Minnesota beginning dairy farmers' financial performance and outlook

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INTRODUCTION

The U.S. per capita consumption of dairy products has increased from 539 pounds per capita in 1975 to 655 pounds per capita in 2020 (USDA-ERS, 2021). With increasing consumption of dairy products over the past 45 years, it is essential to ensure farmers are entering the industry to meet demand. Entering agriculture requires a large capital investment and it may be challenging for beginning farmers to source these funds to start their operations. Only 18.8% of all U.S principal operators are beginning farmers (USDA Census, 2017). U.S. principal operators have an average age of 58.6 years old, with 36% over the age of 65 and expected to retire in the near future (USDA Census, 2017). With increasing consumption and many farmers nearing retirement, it is essential to place an emphasis on beginning dairy farmers. This research aims to determine what factors impact a beginning farmer's profitability and efficiency and ensuring the viability of dairy farms moving forward, specifically analyzing dairy farms in Minnesota.

The United States Department of Agriculture (USDA) defines a beginning farmer as an individual or entity who has not operated a farm for more than 10 years (USDA-Farm Service Agency, 2022). Beginning farmers include both local foods producers and conventional commodity producers as well as first-generation and second-generation and beyond beginning farmers. Each of these types of beginning farmers have different starting points, management experience, and financial performance capabilities.

Farming is a capital-intensive industry and government programs are available to set farmers up for success while simultaneously encouraging entry into the dairy industry. Beginning farmers tend to be grouped together in terms of policy consideration regardless of what commodities they produce or generational status with programs available at the federal and state level. The USDA-FSA provides farm ownership loans, direct and guaranteed loan programs, and

operating loans for beginning farmers (USDA-FSA, 2022). These loan programs offer a lower interest rate to assist farmers that are just entering the profession. Additionally, the National Institute of Food and Agriculture provides grants via the Beginning Farmer and Rancher Development Program (BFRDP) providing education, mentoring, and technical assistance to beginning farmers (USDA-NIFA, 2022). The state of Minnesota offers the unique Minnesota State Farm Business Management (FBM) program in which eight colleges and universities offer one-on-one student-led programs to help farmers meet their business goals (AgCentric, 2022). This program offers a scholarship for beginning farmers with 25-50 percent of the tuition for the course covered and has helped beginning farmers become more efficient to enhance their financial viability. An additional benefit of this program is that the farmers participating contribute farm data to FINBIN (www.finbin.umn.edu), and the data is used to do economic research to enhance educational programming. Within this dataset, second-generation beginning farmers can be identified and compared with first-generation beginning farmers, as well as established farmers and farmers transitioning from beginning to experienced farmers based on the years of experience criteria.

Finding the next generation of dairy farmers is a priority to keep the dairy industry strong. In Minnesota, the number of licensed dairy farms has decreased from 4,567 in January 2010 to 2,171 in January 2022 (MDA, 2022). This research analyzes four groups of Minnesota dairy farmers' financial performance, including first-generation beginning, second-generation beginning, established, and transitioned to established farmers from 1996-2021 to determine effective strategies to enhance farmers' financial success. The research findings will be used to support the rebuilding of small-medium sized farms in terms of potential agricultural policy

advancement and knowledge for producers to utilize effective practices and characteristics which would directly impact their survival in the industry.

DATA DESCRIPTION

Data for this research was collected from FINBIN, which is the largest nationally representative farm financial data source housed by the Center for Farm Financial Management at the University of Minnesota (finbin.umn.edu). Rather than issuing surveys, the FINBIN dataset is constructed by farmers working with a Farm Business Management (FBM) instructor to accurately contribute detailed reports of farm information including farm-level financial information as well as farm and operator characteristics. Beginning in 2014, the dataset included an indicator for farms receiving a scholarship through the FBM Beginning Farmer Program which was used to indicate beginning farmers. Prior to 2014, the principal operator's years of experience is used to identify beginning farmers. In this research, FINBIN data used included the principal operator's years of experience, year the farm began operation, herd size, a dummy variable for the farm receiving a beginning farmer scholarship, current ratio, debt-to-asset ratio, and operating profit margin. The dataset includes a total of 3,165 unique farms with 15,074 observations of Minnesota dairy farms from 1996-2021.

FARM EXPERIENCE CLASSIFICATION

Principal operator and farm characteristic data from FINBIN were used to generate four exclusive groups of farmers including beginning, established, second-generation beginning, and transitioned to established farmers A beginning farmer (BF) is a farmer with 10 years of experience or less. Farmers with more than 10 years of experience are termed established farmers (EF). Due to the unique panel structure of this dataset, some farmers are in the dataset as

they make the transition from a beginning to an established farmer. Farmers that were only in the dataset as an established farmer are categorized as established. The farmers that were in the dataset as both a beginning and established farmer are termed beginning farmers prior to having 10 years of experience and after their 10^{th} year in the industry they are termed transitioned to established (TEF). Second-generation beginning farmers (SGBF) are beginning farmers that are transitioning into the principal operator role on an existing dairy farm. They may be a third or fourth generation farmer, but for the purpose of this research, this group has been termed a second-generation beginning farmer. The dataset contained 2,369 observations (16%) of beginning farmers, 10,755 observations (71%) of established farmers, 362 observations (2%) of second-generation beginning farmers, and 1,329 observations (9%) of transitioned to established farmers. The remaining 259 (2%) observations could not be allocated to a group due to missing information of the years the farm was in operation.

Table 1 presents the number of years of observations for each farmer group. There were 839 observations identified as beginning farmers with 1 year of data. There were 2 observations identified as second-generation beginning farmers when they were in their 26^{th} year in the dataset. This does not mean that the farm has 25 years of data as a second-generation farmer but merely that the farm was coded as a second-generation farmer in the 25^{th} year of data.

Table 1: Number of Observations by farmer group, 1996-2021

Years of Consecutive Data	Beginning Farmers (BF)	Established Farmers (EF)	Second-Generation Beginning Farmers (SGBF)	Transitioned to Established Farmers (TEF)	Missing
			Obs.		
1	839	2,159	14	0	153
2	538	1,580	29	65	47
3	348	1,248	33	102	25
4	245	1,019	28	117	14
5	158	843	21	131	6
6	95	691	25	131	5
7	70	566	22	120	3
8	46	491	21	109	2
9	25	407	23	106	2
10	5	329	13	93	1
11		269	16	75	1
12		208	16	59	
13		182	14	48	
14		156	14	40	
15		127	12	34	
16		109	7	25	
17		83	7	18	
18		65	5	15	
19		57	8	10	
20		46	9	8	
21		37	9	6	
22		29	6	5	
23		22	4	4	
24		17	2	3	
25		10	2	3	
26		5	2	2	
Total	2,369	10,755	362	1,329	259

Table 2 presents the number of years of data at a farm level rather than an observation level. There were 302 unique farms that were identified as beginning farmers with one year of data. In year 4, there are 87 unique farms that have 4 years of consecutive data as beginning farmers. Surprisingly, there are a large number of farms that only contribute data for one year, paying tuition and leaving after that initial year in the sample. This does not mean they left

farming, but rather they have discontinued participation in the FBM program. Multiple years of data are necessary to benchmark the financial performance of farms overtime and therefore, the farms with only one year of data are not considered in the analysis.

Table 2: Number of Farms by farmer group, 1996-2021

Years of Consecutive Data	BF	EF	SGBF	TEF
		Obs.		
1	302	581	22	47
2	190	331	26	43
3	103	227	15	31
4	87	180	9	29
5	63	152	*	27
6	25	126	6	21
7	24	75	*	15
8	22	84	*	10
9	19	80	*	8
10	*	60		*
11		58	*	7
12		26	*	*
13		25	*	*
14		29		*
15		20		*
16		25	*	
17		17	*	*
18		7	*	*
19		12		*
20		9		*
21		10		*
22		7		*
23		6		*
24		7		
25		*		
26		*		
Total**	840	2,162	96	264

*Five or less farms are in this category, and for confidentiality we cannot disclose the number.
**Total number of farms does not sum to 3,165 due to farms transitioning into different categories over the course of the study period.

SUMMARY STATISTICS

Summary statistics for each of the four groups are listed in Tables 3-6 for the operating profit margin (OPM), current ratio (CR), debt-to-asset ratio (DA), and net farm income (NFI).

Table 3: Average Operating Profit Margin (OPM) by farm experience group, 1996-2021

Farmer Type	**N**	**OPM (%)**	**Std. Dev.**
Beginning Farmer	2,314	-0.1	307.9
Established Farmer	10,305	12.8	144.3
Second Generation	359	10.1	27.1
Transitioned to Established	1,255	13.0	50.9
Missing	841		
Total	15,074		

The operating profit margin is a profitability ratio that measures the operating efficiency of the farm. In general, a strong operating profit margin is above 25% and a poor operating profit margin is below 15%. Despite each of the farmers falling into the poor profitability range, there was a large difference from beginning farmers compared to the remaining 3 groups. Beginning farmers performed the poorest on average, losing 0.1 cents per dollar of revenue generated on the farm. However, as these farmers gain experience overtime, they are able to generate a profit margin similar to the established farmers retaining nearly 13 cents of every $1 of revenue as profit.

Table 4: Average Current Ratio (CR) by farm experience group, 1996-2021

Farmer Type	**N**	**CR**	**Std. Dev.**
Beginning Farmer	2,222	4.22	39.84
Established Farmer	9,787	13.83	405.11
Second Generation	351	5.79	19.60
Transitioned to Established	1,206	11.73	153.90
Missing	1,508		
Total	15,074		

The current ratio is used as a measure of liquidity for the farm's ability to pay its debts as they come due. Lenders typically prefer current ratios above 2, and all farmers in this sample, regardless of their experience level, have strong current ratios. Beginning farmers have the lowest current ratio on average and the established farmers had the highest current ratio. The second-generation beginning farmers have an average of $5.79 of current assets for every dollar of current liabilities. Each of these groups on average is liquid, with established farmers being the most liquid.

Table 5: Average Debt-to-Asset Ratio (DA) by farm experience group, 1996-2021

Farmer Type	**N**	**DA (%)**	**Std. Dev.**
Beginning Farmer	2,313	70.48	89.45
Established Farmer	10,305	56.03	131.05
Second Generation	359	46.44	24.96
Transitioned to Established	1,255	56.03	53.61
Missing	842		
Total	15,074		

The debt-to-asset ratio measures the solvency of the farm. It is recommended that a farm's debt-to-asset ratio is less than 40%, which means 40% of the farm's assets are owned by creditors, with the remaining 60% owned by the farmer. While none of the groups achieved the recommended solvency rate, beginning farmers had the highest solvency measure of all groups at 70%. Second-generation farmers have the lowest debt-to-asset ratio at 46%. As the beginning farmers gain experience and enter into the transitioned to established farmer group, their financial position improves from 70% to 56% of their farm being owned by creditors.

Table 6: Average Net Farm Income (NFI) by farm experience group, 1996-2021

Farmer Type	N	NFI($)	Std. Dev.
Beginning Farmer	2,314	53,094	91,507
Established Farmer	10,305	82,765	191,930
Second Generation	359	102,148	197,162
Transitioned to Established	1,255	99,774	187,418
Missing	841		
Total	15,074		

Net farm income is the revenue generated by the farm less the expenses incurred on the farm. This is a nominal value that does not allow for comparison across farm sizes. A positive net farm income indicates the farm is generating a profit. Beginning farmers have the lowest net farm income which is likely linked to smaller farm sizes. However, the dispersion or standard deviation of their net farm income values is much smaller than the other 3 groups.

STOCHASTIC DOMINANCE

Stochastic dominance is used to analyze distributional differences of these groups. It allows for comparisons across groups of farmers to determine whether one group out-performs another group. More specifically, this method is used to determine whether one group of farmers dominates another group, meaning that at all levels of the financial variable in question, that farm out-performs the group it is being compared to. Generally, beginning farmers' financial performance is lower than those with more experience, and this can be tested with stochastic dominance.

With this method, the utility function is restricted to have positive marginal utility, that is the farmer would prefer a better financial position to a worse financial position. Cumulative distribution functions (CDFs) are defined for each of the four groups of farmers. Each financial ratio is analyzed separately to show if distributions are equal or different for the four groups of

farmers. Beginning farmers dominate second-generation beginning farmers if $F_{BF}(x) \leq F_{2nd}(x)$ for all x, with at least once strict inequality where x are the range of values of the dependent variable considered and F is the CDF. It is possible for neither to dominate if their CDF's cross, meaning their distributions do not differ. The stochastic dominance graphs for OPM, CR, DA, and NFI are shown below in Figures 1-4.

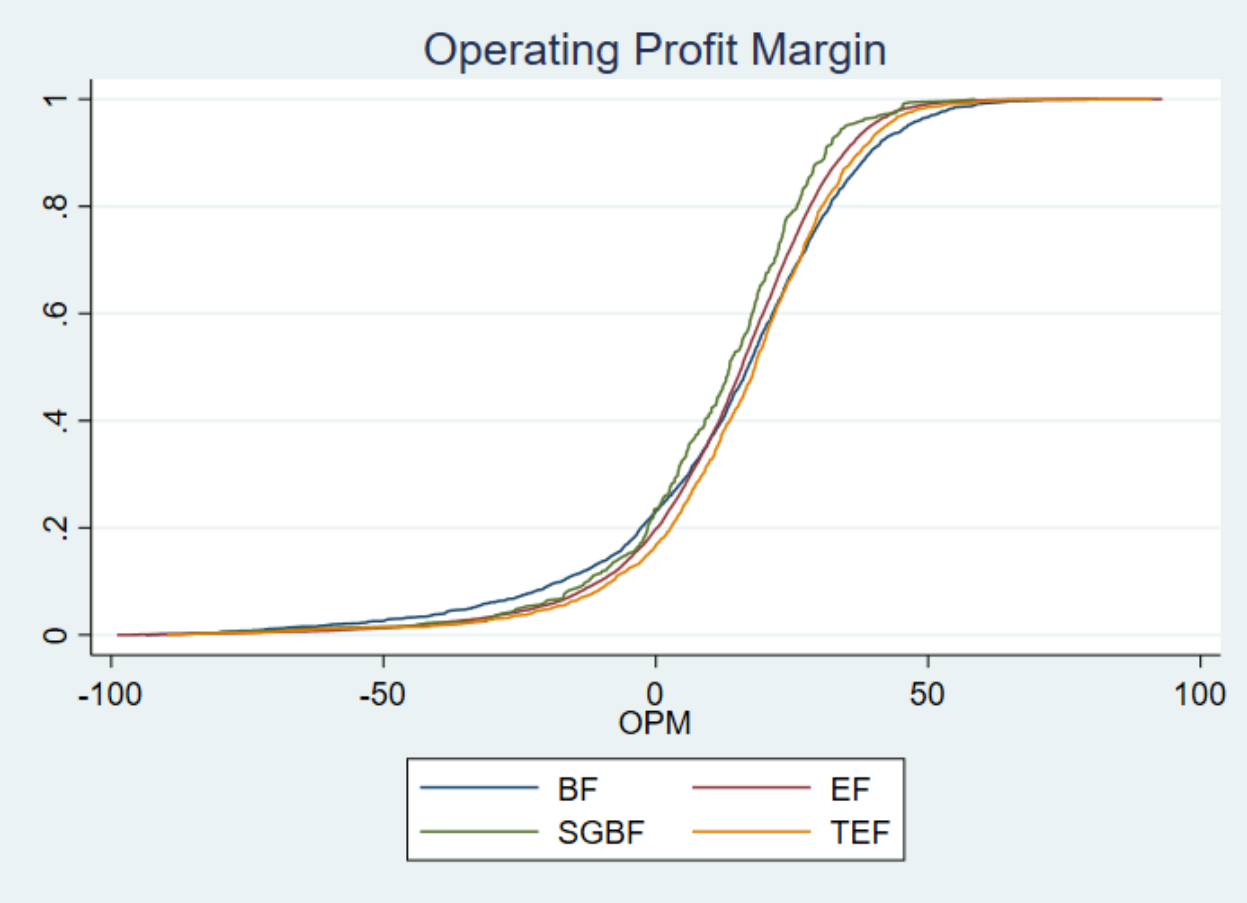

Figure 1: Operating Profit Margin Stochastic Dominance by farm experience group, 1996-2021

None of the farmer groups stochastically dominates another in a pairwise comparison. Each of the CDFs cross at some point along the distribution. But, when analyzing the positive portion of the distribution, second-generation beginning farmers are dominated by each of the other three groups from the 0-40% OPM range, meaning they have a lower expected value for

their operating profit margin than beginning, established, and transitioned to established farmers along this part of the distribution.

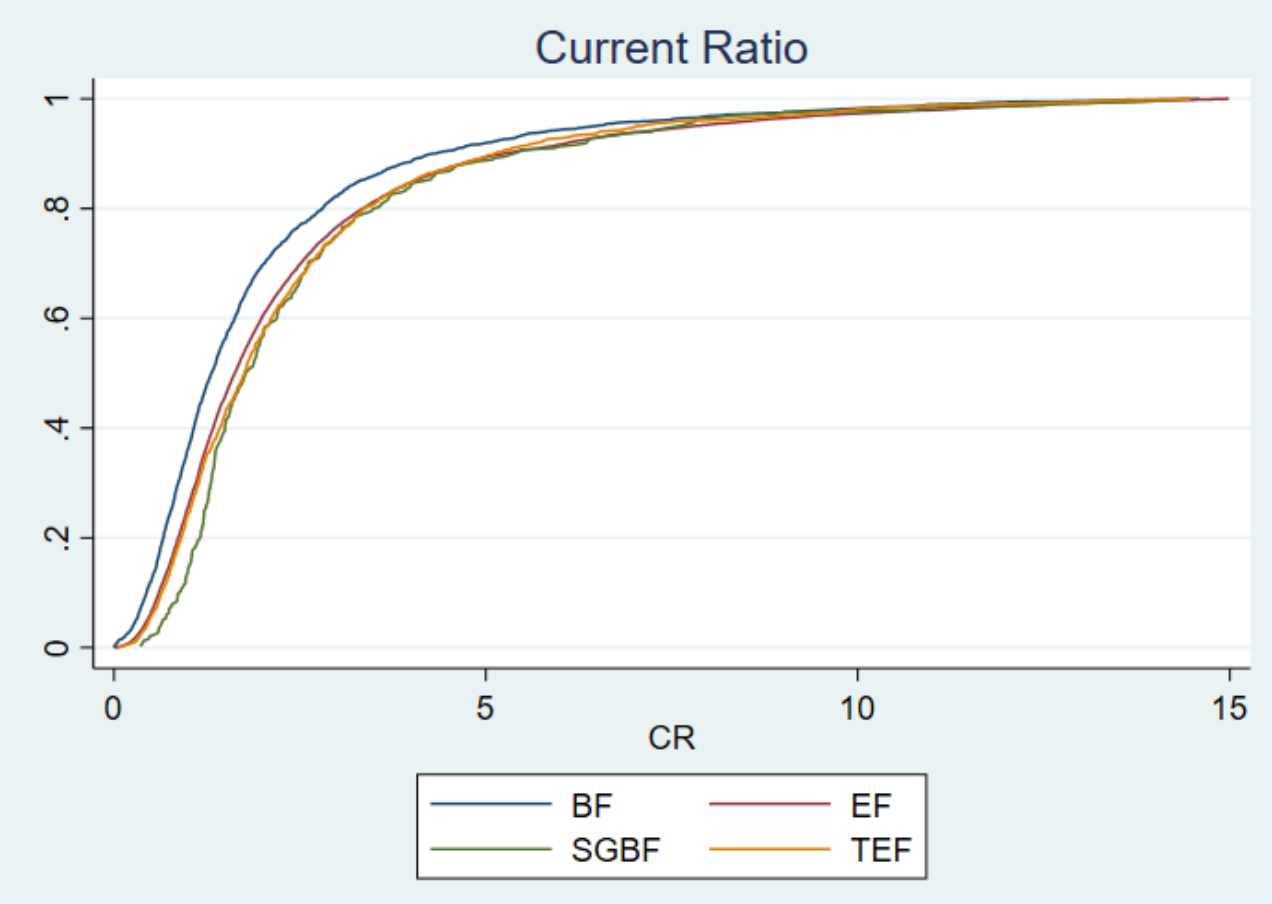

Figure 2: Current Ratio Stochastic Dominance by farm experience group, 1996-2021

There is no dominance or difference in distributions for established, second-generation beginning, and transitioned to established farmers due to their cumulative distribution functions crossing. However, for low values of the current ratio, beginning farmers are dominated by all groups. That is, established, second-generation beginning, and transitioned to established farmers all have higher expected values for their current ratio.

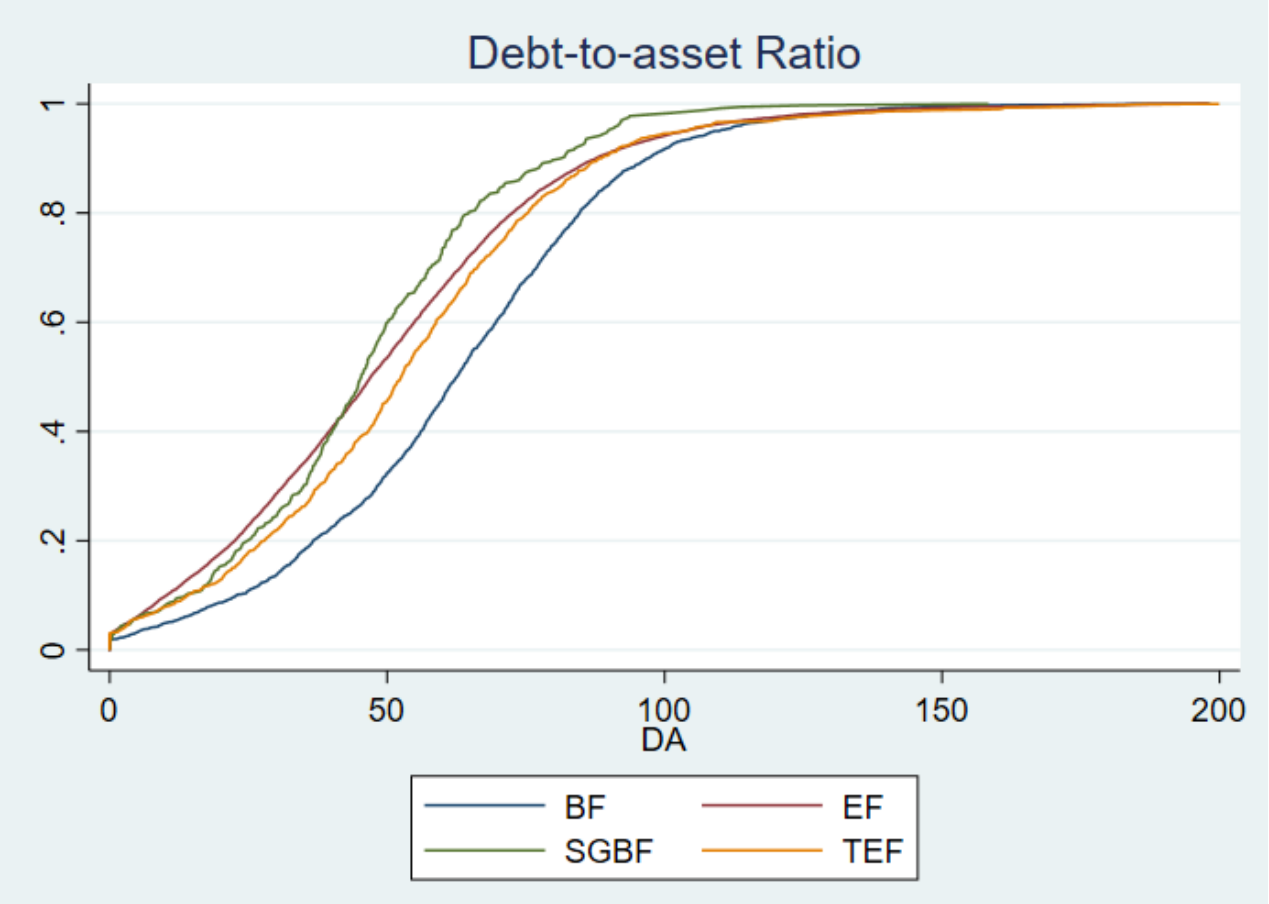

Figure 3: Debt-to-Asset Ratio Stochastic Dominance by farm experience group, 1996-2021

Again, there is no stochastic dominance for established, second-generation beginning, and transitioned to established farmers. Beginning farmers dominate the other groups initially, but when analyzing the full distribution, there is no difference in distributions and no group dominates another.

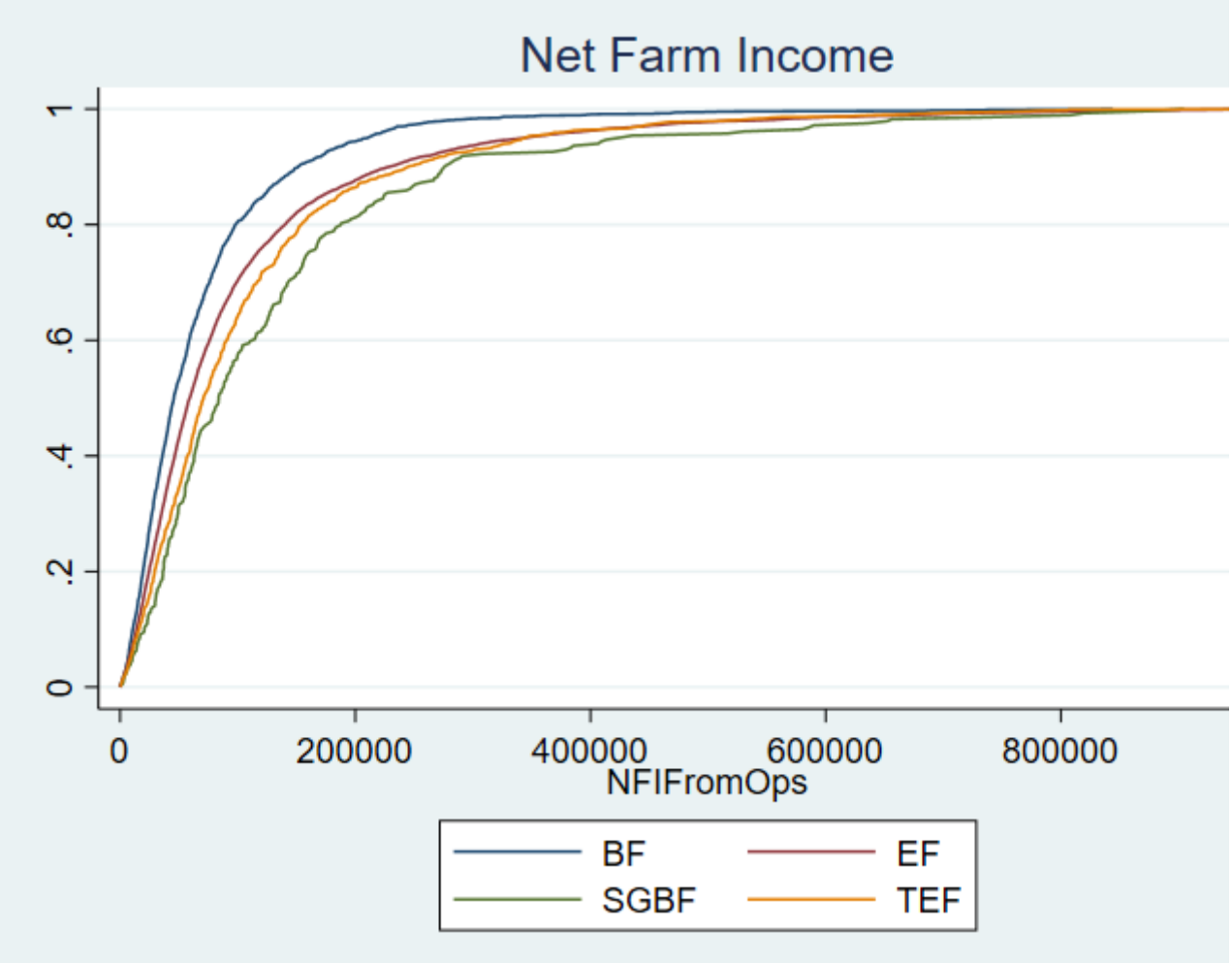

Figure 4: Net Farm Income Stochastic Dominance by farm experience group, 1996-2021

Comparison across net farm income is not a true representation because farm size and other factors are not controlled for; however, when analyzing these at a farm experience group level second-generation beginning farmers stochastically dominate beginning, established, and second-generation beginning farmers, meaning they have a higher expected value for their net farm income. Beginning farmers are dominated by all groups, having the lowest expected value. And, as these farmers gain experience, their net farm income is similar to that of established farmers as there is no dominance between established and transitioned to established farmers.

CONCLUSION

Many farmers are nearing retirement age and it is essential to locate the next generation of dairy farmers to keep the dairy industry strong with continued increases in consumption of dairy products. This research analyzed the operating profit margin, current ratio, debt-to-asset ratio, and net farm income of beginning, established, second-generation beginning, and transitioned to established farmers.

While beginning farmers performed the poorest in each of these financial considerations on average, as they gain experience and transition, their financial performance is similar or even better than that of established farmers. Therefore, while beginning farmers experience financial hardships early on, as they gain experience they are able to have more financial success.

Additionally, results show that there is no dominance with beginning farmer distributions for the operating profit margin, current ratio or debt-to-asset ratio, meaning there are no differences in the overall distributions for these financial variables, but as shown in Figures 1-3, at varying sections of the distribution, dominance exists. Second-generation farmers have a higher expected value of net farm income compared to all other groups, and beginning farmers have the lowest expected value of net farm income compared to all other groups, but this hinges on farm size and other uncontrolled factors.

As beginning farmers gain experience and enter the transitioned to established group, their financial performance improves. Beginning farmer programs assist farmers in the early stages of their career and as they gain experience, their financial performance increases and they are able to be financially successful. Current policy effectively aids beginning farmers to have similar financial performance as established, second-generation beginning, and transitioned to established farmers on average. However, results show some differences at the margins of the

distributions, in which a primary focus on policy for farmers in these parts of the distribution may be beneficial.

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