POET Revisited: A Reanalysis of Albrecht and Murdock's Part-Time Farming Model

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POET REVISITED: A REANALYSIS OF ALBRECHT AND MURDOCK’S PART-TIME FARMING MODEL

LISA A. EARGLE
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ABSTRACT

In this paper, I reanalyze Albrecht and Murdock’s (1984) POET (Population, Organization, Environment, and Technology) model of part-time farming prevalence using 2002 data and two indicators of part-time farming prevalence: percent of farm operators working 100 days or more off-farm and percent of farm operators whose principal occupation is not farming. I compare the results of analyses using these two measures to one another and to the results produced in Albrecht and Murdock’s earlier study using 1978 data. Findings from the analysis of 2002 are similar to those produced with 1978 data. However, the findings from the 2002 analyses do differ according to which measure of part-time farming prevalence is used.

Introduction

Over the last century, much has been written on part-time farming. A search of the Social Science Abstracts article database in November 2005 produced a listing of 151 articles. A search of the Agricultural On-Line Abstracts database produced 241 articles. Similarly, numerous books address part-time farming as one general feature occurring within the restructuring of the production agriculture industry. In examining the part-time farming content of these materials, the foci of these works can be divided into the following categories: (1) the naming, definition, and measurement of part-time farming (Gasson and Himminghofen 1983; Fuller 1990; Gale 2000; Eargle 2003); (2) individuals’ motivations for being part-time farmers (Barlett 1986); (3) theories of part-time farming prevalence across locales (Albrecht and Mudock 1984; Buttel 1982); (4) consequences of part-time farming for social relations within households and communities (Heffernan, Green, Lasley, and Nolan 1981; Deseran 1989; Blekesaune, Haney, and Haugen 1993); and (5) the impacts and contributions of part-time farming to local economic development (Persson 1983; Cawley 1983; Heatherington 1983; Krasovec 1983).

*Presented at the 2005 Mid-South Sociological Association meetings in Atlanta, GA. The author would like to thank Jessica Graves and Wen L. I. Falana, sociology undergraduate research assistants, for their help in downloading and formatting the data, and Dr. Ashraf Esmail for his helpful comments on an earlier draft of this paper. Address all correspondence to Lisa A. Eargle, Sociology Program, 2nd floor Founders Hall, Francis Marion University, P.O. Box 100547, Florence, SC 29501-0547 or email leargle@fmarion.edu.
In each of these areas, scholarly disagreements and unexplored issues exist (Fuller 1990). Among the theories of part-time farming prevalence across places, one perspective is the Human Ecological Approach, exemplified by Albrecht and Murdock’s (1984) version of the POET model. While cited in later scholarly works (Barlett 1986), the original form of this model has remained untested since Swanson and Busch’s (1985) critique and Albrecht and Murdock’s (1985) rejoinder.

This study is a replication of Albrecht and Murdock’s (1984) POET model of part-time farming prevalence. For this replication, I use 2002 data and two measures of part-time farming prevalence. One of these measures is the same measure used by Albrecht and Murdock (operators’ self-reporting of days worked off-farm), while the other measure is an occupationally-based measure (operators’ self-reported principal occupations). I compare these new results with the old results obtained by Albrecht and Murdock more than 20 years ago, to see if the findings have changed over time. I also compare the results from the two studies to assess if variations in the part-time farming prevalence measurement differentially affect the findings.

Background

POET Model and Its Application to Part-time Farming

The POET model is one theory found within the Human Ecological approach to studying social phenomena. The Human Ecological approach assumes that society is a natural system made up of man, his environment, and the processes that allow man to adjust/adapt to his environment. This adaptation is not achieved individually, but is accomplished by the collective population through social organization or a division of labor. This social organization of society affects other spheres of social life, which in turn influences man’s environment (Hawley 1981).

Farm operations are a part of society, influenced by the changes in the larger social system and can be viewed as a microcosm of the larger society. Changes in the larger social system create changes in its various parts, which include changes in structure and functioning of the agricultural industry and the farm operations that comprise it. Changes in the components of the farm operation (such as financing, natural environment, and technology) require adjustments and changes to the other aspects of the farming operation (such as amount and type of labor used). Hence, the Human Ecological perspective can be used to explain the type and extent of the relationships that exist between the components of the farm operation. Since the changes occurring in farm operations vary across farm operations, the
Human Ecological perspective is useful for understanding how adaptations/outcomes can vary.

The Political Economy perspective, on the other hand, tends to focus the exploitation of land and other resources used in farming as part of an industrial, capitalist system. It argues farm operators are being coerced into industrialized agriculture or being pushed out of the industry completely (Albrecht 1997). While the number of industrialized, large farms and individuals exiting farming has increased over time, there has also been an increase in the number of small operations and new people entering farming. Social psychological views of agriculture focus on the transmission of values and belief systems found in farming households and the motivations for individuals remaining, entering, or exiting farming (Barlett 1986). These views, though, can be viewed as stemming from or reflecting other changes in the farm operation.

The POET Model, a derivative of the Human Ecological perspective, has been applied in social research to many phenomena, ranging from community development (Lyon 1999) to environmental change (Dietz and Rosa 2001; Weinstein and Pillai 2001) to organizational structure (Hall 1996). In its most basic form, Population (P), Organization (O), Environment (E), and Technology (T) features of a society are believed to shape the society, both directly and indirectly by influencing each other. Figure 1 displays the basic POET model.

![POET Model Diagram](image)

Note: Some conceptualizations of the POET model also include a fifth concept, Culture, in the model (Weinstein and Pillai, 2001).
Depending upon the social phenomena examined\(^1\), researchers have used one factor from this model as the dependent concept and the other factors as independent concepts in their analyses. In their study of part-time farming, Albrecht and Murdock (1984) treat Organization as the dependent concept, Population as an independent concept, and Environment and Technology as both independent and intermediate concepts. Figure 2 displays their formulation of the model.

**Figure 2. POET Model, as Conceptualized by Albrecht and Murdock (1984)**

Albrecht and Murdock define Organization as part-time farming prevalence. Part-time farming prevalence is a means of adapting, or the consequence of changes that take place within farming operations, the production agriculture industry, and the surrounding communities. One such area of change or factor influencing part-time farming rates is the Environmental features of farming operations and the community. Albrecht and Murdock define Environment in terms of four features: Farm Sustenance Diversity, Non-Farm Sustenance Diversity, Farm Environment, and Non-Farm Environment. These factors take into account those features that affect the survival/success of the farm and the community, such as sales levels and worker concentration in industries. If these features are present at low levels, then part-time farming may be an alternative for farm operators who would prefer part-time farming to leaving the agricultural industry completely.

Another factor influencing part-time farming prevalence is the availability of technologies for farm and non-farm operations. If the technology available to farm

\(^1\)Since the POET model, as shown in Figure 1, cannot be analyzed exactly as it is shown, researchers will designate one the concepts as the dependent concept (phenomenon to be explained) and the remaining concepts as factors influencing it. This limitation is well known by researchers as one of the limitations of the POET model.
operators is such that they can produce more products at a faster pace at the same or higher quality level and have a lower production cost per unit of product, then one is more likely to see farm operators engage in more full-time farming. If the opposite occurs, one would expect more part-time farming to occur. If the technologies available for other, possibly competing industries are more efficient (i.e., makes it possible to produce more for less cost), then one would expect farm operators to leave full-time farming operations for part-time farming or non-farming businesses.

Population may positively influence part-time farming levels if the necessary labor becomes scarce or too costly. This may be regarded as attempting to hire workers who can receive higher wages from working in another industry. This may also apply to farm operators themselves—they have better economic outcomes by working within another industry.

To test their model, Albrecht and Murdock use data from the 1978 Census of Agriculture and the 1978 County and City Data Book. Their sample consists of the 2413 counties in the U.S. County-level data are analyzed using weighted regression analyses. Part-time farming prevalence, their dependent concept, is measured as the percent of farm operators in a county who work 100 days or more off-farm. Their independent and intermediate concepts are Farm and Non-farm Sustenance Diversity, Farm and Non-farm Environment, Farm and Non-farm Technology.

Farm Sustenance Diversity is measured as the concentration of (or lack of) farms in different sales volume categories. Non-Farm Sustenance Diversity is measured as the concentration of workers in different industry sectors. Farm Environment is measured as the percentage of acreage used for harvested crop land in an area. Non-Farm Environment is measured as the total non-farm labor force of an area. Farm Technology is measured as the market value of farm machinery/equipment per dollar value of farm sales. Non-Farm Technology is measured as the total value added per establishment in non-agricultural industries. Population features are considered by Albrecht and Murdock to have negligible impacts on part-time farming prevalence. Figure 3 displays the model originally tested by Albrecht and Murdock.

They hypothesize that Part-time Farming Prevalence is positively influenced by the Non-farm Labor Force, Farm Technology, Non-Farm Technology, and Non-Farm Sustenance Diversity. Part-time Farming Prevalence is expected to be negatively affected by Farm Sustenance Diversity and Total Acreage Harvested.
Albrecht and Murdock’s (1984) Results

Figure 4 is a path model that contains the regression coefficients from Albrecht and Murdock’s analysis of 1970s data. They find that Percent of Total Acreage Harvested and Non-farm Labor Force have a negative and statistically significant relationship. Total Acreage Harvested and Prevalence of Part-time Farming, and Farm Mechanization and Farm Sustenance Diversity also have statistically significant and negative relationships. Non-farm Labor Force also has a negative impact on Part-time Farming Prevalence, but it is statistically non-significant. All other relationships between variables in the model are positive and statistically significant. These relationships include Farm Mechanization’s, Farm Sustenance Diversity’s, Non-farm Technology’s, and Non-farm Sustenance Diversity’s impact on Part-time Farming Prevalence. In terms of R Square, 55 percent of the variation in part-time farming rates are explained by the Total Acreage Harvested, Farm Mechanization, Farm Sustenance Diversity, Non-farm Labor Force, Farm Mechanization, and Non-farm sustenance diversity.
Figure 4. Prevalence of Part-time Farming Path Model: Albrecht and Murdock (1984) Results.

Table 1 depicts the direct, indirect, and total (net) impacts that each of the independent and intermediate variables have on Part-time Farming Prevalence (dependent variable). I note that Percent Acreage Harvested has a negative net impact on Part-time Farming Prevalence. All other variables (Non-farm Labor, Farm Mechanization, Non-farm Technology, Farm Sustenance Diversity, and Non-farm Sustenance Diversity) have positive net impacts on Part-time Farming Prevalence.
Table 1. Direct, Indirect, and Total Effects of Variables on Part-Time Farming Prevalence: Revised Albrecht and Murdock (1984) Results.

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<tbody>
<tr>
<td>Farm Mech.</td>
<td>% Acreage</td>
<td>.000</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>.000</td>
</tr>
<tr>
<td>Farm Diver.</td>
<td>% Acreage</td>
<td>.027</td>
<td>.000</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>.207</td>
</tr>
<tr>
<td></td>
<td>Farm Mech.</td>
<td>-.267</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>-.267</td>
</tr>
<tr>
<td>Nonfarm Tech.</td>
<td>Nonfarm Labor</td>
<td>.266</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>.266</td>
</tr>
<tr>
<td></td>
<td>Nonfarm Tech</td>
<td>.365</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>.365</td>
</tr>
<tr>
<td>Part-time Farming</td>
<td>% Acreage</td>
<td>-.624</td>
<td>.000</td>
<td>—</td>
<td>.008</td>
<td>—</td>
<td>-.616</td>
</tr>
<tr>
<td>Prevalence (100+</td>
<td>Nonfarm Labor</td>
<td>.000</td>
<td>—</td>
<td>.028</td>
<td>—</td>
<td>.059</td>
<td>.087</td>
</tr>
<tr>
<td>Days Worked Off</td>
<td>Farm Mech.</td>
<td>.181</td>
<td>—</td>
<td>—</td>
<td>-.010</td>
<td>—</td>
<td>.171</td>
</tr>
<tr>
<td>Farm)</td>
<td>Nonfarm Tech</td>
<td>.106</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>.125</td>
<td>.231</td>
</tr>
<tr>
<td></td>
<td>Farm Diver.</td>
<td>.036</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>.036</td>
</tr>
<tr>
<td></td>
<td>Susten. Diver.</td>
<td>.341</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>.341</td>
</tr>
</tbody>
</table>

In the original study, Albrecht and Murdock used statistically nonsignificant coefficients in their calculations of direct, indirect and net effects. This is a questionable analysis practice. Hence, the results reported in the table above have been adjusted to reflect the exclusion of those nonsignificant coefficients.
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Since the publication of Albrecht and Murdock’s article, the production agriculture industry (and the economy overall) has experienced major structural changes in technology, related public policy, and other features. Increasing prevalence of part-time farming is well documented. According to the 1997 Census of Agriculture, approximately 50 percent of the 1.9 million farms were operated by part-time farmers. A decade earlier, 39 percent of the 2.1 million farms had part-time operators (Gale 2000). Considering these changes, my research question is: Do the findings from Albrecht and Murdock’s study remain consistent today? This paper addresses this question by testing their version of the POET model using more recent data.

Data and Methods

The data for this current study come from the 2002 Census of Agriculture, 2000 Census of Population and Housing, and the 2000 County and City Data Book. The sample consists of the 3076 counties and independent cities in the U.S., in which farming operations are present. The main dependent variable is the Prevalence of Part-time Farming, measured in two ways: (1) percent of farm operators who worked 100 days or more off-farm and (2) percent of farm operators who identify their principal occupation(s) as not farming.

Serving as independent and/or intermediate variables in the analyses are: Farm Sustenance Diversity, Non-farm Sustenance Diversity, Farm Technology, Non-Farm Technology, Farm Environment, and Non-farm Environment. Farm Sustenance Diversity is measured through a farm sales diversity index. It is calculated as:

\[
N \left( 1 - \frac{\sum |x - \bar{x}|}{\sum x} \right)
\]

where \(N\) is the number of sales categories and \(x\) is the number of farms in each sales category. Seven sales categories are used for this index: less than $2,500, $2,500 to $4,999, $5,000 to $9,999, $10,000 to $24,999, $25,000 to $49,999, $50,000 to $99,999, and $100,000 or more. As the values of this index become larger, the less diverse (more concentrated) farms are in a sales category.

Non-farm Sustenance Diversity is measured through an industry employment index. It is calculated as:
where \( N \) is the number of industry categories used and \( \times \) is the number of employees in each industry category. Five broad NAIC (North American Industry Classification) industry categories are used for this index: extractive, construction, manufacturing, wholesale and retail trade, and other services. As the values of this index become larger, the less diverse (more concentrated) employment is an industry category.

Farm Environment is measured as the percentage of a county’s acreage used for harvested crop land. Non-farm Environment is measured as the total non-farm labor force of a county. Farm Technology is measured as the market value of machinery/equipment per dollar value of farm sales. Non-farm Technology is measured as the sum of the value added in manufacturing, retail and wholesale trade, and other services, per establishment.

Weighted Ordinary Least Squares Regression is used to estimate the models to determine how environmental (Harvested Crop Land and Non-farm Labor Force), technological (Farm Mechanization and Non-farm Technology), and diversity (Farm Sustenance Diversity and Non-farm Sustenance Diversity) factors influence the Prevalence of Part-time Farming across counties.\(^2\) Weighted regression is used to weight county level statistics based on the numbers of farms present in a county, so that counties with few farms would not overly influence the analyses’ results. The results produced from these analyses are then shown as path models/diagrams and the direct and indirect effects (coefficients) are used to calculate the total (net)

\(^2\)Albrecht and Murdock (1984) do not present the means and standard deviations for their variables. Likewise, this study does not present these statistics because a comparison of results between 1978 (the year of Albrecht and Murdock’s data) and 2002 (the year of this study’s data) is not possible. Also, while Albrecht and Murdock (1984) present a correlation matrix for their variables, this study does not include correlation matrices because the results produced by weighted correlations are quite similar to those produced by the regression analyses (which are presented in Figures 4 through 6). Hence, to report both sets of statistics would be redundant information. Moreover, the part-time farming prevalence is influenced by multiple variables, so to perform analyses that examine the relationship between part-time farming and one other variable (bivariate analyses) would be an incorrect analysis of the model.
effects of independent and intermediate variables have on Part-time Farming Prevalence. These results, based on the analysis of 2002 data, are also compared with the results produced by Albrecht and Murdock (1984) to see if the influences of (relationships between) these variables have changed since the 1970s. Finally, the results produced from using the two different measures of part-time farming prevalence (days worked versus principal occupation) are compared to see if the operationalization (measurement) of part-time farming prevalence affects analysis results.

Results

Replication of Albrecht and Murdock’s Model: 2002 Results

In Figure 5, the results obtained from analyzing the part-time farming model using 2002 data are displayed. The numbers in the figure are standardized, weighted regression coefficients, showing the impact that various independent variables have on intermediate and dependent variables. Standardized regression coefficients are interpreted in standard deviation units of change. By using standardized regression coefficients, one can make direct comparisons of the impacts that various independent variables (which, in their unstandardized forms, often measured in different units) have on a dependent variable (Bohrenstedt and Knoke 1994).

The coefficient represents change in the dependent variable expected when a one unit increase in the independent variable occurs. For example, the coefficient of .259 on the path between Percent of Total Acreage Harvested and Farm Sustenance Diversity can be interpreted as follows: As the Percent of Acreage Harvested in counties increases by one standard deviation, the Farm Sustenance Diversity in counties increases by .259 standard deviations.

Moving from left to right in the diagram, one can see that Percent of Total Acreage Harvested and Non-farm Labor Force have a negative and statistically significant relationship. As the Total Acreage Harvested increases by one standard deviation, the Non-farm Labor Force decreases by .115 standard deviations. Likewise, Total Acreage Harvested negatively affects Farm Mechanization and Prevalence of Part-time Farming; Farm Mechanization negatively influences Farm Sustenance Diversity; and Non-farm Labor Force negatively affects Non-farm sustenance Diversity. Non-farm Technology has a statistically non-significant impact on Non-farm Sustenance Diversity.

Positive and statistically significant impacts/relationships displayed in Figure 5 are as follows: The impact of Total Acreage Harvested on Farm Sustenance
Diversity; Farm Sustenance Diversity's impact on Prevalence of Part-time Farming; Farm Mechanization's impact on Prevalence of Part-time Farming; Non-Farm Labor Force’s impact on Non-farm Technology; Non-farm Technology’s impact on Prevalence of Part-time Farming; and Non-farm Sustenance Diversity’s impact on Prevalence of Part-time Farming. In terms of R Square, only 17 percent of the variation in Part-time Farming rates is explained by the model.

Table 2 displays the direct, indirect, and total (net) effects that each of the independent and intermediate variables have on Part-Time Farming Prevalence (dependent variable). Moving to the bottom portion of the table, one can see that
Table 2. Direct, Indirect, and Total Effects of Variables on Part-Time Farming Prevalence: Part-Time Farming Measured as Percent of Operators Working 100 or More Days Off-Farm (2002 Results)

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</thead>
<tbody>
<tr>
<td>Farm Mech</td>
<td>% Acreage</td>
<td>-.153</td>
<td></td>
<td>-</td>
<td></td>
<td></td>
<td>-.153</td>
</tr>
<tr>
<td>Farm Diver.</td>
<td>% Acreage</td>
<td>.259</td>
<td>.030</td>
<td>-</td>
<td></td>
<td></td>
<td>.289</td>
</tr>
<tr>
<td></td>
<td>Farm Mech.</td>
<td>-.196</td>
<td></td>
<td>-</td>
<td></td>
<td></td>
<td>-.196</td>
</tr>
<tr>
<td>Nonfarm Tech</td>
<td>Nonfarm Labor</td>
<td>.329</td>
<td></td>
<td>-</td>
<td></td>
<td></td>
<td>.329</td>
</tr>
<tr>
<td>Susten. Divers.</td>
<td>Nonfarm Labor</td>
<td>-.301</td>
<td></td>
<td>.000</td>
<td></td>
<td></td>
<td>-.301</td>
</tr>
<tr>
<td></td>
<td>Nonfarm Tech.</td>
<td>.000</td>
<td></td>
<td>-</td>
<td></td>
<td></td>
<td>.000</td>
</tr>
<tr>
<td>Part-time Farming Prevalence (100+ Days Worked Off Farm)</td>
<td>% Acreage</td>
<td>-.202</td>
<td>.055</td>
<td>-</td>
<td>.038</td>
<td>-</td>
<td>-.218</td>
</tr>
<tr>
<td></td>
<td>Nonfarm Labor</td>
<td>-.107</td>
<td>.025</td>
<td>-</td>
<td>-018</td>
<td>-</td>
<td>-.101</td>
</tr>
<tr>
<td></td>
<td>Farm Mech.</td>
<td>.358</td>
<td>-</td>
<td>-</td>
<td>-.026</td>
<td>-</td>
<td>.332</td>
</tr>
<tr>
<td></td>
<td>Nonfarm Tech</td>
<td>.075</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.000</td>
<td>.075</td>
</tr>
<tr>
<td></td>
<td>Farm Diver.</td>
<td>.132</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.132</td>
</tr>
<tr>
<td></td>
<td>Susten. Diver</td>
<td>.061</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.061</td>
</tr>
</tbody>
</table>

The results reported in the table above have been adjusted to reflect the exclusion of statistically nonsignificant coefficients.
Percent Acreage Harvested has a negative net impact on Part-time Farming Prevalence (-0.202 -0.055 + 0.038 = -0.218). This means as the Acreage Harvested in counties increases by one standard deviation, Part-time Farming Prevalence in counties decreases by 0.218 standard deviations. Likewise, Non-Farm Labor Force has a net negative impact on Part-time Farming Prevalence (-0.107 + 0.025 -0.018 = -0.101).

Farm Mechanization has a positive net impact on Part-Time Farming Prevalence (0.358 -0.026 = 0.332). This means as Farm Mechanization in counties increases by one standard deviation, Part-Time Farming Prevalence in counties increases by 0.332 standard deviations. Likewise, Non-farm Technology, Farm Diversity, and Non-farm Sustenance Diversity have positive net impacts on Part-time Farming Prevalence.

Comparing 2002 Results with Albrecht and Murdock’s (1984) Results
Comparing the results presented in Figure 4 (Albrecht and Murdock’s results) with those displayed in Figure 5 (2002 results), one can see many similarities. The coefficient representing the impact of Acreage Harvested on Non-farm Labor Force is negative and statistically significant in both Figures 4 and 5. Likewise, the coefficients representing the relationships between Farm Mechanization and Farm Sustenance Diversity, and Acreage Harvested and Part-time Farming Prevalence, are negative and statistically significant in both Figures 4 and 5. The coefficient for Non-farm Labor Force’s impact on Part-time Farming Prevalence, while negative in both figures, is statistically non-significant in Figure 4 and statistically significant in Figure 5.

Statistically significant and positive relationships (coefficients) appearing in both Figures 4 and 5 are: Acreage Harvested and Farm Sustenance Diversity; Farm Sustenance Diversity and Part-time Farming Prevalence; Farm Mechanization and Part-time Farming Prevalence; Non-farm Labor force and Non-farm Technology; Non-farm Technology and Part-time Farming Prevalence; and Non-farm Sustenance Diversity.

However, the signs for three coefficients do differ between Figures 4 and 5, when comparing change between 1978 and 2002 data. In Figure 5, Acreage Harvested has a negative and statistically significant impact on Farm Mechanization; whereas in Figure 4, the relationship is a positive, statistically non-significant relationship. Another difference appears in the relationship between Non-farm Labor Force and Non-farm Sustenance Diversity, which is negative in Figure 5 but is positive in Figure 4. Last, Non-farm Technology has a positive and
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statistically significant impact on Non-farm Sustenance Diversity in Figure 4, but changes to a statistically non-significant and negative relationship in Figure 5.

One possible methodological explanation for the changes observed in Non-farm Labor Force’s and Non-farm Technology’s relationships with Non-farm Sustenance Diversity are the changes in the way that Non-farm Sustenance Diversity is measured. While the basic measurement scheme consisting of a diversity index using five broad industry sectors does not differ between this study and Albrecht and Murdock’s study, the individual industries comprising these categories did change. In the time of Albrecht and Murdock’s study, individual industries are divided into SIC (Standard Industrial Classification) categories, whereas individual industries are now classified according to the five category NAIC (North American Industrial Classification) scheme. SIC classified establishments into industries based upon their primary activities, whereas NAIC classifies establishments according to their production processes (Ohio Workforce 411 2006). Some industries previously classified as Manufacturing under the SIC (Communications and Utilities, for example) are now classified as a type of Service industry under the NAIC (U.S. Census Bureau 2006). While every attempt is made to make the broad industrial sectors used in this study align with those used by Albrecht and Murdock, the alignment is not perfect. Also, Albrecht and Murdock’s do not provide a detailed description of what individual industries comprise their broad industrial categories (e.g., “Services” and “Other”), making this alignment more difficult to achieve.

A possible non-methodological explanation could be that investments made in machinery (Non-farm Technology) previously meant that industrial employment (Non-farm Sustenance Diversity) would be concentrated in just a few industries. Dual Economy theory argues that center sector firms (Averitt 1968) or core industries (Beck, Horan, and Tolbert 1978) were those that dominated economies, for they had the most resources in terms of capital investments and were most economically efficient. In recent years, firm/industry success (and domination) is based less upon size or amount of investment, but more on the rate of innovation and response to consumer demand. This is often easier to accomplish in smaller firms than with older, giant firms. In addition, the very nature of the American economy has changed, with smaller firms producing a larger share of employment in local economies than larger firms and with many economies becoming more diversified overall. As a means to avoid the Boom/Bust syndrome, local officials seek to attract a variety of service and manufacturing firms to areas (Gottdenier and Hutchinson 2000).
Comparing Tables 1 and 2, which display the direct, indirect, and net effects of independent and intermediate variables have on Part-time Farming Prevalence for 1978 and 2002 (respectively), one major change stands out: the net effect of Non-farm Labor Force on Part-time Farming Prevalence. In Table 1 (Albrecht and Murdock’s study), the impact is positive. In Table 2 (2002 data results), the impact is negative. This change may be due to the increasing opportunities for extra employment, with more financial gain, outside farming. Also, many farmers have increased the size of their operations and became full-time or just dropped out of farming completely (Gale 2000). The magnitude of other effects may differ between Tables 1 and 2 (e.g., Farm Mechanization’s net impact on Part-time Farming Prevalence), but the direction of their impacts remains the same.

Using an Alternative Measure of Part-time Farming Prevalence: Percent of Operators Whose Principal Occupation Is Not Farming

Figure 6 displays the results of analyzing the part-time farming model using an alternative measure of part-time farming prevalence: percent of operators who identify their principal occupations as something other than farming. According to the Census of Agriculture, individuals who spend less than 50 percent of their work time on the farm are considered to have a non-farm occupation. Since changing the way part-time farming prevalence is measured only affects the direct relationships that variables have on part-time farming prevalence, this discussion will be focused upon those regression coefficients that describe these relationships.

Three variables, Percent of Total Acreage Harvested, Farm Sustenance Diversity, and Non-farm Sustenance Diversity, have negative and statistically significant impacts on Part-time Farming Prevalence. Non-farm Labor Force also has a negative relationship (coefficient) with Part-time Farming Prevalence, but it is statistically non-significant. Two variables, Farm Mechanization and Non-farm Technology, have positive and statistically significant impacts on Part-time Farming Prevalence. In terms of R Square, 51 percent of the variation in Part-time Farming rates is explained by the model.

Table 3 displays the direct, indirect, and total (net) effects that each of the independent and intermediate variables having on Part-time Farming Prevalence, where Part-time Farming Prevalence is measured as the percent of operators who identify their principal occupations as not farming. Three variables, Acreage Harvested, Farm Sustenance Diversity, and Non-farm Sustenance Diversity, have negative net impacts on Part-time Farming Prevalence. Three variables’ net effects

- Statistically significant at the .05 level (2 tailed test).
- Statistically significant at the .01 level (2 tailed test).

...Comparing these results (Figure 6 and Table 3) to those in Figure 5 and Table 2 (which are based upon measuring Part-time Farming Prevalence as the percent of operators who work 100 days or more off-farm), one sees some differences in the signs of regression coefficients and net effects. The signs of the coefficients for Farm Sustenance Diversity and Non-farm Sustenance Diversity, which describe these variables’ relationship with Part-time Farming Prevalence, are negative in Figure 6 and positive in Figure 5. The coefficient for Non-farm Labor Force is negative in...
Table 3. Direct, Indirect, and Total Effects of Variables on Part-Time Farming Prevalence: Part-Time Farming Measured as Percent of Operators Whose Principal Occupation Is Not Farming (2002 Results)

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>Farm Mech</td>
<td>% Acreage</td>
<td>-.153</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.153</td>
</tr>
<tr>
<td>Farm Divers.</td>
<td>% Acreage</td>
<td>.259</td>
<td>.030</td>
<td></td>
<td></td>
<td></td>
<td>.289</td>
</tr>
<tr>
<td></td>
<td>Farm Mech</td>
<td>-.196</td>
<td></td>
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<td></td>
<td></td>
<td>-.196</td>
</tr>
<tr>
<td>Nonfarm Tech</td>
<td>Nonfarm Labor</td>
<td>.329</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.329</td>
</tr>
<tr>
<td>Susten. Divers.</td>
<td>Nonfarm Labor</td>
<td>-.301</td>
<td></td>
<td></td>
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<td></td>
<td>-.301</td>
</tr>
<tr>
<td></td>
<td>Nonfarm Tech</td>
<td>.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.000</td>
</tr>
<tr>
<td>Part-time</td>
<td>% Acreage</td>
<td>-.547</td>
<td>-.037</td>
<td></td>
<td>-.037</td>
<td></td>
<td>-.621</td>
</tr>
<tr>
<td>Prevalence</td>
<td>Nonfarm Labor</td>
<td>.000</td>
<td></td>
<td></td>
<td>.032</td>
<td>.029</td>
<td>.050</td>
</tr>
<tr>
<td>(Nonfarm Occupation)</td>
<td>Farm Mech</td>
<td>.241</td>
<td></td>
<td></td>
<td>.025</td>
<td></td>
<td>.266</td>
</tr>
<tr>
<td></td>
<td>Nonfarm Tech</td>
<td>.098</td>
<td></td>
<td></td>
<td></td>
<td>.000</td>
<td>.098</td>
</tr>
<tr>
<td></td>
<td>Farm Diver</td>
<td>-.127</td>
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<td>-.127</td>
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<tr>
<td></td>
<td>Susten Diver</td>
<td>-.095</td>
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<td>-.095</td>
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</tbody>
</table>

NOTE: The results have been adjusted to reflect the exclusion of statistically nonsignificant coefficients.
both Figures 5 and 6, but is statistically significant only in Figure 5. Comparing Tables 2 and 3 results, the net effects of Non-farm Labor Force, Farm Sustenance Diversity, and Non-farm Sustenance Diversity are negative in Table 4; in Table 3, they are positive.

These differences may be due to differences in measurement. According to the Census of Agriculture, individuals working four or more hours off-farm in a day are considered to have worked one day off-farm. (This assumes that a normal work day is eight hours.) Hence, those that work four hours or more off-farm for 100 days or more are considered part-time farmers. These individuals, however, when asked if they spend less than 50 percent of their work time doing on-farm work, could respond “No” (if their work days are longer than eight hours). Therefore, they would be considered as having Farming as their primary occupation and be full-time (not part-time) farmers.

Discussion—Relating Agricultural Policy to Research Findings

Since the 1930s, price and income supports have been a major component of agricultural policy. These supports have varied, including supply controls, loans, conservation and commodity payments, and incentives for global marketing (Dimitri, Eflland, and Conklin 2005). One major support payment, commodity payments, target field crop production and are linked to amount of goods produced. More than 77 percent of these payments are received by family farms with annual sales of $100,000 or more. These farms account for only 13 percent of all farms present in 2003 (Hoppe and Banker 2006). More recently, decoupled payments (income support payments not directly linked with farm production plans) have emerged (Dimitri et al. 2005). American Farmland Trust, in its Agenda 2007, advocates programs centered around commodity price and yield, as well as private crop insurance programs, expanding conservation grants, and the creation of crop block grants and alternative product markets (American Farmland Trust 2006). During the last 50 years, social programs directed toward poverty relief (Food Stamp Act of 1964) and rural development (1972 Rural Development Act) were enacted to improve the economic well-being of farm households and assist farming communities with adjusting to economic restructuring.

However, during the last century, many changes have occurred in agriculture and farm households that makes one question the utility of such social policies. Most farm households (90 percent) receive income from non-farm sources. More than 50 percent of farm households have incomes at or above the non-farm household average. Less than 2 percent of the employed labor force are agricultural
workers. The number of farms has declined, while the average farm size has increased dramatically (Dimitri et al. 2005). Most of the farming operations are small-scale (annual sales below $250,000), but production by large corporations has steadily increased (Hoppe and Banker 2005). The number of commodities produced by a single farm has declined, while the average land used by a farm remains steady. Investments made by farm households have diversified to include corporate stocks, IRAs, and 401Ks. Agriculture's role as the cornerstone in rural economies has declined, with only 20 percent of non-metropolitan counties being classified as farming-dependent in 2000 (Dimitri et al. 2005).

This study's results support these arguments that agricultural and social policies, as they currently exist, do little to help small farmers and provide unnecessary support to large farms. Farm Diversification positively affects Part-time Farming Prevalence because the smaller farms have income support from outside the farming operations (from non-farm labor force participation), while larger farmers are receiving both subsidies from the government as well as from non-farm laboring. The source of small farming operations survival is from farm operators and other household members investing non-farm wages and earnings into the farming operation (Barlett 1986). Part of these investments occurs as technology purchases. With the acquisition of newer, more efficient technologies, part-time operators are better able to maintain an effective competitive position in the market. Hence, farm technology continues to affect Part-time Farming Prevalence positively during the last 20 years. Likewise, as companies continue to invest in other industries (evidenced by increases in Non-farm Technology) and expand employment opportunities in non-agricultural industries (Non-farm Sustenance Diversity), part-time farm operators can probably obtain income from non-farm employment. Thus, they can continue to invest this non-farm income into their farming operations.

**Conclusion**

Given the changes that have occurred in the agricultural industry, in particular the production agriculture sector, the findings of the POET model remarkably remain stable over the 1978-2002 period. Differences in results produced by the two measures of part-time farming (worked 100 days or more off-farm and non-farm occupation measures) in 2002 may be due to the way part-time farming is defined by the Census of Agriculture.

Future research should involve comparing the results of the POET model to results produced by other part-time farming models that take a different theoretical
approach and see if significant differences emerge. Research could expand the notion of part-time farming from being a two-category concept (either a person is a part-time farmer or is not a part-time farmer) to being points along a continuum (degrees of part-time farming, ranging from “not at all,” “a small amount,” “a great deal,” to “almost all the time”). The Census of Agriculture, in its question about days an operator worked off-farm, has several categories including 0 days, 1 to 49 days, 50 to 99 days, 100 to 199 days, and 200 days or more worked off-farm. By adopting a more flexible view of part-time farming, this would better reveal the extent of part-time work that exists among farm operators and its relationship with other components of the POET model.

Moreover, cultural variables could be included in the analyses to assess their impact on part-time farming. More recent applications of the POET model include culture as a component. Weinstein and Pillai (2001) discuss how the transmission and adoption of Western values and beliefs have transformed the economy and affected the natural environment in India. Barlett (1986) finds farm operators cite different motivations for part-time farming, which include receipt of additional income as well as the transmission of beliefs/values to the next generation, using land as an investment, and farming as a form of recreation (Barlett 1986). In his interviews with South Carolina farmers, Poland (2005) finds many entered farming to practice what they had studied in college, to rear their children in the “right” communities, and for community interaction and entertainment.

Studies of wage determination, self-employment, and employment hardship suggest additional factors that could influence part-time farming rates, but remain unexplored. South and Xu (1990) find individuals’ earnings are influenced by their education levels, sex, race/ethnicity, and work experience, as well as the dominance of their industries in the local economy. Hamilton (2000) finds race/ethnicity, disability status, marital status, and job tenure influence financial success in entrepreneurship. Blau (1987) finds tax rates, minimum wage levels, age of entrepreneur, and the local industrial structure affect self employment rates. Slack and Jenson (2002) find race/ethnicity and non-metropolitan residence affects the likelihood of an individual being underemployed (low wages, unemployed, intermittent employment, and involuntary part-time employment).

These studies are worth considering in the study of part-time farming because farming – if an operator owns his/her own operation – is a form of self-employment and entrepreneurship. The difference between a part-time farmer who owns his/her business and someone who (for example) owns his/her own construction company is the commodity or service being produced. Also the “part-time” aspect of farming
may be due to (1) low earnings produced by the operation and (2) may be a form of involuntary part-time employment (an operator may desire full-time employment in farming, but cannot rely solely on farming as an adequate form of financial support; hence, it is a form of employment hardship).

References

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