The Seasonality of Agricultural Employment: Evidence from Farm Accounts

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Seasonal fluctuations in agricultural employment are thought to have important economic and social consequences. Sokoloff and Dollar (1997) argue that, since English agriculture was more seasonal than US agriculture, and cottage industry could be more easily combined with seasonal agricultural work, the English had more cottage industry, while the US had more factory production. Hobsbawm and Rude (1968) argue that the reaction to the threshing machine was so hostile because it took away one of the few forms of winter employment. Blaug (1963) suggested that poor law allowances were designed to deal with seasonal agricultural employment, and that the Speenhamland system appeared in regions of arable agriculture, where employment was more seasonal. Boyer (1990) argues that workers had to be paid incomes sufficient to prevent them from emigrating to the city, and farmers preferred to use poor law payments to subsidize incomes because part of the relief bill was paid by other rate-payers.

The regularity of employment also has important consequences for the standard of living debate. Even if the daily wage rate stays the same, living standards could fall if the number of days a labourer was employed fell.[1] Feinstein (1998, p. 647) adjusts his real wage series for seasonal unemployment in agriculture, assuming that 10 percent of agricultural day-labourers in counties with primarily arable agriculture were unemployed for five months per year.

In spite of the importance of seasonality in the historical literature, most historians have relied on indirect measures of seasonality. Timmer (1969) reconstructed a seasonal labour pattern based on the tasks necessary at a farm running the Norfolk rotation. His conclusions are entirely based on a hypothetical farm, and are not checked against the labour patterns of an actual farm. Other approaches measure some variable affected by fluctuations in employment. When unemployment is high more people would need poor relief, so Goose (2006) uses the number of paupers as a measure of the seasonality of unemployment. An increase in the demand for labour should also increase wages, so Sokoloff and Dollar (1997) use the ratio of harvest to winter wages as a measure of seasonality. The wage is itself an important economic variable, but will not tell us how much employment changed. An increase in the demand for labour should increase both wages and employment, but the size of the wage increase does not tell us the size of the employment increase unless the elasticity of supply is known. Large increases in wages are compatible with either large or small changes in employment. Relatively few measures of seasonality are based on reports of the number of workers employed. Boyer (1990) calculated unemployment rates based on the number of unemployed labourers

[1] Lindert and Williamson (1985, p. 188-191).

reported in the 1833 Rural Queries. Burnette (1999) uses wage accounts from a farm near Sheffield to measure seasonality and shows that was highly seasonal for females and less seasonal for males. However, this one farm, which was the home farm of an estate, may not be representative of English farming.

Since seasonal unemployment has been indirectly measured, estimates of winter unemployment vary widely. Blaug (1963, p. 154) suggested that "during slack seasons, which comprise from one third to one half of the calendar year, as much as half the labour force may be idle." Feinstein (1998, p. 647) assumes a much more modest 10 percent unemployment. Boyer (1990, p. 89) estimates that 17.0% of labourers were unemployed in the winter, and 6.6% in the summer. Whether the unemployment rate was closer to 10 or 50 percent would have a big impact on the standard of living of agricultural labourers.

Paid farm workers were either indoor farm servants, who received annual wages, or outdoor farm labourers, who received daily or weekly wages. While farm servants were hired for the whole year and theoretically would not have seasonal unemployment, Snell (1985) has shown that in fact there was a seasonal pattern of unemployment for farm servants. Males were least likely to be unemployed in July and August. For females the seasonal pattern was the same in the eighteenth century, but by the nineteenth century the nadir of female unemployment seems to have shifted to the spring. This paper will focus on farm labourers rather than farm servants. Labourers should be more vulnerable to unemployment than servants because they did not have annual contracts, but might be hired or not on a daily basis.

Considering the important consequences attributed to the seasonality of employment, the subject deserves more careful measurement. This paper will measure the seasonality of employment directly, by counting the number of days worked in each quarter. I find that seasonal fluctuations were greater for women than for men, though they were still substantial for men. Harvest wage premiums are not good measures of the seasonality of employment because the elasticity of labour supply varied across regions.

Data

This paper is based on a sample of farm accounts from 65 different farms. For each farm I collected the total number of days worked by men, boys, and females. Gender is assigned based on the worker's first name. Boys are distinguished from men by their wages; males with wages one-half of the median male wage or less are counted as boys.[2] I then divide the total days worked by each type of labourer into quarters of thirteen weeks each.[3] The division of the year into quarters closely matches important transition dates in the agricultural year. The two most important days in the farming year were

[2] See Burnette (2010). The determination of the wage levels for boys is based on wage profiles constructed in Burnette (2006).

[3] I define the first week of the year as the week ending in the range Jan 4 to Jan 10. In years that contain 53 paydays, one is dropped. Where labourers were paid biweekly, pay periods that fell in two quarters were split evenly. I did not use accounts from farms that paid labourers less frequently than biweekly.

Ladyday and Michaelmas. Rent was usually due at these days, and in the south and east servants were hired on Michaelmas.[4] The transitions into the first and third quarters are marked by Christmas and St. John's Day. The first quarter is approximately, but not exactly, Christmas to Lady Day, and the second quarter is approximately Lady Day to St. John's Day.

Figure 1 shows the location of farms in the sample. Farms with a greater portion of total employment in the third quarter are shown in a darker color. Surprisingly, the map does not show a pronounced east/west divide.

Results

To begin the analysis, I average values for multiple years at the same farm, creating a data set with 65 observations, one for each farm. Table One shows the average over the 65 farms of the of the percentage of days worked in each quarter. It is clear that female employment was much more seasonal than male employment. Overall 32.1 percent of total days worked are worked in the third quarter, about fifty percent more days than were worked in either the first or fourth quarters. Females were hardly employed at all in the fall and winter; these quarters account for only 17.5 percent of female employment, compared to 44.8 percent of employment for adult men, and 43.2 percent of employment for boys. While there were seasonal workers of both sexes, only men were regular workers who worked year-round.[5]

The flexibility of female employment allowed male employment to fluctuate less than total employment. However, even large seasonal patterns in female employment only modestly dampen fluctuations in male employment because females were such a small percentage of the labour force. Even at their peak, in the third quarter, female employment only provided 5.4 percent of total annual days worked, or 17 percent of days working during that quarter.

Armstong (1988, p. 64) notes that high levels of seasonal unemployment were not universal. He notes that "seasonal fluctuations were much less in evidence in pastoral areas where livestock provided year-round work, on small estates where a country house and its supporting farm or farms were run as an integrated enterprise, or where alternative occupations were readily available." My data confirm that work was less seasonal on estate farmers, and on pastoral farms. However, I do not find greater seasonal fluctuations in the southeast.

Table Two shows the distribution of work across quarters for different types of farms. Farms are divided into estate, yeoman, and tenant farms. Tenant farms are those for which the occupier paid rent. Estate farms were owned and occupied by someone who received rent on other land owned. Yeoman farms were occupied by a farmer who neither paid nor received rent. The fourth category includes farms where the ownership

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[4] Kussmaul, 1981, p. 50-51.

[5] See Burnette (1999) and Yamamoto (2004)

type is not known, and probably contains a mix of the three types. There is evidence of differences across farm types. Estate farms have less seasonal fluctuations than tenant farms, perhaps because there was more capital improvement work to do during the winter, or because servants and family labour provided year-round employment on tenant farms. While most of the surviving farm accounts are from estates, tenant farms were more typical of English agriculture, so my sample underestimates the seasonality of employment. Below I re-weight the results to account for the fact that I have under-samples tenant farms.

Table Three examines the relationship between farm output and seasonality. For about half of the farms I have information on farm revenues. I divide these farms into mainly arable and mainly pastoral farms, defining arable farms as those that received more than half of their revenues from the sale of grain. Arable farms have more seasonal employment than pastoral farms, though the differences between the two are not as large as we might have expected. Employment in the third quarter was 36.5 percent of total employment at arable farms, and 31.9 percent of total employment at pastoral farms.

Table Four examines the seasonality of employment in different regions. About half of the farms in the sample are located in the Southeast. The results for the Southeast are similar to the overall averages, though the number of women hired relative to men is a bit lower than average. The seasonal pattern of male employment in the Southwest is very similar to that in the Southeast. Females, however, had more regular employment throughout the year in the Southwest than in the Southeast. Compared to the South, the Midlands had a smaller seasonal peak and the North had a larger seasonal peak.

In order to examine whether there were changes over time, I revert to the sample that contains 161 observations, one for each year of data collected. On average each farm has 2.5 years of data, and the largest number of years contributed by any one farm is 21. Table Five gives regressions predicting the percentage of total days worked in the third quarter for both men and women. The low R-squared's indicate that there was a great deal of variation in seasonality which is not explained. There is some evidence that tenant farms had more seasonal employment than estate farms, though the coefficient is only significant for men if regional controls are included.

Other things equal, the decline of service should make the employment of labourers less seasonal, as labourers take over year-round tasks previously done by servants. Since we know the use of servants was declining during this period, this would lead us to expect a negative coefficient on the time trend, indicating that day-labour to become less seasonal over time. There is evidence that female employment became less seasonal over time; in the female regressions the time trend is negative and significant. For males, however, there is no evidence of change over time; the coefficient on trend is positive, but not statistically significant.

The size of the farm affected the seasonality of employment. For males, larger farms had significantly less seasonal employment than smaller farms. This is most likely related to the mix of indoor servants and outdoor labourers. Indoor servants had to be fed and

housed, so larger farms had proportionally fewer indoor servants and more outdoor labourers. This would imply that, at large farms, labourers took over some of the regular tasks that at smaller farms were performed by family member or servants. This explains why larger farms would have less seasonal employment patterns.

Since the sample used for this paper is not representative of farm size or ownership, I construct an estimate of seasonality by re-weighting the sample by farm size and tenancy. Table Six shows the weights used to construct this estimate. I began with the number of farms and the average male employment in 14 size categories from the 1851 census. I constructed two sets of weights, one weighting each category by the percent of male employment in that category, and one weighting each category by the percent of farms in that category. The employment weights will emphasize larger farms, and the farm weights will emphasize smaller farms. In each case I assumed that 80 percent of farms were tenanted and 20 percent were estate farms.[6]

To calculate a re-weighted value for the percent of days worked by men in the third quarter, I use the first regression in Table Five to calculate a predicted percentage for farms in each size/ownership category. For example, for tenant farms of the smallest size I use 0.07 as the size and a value of one for the variable "Tenant". I also assume a value of 110 for trend, so that employment patterns are predicted for 1850. I calculate 28 such numbers and I then use the weights in Table Six to find a weighted average. Table Seven presents the results of this calculation for each type of worker and each quarter. Table Seven suggests greater seasonality than Table One.

The figures in Table Seven suggest that, for men, winter employment was only 55 to 60 percent as high as summer employment. If no harvest workers were drawn from other locations or industries this would imply winter unemployment rates of 40 to 45 percent. Of course, there is ample evidence that agriculture was able to draw on non-agricultural or migrant workers for the peak season. Collins (1976) suggests that during the pre-industrial period farmers relied on local industrial workers to provide extra harvest labour, and that migrant labour took over this role when cottage industry declined.

If workers were imported from other occupations or locations in the third quarter, then second quarter employment may be more accurate measure of the size of the local agricultural labour force. Relative to the second quarter, winter unemployment was 12 to 16 percent. This level of unemployment is slightly higher than Feinstein's unemployment estimate of ten percent. Boyer estimated unemployment rates of 17 percent in the winter and 6.6 percent in the summer. This would imply that 89 percent of those employed in the summer were also employed in the winter, which is similar to the results for men in Table Seven. While I cannot determine what portion of harvest workers were imported, my estimates are consistent with Boyer's findings.

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[6] Thanks to Leigh Shaw-Taylor for this rough estimate.

Are Wages a Good Measure of Employment Seasonality?

Since harvest premiums have been used as measures of the seasonality of employment, it is worth examining the relationship between price and quantity movements. For each farm I identify three wages: winter summer, and harvest. Winter wages are the median males wages for the period October through May. Harvest wages are the maximum wages paid. Summer wage is the median over the period June through September, not including the harvest period. I calculate two measures of the harvest premium: the harvest wage divided by the winter wage, and the harvest wage divided by the summer wage.

Table Eight shows both descriptive statistics and correlations with employment measures. Harvest premiums are positively correlated with third-quarter employment and negatively correlated with both first and fourth quarter employment, which suggests that the wage changes are driven by demand shocks. However, the correlations are small, suggesting that wage premiums are not very accurate predictors of quantity changes.

If different regions have different supply curves, than an increase in the demand for labour at harvest will translate into different wage changes in different regions. Where the supply curve is inelastic, wage changes will be large and quantity changes small. Where the supply curve is elastic, wage changes will be small and quantity changes large. Table Nine shows that the harvest wage premium was largest in the southeast. At the same time, the quantity change in this region was smaller than in the southwest. This suggests that the supply curve was relatively inelastic in the southeast. By contrast, the Southwest had a more elastic supply curve; employment could expand substantially in the third quarter without much increase in the wage. The North also had relatively elastic labour supply, and seems to have had a larger demand for third-quarter employment than the Southwest.

The supply of labour to agriculture should be more elastic where there are people engaged in other occupations who can easily be drawn into agriculture in the peak season. To test this hypothesis, I examine whether agricultural employment expands more in counties with a smaller percentage of families listed as agricultural in the census. The Southeast region was most specialized in agriculture. Since there were fewer non-agricultural workers to draw on, the supply of labour to agriculture was relatively inelastic. The percentage of the population in agriculture was the lowest in the North; there third-quarter employment was 60 percent higher than first quarter employment. This could be accomplished with a relatively small increase in the wage because labour supply was elastic. Table Ten shows the result of adding wage premiums to the regression equations. The wage premium does not have a significant effect on employment in the third quarter. However, the percentage of families in the agriculture does have a significant effect on employment in the third quarter. "Percent in Agriculture" is the percentage of families in the county that were listed as employed in

agriculture in the 1831 census.[7] This variable has a negative effect on relative third-quarter employment. This means that third-quarter employment in agriculture expands more in counties with relatively more non-agricultural employment. The labour supply curve is more elastic where workers in other industries can be drawn into agriculture.

Seasonal changes in wages have been used as an indicator of the seasonality of agricultural wages. However, the strength of the demand shock was not the only factor affecting the size of the wage change. The elasticity of supply was an important determinant of the wage change. Regions with the greatest seasonal wage change were regions with the most inelastic supply of labour. Labour supply was more elastic in areas where relatively more people were employed in non-agricultural occupations.

Threshing Machines and Unemployment

During the Swing Riots many threshing machines were broken, and many were saved only because farmers promised not to use them. Hosbawm and Rude (1968) attribute this hostility to the fact that the threshing machine took away employment during the winter, when employment was particularly scarce. This section will compare employment at farms with threshing machines to employment at farms using hand-threshing. Only farms with evidence of either machine or hand threshing are included in the sample for this section; other farms are dropped. My sample contains five farms that had threshing machines, and 26 farms with evidence of hand-threshing. The earliest date that evidence of a threshing machine appears is 1791. The farms with threshing machines were located in Hampshire, Norfolk, Nottinghamshire, and Shropshire.

The effect of the threshing machine seems to have been to move men's employment from the first quarter to the fourth quarter. Table Eleven shows the distribution employment for machine-threshing and hand-threshing farms. Machine-threshing farms use more men in the fourth quarter, and less in the first quarter. There is also evidence that they use more females and boys in the fourth quarter, perhaps because females and boys can be used for operating the threshing machine.

As has been claimed, threshing machines did reduce winter employment. How much unemployment did a threshing machine cause? First quarter employment was lower at farms with threshing machines, but only by about eight percent. To see if the threshing machine has a significant effect, after controlling for other things, I regress first quarter employment a dummy variable indicating the presence of a threshing machine. Table Twelve shows the results. The presence of a threshing machine does have a negative effect on first quarter employment, though the effect is not statistically significant. The size of the effect is to reduce the portion of employment in the first quarter by 0.026, which is 11 percent of the mean of that variable, and 13 percent of the re-weighted percentage presented in Table Seven. A reduction of winter employment of twelve percent is substantial relative to the levels of unemployment estimated above.

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[7] The percentage of families in agriculture was taken from the 1831 census. P.P. 1833, vol. XXXVI and XXXVII.

Conclusions

This paper has used direct measures of employment from farm accounts to measure seasonal fluctuations in agricultural employment. For adult males first quarter employment was only 84-88 percent of second quarter employment and only 55-60 percent of third quarter employment. Since migrants and industrial workers were used for harvest, winter unemployment was probably closer to 12-16 percent than it was to 40-45 percent. The employment of boys was less seasonal than men's employment, and the employment of females was much more seasonal. Employment at arable farms was greater than at pastoral farms, but pastoral farms still employed more workers in the third quarter than in other quarters. Threshing machines reduced first quarter employment but increased relative employment in the fourth quarter.

Seasonal wage fluctuations are not good measures of fluctuations in employment because the elasticity of demand varied. In some places seasonal demand for harvest labour resulted in relatively large changes in employment with only small increases in wages, while in other places wage changes were large and employment changes were small. This suggests that harvest wage premia should not be used as measures of seasonal employment fluctuations. Labour supply was relatively inelastic in the Southeast, where a greater portion of the population was employed in agriculture.

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Figure One
Farm Locations

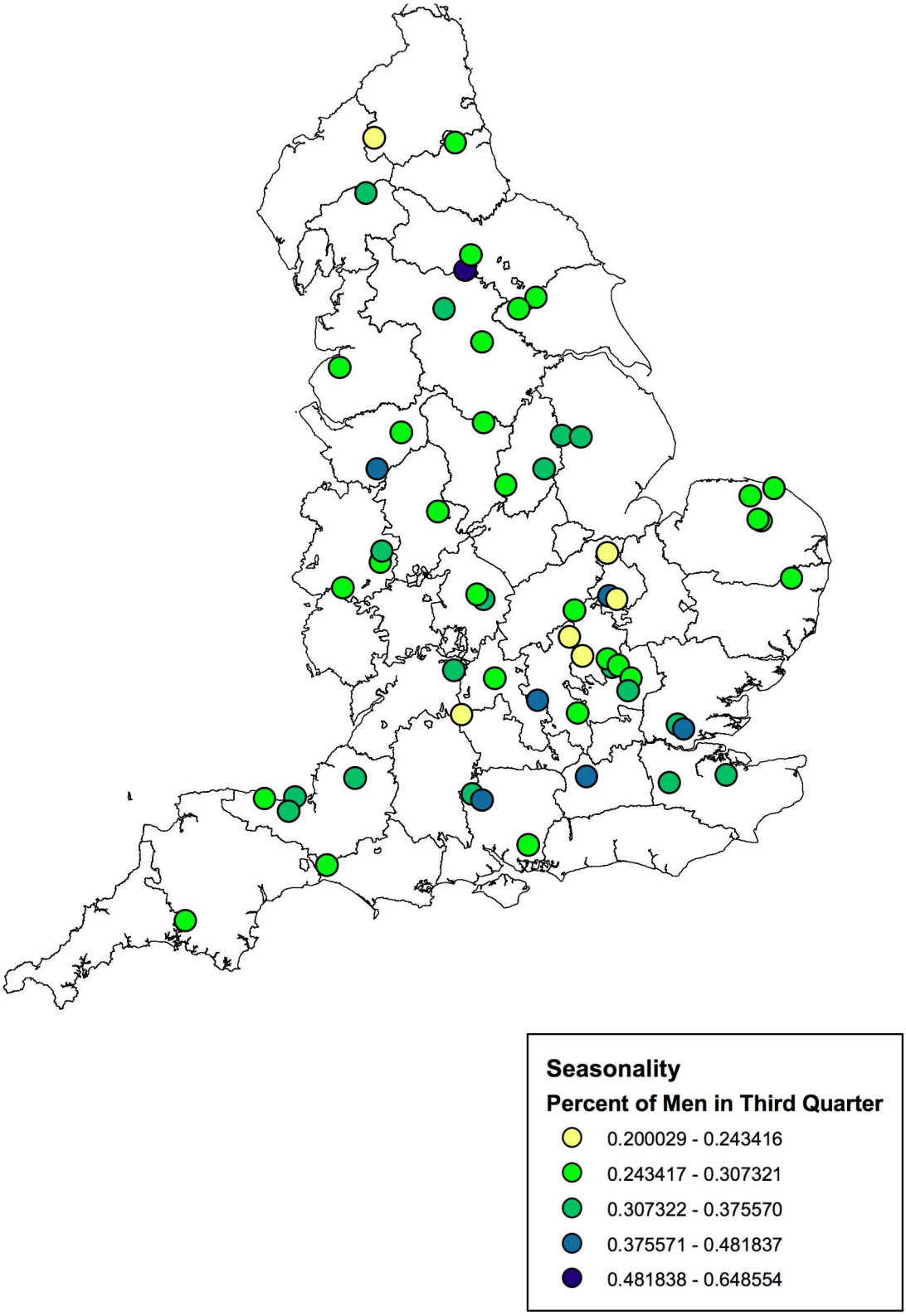

Table One: Distribution of Days Worked by Quarter

	As Percentage of Days Worked Within Type				As Percentage of Days Worked by All Workers		
	Men	Boys*	Females	Total	Men	Boys	Females
Q1	22.9	21.1	8.0	21.3	17.3	2.8	1.2
Q2	23.8	27.7	37.4	25.8	17.9	3.5	4.4
Q3	31.4	29.0	45.1	32.1	23.2	3.5	5.4
Q4	21.9	22.1	9.5	20.8	16.4	3.0	1.4
Min/Max	0.70	0.73	0.18	0.65	0.71	0.80	0.22

* Excludes three farms that did not employ any boys.

Table Two: Distribution of Days Worked by Quarter and Type of Farm

	As Percentage of Days Worked Within Sex				As Percentage of Days Worked by All Workers		
	Men	Boys*	Females	Total	Men	Boys	Females
Estate (n=38)							
Q1	23.6	21.0	7.7	21.8	17.6	3.0	1.2
Q2	24.4	29.4	39.9	26.5	18.2	3.8	4.5
Q3	29.6	29.7	42.3	30.9	21.8	3.6	5.4
Q4	22.3	19.9	10.0	20.8	16.5	2.9	1.5
Min/Max	0.75	0.67	0.18	0.67	0.76	0.76	0.22
Yeoman (n=7)							
Q1	22.3	18.0	20.3	21.7	17.0	2.3	2.4
Q2	22.7	24.4	17.0	22.6	17.4	3.0	2.3
Q3	35.0	23.8	49.5	34.8	26.7	2.9	5.3
Q4	19.9	33.9	13.2	20.9	14.8	3.8	2.3
Min/Max	0.57	0.53	0.27	0.60	0.64	0.61	0.43
Tenant (n=14)							
Q1	21.9	18.6	5.2	20.0	16.6	2.7	0.7
Q2	23.1	26.9	41.5	26.8	17.2	3.4	6.2
Q3	33.9	30.7	46.4	33.0	24.6	3.4	5.1
Q4	21.2	23.8	6.9	20.2	16.0	3.0	1.2
Min/Max	0.63	0.61	0.11	0.61	0.65	0.79	0.11
Unknown (n=6)							
Q1	21.4	29.9	3.7	20.6	17.5	2.5	0.5
Q2	22.6	21.7	32.3	23.0	18.2	2.3	2.5
Q3	32.9	25.7	55.5	34.5	24.8	3.2	6.4
Q4	23.2	22.7	8.5	22.0	18.3	2.7	1.0
Min/Max	0.65	0.73	0.07	0.60	0.71	0.72	0.08

* Excludes three farms that did not employ any boys.

Table Three: Distribution of Days Worked by Quarter Grain Intensity

	As Percentage of Days Worked Within Sex				As Percentage of Days Worked by All Workers		
	Men	Boys*	Females	Total	Men	Boys	Females
Arable Farms (Grain > 50%) (n=12)							
Q1	20.2	18.6	3.2	18.8	15.2	3.2	0.4
Q2	22.5	27.1	40.7	24.6	16.7	4.3	3.5
Q3	35.4	32.8	47.8	36.5	25.7	5.1	5.7
Q4	21.9	20.6	8.3	20.1	16.1	3.0	1.0
Min/Max	0.57	0.57	0.07	0.52	0.59	0.59	0.07
Pastoral Farms (Grain < 50%) (n=19)							
Q1	23.8	24.1	11.7	22.4	17.8	2.6	2.0
Q2	23.2	27.1	37.3	26.1	16.7	3.1	6.4
Q3	32.3	28.2	41.2	31.9	23.0	2.8	6.0
Q4	20.7	21.5	9.8	19.6	15.2	2.6	1.9
Min/Max	0.64	0.76	0.24	0.61	0.66	0.84	0.03

Table Four: Distribution of Days Worked by Quarter and Region

	As Percentage of Days Worked Within Sex				As Percentage of Days Worked by All Workers		
	Men	Boys*	Females	Total	Men	Boys	Females
Southeast (n=33)							
Q1	23.3	21.6	5.1	22.0	18.1	3.5	0.5
Q2	23.7	28.3	41.8	25.7	18.5	4.1	3.1
Q3	31.4	26.5	46.4	31.4	23.9	4.0	3.4
Q4	21.7	23.5	6.7	20.9	16.8	3.6	0.5
Min/Max	0.69	0.76	0.11	0.67	0.70	0.85	0.15
Southwest (n=7)							
Q1	21.4	20.8	13.6	20.1	14.6	2.7	2.7
Q2	23.8	37.9	30.3	26.8	16.5	4.6	5.7
Q3	31.5	25.6	38.7	31.6	21.9	3.3	6.4
Q4	23.3	15.7	17.3	21.6	15.8	2.4	3.4
Min/Max	0.68	0.41	0.35	0.64	0.67	0.52	0.42
Midlands (n=13)							
Q1	24.8	21.5	5.1	21.7	18.6	2.4	0.8
Q2	22.8	23.4	37.5	24.9	17.2	2.7	5.0
Q3	29.6	33.8	49.2	32.6	22.1	3.0	7.5
Q4	22.8	21.2	8.1	20.7	16.9	2.7	1.1
Min/Max	0.77	0.63	0.10	0.63	0.76	0.80	0.11
North (n=12)							
Q1	20.8	18.9	16.6	19.3	15.4	1.3	2.6
Q2	25.1	23.8	28.7	26.7	17.8	2.0	6.9
Q3	33.4	34.1	40.3	33.9	23.2	2.5	8.1
Q4	20.7	23.2	14.4	20.1	14.9	2.0	3.1
Min/Max	0.62	0.55	0.36	0.57	0.64	0.52	0.04

Table Five: Determinants of Third-Quarter Employment

Dependent Variable = Portion of Days Worked in the Third Quarter

	Men	Men	Boys	Boys	Females	Females
Constant	0.299*	0.3002*	0.3261*	0.3351*	0.5889*	0.6003*
	(0.0177)	(0.0184)	(0.0432)	(0.0445)	(0.0563)	(0.0583)
Trend	0.0004	0.0004	–0.0001	–0.0006	–0.0016*	–0.0017*
	(0.0002)	(0.0002)	(0.0005)	(0.0006)	(0.0007)	(0.0007)
Size	–0.0020*	–0.0020*	–0.0015	–0.0016	–0.0048	–0.0049
	(0.0009)	(0.0008)	(0.0021)	(0.0021)	(0.0027)	(0.0027)
Tenant	0.0304	0.0323*	–0.0277	–0.0285	0.0104	–0.000
	(0.0162)	(0.0163)	(0.0396)	(0.0395)	(0.0517)	(0.0517)
Yeoman	0.0378	0.0309	–0.0819	–0.0384	0.0483	0.0696
	(0.0224)	(0.0228)	(0.0626)	(0.0644)	(0.0758)	(0.0766)
Unknown	0.0183	0.0175	–0.0530	–0.0525	0.1067	0.0995
	(0.0221)	(0.0223)	(0.0522)	(0.0523)	(0.0701)	(0.0707)
Southwest		0.0034		–0.0158		–0.0076
		(0.0205)		(0.0479)		(0.0649)
Midlands		–0.0228		0.0743		0.0638
		(0.0165)		(0.0402)		(0.0522)
North		0.0078		0.0919		–0.0338
		(0.0177)		(0.0488)		(0.0577)
R^2	0.11	0.13	0.02	0.02	0.09	0.09
N	161	161	151	151	160	160
Sum of Weights	64	64	60	60	63	63

Table Six: Distribution of Farm Size in 1851

Farm Size	Average Male Labourers	Average Total Labourers	Number of Farms	Weight by Employment Estate	Weight by Employment Tenant	Weight by Farms Estate	Weight by Farms Tenant
Under 5 acres	0.06	0.07	18,975	0.0003	0.0013	0.0133	0.0533
5–	0.13	0.15	25,299	0.0010	0.0038	0.0178	0.0710
10–	0.60	0.66	93,025	0.0161	0.0642	0.0653	0.2611
50–	1.44	1.59	33,515	0.0139	0.0556	0.0235	0.0941
75–	1.99	2.20	19,759	0.0113	0.0452	0.0139	0.0555
100–	3.03	3.35	34,044	0.0297	0.1187	0.0239	0.0956
150–	4.36	4.83	18,463	0.0232	0.0928	0.0130	0.0518
200–	4.83	5.34	15,492	0.0216	0.0862	0.0109	0.0435
250–	7.02	7.76	7,111	0.0144	0.0575	0.0050	0.0200
300–	8.96	9.91	9,031	0.0233	0.0932	0.0063	0.0254
400–	11.65	12.89	4,067	0.0137	0.0546	0.0029	0.0114
500–	14.37	15.89	2,248	0.0093	0.0372	0.0016	0.0063
600–	18.54	20.51	2,816	0.0150	0.0602	0.0020	0.0079
1000+	22.32	24.68	1,132	0.0073	0.0291	0.0008	0.0032

Source: A.H. John, "Statistical Appendix", in Joan Thirsk, ed., *The Agrarian History of England and Wales*, vol. VI, 1750-1850, Cambridge, Cambridge Univ. Press, 1989, pp. 1072-3. Calculations exclude farms of unknown acreage. Average male labourers is somewhat underestimated because I use the lower bound of each interval. (For farms with between 10 and 14 labourers, I estimate 10 labourers.)
To obtain Total Labourers, I assume that female labourers were 10.6 percent of the total labor force.

Table Seven: Percent Distribution of Employment, Re-weighted by Farm Size and Tenancy

	Men	Boys	Females	Total
Weighted by Employment				
Q1	20.6	24.2	3.8	18.9
Q2	23.4	21.8	46.1	27.8
Q3	34.7	28.2	38.7	32.5
Q4	21.5	25.8	11.4	20.9
Weighted by Farms				
Q1	19.8	23.7	2.9	18.0
Q2	23.6	22.0	44.9	28.1
Q3	35.7	29.0	41.1	33.5
Q4	20.9	25.4	11.1	20.5

Table Eight: Wage Premiums

	Harvest/Winter	Harvest/Summer
Average	1.52	1.45
Std. Dev.	0.61	0.60
Min	1.00	1.00
Max	4.00	3.81
N	146	145
Correlation with Percent Men in Quarter		
1	–0.09	–0.09
2	0.02	–0.01
3	0.11	0.14
4	–0.06	–0.08

Table Nine: Havest Premiums and Quantity Premiums for Men by Region

Region	Harvest Wage/ Winter Wage	Third Quarter/ First Quarter Employment	Percent of Families in Agriculture
Southeast	1.88	1.35	44.8
Southwest	1.19	1.47	34.2
Midlands	1.22	1.19	29.3
North	1.28	1.61	22.4

Table Ten: Regressions of Percent Employment in Third Quarter on Wage Premia

Dependent Variable = Portion of Days Worked by Men in the Third Quarter

Constant	0.3044*	0.3137*	0.3848*
	(0.0165)	(0.0273)	(0.0339)
Harvest Premium	0.0021	0.0002	0.0143
	(0.0098)	(0.0120)	(0.0123)
Trend		0.0001	–0.0000
		(0.0002)	(0.0002)
Size		–0.0013	–0.0015*
		(0.0008)	(0.0008)
Tenant		0.0131	0.0220
		(0.0157)	(0.0153)
Yeoman		0.0373	0.0419*
		(0.0215)	(0.0208)
Unknown		0.0231	0.0288
		(0.0198)	(0.0192)
Southwest		–0.0008	–0.0092
		(0.0204)	(0.0199)
Midlands		–0.0070	–0.0257
		(0.0174)	(0.0177)
North		–0.0219	–0.0522*
		(0.0185)	(0.0201)
Percent in Agriculture			–0.0021*
			(0.0006)
R^2	0.000	0.086	0.156
N	146	146	146

Table Eleven: The Effect of Threshing Machines on Seasonality

	Threshing Machine	Hand Threshing
Men		
Q1	21.7	23.5
Q2	23.3	22.9
Q3	30.7	32.0
Q4	24.2	21.6
Boys		
Q1	22.4	22.8
Q2	24.8	24.6
Q3	25.2	31.1
Q4	27.6	21.5
Females		
Q1	7.0	7.6
Q2	47.9	38.1
Q3	35.9	47.4
Q4	9.2	6.9
Females as Percent of Total Labor	9.9	9.8
Boys as Percent of Total Labor	15.0	12.2

Table Twelve: The Effect of Threshing Machines on First Quarter Employment

Dependent Varaible = Percent of Men's Employment in First Quarter

Constant	0.2502*
	(0.0283)
Threshing Machine	–0.0256
	(0.0283)
Trend	–0.0006
	(0.0004)
Size	0.0019
	(0.0018)
Tenant	–0.0094
	(0.0272)
Yeoman	0.0110
	(0.0327)
Unknown	–0.0215
	(0.0273)
Southwest	0.0212
	(0.0573)
Midlands	0.0697*
	(0.0324)
North	0.0328
	(0.0313)
R^2	0.127
N	69
Sum of Weights	31