Part-time farming and farm resilience: Evidence from Australia

(Nebenerwerbslandwirtschaft und Resilienz: Evidenz aus Australien)

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2016

Paper prepared for presentation at the 56th annual conference of the GEWISOLA (German Association of Agricultural Economists) „Agricultural and Food Economy: Regionally Connected and Globally Successful“ Bonn, Germany, September 28 – 30, 2016

PART-TIME FARMING AND FARM RESILIENCE: EVIDENCE FROM AUSTRALIA

The literature on part-time farming suggests that off-farm income reduces risk and improves resilience. Our paper challenges this popular view. Our hypothesis is that the pursuit of off-farm activities may have negative effects on farm productivity by reducing scale and dissipating the gains from labour specialization. These productivity losses may more than offset the benefits derived from risk diversification. If this hypothesis is correct, we should observe that farmers who rely more intensely on off-farm income are also the ones least likely to adopt scale-expanding production strategies when faced with unexpected challenges. Using recent survey data from Australia, we examine the strategic reaction of farmers affected by major challenges such as drought and price volatility, distinguishing between adoption of defensive and offensive adjustment strategies. We find that off-farm income significantly reduces the likelihood of adopting offensive adaptation strategies, which supports our working hypothesis.

1. Introduction

Agricultural economists and rural sociologists have long explored the structural impacts of part-time farming (as most economists call it) or pluri-activity in agriculture (as most sociologists prefer to name it). Research attention was particularly devoted to the connection between risk and off-farm employment. Although empirical evidence is scarce, both farmers (Zurek, 1986; Barlett, 1991) and social scientists (Eder, 1993; Kinsella et al., 2000; Andersson et al., 2003) promote the perception that the pursuit of off-farm income is a risk mitigating strategy.

This paper challenges this principle. One consideration that remains little appreciated in this analysis is the side effect of off-farm activity on farm productivity. To the extent that farm productivity is sufficiently affected by diversification of farm' labour resources into off-farm activities, it is quite possible that the overall farm vulnerability to shocks is increased rather than mitigated by off-farm strategies. We examine this question by looking at a group of agricultural socio-economic agents most exposed to market and environmental risk: Australian farmers. With low- to nil levels of tariff protection and subsidy support, Australian farmers have long endured the high price volatility of world markets in primary products (Kingwell and Pannell, 2005; Williams, 2009). They have also experienced repeated and devastating periods of drought, most prominently in the years between 1995 and 2012 with a peak in 2006-7 (Botterill, 2003; van Dijk et al., 2013).

This high-risk environment presents a very suitable context to attempt determining whether off-farm income help farmers choose more active and expansive adjustment strategies in such

situations and therefore whether off-farm income significantly help farming communities achieve a high degree of resilience. We first present our hypothesis through a brief, conceptual specification of farmers' adjustment to risk (price, droughts etc.): the framework involves diversifying into off-farm jobs as ex-ante strategy, and adopting production strategies as ex-post control variables. We use the model to make predictions about farmers' degree of off-farm diversification and the probability of adopting specific adjustment strategies ex-post (once demand- or supply-side shocks have materialised). We then test these predictions empirically using data from the 2013 Regional Wellbeing Survey in Australia.

Section 2 summarizes the relevant body of academic literature about roles and perceptions of off-farm activities and the different impacts of part-time farming, particularly with regard to risk mitigation and farm resilience. Section 2 also briefly reviews existing knowledge about how firms respond to risk and contingencies through the adoption of adjustment strategies. The section discusses the type of strategies available to organisations in general and how these strategies can be interpreted in the farming context. Section 3 presents the data and our methodology, and section 4 presents the results of our logit regressions. Section 5 concludes the paper.

2. Background literature

2.1 The pros and cons of part-time farming

Kimhi (2000) was probably the first scholar to point to a socioeconomic particularity of the farming sector: while occupational specialization (the division of labour) is highly regarded among economists as a driving force for productivity gains and economic progress (and therefore an efficient farming strategy, e.g. Weiss, 1971) most farming units steadily contradict this proposition by assigning one or more members of the farming household to remunerated non-farm activities. Thus, part-time farming has emerged as a stable and mainstream model for food production. Yet, this model contrasts with labour allocation patterns in almost all other sectors of the economy, where part-time work is usually considered less attractive than (or at the very least as a pathway to) full-time employment (Natti, 1995). Part-time work is less remunerating than full-time work (Maher, 2008) and has potentially precarious effects on individual or household wellbeing (Husbands, 1998).

The farming particularity is of interest to researchers because the benefits of specialization and full time work in the farming context have been confirmed by a number of empirical studies, which also demonstrated the financial disadvantages of part-time farming. For instance, for the U.S. State of Utah, Kumbakhar et al. (1989) analyse farm performance and isolate the productivity losses of farming part-time relative to farming full-time. In Switzerland, Mann (2007) empirically shows that part-time farms are less profitable due to basic scale factors: they are generally smaller than full-time farms in a sector of activity characterised by large economies of scale (Mann, 2007). Darnhofer (2010) reports the time constraints faced by part-time farmers, which represent an obstacle for the appropriate care of farm animals. Finally, in a survey of Norwegian farm- and non-farm households, Mann and Mittenzwei (2016) show the presence of a U-shaped income distribution among Norwegians with respect to their income share from agriculture. In other words, farming households deriving half of their income from farming and the other half from other (non-farming) sources fared worst.

These results do, of course, come against the conventional wisdom that taking up an off-farm occupation is a rational strategy to secure the economic existence of the farm against contingencies and maximize farmer income subject to the restrictions set by these contingencies (Schmitt, 1989; Evans and Ilbery, 1993). In addition, farms too often face growth constraints due to a lack of land or lack of access to credit, and off-farm income can provide an important source of complementary resources to finance expansion activities.

Yet, the proposition that farmers' off-farm activities constitute an effective risk mitigation strategy contributing to farm resilience rests essentially on two pillars. One is the information derived from interviews with part-time farmers who consider themselves more secure and in a number of cases, admit having chosen an off-farm occupation with the sole purpose of buffering their income streams against downside risk (Zurek, 1986; Barlett, 1991). The other pillar consists of a set of reflections and thoughts by social scientists, such as by Djurfeld and Gooch who contend for instance that "off-farm incomes cover whole or part of the household subsistence costs, and may periodically also subsidize farming itself" (2002; 77). To our knowledge, the only empirical result supporting this claim to date is the negative covariance between off-farm and agricultural income found over time in a sample of Swiss farms (El Benni et al., 2012).

However, this result is in itself insufficient to validate off-farm activities as an effective risk mitigation strategy. On the one hand, it is dangerous to base a claim on subjective perceptions and limited empirical findings. On the other hand, even if this negative relationship between deteriorating farmer income and increases in off-farm activity was confirmed, the causality could be of a reverse nature: the observed phenomenon (declining income from farm operations) could be at least partially attributable to the negative effects of off-farm occupations on farm productivity. What if the productivity costs to the farm of devoting key household (labour) resources to off-farm work happened to more than offset the gains made from additional off-farm income? At the very least, it would seem that additional empirical research is needed to shed further light on this relationship, which is what motivates our study. Our aim, therefore, is to providing new insights into this research question by examining a new context (Australian farming) in which the influence of off-farm income (viewed as a risk-mitigation strategy) can be explored empirically.

2.2 Offensive and defensive adjustment strategies

Strategic management is the social science discipline most consistently associated with the study of adjustment strategies. It defines the latter as `the process through which a manager ensures the long term survival and growth of his firm' (Chakravarthy, 1982; 35). There is, of course, a broad array of strategies that are available and potentially advisable for organizations to address a whole range of contingencies. However, a number of strategic management scholars have found it useful to draw a key distinction between offensive and defensive strategies (Rizzoni, 1994; Deans, 2009; Kylaheiko et al, 2012). According to Limnios et al. (2014), resilient enterprises that adopt offensive strategies are able to at least selectively adopt expansionary or intensifying production strategies. Other scholars, such as Luo (2000) go on to show the central role of capabilities for pursuing successful offensive strategies. Defensive strategies, on the other hand, often involve cutting back production and input-hire, and outsourcing certain activities. Defensive strategies are often considered as a pathway towards `organizational decline' (Levine, 1978).

The farming sector is no exception to these considerations, in the sense that offensive and defensive strategies can also be distinguished as available options to farmers facing

difficulties. However, there are key differences too because the concrete nature of the instruments available to implement strategic adjustment differs quite fundamentally from other sectors. It is therefore worthwhile to define a number of offensive and defensive strategic options for farmers. In countries facing sharp and recurrent water scarcity, water availability is one of the main barriers to farmers' adoption of offensive strategies. Bjornlund (2003) has observed that in those countries water is increasingly treated as a commodity: more and more farmers invest into water usage rights in areas where these titles generate a high marginal benefit - see also Bjornlund (2004). Where markets for water permits are sufficiently developed, purchasing additional temporary water rights (and a fortiori buying permanent water rights) can clearly be viewed as an example of an offensive strategy in regions marked by drought or water scarcity.

Adjusting the production technology offers an alternative to buying additional water rights in regions where water is the main limiting factor to the expansion of operations (Mortimore and Adams, 2001). For example, investment in drip irrigation equipment can improve the marginal utility of water considerably. However, large amounts of funding are usually needed in order to make major improvements to the farm's capital equipment stock, and the former is usually borrowed from commercial banks. Hence, investment in newer capital equipment and acquisition of additional credit may both be considered examples of offensive strategies. Thinking of typical defensive strategies is relatively straightforward as they are often just the reverse of expansionary strategies. Selling land or water rights, or holding off any kind of much needed investments are examples of long-term defensive strategies, whereas the reduction of variable inputs on the land (laying-off workers, selling seeds or livestock) is an example of short-term defensive strategy. Importantly, it should be stressed that the decision to farm part-time to generate off-farm income is not part of an adjustment strategy (neither in an offensive nor in a defensive sense), it is merely a risk-mitigation strategy (pre-emptive rather than responsive).

3. Data and methodology

3.1 The Regional Wellbeing Survey

In order to test our hypothesis empirically, we use data from Australia's first Regional Wellbeing Survey (RWS), which was conducted in 2013. Australia offers ideal conditions to test the relationship between farmers' reliance on off-farm income and their propensity to adopt specific strategies in order to respond to external challenges. Polain et al. (2011) draw a grim depiction of the hardships Australian farmers encountered at the turn of the 21st century. Severe draughts have repeatedly led to lost or dismal harvests, which, combined with the perennial volatility of fuel and food prices significantly affected farm profitability and farmers' wellbeing. The 2013 Regional Wellbeing Survey is part of an ongoing project funded by MDBFutures, a collaborative research network led by University of Canberra and funded by a number of Government organizations. It covers all of rural and regional Australia, was specifically designed to collect information about farmers' and community wellbeing, and is expected to be conducted every year from 2013 onwards. The survey targeted a geographically stratified sample of rural and regional communities (excluding the State of Tasmania and the Northern Territory) and obtained 9135 responses. For further details about survey design and the methods underpinning the RWS 2013 and 2014, the reader is invited to download and read the summary reports by Schirmer and Berry (2014) and Schirmer et al. (2015).

3.2 Off-farm income

Schirmer et al. (2015 p.33-36) document RWS data about farmers' off-farm activities and derived income over the period 2013-2014. They distinguish between off-farm income originating in paid work activity and from other sources (shares, real estate, superannuation). They find that more than three quarters of surveyed farmers resorted to off-farm activities. The farmer distribution of off-farm income intensity displays a U shape, with larger proportions of farmers deriving a very little or very high share of their total income from off-farm activities.

The most prevalent form of off-farm activity is paid work (55 percent of respondents, 43 percent for other sources). Female farmers and farmers aged 40 to 55 derive a much higher proportion of their income from off-farm paid work than other categories of farmers do (35 percent relative to 20-25 percent approximately for male and younger/older farmers). Schirmer and her colleagues also examine the motivation for engaging in off-farm activities by asking farmers how they agreed or disagreed with a number of statements on a Likert scale (1 to 7). Amongst their findings is that two thirds of farmers enjoy their off-farm work, three quarters of farmers view off-farm income as at least as important as on-farm income and a still higher percentage agrees that it is an effective back-up against bad years. These positive views about the role of off-farm income correlate strongly and positively with the importance of off-farm income as a share of total income.

3.3 Adjustment strategies

To estimate farmers' adjustment strategies, a specific subset of questions were developed by a team of University of Canberra economists including one of the authors of this paper. These questions were integrated into the RWS 2103 and seek to capture how farmers respond to adverse natural and economic conditions. The adjustment strategy questions attracted a total of 1365 responses (568 responses from irrigation farmers and 797 responses from dryland farmer). The key variables estimated by these questions are the water-related and price volatility challenges faced by farmers over the specified recall period (2008 - 2013) and the strategies that they adopted in response to these pressures. All irrigators and dryland farmers were asked about the severity of the drought that they experienced over 2008-2013, but irrigators were also asked to report their experience with four other water-related challenges: (i) reduced allocation of water for one or more seasons, (ii) increased fixed charges on permanent water entitlement, (iii) increases in costs of purchasing temporary water entitlement, and (iv) restrictions on the timing of water trading.

To explore the capacity of farmers to cope with water and price stressors, all surveyed farmers were also asked to identify whether they undertook any of 20 listed activities in response to changes in water availability and prices. Some adjustment strategies, like sharing resources with neighbouring farms, were neither clearly defensive nor offensive and therefore not of interest for our study. For the purpose of our analysis, the paper groups the remaining activities into five broad types of expansionary (offensive) strategies and five categories of contractionary (defensive) strategies (details of grouping shown in Table 1). The decision to adopt these strategies or not represents the dependent variable in our analysis. The analysis is further broken down by farmers' characteristics including the level of reliance on off-farm income and a number of other key variables listed at the bottom of table 1 and which we discuss below. These variables represent the regressors in our analysis

Table 1: Dependent and explanatory variables used in logit regressions

Offensive Dependent variables	**Description**	**Unit Scales**	**Mean**
moreland	Bought or leased additional land	0 -- No; 1 – Yes	0.29
buywaterperm	Bought permanent water permits	0 -- No; 1 - Yes	0.07
buywatertemp	Bought temporary water permits	0 -- No; 1 - Yes	0.16
infrastructure	Invested in new technologies	0 -- No; 1 - Yes	0.61
borrowbank	Increased borrowing from bank	0 -- No; 1 - Yes	0.44
Defensive Dependent variables	**Description**		
reduceland	Sold or rented some land	0 -- No; 1 - Yes	0.14
sellwaterperm	Sold permanent water permits	0 -- No; 1 - Yes	0.07
sellwatertemp	Sold temporary water permits	0 -- No; 1 - Yes	0.12
redproduction	Reduced farm production	0 -- No; 1 - Yes	0.47
stopinvest	Postponed investment	0 -- No; 1 - Yes	0.62
Regressors	**Description**		
Offfarm	Share of off-farm income	Percentage	8.2
Age	Respondent's Age	Years	41
Familywork	Number of family members working in farm business	Number	2.5
Education	Highest level of school achievement	6 points Likert (1=no achievement)	5.1
Irrigator	Farm type	0 - Dryland farm 1 - Irrgator	0.37
NumberProp	Number of properties managed	Number	1.9
Area	Land size	26 points area scale (1 = < 10ha)	10

4. Results

The results of the logit analyses are reported in tables 2 and 3 below. Estimates of the effect of off-farm income on the adoption of specific strategies indicate a strong systemic effect. The first row of table 2 exhibits significant negative effects of off-farm occupations on the choice of adopting offensive adjustment measures. So, the higher the income share from off-farm occupations, the less likely is a farmer to resort to expansionary production measures like purchasing additional water rights, investing in new physical capital, or applying for new credit lines.

The impact of the other control variables listed and described in table 1 more or less matches expectations. With rising age, farmers become more reluctant to adopt offensive strategies: this negative effect is particularly pronounced with respect to making long-term investments into additional land acquisitions. Large farming families need more resources to sustain themselves so they are more likely to take up additional credit lines in times of adversity and less likely to sell their land, which is their most important factor of production. We observe indeed that the number of family workers has a strong positive effect on the likelihood of adopting offensive borrowing strategies.

Educational attainment does not seem to play a major role for the adoption of offensive strategies, except for investments in new infrastructure, which perhaps indicates that (typically large) investments of that nature are apparently more easily made by farmers equipped with more human capital. That water trading plays a much more important role for farmers who report themselves as irrigators is a self-explanatory result (also evident in estimates reported in table 3 for defensive strategies), but there are other significant differences between irrigation and dryland-based farms: dryland farmers are likelier to acquire more land than irrigators are, most probably to make up for poor crop yields on their properties.

Table 2: Result of the logit regressions: offensive strategies

	moreland	**buywaterperm**	**buywatertemp**	**borrowbank**	**infrastructure**
n	1499	1085	1130	1486	1557
Offfarm	-0.029**	-0.045*	-0.028*	-0.017*	-0.029**
	(-3.22)	(-2.17)	(-1.99)		(-3.22)
Age	-0.030***	-0.018	-0.012	-0.019***	-0.030***
	(-5.42)	(-1.70)	(-1.25)		(-5.42)
Familywork			-0.068	0.072*	
			(-1.13)	(2.04)	
Education	0.066	0.11	-0.12	0.041	0.29***
	(1.05)	(0.78)	(-1.22)	(0.77)	(5.48)
Irrigator	-0.35**	2.2***	3.6***	0.31*	0.51***
	(-2.56)	(5.34)	(8.61)	(2.45)	(4.23)
NumberProp	0.51***	0.090	0.19**	0.18***	0.17***
	(8.58)	(1.24)	(3.28)	(3.87)	(3.87)
Area				0.041***	
				(4.13)	
R2	0.16	0.18	0.31	0.10	0.08

*** p<0.001; **p<0.01; *p<0.05

On the other two strategies, however, irrigators seemed to react in a more flexible way than dryland farmers, being more likely to borrow from banks and to invest into new infrastructure. Finally, large properties are more likely to adopt offensive adjustment measures than smaller ones. For instance, large farm enterprises have been known to switch away from a strategy of holding permanent water rights (which they were likely to sell) to one consisting of more flexible `just in time' water usage through use of temporary water titles. Large farms are also much more likely to take up new credit lines, to buy additional land or to invest into new infrastructure.

Table 3 exhibits significantly different explanatory patterns for the adoption of defensive strategies. Most prominently, uptake of any of the five defensive strategies is not significantly impacted by off-farm occupations; even though the sign of the off-farm coefficient is positive for all defensive strategies listed in table 3, none of these coefficients comes close to achieving statistical significance. Looking at the effect of farmer age, we observe that older farmers are more likely to defensively sell or lease some of their land, possibly to develop a source of financial security for old age retirement.

On the other hand, the most significant effect of age on the adoption of defensive strategies is the negative, large and highly significant effect observed on the postponement of investment into new physical equipment. So if older farmers are more likely to reduce land holdings, young farmers are more likely to defer much needed investments and to reduce on-farm production. This latter result is in keeping with the output-reducing prediction of the Sandmo model since younger farmers should be expected to face higher income risk than older ones. More family workers has a strong negative effect on selling temporary water rights perhaps due to input substitution effects at play in irrigation farms.

Table 3: Result of the logit regressions: defensive strategies

	reduceland	**sellwaterperm**	**sellwatertemp**	**redproduction**	**stopinvest**
n	1385	1540	1554	1422	1421
Offfarm	0.00094 (0.09)	-0.0059 (-0.38)	0.084 (0.70)	0.0064 (0.82)	0.0080 (0.99)
Age	0.015* (2.06)	0.0045 (0.49)	0.011 (1.39)	-0.011** (-2.26)	-0.029*** (-5.36)
Familywork	-0.14* (2.42)	-0.14 (-1.94)			
Education	0.30 (0.40)	-0.15 (-1.58)	-0.088 (-1.12)	0.081 (1.50)	0.047 (0.89)
Irrigator	0.18 (1.08)	2.28*** (8.38)	2.83*** (11.76)	0.22 (1.86)	0.27* (2.11)
NumberProp		0.14* (2.35)			
R2	0.03	0.17	0.23	0.03	0.04

*** p<0.001; **p<0.01; *p<0.05

5. Conclusions

External challenges such as drought reduce the stock of productive resources available to farmers. It is therefore important that in difficult economic times, resilient farm enterprises be able to adopt offensive adjustment strategies such as by acquiring new resources or by intensifying production. A larger-scale production unit may in certain conditions be better able to counterbalance the adverse effects of external shocks, be they economic or natural.

Accordingly, lacking the capacity to adopt and implement these offensive strategies due to risk mitigation and resource diversification is likely to act as a significant constraint on farm resilience. It is therefore worthwhile to identify which factors may weaken the thus-defined resilience of farms in a country which is regularly struck by adverse weather conditions and volatile agricultural prices.

In this article we showed conceptually and empirically that the pursuit of off-farm income is likely to be one of these weakening factors. Whereas the literature suggests that part-time farming is adopted as a risk reduction strategy (through income-source diversification), our research suggests and tests the hypothesis that increasing resources allocated to the pursuit of off-farm income also leads to negative productivity effects inhibiting the adoption of offensive strategies. Since moving from full-time to part-time farming necessitates the reallocation of critical farmer resources away from agricultural production, farms lose scale and become less able to pro-actively respond to external difficulties by use of offensive strategies. Our study thus established a negative link between part-time farming and farm resilience.

One plausible explanation to our finding is that these results are driven by a variable degree of risk aversion: highly risk-averse farmers are more likely to divert their human resources (time, family members) away from agriculture because the expected utility gains from risk diversification are perceived to exceed the productivity losses from labour reallocation and smaller-scale production. After all, acute risk aversion is unlikely to be compatible with the entrepreneur mindset required to undertake offensive production decisions.

An alternative explanation would be that part-time farmers simply do not care as much about shrinking farm size and productivity, and see part-time farming not in risk-mitigating terms but as a lifestyle decision (e.g. an opportunity to socialise, to get away from routine etc.). This alternative perspective rests on a different behaviour but remains compatible with the model sketched out in this paper: risk aversion and expected utility may play a reduced or inexistent role but here too production is adjusted to match the utility gains from improved lifestyle with the utility losses from reduced farm productivity. Which of the two types of reasoning correctly reflect farmers' actual attitudes towards part-time farming and farm resilience is left for future research to determine.

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