Constrained Occupational Choice

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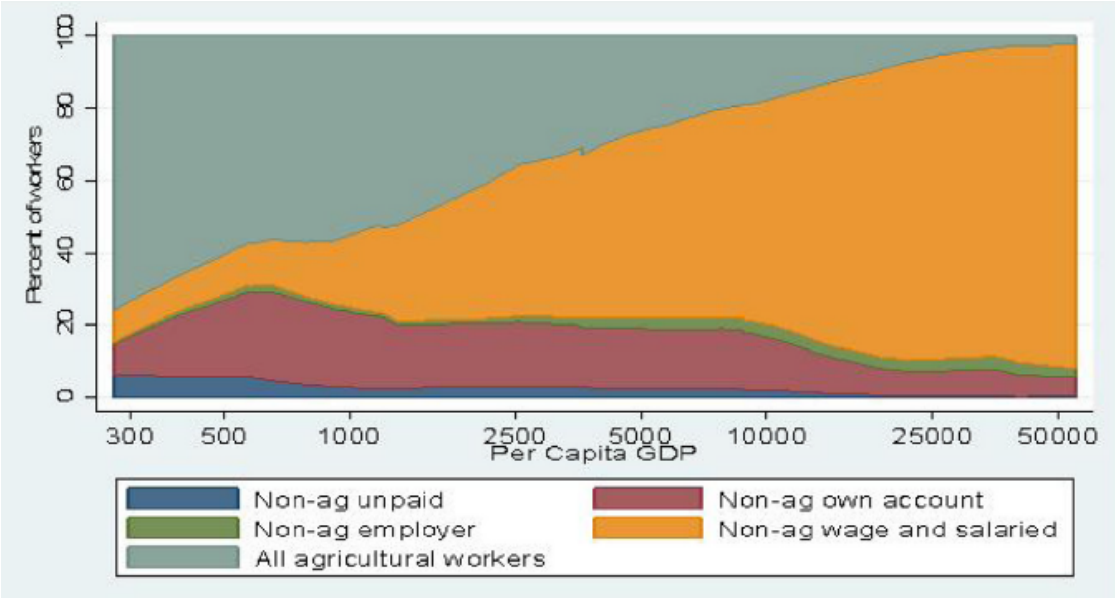
The issue

- Wage employment is rare developing countries
- Self-employment (within and outside of agriculture) makes up more than half of jobs in most countries.



Source: Gindling and Newhouse(2014)

Who gets the (rare) wage jobs?

By Choice or By Necessity?

Debate in the literature about why so many people are self employed:

- Self-employed would like wage jobs but cannot get them.
- Self-employment is a choice, some prefer it to wage employment.

Various authors (Perry et al., 2007; Margolis, 2014) have noted that both reasons can coexist.

To know who has a choice and who does not, one needs to understand who actually receives an offer of wage employment.

What does this paper do?

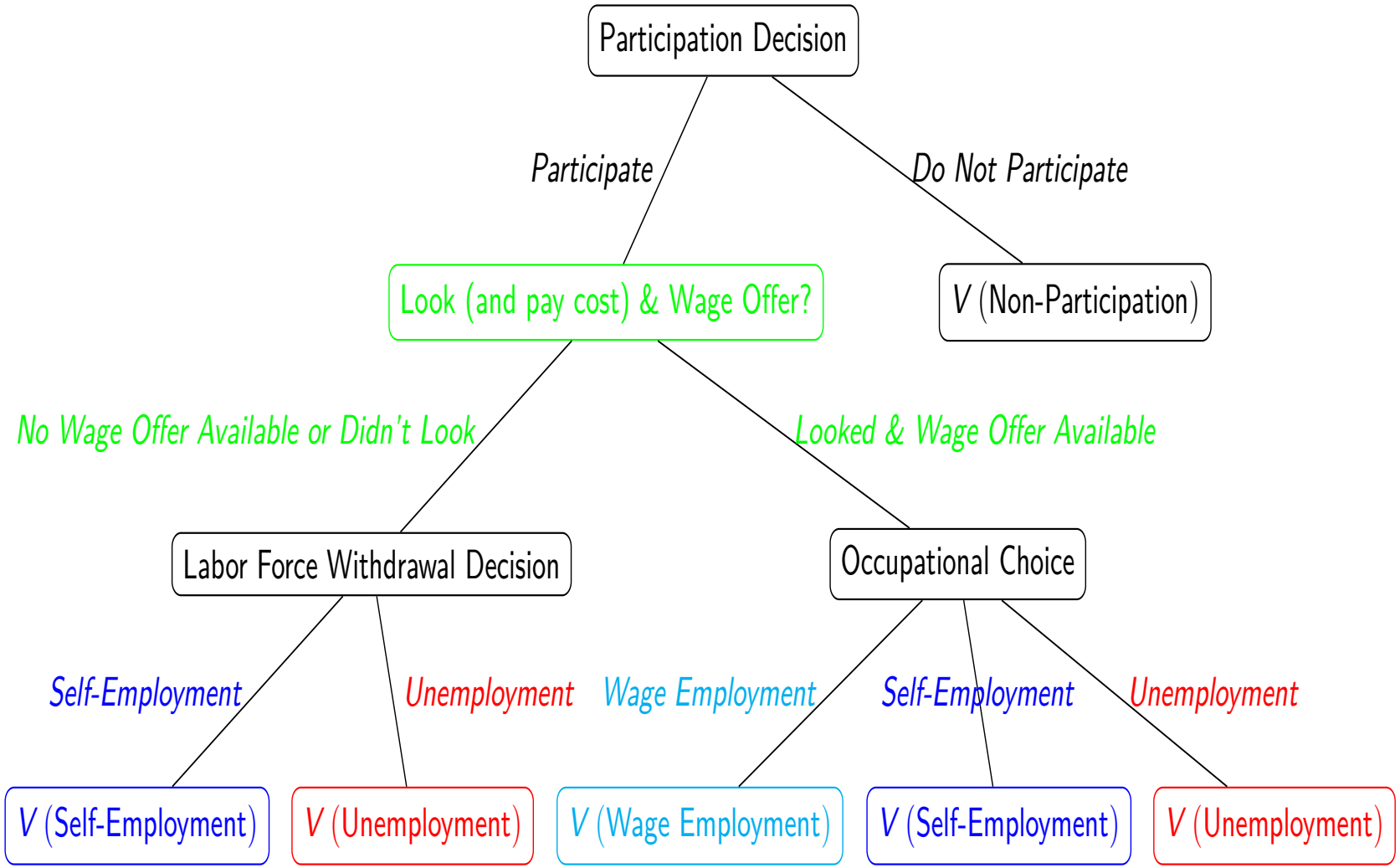
1. Present a structural model of constrained occupational choice.
2. Present the reduced form specification and how to recover the key component: the probability of receiving a wage job offer.
3. Estimate the model using data from Sierra Leone in 2016.

The objective: characterize the distribution of wage offers, to know how empirically relevant choice is, relative to necessity.

The Ebola epidemic in Sierra Leone provides an exogenous source of variation in factors that affect the returns to each alternative:

- Agricultural markets closed: affects returns to agricultural self-employment.
- Travel restrictions: increase the cost of traveling to wage jobs.
- Increased cost of inputs: reduces return to non-agricultural self-employment.

A structural model: Graphically



The structural model is based on the following value functions:

$$\begin{aligned} V_N &= \boldsymbol{x}_N \beta_N + \varepsilon_N \\ V_W &= \log(w) = \boldsymbol{x}_W \beta_W + \varepsilon_W - A \\ V_S &= \log(R) = \boldsymbol{x}_S \beta_S + \varepsilon_S - A \\ V_U &= V_N - A \end{aligned}$$

The decision at the occupational choice node maximizes its value:

$$V(\text{Occupation Choice}) = \max\{V_W, V_S, V_U\}$$

Similarly for the "Labor Force Withdrawal Decision" node:

$$V(\text{LF Withdrawal}) = \max\{V_S, V_U\}$$

Value of participation depends on the likelihood of getting an offer:

$$\begin{aligned} \mathbf{E}(\text{Part} \,|\varepsilon_N) \quad &= \mathbb{P}(\text{Offer} = 1)\, \mathbf{E}(V(\text{Occupation Choice} \,|\text{Offer} = 1)) \\ &+ \mathbb{P}(\text{Offer} = 0)\, \mathbf{E}(V(\text{LF Withdrawal} \,|\text{Offer} = 0)). \end{aligned}$$

Implications of the Structural Model

- Dichotomous choice for participation.
- Dichotomous (conditionally) random wage offers
- Dichotomous choice for labor force withdrawal
- Trichotomous choice for occupational choice
- Value of earnings in self-employment and wage employment, value of unemployment and non-participation when not working, are key determinants of decisions

What can we see?

- Non-participation
- Unemployment (no unemployment benefits in Sierra Leone)
- Wage employment and wage
- Self-employment and earnings

Building the reduced form: Basics

$$V_N = \boldsymbol{x}\beta_N + \varepsilon_N$$
$$V_W = \boldsymbol{x}\beta_W + \varepsilon_W - A$$
$$V_S = \boldsymbol{x}\beta_S + \varepsilon_S - A$$
$$V_U = V_N - A$$

$$\begin{aligned}
&\mathbf{E}\left(\text{Occupation Choice}\right) \\
&= \mathbb{P}\left(V_W > V_S, V_W > V_U\right)\mathbf{E}\left(V_W \,|V_W > V_S, V_W > V_U\right) \\
&\quad + \mathbb{P}\left(V_S \geq V_W, V_S > V_U\right)\mathbf{E}\left(V_S \,|V_S \geq V_W, V_S > V_U\right) \\
&\quad + \mathbb{P}\left(V_U \geq V_W, V_U \geq V_S\right)\mathbf{E}\left(V_U \,|V_U \geq V_W, V_U \geq V_S\right)
\end{aligned}$$

$$\begin{aligned}
&\mathbf{E}\left(\text{LF Withdrawal}\right) \\
&= \mathbb{P}\left(V_S > V_U\right)E\left(V_S \,|V_S > V_U\right) + \mathbb{P}\left(V_U \geq V_S\right)E\left(V_U \,|V_U \geq V_S\right)
\end{aligned}$$

$$\begin{aligned}
\mathbf{E}\left(\text{Participation}\right) &= \mathbb{P}\left(\text{Wage Offer}\right)E\left(\text{Occupation Choice}\,|\text{WO}\right) \\
&\quad + \left(1 - \mathbb{P}\left(\text{Wage Offer}\right)\right)E\left(\text{LF Withdrawal}\,|\text{No WO}\right)
\end{aligned}$$

Translating to observables

$$
\begin{aligned}
\mathbb{P}\left(\text{Part}\right) &= \mathbf{E}\left(\text{Part}\right) > V_N \\
\mathbb{P}\left(\text{Wage Employment}\right) &= \mathbb{P}\left(\mathbf{E}\left(\text{Part}\right) > V_N\right) \\
&\quad \left(\mathbb{P}\left(\text{WO}\,|\text{Part}\,\right)\mathbb{P}\left(V_W > V_S, V_W > V_U\,|WO\,\right)\right) \\
\mathbb{P}\left(\text{Self Employment}\right) &= \mathbb{P}\left(\mathbf{E}\left(\text{Part}\right) > V_N\right) \\
&\quad \left(\left[\mathbb{P}\left(\text{WO}\right)\mathbb{P}\left(V_S \geq V_W, V_S > V_U\,|\text{WO}\,\right)\right]\right. \\
&\quad \left.+\left[\left(1-\mathbb{P}\left(\text{Wage Offer}\right)\right)\mathbb{P}\left(V_S > V_U\,|\text{No WO}\,\right)\right]\right) \\
\mathbb{P}\left(\text{Unemployment}\right) &= \mathbb{P}\left(\mathbf{E}\left(\text{Part}\right) > V_N\right) \\
&\quad \left(\left[\mathbb{P}\left(\text{WO}\right)\mathbb{P}\left(V_U \geq V_W, V_U \geq V_S\,|\text{WO}\,\right)\right]\right. \\
&\quad \left.+\left[\left(1-\mathbb{P}\left(\text{WO}\right)\right)\mathbb{P}\left(V_U \geq V_S\,|\text{No WO}\,\right)\right]\right)
\end{aligned}
$$

Focusing on the wage equation, conditioning on $\boldsymbol{x}$

$$\mathbb{P}\left(\text{Wage Employment}\,|\boldsymbol{x}\right) = \mathbb{P}\left(\mathbf{E}\left(\text{Part}\right) > V_N\,|\boldsymbol{x}\right)$$
$$\left(\mathbb{P}\left(\text{WO}\,|\boldsymbol{x}, \text{Part}\right)\mathbb{P}\left(V_W > V_S, V_W > V_U\,|\boldsymbol{x}, WO\right)\right)$$

implies

$$\mathbb{P}\left(\text{WO}\,|\boldsymbol{x}, \text{Part}\right) =$$
$$\frac{\mathbb{P}\left(\text{Wage Employment}\right)}{\mathbb{P}\left(\mathbf{E}\left(\text{Part}\right) > V_N\,|\boldsymbol{x}\right)\mathbb{P}\left(V_W > V_S, V_W > V_U\,|\boldsymbol{x}, WO\right)}$$

So if we can get conditional estimates of the probability of wage employment, the probability of participation and the probability of choosing a wage job conditional on receiving a wage offer, we can derive the probability of getting a wage offer.

Identification of the structural model

Unfortunately, we cannot observe

$$\mathbb{P}\left(V_W > V_S, V_W > V_U \,|\boldsymbol{x}, WO\right)$$

since we cannot observe which individuals receive a wage offer.

Identifying assumption: conditional on observable characteristics $\boldsymbol{x}$, unobservable factors that influence the probability of receiving a job offer are uncorrelated with the difference in unobservables associated with wage employment, self-employment and unemployment (weaker than conditional independence).

This assumption allows us to write

$$\mathbb{P}\left(V_W > V_S, V_W > V_U \,|\boldsymbol{x}, WO\right) = \mathbb{P}\left(V_W > V_S, V_W > V_U \,|\boldsymbol{x}\right)$$

The right hand side is a simple multinomial model.

The pieces we need

We can write the reduced forms we need as

$$\mathbb{P}\left(\text{Wage Employment}\right) = f_W\left(X\right)$$
$$\mathbb{P}\left(\text{Participation}\right) = f_P\left(X\right)$$
$$\mathbb{P}\left(\text{Wage Chosen over Self-Employment \& Unemployment}\right) = f_{OC}\left(X\right)$$

The first two equations are dichotomous, the last is multinomial.

Three estimation approaches:

- Uncorrelated models
- Correlated models of only the probabilities needed
- Correlated models with the additional information on earnings in wage and self-employment

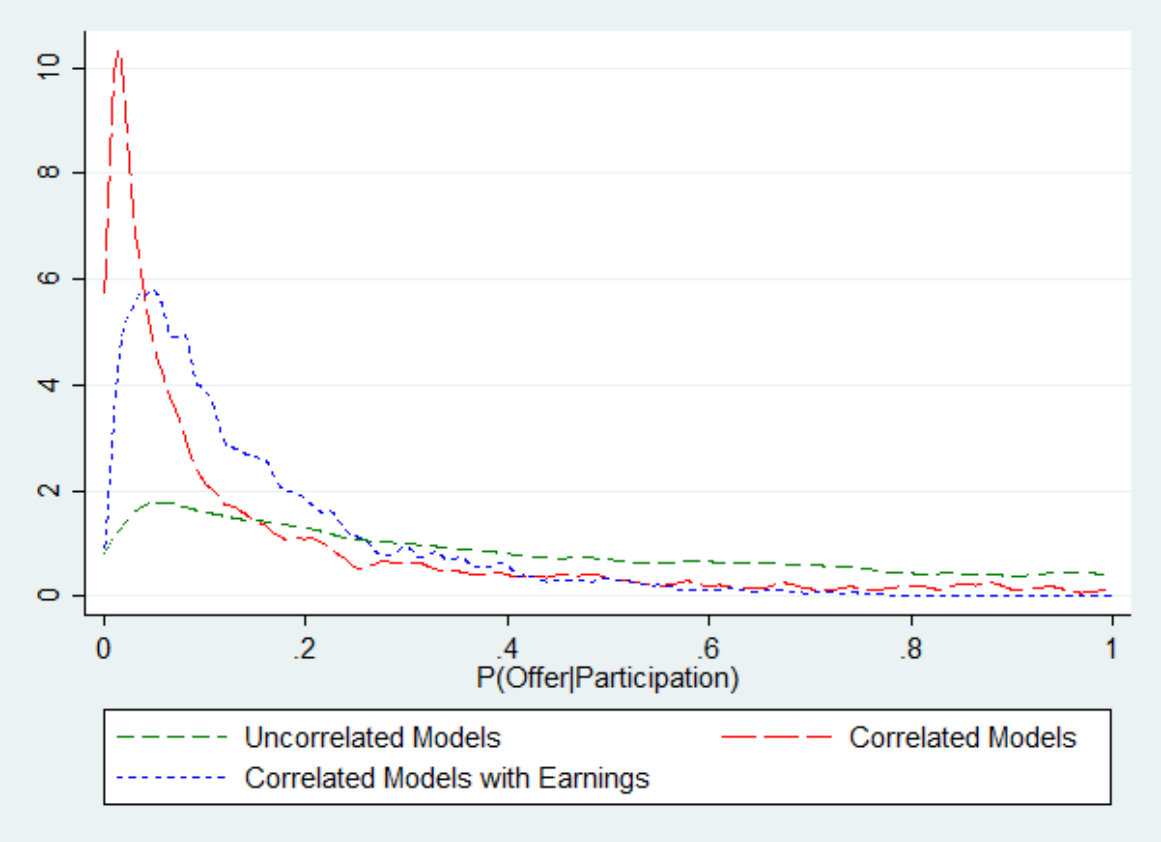
▸ Model Variables

The 2016 Sierra Leone Labor Force Survey

Follow up to 2014 SLLFS (downloadable from the World Bank).

- Nationally representative household survey with:
  - All the basic demographics, Labor Force status indicators, earnings of a standard LFS
  - Information on various measures of formality
    - Written contract
    - Pension/retirement fund deductions
    - Income tax deductions
    - Paid leave
    - Medical benefits
  - Household enterprise module
  - Agriculture module
  - New! Cognitive and non-cognitive skills module
  - New! Ebola module
- Available soon!

Offer Probabilities



The vast majority of the population has a very low probability of receiving a wage offer

Median Probability of Receiving a Wage Offer

	Uncorrelated Models	Correlated Models	Correlated Models with Earnings
Overall	0.384	0.075	0.107
Never Went to School	0.295	0.033	0.078
Incomplete Primary	0.285	0.032	0.060
Completed Primary	0.327	0.123	0.100
Completed Lower Secondary	0.430	0.240	0.195
Completed Upped Secondary	0.737	0.405	0.219
Tech Degrees and Certificates	1.000	0.857	0.382
Tertiary Degree	1.000	0.848	0.547
Cannot Read and Write	0.298	0.033	0.076
Can Read and Write	0.550	0.265	0.186

	Uncorrelated Models	Correlated Models	Correlated Models with Earnings
Women	0.270	0.047	0.106
Men	0.555	0.131	0.110
Urban Freetown	0.653	0.401	0.341
Other Urban	0.497	0.148	0.146
Rural	0.288	0.035	0.066
Adolescents (15-19)	0.178	0.107	0.109
Young Adults (20-24)	0.281	0.140	0.145
Early Adulthood (25-35)	0.438	0.086	0.116
Adulthood (36-64)	0.526	0.053	0.094

	Uncorrelated Models	Correlated Models	Correlated Models with Earnings
Lowest HH Income Decile	0.294	0.049	0.062
2	0.285	0.029	0.056
3	0.438	0.047	0.071
4	0.169	0.085	0.167
5	0.969	0.037	0.121
6	0.144	0.018	0.081
7	0.543	0.032	0.065
8	0.671	0.135	0.113
9	0.820	0.264	0.174
Highest HH Income Decile	0.724	0.308	0.225
No Effect of Ebola	0.461	0.124	0.161
Small Effect of Ebola	0.427	0.085	0.132
Medium Effect of Ebola	0.326	0.056	0.089
Large Effect of Ebola	0.359	0.065	0.091

Conclusions

Most of the self-employment seen in Sierra Leone is likely due to the absence of any wage offer (necessity instead of opportunity).

- Unobservable factors that are related to participation are related to factors that affect the value of wage and self-employment (difference between uncorrelated and correlated models).
  - When accounting for unobservables, we see that the median probability of receiving a wage job offer is only 0.075-0.107, and not 0.384.
- Skills matter a lot for receiving a wage offer.
  - Being able to read and write increases the chances of getting an offer between 2.4 and 8 times.
  - There is also a steep gradient with education.

- Demographics also matter
  - Women are less likely to get wage offers.
  - Wage offer probability follows an inverse U-shape, peaking among young adults (20-24)
- As rurality increases, the chances of getting a wage offer fall.
- Relatively little variation with household income, except at the top of the distribution (deciles 8-10).
- The scars of Ebola are still felt: those whose day-to-day lives were unaffected had a 77% to 91% higher chance of getting a wage offer 10 months after the last case was detected.

Overall, the factors that we expect might make a person less desirable, or be associated with a thinner labor market, reduce the chances of getting a wage offer.

Thank you for your attention

References

Margolis, David N, "By Choice and by Necessity: Entrepreneurship and Self-Employment in the Developing World," *The European Journal of Development Research*, September 2014, *26* (4), 419–436.

Perry, Guillermo, William Maloney, Omar Arias, Pablo Fajnzylber, Andrew Mason, and Jaime Saavedra-Chanduvi, *Informality: Exit and Exclusion*, Washington, DC: The World Bank, 2007.

Model Specification

Back to Reduced Form

- **Skill Variables**: Can Read and Write, Enrolled in School, Highest Degree Obtained
- **Base Demographic Variables**: District, Freetown/Other Urban/Rural, male, age, age^2, Disabled
- **Extra Demographic Variables**: Number of Household Members, Number of Children in Household, Number of Young Children (under 6), Marital Status, Land Size (Acres), Land Owner, Has Title to Land
- **Financial Variables**: Household Income Decile
- **Other Wage Equation Variables**: Formal Job, Sector, Travel Restrictions During Ebola
- **Other Non-Agricultural Self Employment Variables**: Quintile of Start-Up Capital, Location of Operation, Employs Outside Labor, Perceives Capital Constraints, Sector, Higher Input Costs During Ebola
- **Other Agricultural Self Employment Variables**: Employs Outside Labor, Perceives Capital Constraints, Uses Mechanical Equipment, Agricultural Markets Closed Ebola

Variables in Each Model

Back to Reduced Form

- **Occupation Choice Model**: Skill Variables, Base and Extra Demographic Variables, Financial Variables
- **Participation Equation**: Skill Variables, Base and Extra Demographic Variables, Financial Variables
- **Wage Equation**: Skill Variables, Base and Extra Demographic Variables, Financial Variables, Other Wage Equation Variables
- **Non-Agricultural Self-Employment Earnings Equation**: Skill Variables, Base Demographic Variables, Financial Variables, Predicted Other Non-Agricultural Self Employment Variables
- **Agricultural Self-Employment Earnings Equation**: Skill Variables, Base Demographic Variables, Financial Variables, Predicted Other Agricultural Self Employment Variables
- **Wage Employment Equation**: Skill Variables, Base and Extra Demographic Variables, Financial Variables, Predicted Wage Equation Variables,Predicted Other Non-Agricultural Self Employment Variables, Predicted Other Agricultural Self Employment Variables