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Understanding the Local Unrecorded Economy: Informal Work and Home Production in Non-Metropolitan Wisconsin

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Abstract. Using a survey of 1,611 families in non-metropolitan Wisconsin, we assess the extent and importance of certain activities to make money, save money, or barter. Approximately 59% of families report involvement in the activities considered, with 122 median annual hours and median imputed value of \$1368. Hours of such work are highly skewed. While some households are extensively involved, most report only approximately 2-3 per week. Overall, while such work is common and some households engage in it extensively, substantial involvement in it appears too infrequent for it to serve as a major part of most households' well-being.

1. Introduction

In examining rural well-being, one factor that has received frequent mention, but less study, is something generally not measured: unrecorded work. In this study we examine two dimensions of this unrecorded work: informal work (legal but unrecorded activities done as barter or to make money such as running a farm stand, plowing roads, or selling crafts) and home production such as do-it-yourself repairs or self-provisioning activities done to save money.¹

Knowledge of this type of activity is important for policy-makers who want better understanding of the local economy, of the well-being of families in rural areas, and of the possibilities of using unrecorded work as an element in community development. If substantial opportunities for obtaining income from informal work and for replacing market goods and services with home production exist, people may be just as well off with a combination of unrecorded and formal work as others may be with only formal work, and observed measures such as income or employment would give an inaccurate picture of actual household well-being. This reasoning could apply to

regions as well. For example, residents in rural areas have the space and land that would make possible more of certain types activities such as food production. Differences in this at the regional level could skew perception of regional well-being based upon formal measures such as income (e.g. Carter 1995), wages (e.g. Cherry and Tsournos 2001) or employment if this greater participation in unrecorded work affected participation in formal sectors. This possibility was alluded to, though unexplored, in Dorsey's (1991) and Isserman and Rephann's (1993) examination of why West Virginia's labor force participation rate is so low.

Examining this connection more directly using small surveys of England and Nova Scotia, respectively, Pahl (1987) and Felt and Sinclair (1992) argue that the unemployed do not shift into repairs because these often require purchased inputs which they cannot afford. On the other hand, Gronau (1997) claims that we currently have too little knowledge of how the unemployed use their time, including whether this is in additional home production. Finally, unrecorded work has received some consideration for its possible role in community development. Levitan and Feldman (1991) argue that the reciprocal relationships in bartering

¹ A more formal typology of unrecorded work is presented in the second section. Our focus on the informal work and do-it-yourself types of home production thus excludes other types of unrecorded work such as chores (cooking, cleaning, childcare, yardwork), and under-the-table or illegal work.

serve an important function connecting people in rural economies.²

Others have made similar arguments for mechanisms of exchange to connect residents and retain spending power via concepts such as “time dollars” (Pollard 2004; Fung 1995; Cahn and Rowe 1992) and other types of local exchange trading systems (LETS). In these systems, people performing services for one another receive payment not in formal currency, but in local certificates redeemable for services in exchange.³ But the efficacy of these programs depends upon how substantial unrecorded work is, both in participation and degree (e.g. hours of involvement). Thus greater knowledge of unrecorded work can assist policymakers and researchers in understanding the rural economy more fully.

To assess the importance of informal work and home production, we use the Wisconsin Rural Family Survival Strategies survey. This survey of 1,611 non-metropolitan Wisconsin families was conducted in 1996 to examine all resources available to rural residents in the state to give a more complete perspective of how rural families get by. For this reason, it sought information on eleven types of activities besides typical household work or chores (e.g. cooking, cleaning, child care, yardwork) or formal market work: fishing or hunting, raising animals, raising produce, landscaping or farmwork, car or appliance repairs, house repairs, remodeling, other building services, crafts and woodworking, personal services, and boarding (these are given in greater detail below). It also asked for reasons (and hours) for the activities so as to separate cases in which households relied upon the activities as a means of survival (make money, save money, barter) from cases which were more recreational in nature (e.g. hobbies). In addition, its information on formal market work, social network and community attachment, and public assistance provide an unusual opportunity to examine unrecorded work in relation to a number of other factors affecting household well-being. Using this data, we examine participation rates, hours, and value of the activities done to make money, save money, or barter (here labeled informal work and home production), and factors associated with involvement in it such as social networks, unemployment, and income levels.

2. Literature Review

The Wisconsin data provides an opportunity to add significantly to our understanding of unrecorded work in rural areas. Research on the full spectrum of unrecorded work (defined below) has grown extensively in the last thirty years. This has been especially true for studies of home production as chores such as child care and cleaning (e.g. Douthitt 2000; Robinson and Godbey 1997; Hawrylyshyn 1976), informal work in developing countries (e.g. Brown and Kulcsar 2001) or underground and illegal activities (e.g. Feige 1989). Some research (e.g. Edin 1992) has considered informal work by urban households in the United States. Much less exists on the narrower types of informal work (barter and activities to make money) and home production (do-it-yourself work) for rural areas we consider in this study.

What little there is on these has mostly come through focused studies on small samples in particular areas: Salstrom (1996) and Pudup (1990) for Appalachia; Nelson and Smith (1999) for a county in Vermont; Brown, Toth, and Xu (1998) for the Mississippi Delta; and Levitan and Feldman (1991) for a county in New York. These studies have the virtue of providing detailed pictures of such work in specific regions. Brown et al., for example, assess the motives behind engaging in these kinds of work and conclude that while economic motives appear most significant relative to social factors, they explain only small portion of participation. But only two studies (Tickamyer and Wood 1998; Jensen, Cornwell, and Findeis 1995) use large samples of rural populations. Jensen et al., considering only activities to make money but using a broader range of activities, find approximately 56% of the 465 households they studied in non-metropolitan Pennsylvania report some type of them. In addition, while participation rates were slightly higher for poor families, this effect did not hold up in multivariate analysis. Tickamyer and Wood, who consider both activities to make money and activities to save money (and who use definitions closest to this study), estimate that nearly 70% of all households in rural Kentucky engaged in such work.

But participation rates alone are insufficient as a measure of the overall value and importance of such work. For example, if participation rates are high, but most people devote few hours to it, the actual importance of such work would be low. Consequently, determining time devoted to unrecorded work is also necessary. While research on time use (e.g. Stinson 1999; Robinson and Godbey 1997; Juster and Stafford, 1985) and the value of non-market work (e.g. Hawrylyshyn 1976) has grown in the past thirty years, most

² Findings regarding work done by families as favors for others, and more in-depth analyses of how others help the families with the types of work examined here are available from the lead author.

³ Substantial information on these can be found via such organizations as Time Banks (www.timebanks.org) and Transaction Net (www.transaction.net).

of this research has been on household production generally (the bulk of which is activities such as cooking, cleaning, and child care and basic yardwork). Few studies with time data have looked at do-it-yourself or self-provisioning types of work, particularly for rural households. Van Eck and Kazemier (1988), and Merz and Wolff (1993), for example, examine participation in and hours devoted to activities to make money or save money in the Netherlands and Germany, respectively, but without examination of rural areas. Sinclair and Lewis (1981) compare hours devoted to certain types of unrecorded work by rural and urban households, but do not provide reasons for which the work was done.

The data set from Wisconsin thus provides an opportunity to obtain deeper insights into some of these questions regarding unrecorded work in rural areas because it includes data on participation, hours, and reasons. Having both hours and reasons for which activities are done allows better assessment of the actual importance of this to the households that participate since one can measure how much time people actually spend in the activities and eliminate activities which are less important for survival of the family (e.g. hobbies).⁴ In addition, its large size and extensive background variables allow for examination of a number of factors which may play a role in the unrecorded work decisions of rural households. Using this data, we analyze a number of related questions. How extensive and important is this type of work in terms of participation rates, hours, and value? How substantial are the types of activities for which rural areas have advantages? What factors affect involvement in it? How important are social networks in this work? How does involvement vary by income level?

The remainder of the study is outlined as follows. In the next section we provide a more detailed exploration of the difficulties of accounting for and studying unrecorded work of different types. This is necessary for any such inquiry because lack of consistent definitions makes comparing results across studies quite challenging. After discussing the data and its limitations, we examine participation rates, hours, and imputed value of the activities. Finally we close with multivariate analyses of factors associated with involvement in the activities considered using logit

⁴ We acknowledge that in some cases, this distinction is arbitrary. Many of those who report such work as a hobby may nonetheless benefit from it, and some may do the activities for both reasons. On the other hand, this information sheds light on the circumstances of the households: families reporting these activities as hobbies are less financially stressed than those reporting them as important to make or save money.

analysis of the participation decision and ordinary least squares analysis of hours supplied.

3. Accounting for Unrecorded Work

We examine as unrecorded work those activities reported in the data as done to save money (home production which is not chores), make money or barter (informal work). In fact, however, the general term "unrecorded" encompasses a substantial amount of work done under a broad array of conditions (cooking, cleaning, gardening, do-it-yourself repairs, babysitting or child care for pay, under-the-table/off-the-books work, drug dealing, etc.) and researchers in national income accounting have devised a number of terms (home production, informal, underground, irregular, gray, black, among others.) to describe or categorize particular types of it (Ironmonger 1996; Chadeau, 1985; Hill, 1979; Hawrylyshyn, 1977). Though few of these terms have received universal acceptance in referring to any given collection of activities under study, several key distinctions are commonly used to characterize it: the manner in which the good or service is exchanged, the legality of the activity, and the nature of production.

For example, Thomas (1992) defines home/household activities as those in which the output and production method are completely legal, but the output is not traded in a market (like do-it-yourself work or caring for one's children). He distinguishes them from informal activities, in which people producing for others outside the household (like odd-jobs, yard/craft sales, or roadside farm-carts). Finally, he defines irregular activities as under-the-table work (legal market work which is not reported) and criminal activities as market activities in which output and production are illegal, such as drugs and prostitution. Schneider and Enste (2000) provide a comprehensive current review of these last types (irregular, and illegal).⁵

Still, many activities do not fit neatly into such typologies. For example, examining activities to save money (e.g. do-it-yourself) independently (as we do), considers only the smaller part of what Thomas labels "home production," and ignores the much more substantial area of chores. This separation of chores from "do-it-yourself" rests upon conventions of what is "typical" that may change with time. Similarly, what distinguishes informal from irregular activities, for instance, may vary from jurisdiction to jurisdiction as

⁵ Such illegal activities require significantly different means of obtaining information on them. Also this survey predates the rise of internet related opportunities.

states have diverse laws on reporting such work. Favors may or may not be done with expectation of reciprocal action in the future and do not represent direct benefit to the household in this period though important over time to families and communities. Similarly, though a few households may gain tremendously from activities done as hobbies, most see them as forms of leisure and not as substantial measures to assist the family to survive.⁶ Finally, the lack of agreed upon definitions, differences in activities covered by studies, and the means by which surveys are conducted contributes to differences across studies as well which often makes generalizations difficult. For example, Smith (1985) includes professional services, while most other studies do not. Unfortunately, the problem of differences in study results due to differences in definitions and methods cannot be fully addressed easily by this study either.⁷ The best approach is to be clear how the definitions used here relate to those used elsewhere.

Defining activities by whether they were to make money, save money, barter, as a favor, hobby, or other reason is understandable given that the main focus of the Wisconsin Rural Family Survival Strategies survey was to document resources and strategies available to rural families. Unfortunately, such designations do not lend themselves easily to classification in the more formal way sought in national accounting (Ironmonger 1996; Thomas 1992). To improved comparability, we use Thomas' framework. The best approximation to that framework is that the activities to save money are certain forms of home production, while bartering and activities to make money are informal work. In fact, they should be collectively referred to as "certain types of home production and informal work" since they do not include the full range of activities which Thomas covers under both terms. For brevity, however, the terms "informal work and home production" and "unrecorded work" are thus used hereafter to refer to all three unless otherwise specified. Though the designations here (make money, barter, save money) would not fit any typology easily, fitting them to one common form, though imperfectly, should assist in making comparisons to results of other studies of unrecorded work.

⁶ Families report hobby activities as less important than others.

⁷ Although this is beyond the scope of this study, a more complete comparison of the results from the Wisconsin data with those from other studies, adjusting for alternative definitions, is available from the author. Where relevant, those differences are discussed in the results below.

4. Data

The Wisconsin Rural Family Survival Strategies survey sought to measure all resources available to Wisconsin rural families.⁸ It covered a variety of areas including formal and unrecorded work, community services and public assistance, family structure, income and education, community attachment, and local economic conditions. The survey was conducted by the University of Wisconsin-Madison in early 1996 after testing on focus groups with earlier drafts. Respondents were chosen by random sample of households in counties characterized as non-metropolitan and interviewed by phone from the University's survey center. A total of 1,611 households completed surveys, a response rate of nearly 56%. Given the goal of assessing family well-being, the survey screened out non-family households (e.g. adult sibling, roommate), and families in which both parents were over 65.

The activities to make money, save money, or barter examined in this study were those given as answers to the following question from the survey:

"In addition to regular jobs, many families do other things to make ends meet. For example, they may work for friends to earn some extra money or in exchange for goods or services. They may raise their own food or make things for sale. These kinds of things that people do outside of their regular jobs are what I'd like to ask you about now. In the past twelve months have you or anyone in your household ...

... hunted or fished for food?

... raised animals for food or sale?

... grown vegetables, fruits, or other plants for food or sale?

... made crafts, clothes, or other household items?

... done landscaping or yardwork, farmwork, plowed snow, or cut firewood for someone else?

... done home repairs for yourself or someone else?

⁸ While no single state could adequately represent rural life in all 50 states given the great heterogeneity of rural America, Wisconsin is typical of states in the North-Central and Great Lakes region. Moreover, the heavily skewed distribution of hours observed here should provide a starting point for analysis of such activity in other states.

... done repairs on cars, equipment, or appliances?

... built or remodeled your home or someone else's?

... built or remodeled barns, sheds, or other buildings for your family or someone else?

... performed personal services for others such as caring for children, disabled or elderly persons, housecleaning, hair cutting or styling, shopping, or providing transportation?

... taken in boarders, relatives, or friends?"

The survey asked respondents to categorize the activity according to one of six reasons (make money, save money, barter, hobby, favor, or some other reason). It also asked for estimates of the amount of hours devoted to the activities for up to three people per household, but only for the cases of make money, barter, save money, or favor. To limit analysis to that work primarily done either to obtain resources or substitute for market goods and services we only examined the first three reasons (make money, barter, and save money) as informal work and home production.

Respondents were asked to estimate time spent on unrecorded work in the prior year. Time use research finds that time diaries (since they cover only short periods of time) provide the most accurate estimates of time people spend in different activities than such recall methods, especially if the activity involves variable amounts of time (Schwartz, Herz, and Frazis 2002; Stinson 1999; Juster and Stafford 1985). On the other hand, time diaries are more expensive to administer as they require much greater contact with participating families. In addition, since they are typically done over a few short periods during the year, they may also miss larger activities that occur infrequently, out of those survey periods. Given the multiple areas of consideration in the survey, and limited budget, the telephone/recall question format makes sense, though studies explicitly examining home production alone should consider time diaries or direct interviews. We report results for both participation and hours to provide both a more complete picture, but also to guard against possible measurement error in hours.

5. Data Analysis

In order to assess the importance and nature of the informal work and home production we examine sev-

eral dimensions of that work by household. We start with the simplest and most common measure: participation (separated by activity and reason). This includes all the reasons originally surveyed. While this shows the wide array of activities in which people are involved, perhaps more significantly, it gives a sense of the importance people ascribe to the activities based upon the reasons they state. We then examine the hours people report for activities to barter, make money, and save money (including an imputed value for them). This provides the greatest insight into the nature of the unrecorded work since, unlike participation data alone, it conveys both the magnitude of involvement as well as its distribution. Finally, we examine both participation (using logit) and hours supplied (using ordinary least squares) to assess what factors are associated with greater involvement in this type of work.

5.1. Participation by Activity and Reason

Information on participation by activity and purpose is given in Table 1.⁹ Individually, yardwork/landscaping, raising animals, and personal services are the activities most commonly performed to make money, while house and car repairs are the most commonly performed services to save money. Overall, the total number of households reporting activities for one of the three reasons was 957, or approximately 59% of the 1,611 households in the survey, with 12% of the 1,611 doing an activity to make money and 55% to save money.

Activities for which rural families likely have a space/land advantage over metropolitan families include the first four categories: hunting or fishing, raising produce, raising animals, and yardwork/lumber/landscaping. These represent approximately 20% of all the activities recorded. These were done by about 19% of the families, and accounted for about one quarter of all reported hours, for a median of about 40 hours per year with a value of about \$300. If one assumes that opportunities for repairs and services are similar in metro and non-metro areas, this would put an upper limit of around \$300 on the amount by which omission of unrecorded work could underestimate rural well-being. Thus it would appear that these rural activities do not represent so substantial a source of support for rural residents that not observing them substantially skews perceptions of rural well-being.¹⁰

⁹ Full details by activity, reason, hours and for individuals are available from the authors.

¹⁰ This still leaves amenity value as a compensating differential.

Table 1. Participation In Unrecorded Activities for All Reasons

Activity	Reason Given for Particular Activity						Total Responses
	Make Money	Barter	Save Money	Hobby	Favor	Other Reason	
Hunt or Fish	1	3	49	681	0	56	843
Raise Animals	39	2	26	33	2	42	211
Raise Produce	6	1	179	308	2	146	828
Crafts	28	3	63	292	20	46	546
Landscaping/Yard/Farm	53	10	10	17	141	21	325
Home Repairs	15	3	551	63	64	240	1505
Car/Appliance Repair	2	1	518	48	23	124	1237
Build/Remodel Home	7	3	188	25	29	100	550
Build/Remodel Other	6	1	50	22	22	36	194
Personal Services	47	27	0	8	569	59	784
Boarding	5	1	1	0	90	25	129
Total Activities							
for Each Reason	209	55	1635	1497	962	895	5253
# Families w/ Activities	193	53	883	949	713	560	1445

Source: Wisconsin Rural Family Survival Strategies survey. N=1661.

Because some households do multiple activities for the same reason (e.g. raising produce and fixing cars to make money), totals at the bottom exceed the number of households that actually did any activities for the given reason.

Altogether, 1445 families did at least one activity for some reason, and 166 reported none of these activities.

It is often said of unrecorded work generally that “everybody does it.” This is almost true, but it is done for very different reasons by the families. While most (59%) families engaged in activities to obtain or expand resources (to make money, save money, or barter) at least once, a large fraction (64%) of the activities reported were done for other reasons (hobby, favor, other). Thus families do not perceive most of these activities as substantial means of assisting them to “get by.” This implies that data on participation in such activities alone is insufficient to assess the actual extent to which families benefit from them without knowledge of the motives for which the individual activities were done.

Adjusting for differences in definition by study, these results generally match that of the few other available studies. For example, Smith (1985) and Tickamyer and Wood (1998) find participation rates of 16% and 19%, respectively, for activities to make money similar to the ones included here, and Tickamer and Wood report 69% for all three reasons (though that includes garage sales). Lower rates for activities to make money in this data are likely due to the order in which questions were asked. The survey asked about

unrecorded work *after* asking about formal work, while other surveys have asked about these activities without regard to formal employment. It appears likely that some people reported as “formal work” what would have been labeled “informal work” in other surveys. Adjusting the results for these cases and for garage sales would produce participation rates closer to 20-22%. Finally, the apparently low participation rate of households who barter (53 households, i.e. 3.4%) indicates that simultaneous exchanges of goods or services are relatively uncommon. Studies finding higher rates of reciprocity (e.g. Levitan and Feldman 1991) likely rely on longer time frames more consistent with favors than bartering per se.

5.2. Hours and Imputed Value

But knowing motives and participation rates alone may be insufficient to assess the actual level of importance to most households if such activities (even if common) involve little time, or if that time is highly skewed. Thus information on hours is necessary to provide a more complete picture of the extent to which households benefit from unrecorded work. As

shown in Figure 1 and Table 2, average (median) annual hours devoted by parents to activities to make money, save money, and for any reason are 466, 340, and 403 (258, 109, 122) for those who participate in such activities.¹¹ While activities to save money are more common and involve more hours in total, average hours devoted to activities to make money are higher for those who do them. To give a sense of the importance relative to the entire sample, specifically, participants and non-participants alike, full sample averages (total reported hours divided by sample number of families) across all households are about 4-5 hours per week per family.¹²

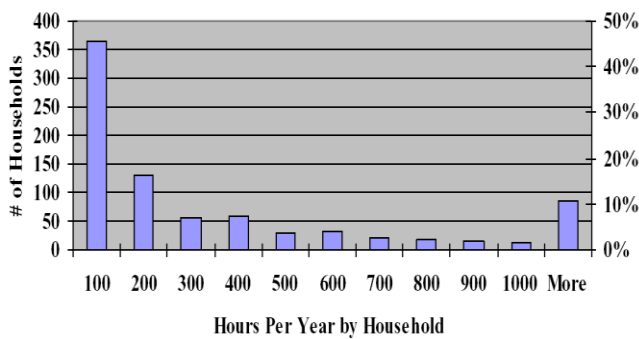


Figure 1. Distribution of hours: Activities to make money, save money, or barter (Source: Wisconsin Rural Family Survival Strategies Survey).

Perhaps the most important observation here is that hours devoted to this kind of work are highly skewed. While a small portion of households are heavily involved, most participants have limited hours. This distribution is so skewed that standard deviations for hours exceed the average hours, and median hours for households that participate are frequently only 1/3 - 1/2 that of the average hours of participants. For example, average annual hours for all activities is 403, while the median is 122. While these cases should be explored, they should not be considered representative. This implies that participation data alone provide a poor picture of the actual benefit from unrecorded work for most people since most of the reported hours are concentrated in a small number of households. Thus hours of such work should be used when ex-

amining the importance of unrecorded work. Again, even if “everybody does it” (or at least 60% of the population if one looks only at activities to make money, save money, or barter), families vary substantially in how much they do.

A comparison with formal work may give some sense of the relative extent and importance of the unrecorded work here. First, as one might expect, time devoted to formal work dwarfs that of unrecorded work. Families in the sample reported approximately 5.5 million hours of formal work (about 220,000 of which were for second jobs), but only about 330,000 hours of informal work and home production, or about 5.5% of total work hours. Thus while the informal work and home production here constitute only a small fraction of total work hours, their total economic value is perhaps more comparable to that of second jobs. On the other hand, formal work, in both first and second jobs, is much more evenly distributed across the population.

Determining the value of unrecorded work has the added difficulty that one does not observe some level of payment or price per hour or per unit of work. Extensive research on this problem of imputing the value of unrecorded work in the household has been done since the 1920's (Bryant, Zick, and Kim 1994; Thomas 1992; Hawrylyshyn 1977, 1976). The most common methods are opportunity cost of the time involved (based upon the market wage a person has to give up to have another hour for home production) and the replacement cost for that time (i.e. what it would cost to hire a person to do that work). Murphy (1978) finds the two methods tend to give similar results.

We estimated values with both the opportunity and replacement cost methods and also found them to be quite similar. Thus we present only the replacement cost results here for simplicity. To calculate these values, we multiplied wages (obtained from the Wisconsin Department of Workforce Development) for occupations most closely matching those of the informal activity reported times the number of hours reported for the activity. On average, such activities represent approximately \$4,100 of value to those who participate in them. The skewed distribution of hours implies that most participants will benefit far less from the activity than these averages imply, however: median values for this work are approximately \$1,328.¹³

¹¹ Here we only consider hours done by parents. Examination work done by other family members is available from the authors.

¹² About 4%, 12%, and 14% of parents reporting activities to make money, save money, or for any reason, respectively, did not report hours for them. Assuming such households were similar to those who reported hours, this would raise average hours for all households to about 230.

¹³ Similarly, if one excludes as outliers the 10% of families with the most hours, the average hours and value would drop to approximately 209 and \$2100.

Table 2. Annual Hours of Unrecorded and Recorded Work by Household

Informal Work and Home Production	Make Money	Save Money	Make Money, Barter, or Save Money
For Participants ^a			
Families Reporting Activities	193	883	957
Participation Rates (%)	12	54.8	59.3
Average Annual Hours	466	340	403
Standard Deviation	670	683	737
Median Annual Hours	258	109	122
Total Reported Hours	63,407	264,143	331,814
Average Annual Hours for Entire Sample ^b			
	39	164	206
Imputed Value of Reported Hours			
Mean Value for Participants	3500	3704	4100
Median Value for Participants	2068	1047	1368
Mean Value for Entire Sample (\$) ^b	295	1784	2087

a. Hours are only for those who reported participation in the informal work and home production.

b. Calculated as hours or value relative to the entire population, not just participants.

These results give a clearer picture of the role of informal work and home production among these non-metropolitan Wisconsin households. While participation in the work is widespread, it constitutes only a modest means of support for most participants since hours of it are highly concentrated in a small percentage of households.

5.3. Participation and Hours by Socioeconomic Factor

Who are the families with such heavy involvement? To assess this we computed participation rates and median hours devoted to activities for all three reasons, according to various socioeconomic criteria (Table 3). As noted above, the skewed distribution of hours gives standard deviations so high that no differences in means are statistically significant. Nonetheless, some patterns are hinted at. For example, families with three or more children have higher participation rates and higher median hours than families with any children generally, or families without any children.

Homeownership and an adult having a second job are associated with higher participation rates and hours. Interestingly, single parents have lower participation rates and lower mean hours but higher median hours.

As for income, participation rates are fairly similar across income levels (though lowest on either extreme). Median hours generally decline with income, but differ most substantially for the two extremes, from 360 hours per year for those below the poverty line, to 80 for those with incomes over \$100,000. This pattern by income is expected due to the higher opportunity cost (of sacrificed formal market work) of home production for higher income individuals (who have higher formal market wages). This may also be partly due to a life-cycle dynamic in which younger and typically poorer couples seek to provide for their children by home renovations and food production. This is partly corroborated by the results for children. These patterns may hint at a more general phenomenon: that many families engage in major projects only occasionally. If so, a cross sectional analysis such as this would observe that most households do little, while a few are heavily involved. This would produce the highly skewed distribution of hours observed, and explain why the socioeconomic criteria appear so unrelated to the unrecorded work.

Table 3. Participation rates and median annual hours of informal work and home production (Barter, Make Money, or Save Money) by socioeconomic factor, for all eleven activities.

Characteristic	Cases	Participation Rate	Median Hours
Full Sample	1611	59.3	122
Family with Children Under 18	1066	63.2	140
Couple with No Children Under 18	434	51.4	100
3 or More Children Under 18	295	70.2	228
Single Parent Family	121	45.5	232
Two Parent Family	1490	60.6	120
A Parent Has a Vocational Degree	348	64.1	120
Neither Parent Has Vocational Degree	1263	58.2	123
A Parent Has a College Degree	408	59.2	120
Neither Parent Has College Degree	1203	59.5	126
Family Owns Home	1343	61.6	128
Family Does Not Own Home	267	48.5	82
A Parent Has a Second Job	405	69.1	192
Neither Parent Has a Second Job	1206	56.2	110
Received Public Assistance	114	62.3	103
Did Not receive Public Assistance	1497	59.2	125
Adults Are Over 50	260	50.8	116
Adults Are 35-50	939	62.0	128
Adults Are Under 35	392	58.7	120
Household Income			
>\$100,000	57	45.6	80
\$50,001 - \$100,000	386	64.8	110
\$40,001 - \$50,000	261	60.2	160
\$30,001 - \$40,000	295	62.4	130
\$20,001 - \$30,000	236	66.9	144
0 - \$20,000	211	52.1	200
At/Below Poverty Line	91	50.5	360

Median hours is conditional: only for those households who participated and reported informal and/or home production hours. Standard deviations exceed means in all cases.

This is for all 3 reasons: i.e. to make money, save money, or barter.

Public assistance includes AFDC, Food Stamps, General Assistance.

5.4. Multivariate Analysis

Do these patterns hold up when controlling for multiple factors simultaneously? To assess this, we examine both participation in and hours supplied to the unrecorded work using multivariate analysis. We

examine activities by type (broken into three large categories: farming/rural, repairs, personal services) and all activities to make money, save money, or barter. We use a logit regression to examine the decision to participate, and ordinary least squares to examine (natural log of) hours supplied to the unrecorded

work.¹⁴ Since Jacobs (1998) reports people with greater formal hours tend to overestimate their hours, a pattern likely to occur with unrecorded work as well, we use natural log of hours to reduce the impact of this effect. As the interest is household welfare, we examine these by family, using household level variables, following the general implications of Gronau's model of home production (Gronau 1997, 1986, 1980, 1977).

This model assumes that people get utility from a combination of leisure and goods and services and that these goods and services can be either purchased in the market or produced at home. To purchase goods and services in the market, people must engage in formal work to earn income. To produce them at home, they use a production technology with productivity determined by household specific characteristics and for which marginal productivity decreases as families devote more hours to the activities. The household maximizes utility subject to its budget and time constraints. Thus total consumption is based upon what can be purchased with the combination of earnings (and unearned income) plus what is produced at home.

In Gronau's formulation for all household production generally, people first engage in home production until the marginal productivity per hour of home production has decreased to equal the returns from an hour of market work (the wage). After that, they only engage in market work, at the constant market wage. Increases in wage raise the price of home production relative to market purchased goods and induce the household to decrease home production until its marginal productivity equals this new, higher wage, and vice-versa. Therefore, wages should be negatively correlated with home production. Given the correlation between wages and household income, we extend that reasoning to apply to gross household income: increases in market returns (proxied for by gross household income) raise the relative price of home production. Thus we expect that home production will be negatively related to income, a pattern observed weakly above, and that this holds for both participation and hours supplied.

Household income alone may not be a sufficient measure of financial well-being. For example, couples

in early middle age may have not only larger incomes but also mortgages and children in college, while older or very young families may have lower incomes without these obligations. Thus we include an income satisfaction measure as a taste shifter which might capture household conditions not clear from income alone. Households were asked to what extent they agreed with the statement "We have sufficient income to meet our basic needs and have some income left over." Responses ranged from 1 (strongly agree) to 4 (strongly disagree). If households engage in informal work and home production out of perceived necessity, this should be positively related to it.

We use 1995 county unemployment rate as an indicator of the local economic opportunity, following Dorsey's (1991) arguments regarding unemployment in West Virginia and Merz and Wolff's (1993) findings for Germany. This might be correlated with greater unrecorded work if residents of the county have responded to generally lower formal market opportunities by increasing unrecorded work or if people who prefer unrecorded work have lower formal labor market attachment. Given that total informal hours were comparable to hours in second jobs, it was hypothesized that households might be choosing between unrecorded work and additional jobs. If so having a second job should be negatively correlated with participation in and hours of informal work. In addition, public assistance (here food stamps, Aid to Families with Dependent Children, and/or General Assistance) is likely correlated with greater unrecorded work since returns from such work are not subject to benefit reduction as occurs with formal income (Lemieux, Fortin, and Frechette 1994).

Factors which raise the productivity of the household in unrecorded work will increase the probability of participation in it and hours devoted to it. Vocational education would directly impart many of the skills needed for the activities here. The role of university education is less clear because while it raises returns to formal work, it may raise productivity in unrecorded work as well (Gronau, 1980; Leibowitz, 1974; Michael, 1973). Leibowitz found these effects roughly cancel in her examination of basic household tasks such as child care. Given the physical nature of many of the activities considered, and rising returns from formal work as people get older, we expect that unrecorded work would decrease with age.¹⁵

We hypothesize that social networks likely increase involvement in unrecorded work because they provide access to (productivity raising) help outside of

¹⁴ Tobit variations to correct for selection gave similar results to those presented here by variable. However, we do not use them here because they depend heavily upon the distribution of the censored variable. If it is highly skewed, as is the case here, the Tobit assumption of normality will be erroneous. In fact, pseudo R² values for those analyses were 0.03 or less. Similarly, while Tobit can give both participation and hours information, we wanted to retain separate analyses for participation given possible errors in measuring hours.

¹⁵ We use average age of the parents for couples, but age of the mother for single parent families.

the family, especially to people who could assist in the work, loan tools, or give advice (Nelson and Smith 1999; Hill, 1985), and likely reduce transaction costs in the search for customers for activities to make money (Merz and Wolff 1993). To represent this effect, we use (log of) number of friends in the area, and (log of) number of relatives in the area. Similarly, presence of children would likely both provide access to inexpensive labor and increase demand for household production.

We also include several proxies for productivity: homeownership, number of vehicles, and distance to neighbor (to capture land size).¹⁶ Those with more land would be more able to engage in raising animals or produce, those who own vehicles and homes would have places in which to engage in the unrecorded work, and transportation to obtain supplies and/or interact with potential customers. These might also reflect unseen differences in tastes since people who prefer such work are more likely to own their homes, cars, and more land. Since the models control for household income, these variables primarily indicate productivity in or taste for the unrecorded work. This should account for cases in which those families with homes, more cars, or more land do more because they can afford more inputs.

Results from these models are presented in Tables 4 and 5. Single parents are significantly less likely to participate and have fewer hours. Unlike Lemieux et al. (1994) or Merz and Wolff (1993), people on public assistance do not appear more likely to be involved in this work. Age is negatively related to hours supplied, but less consistently related to participation.

Contrary to expectations, households in which a member holds a second job appear significantly more likely to participate in the unrecorded work and devote more hours to it. It is not clear if this indicates that people take on second jobs in response to need or if people more likely to work second jobs are also more disposed to engage in unrecorded work. Children are strongly related to the level of the unrecorded activity: those with more children both participate more and have more hours.¹⁷

Household productivity measures perform as expected: generally positive and strongly significant in both the participation and hours regressions. Formal

market resources also factor in as expected. Respondents who think household income is insufficient are more likely to participate in and devote more hours to the unrecorded work generally. Household income is negatively and significantly related to the activities.¹⁸

Surprisingly, the two social network measures have little impact, and in an inconsistent direction. Number of friends is positively related to participation (but not hours) in services, while number of relatives is negatively related to hours and participation in services.¹ While such assistance surely occurs, it seems surprising that this does not play a substantial role, but we did not find that in this data set. The data includes a number of additional measures of social networks and community attachment (e.g. participation in a range of community activities, length of residence, distance to sources of favors and assistance, etc.). But considerable examination of them did not find them significantly related to the unrecorded work either. One explanation may be that families generally perceive such work as inherent to the family, and turn to assistance only rarely. There may also be separate factors for participation and hours. For example, if most projects are small ones which do not require assistance, then social networks will affect involvement only in a small proportion of cases, leaving little variation for analysis. On the other hand, assistance from family and friends may result in *fewer* hours since projects can be completed sooner. If these explanations are correct, it would require more careful sample design to separate out these effects. This will be explored in greater detail in future work.

Interestingly, county unemployment rates were negatively related to participation and hours for repair type activities, but unrelated to rural/farm or service activities (or activities overall). This would make sense for unemployment status of the individual household if households were unable to afford purchased inputs necessary for such work as repairs (Pahl, 1987) but it is not so clear why this should be so for county unemployment. Initial exploration of unemployment effects using employment variables of the individual households (not presented here) found little connection between employment status and unrecorded work. A possible explanation for this may be that most unemployment spells are too short to justify the fixed costs of investments in the human, social, and physical capital necessary. For example, an unemployment spell may occur at a time which does not lend itself easily to engaging in some home production (e.g. repairs or raising produce). Similarly, if people expect that spells

¹⁶ The survey did not include land size, but distance to neighbor should be highly correlated with it. Gronau (1980) uses number of rooms in the house, number of children, and age of youngest child, and Hill (1985) uses ownership of power tools in examining repair related work.

¹⁷ Children may provide labor to raise productivity or change the taste for home production. Since only about a fifth of families reported work by children as done to barter, make money, or save money, children seem to shift tastes, rather than to assist substantially in this work.

¹⁸ This effect for income is strengthened if the income insufficiency measure is removed.

Table 4. Logit analysis: Participation in informal work and home production by activity

	Farm/Rural			Repairs			Services			All Activities		
	Coef.	z-Stat.		Coef.	z-Stat.		Coef.	z-Stat.		Coef.	z-Stat.	
Intercept	-4.525	0.000	***	-1.317	0.005	***	-3.151	0.000	***	-1.018	0.031	**
Household Income (1000s)	-0.003	0.320		-0.005	0.026	**	-0.006	0.134		-0.006	0.002	***
Income Sufficiency	0.115	0.267		0.200	0.019	**	0.296	0.018	**	0.123	0.155	
1995 County Unemployment	0.073	0.229		-0.079	0.102	*	-0.004	0.961		-0.068	0.167	
Multiple Jobs	0.391	0.016	**	0.493	0.000	***	0.348	0.083	*	0.361	0.008	***
Vocational Education	-0.213	0.249		0.266	0.071	*	-0.129	0.571		0.176	0.246	
College Education	-0.291	0.130		0.066	0.650		0.346	0.111		0.101	0.497	
Average Age	0.007	0.468		-0.012	0.099	*	-0.024	0.045	**	-0.011	0.146	
Public Assistance	0.114	0.674		-0.166	0.491		0.155	0.617		-0.077	0.757	
Single Parent	-0.129	0.660		-1.167	0.000	***	0.381	0.230		-0.722	0.003	***
Number of Children	0.334	0.000	***	0.126	0.014	**	0.199	0.005	***	0.251	0.000	***
Number of Friends (ln)	-0.024	0.708		-0.004	0.931		0.131	0.093	*	-0.031	0.548	
Number of Relatives (ln)	0.014	0.811		-0.039	0.418		-0.197	0.009	***	-0.063	0.204	
Home Ownership	0.208	0.348		0.879	0.000	***	0.488	0.070	*	0.660	0.000	***
Number of Vehicles	0.099	0.154		0.236	0.000	***	0.178	0.034	**	0.265	0.000	***
Distance to Neighbor (ln)	0.261	0.000	***	0.107	0.003	***	0.037	0.500		0.155	0.000	***
Observations		1255			1255			1255			1255	
Log Likelihood		-572			-805			-418			-779	
Pseudo R ²		0.078			0.070			0.061			0.071	

*, **, *** represent significance at the 10%, 5%, and 1% level, respectively.

Farm/rural activities includes hunting or fishing, raising animals, raising produce, and landscaping/farmwork, yardwork.

Repair activities includes cars, appliances, houses, remodeling, and other building work.

Personal services includes crafts, woodwork, personal services, and boarding.

Income Sufficiency: Response to "sufficient income to meet basic needs with some left over:" 1= completely agree; 4 = completely disagree.

Table 5. Hours supplied to informal work and home production by activity (OLS, ln(hrs))

	Farm/Rural			Repairs			Services			All Activities		
	Coef.	t-Stat.		Coef.	t-Stat.		Coef.	t-Stat.		Coef.	t-Stat.	
Intercept	-1.272	0.002	***	0.215	0.678		-0.171	0.535		0.122	0.828	
Household Income (1000s)	-0.003	0.067		-0.008	0.001	***	-0.002	0.100	*	-0.011	0.000	***
Income Sufficiency	0.128	0.089		0.237	0.012	**	0.169	0.001	***	0.276	0.007	***
1995 County Unemployment	0.053	0.221		-0.102	0.058	*	-0.002	0.944		-0.069	0.235	
Multiple Jobs	0.351	0.003	***	0.385	0.009	***	0.220	0.005	***	0.491	0.002	***
Vocational Education	-0.134	0.303		0.277	0.089	*	-0.086	0.316		0.128	0.466	
College Education	-0.085	0.514		0.153	0.348		0.121	0.160		0.169	0.333	
Average Age	-0.003	0.645		-0.019	0.019	**	-0.004	0.319		-0.021	0.014	**
Public Assistance	0.044	0.837		-0.129	0.629		0.046	0.745		-0.098	0.737	
Single Parent	-0.234	0.285		-0.937	0.001	***	-0.178	0.226		-0.887	0.004	***
Number of Children	0.218	0.000	***	0.170	0.003	***	0.054	0.069	*	0.274	0.000	***
Number of Friends (ln)	-0.007	0.874		0.076	0.185		0.040	0.187		0.048	0.436	
Number of Relatives (ln)	0.020	0.644		-0.048	0.375		-0.051	0.078	*	-0.048	0.418	
Home Ownership	0.302	0.052		1.379	0.000	***	0.063	0.542		1.271	0.000	***
Number of Vehicles	0.077	0.142		0.258	0.000	***	0.046	0.189		0.311	0.000	***
Distance to Neighbor (ln)	0.206	0.000	***	0.151	0.000	***	0.016	0.449		0.239	0.000	***
Observations		1250			1250			1246			1241	
R ²		0.081			0.109			0.036			0.124	
Adjusted R ²		0.069			0.098			0.024			0.114	

*, **, *** represent significance at the 10%, 5%, and 1% level, respectively.

Farm/rural activities includes hunting or fishing, raising animals, raising produce, and landscaping/farmwork, yardwork.

Repair activities includes cars, appliances, houses, remodeling, and other building work.

Personal services includes crafts, woodwork, personal services, and boarding.

Income Sufficiency: Response to "sufficient income to meet basic needs with some left over:" 1= completely agree; 4 = completely disagree.

will be of short duration, it may not justify making substantial effort to become involved in activities, e.g. raising animals, which may require a longer time commitment. Future work will explore this in greater detail.

Despite the insights provided by the models discussed, the low R^2 values (e.g. 0.124 for hours supplied, for all activities for any reason) imply that the models explain only a small portion of the variation in participation and hours. This is common in studies of unrecorded work. We believe our findings on the distribution of hours hint at the explanation for these results. If the activities are common but infrequent, then analyses using cross-sectional data will have low explanatory power because only a few households will have extensive involvement at any one time. The strong results for children are probably indicative of children as being a key factor in deciding when to engage in such work. This fact is helpful for understanding the importance of this kind of work to households generally as it reinforces the implications of Table 2 that involvement in this work is common, but heavy involvement is not.

Finally, it should be noted that the findings described above are robust across many model and activity variations. Income (or wages when used), holding a second job, number of children, home ownership, number of vehicles, distance to neighbor are consistently significantly related to involvement in the unrecorded work (income negatively, the rest positively), while social network, education, and unemployment characteristics are generally insignificant.

6. Conclusions

In order to better assist areas in development, identify needs, and choose among many competing regions and types of projects, governments must have reasonably accurate measures of the well-being of those regions. If unrecorded work is an unusually important strategy for family survival, then formal measures of well-being such as income or employment may be inadequate. Thus improved understanding of the degree to which people rely on unrecorded work is helpful to provide a more accurate picture of rural well-being. This study adds to such efforts by analyzing of the nature and importance of certain types of unrecorded work for families in rural Wisconsin: e.g. How extensive is it? Who does it? How important is it? How does it relate to formal work?

This analysis provides answers to a number of questions regarding the role of informal activities and home production in rural areas. Since most *occasions* of

unrecorded work are done as hobbies, favors, or for some other reason, knowledge of motives for which these kinds of activities are done is necessary to properly assess the importance of it to the families involved. Nonetheless, participation in activities to make money, save money, or barter is still quite common, with nearly 60% of households reporting at least one activity for those three reasons. Altogether, these appear to involve a level of time roughly equal to that of second jobs, or about one-twentieth the size of formal work hours. Multivariate analysis finds that these unrecorded activities (in participation and hours) decrease with income and are positively related to perceived income insufficiency, multiple (formal) job holding, number of children, and several home productivity characteristics. Surprisingly, they appear unrelated to social network and unemployment measures.

The most significant finding, however, is that the distribution of hours of such work is highly skewed. While a small fraction of households are greatly involved, the majority of participants report the equivalent of only 2-3 hours per week. This likely arises from two factors: some households engage in far more of this work on a regular basis, and, on the other hand, many households engage in major projects only occasionally. This latter reason is perhaps the more likely explanation for the results observed here. If many households participate, but only do a major project every few years, then cross sectional analyses would observe that at any one time only a small number of houses are heavily involved and most appear to do little. Moreover, socioeconomic factors would show little relation to the work, and models would explain little variation in participation or hours because the critical factor is time. Unfortunately, resolving this would require panel data sets which examine time use over long periods for the same households to separate out life-cycle (within family) from inter-family differences.

Nonetheless, this heavily skewed distribution of hours has several implications for researchers and policy-makers. First, for researchers, participation in such activities, even if motives are known, is insufficient to assess the importance of the work to the household, and studies of these activities in the future should seek to obtain information on the intensity of involvement. Second, while this work clearly provides substantial opportunities for the small portion of households intensively involved at any one time, and even modest support for most, the low median hours (122) and imputed values (\$1,328) indicate that failure to account for this work does not substantially underestimate

well-being for most families. This fact would hold for regional differences too, as the activities for which rural families would have an advantage constitute only about a fifth of this amount, or about \$300 per year. Finally, if most involvement is relatively minor (either because only a small portion of households have extensive involvement or because only a small portion have such involvement in any one year), then its significance in the local economy would appear small. The combination of relatively modest size, concentrated involvement, and limited significance for the social network measures would appear indicate that development strategies based upon this unrecorded work could have only limited impact.

While this study has several limitations (e.g. the data set itself is not representative of the rural population since it includes only couples ages 18-65 and only rural households in Wisconsin; it is only one part of unrecorded work and it excludes any illegal or under the table work), its conclusions should provide useful guidance for policy makers and researchers. These findings suggest a number of areas for future inquiry. Clearly one is how people engage in these activities over time. Another is greater study of the connection between unemployment and home production as suggested by Gronau (1997). The results here imply that the timing and duration of unemployment spells may be as important in explaining the limited shift into these types of activities as the inability to purchase inputs cited by Pahl (1987). Finally, the results for county unemployment rate may imply that differences in this type of work occur by county or region. One particular factor may be transaction costs for rural residents. As distance to obtain services increases, it raises the price of purchase relative to home production, perhaps increasing the degree to which people produce on their own.

Acknowledgments

The data for this study were obtained with support from CSREES-USDA National Research Initiative, Project #144-EL-77 and College of Agriculture and Life Sciences, UW-Madison Hatch #142-N660. Note: Professor Emeritus Ron Shaffer, a long-time regional science colleague (and mentor to many of us), passed away in 2005.

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Appendix 1. Sample statistics

Variable	Mean	S. Dev.
1995 County Unemployment Rate	4.73	1.28
Household Income (1000s)	46.80	34.97
Income Sufficiency	2.01	0.76
Received Public Assistance (%)	7.08	25.66
Single Parent (%)	7.52	26.37
Number of Children	1.39	1.29
Youngest Child Is Six or Less (%)	31.88	46.61
Average Age of Parents	40.90	10.21
A Parent Has College Degree (%)	25.28	43.47
A Parent Has Vocational Training (%)	21.61	41.17
A Parent Held Second Job (%)	12.37	53.28
Number of Friends in Area	25.46	47.65
Number of Relatives in Area	11.16	29.88
Home Ownership Rate (%)	82.83	37.33
Number of Vehicles	2.36	1.05
Distance to Neighbor (feet)	707.63	2277.35

Source: Wisconsin Rural Family Survival Strategies survey. N = 1611.

Second job refers to those who reported holding a second job simultaneously with their primary job at any time in the prior year.

Income Sufficiency: Response to "sufficient income to meet basic needs with some left over:" 1= completely agree; 4 = completely disagree.