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ABSTRACT
              Rural-to-urban migration of educated rural youth is a
factor leading to economic marginality and community decline in rural
America. This paper examines the extent to which high school
curriculum contributes to the postschool outmigration of high school
graduates, particularly those in rural areas. The study analyzed data
from a national longitudinal survey, High School and Beyond, using
two-level logit models for generating reliable estimates of
organizational effects on individual behavior. The final sample
included 16,492 students from 875 schools who were seniors in 1980 or
1982 and who participated in the 1986 follow-up survey. Controlling
for local labor market conditions and student socioeconomic and
demographic background, analyses revealed that: (1) a school's
average outmigration is positively related to the school's emphasis
on academic programs and negatively related to emphasis on vocational
programs; (2) the probability of student outmigration is positively
related to students' academic coursework and negatively related to
students' vocational coursework; (3) these relationships hold in the
subsample of youth who did not attend college in the 4 years after
high school completion, as well as in the total sample; and (4)
overall, curriculum effects did not differ between rural schools and
those elsewhere. The implementation of two-level logit models through
the software MLn and related statistical issues are addressed.
Contains 33 references. (SV)

EFFECT OF HIGH SCHOOL PROGRAMS ON OUT-MIGRATION OF RURAL YOUTH

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This article presents a study which addressed a policy research issue regarding outmigration among rural high school graduates. The study analyzed data from a national longitudinal survey, the High School and Beyond (HS&B) sponsored by the National Center for Education Statistics, using two-level logit models for generating reliable estimates of organization effects on individual behavior. This study examined the post-school outmigration pattern in connection to students' coursework and schools' curriculum, focusing on the effect of academic program versus vocational program adjusting for the effects of local labor market condition and student sociodemographic background. This study also systematically examined the implementation of two-level logit models through the software MLn. Related statistical issues were addressed.

1. Introduction
1.1 The Policy Issue

Rural-to-urban migration of educated rural youth is a factor leading to economic marginality and community decline in rural America (McGranahan & Ghelfi, 1991; O'Hare, 1988; Reid, 1990; De Young, 1987). Some analysts say that the existing public school curriculum has contributed to the problems (Berry, 1990; Theobald, 1992; Snauwaert, 1990; Thompson & Kutach, 1990). Schools, they argue, have failed in educating the young to strengthen their community identity and to preserve the environment and community. Typical rural school programs provide predominatly occupational skills, which essentially prepare students for the urban labor market. Thus, rural schools are contributing to the decline of rural areas (Berry, 1990).

Some rural advocates suggest that it is necessary to strengthen liberal arts and humanities education, rather than occupational training, in rural schools (Berry, 1990, 1989,). The idea has drawn attention from rural educators who support strengthening liberal arts and humanities curricula (Theobald, 1992; Snauwaert, 1990; Thompson & Kutach, 1990). They believe that liberal education can nurture the understanding and appreciation of the links between man and the land, local heritage and the global civilization, and help students maintain their attachment to the community. Only with a strong root in the community, is it possible for young people to contribute to the community development while achieving personal wellness.

On the other hand, many aruge that vocational and technical education oriented toward providing marketable skills to students are essential for local community development as well as for individuals' occupational success (e.g., Klerman & Karoly,1995; Vandegrift & Danzig, 1993; Muraskin, 1993). In this perspective, vocational/technical training, often developed to fulfill the market needs, not only helps students get jobs but also foster entrenprieniorship that contributes to local economic development (Finch, 1993; Sherr, 1977).

Further, vocational and technical education may be particularly helpful for youth who are disadvantaged in socioeconomic background, disabilities, and rural locale by training them to learn cognitive skills in job-specific contexts (Teixeira & Swaim, 1991). The programs require a shorter period for student to complete than academic programs do, and allow them to promptly apply learned knowledge and skills to their workplace (Muraskin, 1993; Finch, 1993). Such features in vocational/technical education may contribute to graduates' success in labor market of local areas or elsewhere.

To address problems in rural education and rural development, it is critical for research to understand the mechanism in which educated youth are moving out from rural areas (Teixeira, 1993). This study is intended to explore the impact of the content of rural education on outmigration . We recognize, however, the differential benefits of specific school programs to different student subgroups, the unique concerns of local communities, and the diverse contexts wherein schooling takes place. The study is not meant to offer a uniform answer to the question as what kind of program is suited to a particular community.

1.2 Prior Studies

The research on rural outmigration has been largely motivated by economic and demographic concerns. In

dealing with the factors responsible for rural outmigration, research often focused on job market; life quality; housing conditions; and demographic background of migrants such as race, age, income, and residential history (e.g., Cromartie, 1993, Sandefur & Jeon,1991; Voss & Futuitt, 1991; Johnson, 1989; Adamchak, 1987). Educational attainment has been studied as a predictor variable for migration, but the content of schooling in connection to subsequent mobility has been rarely studied. Little has been known about the differential effects of secondary school curriculum and student coursework on later geographic mobility.

An available study (Pollard, O'Hare & Berg, 1991) did provide a ground for further research. This study examined a series of correlates to post-high school migration with HS&B data, including students' enrollment in different curricular programs. It described a pattern in which a large portion of outmigrants-- relative to those who stayed in the community-- were enrolled in high school academic programs. The analysis, however, was not adequate to answer the questions we pose. While dealing with a large number of variables in predicting migration, it has not focused on the impact of content of schooling, nor differentiated the effects of school program provision vis-a-vis individual student coursework.

Building upon this line of research, we examined the issue by focusing on the joint effect of student coursework and school instructional programs in predicting post-school moving, adjusting for the effects of student background and community context. With the two perspectives about school curriculum as a conceptual framework, we analyzed data simultaneously at student- and school-levels to sytematically investigate the differential effects on outmigration by academic and vocational\tecnical education in terms of both student coursetaking and school program provisions.

The analysis linked post-school migration to liberal arts education embodied in academic curriculum in contrast to vocational/technical education geared to acquiring occupational skills. Theoretically, academic learning differed from that of job-skill acquisition in influencing students' willingness to stay in the local community. We considered the school "compositional" effect and the effect of individual students' coursework as distinctive factors contributing to post-school mobility. The compositional effect at the school level could be represented by enrollment in a particular program. High enrollment in a program reflected the school emphasis on the given program. A large proportion of students in academic program often indicated the school's value of academic learning and its commitment of resource to the program. Moreover, high enrollment in academic program probably suggested an overall school atomosphere pressing student toward academic learning. Likewise, high enrollment in vocational/technical programs represented the school emphasis on job skill training and likely a strong climate that forstered student interest and effort to acquire such skills.

Normally, students who were in academic programs tended to be involved in more liberal arts education (literature, history, math, and science); whereas students in vocational and technical programs were more likely to learn practical, specific occupational skills. Specific coursetaking also should be a factor influencing the amount of students' exposure to liberal arts and vocational learning.

2. Study Design
2.1 Data

We used HS&B (1980-1992)'s 1980 sophomore cohort data combined with the senior cohort in order to have adequate within-school student samples. For the 1980 sophomore cohort data, we used: (1) the first followup (1982, the senior year) data on coursetaking (from transcripts file), curriculum program (academic vs. vocational), test scores (composite and 1982 IRT scores on reading and math), and other background measures; and (2) the third followup (1986) data on migration. For the senior cohort, similar data from the base year (1980, the senior year) and the second followup were used. Local economic indicators from the Census component were, as school-level variables, attached to each student record of both cohorts.

A group of students whose schools contained less than 3 students in the sample were removed from the analysis. The final file contains 875 schools with a total of 16,492 students. The within-school sample size averaged 18.8, with a standard deviation of 7.78, ranging from 3 to 48. The student sample represented the 1980 and 1982 public high school seniors in the U.S. who participated in the HS&B followup surveys as specified above. The school sample represented the public high schools to which these students went.

To improve the data quality, we edited data, including recoding, rescaling, and imputing missing values. Data were largely compatible between the two cohorts with one exception, the curriculum credits. For sophomores, an official transcripts survey provided valid records of their coursework and composites for academic and vocational credits were in file. For seniors, only self-reported coursework was available. To retain the good quality of the sophomore transcript data while making the senior self-reported credit data comparable, we took the following approach: first,

scales for senior self-reported academic and vocational credits were developed; second, both senior and sophomore scales were standardized so that the measures were statistically compatible.

2.2 Variables

Following variables were selected for the analysis:

Outcome variable: Outmigration rate (MIGRATE). A binary indicator for outmigrant, defined by the student-reported residential location of 50 or more miles away from the original community four years after high school completion.

Student level variables:

Academic coursework measure (ACADCRC). A standardized score of two source of information: seniors' self-reported course-taking and sophomores' academic curriculum credits from the transcripts survey file.

Vocational coursework measure (VOCTCRC). Scaled with the same approach as for academic coursework.

Senior-year test score (FUTESTC). A standardized measure of academic achievement.

Parents' education (PCOLLEGE). As an indicator for student socioeconomic status because of substantial missing of student economical status composite data.

Minority (MINORITY). A dummy variable (Black, Hispanic, Native American and Others versus otherwise).

School level variables:

School academic program enrollment rate (ACADEMM).

School vocational program enrollment rate (VOCATM).

A binary locale indicator of rural versus others (RURAL).

County-level employment growth rate between 1980 and 1982 (CEMPG02). As an indicator of the local labor market conditions, used as a school-level variable.

Two cross-product interaction terms: interaction between RURAL and ACADEMM (RU_ACADM), and interaction between RURAL and VOCATM (RU_VOCTM).

Imputation Missing values for most variables were a small portion and imputed with the sample means. MIGRATE, with approximately 3 percent nonresponse, was examined in relation with race, parents' education, program enrollment, coursework, and local economic indicators. A pattern identified with these predictors was used to generate imputing

values. The rate of outmigration among the imputed cases was similar to that of the total sample.

Centering All student-level variables were centered around their school means. Centered metrics were used since level-2 intra-unit correlation was found substantial (for the debate on the issue, see Plewis, et al., 1989).

2.3 Weighting After exploring a number of weighting procedures, we decided not to use any of them due to the restrictions imposed by the software and logistic regression procedures. The weighting issue will be discussed later in section 5.1 of this article.

3. Multilevel Logit Modeling

Multilevel logit modeling (Goldstein, 1995) was used to analyze the data. The software MLn (Rasbash, et al., 1995; Woodhouse, et al., 1995) was used to implement the models.

For binary responses y_{ij} for student i in school j, with outcome probability π_{ij}, the two-level logit model is described as follows (Goldstein, 1995). At level-1,

$$y_{ij} = \pi_{ij} + z_{ij} e_{ij}$$

where $z_{ij} e_{ij}$ is the level-1 binomial error, $z_{ij} = [\pi_{ij}(1 - \pi_{ij})]^{1/2}$, $\sigma_e^2 = 1$, and

$$\log it(\pi_{ij}) = \log \frac{\pi_{ij}}{1 - \pi_{ij}}$$

is modeled by a linear predictor that contained student explanatory variables with coefficients containing random components representing the variation of school characteristics. In a baseline model addressing the question as how much is the variance of outmigration across schools, the linear predictor consists of only a random intercept β_{0j} with

$$\beta_{0j} = \gamma_{00} + u_{0j} \qquad (1)$$

where γ_{00} is the fixed intercept and u_{0j} is the level-2 error associated with the intercept, $u_{0j} \sim N(0, \sigma_{u0}^2)$. The intercept-as-outcome model contains school-level explanatory variables:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{RURAL}) + \gamma_{02}(\text{CEMPG02})$$
$$+ \gamma_{03}(\text{ACADEMM}) + \gamma_{04}(\text{VOCATMM}) + \qquad (2)$$

γ_{05} (RU_ACADM) $+ \gamma_{06}$ (RU_VOCTM) $+ u_{0j}$

addressing such question as how school-level variables contribute to the average outmigration rate, and how they explain the variance of the outmigration rate.

With all the five student variables included in the level-1 model, the linear predictor is formed as

$$\beta_{0j} + \beta_{1j}(\text{ACADCRC}) + \beta_{2j}(\text{VOCTCRC}) +$$
$$\beta_{3j}(\text{FUTESTC}) + \beta_{4j}(\text{PCOLLEGE}) +$$
$$\beta_{5j}(\text{MINORITY}).$$

For our data, we found the slopes in the level-1 model did not vary significantly at level-2. Thus we focused on the intercept-as-outcome model with fixed level-1 covariates.

Table 1 presents the estimates from two intercept models: without and with level-1 covariates.

Table 1. Estimates of Two-level Random-Intercept Logit Models (standard error in parenthesis): The sample of the 1980 and 1982 seniors of US public high schools

Estimate	Without student variable	With student variable
Fixed effects		
School mean outmigrt.	1.160(.134)	-1.245(.140)
RURAL	.499(.053)	.809(.214)
CEMPG02	-.009(.004)	-.009(.004)
ACADEMM	.806(.206)	.794(.215)
VOCATMM	-.911(.228)	-.893(.239)
RU_ACADM	-.578(.353)ns	-.655(.370)ns
RU_VOCTM	-.135(.385)ns	-.182(.403)ns
ACADCRC		.217(.023)
VOCATCRC		-.128(.021)
FUTESTC		.041(.003)
PCOLLEGE		.469(.042)
MINORITY		.042(.050)ns
Random effects		
School mean outmigrt.	.202(.023)	.232 (.025)
Log likelihood	19747.4	18304.2

Note: All estimates are statistically significant at p<.05 level except those noted with n.s.

It is possible that relationship found in the analysis reflected the association between academic learning and college attendance that required moving out of rural communities. To make sure that this possibility not confound the relationship between curriculum and

outmigration, we further analyzed data of students who did not to to college in the 4-year period after high school, with models same as that for the total sample.

Findings from the two analyses are largely consistent. Similar to the pattern found in the total sample analysis, estimates from non-college goer data confirm that outmigration is positively related to school academic curriculum and student academic coursework (in the model with level-1 covariates, the two estimates are respectively .794 and .217 in logit), and negatively related to school vocational program enrollment and student vocational coursework (respectively, -.449 and -.131). The two analyses also generate similar estimates of the effects of other variables at both levels.

4. Discussion

This study examined the effects of public school curriculum on rural youth outmigration with HS&B logitudinal data. Two-level random-intercept logistic regression models were tested, taking student-level logit of outmigration and school average outmigration as the outcome variables in simultaneous analyses. We decomposed the effects into school- and individual-levels components, controlled for the effects of local employment conditions and student test scores and sociodemographic background, and introduced interaction terms to determine the specific effects of curriculum on rural school average outmigration. .

The analyses suggest that (1) school average outmigration is positively related to the school emphasis on academic programs and negatively related to the school emphasis on vocational programs; (2) also, the probability of student outmigration is positively related to students' academic coursework and negatively related to students' vocational coursework; (3) these relationships hold in the subsample of the youth who did not go to college in the period of the four years after high school completion, as well as in the total sample; and (4) overall, curriculum effects do not differ in rural schools vis-a-vis schools elsewhere. In brief, vocational education seems to work better than academic programs in retaining youth in the rural areas.

As discussed earlier, the findings from this study are intended to further the understanding about the functions of public school curriculum in connection to postsecondary student mobility in rural areas. They cannot be applied to assessing the value of specific programs in local schools. An implication is that vocational and technical education programs tailored to local economic needs are capable of serving communities in retaining educated youth in rural areas. An emerging consensus seems to favor curriculum

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integration that encompasses cooperative learning, experiential education, and community based learning, in addition to both conventional academic and vocational education.

Future research may be directed to look at more specific elements of school curriculum contents in explaining student postsecondary mobility. Within large categories of programs, sub-groups of courses that are more relevant to the needs of local development may be identified and examined. For example, rural areas with tourist resources may benifit from educational programs that concentrate in tourist business; whereas areas with correctional facilities may need criminal justice and other related training programs. The rapid development of elecommunication technology is making it possible for professionals to work in places that are remote from urban centers. In responding to such changes, schools are providing increasingly more courses on new technology. The changing curriculum is likely to contribute to retaining educated youth in rural areas. How and to what extent this actually happens is an issue needs to study.

5. Statistical issues

In this study, with the implementation of multilevel logit models, related statistical issues in weighting and model assessment were addressed methodologically and empirically.

5.1 Weighting

Weighting for survey data in multilevel logit modeling was an issue (Skinner ,1996). Literature review showed there were few studies reported in multilevel logit modeling of binary responses, and none of them involving use of weighted models (McArdle and Hamagami, 1994; Rodriguez and Goldman, 1995).

Both MLn and HLM (Bryk, et al., 1996), another widely used software for multilevel modeling, can perform weighted multilevel linear modeling, though they have different design of weighting procedure. However, neither MLn nor HLM is ready to perform weighted multilevel logit modeling. In fact, HLM's newly available procedure for hierarchical generalized linear modeling (HGLM) doesn't contain a weighting device. And for MLn, our examination showed its weighting procedure is applicable also only to linear modeling. We thus decided to use unweighted models for this study.

In an atempt to perform weighted multilevel ligit modeling, we explored the way of adapting MLn's weighting device to implement weighted logit models. A promising strategy is to use weights as frequencies

for modeling binary data in the event/trial model syntax (SAS, 1992).

5.2 Intraclass correlation

It was desirable to have a simple measure assessing the effect of clustering in the context of multilevel logit model as does for multilevel linear model. We derived the intraclass correlation associated with a random-intercept-only logit model, as an analogue of the intraclass correlation for multilevel linear model (Goldstein, 1995; Bryk and Raudenbush, 1992), using the technique of linearization (Rodriguez and Goldman, 1995). It takes the following form:

$$\frac{\sigma_{u0}^2}{\sigma_{u0}^2 + [\mu_0(1 - \mu_0)]^{-1}}$$

where σ_{u0}^2 is the level-2 variance associated with the intercept, and $\mu_0 = logit^{-1}(\gamma_{00})$, where γ_{00} is the fixed intercept of the logit model. We used this measure to our data. The intraclass correlation is calculated as 0.054 for a simple random-intercept-only model (not containing school variables). Thus the level-2 variance accounts for about 5 percent of the total variance. This assessment is consistent with the models we obtained.

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