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A DECOMPOSITION APPROACH TO ANALYZING RACIAL AND GENDER BIASES

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A DECOMPOSITION APPROACH TO ANALYZING RACIAL AND GENDER BIASES

The Farm Service Agency (FSA), an agency of the U.S. Department of Agriculture (USDA), provides direct and guaranteed loans as temporary sources of agricultural credit to farmers. The mission of the FSA is to fill the gaps in the commercial credit market where potentially creditworthy farmers are unable to obtain credit due to insufficient collateralization and credit history, among other reasons. The FSA's clients are usually either younger farmers with inadequate financial resources or established farmers whose businesses have been affected by significant economic downturns or disasters. Borrowers must provide proof of previous denials of loan requests by commercial lenders to be qualified for making FSA loan applications. As such, the FSA has been regarded as the farmers' "lender of last resort" (Chite 1997; Hanson, Delavan, and Power 1996).

However, the equitable implementation of FSA's loan programs has been challenged in the last decade. Racial and gender groups have made allegations of discriminatory practices in the administration of FSA loan programs. These allegations have resulted in a number of lawsuits. The most controversial racially-motivated lawsuit is the "Pigford versus Glickman" case formally filed in 1997. Starting as individual lawsuits filed by several African-American farmers, the cases were elevated to class action status. In the litigations, the African-American farmers' testimonies unveiled various forms of discriminatory lending practices: higher probability of denial of loan applications, longer processing times, understated projected crop yields, and eventual loan rejection. Furthermore, those fortunate enough to have loan applications approved complained about the significant disparity between the loan amount requested and

approved. This class action suit ended in an amicable settlement between the USDA and African-American farmers, whereby a five-year consent period was established so that the USDA could make remuneration payments to farmers who could successfully prove the validity of their discrimination complaints.

In terms of gender bias, the Love vs. Johanns case was filed against the USDA by several female farmers. An attempt to duplicate the class action status of the African-American farmers' lawsuit, however, was unsuccessful. The female farmers' lawsuits are instead currently under litigation individually in U.S. courts.

Previous research on the racial and gender discrimination issue did not produce convincing evidence of bias in loan approval decisions. These studies employed binomial logistic regression, Heckman selection or instrumental Probit regression techniques based on the probability of approval of a loan application. However, to date, research has not been conducted on possible discrimination with respect to the loan amount approved for nonwhite and female borrowers. This study utilizes FSA loan application data from 1999-2002 supplied by the Georgia FSA State Office and focuses on the observations of approved loan application to uncover whether there is convincing evidence of racial or gender discrimination against nonwhite or female borrowers regarding the determination of approved loan amounts.

FSA Lending Practice

As government credit programs, direct and guaranteed loan programs provided by the FSA are guided by the government's mission to assist underserved sectors of farming where producers have no access to credit through commercial banks. In general,

commercial lenders calculate for each borrower a credit score based on borrower performance measures to assess creditworthiness. This risk assessment practice has less significance for FSA's lending decisions.

Underserved Borrowers

Much of the FSA loan program funding is targeted to help underserved sectors of the farm economy. For instance, the FSA is required to set aside funds for use exclusively by socially disadvantaged applicants (SDA). SDA applicants are considered to include African Americans, American Indians, Women, Alaskan Natives, Asians, Hispanics, and Pacific Islanders (Ahrendsen et al. 2005). The FSA also serves established farm operators whose businesses have been affected by significant economic downturns or disasters. In addition, beginning farmers are most likely to be denied loans from commercial lenders since they have little experience, no credit history, and little equity. The Food, Agriculture, Conservation and Trade Act of 1990 expanded the scope of SDA lending to include both farm ownership and operating loan programs (Koenig and Dodson 1999). Some 70% of farm ownership and 35% of operating allocations are targeted to beginning farmers (Ahrendsen et al. 2005).

Credit Risk Assessment

FSA loans are different from government subsidy payments as FSA loans are implemented under guidelines requiring the assessment of credit risk or repayment potential of prospective program participants. The lending guidelines of FSA loan programs state that compliance is required regarding specific eligibility criteria. Even in the case of SDA farmer applicants, there is no guaranteed loan approval (USDA-FSA 2003). The Department of Agriculture Reorganization Act of 1994 repealed the statutory

provisions to define applicant "creditworthiness" as "(1) character, industry, and ability to carry out the proposed operation, and (2) honesty in endeavoring to carry out obligations associated with the loan" (USDA-FSA 1995, p.1; also in USDA-FSA, May 1997, September 1997).

FSA loan evaluation criteria are less stringent than those followed by commercial lenders. The following FSA lending guidelines provide for special considerations in defining "historical credit delinquency" or "unacceptable credit history" for borrowers who:

a) Have been unable to pay previous loans or have delinquent payments due to temporary circumstances such as job loss, loss of benefits or other income, and increased living expenses due to illness, injury, or death (USDA-FSA, 1995, May 1997, September 1997);
b) Have no previous credit history (USDA-FSA, 1995).

Notably, commercial lenders do not generally grant such special considerations. Imperfections in a borrower's credit track record significantly diminish chances of loan approval.

Borrower Discrimination Lawsuits

Over the years, the equitable implementation of the FSA's loan programs has been challenged. Racial and gender groups have made allegations of discriminatory practices in the administration of FSA loan programs. These allegations have resulted in a number of lawsuits. The complaints include: higher probability of denial of loan applications, longer processing times, understated projected crop yields, and significant disparity

between the requested and approved loan amount (Bennett 2001; Mittall and Powell 2000).

Racial Bias

The most noted racially-motivated lawsuit is the "Pigford versus Glickman" case, which originated from litigations against the USDA-FSA in August 1997 for two discrimination suits filed by African-American farmers (Vina and Cowan 2005; Bennett 2001; Mittall and Powell 2000). In October 1998, the United States District Court for the District of Columbia approved the African-American farmers' petition to elevate the individual lawsuits to class-action federal suit status (GAO 2006). A Civil Rights Action Team (CRAT), formed by the USDA, verified and found evidence of discrimination during the agency's operations from 1981 to 1996 and made 92 recommendations to avoid recurrence of such practices (Vina and Cowan 2005; Bennett 2001). This class action suit ended in an amicable settlement between the USDA and the African-American farmers, whereby a five-year consent period was established so that the USDA could make remuneration payments to farmers who could successfully prove the validity of discrimination complaints. During this five-year period, farmers' claims and allegations were reviewed by the USDA and remunerations were released to successful claimants. As of October 2007, the USDA had reviewed 22,642 cases, of which 15,229 were approved to receive a total of over $960 million in relief payments (Office of the Monitor 2007).

Further, other racial minority groups started the use of lawsuits such as Hispanic farmers in the Williams v. Glickman case in 1995 (Bennett 2001) and the Garcia v. Glickman case in 2000 (Dyckman 2002), and Native American farmers, who filed the

Keepseagle v. Glickman case in 1999 (GAO 2006). But none of these achieved the same success as the Pigford v. Glickman case.

Gender Bias

Originally, the Love vs. Johanns case was filed against the USDA by several female farmers in 2000. In January 2004, supported by 2,000 women farmers across the country, the plaintiffs filed a motion for class certification with the U.S. District Court for the District of Columbia for female applicants who were not provided loan applications or were denied an initial farm loan (Fox 2006; Dunne 2006). However, this attempt to duplicate the class action suit of the African-American farmers was unsuccessful. The motion was denied by the Court later that year and the higher court did not act favorably on the female farmers' motion and appeal. As a result of this decision, the female farmers' cases have been referred back to the District Court where they are currently under litigation.

FSA Borrower Data

The borrower data used in this study were obtained from the loan application database of the Georgia FSA State office for the period 1999-2002. The dataset consists of 367 loan applications filed with the agency from 1999 to 2002 and reflects a loan approval rate of 57.22% (210 out of 367 loan applications). Table 1 presents a summary of the approval and rejection rates of the entire sample and sub-groupings according to racial and gender classifications. In terms of racial classification, white farmers comprise the majority

(85.83%) of the study sample with 315 observations. The dominant gender class is the male borrower with 88.01% of the sample (323 observations).

Table 1. Loan Data Sampling and Approval Rates of Georgia FSA Loans, 1999-2002

Categories	Number of Borrowers		Approval Rate (Class Sample)	Percentage of Approval
	Approvals	Rejections	%	%
All Loans	210	157	57.22	100.00
White Borrowers	189	126	60.00	90.00
Nonwhite Borrowers	21	31	40.38	10.00
Male Borrowers	181	142	56.04	86.19
Female Borrowers	30	14	68.18	13.81

The dataset consists of a sampling of approved loan applications which were compiled using separate sampling techniques. The Georgia FSA State office supplied a subset of 210 approved loan observations compiled by the agency using simple random sampling procedures. Among all approved observations, again, white farmers are the majority (90%) of the approved loan applications with 189 observations, in terms of racial classification. The dominant gender class is the male borrower with 86.19% of all approved loan application (181 observations).

Information extracted from the loan portfolios include borrower declarations from income statements and balance sheets in addition to information regarding ethnic

background and gender of the primary borrowers. Portfolio data were verified by FSA loan officers through tax returns, lien searches, and credit checks.

Oaxaca-Blinder Decomposition

The Oaxaca-Blinder decomposition method is employed in this study to determine whether there exists a significant difference between the loan amount approved for white and nonwhite borrowers, as well as between the loan amount approved for male and female borrowers. The decomposition method has been employed using an array of standards of creditworthiness as determined by, among others, the applicant's character, financial characteristics, and repayment ability.

This decomposition method was originally developed by Oaxaca (1973) and Blinder (1973) and subsequently refined by Newmark (1988) and Oaxaca and Ransom (1994). The Oaxaca-Blinder decomposition explains the differential in the means of an outcome variable between two groups. The differential is decomposed into the estimated effects of differences in individual characteristics and the estimated effects of discrimination, respectively. This decomposition method has been widely used by labor economists to explain the gender wage gap in labor markets.

Two non-invariance problems of Oaxaca-Blinder decomposition have been addressed and modifications have been implemented and reported in the literature, e.g., Oaxaca and Ransom (1994), Reimers (1983), Cotton (1988), Neumark (1988), and Fortin (2006). The first non-invariance problem is that the proportion of the gender wage gap explained by the group difference between male and female is not invariant as to whether the male or female wage structure is chosen as the reference point (nondiscriminatory

structure). To alleviate this problem, the nondiscriminatory wage structure can be chosen to be the one under which the advantage of male is equal to the disadvantage of female. The second non-invariance problem occurs in the presence of categorical variables. The fraction of the gender wage gap attributable to gender differences in specific categorical variables is not invariant to the choice of the omitted category. This problem can be solved by imposing a zero-sum restriction on the estimated coefficients of each categorical variable and estimated via restricted least squares. The advantage of this modified decomposition is that it is fully compatible with the usual pooled regression that simply includes a dummy for the hypothesized disadvantaged group (Fortin 2006).

In this study, we extend the scope of the Oaxaca-Blinder decomposition method to analyze the approved loan amount differential between white and nonwhite borrowers and between male and female borrowers. The econometric design of Oaxaca-Blinder decomposition in terms of racial gap is developed below. The approved loan amount differential between male and female borrowers is analyzed by using the same approach, thus the theoretical framework is not presented.

The log approved loan amount equations estimated separately for white (*w*) and nonwhite (*nw*) borrowers are denoted as follows (Fortin 2006):

$$\ln LAM_{ir} = \beta_{0r} + X_{ir}\beta_r + \varepsilon_{ir}, \qquad r = w, nw, \tag{1}$$

where X_i is a 1 × k vector of explanatory variables and β is a k × 1 vector of coefficients.

Under the usual zero mean assumption ($E(\varepsilon_{iw}) = E(\varepsilon_{inw}) = 0$), the difference between the means of white and nonwhite log approved loan amount is (Fortin 2006)

$$\overline{\ln LAM_w} - \overline{\ln LAM_{nw}} = \overline{X}_w\hat{\beta}_w - \overline{X}_{nw}\hat{\beta}_{nw} + (\hat{\beta}_{0w} - \hat{\beta}_{0nw}). \tag{2}$$

Following Oaxaca-Blinder decomposition (Oaxaca 1973; Blinder 1973), letting $\Delta X = \overline{X_w} - \overline{X_{nw}}$ and $\Delta\beta = \overline{\beta_w} - \overline{\beta_{nw}}$, equation (2) can be rewritten as (Fortin, 2006):

$$\overline{\ln LAM_w} - \overline{\ln LAM_{nw}} = \Delta X\hat{\beta}_w - \overline{X}_{nw}\Delta\beta + (\hat{\beta}_{0w} - \hat{\beta}_{0nw}) = \Delta X\hat{\beta}_{nw} - \overline{X_w}\Delta\beta - (\hat{\beta}_{0w} - \hat{\beta}_{0nw}). \quad (3)$$

Depending on whether the white or nonwhite approved loan amount structure is chosen as the reference (nondiscriminatory) structure, $\Delta X\hat{\beta}_r$ explains the fraction of the racial loan amount gap due to group characteristic differences while $(\hat{\beta}_{0w} - \hat{\beta}_{0nw})$ captures the proportion of the gap due to the efficacy (market returns in the labor market case) of those characteristics.

As stated earlier, the first problem of the Oaxaca-Blinder decomposition is that the results will vary along with the choice of the nondiscriminatory loan amount structure, either white or nonwhite (Cotton 1988). Improved methods have been addressed in several studies such as those by Oaxaca and Ransom (1994), Neumark (1988), and Cotton (1998). As shown by Oaxaca and Ransom (1994), a further decomposition is given as:

$$\overline{\ln LAM_w} - \overline{\ln LAM_{nw}} = \overline{X}_w(\hat{\beta}_w - \beta^*) - \overline{X}_{nw}(\beta^* - \hat{\beta}_{nw}) + (\overline{X_w} - \overline{X_{nw}})\beta^*. \quad (4)$$

And the representation of the nondiscriminatory loan amount structure is given by

$$\beta^* = \Omega\hat{\beta}_w + (I - \Omega)\hat{\beta}_{nw}, \quad (5)$$

where Ω is a weighting matrix and I is an identity matrix, and any assumption about β^* can be seen as an assumption about Ω. The literature has proposed different weighting schemes regarding the index problem. Oaxaca (1973) proposes to use either $\Omega = I$ (advantaged group as reference structure) or $\Omega = 0$ (disadvantaged group as reference structure). Reimers (1983) used $\Omega = 0.5I$, which assign identical weights to

both advantaged and disadvantaged groups. Cotton (1988) argues that the nondiscriminatory structure should approach the structure that holds for the larger group and implemented such that $\Omega = I_w I$, where I_w is the fraction of the advantaged group in the sample (Paternostro and Sahn 1999).

A more generalized method is known as Neumark method. Neumark (1988) proposed to use the weighted average of both advantaged and disadvantaged group structure as the nondiscriminatory one. However, the shortcoming of the Neumark method is that the pooled coefficient captures part of the between group effects and overstates the effects of variables with larger racial differences (Fortin 2006). In addition, if the advantage of advantaged group and the disadvantage of disadvantaged group are not equal, the reference structure can hardly be called nondiscriminatory.

Following Fortin (2006), a better alternative is employed in this study by including racial intercept shifts in the regression of white and nonwhite pooled together, and imposing an identification restriction (Fortin 2006) :

$$\ln LAM_i = \gamma_0 + \gamma_{0w} * W_i + \gamma_{0nw} * NW_i + X_i\gamma + \nu_i, \quad (6)$$

subject to $\gamma_{0w} + \gamma_{0nw} = 0$.

In equation (6), W_i is the white dummy and $NW_i = 1 - W_i$ is the nonwhite dummy. Then according to Fortin (2006):,

$$\overline{\ln LAM_w} = \hat{\gamma}_0 + \hat{\gamma}_{0w} + \overline{X}_w\hat{\gamma} + E(\nu_i \mid NW_i = 0) \quad (7)$$

$$\overline{\ln LAM_{nw}} = \hat{\gamma}_0 + \hat{\gamma}_{0nw} + \overline{X}_{nw}\hat{\gamma} + E(\nu_i \mid NW_i = 1). \quad (8)$$

Again, under the zero mean assumption, the resulting decomposition is

$$\overline{\ln LAM_w} - \overline{\ln LAM_{nw}} = (\overline{X}_w - \overline{X}_{nw})\hat{\gamma} + (\hat{\gamma}_{0w} - \hat{\gamma}_{0nw}). \quad (9)$$

To the extent that $\hat{\gamma}_{0w}$ is positive and $\hat{\gamma}_{0uw}$ is negative, we can say that $\hat{\gamma}_{0w}$ represents the advantage of white and $\hat{\gamma}_{0uw}$ represents the disadvantage of nonwhite (Fortin 2006).

The decomposition (9) can be rewritten in terms of the Neumark-Cotton decomposition as (Fortin 2006):

$$\overline{\ln LAM}_w - \overline{\ln LAM}_{nw} = [\overline{X}_w(\hat{\beta}_w - \hat{\gamma}) + (\hat{\beta}_{0w} - \hat{\gamma}_0)] \\ [\overline{X}_{nw}(\hat{\gamma} - \hat{\beta}_{nw}) + (\hat{\gamma}_0 - \hat{\beta}_{0nw})] + (\overline{X}_w - \overline{X}_{uw})\hat{\gamma}. \quad (10)$$

The first term on the right-hand side is an estimate of the white advantage; the second term is an estimate of the nonwhite disadvantage; and the third term is an estimate of the difference resulting from the characteristics. If the coefficients $\hat{\gamma}$ and $\hat{\gamma}_0$ truly represent a nondiscriminatory loan amount structure, then the advantage of white will be equal to the disadvantage of nonwhite (Fortin 2006).

In the case of having categorical variables, the second problem of the Oaxaca-Blinder decomposition is that the assignment of the explained proportion of the racial loan amount gap to specific variables will vary along with the choice of the omitted category (Fortin 2006). Following Gardeazabal and Ugidos (2004), all categorical variables are included and a zero-sum restriction on the estimated coefficients of each categorical variable is imposed (Fortin 2006):

$$\gamma_{0w} + \gamma_{0nw} = 0 \quad \text{and} \quad \sum_{j=1}^{C_q} \gamma_{jq} = 0, \quad q \in C, \quad (11)$$

where C denotes the set of categorical variables and c_q is the number of categories for variable q. Equations (6), (7), and (8) are now estimated subject to the restrictions in (11).

Results

Tables 2 to 4 present the descriptive analysis results. Table 5 presents the Oaxaca-Blinder decomposition results of the approved loan amount differential between white and nonwhite borrowers. Table 6 contains the corresponding results of Oaxaca-Blinder decomposition regarding the approved loan amount differential between male and female borrowers.

Descriptive Analysis

Table 2 presents the mean values of selected financial performance variables for the entire dataset and for three categories of farmer applicants based on loan decision, racial groups, and gender groups. A significance test of the differences indicates that farmers with successful loan applications have better profitability, repayment, and liquidity conditions than those with rejected applications.

White farmers have significantly larger operations (in terms of assets and revenues) with more favorable profitability, financial efficiency, and liquidity positions than nonwhite farmer applicants. While male farmers in the sample have larger gross revenues, their female counterparts have significantly better financial efficiency, repayment, and leverage ratios. Moreover, larger loan amounts are associated with approved loan accounts as well as white and female applicants.

Tables 3 and 4 present the race and gender class analyses, respectively, by incorporating the loan approval decision classification.

As shown in table 3, the approved white and nonwhite applications expectedly have better financial conditions than respective rejected counterparts. Comparing inter-

race loan approval decision categories, rejected white farm operators have larger farm assets and gross revenues than the rejected nonwhite applicants.

Table 2. Means of Financial Performance Measures by Loan Decision, Racial and Gender classes

Financial Variables	All	Loan Decision		Race		Gender	
		Approved	Rejected	White	Nonwhite	Male	Female
Total Assets ($)	504,819	541,593	455,630	549,928[a]	231,560[a]	505,957	496,465
Total Net Worth ($)	165,461	191,125	131,132	181,485[a]	68,387[a]	159,318	210,554
Gross Farm Income ($)	272,649	295,331	242,311	295,087[a]	136,727[a]	287,058[a]	166,878[a]
Net Farm Income ($)	58,060	68,919[b]	43,535[b]	63,595[a]	24,528[a]	59,470	47,705
Return on Assets (%)	23.21	29.64[b]	14.61[b]	23.68	20.40	24.00	17.43
Net Profit Margin (%)	19.82	26.36[a]	11.06[a]	21.28[b]	10.97[b]	18.32[a]	30.82[a]
Repayment Margin Ratio	1.36	1.75[a]	0.84[a]	1.40	1.12	1.18[a]	2.67[a]
Current Ratio	2.97	4.78[b]	0.55[b]	3.39[b]	0.45[b]	1.87	11.05
Debt-Asset Ratio	0.90	0.76	1.08	0.91	0.81	0.93[c]	0.64[c]
Loan Amount	165,127	179,422[b]	146,007[b]	170,620[a]	131,853[a]	154,399[b]	243,882[b]
No. of Obs	367	210	157	315	52	323	44

[a, b, c] Denote significance of pair-wise comparison of mean at the 99%, 95%, and 90% confidence levels, respectively.

Table 3. Means of Financial Performance Measures of Approved and Rejected Loan Applications by Racial Class

Financial Variables	White Borrowers		Nonwhite Borrowers	
	Approved	Rejected	Approved	Rejected
Total Assets ($)	565,539	526,511	326,073	167,534
Total Net Worth ($)	202,036	150,659	92,924	51,766
Gross Farm Income ($)	310,550	271,894	158,361	122,072
Net Farm Income ($)	71,485	51,760	45,821	10,103
Return on Assets (%)	29.96	14.25	26.79	16.08
Net Profit Margin (%)	26.76	13.05	22.76	2.99
Repayment Margin Ratio	1.76	0.86	1.66	0.75
Current Ratio	5.22	0.64	0.90	0.15
Debt-Asset Ratio	0.76	1.14	0.73	0.86
Loan Amount	176,447	161,879	206,196	81,493
No. of Observations	189	126	21	31

Table 4 states that the approved male and female applications expectedly have superior financial conditions than respective rejected counterparts. Comparing inter-gender loan approval decision categories, rejected male farm operators have larger farm assets and gross revenues than the rejected female applicants. On the other hand, successful female applicants have significantly higher repayment, leverage, and financial efficiency ratios than male farm operators with approved loan applicants, although the

latter have larger gross revenues and better profitability (return on assets) than the successful female loan applicants in the study sample.

Table 4. Means of Financial Performance Measures of Approved and Rejected Loan Applications by Gender Class

Financial Variables	Male Borrowers		Female Borrowers	
	Approved	Rejected	Approved	Rejected
Total Assets ($)	529,089	476,471	619,632	258,341
Total Net Worth ($)	182,086	130,297	247,543	139,041
Gross Farm Income ($)	313,379	253,507	182,684	136,321
Net Farm Income ($)	70,212	45,777	60,845	22,302
Return on Assets (%)	32.12	13.65	14.19	23.71
Net Profit Margin (%)	24.41	10.56	38.57	15.83
Repayment Margin Ratio	1.45	0.83	3.58	0.91
Current Ratio	2.92	0.54	16.45	0.60
Debt-Asset Ratio	0.78	1.13	0.63	0.67
Loan Amount	160,228	146,969	299,221	136,893
No. of Observations	181	142	29	15

Econometric Analysis

Table 5 presents the results of Oaxaca-Blinder decomposition performed by estimating equations (6), (7), and (8) subject to restrictions (11), in terms of white and nonwhite borrowers. The raw racial log loan amount gap (0.2534) is presented in the first row. This gap resulted from both the explained part (due to differences in characteristics) and the

Table 5. Oaxaca-Blinder Decomposition of Racial Approved Loan Amount Gap

RAW ln(loanAmt) gap	0.2534
Advantage of white(γ_{0w})	0.1035
Disadvantage of nonwhite(γ_{0nw})	-0.1035
Discrimination(γ_{0w} - γ_{0nw})	0.2071
Discrimination as % of the raw gap	81.73%
Differences in characteristics	0.0463
Differences in characteristics as % of the raw gap	18.27%
Contribution of explanatory variables to difference in characteristics	0.0465
A. Credit scoring-related variables	0.0211
Return to assets	-0.0005
Asset turnover ratio	0.0180
Repayment margin ratio	-0.0011
Current ratio	-0.0073
Net farm income ratio	0.0080
Debt-asset ratio	0.0040
B. Demographic/structural and FSA regional indicator variables	0.0254
Direct loan	0.0748
Guaranteed loan	0.0748
Large farm	0.0613
Farm size	0.0613
Female	-0.0817
Male	-0.0817
East region	0.0032
South region	-0.0270
Central region	-0.0141
South-D6 region	-0.0455

unexplained part (usually attributed to discrimination). The differential of the log loan amount explained by the differences in characteristics is 0.0463, which only accounts for less than 20% of the total log loan amount gap. As expected, the magnitudes of the advantage of white and the disadvantage of nonwhite are equal (0.1035). The fraction of the log loan amount gap that cannot be explained by the differences in characteristics is deduced from the efficacy of differences in characteristics. As shown in the forth row, the differential of the log approved loan amount attributed to racial discrimination ($\gamma_{0w} - \gamma_{0nw}$) is 0.2071 which accounts for more than 80% of the total log loan amount gap.

The contributions of each explanatory variable to explain the log loan amount gap are listed in the latter portion of table 5. The explanatory variables are separated into two groups. Group A includes indicators of financial performance measures representing the recurring components of credit-scoring models. These variables are the following: return to assets, asset turnover ratio, repayment margin ratio, current ratio, net farm income ratio, and debt-asset ratio. Group B includes indicator variables capturing demographic and regional attributes of the farmers. These variables include loan type, farm size, gender, east, south, central, and south-d6. Both groups explain about 50% of the explained racial log loan amount gap with group A contributing 0.0211 while group B explaining 0.0254.

By implementing a binomial logistic framework based on the probability of a loan application's approval, Escalante et al. (2006) did not find convincing evidence of racial discrimination against nonwhite borrowers in loan approval decisions made by FSA lending officers in Georgia during the period 1999 to 2002. Using the same dataset, this study focused on the approved observations and analyzed the racial gap of the log loan amount between white and nonwhite borrowers. In terms of the approved loan amount,

the results suggest that a significant component of the log loan amount gap between white and nonwhite borrowers can be attributed to racial discrimination against nonwhite borrowers. While racial discrimination against nonwhite borrowers could not be established in the analysis of loan application approval decisions, the decomposition method used in this study indicates racial discrimination beyond the loan approval decision. Yet most all of the financials in table 3 strongly support higher loan amounts for white borrowers while the average loan amount for nonwhite borrowers is greater -- $206,196 for nonwhites versus $176,447 for whites. Table 3 speaks volumes against a discrimination claim. Moreover, it would be imprudent to give credence to any assertion based on 21 nonwhite observations, table 3.

In terms of gender bias, the same Oaxaca-Blinder decomposition procedure was performed by estimating equations (6), (7), and (8) subject to restrictions (11) with respect to male and female borrowers. The raw gender log loan amount gap is found to be -0.4431, table 6. No convincing evidence of gender discrimination against female borrowers was uncovered. In fact, the differential of the log approved loan amount which is -0.5065, accounting for more than 114% of the total log loan amount gap, signals reverse gender discrimination, table 6. The finding of no female borrower discrimination is consistent with the previous Georgia FSA lending study, but the finding of reverse discrimination is not. Though reverse discrimination is indicated by the decomposition method, most of the financials in table 4 strongly support higher loan amounts for female borrowers. However, nothing conclusive can be proffered based on 29 female observations, table 4.

Table 6. Oaxaca-Blinder Decomposition of Gender Approved Loan Amount Gap

RAW ln(loanAmt) gap	-0.4431
Advantage of male(γ_{0m})	-0.2533
Disadvantage of female(γ_{0f})	0.2533
Discrimination(γ_{0m} - γ_{0f})	-0.5065
Discrimination as % of the raw gap	-114.31%
Differences in characteristics	0.0634
Differences in characteristics as % of the raw gap	14.31%

Summary and Conclusions

This study provides a different perspective in revisiting the racial and gender discrimination issue. Known as Oaxaca-Blinder decomposition, this method has been widely used by labor economist to analyze the gender wage gap in labor markets. The gap is decomposed into the parts due to group differences in individual characteristics and group differences based on the efficacy (market returns in the labor market case) of those characteristics. This dataset of this study allows for the analysis of possible manifestations of racial or gender bias in approved loan amount determination. By substituting the approved loan amount gap in our case for the gender wage gap in labor market cases, this study is designed to uncover possible biases against minority or female borrowers in determining approved loan amounts.

While previous studies did not uncover convincing evidence of discrimination against nonwhite or female farmer applicants in loan approval decisions, this study, using Oaxaca-Blinder decomposition, found noticeable racial and gender approved loan amount

gaps. To be specific, the implications are discrimination against nonwhite FSA borrowers and reverse discrimination against male FSA borrowers. Yet the computed financials from the dataset, by a wide margin, do not support either suggestion. Most of the financials strongly support higher loan amounts for white borrowers while the average loan amount for nonwhite borrowers was greater. Most of the financials also strongly support higher loan amounts for female borrowers. Further, it would be extremely unwise to give plausibility to any assertion of discrimination based on 21 nonwhite and 29 female observations.

Overall, this study did not find clear and compelling evidence to support racial or gender discrimination with respect to approved loan amounts by FSA officers in Georgia for study period 1999 to 2002. The findings of this study fail to contradict those of previous studies regarding FSA loan activity in Georgia.

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