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FARMS, FAMILIES, AND MARKETS: NEW EVIDENCE ON AGRICULTURAL LABOR MARKETS

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ABSTRACT

The farm household model has played a central role in improving the understanding of small-scale agricultural households and non-farm enterprises. Under the assumptions that all current and future markets exist and that farmers treat all prices as given, the model simplifies households' simultaneous production and consumption decisions into a recursive form in which production decisions can be treated as if they are independent of preferences of household members. These assumptions, which are the foundation of a large literature in labor and development have been tested and not rejected in several important studies, notably Benjamin (1992). Using new, longitudinal survey data from Central Java, Indonesia, this paper tests a key prediction of the recursive model: demand for farm labor is unrelated to the demographic composition of the farm household. This prediction is rejected. This rejection is not explained by contamination due to unobserved heterogeneity at the farm level, potential endogeneity of household demographic composition, nor differential monitoring costs for family and hired labor. The difference in conclusions can be attributed to implausibly low levels of family labor in the data used by Benjamin.

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1. Introduction

Small-scale, family-run enterprises form the backbone of many developing countries, and millions of households around the world produce goods and services both for their own consumption as well as for sale. These family farms and business enterprises operate in complex, interlinked markets for consumption, labor, credit, and output, and face considerable risk and uncertainty.

Modeling production and consumption decisions of family firms is a substantial challenge and many studies have relied on the neoclassical agricultural household model that integrates a family operated firm within a household utility maximization problem. The vast majority of empirical studies in this literature are founded, explicitly or implicitly, on a particularly simple form of the agricultural household model that assumes markets can be treated as if they are complete (Singh, Squire and Strauss, 1986). The implications of this model were tested and not rejected in an extremely influential and widely-cited study by Benjamin (1992) published in *Econometrica* using data from rural Indonesia. Pitt and Rosenzweig (1986) also failed to reject the model. This paper re-examines the evidence presented by Benjamin using recently collected data from rural Indonesia and finds that the assumption of complete markets is rejected. We also provide evidence that data quality likely explains the difference in conclusions.

The result is important. There is a large and influential body of work that is predicated on the model with complete markets. This includes seminal work on nutrition and farm productivity, adoption of agricultural technology, labor supply choices, and responses to policy interventions (e.g. Yotopolous and Lau, 1974; Barnum and Squire, 1979; Strauss, 1982, 1986; Singh Squire and Strauss, 1986).[1] Recent studies that have their origins in this model have made important contributions to the study of distributional impacts of agricultural productivity shocks and the operation of labor markets (Jayachandran, 2006; Kaur, 2014; Mobarak and Rosenzweig, 2014), risk sharing (Townsend, 1994), the impact of microcredit (Kaboski and Townsend, 2011), understanding intra-household resource allocation (Udry, 1996), property rights (Field, 2007), and child labor and household production (Akresh and Edmonds, 2012).

Under the complete markets assumption, the agricultural household is assumed to behave as a price taker in all markets, and all farm production decisions can be treated as if the household operates a profit-maximizing firm. To wit, input choices depend only on the prices of inputs and characteristics of the farm. Production choices are made without reference to the preferences of household members and, therefore, to consumption allocations. The agricultural household can be

[1] Taylor and Adelman (2003) provide a review of the agricultural household literature. See also Strauss and Thomas (1995), Behrman (1999) and Schultz (2001).

modeled as if decisions are recursive in that production choices are made in the first stage, and, in the second stage, consumption choices are made taking into account income from farm profits. Consumption choices depend on production decisions but not vice-versa: the recursive form (or the model assuming separation) substantially simplifies empirical implementation of the model.

The assumptions that underlie the recursive model are not only very powerful, they are also very strong. It is assumed that the household behaves as if all current and futures markets exist, that all prices are treated as parametric by all agents in the economy, that there is no uninsurable uncertainty, and that household labor and hired workers are perfect substitutes in on- and off-farm work. It is important to underscore that if farm household behavior is consistent with the recursive model, it does not mean that complete markets actually exist. Rather, one can conclude that households allocate resources in ways that make up for missing markets and, thereby, their choices can be modeled as if all markets exist. See, for example, Stiglitz (1974) for an articulation of how sharecropping serves such a purpose or the large literature describing how family and social networks substitute for credit and insurance markets.

The contribution of this research is an empirical assessment of whether the recursive model is consistent with decision-making by farm households in rural Central Java, Indonesia using new, longitudinal data specifically designed to address limitations in the existing literature. Indonesia is a good context for this research since the key papers in this literature relied on data collected from rural households in Indonesia in the early 1980s and concluded that those households behave as if complete markets exist (Pitt and Rosenzweig, 1986; and Benjamin, 1992). Using data collected two decades later, it is reasonable to suppose that markets have deepened and there are more inter-linkages across markets since the agricultural sector has undergone dramatic change over the last quarter century with the adoption of new technologies and diversification out of rice and into a broad array of cash crops. There is an active rural labor market, substantial migration between the rural and urban sector and many rural dwellers are engaged in both agricultural and non-agricultural work (see, for example, Booth (2002) for a discussion).

In fact, the recursive model is unambiguously rejected in our more recent data: demand for labor on the farm varies systematically with household characteristics even after taking into account unobserved heterogeneity at the farm level in a flexible way and treating household composition as endogenous, issues which plague past studies examining the agricultural household model (see, for example, Lopez 1984, 1986; Jacoby, 1993; Grimard, 2000). Many models in the development literature highlight the theoretical importance of differential monitoring costs of hired relative to own labor, which, if empirically important, is not consistent with the assumption of perfectly

substitutable hired and own labor (Stiglitz, 1974). This issue is investigated directly and no evidence is found to suggest that our rejection of recursion is explained by differential monitoring costs of own and hired workers.

Further investigation suggests the divergence of our results from Benjamin's stems from a stark difference across the two studies in how much family members work on their own farms. Recording unpaid laborers as family labor, Benjamin uses an agricultural supplement to the 1980 Indonesian National Socioeconomic Survey (SUSENAS) which suggests families hire approximately 78 person-days of labor over the course of the year but supply only 26 person-days; an average of one day of work by one family member every fortnight. We show that this labor supply estimate is implausibly low and inconsistent with information on employment activities in the same 1980 SUSENAS, ethnographic data collected during the period, and the income sources of farm households in the 1983 Indonesian agricultural census. Moreover, down-weighting the labor use data in our sample to match the first-moment of labor supply from Benjamin's data suggests an underestimate of family-supplied labor plausibly yields an incorrect failure to reject recursion.

These results are important not only for modeling farm household decision-making, but for the design and evaluation of development policy, and for understanding rural markets around the world. Analyses that assume the recursive model is valid are likely to yield misleading inferences about markets, production, preferences, and consumption. The next section outlines a dynamic version of the neoclassical agricultural household model as a guide for the empirical research. After describing the data, we present empirical tests of implications of recursion and draw our conclusions.

2. Theoretical Framework

This section presents a dynamic generalization of the neoclassical agricultural household model in Singh, Squire and Strauss (1986) to formalize intuition and establish the empirically testable implications of the model. The model incorporates production choices into an intertemporal utility maximization objective function with exogenous prices and complete markets.

If implications of the recursive model are rejected, formalizing specific deviations from this framework is a natural next step. Given the state of the literature, it behooves us to first provide convincing evidence on the empirical validity of the recursive model in our setting.

The farm household's problem

Farm households simultaneously act as both producers and consumers making decisions regarding

farm production in one realm, and maximizing household utility in the other. For an infinitely lived household, the objective is to maximize the expected present discounted value of current and future utility choosing consumption, leisure, savings, farm labor, and other variable farm inputs in each time period and state. The household is constrained by the farm production process, its time endowment, and an intertemporal budget constraint. Formally, the objective is:

$$\max \; E\left[\sum_{t=0}^{\infty} \beta^t u(x_{mt}, x_{at}, \ell_t; \mu_t, \varepsilon_t)\right] \tag{1}$$

where x_{mt} is a vector of market consumption goods, x_{at} is a vector of agricultural consumption goods (i.e. food, some of which may be grown by the household), and ℓ_t is a vector of household members' leisure. Preferences are captured by μ_t, which includes observed household characteristics such as household size and composition, and unobserved characteristics, ε_t. The utility function may be of general form as long as it is inter-temporally separable, quasi-concave, non-decreasing, and strictly increasing in at least one argument.

The agricultural production function specifies the technology that links inputs to output, Q_t, in period t:

$$Q_t = Q_t(L_t, V_t, A_t) \tag{2}$$

where the period t is a complete crop cycle from land preparation through harvesting. The inputs include labor used on the farm that period, L_t, a vector of other variable inputs, V_t, such as seed and fertilizer, and fixed inputs, A_t, which in the study setting is effectively land.[2] Rice is by far the dominant crop in the study area and for expositional simplicity, we assume a single output; the empirical implementation allows multiple outputs on a farm.[3]

Total farm labor consists of the sum of family labor supplied to the farm, L^F_t, and outside labor hired onto the farm from the marketplace, L^H_t.

$$L_t = L^F_t + L^H_t \tag{3}$$

[2] Land remains a choice variable in the model, but in the actual rural Indonesian setting studied in this paper there is little new land to acquire, and very few purchases or sales of land in the data. Family farms remain generally stable over time. Ethnographic evidence suggests land is typically inherited by the eldest son rather than divided amongst all siblings. Often the eldest may temporarily share the land with their younger siblings while retaining ownership, but when the younger siblings become deceased, the entire plot falls to the primary heir and their children (White and Schweizer, 1998). Technology in the study area is not capital intensive and while farms have small capital stocks, primarily sickles to harvest rice, these are treated as variable inputs.

[3] The empirical application of the model is robust to a number of alternative forms of the production function, including those allowing for intertemporal links in production where output in period t is a function of inputs in the current period as well as those from a previous period (e.g. Kochar, 1999). The empirical tests and results are also robust to production frameworks that explicitly include capital as an input and specify a transition process for capital over time. The form in equation (2) is maintained for ease of exposition.

Both family and hired labor are assumed in the baseline model to share a common shadow wage as in Benjamin (1992), although specifying differential productivity for family and hired labor does not change the results. A household's endowment of labor, E^L, is divided between leisure, time spent working on the family farm, and time in off-farm labor, L^O_t.

$$E^L = \ell_t + L^F_t + L^O_t \tag{4}$$

The household is also constrained by an intertemporal budget constraint that describes the evolution of wealth between periods. In the presence of credit markets or some other mechanism for inter-temporal smoothing, farmers can borrow resources in period t to be repaid with interest rate r_{t+1}; a parallel market exists for savings that earn the same interest rate. Let W_t be assets or wealth at the beginning of time period t, the budget constraint is:

$$W_{t+1} = (1+r_{t+1})\,[W_t + w_t(E^L - \ell_t) + \{p_{at}Q_t - w_tL_t - p_{vt}V_t - p_{At}A_t\} - \{p_{mt}x_{mt} + p_{at}x_{at}\}] \tag{5}$$

Wealth in the next period is equal to the interest earned on current period wealth and income from work and farm profits, less expenditure in the current period. Wealth is negative if a household is in debt. The household earns wage income from off-farm labor at the market wage, w_t, which, under the assumption of complete markets, is also the shadow wage for work on the farm. Thus, the imputed value of labor supply is $w_t(E^L - \ell_t)$. Net profits is the first pair of braces; it is the value of output $p_{at}Q_t$ evaluated at the market price less the cost of inputs including the imputed value of labor demand (at the market price), w_tL_t, and the costs of variable and fixed inputs, $p_{vt}V_t$ and $p_{At}A_t$, respectively. The value of consumption is in the final pair of braces and is given by total spending on goods purchased in the market, $p_{mt}x_{mt}$, and the value of consumption of own production evaluated at the market price, $p_{at}x_{at}$.

Under the assumption of complete markets, maximizing the household's objective function subject to restrictions (2)-(5) and additive inter-temporal separability yields the standard first order conditions. Current consumption demands depend on current prices, wages, the interest rate, and net income, as well as expected future prices, wages, and interest rates. An Euler equation guides inter-temporal decisions, and the demands for farm inputs are determined solely by the relationship between their marginal products and prices in every period.

The solution to the joint production-consumption problem reveals that the optimal choice of farm inputs is determined as if households operate their farms as risk neutral profit maximizing firms. There is a separation between production and a household's preferences which implies the joint problem may be formulated recursively in a two-step process. In the first stage, households

maximize profits on their farms independent of preferences or any consumption side influences by choosing farm labor, variable inputs, and land. Utility is then maximized in the second stage, and consumption allocations are affected by production decisions only through the amount of income provided by farm profits. The result of the second stage is a set of conditional demand functions similar to those obtained in standard inter-temporal models, but augmented by farm profits entering as any other (non-labor) income. The demand for consumption good c in period t is:

$$x_{ct} = x_{ct}(p_{mt}, p_{at}, w_t, r_{t+1}, \pi_t(p_{vt}, p_{at}, w_t, p_{At}), y_t, \lambda_t; \mu_t, \varepsilon_t) \tag{6}$$

where consumption depends on market and agricultural prices, p_{mt} and p_{at}, wages, interest rates, farm profits, π_t, income, y_t, and expected future prices through the marginal utility of wealth, λ_t.

The assumptions that yield a recursive system for the neoclassical agricultural household are very powerful: the model with recursion is substantially more tractable than the general model. The implication of recursion that will be the focus of this paper follows directly: since consumption behavior (and factors that affect consumption) have no impact on production, the composition of the farm household will have no direct impact on production choices. Put another way, since farm labor can be supplied on and off the farm at the same (shadow) wage, which is also the wage of hired farm labor, excess demand for labor over and above that of household members can be purchased in the market, hiring people who are exchangeable with household members. Excess supply of labor can be sold at the same wage (Benjamin, 1992).[4]

Recursion, farm production, and labor demand

The implications of recursion for farm labor demand choices follow from the first order condition for profit maximization, which sets the marginal revenue product for labor to its price:

$$p_{at}\frac{\partial Q_t}{\partial L_t} = w_t \quad \forall\, t \tag{7}$$

Solving (7) and inverting, total demand for labor on the farm in period t, L^D_t, is the sum of hired and family labor, which depends on all prices including the (shadow) wage:

$$L^D_t = L^D_t(p_{at}, p_{vt}, w_t, p_{At}) \quad \forall\, t \tag{8}$$

[4] The model with recursion also predicts that all decisions on the family farm affect consumption only through profits. This restricts the influence on consumption of any production-side exogenous factors that do not directly enter the demand system, such as prices of variable inputs: they can only affect consumption through an income effect which operates through their impact on farm profits. See LaFave, Peet and Thomas (2011) for more detail.

and, is independent of observed and unobserved characteristics that affect consumption choices of the farm household, μ_t and ε_{ht} respectively. Concretely, demand for farm labor does not depend on the demographic composition of the household.

The model rules out many situations that have been discussed in the theoretical – and to some extent – empirical literature. There is no scope for differences in the productivity of farm household workers and hired labor because of, for example, farm-specific experience or differences in the propensity to shirk or because of unobserved differences in productivity that are not rewarded in the market. The latter might include entrepreneurship, farm management skills or tastes for doing well on one's own farm. There are no costs of monitoring workers and no transactions costs (and commuting costs) that differ between own and hired workers or between on- and off- farm work. Labor is readily available at the prevailing wage at all times during the production process and there is no unemployment (or under-employment) in the local labor market. The model also rules out credit constraints, a wedge between farm gate and consumption prices, and within-household bargaining over labor supply, resource allocation or farm production.

3. Empirical model of farm labor demand

Whether recursion provides a reasonable approximation of farm household behavior is an empirical question. It is tested in this paper by determining whether the demand for farm labor (8) depends on the demographic composition of the farm household using longitudinal survey data from Central Java, Indonesia. Given a Cobb-Douglas production function as in Benjamin (1992), the demand for labor by farm household *h* in community *j* at time *t* is:

$$\ln L_{hjt} = \alpha + \beta N_{hjt} + \delta X_{hjt} + \eta_{jt} + \eta_h + e_{hjt} \tag{9}$$

where L_{hjt} is the total number of person-days of farm labor and N_{hjt} represents household demographic characteristics; X_{hjt} are time-varying household and farm level characteristics such as farmer experience, land size and farm productivity; η_{jt} are community-specific fixed effects, one for each period t; and η_h are household-farm fixed effects. Under the null that farm household decisions are recursive, N_{hjt} has no impact on labor demand and β is zero.

The labor demand function, (9), addresses two potentially important concerns raised in studies that have relied on cross-sectional data. First, there may be unobserved farm-specific characteristics that affect labor demand and are correlated with household demographic composition. These include, for example, soil quality, plot fertility, farm specific knowledge, and

managerial experience, all of which are extremely difficult to measure and likely correlated with wealth and thus household composition (Benjamin, 1992; Udry, 1996; Rangel and Thomas, 2012). The farm fixed effects, η_h, absorb all observed and unobserved farm-specific heterogeneity that is fixed over time and affects labor demand in a linear and additive way so that the tests are not contaminated by these sources of heterogeneity.[5] Second, demand for labor will vary with wages and prices as well as with technology or weather shocks; these factors are absorbed in the community- and time-specific fixed effects, η_{jt}. Tests for recursion presented below exploit variation in household composition for the same farm household over time while also controlling all local area variation in each period. Households are surveyed multiple times and standard errors are clustered allowing for arbitrary correlation within households across time.[6]

Demographic composition of the household is allowed to affect labor demand flexibly by specifying the number of members, n^k_{hjt}, in each of 12 gender- and age- specific demographic groups.[7] Household composition, N_{hjt}, is defined as:

$$N_{hjt} = \sum_{k=1}^{12} n^k_{hjt} \tag{10}$$

Six age groups are distinguished -- children and adolescents from birth to 14 years old, young adults ages 15 to 19, prime age adults ages 20 to 34 and 35 to 49, adults 50 to 64 and seniors 65 and above. Variation in n^k_{hjt} arises from aging into the next age category, births, deaths, and migration into and out of the household. Conclusions based on finer or coarser age stratifications are not different, nor do they differ in a model with household size as the only indicator of the demography of the household. The data used to estimate the model is described in the next sub-section.

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[5] This is similar to the approach used by Bowlus and Sicular (2003) who analyze recursion using a four-wave panel of 250 households in China. The authors report that of 442 person days of labor used per year on the average farm, only 4 person days per year are hired in with the remaining 438 provided by household members. In the absence of a local labor market, it is not surprising that complete markets are rejected in their setting.

[6] Standard errors calculated using block-bootstraps with blocks defined at the household level do not change the quantitative nor qualitative results presented here with clustered standard errors.

[7] Benjamin (1992) and Bowlus and Sicular (2003) follow Deaton (1986) and specify the vector N as

$$N = log(n) + \sum_{k=1}^{K-1} \frac{n^k}{n}$$

where n is total household size and n^k is the number of household members in demographic group k. This specification separates scale effects from composition effects (holding scale constant). None of our results depend on the specification of N; we prefer to use (10) which has a clearer interpretation of the impact of a change in household composition on labor demand.

4. Data

The Work and Iron Status Evaluation (WISE), a large-scale longitudinal survey conducted in Central Java, Indonesia, is designed to collect the information on individuals, households and communities necessary to test implications of recursion in the agricultural househol model. After a listing survey in late 2001, a population-representative sample of households living in Purworejo kabupaten were interviewed every four months beginning in 2002 and continuing through 2005. A longer-term follow-up was conducted five years after the start of the survey in 2007. All waves of the survey are included in this study. Since the tests of recursion rely heavily on changes in household composition, it is imperative that selective attrition does not contaminate inferences. Attrition is extremely low in WISE: ninety-seven percent of the baseline farm households from the 2002 baseline were re-interviewed five years later in the 2007 wave (Thomas et al., 2011).

The WISE instrument collects extensive and detailed information on each household's farm business every four months. This includes ownership and use of land, the value of farm assets, farm activities performed by each household member, the number of hired laborers, their wages and activities and amount of work performed. This information, combined with detailed data on the costs of all other variable inputs and the quantity and value of output of each crop as well as quantities sold are collected so that it is possible to estimate farm profits.

Table 1 reports means and standard errors of the data pooled over the eleven waves of WISE used in this paper. The sample consists of approximately 4,500 farm households and 38,000 household-wave observations. As the baseline sample is representative of the study population, every individual interviewed at baseline is eligible to be followed and interviewed throughout the study. When an individual moves out of a baseline WISE household and forms a new household, it becomes part of the WISE sample.

Panel A describes characteristics of the farms in the sample. Agriculture is the primary source of income in the study area, with wetland rice being grown by eighty-five percent of farm households. Rice is harvested three times per year and an increasing fraction of farmers have diversified into also producing oranges, groundnuts, and coconuts. The average farm household owns approximately half an acre of land and a modest capital stock.

Household composition is reported in panel B of the table. The average household has 3.83 members including one prime age (20-64) male and female. Variation in household composition is key for identification in our models with household fixed effects; the percentage of households that experience changes in composition is displayed in column 3. There is substantial variation over time with sixty percent of households having a change in the number of members as a result of birth,

death, exit or entry. This understates the extent of change (if an entrant offsets an exit in a period): over eighty percent of households experience at least one change in household composition during the study period. An average of two individuals work on the farm in each household, while both men and women participate in nearly all tasks.[8] Household members also sell their labor off farm, with seventy-eight percent of households ever having a member who works away from the farm as a private employee. Approximately one-third of all off-farm jobs are in the service sector in small shops and restaurants.

The allocation of labor on the farm is reported in panel C. The average farm uses seventy-two person days of labor in each four-month season. Three-quarters of the labor (fifty-four person days) is provided by family members, of which over three-quarters is supplied by male household members. There is an active and functioning labor market. Workers are hired by ninety percent of farm households and ninety-five percent of them are paid a daily wage; the rest are involved in exchange labor contracts in which the worker provides labor in exchange for labor on his farm. Hired workers are engaged primarily in planting, weeding and harvesting with the daily wage for the latter at approximately Rp18,000, three times greater than the wage for planting or weeding.

5. Empirical tests of an implication of complete markets

Estimates of the demand for farm labor model (9) are presented in Table 2 which displays estimates of each element of β_k, the coefficients on household demographic composition as specified in (10). Under the null that the model is recursive, all of these coefficients should be zero. Test statistics for joint significance are presented at the bottom of the table, and estimates of variance-covariance matrices take into account clustering at the household level.

Farm household fixed effects are excluded from the model in column 1 to provide a direct comparison with the existing literature, while fixed effects are included in column 2 and thereafter. In both models recursion is rejected as indicated by the F-tests for all demographic covariates with prime age males and females significantly predicting farm labor demand. Older and younger household members predict labor demand in models without household fixed effects and to a less extent in the models with fixed effects. This, and the fact that the estimated coefficients on prime age males are smaller in models with farm household fixed effects suggests part of the association in the first model reflects the influence of unobserved heterogeneity.

[8] The exceptions are preparing land and working with livestock, which are nearly exclusively male tasks.

Labor demand by farm task

It is possible that these tests are contaminated by unobserved heterogeneity that varies within a farm household over time. For example, theory has highlighted principal agent problems inherent in the farmer-hired worker relationship in settings where monitoring is costly. These concerns may be especially important for weeding, planting, and applying fertilizer in rice cultivation since all of these activities are conducted in a flooded paddy. In contrast, harvesting is substantially easier to monitor. Hired labor is widely used in all of these activities. Arguments for using household labor because of difficulties monitoring workers have been discussed in the literature for land preparation and caring for livestock (Rosenzweig and Wolpin, 1993). Indeed, these tasks are done almost exclusively by male household members, while female household members do most of the drying, selling and milling of the rice. We therefore examine demand for labor in these tasks separately.

To capture these features of the local economy, in each wave, the WISE agricultural business module records the number of person-days hired for each of seven tasks performed on the farm during the prior four months, as well as which household members work in each task.[9] Task-specific labor demand is the sum of person-days hired for that task and labor supplied by family members to a task. Family supplied labor is calculated by matching the farm tasks reported for each household member to their individual employment data.[10]

Panel B of Table 2 presents estimates of the demand for farm labor for three groups of activities: land preparation, caring for livestock, and drying, selling and milling rice (in column 3), weeding, planting and applying fertilizer (in column 4) and harvesting (in column 5). Monitoring costs does not explain the rejection of recursion. Household composition predicts demand for labor for harvesting, for which monitoring is likely to be less salient, as well as the other two groups of activities. If shirking is a substantial concern, farm owners and hired labor are likely to respond by making multi-season contracts and, in fact, such contracts are widespread for planting, weeding and harvesting in the study area.

Treating household composition as endogenous

Some farm tasks such as land preparation and caring for livestock rely heavily on labor of household members and use relatively little hired labor. This suggests an alternative threat to identification in our empirical model: household composition may be jointly determined with the nature of farm

[9] The seven tasks are: working with livestock, preparing land, planting, weeding, fertilizing, harvesting, and drying, selling and milling the harvest.

[10] Every adult member of each farm household describes their labor activities on and off the farm in detail. Hours recorded on each of the seven farm tasks are summed across all members to calculate total hours provided by farm household members for each task.

activities and, therefore, with farm labor demand. The farm household fixed effects included in the model absorb household-specific time-invariant unobserved heterogeneity and community-time fixed effects absorb variation in each time period at the community level. It is possible that there are unobserved farm-household specific productivity shocks that are related to household composition which contaminate the test statistics. For example, in a particularly good season when demand for labor (and thus wages) are high, family members who are not co-resident may return to the farm to work; in a bad season, household members may temporarily exit the household in search of work elsewhere.

One approach to addressing this concern is to relate current labor demand to household composition in the prior season. These estimates, which are purged of contamination due to contemporaneous movements of members into and out of the household, are reported in column 6 of Table 2. Prior season household composition predicts current labor demand. It is possible that there are costs of moving into and out of the household and so we examine the relationship between farm labor demand and household composition in the next season as well. There is no reason to expect future household composition to be driven by unanticipated productivity and labor demand shocks and so these estimates should not be contaminated by reverse causality. Column 7 establishes that future household composition – particularly males – does predict labor demand. In order to close down scope for selective migration into or out of the household, column 8 reports estimates that include only households for whom variation in composition over time can be attributed to aging of household members and not to new entrants or exits.[11] This reduces the sample by two-thirds. Even within this select sub-sample, household composition predicts labor demand.

Finally, we adopt an instrumental variables approach to address the potential endogeneity of household composition. Controlling farm household and time-specific community-fixed effects, conditional on current household composition, composition in prior seasons should have no impact on labor demand. Column 9 reports fixed effects instrumental variables estimates using composition lagged one, two, and three seasons as instruments. All of the first stage estimates are well determined (with F test statistics for the identifying covariates ranging between 26 and 75 with 8 of the 12 test statistics exceeding 50; see Appendix Table A). The models are over-identified and we cannot reject that composition lagged one and two seasons is exogenous conditional on assuming composition lagged three seasons is exogenous. Treating household composition as endogenous has no impact on

[11] As this subsample has the same men and women in a household in each wave, family size is captured by the household fixed effect. Given that changes in demographic composition do not then change total size, estimates must be interpreted relative to an omitted group for both males and females (birth to age fourteen).

our substantive finding: household composition significantly predicts farm labor demand in the fixed effects instrumental variables model.[12]

The evidence presented in Table 2 establishes that the behavior of the average farm household is not consistent with the existence of complete markets. It is, however, possible, that a subset of households invest in financial capital, family or social networks, risk diversification or risk mitigation strategies that serve as substitutes for missing markets. For such households, behavior may be consistent with complete markets. For example, there is evidence suggesting that wealthier and better-educated households are better able to cope with unanticipated shocks (Townsend, 1994; Frankenberg, Smith and Thomas, 2003).

To investigate this issue, the sample of farm households has been stratified by measures of resource availability and the labor demand functions have been estimated separately for each sub-sample. Results are reported in Table 3. We begin with better educated farmers who are not likely to have better access to resources but are also likely to be better informed about markets and more able to exploit new technologies and entrepreneurial opportunities. The first panel of Table 3 stratifies the sample into three groups by the education of the household head: 15% who did not complete primary school, 67% who did not complete secondary school and the 18% who completed at least secondary school. For all three groups, including the better-educated, household composition is a significant predictor of farm labor demand. The same conclusion emerges when the sample is stratified by a measure of the cognitive ability of the household head and when households are stratified by the level of education of the best educated adult in the household.

It is possible that it is financial resources rather than education or cognitive ability that are key in assuring that incomplete markets do not distort behaviors. The second and third panels in the table stratify farm households based on average real per capita household expenditure over the entire survey period which we interpret as a measure of longer run resource availability or "permanent income." Results in columns 4 and 5 of the table stratify households at the median of permanent income. While recursion is rejected for both groups, the effects of household composition are smaller for households with more resources.

We have investigated this more fully and find that when we separate households into the bottom 15 percent, the middle 70 percent and the top 15 percent in the permanent income distribution, there is evidence that among households with more resources, household composition

[12] IV estimates are not substantively different using only three and two season lags in household composition as instruments. In all cases, the first stage estimates and overidentification tests indicate the instruments are valid, the joint test of all demographic groups rejects recursion, and individual coefficient estimates are similarly significant and slightly larger than the model including one season lags in the instruments.

is not a significant predictor of demand for farm labor. However, there are legitimate concerns regarding the power of the test. The estimated coefficients on 35-49 year old males and females in the top income group are very close in magnitude to the estimates for the middle-income group and none of the coefficients on the demographics groups are significantly different between the two groups. The failure to reject recursion in the top income group is arguably largely driven by the relatively large standard errors.

We have also explored whether household composition predicts labor demand for several other sub-samples. These include households with only one adult member (who is likely to need hired labor) relative to households with many adults (and unlikely to hire labor); households with large plots (whose demand for labor is greater) and those with small plots; and households that experienced a negative weather shock (and may need help at that time). In all of these cases, household composition is a significant predictor of farm labor demand for every sub-sample.

While there are active labor markets across the entire study area, there is heterogeneity in the level of development, nature of markets and, importantly, for this study, the extent to which labor is hired for farm work. Stratifying communities into quintiles of the extent to which labor is hired in the local economy, we find that recursion is rejected in every sub-sample including those communities where over a third of labor demand is hired.

The only sub-sample for which there is any evidence that recursion is not rejected is those farm households in the top 15 percent of the resource distribution. We conclude that there is only modest evidence that some households behave as it there are complete markets. For the vast majority of farm households in the study area, the assumption that complete markets exist is not consistent with observed household behavior. In contrast, Benjamin (1992) implemented the same test using data on farm households in rural Java collected in 1980 and could not reject the complete markets hypothesis. It is useful to investigate the reasons for these different conclusions.

It is possible that local economies have become less efficient over time in rural Java. That seems very unlikely. There has been a sustained and substantial increase in the use of hired labor in the agricultural sector over the last forty years with the majority of farm households both purchasing labor for their own farms while household members work off the farm (Booth, 2002). Agricultural production has been transformed over the last quarter century with the adoption of high yielding varieties of rice and diversification into other cash crops (Pearson et al, 1991).

Our investigation suggests that a more likely explanation lies in differences in the data. Benjamin used a business module administered as part of the 1980 Survei Sosial Ekonomi Nasional (National Socioeconomic Survey, SUSENAS), a multi-purpose cross-sectional survey conducted in

February of each year by Statistics Indonesia.[13] At that time, the centerpiece (or core) of the survey, which was repeated every year on a new sample, was a detailed consumption module that usually took up the vast majority of interview time along with a listing of household members and their activities.

The business module was administered to a 10% subsample of households and has been administered only once. Questions are asked of the household head about sources of household business income and, for agricultural businesses, information about land holdings, choice of technology, labor and other inputs, and harvest and sales. Farmers are also asked to recall the number of person days provided by unpaid workers and the number of person days provided by paid workers and their total wage bill over the last 12 months. These questions are asked about each of six tasks (e.g. planting, harvesting). Unpaid workers are assumed to be family workers. Benjamin (1992) estimates that the average farm household that produced rice in Java used 104.5 person days of labor in the prior year of which 78.2 person days were hired workers and 26.3 person days were contributed by household members.

This estimate of household labor appears to be very low. First, it implies that one household member worked on the farm for one day in each fortnight of the previous year. This seems unlikely since the average farm household had 1.4 males and 1.4 females, rice was cropped three times a year at the time, and rice farming is the primary activity of the farm households examined in Benjamin (1992).

Second, the activity module of the SUSENAS core provides a check on this estimate. For each household member age 10 and older, the household head reports whether the person worked and, if so, whether the person worked in a family business and the number of hours worked in the past week. Benjamin (1989) summarizes those data. For the same Javanese rice farmers, the household head reported that in the last week, male household members worked 28.5 hours, female household members worked 14.2 hours, and so the average household provided 42.7 hours of labor for the household businesses in the week before the survey. This is at least 5 person days in the last week and, if the previous week was not unusual, around 200 to 250 person days in the last year.

It is possible that households had many farm businesses and that only about one-tenth of their labor (26 person days) was allocated to rice farming. While other businesses likely account for some of the time, it is unlikely that they account for ninety percent of the time since rice farming is the primary activity of the households. It seems more likely that unpaid labor reported in the

[13] Unfortunately, the micro-data from the Agricultural Supplement (Section IV) to the 1980 SUSENAS is no longer available from Statistics Indonesia and we have been unable to locate the data from any other source.

business module is a substantial under-estimate, possibly, in part, because of the substantial cognitive demands of recalling over the last 12 months the number of person days of household labor worked on the farm.

Third, Hart (1978) followed rice farmers in Central Java as part of an intensive ethnographic study. She estimates that the average household provided about 202 person days of labor on the family farm, which is much closer to the estimate from the SUSENAS core module than the estimate reported in the business module. (Hart did not enumerate hired labor.)

In contrast with the design of SUSENAS, in WISE each household member reports the amount of labor supplied on the farm over the last four months, and hired labor for the last four months is reported by the person who manages the farm, usually the household head. Farm labor demand is the sum of all these components. It amounts to nearly 220 person days aggregated over the last 12 months, of which one-quarter is hired and over 160 days of labor are provided by household members. This estimate is closer to Hart and the SUSENAS activity module; again the SUSENAS business module appears to be very low.

It is not straightforward to draw comparisons over time; average farm size has declined, technology has changed as high yield rice varieties have been adopted, household size has declined and labor productivity on and off the farm has changed. However, it is straightforward to adjust for a key change that likely captures much of the variation in labor intensity over time: the decline in farm sizes. According to Benjamin (1992), in the 1980 SUSENAS, the average farm uses 220 person days of labor per hectare of which less than one-quarter, 50 person days per hectare, was provided by household members. Hart estimates that rice farm household members worked 404 person days of labor per hectare of land cultivated in 1978. This is eight times the estimate in the SUSENAS business module. In WISE, it is estimated that farm household members work 490 person days per hectare on the farm which is very close to Hart's estimate. Total demand for labor per hectare in WISE is 660 person days per year. This suggests that labor intensity in rice cultivation has increased over time, which is plausible given the smaller farm sizes, shift to high yield varieties and increased use of other inputs.

It is also possible to compare sources of income across surveys. Statistics Indonesia has conducted an Agricultural Census every decade since 1983. Those data document that in 1983, 83% of total farm household income was earned from agricultural activities and the rest was from non-farm work (Rusastra, Lokollo, and Friyanto, 2009). It is difficult to reconcile this estimate with the 1980 SUSENAS estimate of only one-quarter of farm labor being provided by household members. The Agricultural Census also documents a secular decline in the share of household income from

agriculture as more off farm opportunities have arisen. In 2003, 69.5% of the income of farm households was from farm work (Rusastra, Lokollo, and Friyanto, 2009). The estimate of the share of income from agriculture in farm households in WISE is very close: 71%.

The balance of the evidence points to the 1980 SUSENAS data on farm work by household members being implausibly low. We have explored whether this is likely to lead to failing to reject recursion. The labor use data in WISE have been reweighted to match the first moment of household labor supply in Benjamin (1992) and we have replicated his specification of the demand for farm labor with farm fixed effects. None of the household demographics is individually significant nor are they jointly significant. Recursion cannot be rejected. This conclusion is reversed if the models do not include farm fixed effects or if the specification of demographics is the more flexible form used in Table 2.

We conclude, based on the evidence in WISE, that household behavior is not consistent with the existence of complete markets for the vast majority of households, with the possible exception of those at the top of the income distribution.

6. Conclusion

Family-run farms and microenterprises play an important role in low income settings and are thought to be key drivers of global growth. In order to understand the labor market choices of these households and formulate and evaluate policies, it is essential to model the opportunities and constraints such households face. This research has established that the model of a farm household under the assumption that markets are complete, which implies that there is a separation between production and consumption decisions, is rejected using recently collected longitudinal survey data from Central Java, Indonesia. Specifically, with complete markets, household demographic composition should not be related to the demand for farm labor. This implication is rejected even after taking into account time invariant unobserved heterogeneity at the farm level, treating household composition as endogenous, and examining labor demand for separate farm tasks that vary in the extent to which shirking is likely to have an impact on profits.

These results contrast with the prevailing wisdom in the literature based on seminal research by Benjamin (1992), which failed to reject the implications of complete markets in rural Java in the 1980s. While there are many potential explanations for the difference in conclusions, our empirical strategy has followed the approach described by Benjamin and, after extensive investigation we attribute the difference in conclusions to differences in the quality of the data.

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Table 1: Summary Statistics

Panel A Farm Characteristics	(1) *Mean*	Panel B Household Composition	(2) *Mean*	(3) *Percent with a Change*	Panel C Farm Labor in the Last 4 Months	(4) *Mean*
Rice Farm (%)	84.89	Household Size	3.83	60.34	*Person-Days of […]*	
	(0.18)		(0.008)	(0.77)	Total Labor Demand	72.45
		Males age […]				(0.30)
Own Land (%)	73.20	0 to 14 years	0.51	28.87		
	(0.23)		(0.004)	(0.72)	Family Supplied Labor	54.38
Size of Land Owned (m^2)	2076.45	15 to 19	0.19	27.64		(0.22)
	(70.72)		(0.002)	(0.71)		
		20 to 34	0.30	27.02	Hired Labor	18.07
Value of Farm Assets	236.29		(0.003)	(0.70)		(0.19)
(Rp0,000)	(4.50)	35 to 49	0.36	22.36		
Value of Non-Farm Assets	461.01		(0.003)	(0.66)	*Family labor supplied by […]*	
(Rp0,000)	(5.49)	50 to 64	0.31	24.44	Male Household Members	40.33
			(0.002)	(0.68)		(0.18)
Age of […]		65 and older	0.30	16.07	Female Household Members	14.05
Primary Male	54.50		(0.002)	(0.58)		(0.10)
	(0.07)	*Females age […]*				
Primary Female	49.23	0 to 14 years	0.47	26.36	*Person-Days Hired for […]*	
	(0.06)		(0.004)	(0.70)	Planting	6.39
		15 to 19	0.14	24.51		(0.07)
Years of Education of […]			(0.002)	(0.68)	Harvesting	4.86
Primary Male	6.14	20 to 34	0.27	26.19		(0.07)
	(0.02)		(0.002)	(0.70)	Weeding	4.10
Primary Female	4.98	35 to 49	0.41	23.76		(0.08)
	(0.02)		(0.003)	(0.67)	Other Farm Tasks	2.72
		50 to 64	0.34	25.91		(0.08)
			(0.002)	(0.69)		
N. Households	4452	65 and older	0.25	17.70		
N. Household-wave Obs.	38189		(0.002)	(0.60)		
		Any Change in Household Composition		81.42 (0.62)		

Notes: Table reports means and standard errors in parentheses for variables of interest. The sample consists of households with farm businesses, approximately 75% of households in the survey. All labor measured as unconditional means of person-days over the past 4 months, and assets as January 2002 Rp0,000.

Table 2 : Labor Demand (in log of person days per season) and Household Composition

	A. Baseline Results		B. Labor Demand by Farm Task			C. Treating Household Composition as Endogenous			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Household demographic composition	**Pooled Cross Sections**	**Household Fixed Effects**	**Land Prep Livestock Dry/Sell/ Mill**	**Weeding Planting Fertilizing**	**Harvesting**	**Composition in prior period**	**Composition next period**	**Households with only aging variation**	**Instrumental vars: composition in (t-1), (t-2), & (t-3)**
Number of males in farm HH									
0 to 14 years	0.02	-0.00	-0.01	-0.01	-0.04	-0.02	0.03	-	0.00
	(0.01)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.02)		(0.04)
15 to 19	0.11	0.09	0.16	0.07	0.06	0.06	0.07	0.10	0.10
	(0.01)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.02)	(0.05)	(0.04)
20 to 34	0.17	0.13	0.14	0.09	0.12	0.08	0.07	0.17	0.17
	(0.01)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.02)	(0.11)	(0.05)
35 to 49	0.20	0.16	0.18	0.11	0.17	0.07	0.04	0.16	0.15
	(0.02)	(0.03)	(0.05)	(0.03)	(0.04)	(0.03)	(0.02)	(0.12)	(0.08)
50 to 64	0.27	0.21	0.22	0.13	0.21	0.07	0.11	0.25	0.17
	(0.02)	(0.03)	(0.06)	(0.04)	(0.05)	(0.03)	(0.03)	(0.12)	(0.09)
65 and older	0.20	0.19	0.17	0.11	0.18	0.05	0.11	0.25	0.11
	(0.03)	(0.03)	(0.06)	(0.04)	(0.05)	(0.04)	(0.03)	(0.13)	(0.11)
Number of females in farm HH									
0 to 14 years	-0.02	-0.04	-0.03	-0.05	-0.03	-0.02	-0.01	-	-0.02
	(0.01)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.02)		(0.04)
15 to 19	0.01	-0.01	0.01	-0.02	-0.03	0.00	-0.01	-0.01	-0.02
	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.02)	(0.05)	(0.04)
20 to 34	0.01	0.06	0.05	0.05	0.07	0.06	0.01	0.21	0.09
	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.02)	(0.10)	(0.05)
35 to 49	0.08	0.14	0.06	0.13	0.10	0.12	0.05	0.32	0.26
	(0.02)	(0.03)	(0.05)	(0.03)	(0.04)	(0.03)	(0.03)	(0.11)	(0.08)
50 to 64	0.10	0.11	0.04	0.11	0.10	0.07	0.07	0.32	0.18
	(0.02)	(0.03)	(0.05)	(0.03)	(0.04)	(0.03)	(0.03)	(0.12)	(0.08)
65 and older	-0.04	0.04	-0.05	0.05	0.07	0.03	0.00	0.25	0.08
	(0.02)	(0.03)	(0.05)	(0.03)	(0.05)	(0.03)	(0.03)	(0.13)	(0.08)
Tests for joint significance of demographic composition									
All Groups	37.73	12.57	6.23	4.91	4.59	5.18	5.21	2.72	39.23
p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Males	53.81	17.86	9.83	6.08	6.37	5.61	7.63	2.28	20.74
p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Females	10.01	6.66	1.29	3.60	1.65	3.87	2.12	2.90	13.33
p-value	0.00	0.00	0.26	0.00	0.13	0.00	0.05	0.01	0.04
Prime age adults	48.78	21.77	10.27	8.86	7.34	9.39	5.84	2.65	36.27
p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
C-test - 1 Period Lags (χ^2)									12.65
p-value									0.97
Observations	38189	38189	27387	33166	24353	34414	34769	11594	26951
N. Households	4452	4452	4176	4166	4022	4300	4305	1584	3861

Notes: All estimates of variance-covariances take into account clustering at the household level and allow arbitrary heteroskedasticity. Joint tests for the significant of demographic groups are F-statistics (columns 1-8) and chi-squared (column 9). The C-test is an overidentification test examining the exogeneity of 1 and 2 period lags conditional on the validity of the 3 period lags. All models control land ownership status and the size of land owned, whether land is irrigated and size of irrigated land, quintiles of farm and household (real) assets, age and education of the household head and spouse, and month of interview indicators. Columns 2 through 9 include farm household fixed effects and community-time fixed effects. As column 8 limits the sample to household with the same men and women across waves, changes in demographic composition do not change household size and are therefore interpreted relative to omitted groups (birth to age 14).

Table 3: Labor Demand for Stratified Samples

	Household Head's Years of Education			Position in Per Capita Expenditure Distribution				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	5 or Less	**6 to 11**	**12 or More**	**Bottom 50%**	**Top 50%**	**Bottom 15%**	**Middle 70%**	**Top 15%**
Number of males in farm HH								
0 to 14 years	0.03	-0.01	0.03	-0.01	0.01	-0.04	0.01	-0.05
	(0.05)	(0.02)	(0.04)	(0.02)	(0.02)	(0.04)	(0.02)	(0.06)
15 to 19	0.09	0.07	0.11	0.10	0.06	0.11	0.09	0.05
	(0.05)	(0.02)	(0.04)	(0.02)	(0.03)	(0.05)	(0.02)	(0.05)
20 to 34	0.13	0.15	0.11	0.17	0.11	0.19	0.15	0.05
	(0.06)	(0.02)	(0.05)	(0.02)	(0.03)	(0.04)	(0.02)	(0.06)
35 to 49	0.08	0.16	0.19	0.24	0.09	0.32	0.15	0.13
	(0.09)	(0.04)	(0.06)	(0.04)	(0.04)	(0.08)	(0.03)	(0.10)
50 to 64	0.09	0.21	0.29	0.29	0.12	0.29	0.20	0.11
	(0.10)	(0.04)	(0.07)	(0.05)	(0.05)	(0.09)	(0.04)	(0.10)
65 and older	0.23	0.18	0.17	0.27	0.09	0.28	0.19	0.02
	(0.12)	(0.04)	(0.07)	(0.05)	(0.05)	(0.09)	(0.04)	(0.11)
Number of females in farm HH								
0 to 14 years	-0.08	-0.06	0.03	-0.04	-0.04	-0.05	-0.02	-0.08
	(0.05)	(0.02)	(0.04)	(0.02)	(0.03)	(0.05)	(0.02)	(0.06)
15 to 19	0.13	-0.01	-0.05	0.01	-0.04	-0.06	-0.00	-0.02
	(0.06)	(0.02)	(0.04)	(0.02)	(0.02)	(0.05)	(0.02)	(0.05)
20 to 34	0.12	0.05	0.04	0.07	0.05	0.08	0.06	0.07
	(0.06)	(0.02)	(0.05)	(0.03)	(0.03)	(0.05)	(0.02)	(0.06)
35 to 49	0.23	0.12	0.22	0.16	0.13	0.15	0.16	0.14
	(0.08)	(0.03)	(0.06)	(0.03)	(0.04)	(0.06)	(0.03)	(0.09)
50 to 64	0.16	0.09	0.2	0.13	0.08	0.03	0.15	0.09
	(0.09)	(0.03)	(0.06)	(0.04)	(0.04)	(0.07)	(0.03)	(0.08)
65 and older	0.13	-0.00	0.10	0.08	-0.01	0.05	0.06	0.05
	(0.10)	(0.03)	(0.06)	(0.04)	(0.04)	(0.07)	(0.03)	(0.08)
Joint test of demographic variables								
All Groups	2.53	9.01	4.28	10.34	3.85	3.70	10.76	0.95
p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
Mean person-days of […]								
Hired Labor	10.61	16.82	28.26	11.06	25.07	7.42	16.95	33.96
Family Supplied	57.51	57.16	42.15	59.67	49.30	62.73	55.73	40.38
Observations	5557	25426	7206	19227	18962	5827	26724	5638
N. Households	687	2825	940	2218	2234	757	2966	729

Notes: Table reports estimates of labor demand regressions for stratified samples. All estimates of variance-covariances take into account clustering at the household level and allow arbitrary heteroskedasticity. Joint tests for the significant of demographic groups are F-statistics. All models control land ownership status and the size of land owned, whether land is irrigated and size of irrigated land, quintiles of farm and household (real) assets, age and education of the household head and spouse, month of interview indicators, farm household fixed effects and community-time fixed effects.

Appendix Table A
Labor Demand Regressions - First Stage Results
1, 2, and 3 Period Lagged Household Composition as IVs

	Dependent Variable											
	Number of males […]						Number of females […]					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Birth to 14 years	**15 to 19**	**20 to 34**	**35 to 49**	**50 to 64**	**65 and older**	**Birth to 14 years**	**15 to 19**	**20 to 34**	**35 to 49**	**50 to 64**	**65 and older**
Joint Test of all IVs												
F-statistic	75.63	56.21	49.85	57.98	52.09	28.98	61.37	53.04	53.92	54.26	41.69	26.19
p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Observations	26951	26951	26951	26951	26951	26951	26951	26951	26951	26951	26951	26951
N. Households	3861	3861	3861	3861	3861	3861	3861	3861	3861	3861	3861	3861

Notes: Table reports joint F tests of IVs from the 1st stage of labor demand regressions using 1, 2, and 3 period lagged household composition as instruments for the number of household members in the demographic group in each column. Along with locality-wave and household fixed effects, additional controls include land ownership status and the size of land owned, whether land is irrigated and size of irrigated land, quintiles of farm and household (real) assets, age and education of the household head and spouse, and the month of interview. All estimates of variance-covariances take into account clustering at the household level and allow arbitrary heteroskedasticity.