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ACCESSIBILITY AND THIRD WORLD RURAL DEVELOPMENT:

A Case Study of Sumatra*

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Road and transport service improvements are widely recognized as important catalysts to economic development in most third world countries. When integrated with other programs which create new employment opportunities, roads and bus services enable subsistence farmers to seek off-farm salary-earning jobs. This paper examines the relationship between accessibility and economic well-being using data from rural Sumatra in Indonesia. The research relies on multiple indicators of both measures. Households in more remote rural villages are found to average appreciably lower levels of consumption expenditures. When isolated from subregional market and trade centers, consumption levels fall dramatically. The research also shows that the average value of farm produce increases with road quality, frequency of bus service, and close proximity of commercial centers. Thus, agriculture productivity is linked to both transport supply and spatial proximity factors. Additionally, the analysis shows that off-farm earnings increase when migrant households have access to both motorcycles and bicycles. Loans and subsidies for purchasing such "low tech" vehicles as bicycles, scooters, and micro-buses could prove more beneficial to many rural villagers than capital-intensive road projects. Lastly, the research suggests that the siting of transmigration settlements within reasonable proximity to regional and subregional market centers is important if the planned villages are to develop trade linkages and experience sustained economic growth.

1. Introduction

Isolation and poor road access are widely recognized as major impediments to rural economic development in the third world. Transport provides access to resources and markets, facilitates trade, and links people with jobs. Equally important, it encourages social interaction. While not a sufficient condition for either economic growth or socialization, transport facilities and services are unquestionably important precursors (Wilson, 1973; Schloss, 1983; Howe and Richards, 1984; Barwell, et al., 1985).

This paper examines the effects of accessibility on various indicators of household well-being, using two rural provinces of the island of Sumatra in Indonesia as a case context. Various indicators of rural accessibility are presented. These indicators are statistically associated with several expressions of household earnings and expenditures, using both multiple regression and discriminant analysis. Emphasis is placed on sifting through the relative importance of accessibility vis-a-vis other explanatory factors. Such

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research can shed light on the importance of channeling development aid into road infrastructure versus "human infrastructure" and other programs in stimulating rural economic development. The paper concludes with a discussion of policy directions for maximizing the affects of road and transport service investments on rural economic conditions in countries like Indonesia.

2. Transport Investment and Rural Development

Disparities in the level of accessibility among first and third world countries are glaring. Developing countries have around 75 percent of the world's people but account for only 10 percent of its paved highways and 9 percent of its motor vehicles (Owen, 1985). A dozen countries with half the world's population have only 2 percent of its motorized transport equipment. Today, immobility and isolation characterize large numbers of countries in Africa, Asia, and Latin America.

While there are many other ingredients of economic progress, transportation is a prerequisite of almost everything else that is needed to improve living conditions. For this reason, transport has historically been a central focus of international lending banks, such as the World Bank and US AID. In the 1950's, around 40 percent of all foreign loans went for transport projects; today, the share is less than 20 percent (Owen, 1985). This decline is due, in part, to some skepticism over the cost-effectiveness of past investments (Friedmann, 1975; Leinbach, 1982; Schloss, 1983). Indeed, empirical evidence on the effects of new roads on rural economic conditions is mixed at best. There are few before-and-after studies which use the kinds of statistical controls which allow the unique effects of road investments to be isolated from other macro-forces. For the most part, anecdotes are what potential donor agencies must rely upon.

The general intent of many rural aid programs is to encourage some shift from a subsistence, agrarian-based economy to a more industrial and service-oriented one. Good transport, it is often argued, is absolutely essential to such modernization (Baron, 1980). For many developing countries, roads are also important for transporting food surpluses to urban areas. Farm-to-market transport typically involves three separate links: the movement of harvested crops to some central collection point, perhaps a house; shipment to a roadside location; and lastly, transport to a market or processing plant (Leinbach, 1982). Simple modes, like scooters, bicycles, and animal carts, are often used in the accessing roadsides while mini-buses (or lifts from private motorists) are used for hauling produce to the market.

Some rural road programs have also sought to promote inter-regional migration. Studies show that roads encourage movement in both directions — from lagging rural areas to more prosperous urban ones as well as from crowded cities to the countryside (Leinbach, 1982). Rural-to-urban migration often involves temporary, short-term, and repeated relocations of young men in search of employment (Wilson, 1973; Lipton, 1980; Richards, 1984). Usually, migrants are neither the poorest or richest villagers. Where radial roads are built to primate cities, a braindrain sometimes occurs (Leinbach, 1983). For the most part, other capital and human service investments need to be made at the time roads are built in order to stimulate rural economies enough to make it attractive enough for indigenous residents to stay in their villages.

Of course, roads are only the medium on which travel occurs. Travel modes — trucks, jeeps, scooters, mini-buses, cars, bicycles, horsecarts — must be available if rural households are to enjoy increased accessibility. In rural areas where bartering is prevalent, few villagers can pay cash bus fares, much less purchase their own vehicles. In such settings, there is a need to create a market for travel by raising real incomes. New employment opportunities must be provided. For villagers to purchase vehicles, off-farm employment wages need to rise faster than the cost of capital. Accordingly, the general consensus among lending banks today is that road programs need to be part of an “integrated” package (Leinbach, 1983). That is, they should be tied to a general plan that aims to stimulate economic growth through new cash crop production, the introduction of training and extension programs, the construction of rural health clinics, and the like. When part of an integrated package, new roads in Indonesia have resulted in spontaneous construction and upgrading of unsponsored road projects in other remote areas (Leinbach, 1982). While there remains some debate over how high of a priority road construction should be, most observers concede that transportation improvements are necessary, albeit not sufficient, prerequisites for sustained economic growth.

3. Case Study of Accessibility in Sumatra

Over the past three decades, the government of Indonesia has pursued a national policy of encouraging poor residents of the crowded inner islands of Java, Madura, and Bali to relocate to newly developing rural areas of outer islands (Hardjono, 1978; World Bank, 1988). Called “transmigration”, the program has sought to relieve population pressures on the inner islands and to promote rural economic development in the sparsely populated outer islands of Sumatra, Kalimantan, Sulawesi, and Irian Java through large-scale agricultural development projects. Indonesia has a significant population imbalance. The island of Java comprises less than 7 percent of the country’s land area yet accounts for 61 percent of its 180 million inhabitants (World Bank, 1988). The resettlement program places landless families into planned agricultural communities with the mission of cultivating arable food and tree crops. Since the program’s inception in the early 1950s, over 2.2 million families have been resettled, 65 percent of whom have gone to Sumatra (Ardnt, 1983; World Bank, 1983).

Indonesia’s transmigration program has helped finance rural road development. Around 15 percent of the all-weather roads in Indonesia’s outer islands were built through the transmigration program. According to a recent World Bank (1988) evaluation of the transmigration program, roads have been one of the most important factors in stimulating economic growth.

This paper examines the relationship between accessibility and various indicators of economic well-being using socio-economic data compiled from villagers who reside in areas with established transmigration programs. As part of Indonesia’s TRANS-V evaluation phase of the transmigration program, data were collected during interviews carried out in 1988 of 275 upland villagers in both Riau and Jambi Provinces of central Sumatra. (See Figure 1 for the location of the two provinces.) All interviews were carried out by Indonesian planners through the funding support of Indonesia’s Ministry of Transmigration. Nearly all of those interviewed were heads-of-households who had relocated to oil

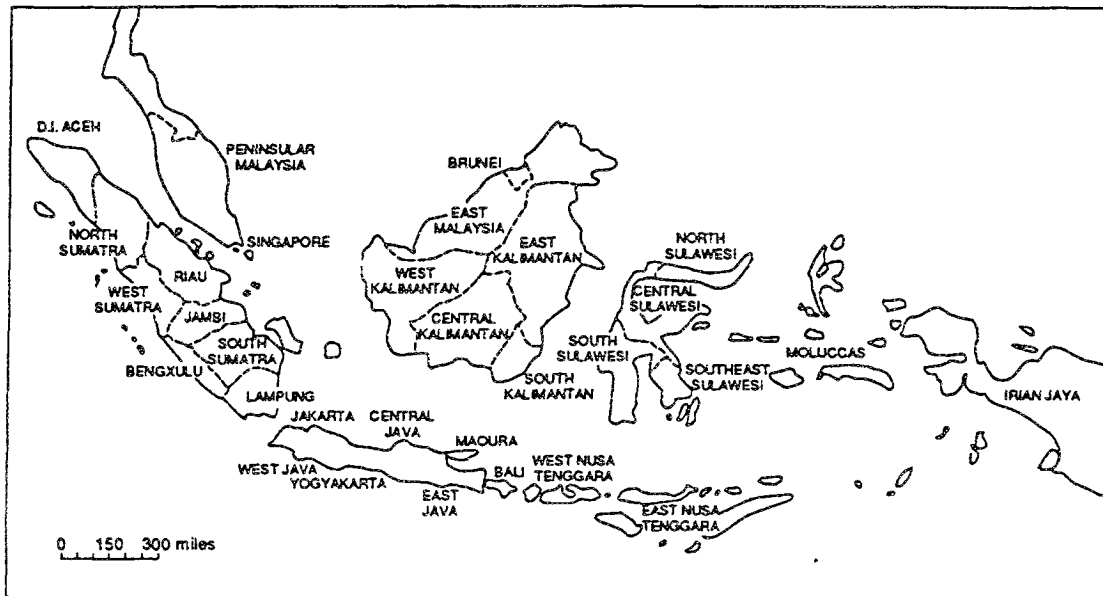


Figure 1. Location of Riau and Jambi Provinces in Indonesia

palm or rubber crop plantations in upland areas of Riau and Jambi Provinces. Most maintained 2 hectare farm plots consisting mainly of rice, cassava, and maize for household consumption. Some also found off-farm employment as common laborers, field workers, and rubber tappers from time to time.

An additional data base was developed for 75 rural villages within both Riau and Jambi Provinces, all of which had 1986 populations below 5,000. These data were compiled for the purpose of studying how regional proximity to markets appears to affect economic conditions. Community-level data were obtained from the Statistical Offices of both Riau and Jambi Provinces (Syarikat Sailcos, 1988).

Three specific research inquiries follow. First, the association between regional proximity and household consumption are investigated for the 75 rural villages. Next, average farm income is related to a multi-variable measure of accessibility. Last, the extent to which access to vehicles influences whether the 275 interviewed transmigrants are able to secure off-farm employment is investigated. Varying measures of economic well-being are used in this analysis due, in part, to the fact that no single measure captures the full dimensionality of "household welfare". By triangulating the research to study how various indicators of accessibility are related to various indicators of economic well-being, it is felt that more robust policy insights can be gained.

It should be noted that the statistical results which follow are based on stepwise regression analysis. This approach was taken because the research was more exploratory than inductive in approach as well as the fact that some explanatory variables that would aid the analysis simply were not available. Still, the analyses which follow provide useful insights into the link between various measures of accessibility and economic well-being in rural third world settings.

3.1 Household Expenditures and Regional Proximity

Proximity to major markets and retail centers should have some affect on the standard of living of rural villagers in Sumatra. In the analysis below, average annual household expenditures are correlated with distance to two kinds of market centers: the capital and primate city of each province; and the closest regional marketplace, which in most cases is the sub-provincial, or regency (Kabupaten), capital. Riau's Provincial Capital is Pekanbaru, a city of approximately 220,000 inhabitants, located on the Siak River. In the case of Jambi, the Provincial Capital is the city of Jambi, which had a 1986 population of around 300,000 residents. In addition to the two measures of proximity, two other explanatory variables are included in the analysis: imputed average value of farm household produce (a proxy for income); and average household size. By controlling for these determinants of household consumption patterns, the unique affects of proximity can be isolated.

Average household consumption expenditures was chosen as the dependent variable mainly because income data for third world countries like Indonesia are often suspect. According to Grootaert (1982), household expenditures obtained from surveys in developing countries typically exceed reported household income for 80 to 90 percent of the population. Because household expenditures tend to be more accurately reported, there is general agreement that consumption data are most appropriate for assessing economic welfare in third world countries.

A log-log functional form has traditionally been shown to best explain household consumption patterns in third world countries (Hothakker, 1959; Berry, 1978; Dixon, 1982; Chow, 1985). This form also produces coefficient estimates that represent elasticities — i.e., measures of the marginal propensity to consume. For the 75 rural Sumatran villages studied, the following equation, estimated using ordinary least squares, was the best fitting:

$$\text{HHEXP} = 309.2 * \text{HHY}^{.501} * \text{HHSIZE}^{.467} * \text{DISCAP}^{-.122} * \text{DISREG}^{-.198} \quad (1)$$

(.000)
(.002)
(.004)
(.002)

$$R^2 = .805, F = 63.14, \text{ prob (F)} = .000, N = 75$$

where:

HHEXP = average annual 1988 household expenditure, in Rupiah (1 SUS = 1,700 Rupiah)

HHY = average annual 1988 household income, imputed as value of farm produce, in Rupiah

HHSIZE = average number of persons per household

DISCAP = airline distance in kilometers to the provincial capital and primate city (in Jambi Province, the city of Jarnbi; in Riau Province, the city of Pekanbaru)

DISREG = airline distance in kilometers to the closest regional market (generally the sub-provincial, or regency, capital).

() = probability value of regression coefficient

R² = coefficient of determination

F = F statistic

N = number of cases

As expected, equation 1 indicates that, *ceteris paribus*, average household consumption increases with farm production and household size and declines with distance to both provincial capitals and the nearest regional market center. Based on the elasticity coefficients, it is seen that household consumption is most sensitive to levels of farm output and family size. For every 1,000 Rupiah of farm produce, the model indicates that household consumption expenditures rise by 501 Rupiah, all else equal.¹

Equation 1 also confirms the general affects of rural isolation on household well-being. Controlling for imputed income and family size, consumption declines with distances to major commercial markets. Clearly, isolated farmsteads that rely on subsistence crop production and bartering are least able to participate in a cash-oriented market economy. The equation suggests that isolation from the major regional marketplace has more of a dampening affect on consumption than isolation from the Provincial capital. For every 10 percent increase in distance to the nearest regional marketplace, average household consumption falls by nearly 2 percent. One might surmise that access to the Provincial capital relates more to the consumption of relatively expensive, less frequently purchased durable goods. Access to regional market centers, on the other hand, is probably associated more with the consumption of frequently purchased food items and common household goods. Accordingly, average expenditures are more sensitive to proximity to regional trade centers than to the Provincial capital. Overall, one can infer from Equation 1 that increasing farm output and non-farm earnings, combined with access improvements to regional marketplaces, could be expected to stimulate household consumption rates and, accordingly, rural economies.

The significance of the "distance" variables seems to support the Central Place Theory of efficient settlement hierarchy (King, 1984). Importantly, the results suggest that those transmigration settlements that are reasonably close to major market centers are better off, economically, than those that are farther away. To the extent that transmigration settlements are sited according to some Central Place hierarchy, thus facilitating interactions and expediting the distribution of goods and resources, general levels of economic well-being could be expected to improve.

3.2 Farm Production and Accessibility

In this section, the concept of accessibility is extended. While the relative location of farm communities to marketplaces captures the spatial dimension of accessibility, it overlooks the quality of transportation facilities and services that exist. In order to capture both the spatial and supply dimensions of accessibility, more of a multi-factor expression is needed.

The measure of economic well-being used in this section is average value of farm output, imputed from the estimated production outputs of different crops within each community and average farmgate prices in 1988. Since all 75 rural communities examined in this study have principally agro-based economies, this was considered to be the most accurate proxy of average household incomes. Using a stepwise analysis of numer-

¹In 1988, 1 \$U.S. = 1,700 Indonesian Rupiah.

ous variables measuring socio-economic conditions and levels of farm inputs, the best-fitting equation for predicting the value of farm outputs is summarized in Table 1. As would be expected, the model indicates that the average value of farm outputs for the 75 rural Sumatran communities increases with the average age of the household head and family size. More important from a policy standpoint is the accessibility indicator. *Ceteris paribus*, high levels of accessibility are associated with high levels of farm output.

It should be noted that the relative accessibility of each rural village is gauged in terms of three factors: (1) its relative distance to three hierarchical levels of market centers — the Provincial Capital, regency centers (Kabupaten), and sub-regional centers (Kecamatan); (2) the lineal kilometers of all-weather roads within a 25 kilometer distance of the village; and (3) the frequency of regional bus services to the village.² Since these factors are based on different units of measurement, it is necessary to standardize them. This was done using standardized scores, or Z scores. Those villages with close proximity to market centers, high levels of paved road, and frequent bus services relative to the "average" village received high Z scores.³ Thus, high scores denote high levels of accessibility.

This analysis provides a richer perspective into the affects of accessibility on economic conditions because both road supply and transit services are accounted for. Although household characteristics, such as family size, were stronger predictors of average farm output, levels of accessibility nonetheless proved more important than other factors that did not enter the stepwise equation, such as levels of educational attainment and indicators of soil quality. One can infer that access to market centers is necessary to obtain both farms inputs (e.g., hand tools, seeds, fertilizers, pesticides) as well as to sell farm outputs and food surpluses. Thus, reasonably good accessibility appears to be important toward stimulating market transactions and trade in rural Sumatra.

3.3 Off-Farm Earnings and Vehicle Access

The final inquiry involved studying the relationship between off-farm earnings and vehicle ownership for transmigrant households themselves. Thus, rather than examining the relationship between economic conditions and accessibility for villages, this analysis was far more disaggregate, using individual households as the unit of study. And while the prior analyses involved both indigenous inhabitants and transmigrants, this one looks only at the relationship between economic well-being and accessibility for the 275 surveyed transmigrant families.

²If each factor was treated as a separate variable in the analysis, the model would have broken down because of high inter-correlations. A composite measure of accessibility gets around the problem of multicollinearity. As with factor analysis, a composite index linearly combines the measures into a single expression. In this way, the different dimensions of accessibility are captured and model integrity is retained.

³In measuring accessibility, the three distance measures were inverted (by dividing each into one) in order to develop an index that was consistent with the other two measures (kilometers of paved roads and frequency of bus service). Thus, summed over the five measures, a high Z score represents a high index of accessibility.

Table 1
Predictors of Average Value of Farm Outputs
for Rural Communities in Riau and Jambi Provinces of Indonesia, 1988

Dependent Variable: Average Imputed Value of
 Farm Output, in Rupiah *

	Coefficient	t statistic	Significance
Average age of head of household	38,274.5	5.19	.000
Average family size, persons per household	153,563.1	2.80	.007
Accessibility Index **	33,070.1	1.97	.051
Constant	-1,801,107	-5.00	.000

Summary Statistics:

R² = .397
 F = 15.56
 Prob (F) = .000
 N = 75

Note:

* Average value of farm output is estimated using the surveyed data on annual farm produce for villagers sampled under the TRANS-V program. Average farmgate prices for each of the food crops and produce were used in estimating cash value of output.

$$** \text{ Accessibility Index}_i = \sum_{j=1}^k \left[\frac{X_{ij} - \bar{X}_j}{S_j} \right],$$

where: X = variable
 \bar{X} = mean of variable
 S = standard deviation
 i = case subscript
 j = variable subscript
 k = number of variables.

Variables used:

- (1) l/Airline distance to Provincial Capital (Pekanbaru or Jambi) in kilometers;
- (2) l/Airline distance to Regency, Sub-Provincial Capital (Kabupaten) in kilometers;
- (3) l/Airline distance to Sub-regency, regional center (Kecamatan) in kilometers;
- (4) oneway length of paved or all-weather roads within a 25 kilometer radius of village; and
- (5) weekly number of intra- and inter-regional buses servicing the village.

As discussed earlier, one of the main objectives of Indonesia's transmigration program is to encourage the industrialization of rural economies through the establishment of tree crop estates, extractive industries, or some other export-based activity. Such enterprises can create off-farm employment opportunities for adults who would otherwise subsist as farmers. To date, transmigrants in rural Riau and Jambi Provinces have found off-farm jobs as common laborers, field workers, field supervisors, truck drivers, retailers, contractors, and semi-skilled workers in such cottage industries as rattan weaving and brick-making. These off-farm occupations introduce cash income into rural economies, which in turn stimulate consumption, investment, trade, and new production activities. Thus, the link between off-farm earnings and accessibility is a particularly important one.

From survey results, 64 percent of the transmigrant households were found to earn less than \$200 U.S. per year. By income source, about 45 percent comes from the sale of farm produce, 42 percent from off-farm earnings and employment, and the remaining 13 percent from the sale of livestock, subsidies, and remittances from relatives. Thus, off-farm sources contribute nearly as much to the total earnings of transmigrant households as do sales of farm produce.

To identify the most significant variables differentiating households with unequal off-farm earnings, a discriminant analysis was performed. Discriminant analysis was chosen instead of regression analysis because there was a distinct tri-modal distribution in the "off-farm earnings" variable. If regression analysis was used instead, parameter estimates would have been biased due to heteroscedasticity problems. Thus, treating the three distinct clusters as categories yielded less biased, albeit statistically less robust, estimates.

For the discriminant analysis, three groups of households were defined on the basis of their annual off-farm earnings: under \$60 (U.S.); \$61 to \$200 (U.S.); and above \$200. Table 2 shows that nine variables were effective at discriminating among the three off-farm earnings groups. Of relevance to this research, both bicycle and motorcycle ownership were found to be significant predictors of group membership.

Two discriminant functions were created by linearly weighing and combining the nine predictor variables. The first function was dominant, explaining 91.3 percent of total variance. Jointly, the two functions correctly predicted the group membership of 74.5 percent of the transmigrant households.

Figure 2 plots the coefficients of the nine predictor variables for the two discriminant functions. The figure suggests that discriminant function 1 characterizes those household heads who spend a considerable length of time on both farm and off-farm employment, possess some form of specialized skills, and were non-farmers prior to becoming transmigrants.⁴ Their households generally have a high rate of bicycle and motorcycle owner-

⁴The inclusion of the two time-input variables may appear self-fulfilling since an individual usually cannot earn more off-farm income by spending less time in such activities. As statistical controls, however, they allow the marginal contribution of other more policy relevant variables to be identified. A strong positive association was found between farm and off-farm time inputs. Since household heads who work longer hours in off-farm jobs also expend comparable efforts on farm activities, it appears that successful off-farm workers need not necessarily cut back their farm work. Instead, they appear to work harder.

Table 2
Summary Statistics of
Discriminant Analysis of Off-Farm Earnings*

Variables:	Standardized Canonical Discriminant Coefficients	
	Function 1	Function 2
Time spent on off-farm employment (hrs./day)	.787	.711
Time spent on business activities (hrs./day)	.777	.469
Bicycle ownership (bicycles/HH)	.322	-.097
Amount of loan from cooperative (KUD) in last 12 months (in Rupiah, 1988)	.286	-.586
Time spent on farm employment (hrs./day)	.185	.400
Motorcycle ownership (motorcycles/HH)	.144	-.453
Skill level of head of household, 3=high, 2=medium, 1=low	.141	-.406
Presence of someone over 50 years living in household, 1=yes, 0=no	-.131	.327
Occupation of household head prior to joining transmigration, 1=farmer, 0=non-farmer	-.368	-.406
Summary Statistics:		
Eigenvalue	.854	.082
Pct of Variance Explained	91.26	8.74
Wilks' Lambda	.499	.924
Significance	.000	.059

Note:

* The three groups of annual off-farm earnings are: (1) < \$60 (U.S.); (2) \$61 to \$200 (U.S.); and (3) above \$200 (U.S.)

ship, are able to secure loans from their village cooperatives (KUDs), and have few members above 50 years of age.

All of these factors seem intuitive. Specialized skills and prior non-farm experience increase the likelihood of transmigrants being qualified for job openings. Financial loans reflect the importance of cooperatives in providing the capital needed to start up new businesses or acquire new skills. Apropos to this research, the variables denoting vehicle ownership suggest that mobility tends to enhance accessibility to off-farm work opportunities. Thus, controlling for such factors as time inputs, prior experience, and financial loans, access to vehicles still emerges as a significant determinant of off-farm earnings. In the case of virtually all of the surveyed households, bicycles and motorcycles are the only mechanical forms of transport available to them. Four-wheel vehicles are far too expensive for most. Moreover, the hard-packed dirt roads serving many transmigration villages are impassable during rainy seasons, except by two-wheel vehicles. Typically, transmigration settlements lie around ten to fifteen kilometers from the nearest commercial village or industrial estate where off-farm employment opportunities might exist. Such distances can be covered daily by either human-powered or motorized two-wheelers; by foot, however, they are too far. Thus, the availability of even low-cost transport modes like bikes and scooters appear to be important factors in encouraging off-farm employment among transmigrants.

4. Conclusion

Accessibility is a multi-dimensional concept that relates to the opportunities available to individuals for reaching places they wish to go. In the third world, it is affected by such factors as distance to markets, road quality, and the availability of bus services and other modes, including bicycles. Only by exploring how these factors, individually and collectively, influence the living standards of rural households can one gain insights into the relative importance of accessibility in stimulating rural economic growth.

Using data from rural Sumatra, this research confirmed the supposition that accessibility is vital to stimulating rural economic growth. The analysis relied on multiple indicators of both economic well-being and accessibility. The work also concentrated on the importance of accessibility among the poorest of the poor — transmigrant households who leave their native villages almost as a last resort in search of better living conditions.

Overall, households in more remote rural villages averaged lower levels of consumption expenditures. When isolated from market centers, consumption levels fall dramatically. The research also showed that the average value of farm produce increases with road quality, frequency of bus service, and close proximity to commercial markets. Thus, agricultural productivity is linked to both transport supply and spatial proximity factors. Lastly, the analysis demonstrated that off-farm earnings increase when transmigrant households have access to both motorcycles and bicycles.

Collectively, these findings suggest that investments in roads as well as transport modes are important catalysts to economic growth in rural Sumatra. Of course, there must be jobs and social services to go to for the benefits of improved accessibility to be realized. Thus, transport investments must be integrated with such human infrastructure investments as manpower training, health clinics, and schools. Clearly, there must be

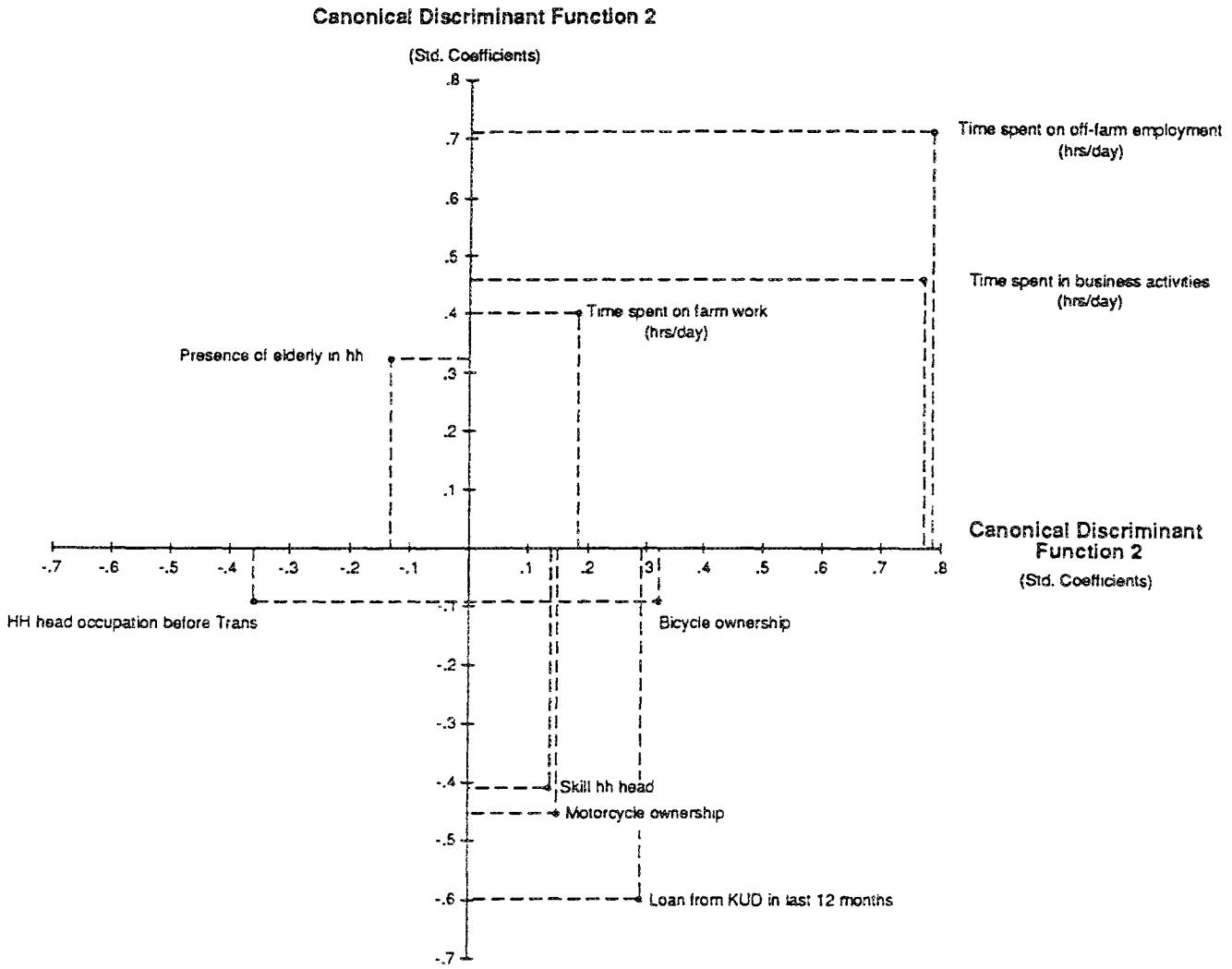


Figure 2. Variable Loadings on Two Discriminant Functions for Off-Farm Earnings

investments in human infrastructure for the investments in physical infrastructure to reap dividends. In general, targeting capital improvements into surfacing and rehabilitating existing roads and opening up new passageways in newly developing areas would seem to have high pay-off potential. Likewise, loan programs which enable transmigrants and other rural households to purchase bicycles and motor scooters are essential if off-farm employment is to be encouraged. Often, aid programs focus on improving feeder roads, which do little to help people who have few opportunities to use mechanized transport either because it is unavailable or too costly. Loans and subsidies for purchasing such "low-tech" vehicles as bicycles, scooters, and micro-vans could prove more beneficial in the case of many transmigrant households. Finally, this research suggests that the location of transmigration settlements with reference to market and trade centers is also important. By strategically locating settlements so as to build a central place hierarchy, economic linkages can be strengthened. In general, those settlements which are within an hour or so of a regional or subregional marketplace via buses, trucks, or motorcycle can be expected to experience more economic growth than more remote settlements. In sum, the careful siting of new transmigration settlements, combined with the provision of all-weather road facilities and modal travel opportunities, appear to be vital toward sustained economic development in settings like rural Sumatra.

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