

## Local and global factors in work stress—the Australian dairy farming exemplar

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**Objectives** Whether the job demand–control model is necessary, but not sufficient, to explain farmers' high levels of strain was studied. If the model were sufficient, then the impact of deregulation would mean that Australian dairy farmers would experience high-strain jobs rather than the active jobs reported for American and European farmers.

**Methods** Longitudinal survey data were used from 348 farmers in 2002 and 195 farmers matched in 2003.

**Results** The dairy farmers had extremely high distress levels, which increased significantly over 12 months (39% according to the General Health Questionnaire, binary scoring), exceeding those of several other Australian occupations. The dairy farmers had active jobs. This situation indicated that theoretically the job demand–control model was not sufficient to explain high levels of distress. Specific measures (globalization, finances, demands of work in sheds) explained the variance in psychological distress beyond the job demand–control theory cross-sectionally, whereas specific demands alone predicted distress over 12 months. In addition, specific demands increased significantly over 12 months.

**Conclusions** The job demand–control model requires supplementation if the impact of important external or upstream factors such as globalization or free market forces, and environmental demands are to be fully assessed. Deregulation demands appear to be the most important and may have reached a ceiling of tolerance that cannot be moderated by control and that requires intervention upstream at the community, industry, and government level. The study builds knowledge, given that little previous research has used the job demand–control model to study self-employed or rural workers.

**Key terms** dairy farmer stress; farm stress; job demand–control model; psychological distress; work stress.

Increasingly, worker health and well-being is not only influenced by the local work context, but also by intense external and global factors. Dairy farming in Australia is an example of this situation. Globalization, deregulation, and trade liberalization mean that farmers now sell their primary produce on a worldwide basis and are thus exposed to the vagaries of the free market. This situation can be richly rewarding if the market favors the seller, but the farmer must now accept less financial security in order to reap potential benefits. The aims of this article are to explore the impact of deregulation on an important Australian industry, to test the “fit” of the widely accepted job demand–control, work stress model to self-employed farmers and to determine whether or not the model is sufficient in itself to predict work stress among Australian dairy farmers.

The nature of work is changing rapidly, and organizations and jobs are increasingly influenced by local and global economic, political, technological, and social developments (1, 2). Important multilevel influences operating at work have been modeled in a recent framework proposed by Sauter and his colleagues in the United States (US) National Occupational Research Agenda (NORA) (3). The model emphasizes the continuity between broad external factors (eg, economic, political, and technological forces at the national or international level), organizational context (eg, management structures, supervisory practices, and production methods), and the work context (eg, task attributes such as autonomy, physical and psychological demands, and social-relational aspects of work). This framework is useful with respect to understanding how different

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contextual levels of work influence worker health and safety. Yet much research in disciplines of interest (ie, occupational health and safety and occupational health psychology) focus only on the work context (4). Furthermore, there is a paucity of research with rural or remote contexts (4).

More than most research on occupational stress, research on farming stress has examined themes that have included external factors. Commonly measured farm stressors include financial themes of economic strain, irregular cash flow and debt load, the weather, bureaucracy, machinery problems, and time pressures (5). These factors appear to cut across cultures and countries and thus may conform to an underlying structure or theoretical framework of work stress. Many such work-stress frameworks exist, but they are usually tested for their fit among the employed workers of the world. This study focused on South Australian (SA) dairy farmers, as a homogeneous population of self-employed workers expected to experience the cluster of farming stressors previously discussed, with the addition of a recent acute “upstream” or global stressor in the form of deregulation.

Like other agricultural industries across Australia, most dairy farms are family owned and operated (6). Dairy farmers work a long week (7), more than the national average and also more than other Australian farmers (8). They are tied to the farm morning and night every single day of the year because, if the cows are not milked, production dries up. Some of the most taxing demands according to farmers and industry stakeholders include environmental and bureaucratic demands, deregulation, and the subsequent globalization of the industry, financial demands and physical shed demands (7).

In 2000, the Australian dairy industry was deregulated—all government support and protection was terminated. Farm gate milk prices are now set by market forces through negotiation with the processor who buys the milk, and according to world milk prices (9). This situation forces farmers to increase the size of their farms or to be “more efficient” in producing milk at the lowest possible price and to maximize sales (10).

Closely related to deregulation are financial demands. Many studies on farm stress have demonstrated relationships between financial difficulties and ill health, although a few are longitudinal or well-designed studies (11). In Australia, farmers’ profit margins are decreasing every year (12). To halt declining terms of trade, Australian dairy farmers must reduce input costs and maximize production, and they have taken such steps vigorously, but apparently with concomitant emotional and cognitive costs (7).

Environmental demands for dairy farmers revolve somewhat around irrigation, commonly used to generate pasture for production. Due to years of sporadic drought and the threat of global warming, there are now

major demands on irrigators to increase their water-use responsibility and to deal with the associated bureaucracy (13).

Physical shed demands are likewise challenging. Shift work, noise, heat or cold, and lead and other chemicals have been found to be associated with sleep interference and fatigue (14, 15). The physical demand associated with the structure of the dairy shed varies from farm to farm. Yet how do these specific farming demands fit the job demand–control work-stress theory.

### *The job demand–control model*

The job demand–control model assumes that elements of the work environment have an impact on the health of workers. Strain results not primarily from personality or demographic variables, but from the joint effects of work demands and the limitations of control available to workers when demands are modified. When job demands are high and job control is low, the result will be poor health outcomes for the worker—that is, strain (16). The job demand–control model has proliferated over the last 20 years (17) and was expanded to include social support at work as another important predictor of worker health (18). Several meta-analyses of the job demand–control–support model have found strong and consistent evidence for the usefulness of the model as a predictor of health outcomes (19).

The job demand–control model has been shown to be a relevant framework for self-employed farmers. Farmers in the United States in the 1980s were found to have active jobs, with high levels of demands, but concomitant levels of control, potentially leading to lower strain than in other occupations (20). Similarly Swedish farmers have been found to have active jobs, and these jobs perhaps explain the farmers’ low risk of coronary heart disease when they are compared with people in other occupations in Sweden (21). However, the United States maintains a dairy subsidy scheme, which usually allows the price of their dairy produce to fall below world prices (22). In addition, the European Union (EU) supports the domestic production of dairy products by restricting imports, giving minimum price supports to their farmers, and allowing the governments of member states to purchase excess production. In 2001, EU supports for dairy farmers were double those of Australian dairy farmers (23). A major difference is that Australian dairy farmers work in a context without such government subsidies and supports.

Interestingly the measurement vehicle of the job demand–control model, the job content questionnaire, added a “globalization” scale that recognized factors that create higher demands, lower control and increased job insecurity for workers at a global economy level (24). This situation is directly relevant for Australian

self-employed farmers, who are experiencing globalization in the form of a deregulation of their industries and full exposure to free-market economies.

### *Current study*

Much has changed for the farming industry in Australia since Karasek and his colleagues found that farmers have active jobs with high demands but correspondingly high control (24). The increase in the upstream or global demands of farming and the lack of government protection probably has a penalty in terms of experienced control or autonomy over how to run the dairy business. Therefore, if the job demand–control model is sufficient to explain the expected high levels of distress in Australian dairy farmers, then it is expected that farmers will actually experience high general demands (ie, work pressure) and low general control over their work when compared with other workers; in other words, they have high-strain jobs in the terms of the job demand–control model.

*Hypothesis 1: Dairy farmers have high-strain jobs rather than active jobs, as found among US and EU farmers.* We argue that the general job demand–control model is necessary, but not sufficient, for a work-stress model among dairy farmers. Specific demands, new upstream demands that add work pressure but carry little opportunity for control, and specific control factors contribute substantially towards the development of a specific work-stress model for this population.

*Hypothesis 2: Demands are positively related psychological distress, and control is negatively related to it.*

*Hypothesis 3: Specific demands and control explain the variance in distress in addition to that accounted for by general demands and general control.* Control was considered to be an extremely strong work-stress theme by farmers in an earlier qualitative study (25). The amount of control that farmers experience in a globalized or free-market economy is not known, but we theorize that it differs from that experienced under a protected industry system. While the mechanism by which control exerts its influence over psychological strain has been shown to be unclear in reviews of job demand–control, we used the original demand–control hypothesis that control moderates the effects of demands in our study.

*Hypothesis 4: High job control (general or specific) moderates the relationship between job demands (general or specific) and psychological distress.* In addition, we sought to test the main and interaction effects of social support but found the reliability unsatisfactory. Due to space, the social support results have not been discussed further.

## **Study population and methods**

### *Procedure and sample*

The participants were a sample of convenience, recruited via a mail out to the entire known population (derived from South Australia's representative body for dairy farmers and information from milk processors) of 1219 South Australian dairy farmers.

At time 1 ( $T_1$ ) in 2002, 348 South Australian dairy farmers responded. Altogether 62% were men and 38% were women, reflecting the proportions in data of the Australian Bureau of Statistics (ie, 33% women) (8). The average age of the respondents was 47 years, while that of Australian farmers is 51 years (8). Altogether 91% were married, in comparison with 96% of the general farming population (8). Thus the sample was representative of the national sample of dairy farmers.

The response rate was 34%. Nonresponse was analyzed by asking farmers why they did not respond. A total of 26% stated that they were "too busy" to respond, and a further 28% said that they doubted the impact of the study or were not interested.

A follow-up study at time 2 ( $T_2$ ) was conducted 1 year after  $T_1$ . At  $T_2$ , 195 of the 348 farmers invited to participate a second time responded again. We determined which farmers at  $T_2$  had also responded at  $T_1$  as each farmer received the same code as at  $T_1$ , which matched the names and addresses of each dairy farmer. When farm exits were taken into account, the response rate at  $T_2$  was 60%.  $T_2$  versus  $T_1$  participation was regressed upon all  $T_1$  measures. There were no differences between the samples at  $T_1$  and  $T_2$  in terms of demographics. However, panel attrition showed a trend towards farmers with the highest scores on the general health questionnaire (12 items) (GHQ-12) (30) not participating at  $T_2$  ( $P < 0.01$ ). That is, the nonparticipants had higher distress levels than the participants. In addition, those who had left the industry ( $N = 21$ ) also had significantly higher scores on the GHQ than the  $T_2$  participants [ $t(210) = -2.41, P < 0.05$ ].

### *Scales of the job demand–control model—general job demands and control*

The items of the job content questionnaire (24) required minor adjustments to suit self-employed workers. Job demands measured work pressures, while two aspects of job control were measured, skill discretion (4 items), or the skills required and the flexibility to choose skills, and decision authority (3 items), or the degree of autonomy felt at work. The reliabilities for  $T_1$  are reported in the correlation matrix. [See table 3 in the Results section]. A somewhat low alpha for job demands (5 items) was deemed acceptable for analysis on the basis of a similar alpha in the original job content questionnaire (26).

### Specific demands and control

Specific demands were related to farming and were local or global. "Shed conditions" (9 items) referred to the physical conditions and demands in the dairy (27, 28) and included questions such as "the dairy shed is very noisy". The questions concerning "globalization demands" (4 items) were taken from the job content questionnaire, but substantial changes were made to measure dairy farmers' specific demands due to deregulation and global markets (eg, "I have to work harder to be profitable because of deregulation"). "Environmental demands" (4 items) measured the farmers' views of the demands of government regulations regarding the farm environment (eg, "Regarding water and environmental issues, there are uncertainties in government policies that make it difficult to plan the future of the farm"). For "financial demands" (3 items), the farmers were simply asked whether they made a loss, broke even, or made a profit over the three preceding, consecutive financial years. There is precedent for such a simple measurement of farmers' financial status (29). Specific control (2 items) measured dairy farmers' uptake of local avenues for skill use and development.

### Health outcome variables

The GHQ-12 (30) was used, without changes, as a measure of psychological distress or strain (31). An example item was "Have you recently been able to concentrate on whatever you're doing?" The scores ranged from 0 to 36. The degree of distress was assessed using binary scoring (0, 0, 1, 1) for items that were then added up to create a scale score ranging from 0 to 12, with high, moderate, and low distress categories (32).

### Statistical analysis

Hierarchical regression modeling was used to test the relationship between the job demand-control variables and psychological strain (33). The variables were standardized, and multiplicative interaction variables were computed using the standardized variables (34). Various scales were transformed to normalize the distributions (35). We used eight moderated regression models with combinations of general and specific job demand-control to test for moderation effects.

## Results

### Descriptives

The sample was representative in terms of gender, age, marital mix, and farm herd size. The dairy farmers

reported working an average of 59 hours per week, which is higher than for farmers in general (49 hours per week) and higher than the national average of 42 hours per week (8).

### Psychological distress compared across occupations

The dairy farmers' psychological distress (GHQ-12) was compared across occupations in Australia. T-tests for independent samples revealed that the South Australian dairy farmer's scores on the GHQ-12 were significantly higher than those of eight other Australian occupational groups (table 1). Of special interest is the comparison against the mixed-farming control sample of Williams & Ranzijn (36). The farmers in this sample were nondairy farmers (mainly grazing, broad acre, mixed), who were experiencing drought conditions similar to the dairy farmers and were also exposed to deregulation (implemented a few years earlier).

Altogether 30% of the dairy farmers were in the high distress binary category ( $\geq 4$ ) at  $T_1$ , and 39% were in this position at  $T_2$ . Those who participated at  $T_1$  only had significantly higher scores on the GHQ-12. In addition, almost half of the dairy farmers had at least mild distress.

### Demand and control comparisons

The comparison between the sample of dairy farmers and other workers with respect to the general job

**Table 1.** Comparison between dairy farmers and other occupations with respect to scores on the general health questionnaire (12 items). (STA = State Transport Authority)

Occupation	N	Mean	SD	t-test
South Australian university staff	1961	12.20	5.90	t(2302)=2.76 <sup>a</sup>
South Australian correctional officers	414	12.18	7.22	t(755)=2.01 <sup>b</sup>
South Australian private sector workers	143	11.76	6.29	t(484)=2.35 <sup>b</sup>
South Australian family and community service workers	798	11.53	5.83	t(1139)=4.31 <sup>c</sup>
South Australian nurses	106	11.49	5.71	t(447)=2.58 <sup>a</sup>
Salvation army officers (Australian)	359	11.39	5.07	t(700)=4.29 <sup>c</sup>
STA clerical administration (Australian)	176	11.25	5.20	t(517)=3.66 <sup>c</sup>
South Australian mixed farmers <sup>d, e</sup>	163	11.67	5.10	t(342)=4.74 <sup>c</sup>
South Australian dairy farmers ( $T_1$ ) 2002	349	13.15	5.80	..
South Australian dairy farmers ( $T_2$ ) 2003	194	13.87	6.75	..

<sup>a</sup>  $P < 0.01$ .

<sup>b</sup>  $P < 0.05$ .

<sup>c</sup>  $P < 0.001$ .

<sup>d</sup> Data from 2004. Full references available from the first author.

<sup>e</sup> Williams & Ranzijn, 2007 (36)

demand–control scales was based on the mean scores for the scales used for US participants in the quality of employment surveys (N=4319) (26). Note that the skill discretion measure was adjusted for number of items.

Hypothesis 1, that dairy farmers had high-strain jobs, was not supported. Independent t-tests revealed that South Australian dairy farmers had significantly higher job demands than the average US worker in 1982 [t(4660)=12.11, P<0.001]. However, their levels of control were not lower as predicted. In fact, the South Australian dairy farmers' skill discretion was significantly higher than that of the average US worker [t(4660)=12.47, P<0.001], while their decision authority did not differ [t(4660)=0.36, P=not significant]. Overall then, the South Australian dairy farmers appeared to fit into the "active job" quadrant of the job demand–control model, but only when control was measured by skill discretion (table 2). However, active jobs should correlate

**Table 2.** Comparison of the scores of the dairy farmer questionnaire with scores of the job content questionnaire in the United States. [source: Department of Work Environment, University of Massachusetts, Lowell (2001)]

Demand–control scale	Job content questionnaire			Dairy farmer questionnaire		
	Persons (N)	Score		Persons (N)	Score	
		Mean	SD		Mean	SD
Skill discretion <sup>a</sup>	4319	33.8	7.9	343	39.2	4.9
Decision authority <sup>b</sup>	4319	36.4	10.0	341	36.6	6.5
Job demands <sup>c</sup>	4319	30.3	7.2	341	35.1	5.1

<sup>a</sup> df 4660, t-test 12.47 (P<0.001).

<sup>b</sup> df 4658, t-test 0.36.

<sup>c</sup> df 4660, t-test 12.11 (P<0.001).

**Table 3.** Comparison of scale scores between surveys carried out at time 1 (T<sub>1</sub>) and time 2 (T<sub>2</sub>)—matched data only (N=195).

Variable	Mean score T <sub>1</sub>	Mean score T <sub>2</sub>	Mean T <sub>1</sub> –T <sub>2</sub>	SD difference	df	t
<b>General</b>						
Decision authority	36.17	35.77	0.32	6.23	186	0.70
Skill discretion	39.44	38.54	0.82	4.77	186	2.34 <sup>a</sup>
Job demands	34.99	35.91	-0.92	5.24	186	-2.38 <sup>a</sup>
<b>Local</b>						
Shed demands	20.82	20.99	-0.17	3.96	187	-0.57
Globalization demands	11.25	12.90	-1.65	2.44	183	-9.19 <sup>b</sup>
Environment demands	11.64	12.67	-1.01	2.30	192	-6.11 <sup>b</sup>
Financial status	7.68	6.32	1.36	1.89	184	9.95 <sup>b</sup>
Local control	4.65	4.37	0.28	0.23	186	1.25
<b>Distress</b>						
General health questionnaire	12.15	13.87	-1.76	5.29	190	-4.59 <sup>b</sup>

<sup>a</sup> P<0.05.

<sup>b</sup> P<0.001.

with low psychological strain, whereas the preceding evidence shows that the dairy farmers reported higher levels of distress than people in many other occupations, including other South Australian farmers.

### Comparison of mean scores of measures over time

There were several areas in which the participants' scores changed significantly between T<sub>1</sub> and T<sub>2</sub> (table 3). The job demand–control scores for skill discretion significantly decreased, and job demands significantly increased. But much stronger effects were shown for dairy-specific job demands with an increase in globalization demands, an increase in environmental demands, and a reduction in financial status. There was also a significant increase in farmers' distress at T<sub>2</sub> [t(190)=-4.59, P<0.001].

### Correlations

The demographics did not generally show correlations with the outcome measures. An exception was that higher numbers of hours worked per week was related to higher distress (r=0.22, P<0.01).

Table 4 shows intercorrelations between T<sub>1</sub>-independent variables and both T<sub>1</sub> and T<sub>2</sub> psychological strain. Hypothesis 2 was supported in the case of general and specific demands both cross-sectionally and longitudinally. Note that, when job demand–control measures were added to form decision latitude, a significant negative relationship was found cross-sectionally.

### Multivariate analysis

At T<sub>1</sub>, we found that general demands and control explained 22% of the variance in the GHQ-12 scores, and an additional 10% of the variance was accounted for by adding specific demands and controls. Most of the variance in the GHQ-12 scores at T<sub>1</sub> was due to general and specific demands, and the variance in the GHQ-12 scores at T<sub>2</sub> was due only to specific demands (demands of work in the sheds, globalization demands, and financial status) (table 5). Thus hypothesis 3, that specific demand and control explain the additional variance in the outcome measure, was supported in the case of specific demand but not in the case of specific control. Thus, a general job demand–control model may be insufficient in determining strain among dairy farmers, and a more specific model seems plausible. After control for the T<sub>1</sub> GHQ-12 scores, an additional analysis showed that globalization demands and financial status were the most important predictors of change in the variance of the GHQ-12 scores over time.

Hypothesis 4, that high job control moderates the relationship between job demands and psychological

**Table 4.** Means, standard deviations, and Pearson correlation of general and specific work measures at time 1 with the general health questionnaire, 12 items (GHQ-12) at time 1 (T<sub>1</sub>) (N=348) and time 2 (T<sub>2</sub>) (N=198).

	Range	General			Specific					Distress	
		Skill discretion	Decision authority	Job demands	Local control	Shed demands	Globalization demands	Environmental demands	Financial status <sup>a</sup>	T <sub>1</sub> GHQ-12	T <sub>2</sub> GHQ-12
<b>General</b>											
Skill discretion	27–48	0.72 <sup>b</sup>	0.32 <sup>c</sup>	0.42 <sup>c</sup>	0.28 <sup>c</sup>	-0.07	-0.06	0.03	-0.09	-0.03	-0.08
Decision authority	12–48		0.66 <sup>b</sup>	0.07	0.18 <sup>d</sup>	-0.07	-0.13 <sup>e</sup>	-0.02	0.13 <sup>e</sup>	-0.07	-0.04
Job demands	22–48			0.59 <sup>b</sup>	0.07	0.25 <sup>c</sup>	0.22 <sup>d</sup>	0.38 <sup>c</sup>	-0.17 <sup>e</sup>	0.41 <sup>c</sup>	0.21 <sup>d</sup>
<b>Specific</b>											
Local control	2–12				0.63 <sup>b</sup>	0.07	-0.17 <sup>d</sup>	0.09	0.01	0.01	-0.13
Shed demands	9–34					0.79 <sup>b</sup>	0.12 <sup>e</sup>	0.19 <sup>e</sup>	0.02	0.38 <sup>c</sup>	0.25 <sup>d</sup>
Globalization demands	5–16						0.76 <sup>b</sup>	0.16 <sup>d</sup>	-0.26 <sup>c</sup>	0.27 <sup>c</sup>	0.30 <sup>c</sup>
Environmental demands	5–16							0.79 <sup>b</sup>	-0.02	0.28 <sup>c</sup>	0.25 <sup>c</sup>
Financial status <sup>a</sup>	3–9								-	-0.17 <sup>c</sup>	-0.28 <sup>c</sup>
<b>Distress</b>											
T <sub>1</sub> GHQ-12	2–35									0.90 <sup>b</sup>	0.64 <sup>c</sup>
T <sub>2</sub> GHQ-12	2–35										-

<sup>a</sup> Financial Status scored as follows: 1 = made a loss, 2 = broke even, 3 = made a profit.

<sup>b</sup> T<sub>1</sub> reliability on diagonal.

<sup>c</sup> P<0.001.

<sup>d</sup> P<0.01.

<sup>e</sup> P<0.05.

distress, was not supported cross-sectionally or longitudinally. The impact of demands, both general and specific, could not be offset by control.

## Discussion

This study adds to the occupational health literature in several significant ways. It is one of the first to assess the impact of external global pressures on an occupation. Furthermore, it focused on the understudied area of occupational health psychology among rural workers and among self-employed workers (37).

The study found that dairy farmers have high levels of distress when compared with people in many other occupations. Yet this finding could not be explained by the job demand–control model of work stress because dairy farmers have active jobs in terms of job design. Additional stressors therefore need to be considered to account for the extremely high levels of strain among dairy farmers.

Dairy farmers did not fall into the high-strain quadrant of the job demand–control model, despite the fact that they reported high levels of distress; therefore, the investigation of the usefulness of the general model was important. This finding indicates that the known differences between Australian, American, and some European farmers in the form of government subsidies and support and their impacts on well-being are not manifest in the job demand–control model. Furthermore, it can be seen from the correlation and regression models

**Table 5.** Regression for psychological distress [general health questionnaire, 12 items (GHQ-12)] at time 1 (T<sub>1</sub>) and time 2 (T<sub>2</sub>) on general and specific demands and control.

	GHQ-12	
	T <sub>1</sub>	T <sub>2</sub>
Job demands	0.10 <sup>a</sup>	0.02
Shed demands	0.12 <sup>a</sup>	0.23 <sup>b</sup>
Environmental demands	0.08 <sup>a</sup>	0.12
Globalization demands	0.07 <sup>a</sup>	0.17 <sup>c</sup>
Financial status	-0.03	-0.26 <sup>b</sup>
Skill discretion	-0.05	0.00
Decision authority	0.01	0.04
Local control	0.04	-0.11
Adjusted R <sup>2</sup> , F (8, 262)=	0.32	0.19

<sup>a</sup> P<0.001.

<sup>b</sup> P<0.01.

<sup>c</sup> P<0.05.

that demands in particular (rather than low control) are the most taxing in terms of psychological distress. The main effects model of high general demands with the addition of dairy-specific demands accounted for acute strain, whereas specific demands were responsible for chronic distress over time. At the theoretical level, this finding indicates that a more comprehensive multilevel model needs to be designed to account for powerful occupation-specific demands, in this case financial status and the demands of work in the sheds, and to include external forces such as globalization demands. Research

and development in the area needs to be responsive to changes in the nature of work (1).

Strain among South Australian dairy farmers was significantly higher than the strain among people in many other Australian occupations. The distress levels among the participants in this study rose from  $T_1$  to  $T_2$ , to the point that 39% of the farmers at  $T_2$  reported clinical levels of distress. This finding may be an underestimation of the problem, as the farmers who left the sample after  $T_1$  reported significantly higher levels of distress. Although we have no prior benchmark to confirm that the levels of distress increased as a result of deregulation, we do have anecdotal and scientific evidence. Specifically, we showed that farmer's demands from deregulation increased, and their reported financial status decreased from  $T_1$  to  $T_2$ , and, in turn, these factors were correlated with distress, even after distress at  $T_1$  was accounted for. In summary, it appears that, for many dairy farmers, job-related stress is alarmingly high and that the economic and political changes that have been introduced to the industry probably increased the severity of psychological distress among these workers, with no systemic way to manage stress.

If our estimations about the effect of these external issues are correct, it should be considered that it is not a matter of simply concluding that globalization always brings negative consequences. Shortly after the deregulation in 2001–2002, Australian dairy farmers experienced one of the best economic years in the last 20 years (38, 39). A major reason was the effect of deregulation in that the Australian dollar was low against the US "greenback" and export prices for our dairy products soared.

Unfortunately, reflecting the unpredictability of conditions in farming, the good news was short lived. In addition to the demands captured in the study during the 2002–2003 financial year, farmers and their families across Australia suffered wide-ranging drought conditions (40). But important world trade terms changed. Farmers' milk checks were low, due to the increased value of the Australian dollar and world political events. These events coincided with an 80% decline in the average Australian farm cash income (38), and dairy farm checks fell by about 20% (12). The contrast between the high rainfall and buoyant markets of 2001–2002 and the drought-afflicted poor markets of 2002–2003 could not have been more cruel.

In hindsight, it was an omission not to have measured the effects of the weather, alongside other stressors. We did, however, have data derived from a nondairy farmer "control" sample from the same time period and also from South Australia, against which to benchmark levels of distress. The dairy farmers showed significantly higher levels of distress, yet both farmer groups experienced drought. This finding helps confirm that it is not

the drought that accounted for high levels of stress. A potential difference between the samples is that the comparison farmer group had experienced deregulation some years earlier. Furthermore, dairy farmers do not have the freedom to take a day off as easily, and therefore their stress cannot be regulated as readily. A further phase of data collection is required to monitor the situation.

The findings of our study must also be considered in light of other limitations. The low response rate and possible nonresponse bias suggest the potential for a biased sample. However, the gender, age, and marital mix in this survey did reflect the demographics of farmers in general (8) at both  $T_1$  and  $T_2$ . In addition, the analysis of panel attrition and industry exits clearly showed a trend for farmers with the highest GHQ-12 scores not to participate at  $T_2$ . That is, the nonparticipants had higher distress levels than the participants, and the effects might have been stronger if they had remained in the sample.

The implications of the research are that many occupations like farming are complex and embedded in a web of forces that are both local and distal. While models such as that for job demand–control help to conceptualize the dynamics of the work stress process, the current study highlights how the operationalization of core components needs to occur at multiple levels (external, organizational, and occupational) to canvas the comprehensive and powerful forces operating at work (3). Melding the job demand–control model with elements of the Sauter model may be a fruitful step forward.

Future research should endeavor to measure these multilevel influences, and further research is required on self-employed workers. In addition, as mentioned, there is little empirical research on the rural sector. At a practical level, the empirical observation that demands cannot be offset by control (decision authority, skill discretion, or local control) does pose a worrying predicament for farmers.

In conclusion, farmers appear to be reaching a ceiling of tolerance for demands above which they cannot control. Farmers may have become vulnerable to a downward spiral of declining health and farm productivity. Poor psychological health that has an impact on financial performance and, in turn, on health again has been documented elsewhere (11). On one hand, policy makers have introduced change to improve productivity and efficiency, but, on the other, the associated stress may lead to a reduced financial performance of the farms. The human element of political economic strategies seems to be missing. And the future looks equally demanding with farmers' terms of trade forecast to fall by 20% by 2006–2007 (39).

We suggest that the unacceptably high levels of distress among Australian dairy farmers have stemmed from deregulation. The job demand–control model is necessary, but not sufficient, in explaining the acute and chronic

impact of work-related factors impinging on farmers' psychological well-being, and it needs to be embellished to include multilevel, local, and global factors. The plight for farmers is that they experience upstream demands over which they have little or no control.

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