated using an econometric model that takes into account the non-random sorting of the sample between borrowers and nonborrowers, thereby avoiding the major flaws of previous studies [see David and Meyer (1980) for a critique of credit impact studies]. An endogenous switching regression model is used to segregate the impact of credit from the impact of latent and observable characteristics of borrowers and nonborrowers. This econometric approach is an improvement over the conventional use of OLS in estimating output supply equations and deriving credit effects from the estimated coefficients. By correcting for selection bias, this econometric approach yields consistent and unbiased estimates of the parameters [Maddala and Nelson (1975)]. The analysis is based on cross-section data obtained from a survey of rural nonfarm enterprises located in the Visayas region of the Philippines. The paper is organized as follows: Section II discusses the issue of urban bias in Philippine development policies. Section III presents a sectoral profile of RNEs. Section IV discusses the issues in measuring the effect of borrowing. Section V describes the methodology used in empirical estimation. Section VI presents the empirical results. Section VII discusses some policy implications.

II. Urban Bias in Philippine Development Policies

The Philippine economy had many similarities with Taiwan in the early 1960s, in terms of per capita income, production structure, and degree of openness. Unlike Taiwan, however, the Philippines followed a different development path that lead to less desirable economic results.

GDP per capita declined in absolute terms in the 1980s as the Philippine economy drastically slowed down in the 1980s because of the heavy debt-service burden that resulted from excessive foreign borrowing in the previous decade. The overall income distribution has remained highly skewed, reflecting in part the high rates of unemployment and underemployment. These problems were exacerbated by the concentration of economic activity and income growth in the urban center of Metro Manila. According to Bautista (1991), Metro Manila accounted for about one-third of the country's GDP and more than one-half of the manufacturing value added in the mid-1980s. Per capita gross regional domestic product (GRDP) in Metro Manila was also more than double the next highest, and more than five times the lowest, GRDP posted in the other regions of the country. Despite the accelerated agricultural growth obtained during the period 1965-80, it did not translate into rapid and sustainable growth of the national economy. One explanation is the concentration of the observed gains in national income that accrued only to a limited segment of the population, which in turn contributed to the inability to develop rural-based, labor-intensive industries that could have helped absorb the rapid expansion of the rural labor force during the period [Bautista (1991)]. It is contended that government price and trade policies, public investment policies, and credit policies have contributed to an urban bias in the development of the country.

A. Price and Trade Policies

Price and trade policies have influenced the growth of rural nonfarm enterprises through their direct impact on product and labor markets. Market intervention policies affect relative product prices, the cost and availability of material inputs, and the real wage, all of which have consequences on the economic viability of rural nonfarm enterprises. For example, domestic price distortions, arising from the induced effect on the real exchange rate, have largely penalized agricultural producers [Bautista (1987), Intal and Power (1990)]. This results in heavy discrimination against all tradable goods production, such that the indirect price effect associated with exchange rate overvaluation was also biased against the development of the nontraditional goods component of rural nonfarm enterprises producing import-competing and exportable nonagricultural goods [Bautista(1991)]. The exchange rate overvaluation and low tariff rates on imported capital goods also had adverse effects on the labor market. They encouraged excessive farm mechanization and promoted the growth of capital-intensive industries mostly based in urban areas, thus largely negatively affecting labor employment. The poor performance of the industrial sector in employment generation, in turn, contributed to the observed lack of upward trend in real wages for agricultural and unskilled labor, thereby weakening the effective demand for consumer goods produced by rural nonfarm enterprises.

Restrictions on foreign trade caused by import and foreign exchange controls in the 1950s have largely remained in place in recent years and have been heavily biased against exports. For example, import duties and quotas directly raise the domestic price of import-competing products relative to exportable products, thereby encouraging a shift away from export production. The same policy instruments also reduce the demand for exports, creating a lower demand for foreign exchange, resulting in lower domestic prices for tradable goods relative to nontradable goods, and

hence indirectly creating production incentive biases against both import-competing and export goods [Bautista (1991)].

Trade and exchange rate policies also contributed significantly to the concentration of industries in urban areas, particularly in Metro Manila, and to the underdevelopment of small enterprises. This exacerbated the unfavorable supply conditions that inhibited the development of rural nonfarm enterprises. For example, the heavy reliance on imported material inputs and capital equipment encouraged by the import-substitution policies in the 1950s and 1960s created a strong inducement to locate plants near the source of supply, the principal port of Manila. This in turn stimulated the development of nearby areas through agglomeration economies and spillover effects [Pernia et al. (1983)]. Metro Manila was also the principal market for the import-competing industries that benefited from heavy protection and exchange rate overvaluation, whereas the more geographically scattered resource-intensive industries were not favored by those policies [Bautista (1991)]. A World Bank (1976) study noted that despite additional fiscal incentives to locate in certain designated less developed areas, more than three-fifths of the 590 new enterprises that registered with the Board of Investments during the period 1968-74 were based in Metro Manila and the Southern Tagalog Region. Moran (1978) argues that the inability of the other regions to substantially expand manufacturing production significantly contributed to the persistence of large disparities in regional per capita incomes. The regional bias in location choice would have influenced the large-scale and capital intensive character of Philippine industrialization as well, to the extent that manufacturing establishments were drawn away from small local markets and low-cost labor in the outlying regions [Bautista (1991)].

B. Public Investment Policies

The supply response of rural nonfarm enterprises to any demand stimulus is also a function of the existing rural infrastructure, both human and physical. The development of rural infrastructure improves labor skills, managerial capacity and the work culture, reduces marketing costs for producers, increases the access of consumers to marketable products, and generally contributes to market integration as a basis for the development of a wide range of rural nonagricultural activities [Bautista (1991)]. The development of physical infrastructure has been largely neglected in the Philippines, however, particularly in rural areas. Intal and Power (1990) estimated that the share of rural roads and bridges in public investment declined steeply from 12.2 percent in 1960-62 to 2.0 percent in 1978-80, although 40 percent of total public investment went into roads and road transport during the period. This is because Metro Manila and, to a lesser extent, other urban areas received the bulk of infrastructure funds [Bautista (1991)].

The neglect of physical infrastructure in rural areas was the mirror image of the urban bias in the government's overall infrastructure policy, resulting in a highly uneven regional distribution of infrastructure facilities. Ranis and Stewart noted that Luzon, the country's main island where Manila is located, accounted for 74 percent of government infrastructure expenditure in 1971-81. Luzon also accounted for 86 percent of the installed electrical capacity of the National Power Corporation in 1978-80, of which 85 percent was in Metro Manila [NEDA (1982)]. A study by

PIDS (1990) estimated that Metro Manila's road density was about nine times higher than that for the entire country in the late 1970s, and 98 percent of its households had access to electricity compared to only 48 percent on average for the other 12 regions. The study also showed that Metro Manila's share of gross value added in utilities from the national income accounts was also more than 70 percent. This underdevelopment of infrastructure and its concentration in urban areas, particularly Metro Manila, represented a supply-side constraint in the linkage effects of agricultural growth on rural nonagricultural production and overall economic growth, reducing the magnitude of employment and income multipliers in the rural, regional, and national economies [Bautista (1991)]. On the other hand, Ranis and Stewart (1987) attribute the rapid growth of rural-based industries in Taiwan to the advanced state and wide dispersion of its physical infrastructure. They also noted that the rural areas in Taiwan benefited from a more even distribution as well as from higher average levels of infrastructure facilities than the Philippines, which explains in large part the differences in rural industrialization between the two countries. Thus, a large public investment in infrastructure in rural areas will likely induce a more rapid expansion of rural nonfarm enterprises, contributing to a more equitable and sustainable growth of the national economy.

In terms of investments in human resources, there appears to be a strong urban bias as well. A World Bank (1980) study noted significant regional, urban-rural, and income-class disparities in education and health. Nearly every adult in Metro manila was literate by 1980, but in the much poorer regions of Central and Western Mindanao more than one-third of the adult population were illiterate. The infant mortality rate in the latter two regions was also more than 2.5 times that in Metro Manila, and the life expectancy lower by about 10 years. In terms of education and health, Central Luzon and Southern Tagalog, the two regions located closest to Metro Manila, had relatively higher levels relative to the rest of the country. Thus, it would appear that such skewness in the distribution of educational and health benefits is likely to weaken the nonagricultural supply response to the demand stimulus arising from the rapid agricultural growth during 1965-80, thereby also reducing the scope for promoting an equitable and self-sustaining development process for the whole economy [Bautista (1991)].

C. Credit Policies

The regime of low interest rates that prevailed in the Philippines during the 1965-80 period significantly affected the effectiveness of financial intermediation in the economy and inhibited the flow of resources into the formal financial market. The excess demand for loanable funds could only be allocated by credit rationing, leading to a system of credit allocation that relied heavily on collateral and personal connections. This subsequently discriminated against small investors, especially those in rural areas. According to Adams et al. (1991), the Philippines has suffered through a number of transitory rural credit efforts that left behind a debilitated rural financial system. Legacies of these efforts are chronic loan recovery problems, few deposits mobilized, high transaction costs, and relatively few people in rural areas having access to formal financial markets. While reliable estimates are not available, Adams et al. (1991) infer that the number of rural people with sustained access to formal financial markets in the early 1990s did

not amount to over 10 to 15 percent of the rural households. In a survey of small-scale garment producers, furniture makers, and metal working concerns, the ILO (1972) revealed the widespread difficulty of obtaining short- and long-term credit from formal sources. Agabin (1988) also noted that the loan portfolio of the commercial banking system consisted predominantly of collateralized loans for large corporate borrowers. Less than ten percent of the loans granted by the Development Bank of the Philippines went to small farmers and rural nonfarm enterprises, despite the banks's small industry program [Bautista (1991)]. Lending under this program, however, was concentrated in the Metro Manila area, which accounted for more than 40 percent of total loans. Given this urban bias in credit allocation and the decline in availability of formal financial services in rural areas, rural producers have had to rely on informal credit sources to meet their financing requirements. The contraction in formal lending in rural areas may have only been partially offset by an expansion in informal finance [Adams et al. (1991)], although recent studies suggest that the relative importance of informal finance has increased substantially over the past decade [Agabin et al. (1989), Bautista and Magno (1990)].

The collapse of the rural banking system in the 1980s also contributed to the contraction of available funds for rural borrowers [Blanco and Meyer (1988)]. Rural banks could have been an important source of finance for rural nonfarm enterprises. Lamberte and Lim (1987) noted that credit demand by rural nonfarm enterprises has been unwarrantly neglected because of the focus of existing studies on agricultural loans. Bautista (1991) argues that credit and interest rate policies in the Philippines during the 1965-80 period impeded rural-based industrialization to the extent that investment activities in rural areas were not financed due to the urban bias in formal sector credit allocation, the high loan rates in informal credit markets, and the failure to mobilize savings. This argument is particularly relevant concerning lending to the manufacturing sector. Recent studies on rural credit markets have revealed the importance of trader-lender arrangements that appear to be effectively working in meeting the credit demand of small farmers and the landless in rural areas [Floro and Yotopoulos (1991), Nagarajan (1992), Esguerra (1993), Teh (1993)].

III. Sectoral Profile of Rural Nonfarm Enterprises

The preceding section discussed how government policies have created an urban bias in the growth and development of the Philippine economy. This bias is posited to have stunted the growth of the manufacturing sector in rural areas. The following discussion shows how the economic performance of this sector compares with the trading and services sectors. The descriptive analysis is based on data collected in a survey of rural nonfarm enterprises in the Visayas region of the Philippines. The survey area included the provinces of Iloilo, Negros Occidental, Cebu, and Bohol where a higher degree of economic activity was observed relative to the other parts of the Visayas region. With Visayas considered as one of the growth centers in the government's latest Medium-Term Development Plan, it can be a potential hub of economic activity in the coming years implying better economic opportunities for microenterprises in the

region. There were 400 enterprises sampled using a two-stage sampling process.[3] Of the total sample in the data set, 125 were engaged in manufacturing, 164 in trading, and 111 in services. Manufacturing activities included the manufacture of bamboo craft, woodcraft, shellcraft, ceramics, pottery, garments, bakery products, pillowmaking, weaving, and blacksmithy. Trading mainly included the retail trade of various commodities. Services, on the other hand, included enterprises operating as carinderia (i.e., small eatery), coffee shops and refreshment shops, as well as automotive and battery charging shops.

A comparison of the initial capital investments[4] shows that the non-manufacturing enterprises on average started operations as relatively larger firms than the manufacturing enterprises. While the majority of both types of enterprises started with an initial capital of no more than ₱5,000, a larger proportion of non-manufacturing enterprises started with more than ₱5,000 worth of capital (see Table 2). In terms of fixed assets at the time of survey, non-manufacturing enterprises are relatively larger on average than the manufacturing enterprises. A relatively larger share of non-manufacturing enterprises have assets of more than ₱100,000, while a larger proportion of manufacturing enterprises have assets below ₱50,000 (see Table 2). This distribution implies that a larger proportion of the manufacturing enterprises are located at the lower end of the asset size spectrum, while a larger proportion of the non-manufacturing enterprises are in the larger end. Hence, a larger proportion of manufacturing enterprises have remained small, reinforcing the contention that the urban bias in development policies have hurt manufacturing in rural areas more than the non-manufacturing sector.

The same situation characterizes the distribution of gross sales and net income. Among those firms with gross sales of more than ₱50,000, non-manufacturing enterprises accounted for a larger share than manufacturing enterprises. On the other hand, manufacturing enterprises accounted for a larger share of firms with gross sales of no more than ₱50,000. A larger share of non-manufacturing enterprises have net incomes of more than ₱100,000, while manufacturing enterprises have a larger share of those with net incomes ranging from ₱10,000 to ₱100,000. This distribution suggests that a larger proportion of non-manufacturing enterprises are in the higher income bracket relative to manufacturing enterprises. Thus, it appears that a larger proportion of non-manufacturing enterprises exhibit better economic performance enterprises as indicated by their assets, gross sales, and net income.

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[3] The sampling design used in the survey is presented in detail in Lapar (1994).

[4] These were obtained from recall information given by the respondents. Hence, they were more likely to be approximate values than exact values.

Returns per worker were also estimated to derive measures of labor productivity.[5] The estimates showed that the average net income per worker employed in manufacturing enterprises is about 30 percent lower than the net income per worker in the non-manufacturing enterprises (see Table 3). This same trend is also apparent in the estimates of gross sales per worker. Non-manufacturing enterprises exhibited larger average gross sales per worker compared to manufacturing enterprises. These results indicate that labor productivity is relatively higher in non-manufacturing than in manufacturing enterprises.

The preference for manufacturing enterprises by lenders in rural credit markets can be inferred from the borrowing profile of the enterprises. Manufacturing enterprises received larger average loan sizes than non-manufacturing enterprises (see Table 4). Moreover, formal loans received by manufacturing enterprises on average are twice the size received by non-manufacturing enterprises. This reinforces the notion that formal lenders are biased toward lending to manufacturing enterprises no doubt because tangible collateral may be more easily pledged. Informal lending, on the other hand, appears to have a more favorable attitude towards non-manufacturing enterprises, particularly trading enterprises where collateral substitutes are available. The average amount of informal loans received by trading enterprises is about 14 percent larger than the average received by manufacturing enterprises. Moreover, the average amount of non-cash loan received by trading enterprises from informal lenders is approximately 23 percent larger than the average received by manufacturing enterprises. Thus, informal lenders appear more likely to service the credit demands of non-manufacturing enterprises, particularly traders, than the demand of manufacturing enterprises. This is consistent with the observation of the preponderance of trader-lender credit transactions where large wholesale traders provide consigned merchandise for resale to smaller retail traders. The consigned goods constitute non-cash loans granted to the small traders by wholesalers based in urban areas of the region. By providing these non-cash loans, the large wholesalers are assured of a market for their own merchandise. The small traders, on the other hand, also benefit from this transaction by minimizing their transaction costs in accessing various sources of funds to finance their working capital requirements. Moreover, they are assured of receiving the "loan" when they need it.[6] The wholesale lenders are in a position to deal with their principal agent problem. They have information on their downstream retailers, can periodically monitor their activity, and through their supply of future goods can more easily enforce contracts.

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[5] Tests for the difference in means between manufacturing and non-manufacturing are both statistically significant at the 5 percent level.

[6] This "matching"of lenders with borrowers is empirically supported in a study of informal lending in the in the Philippines [Nagarajan and Meyer (1991)]. The study concluded that the observed pattern in the matching of lenders with borrowers suggests specialization in rural informal credit markets based on lender's occupation and information base.

The above discussion suggests that there are clear sectoral differences in the borrowing and lending behavior of manufacturing and non-manufacturing enterprises. While both the formal and informal sources of funds can be accessed by these enterprises, manufacturing enterprises borrow more from formal while non-manufacturing enterprises borrow more from informal sources. Traders in particular appear to have a strong credit link with informal lenders. Whether this difference in borrowing behavior is a function of borrower preference or the outcome of supply factors, i.e., lender preference, merits further exploration. Unfortunately, the survey did not obtain information about lender behavior. The central issue of this paper concerns the effect that borrowing has on the output of rural nonfarm enterprises. Does the ability to borrow have an impact on the output of these enterprises? If so, is there a difference in the effect among economic sectors? Which sector would obtain a larger output effect from borrowing? The results of the descriptive data reported above suggest a possible mismatching of loans and intended recipients, given that manufacturing enterprises do not appear to be performing at a more desirable economic level vis-a-vis non-manufacturing enterprises. The findings have significant implications fo improving credit policies for rural nonfarm enterprises.

IV. Issues in Measuring the Effect of Borrowing

Measuring the output effect of borrowing is a tricky matter because of the identification problem. It is difficult to identify the true effects from the use of borrowed funds from the "noise" coming from the effects of other factors, both observable and unobservable. This identification problem subsequently results in imprecise measurement and estimation of the true effects attributed to borrowing, thereby contributing to a weak understanding of the impact of improved access to credit [Carter (1989)]. David and Meyer (1980) pointed out that the fungibility issue contributes to the difficulty in obtaining a precise measure of the "additionality" effect of credit. Empirical problems arising from the likely heterogeneity of borrowers and nonborrowers can affect the process of estimating the true credit effects as well. Thus, some of the studies that have attempted to identify the effect of credit by estimating separate production or supply functions for borrowers and nonborrowers can be criticized for implicitly assuming that all borrowers and nonborrowers have the same credit demand and/or supply situations [David and Meyer (1980)]. The assumption of homogeneity is often invalid because some nonborrowers may have zero demand for credit because they are not liquidity constrained, while others may be rationed out of the credit market for lack of creditworthiness. Comparing the estimates from separate production or output supply equations, therefore, is inappropriate. Similarly, studies in which the sampled observations are pooled to estimate production functions or output supply functions with credit included as a production input or as a supply determinant are subject to the same criticism. Feder et al. (1990) pointed out that the supply function may differ both in parameters and in variables depending on whether or not liquidity is a binding constraint; hence, estimates which do not account for these specification restrictions are flawed.

The violation of the randomness assumption in assigning individual observation to borrower and nonborrower categories will likely result in systematic differences between the two

groups under any credit regime [Carter (1989)]. Indeed, the presence of such differences are often cited as barriers to the estimation of the true effects of credit. While descriptive statistical analysis will show the difference between the average performance of borrowers and nonborrowers, it does not measure the proportion of the difference that is attributable to credit alone. This occurs because the difference measured maybe distorted by the effects arising from the likely heterogeneity of the sample; i.e., borrowers have different inherent characteristics compared with nonborrowers, as a result of an endogenous sorting process where credit status is an outcome of the individual's decision to apply for credit, the lender's decision to provide credit, and the anticipated gains from credit. As Adams (1988) pointed out, it is very likely that borrowers would still be more productive than nonborrowers even without credit because of better inherent characteristics. It is important, therefore, to be able to isolate the effect of credit on productivity from the effect of inherent characteristics of the enterprise and the entrepreneur. By doing so, a more accurate and realistic assessment can be made of the effectiveness and efficiency of using credit as a policy tool to promote the development of rural nonfarm enterprises.

V. The Methodology

A. The Model

The effect of borrowing on the output of rural nonfarm enterprises is estimated in this study using an endogenous switching regression model patterned after the models of Goldfeld and Quandt (1973), Maddala and Nelson (1975), and Maddala (1986). Variants of the model have been used by Carter (1989), Feder et al. (1990), and Sial and Carter (1992). The full switching model[7] can be written as:

$$(1a)\quad D_i = \begin{cases} 1 \text{ if } \eta_i > -\gamma' x_i \\ 0 \text{ otherwise.} \end{cases}$$

$$(1b)\quad E(Q_{ic} \mid D_i=1) = \beta'_c z_i + \alpha' \ell_i + \rho_c \lambda_i^c$$

$$(1c)\quad E(Q_{in} \mid D_i=0) = \beta'_n z_i + \rho_n \lambda_i^n \ .$$

Equation (1a), the credit status equation, is the criterion function that gives structure to the sample separation process. That is, it sorts the sample into borrowers and nonborrowers. D_i is modelled as the result of a latent credit access variable $\mathcal{L}_i$ which is scaled such that an individual becomes

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[7] A detailed discussion of the model is presented in Lapar (1994).

a borrower when $\mathcal{L}_i > 0$.[8] Equation (1b) is the output supply equation of borrowers and (1c) is the output supply equation of nonborrowers.[9] The parameters of the system can be estimated using maximum likelihood methods. Heckman proposed a two-stage procedure for estimating consistent but less efficient parameters of (1) [Maddala (1983)]. Consistent estimates of β may be obtained through separate OLS regressions of the two conditional output supply equations in (1). Alternatively, it is possible and often desirable to estimate (1) using all the observations in Q_i [Maddala (1983)]. Note that

(2) $E(Q_i) = E(Q_{ic}|D_i=1)\text{Prob}(D_i=1) + E(Q_{in}|D_i=0)\text{Prob}(D_i=0)$, so that

(3) $E(Q_i) = \beta'_n z_i + \delta'[\Phi(C_i)z_i] + \alpha'[\Phi(C_i)\ell_i] + (\rho_c - \rho_n)\phi(C_i)$.

From (3), the direct credit effect parameters, the α, and the indirect credit effect parameters, the δ and the $(\rho_c - \rho_n)$ can be estimated. While the direct effect parameters give the increase in output supply attributed to the use of loans, the indirect credit effects represent the additional returns to observable and unobservable endowments when credit is used. If the use of credit does not enhance the returns to other factors, i.e., both δ and $(\rho_c - \rho_n)$ are equal to zero, then (3) reduces to the following equation:

(4) $E(Q_i) = \beta'_c z_i + \alpha'[\Phi(C_i)\ell_i]$.

Equation (4) is a restricted form of (3) wherein credit has direct effects only.

B. Credit effect measures

The credit effect measures[10] to be used in determining the effect of credit on output are defined as follows:

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[8] A reduced form specification for latent credit access can be written as $\mathcal{L}_i = \gamma' x_i + \eta_i$ where x_i is a vector of variables that determine credit access, γ is a vector of parameters, and η is an error component reflecting random and latent factors that influence credit access.

[9] The vector z_i includes variables that account for market opportunities, fixed factors of capital and labor, and entrepreneur characteristics, among others. The parameters β_j (j=c, n) give the impact of the observable variables on output supply and are allowed to vary between the two regimes of borrowing and nonborrowing. The vector ℓ_i is a quadratic expansion of the loan amount L_i. The impact of loans on output supply is given by $\alpha\ell_i$, a nonlinear function of L_i which allows for diminishing returns to loans.

[10] See Carter (1989) and Sial and Carter (1992).

(5a) Random credit effect:

$$E(Q_{ic}-Q_{in}) = [\beta'_c z_i + \alpha'\ell_i + E(v_i|D_i=1)]-[\beta'_n z_i + E(v_i|D_i=0)] = \delta' z_i + \alpha'\ell_i$$

(5b) Counterfactual credit effect for borrowers

$$E(Q_{ic}|D_i=1) - E(Q_{in}|D_i=1) = [\beta'_c z_i + \alpha'\ell_i + E(v_{ic}|D_i=1)] - [\beta'_n z_i + E(v_{in}|D_i=1)]$$
$$= \delta' z_i + \alpha'\ell_i + (\rho_c - \rho_n)\lambda_i^c.$$

(5c) Counterfactual credit effect for nonborrowers:

$$E(Q_{ic}|D_i=0) - E(Q_{in}|D_i=0) = [\beta'_c z_i + \alpha'\ell_i + E(v_{ic}|D_i=0)] - [\beta'_n z_i + E(v_{in}|D_i=0)]$$
$$= \delta' z_i + \alpha'\ell_i + (\rho_c - \rho_n)\lambda_i^n.$$

The random credit effect measure determines the effect of credit if given to an individual selected at random from the overall population of rural nonfarm entrepreneurs. Equation (5a) shows the expected effect of credit if randomly assigned to an average individual without any intervening systematic selection or conditioning on the basis of the unobserved individual characteristics. Hence, the expected value of latent attributes for such an individual is zero. On the other hand, the counterfactual credit effect measure compares the output anticipated by an individual under the actual credit status with the output level that would be anticipated by that same individual in the counterfactual state [Tunali (1985), Carter (1989)]. Note that both counterfactual measures are in fact the sum of the random credit effect and the gains or losses the individual would anticipate given the latent characteristics. While the random credit effect can show the effect of credit on the output supply of an individual with the same observable attributes as the other individuals in the sample, the counterfactual credit effect can indicate the effect of credit on the output of individuals who choose to be or not to be borrowers. Thus, the hypothesis of a positive credit effect can be tested by looking at the estimates of potential output under the counterfactual state for both borrowers and nonborrowers. Notice that both the random and counterfactual effects are measures of total effect of credit on output supply. In order to determine the marginal effect of additional credit on output supply, we use the marginal credit effect which is defined as the partial derivative of output with respect to loan amount. This measure is shown as:

(6) $\partial E(Q_i|D_i)/\partial L_i = \alpha'[\Phi(C_i)]$.

An estimate of the marginal effect of credit can be used to indirectly test the hypothesis that nonborrowers are credit constrained. If the estimated marginal returns to credit are greater than the shadow price of credit at zero loan, this implies that nonborrowers are credit constrained to the extent that an additional unit of loan would result in more than a unit increase in output.

C. Empirical Estimation of the Model

The credit status equation is empirically estimated as a function of factors that explain the borrower's demand for and supply of credit such as the value of fixed assets, total assets, and financial assets owned by the entrepreneur, previous year's income, number of years the enterprise has been operating, age of the owner/operator, number of years spent in school (as a measure of educational attainment), and a dummy variable for bank-client relationship, i.e., existence of a bank account, which equals one if the operator has a bank account and zero otherwise. Dummies for gender, type of activity undertaken and for the province in which the enterprise operates are also included.

The output supply equation is empirically specified as a function of fixed and non-fixed inputs and other observable characteristics such as the entrepreneur's previous work experience, the average number of hours the enterprise operates, and number of years the enterprise has been operating, among others. A quadratic form of the variable loan amount is included to account for the direct effect of credit on output. The loan variable represents the total value of loans received by borrowers during the period 1989-1991, i.e., the preceding two years and the current year of operation covered in the study. The dependent variable is the logarithm of the value of output.

VI. The Empirical Results

The estimation of the econometric model is carried out in a two-stage process. The first stage involves estimating the criterion function or the credit status equation using the probit method. Using the estimated coefficients of this criterion function, the inverse of Mill's ratios are obtained. These are used as regressors in the second stage estimation of the output supply equation. This equation was estimated using OLS.

A. The Criterion Function

Two criterion functions were estimated, one for enterprises in the manufacturing sector and the second for the non-manufacturing sector enterprises (comprised of trading and service activities). As previously discussed, the criterion function explains the determination of credit status, i.e., it consists of factors affecting the decision to be a borrower or a nonborrower. Results of the estimation of the criterion function show that for the manufacturing sector the value of total assets and the gender of the entrepreneur are statistically significant factors affecting credit status[11] (see Table 5). The negative coefficient of the total assets variable is consistent with the "pecking order theory" (Cuevas 1992, Myers 1985). The more assets the entrepreneur has that

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[11] The joint hypothesis that all the coefficients of the criterion function for manufacturing are zero is rejected at the one percent level as -2(Log likelihood) is greater than the one percent critical value of χ^2 (10 degrees of freedom).

can be liquidated, the less likely that external funds will be sought to finance operations. This choice of internal financing is based on the "safety first principle" (i.e., the desire to retain control of the firm from potential creditors) and the results obtained in this study empirically support this proposition. The positive coefficient of the gender dummy variable implies that male entrepreneurs are more likely to be borrowers than female entrepreneurs.[12]

The estimated criterion function for the non-manufacturing sector shows that the previous year's income and gender are the factors that significantly affect credit status[13] (see Table 5). The negative coefficient of the previous year's income variable implies that the larger the income realized in the previous year of operation, the less likely that the entrepreneur will be liquidity constrained because of the availability of internal funds to finance current operations. This result is consistent with the result obtained by Feder et al. (1990) in a study of the relationship of credit and productivity of farms in China.

The positive coefficient of the gender dummy variable implies that male entrepreneurs are more likely to be borrowers than females. This dummy variable has the same positive sign for both criterion functions. This implies that male entrepreneurs are more likely to be borrowers regardless of the type of activity in which they are engaged. This conclusion is counter to the observation that female entrepreneurs predominate in the non-manufacturing sector so that by their number alone, one would expect them to be more likely to be borrowers in this sector. On the other hand, male entrepreneurs have larger asset values on the average than female entrepreneurs (see Lapar 1994 for a detailed discussion). Hence, male entrepreneurs appear to be more creditworthy in terms of having more capacity to pay (in terms of assets). This could be the underlying reason for men being more likely to be borrowers than women.

B. The Output Supply Equation

The results of the estimation of the output supply equations[14] for each sector are shown in Tables 6 and 7. A comparison of the estimates reveals that the loan variable is statistically significant only in the non-manufacturing sector. This implies that borrowing has no direct effect on the output supply of manufacturing enterprises. A factor that could explain this is "fungibility." It has

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[12] This dummy variable is defined to take the value of one for male entrepreneurs and zero for female entrepreneurs.

[13] The joint hypothesis that all the coefficients of the criterion function for manufacturing are zero is rejected at the one percent level as -2(Log likelihood) is greater than the one percent critical value of χ^2 (10 degrees of freedom).

[14] The estimated supply equations have adjusted $\bar{R}^2$ values of 0.73 and 0.63, respectively, for manufacturing and non-manufacturing.

been widely observed that borrowing in the commerce and service sectors, particularly among traders, is usually in the form of consignment of goods. Thus, there is less likelihood that the amount borrowed (i.e., in terms of goods or merchandise for resale) could be diverted to other activities. On the other hand, while there may be borrowing in kind in the manufacturing sector, e.g. raw material inputs provided by the buyer or supplier, this practice is not so prevalent as to make a significant direct effect on output supply for the entrepreneurs in the sector.

The only factor that has a statistically significant effect on output in the manufacturing sector is working capital. This is defined as the value of non-fixed inputs used in production. The positive coefficient is consistent with theoretical expectations, i.e., the more inputs used the higher the level of output produced. This variable also has a positive and statistically significant coefficient in the non-manufacturing sector. In addition, the number of employees has a statistically significant positive effect on output in the non-manufacturing sector. This suggests that more workers employed will result in larger output. Since non-manufacturing enterprises usually use family labor in the enterprise, this additional labor employed does not necessarily require added costs in terms of actual wages paid; hence, the net effect on production is positive.

C. Credit Effect Estimates

The estimation of the credit effect measures discussed above require that the loan variable be statistically significant. Since this variable is not statistically significant in the output supply equation for the manufacturing sector, the direct credit effects cannot be estimated for this sector. Nor did credit have indirect effects as shown by the statistically insignificant estimates of the borrower differential variables (i.e., the δ's in equation 3) and the unobservable endowments and attributes variable (i.e., the $(\rho_c - \rho_n)$ in equation 3). The only factor that has direct output effects is working capital which consists of the non-fixed inputs used in production.

The direct credit effects are computed for the non-manufacturing sector where the loan variable was shown to be statistically significant. The estimated output supply equation for the non-manufacturing sector using the full-switching model shows that borrowers do not obtain differential returns from observable variables as indicated by their estimated δ values, none of which is statistically significant at the 5 percent level. The hypothesis that, aside from the direct effects of credit, borrowers experience no added returns to their unobservable endowments and attributes, cannot be rejected as well because the estimated coefficient of $(\rho_c - \rho)$ is not

significantly different from zero at the 5 percent level.[15] Given these restrictions, the restricted form of the full- switching model (equation 4) is estimated and used to compute the credit effects.

The estimated credit effects for the non-manufacturing sector are shown in Table 7. The estimated random credit effect is 0.22 and is statistically significant at the 1 percent level. This estimated effect implies that an average non-manufacturing entrepreneur will obtain a 22 percent increase in output by being a borrower. A nonborrowing entrepreneur would likewise realize the same result were he or she a borrower in the counterfactual state. Note that this counterfactual effect is the same as the random credit effect because of the statistical insignificance of the (ρ_c - ρ_n) coefficient, implying no indirect credit effects from unobservable endowments and attributes.

Estimates of the marginal credit effects are also positive and statistically significant at the 1 percent level (see Table 8). When evaluated at the mean loan size of ₱28,606, the marginal credit effect is 1.63. This estimate implies that the average loan size received by non-manufacturing entrepreneurs is suboptimal and there is the potential for larger returns to much larger loan sizes. The marginal credit effect evaluated at a zero loan size (1.71) also implies a shadow price of capital that is considerably above the average rate of interest charged on loans. The average rate of interest on loans made to these entrepreneurs at the time of the survey was approximately 35 percent. This implies that they are capable of paying market rates of interest because of the high rates of return that they can potentially realize from their production.[16] Moreover, the fact that the shadow price of capital is substantially above the average cost of credit implies that inefficiencies prevail in the rural credit markets in the Visayas region of the Philippines.

These results suggest a number of possible interpretations. First, non-manufacturing operators are not able to obtain credit in the amount or size that would enable them to realize optimal returns on their loans. One plausible reason is risk aversion on the part of the lender, usually a large merchandiser giving out consigned goods to small traders. On the other hand, the borrowers may also be risk averse and choose to limit their consigned goods. This risk averse behavior could be the result of the perception of low local market demand. At the time the survey was conducted among these enterprises (June-September 1992), the Philippine economy was in a lackluster state which could have reinforced a lack of optimism by rural entrepreneurs.

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[15] The coefficient of (ρ_c - ρ_h) also represents the selection bias variable. Hence, the result obtained indicate the failure to accept the hypothesis of selectivity in either the borrower or nonborrower sample. One caution in interpreting this result, however, according to the results provided by Lee (1982) and echoed in Duncan and Leigh (1985) is that selectivity may be present but not revealed by the inverse Mill's ratio procedure because of its sensitivity to the underlying normality assumption.

[16] This assumes that the transaction cost of accessing loans are not large.

On the other hand, the potentially high rates of return that these entrepreneurs can realize provide empirical evidence of the viability of non-manufacturing activities in rural areas. This is in stark contrast to the observed performance of the manufacturing sector. It appears that the economic conditions make it possible for commerce and services to thrive, while the manufacturing sector is penalized by the strong Metro Manila urban bias in development policies pursued by the government for decades. The protectionist policies of the government have created an anti-export bias in trade policy. This has penalized the export market potential for the manufacturing sector in the outer islands like the Visayas. Exacerbating this problem is the concentration of new infrastructure in the Metro Manila urban area at the expense of similar investments in the rural economy and in the outer islands. This has put the rural enterprises in the Visayas at a disadvantage with small manufacturing enterprises more constrained than commerce and service activities. The local traders are able to transcend the urban and regional bias inherent to the Philippine urban-rural dichotomy by trading urban produced goods in rural areas in the outer islands in the South. Empirical evidence for this observation can be seen in the contrasting values of assets and net income of manufacturing and non-manufacturing enterprises. A larger proportion of non-manufacturing enterprises including those engaged in trading, have substantially larger asset values and net incomes than manufacturing enterprises in the survey area. Trading and service enterprises also surpass manufacturing enterprises contributing to rural nonfarm labor absorption [Fabella (1987)].

VII. Concluding Remarks

This paper used an endogenous switching regression model to estimate the parameters of the output supply equation and to compute direct and indirect credit effects on manufacturing and non-manufacturing enterprises in the Visayas region of the Philippines. This two-stage procedure, following Heckman's estimation method for correcting selectivity bias, is an improvement over the conventional use of OLS in estimating two separate output supply equations for borrowers and nonborrowers. Hence, this method is able to avoid the methodological pitfalls associated with conventional OLS estimation discussed by David and Meyer (1980) in their critical review of earlier credit impact studies.

Using cross-section data for a sample of rural nonfarm enterprises in the Visayas region of the Philippines, the output supply equations for manufacturing and non-manufacturing enterprises were estimated. The estimated equations for the two sectors showed dissimilar parameter estimates. The loan variable in the output supply equation for the manufacturing sector was not statistically significant, whereas it was significant in the equation for the non-manufacturing sector it was significant. This result is interpreted to mean that credit has no direct effect on the output supply of manufacturing enterprises, while it does for non-manufacturing enterprises. One plausible reason for this difference is fungibility. The use of credit in kind (e.g., in terms of consigned goods or merchandise for resale) among non-manufacturing enterprises appears to have limited the diversion of credit to other than production purposes. On the other

hand, it appears that the loans the manufacturing entrepreneurs obtained were likely used for purposes other than production, so the direct credit effect was not statistically validated.

It could also be the case that the rate of return in the manufacturing sector is less than that registered for other activities, so that manufacturing entrepreneurs have more incentive to divert the funds to those activities instead of directly investing them in production. With the fungibility of money, this can easily occur especially if there is no monitoring lenders as to how the loans are being used. It was not possible to directly estimate the expected marginal rate of return for manufacturing enterprises because of the statistical insignificance of the loan variable in the output supply equation. However, the fact that the loan variable has a coefficient that is not statistically different from zero suggests that this variable has no direct effect on expected output, implying zero or even negative expected rates of return.

These empirical results strongly suggest a potential positive impact of credit expansion for the non-manufacturing sector, particularly trading and service enterprises. Hence, credit policies should be redirected to focus on this sector instead of manufacturing activities. Ironically, this finding is contrary to most micro and small enterprise credit programs which are typically designed to supply loans to the producers of goods. There is usually a strong bias among international donors to have their credit facilities issue loans to traders. This is based on a misguided assumption that trading and service activities are not as productive as goods production.

If donors and the government are concerned about stimulating the goods producing sector in the Visayas, they should concentrate on building up the infrastructure for shipping and telecommunications in this region and removing the policy distortions that constrain the export market opportunities for local producers. Only then will credit make a difference. On the other hand, if donor and government programs are determined to exploit existing credit programs to reach rural nonfarm enterprises, they should change their microenterprise program bias and emphasize trading and service activities. Finally, given the substantial marginal output effect generated by access to credit for operators in this sector, there is little need to try to entice borrowers with subsidized interest rates.

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Table 1: Distribution of rural employment by sector, industry, 1975-1990

Industry Group	1975	1980	1985	1990
Agricultural Sector	74.5	68.0	66.5	64.1
Nonagricultural Sector	25.5	32.0	33.5	35.9
Manufacturing	7.5	8.0	7.2	6.7
Wholesale & Retail Trade	6.5	7.2	8.7	9.6
Community, Personal, & Social Services	6.5	9.6	10.2	11.5
Others	5.0	7.2	7.4	8.1
Total	100.0	100.0	100.0	100.0

Note: Figures are percent share to total.

Source: Labor Force Survey, National Census and Statistics Office, various years.

Table 2: Distribution of rural nonfarm enterprises by initial capital, total assets, gross sales, and net income (in pesos), by sector

	Manufacturing	Non-manufacturing
Initial capital		
₱5,000 and below	71 (57)	144 (53)
More than ₱5,000 to ₱100,000	44 (25)	118 (43)
More than ₱100,000	10 (8)	12 (4)
Total	125 (100)	274 (100)
Total Assets		
Less than ₱50,000	47 (38)	55 (20)
₱50,000 to ₱100,000	21 (17)	48 (17)
More than ₱100,000	57 (45)	172 (63)
Total	125 (100)	275 (100)
Gross Sales		
₱50,000 & below	40 (32)	47 (17)
More than ₱50,000 to ₱100,000	20 (16)	56 (20)
More than ₱100,000	65 (52)	172 (63)
Total	125 (100)	275 (100)
Net Income		
₱10,000 & below	16 (13)	35 (13)
More than ₱10,000 to ₱100,000	88 (70)	178 (65)
More than ₱100,000	21 (17)	62 (22)
Total	125 (100)	275 (100)

Note: Figures in parentheses are percent share to total.
Exchange rate at the time of survey: US$1=₱27.

Source of Data: DRD - Survey of Rural Nonfarm Enterprises, 1992.

Table 3: Measures of labor productivity, by sector

Measure	Manufacturing	Non-manufacturing
Net income per worker[a] (in pesos)	16,991 (30,885)	24,502 (35,779)
Gross sales per worker[a] (in pesos)	71,158 (177,869)	113,679 (195,751)

Note: Figures in parentheses are standard deviations.
a - Tests for difference in means is significant at the 5 percent level.
Exchange rate at the time of survey: US$1=₱27.

Source of Data: DRD - Survey of Rural Nonfarm Enterprises, 1992.

Table 4: Average values of loans received (in pesos) by sector, by source

	Formal	Informal	All
Amount received			
Manufacturing	35,474 (77,147)	9,343 (19,084)	19,121 (50,143)
Trading	15,340 (26,242)	10,628 (24,646)	13,100 (23,910)
Services	12,016 (39,536)	3,415 (9,290)	7,288 (26,599)
Amount received in cash			
Manufacturing	35,474 (77,147)	1,794 (4,086)	13,609 (48,583)
Trading	15,340 (26,242)	1,164 (3,442)	7,453 (18,579)
Services	12,016 (39,536)	466 (674)	5,250 (25,813)
Amount received in kind (non-cash)			
Manufacturing	0	7,692 (19,018)	5,512 (16,832)
Trading	0	9,463 (24,853)	5,647 (17,063)
Services	0	2,950 (9,388)	2,038 (7,922)

Note: Figures in parentheses are standard deviation.
Exchange rate at the time of survey: US$1=₱27.

Source of Data: DRD - Survey of Rural Nonfarm Enterprises, 1992.

Table 5: Estimated coefficients of the criterion function, by sector

Variable	Manufacturing	Non-manufacturing
Constant	-0.829 (5.457)**	-0.552 (10.516)***
Value of fixed assets	1.177 (1.564)	0.332 (2.571)
Value of total assets	-3.318 (6.465)***	-0.516 (1.969)
Value of financial assets	0.460 (2.513)	0.170 (1.398)
Age of the firm	-0.056 (0.137)	-0.009 (0.008)
Age of the entrepreneur	0.161 (0.956)	0.087 (0.692)
No. of years in school	-0.021 (0.017)	-0.139 (2.553)
Household size	0.258 (2.501)	-0.014 (0.020)
Previous year's income	0.102 (0.398)	-0.207 (3.249)*
Gender (dummy: male=1)	0.680 (4.780)**	0.376 (4.584)**
Bank account (dummy: with bank account=1)	0.036 (0.012)	0.215 (1.269)
-2Log likelihood ratio	-64.831	-144.708

Note: *** Significant at 1 percent level.
** Significant at 5 percent level.
Figures in parentheses are Chi-square values.

Table 6: Estimated output supply equations for the manufacturing sector

Variable	Full switching model		Restricted Model
	Borrower	Borrower Differential	
Constant	4.676 (0.699)	2.141 (0.180)	5.848 (4.753)***
No. of workers	-0.516 (-1.200)	1.480 (1.638)	0.074 (0.576)
Value of total assets	0.091 (0.240)	-0.045 (-0.066)	0.051 (0.691)
Working capital	0.654 (2.580)***	-0.289 (-0.550)	0.544 (8.270)***
Cost per hour of labor	0.032 (0.573)	-0.037 (-0.362)	0.021 (2.012)**
Age of the enterprise	0.409 (0.965)	-0.939 (-1.152)	-0.042 (-0.385)
No. of years in school	-0.550 (-0.816)	0.785 (0.599)	-0.087 (-0.471)
Work experience	-0.112 (-0.160)	0.479 (0.356)	0.102 (0.568)
No. of hours of operation	-0.111 (-0.063)	-0.049 (-0.016)	-0.230 (-0.656)
Loan		0.00001 (1.044)	0.00001 (1.350)
Loan squared		-5.754×10^{-12} (-0.356)	-8.881×10^{-12} (-0.620)
PDF	-0.025 (-0.006)		
Adj. R^2	0.73		0.73

Note: *** Significant at 1 percent level.
** Significant at 5 percent level.
Figures in parentheses are t-values.

Table 7: Estimated output supply equations for the non-manufacturing sector

Variable	Full switching model		Restricted Model
	Borrower	Borrower Differential	
Constant	4.429 (2.165)**	3.097 (0.847)	5.420 (7.308)***
No. of workers	0.528 (2.341)**	-0.705 (-2.296)	0.007 (0.212)
Value of total assets	0.094 (0.811)	0.022 (0.102)	0.130 (2.795)***
Working capital	0.560 (6.094)***	-0.362 (-1.962)	0.400 (11.958)***
Cost per hour of labor	0.013 (0.880)	0.013 (0.486)	0.023 (4.201)***
Age of the enterprise	0.012 (0.080)	-0.098 (-0.316)	0.033 (0.522)
No. of years in school	-0.026 (-0.816)	0.041 (0.553)	-0.005 (-0.302)
Work experience	-0.247 (-0.960)	0.606 (1.036)	0.044 (0.403)
No. of hours of operation	-0.101 (-0.182)	0.602 (0.058)	0.199 (0.867)
Loan		0.00001 (2.993)	0.00001 (2.986)***
Loan squared		-1.238×10^{-11} (-1.952)	1.232×10^{11} (0.620)**
PDF	-0.543 (-0.548)		
Adj. R^2	0.63		0.61

Note: *** - Significant at the 1 percent level.
** - Significant at the 5 percent level.

Table 8: Estimated credit effects for the non-manufacturing sector

Credit effect	Estimated value
Random credit effect	0.22 (0.036)***
Marginal credit effect at mean loan size	1.63 (0.312)***
Marginal credit effect at zero loan size	1.71 (0.328)***

Note: Figures in parentheses are standard errors.
*** Significant at the 1 percent level.
Under the restricted model specification, random credit effect is equal to the counterfactual credit effect.