

Farming Exit Decision by Age Group: Analysis of Tobacco Buyout Impact in Kentucky

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This article analyzes factors that affected the decision to exit tobacco production in the wake of the tobacco buyout program using the data collected through a survey of Kentucky tobacco farmers. Using the Heuristic logistic regression model, we find that the decision to exit tobacco growing was affected by efficiency considerations, availability of off-farm employment, and exit barriers. Availability of off-farm employment had the strongest effect on farmers younger than 46, while the effect of variables measuring efficiency and exit barriers seemed to be more uniform across age groups. Based on the results we suggest several policy interventions.

Key Words: age group, industry exit, tobacco buyout, tobacco farming

JEL Classifications: C25, D21, E24, J00, J11, J24, J43, Q18, R23

The price support and quotas on tobacco production in the United States were introduced by the Agricultural Adjustment Act of 1933 and were in place for nearly seven decades until they were terminated by The Fair and Equitable Tobacco Reform Act of 2004. Removal of quotas and price support programs were expected to change the economic climate for tobacco farmers and force many tobacco growers—particularly smaller and less efficient ones—to reconsider their participation in the industry. Since tobacco production requires rather specialized machinery and equipment, many farmers did not have readily available alternatives to tobacco growing. The Tobacco Transition Payments Program, sponsored

entirely by the tobacco companies, was designed to provide compensation to current and recent quota holders and to tobacco growers. It was supposed to ease the transition from a regulated to a free tobacco market by compensating for the various divestment costs.

The present study uses farm and household-level data collected from Kentucky tobacco farmers in 2005–2006 to investigate what factors, beyond farm size and productivity, influenced the decision to exit tobacco farming during the first years of the post-buyout era. The data are used to estimate a model that combines elements of both entry-exit theories (Nargundkar, Karakaya, and Stahl, 1996; Tirole, 1988) and life-cycle models (Boehlje, 1992; Gale, 1994). In particular, the present study tests to see if the major determinants of the decision to exit tobacco farming vary across different age groups. The primary contribution of the paper is an empirical examination of producers' behavior following a change in government support policy.

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The rest of the paper is organized as follows. The next section provides a brief summary of changes in tobacco industry immediately preceding and following the bailout legislation, a review of literature on exit-entry decisions, and an overview of life-cycle models. This is followed by a section presenting the model, hypotheses, and data. The estimation results are presented and discussed next. The paper concludes with the discussion of farmers' behavior in the postbuyout tobacco market and the possible policy implications.

Tobacco Market and Determinants of Exit Decisions

Buyout and Tobacco Markets

The dynamics in the tobacco market changed considerably between 2000 and 2004 in anticipation of the tobacco buyout program implementation. Beach et al. (2006) identify tobacco exports/imports, reductions in domestic quotas, higher production costs, and the increasing popularity of contracting as the factors affecting tobacco farmers during this period. Foreman (2005, 2006) indicates that the residual returns from burley tobacco production steadily declined from the estimated \$427/ac in 2001 to –\$119/ac in 2004, primarily due to higher prices for energy, labor, and quota rental. The economic pressure on farm productivity created incentives for exiting tobacco production. However, many interested farmers waited for the implementation of the buyout program before they became qualified for tobacco transitional payments. Indeed, during the same period the total harvested tobacco acreage decreased by only 4% from 432,000 acres in 2001 to 408,000 acres in 2004 (ERS, 2007).

In the summer of 2005, qualified tobacco farmers began receiving the buyout checks and adjusting to new economic conditions, which, in particular, led to a massive exit from the tobacco market. The harvested area plummeted to 297,000 acres in 2005, albeit recovering in subsequent years to 339,000 acres in 2006 and 355,000 acres by 2007 (ERS, 2007). However, the question remains as to whether the more efficient farms were staying in the industry and

whether the tobacco buyout program was helpful in reducing the negative effect of exit barriers.

It is worth noting that the tobacco production industry has a rather unique demographic profile. The average age of the burley tobacco producers in Kentucky in 2002 was 54.8 years, with 18% of producers being older than 65. By comparison, in 2000 the average retirement age in the United States was between 62 and 63 years (U.S. Labor Force data). On the other hand, the high profitability of growing tobacco attracted a relatively large number of young farmers (Gale, Foreman, and Capehart, 2000). The 2002 U.S. Census of Agriculture reported that 23% of tobacco producers were 45 years of age or younger.

Determinants of the Exit Decision

While efficiency is considered a primary factor in determining a firm's success in the market, the literature on industry entry-exit suggests that other factors may also affect the decision to exit the market. For instance, firms with high sunk/divestment costs may remain operating at low profit or even at a loss (e.g., Rosenbaum and Lamort, 1992). In addition, a number of prior studies (e.g., Boehlje, 1992; Bragg and Dalton, 2004) found that where farmers are in their lifecycle contributes considerably to the heterogeneity in entry and exit decisions.

Efficiency Argument

The classical perfectly-competitive market model assumes that there are no barriers to exit and that all economic agents operate under full information. The theory implies that a producer bases the decision to exit the market on the comparison of the market price and the individual short-run average cost (e.g., Tirole, 1988). Gale, Foreman, and Capehart (2000) apply the efficiency argument to analyze the impact of the tobacco buyout program on tobacco farmers. They suggest that tobacco farmers have three alternative strategies to adjust to the new economic environment. First, farmers could stay in tobacco production, in which case they would have to expand operations, raise productivity, and bear increased risk. Second, farmers may identify and market

alternative crops or commodities or seek alternative off-farm employment. In this case, they would need to either obtain financing for new on-farm or off-farm activities or develop new skills to be competitive on the job market. Finally, farmers may choose to retire, in which case they would need to make sure that they have sufficient financial resources to support themselves and (potentially) their family members. Snell (2005) also uses the efficiency argument to suggest that larger-scale farmers who can benefit from the economy of scale are likely to stay in tobacco production after the liberalization of the market, while smaller-scale and older farmers are more likely to retire.

Exit Barrier Models

A number of studies reported the importance of actual and perceived barriers on the decision to exit the farming industry. Nargundkar, Karakaya, and Stahl (1996) provide a review of the relevant literature in which they identify the six most important exit barriers: cost of divestment, operating fit, marketing fit, forward vertical integration, backward vertical integration, and the length of a business unit's association with the firm.

Market barriers are commonly cited as the major factor that may cause an enterprise to keep operating at a low profit or even at a loss (Karakaya, 2000). Rosenbaum and Lamort (1992) demonstrate that exit rates are higher in markets without sunk costs and with relatively high rental-to-asset ratios. Foltz (2004) uses the real option approach of Dixit and Pindyck (1994) in modeling the decision of Connecticut farmers to exit the dairy market. He suggests that the decision to exit the market is based on the long-run profitability and has to take into account market price variability, capital costs, and the opportunity cost of labor used in other activities. Bragg and Dalton (2004) expand the Foltz (2004) methodology to incorporate the effect of demographic characteristics, such as age and education, on the farmers' decision to exit the dairy market in Maine. They find that older producers, higher off-farm income, lower returns over variable cost, and greater diversification of farm income are more likely

associated with a decision to exit the dairy market.

In application to tobacco growing, specialized equipment and skills associated with tobacco farming seem to represent the main barrier to exiting the industry. The tobacco buyout program payments are likely to compensate farmers for sunk cost associated with investments in specialized tobacco growing equipment. However, it is not clear if these payments can help reduce the transaction cost associated, for instance, with the necessity to obtain a new set of skills or to integrate vertically.

The Life-Cycle Model

Boehlje (1992) puts forth the conceptual framework for the relationship between the farmer's age and various farm-related decisions (e.g., resource allocation, spending, and exit). In particular, he identifies three stages of the farmer's lifecycle: entry/establishment, growth/survival, and divestment. He further suggests that farmers at different stages of the lifecycle make important economic decisions differently. During the initial (entry) stage, potential farm operators evaluate the expected return from a career in farming and compare it to other alternatives. During the second (growth and survival) stage, the operators expand the farm's resource base by acquiring additional land, machinery, livestock, and other inputs. Finally, during the third (divestment) stage, the operators gradually prepare to exit the market. At this stage, they may reduce the size of the farm to reduce work load, or perhaps they rent out/sell their equipment to younger, more productive farmers. They are also likely to transfer more managerial and operational responsibilities to other household members involved in farming.

Evidence of farmland contraction in older age cohorts and greater participation in dairy termination programs consistent with the life-cycle hypothesis were already identified in earlier studies by Ehrensaft et al. (1984) and Gale (1990). Gale (1994) evaluates how the timing of entry/exit and patterns of farm size growth change with farmer age and finds that

data are consistent with Boehlje's (1992) framework. For instance, younger farmers and new entrants have smaller farms, grow faster, and are less likely to own farmland than older farmers. On the other hand, older farmers tend to reduce the size of their farms as they age. Gale (1994, p. 114) also observes that "[in] switching from farm job to nonfarm job specific human capital investments are involved, and the time to retirement over which those investments can be recouped is shorter for older farmers." His observation implies that the sunk cost associated with the human capital investment increases with farmer tenure and is higher (lower) for older (younger) farmers.

In this article, we combine elements of all three approaches by modeling the exit decision as a function of farm efficiency, various sunk/divestments costs, availability of off-farm employment, and diversification of farm income. Furthermore, in accordance with the life-cycle model, we allow the effects of all these factors on exit decision to vary by age group.

Based on the prior literature, we expect the decision to exit tobacco farming to correlate negatively with farm efficiency and exit barriers (sunk/divestment costs) and positively with the availability of the off-farm employment and a lower dependence of the household on tobacco income. Because tobacco buyout payments would compensate farmers for financial sunk costs, the exit barriers are mostly associated with nonfinancial sunk/divestment costs (such as obtaining new skills and business contacts). In accordance with the life-cycle models, we expect these nonfinancial exit barriers to have a stronger effect on older farmers. On the other hand, the availability of off-farm income should strongly affect younger farmers.

Methodology and Data

Farm Exit Decision Model

The efficiency argument is typically modeled within the discounted utility theory (DUT) proposed by Samuelson (1937). In particular, the DUT suggests that a farmer chooses to remain in tobacco production at a given point of time if the expected utility of the present value

of profit stream from tobacco farming is greater than the expected utility of the present value of profit stream from other available production alternatives or retirement income.

The effect of exit barriers and life-cycle variables can be incorporated through the reduced-form model, which represents the expected utility of the net present value of profit stream associated with the activity $j = 1, \dots, J$ as:

$$(1) \quad U_{ji} = \beta_j X_i + e_{ji}$$

where U_{ji} is the utility farmer i gains from choice j , X_i is a vector of the farmer's personal, family, and business characteristics, β_j are effects of these characteristics on the expected utility, and e_{ji} is the error term. If a farmer i is observed making a choice j , then we assume that the utility of choice j is the highest among the J utilities of the available activity choices. Thus, the probability $\Pr(Y_i = j)$ that the choice j is made by the farmer i is equal to $\Pr(U_{ji} > U_{ki})$ for all $k \neq j$, where $Y = \{1, \dots, J\}$ is the observed choice variable (Greene, 2000). Therefore the parameters of the model in (1) can be determined by estimating the conventional logit model:

$$(2) \quad \Pr\{Y_i = j\} = \frac{\exp(\beta_j X_i)}{\sum_{j=1}^J \exp(\beta_j X_i)},$$

where β_j and X_i are defined above.

Data Description

The data were collected between June 2005 and August 2006, when Kentucky tobacco farmers were just beginning to adjust to the new economic environment. Five thousand randomly selected Kentucky rural residents received questionnaires that consisted of more than 60 questions designed to assess individuals' responses to the changing economic conditions. Approximately 200 randomly selected individuals among those who did not respond to the mailed survey received a follow-up phone call. Overall, 702 responses were collected, 303 of which were from farmers actively involved in tobacco growing during the last 3 years before

the implementation of the Tobacco Buyout Program (between 2002 and 2005).

The survey addressed a comprehensive set of issues related to tobacco production. In particular, the respondents were asked whether they intend to exit tobacco production as a result of quota elimination. The collected data also provided information on farmers' personal, family, business, and community characteristics.

Variables

The variables used in the analysis are summarized in Table 1. The dependent variable EXIT reflects the response to the question, "Are you planning to continue growing tobacco in the future?" The variable was coded "1" if the respondent answered "No" and "0" otherwise. The independent variables (regressors) include measures of production efficiency, availability of off-farm income alternatives, presence of exit barriers, and demographic characteristics, all of which are expected to affect exit decision.

The production efficiency is measured by the variables ACRES and YIELD. The variable ACRES reflects the total acres available on the farm, while the variable YIELD measures the farm's tobacco productivity (in 1,000 lb/ac). Both are expected to have a negative effect on the probability of exiting tobacco production.

Two variables—COLLEGE and UNEMPRATE—are used to represent the availability

of off-farm employment. The binary variable COLLEGE is equal to "1" if the farmer has at least some college classes completed and "0" otherwise. We hypothesize that farmers with some college education are, on the one hand, more competitive in the off-farm labor market and, on the other hand, are more likely to obtain a new set of skills required for alternative employment. The variable UNEMPRATE reflects the annual unemployment rate in the respondent's county in 2005 (BLS, 2008) and is expected to negatively correlate with the probability to exit tobacco farming, particularly for younger farmers.

Three variables are used to account for exit barriers and are expected to negatively correlate with the decision to exit tobacco farming, with the correlation manifested stronger for older farmers. The variables are TINCOME (percentage of income the household received from tobacco production in 2004), HHMEMB (number of the household members other than the respondent working on farm), and TENURE (years of tenure).

The variable AGE was not included directly in the model, rather it was used to code three binary variables reflecting age cohorts, namely YOUNG (younger than 46), MIDDLEAGE (46–64 years), and OLD (older than 64). For the purposes of estimation, the middle-aged cohort was used as a reference group, with YOUNG and OLD used as shifters.

Table 1. Description of Variables

Variable	Description and Units
EXIT	1 = plan to exit tobacco farming, 0 = otherwise
YIELD	Yield per acre, lb/acres
ACRES	Land own, acres
COLLEGE	1 = at least some college completed, 0 = otherwise
UNEMPRATE	Unemployment rate in the respondent's county in 2005, %
HHMEMB	Household members working on farm excluding respondent, count
TINCOME	Tobacco income as % of total household income, %
TENURE	Length of tenure, years
AGE ^a	Age, years
YOUNG	1 = younger than 46, 0 = otherwise
MIDDLEAGE	1 = age 46–64, 0 = otherwise
OLD	1 = older than 64, 0 = otherwise

^a The variable AGE was used to calculate the indicator variables YOUNG, MIDDLEAGE, and OLD, but was not included in the regression model.

Table 2. Descriptive Statistics by Age Groups (averages)

Variables	Young (Age < 46)	Middle (Age 46–64)	Old (Age > 64)	Pooled Sample	Kentucky Average
	N = 83 (27.39%)	N = 153 (50.50%)	N = 67 (22.11%)	N = 303	
EXIT	33.73 ^a	39.22	38.81	37.62	—
COLLEGE	69.88	66.01	53.73 ^b	64.36	45
YIELD (10,000 lb/acre)	0.22	0.21	0.21	0.2112	0.20
ACRES (1,000 acre)	0.43	0.64	0.46	0.5433	0.160
UNEMPRATE, %	6.46	6.52	6.27	6.45	6.5
TINCOME, %	35.0	36.0	30.0	35.0	N/A
HHMEMB (#)	0.31 ^a	0.38	0.25 ^a	0.33	N/A
TENURE (years)	12.04 ^a	26.52	41.30 ^a	25.91	N/A
AGE (years)	34.77	55.54	73.69	53.86	54.8

^{a,b} Significantly different from other groups according to Univariate Analysis of Variance (ANOVA) at 5% and 10% significance levels respectively.

The descriptive statistics for the regression variables are presented in Table 2. Since the effect of most factors on the exit decision is expected to be different for different age groups, Table 2 also presents descriptive statistics for the three age cohorts. The descriptive statistics by age group indicate that younger farmers on average operate the smallest farms, but are more productive than the other age groups. They also tend to have more members of the household involved in the production.

Sample Limitations

The relatively low response rate (14%) might be attributed to the following two factors. First, the survey was long (it contained approximately 60 questions about farm, household, and personal characteristics). Second, the target group was a rural Kentucky population (mostly farmers) who may be reluctant to participate in research studies.

Despite these limitations, though, average age, unemployment rate, and land productivity in our sample are similar to the Kentucky average (Table 2). However, our sample does include more educated and large-scale operators relative to the Kentucky average (United States Department of Agriculture Census of Agriculture, 2002). We hypothesize that more educated farmers would be more active participants in the scientific studies, whereas large-scale

operators would feel more involved in farming and thus consider their opinions more valuable.

Although our sample cannot be considered fully representative of the rural Kentucky population, we believe it is sufficiently large to investigate factors significantly affecting the decision to exit tobacco farming. In support of this claim, we later evaluate whether the apparent response biases are likely to affect our results.

Analysis and Results

The Heuristic logistic regression analysis¹ was used to investigate the effect of the three groups of explanatory variables—efficiency, availability of off-farm employment, and exit barriers—on the probability of exiting tobacco production and the interaction of these variables with age. First, the basic model was set up with the dependent variable EXIT and seven independent predictors (YIELD through TENURE in Table 1). Next, a series of Heuristic logistic regressions were estimated adding one of 14 possible interaction terms at a time (each independent predictor combined with YOUNG and OLD). If an interaction term of an independent variable with at least one age group dummy passed the log-likelihood ratio test ($\sigma < 0.1$), then both interaction terms were

¹ SPSS 15.0 for Windows software was used to run all logistical regressions reported in this paper.

included in the final model. In addition, the Heuristic logistic regressions were run by adding each group of variables—efficiency, availability of alternative employment, and exit barriers—separately. Table 3 reports the results of log-ratio tests and the estimated coefficients of the final Heuristic logistic model.

As expected, the efficiency variable (YIELD) has a negative effect on the probability of exit and is significant at 1%. Furthermore, there is no measurable difference in the effect of efficiency on the probability of exit across the age cohorts. The size of the farm as measured by ACRES does not significantly affect the decision to exit for young and middle-aged farmers. However, the interaction term between ACRES and OLD is negative and significant, suggesting that older farmers

operating larger farms are less likely to exit tobacco production. This result is consistent with the life-cycle model, which suggests that older farmers may reduce the farm size as they enter the divestment stage before retirement.

Education as measured by COLLEGE turned out to have a positive and significant effect on the probability of exit. This confirms our hypothesis that farmers with some college education may have easier access to off-farm employment, thus it might be easier for them to exit tobacco production. As in the case of YIELD, no significant interaction was found between COLLEGE and age cohort dummies suggesting that the observed effect does not vary across age groups. As expected, the unemployment rate negatively correlates with the probability of exiting tobacco production, with the

Table 3. Results of Heuristic Logistic Regressions (dependent variable EXIT)

Groups of Variables	Log-Likelihood Ratio Test	β	S.E.	Odds Ratio	χ^2	σ	Pseudo R^2
CONSTANT		2.073	1.113***				
Efficiency					10.267	0.036	0.060
YIELD	–	–7.175	2.884*	0.001			
ACRES	–	–0.18	0.294	0.836			
ACRES \times YOUNG	0.758	0.619	0.601	1.857			
ACRES \times OLD	0.005	–0.003	0.001**	0.997			
Availability of Off-Farm Employment					20.741	0.000	0.173
COLLEGE	–	0.901	0.356*	2.463			
UNEMPRATE	–	–0.211	0.117***	0.810			
UNEMPRATE \times YOUNG	0.068	–0.158	0.086***	0.854			
UNEMPRATE \times OLD	0.356	0.059	0.084	1.060			
Exit Barriers					10.355	0.016	0.225
TINCOME	–	–2.108	0.773*	0.122			
HHFARM	–	0.231	0.165	1.260			
TENURE	–	0.1661	0.146	1.180			
Nonsignificant Interaction Variables							
YIELD \times YOUNG	0.128	–	–	–			
YIELD \times OLD	0.397	–	–	–			
COLLEGE \times YOUNG	0.138	–	–	–			
COLLEGE \times OLD	0.723	–	–	–			
TINCOME \times YOUNG	0.203	–	–	–			
TINCOME \times OLD	0.629	–	–	–			
HHFARM \times YOUNG	0.705	–	–	–			
HHFARM \times OLD	0.170	–	–	–			
TENURE \times YOUNG	0.451	–	–	–			
TENURE \times OLD	0.199	–	–	–			

*, **, and *** denote statistical significance at 1%, 5%, and 10% levels, respectively.

effect more profound in younger farmers. In particular, a one percentage point increase in the unemployment rate decreases the probability of exiting tobacco farming for farmers younger than 46 by approximately 30%, compared with just 20% decrease for other age groups.

Among the variables measuring the presence of exit barriers, only TINCOME turned out to be significant and, as expected, negative. Contrary to our expectations, none of the interaction terms within this group were found to be significant either. Higher dependence of the household on tobacco income is likely to indicate a higher vertical integration of the farm in the tobacco industry and less diverse farming skills. Both factors are associated with the most significant nonfinancial divestment costs (Bragg and Dalton, 2004; Nargundkar, Karakaya, and Stahl, 1996). Thus our result suggests that tobacco buyout payments may have a limited capability to eliminate the negative effect of nonfinancial divestment costs.

Overall, the results indicate that the decision to exit tobacco farming across the surveyed sample of Kentucky farmers is affected to some extent by all three groups of factors identified in the literature: efficiency, availability of off-farm employment, and exit barriers. The effect of variables measuring efficiency and exit barriers seems to be more uniform, whereas the effect of off-farm employment availability seems to be stronger for the younger cohort. Interestingly, variables related to the availability of alternative employment accounted for about 11% of the total variance of the dependent variable, whereas efficiency variables explained only 6% and exit barriers variables explained just over 5% of the total variability. The implication of our finding is that operators with the highest opportunity cost rather than operators of the least productive farms were more likely to exit the tobacco industry during the first postbuyout years. This effect seems to be even stronger among younger (<46 years) farmers.

Finally, to evaluate the effect of response bias, we defined an additional variable, LARGE equal to 0 if ACRES < 0.16, and 1 otherwise. We then included interaction terms of this variable and the variable COLLEGE with all other variables included in the final

model. This allowed us to measure the effect (if any) that the higher proportion of more educated and large scale farmers in our sample would have on our results.

The "larger-scale" bias did not seem to interfere with our results. The negative effects of land productivity and farm size were significant ($p < 0.1$ and $p < 0.05$, respectively) only for farmers who completed at least some college. The education level did not interfere with the negative effect of the farm size on the probability of exiting tobacco farming for older farmers. Finally, the negative correlation between the probability to exit tobacco farming and the local unemployment rate and exit barrier variables were not affected by the education level. Therefore, we can conclude that the response bias in our sample would likely result in overestimating the negative effects of the efficiency variables on the probability of exiting tobacco farming in Kentucky during the postbuyout era. This finding only strengthens our conclusion that the operators with the highest opportunity cost rather than the operators of the least productive farms were more likely to exit the tobacco industry during the first postbuyout years.

From a policy standpoint, it seems that targeted subsidies directed to the creation of jobs, especially for younger farmers, and targeted programs that educate tobacco farmers about alternative on-farm activities would facilitate the transition from tobacco growing to alternative employment. In addition, policy-makers might consider developing programs that help farmers to integrate more quickly into the new markets. For instance, extension agents may organize meetings where tobacco farmers will have a chance to meet potential long-term partners for a new production activity. Furthermore, policy-makers might consider employing these programs in regions with relatively low land productivity (e.g., Eastern Kentucky) to incite industry exit and increase the overall efficiency of the remaining tobacco industry.

Finally, in the economic environment characterized by heavy job losses and high unemployment rates, younger farmers, who are more sensitive to the availability of the off-farm employment, might reconsider exiting tobacco farming, which would consequently create a

heavier competition for older farmers who do not have good alternatives to tobacco growing. Consequently, policy-makers might consider developing programs targeting different age groups that educate farmers about the ongoing economic conditions in the United States and available coping strategies.

Conclusion

First years of the post Tobacco Buyout Era have been characterized by a massive exit from the tobacco market. However, results of the present article suggest that the more efficient farms were not always staying in the industry. Although efficiency considerations do play a role, the present article suggests that other factors, such as the availability of alternative employment and sunk/divestment costs, significantly affect farmers' decisions of whether to stay in or exit tobacco production. Moreover, in the sample analyzed, the variables that reflect the availability of alternative employment have higher explanatory power than farm productivity or sunk/divestment cost variables.

The particular focus of the present article is on how the effects of various factors vary by age groups. We found that consistent with the life-cycle hypothesis, younger (<46 years) producers seem to be particularly sensitive to the availability of alternative employment opportunities. This last finding has an interesting implication for the future of the tobacco industry. In the regions with a high unemployment rate, more young farmers, both more and less efficient, are likely to continue tobacco farming. On the other hand, in the regions with low unemployment rate, more farmers, both efficient and inefficient, are likely to leave tobacco farming. Therefore, there might be a tendency for spatial restructuring of the tobacco farming, not according to land productivity, but according to external economic conditions. In addition, our results suggest that during the ongoing economic recession, more young farmers might choose to stay in the tobacco farming. A follow-up study is needed to investigate how new external economic shocks affect the dynamics of tobacco farming.

An implication of the analysis is that a policy designed to help tobacco producers to

adapt to a changing marketing environment may need to educate farmers about available employment alternatives, facilitate vertical integration in the alternative production markets, and be differentially tailored to different age cohorts to achieve the maximum desired effect. In addition, more intensive policy interventions in the regions with lower productivity may be necessary to increase overall efficiency of tobacco farming.

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