Markets and Famines: Evidence from Nineteenth-Century Finland*

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I. Introduction

How markets function during famines is an abiding issue in economics. A tradition extending back at least as far as the French *économistes* of the mid-eighteenth century and reinforced in recent work by Jean Drèze and Amartya Sen argues strongly for the power of market forces to prevent famines. In this view, allowing farmers the benefit of free-market prices maximizes the normal harvest, thereby making future poor harvests, defined as proportionate shortfalls from the norm, less disastrous. How markets function during famines is a separate issue, but here too markets have long had their defenders in the economics literature, notably Adam Smith and Edmund Burke. Another more populist tradition argues that, on the contrary, well-functioning markets may exacerbate subsistence crises by allowing monopolists a field day or even by removing food from where there is no purchasing power for food to richer, less affected areas.[1] Versions of this tradition are articulated in fictional accounts of famine such as Alessandro Manzoni's *I Promessi Sposi* (describing seventeenth-century Lombardy) and William Carleton's *The Black Prophet* (describing nineteenth-century Ireland). Few economists would argue, like the fictional characters in those works, that markets cause famines. However, some would support a third tradition, which holds that markets may not function well during famines for a variety of reasons. The problem might be one of intertemporal allocation, as when producers miscalculate their prospects and hold back supplies. False hopes of yet higher prices may generate ''bubbles'' in the markets for staple foods.[2] Or the problem could be spatial: local or regional markets might become balkanized because bad weather disrupts communications, because the pressures of ''moral economy'' intervene to prevent food shipments dictated by market forces, or because famine conditions produce ''noisy'' information about fundamentals.

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In this article, I use information on grain prices from mid-nineteenth century Finland to shed some light on how markets performed during one important, if unduly neglected, famine, the Great Finnish Famine of 1866–68. I examine regional variations in prices to test whether the famine dulled price transmission between regions. I examine intraseasonal movements in prices for evidence on the increased hoarding of grain. The Finnish famine, Europe's last major peacetime subsistence crisis, resulted in the deaths of over 100,000 people out of a total population of 1.8 million. Largely ignored in famine historiography outside Finland, the famine was preceded by a series of poor harvests, reflected in high grain prices. Hunger- and fever-induced mortality had already been about one-third above the norm in 1866 and 1867, reducing the natural increase of the population below zero. As a result the Finnish poor were ill-equipped to cope with the massive harvest failure of 1867. In 1868 deaths peaked at 77.6 per thousand, almost three times the average. The crisis also reduced births and marriages, though by smaller amounts; marital fertility in 1868 was less than two-thirds its 1860–64 average. A sense that a tardy and insufficient public policy reaction exacerbated the crisis influenced both memory and Finnish historiography.[3]

In the 1860s Finland was a poor and largely agrarian country. Heavily forested and dotted with large lakes, and with only about 8% of its landmass under cultivation, it was sparsely populated. Yet the population had grown fast in the decades before 1865—at an annual rate of 0.8%—and would grow faster in the wake of the famine. Throughout most of the country internal communications, though improving, were not good, particularly in bad weather; according to Yrjö Kaukiainen, ''Although the grain trade was practically free, markets were underdeveloped and a subsistence economy prevailed.''[4] There was an increasing trade in grain between Saint Petersburg, Tallinn, Riga, and coastal Finland, but away from coastal areas the long-distance carriage of grain must have been on a small scale. On the eve of the famine, rye accounted for well over one-half of Finnish grain production. Sown in the autumn, it was the staple food of the poor; in southern Finland oats were also produced in large quantities, mainly as fodder for horses.[5] In the north (as in northern Sweden and parts of Norway) barley was a staple bread grain.[6]

How did the markets for food work in Finland in the 1860s? In this article, I examine both spatial and intertemporal dimensions. The data I use here refer to the monthly province-level price of two of the main grain crops, rye and barley, in urban and rural areas between 1858 and 1873.[7] Like the French *mercuriales* and the Scottish ''fiars'' prices analyzed by Naomi Mitchison and by Alex Gibson and Christopher Smout,[8] these data more than adequately reflect supply and demand. There are a few short (i.e., 1-month or 2-month) gaps in the series, which I filled through simple interpolation. This seemed the most sensible way to fill

the gaps, though the possibility that they exist because of the fact that prices could not be determined, since no grain was sold, cannot be rejected. I use the data to check on spatial variation before and during the crisis (Sec. II) and the speed of adjustment of the different regional series to one another (Sec. III). Section IV focuses on deviations from ''normal'' price seasonality patterns as a possible indicator of hoarding. Section V offers a brief conclusion.

The *mercuriales* and the fiars price data refer to prices in particular cities or towns. However, the Finnish price data are provincial averages; they refer to the Finnish mark or Russian rouble price per barrel (4 marks = 1 rouble) in the eight administrative provinces of Uusimaa, Turku, Häme, Viipuri, Vaasa, Mikkeli, Kuopio, and Oulu, as defined in the 1860s.[9] They are unweighted averages of prices in the jurisdictional districts or towns and cities in the province in question (see fig. 1A). The provinces of Uusimaa (which contains Helsinki) and Turku were located along or near the south and southwest coasts, respectively, and were relatively more developed and commercialized than the rest of the country in the 1860s; most remote and sparsely populated was the vast province of Oulu in the north. Oulu, which then encompassed Finnish Lapland, contained nearly half the landmass of Finland but only one-tenth of the population. Mikkeli and Kuopio in central Finland were probably the poorest provinces, less populated and less accessible than Häme and Viipuri further south. However, a canal linking Viipuri to the Saimaa lake system had opened for traffic in 1856, and this led to a trade in grain between Saint Petersburg and Mikkeli and Savonlinna.[10] Vaasa (southern Ostrobothnia) stretched from the relatively prosperous west coast to a heavily forested interior 150 kilometers away. As figure 1 shows, mortality rates were greatest in Kuopio, Vaasa, Häme, and Oulu; broadly speaking, high mortality was associated with regions where the harvest shortfall was greatest. Still, one-quarter of all deaths occurred in regions that were not severely affected by the harvest decline, and migration proved a powerful transmission mechanism for famine-related diseases.[11]

For the most part Finnish agriculture in the 1860s was backward and holdings were small. The railway had yet to reach inland; indeed, the first line connecting Helsinki and Hämeenlinna had been built only in the early 1860s.[12] The population was overwhelmingly rural. On the eve of the famine, only about one Finn in 14 lived in an urban community. Table 1 reports output and trade data for rye, oats, and barley. It highlights both the drastic character of the failure in 1867 and the relative unimportance of foreign trade. In Finland's case foreign trade neither stabilized consumption, as posited by some classical economists, nor undermined entitlements in the manner described by Drèze and Sen. Note, however, that the significant imports of rye accompanying the poor harvests in the early 1860s were not repeated in 1867–68. The storage requirements imposed by low average yield ratios—about six for rye and

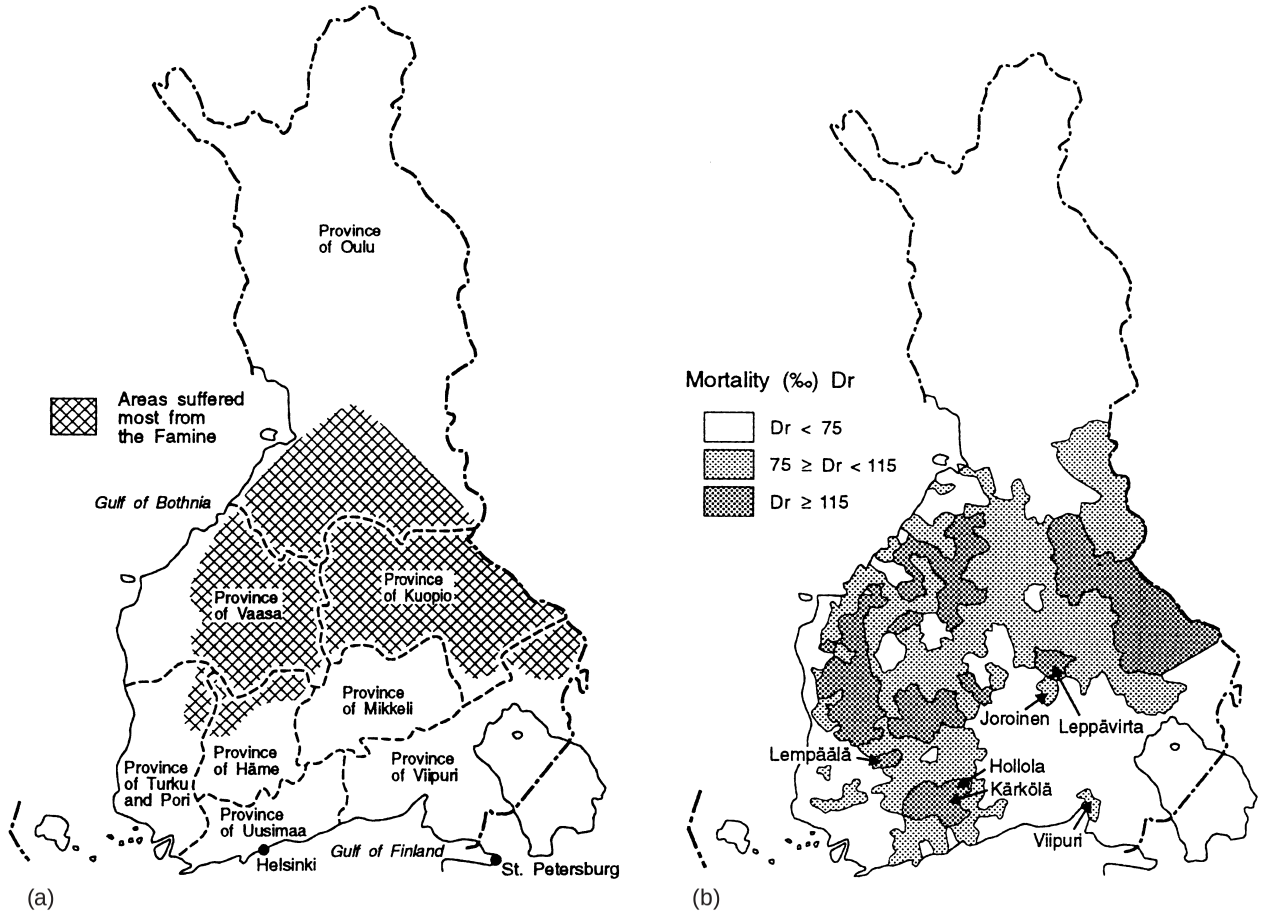

FIG. 1.—Finland in the 1860s and the areas worst affected by the famine

TABLE 1

PRODUCTION, EXPORTS, AND IMPORTS OF RYE, OATS, AND BARLEY 1860–69 (in 1,000 metric tons)

	RYE			OATS			BARLEY	
YEAR	Harvest	Exports	Imports	Harvest	Exports	Imports	Harvest	Imports
1860	256.0	2.2	.5	83.2	4.5	.3	119.2	.5
1861	228.7	7.4	1.4	81.3	7.6	.7	124.0	.5
1862	173.5	2.2	29.9	70.6	2.7	2.1	75.4	9.0
1863	221.7	.8	22.5	74.1	3.6	2.5	105.6	3.5
1864	249.3	1.5	11.7	67.8	2.6	2.4	95.3	2.5
1865	173.9	2.0	15.8	66.2	.1	2.9	101.2	3.6
1866	218.4	.5	6.4	88.0	2.4	1.4	113.9	1.2
1867	128.4	2.6	7.0	52.6	5.3	1.0	60.6	3.0
1868	220.8	.5	7.0	66.8	2.0	3.0	112.0	6.9
1869	269.6	2.6	2.9	96.9	6.5	1.9	129.4	.8

SOURCE.—Kaarina Vattula, ed., *Suomen taloushistoria 3* (Helsinki: Kustannusosakeytiö Tammi, 1983), pp. 81, 188, 192.

TABLE 2

THE SHORTFALL IN GRAIN PRODUCTION BY PROVINCE IN 1867

Province	Average Shortfall (1867)	Harvest per Head (Barrels; 1867)	Implied Norm (Barrels; 1869–72)
Varsinais-Suomi*	60	1.75	2.9
Viipurii	59	.9	1.5
Häme	38	.85	2.2
Mikkeli	56	1.25	2.2
Kuopio	26	.7	2.7
Turku	35	.7	2.0
Uusimaa	44	1.0	2.3
Vaasa	39	.95	2.4
Oulu	46	1.05	2.3

SOURCE.—Derived from Yrjö Kaukiainen, ''Harvest Fluctuations and Mortality in Agrarian Finland (1810–1870),'' in *Pre-industrial Population Change: The Mortality Decline and Short-Term Population Movements*, ed. Tommy Bengtsson, Gunnar Fridlizius, and Rolf Ohlsson (Stockholm: Almqvist & Wiksell, 1984), p. 245. The barrel used here translates into 1.65 hectoliters or, given the output mix indicated in table 1, roughly 100 kilograms.

* The province of Finland proper.

four for barley—can only have intensified the problem of food availability.[13] Table 2 indicates where the harvest shortfall was most severe in 1867.[14] Assuming that per capita consumption was roughly equal across provinces leaves little scope for interregional trade in grain in normal years; the implied deficit in coastal Viipuri (Vyborg) reflects its considerable reliance on imports from nearby Saint Petersburg.

II. A Spatial Approach

The coefficients of variation of the prices of barley and rye in the eight provinces, averaged over the months between October 1858 and December 1873, were as follows:

	Rural	*Urban*
Barley	.096	.095
Rye	.079	.080

Such coefficients of variation, given the large size of Finland, do not seem unduly high. They may be compared with coefficients of variation of 0.109 for oatmeal and 0.249 for potatoes in Scotland in 1843 and of about 0.3 for potatoes in Ireland in the early 1840s.[15] Given the presumption of broad self-sufficiency in the different provinces, this low spatial variation is an interesting outcome.

The Law of One Price, which can be traced back at least to the Irish-born economist Richard Cantillon (d. 1734), argues that in a well-

integrated market persistent price differences between regions stem largely from transport costs. Let T be a vector of the (constant) costs of shipping grain from a region to the most expensive region, and let P_N and P_F be vectors of normal and famine grain prices, respectively. Then the Law of One Price implies that standard deviation (SD) of prices across regions, σ, will reflect T. Normally, P_F will exceed P_N; certainly, in nineteenth-century Finland, prices tracked harvest fluctuations quite well.[16] However, unless T changes, with well-functioning markets arbitrage will produce $\sigma(P_F) \leq \sigma(P_N)$.

A simple example should help make this clearer.[17] Let P_N be a vector of prices in four regions—A, B, C, and D—in normal times. Given the vector of transport and distribution costs, T, these prices reflect the Law of One Price. Next let $P_F(1)'$ and $P_F(2)'$ describe what prices would be in the absence of trade in two situations of harvest failure, $F(1)$ and $F(2)$. In $F(1)$ the failure is most serious in food-exporting areas. Unless T is affected, the higher prices obtaining in regions A and B will cause food to remain in them, and prices will remain at $P_F(1)'$. In $F(2)$, the failure in the supplying areas is such that reverse flows of food from normally deficit regions are necessary to reflect the Law of One Price. Such flows would establish an equilibrium vector such as $P_F(2)$. In $F(3)$ the failure is most serious in the consuming areas. In the absence of trade, prices would be at $P_F(3)'$, but trade flows lead to the equilibrium vector of $P_F(3)$. Note that σ, the SD of prices across regions, is the same in $F(2)$ and $F(3)$ as in N, and less in $F(1)$ than in N. Given these assumptions, a rise in σ would be consistent with the failure of the Law of One Price to operate, due to markets becoming more segmented (see table 3). In this article, I exploit a data set of monthly grain prices between October 1858 and December 1873 in urban and rural areas in eight provinces of Finland. The data refer to provincial averages. Figure 2 describes trends in the mean price of the main food grain, rye, and its SD. Clearly, the mean and the SD tended to move in tandem in these years. This is con-

TABLE 3

MODELING THE LAW OF ONE PRICE

	REGIONS					
	A	B	C	D	MEAN	σ
P_N	2.0	3.0	4.0	4.0	3.38	.96
T	2.5	1.5	.5	.0	. . .	. . .
$P'_{F(1)}$	3.0	3.5	4.0	4.5	3.75	.56
$P'_{F(2)}$	8.0	7.0	4.0	4.5	. . .	. . .
$P'_{F(2)}$	7.5	6.5	5.5	5.0	6.13	.96
$P'_{F(3)}$	2.0	3.0	5.0	6.0	. . .	. . .
$P_{F(3)}$	2.5	3.5	4.5	5.0	3.88	.96

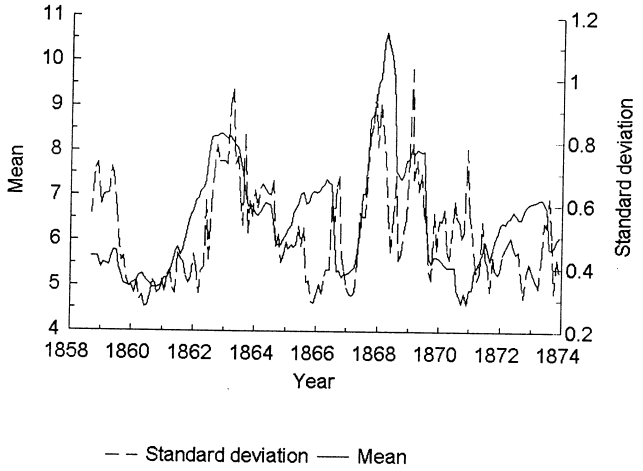

FIG. 2.—Mean and standard deviations: rye prices in Oulu, 1859–73

firmed by correlating the mean and the SD of prices in the different provinces over the same period, which produced the following results:

Crop	*Urban*	*Rural*
Rye	.587	.520
Barley	.823	.755
Oats	.582	.376

The question is whether these positive correlations are an indication that the markets became more segmented in years of crisis. Table 4, which describes the price of rye in the eight provinces over both the period as a whole and subperiods between 1859 and 1873, offers some clues. Both

TABLE 4

MEAN MONTHLY PRICE OF RYE BY PROVINCE (Rural Areas)

Province	1859–73	1859–64	1867–68	1870–73	Rise1	Rise2
Uusimaa	25.70	24.64	32.52	22.31	32.0	45.7
Turku	25.72	24.46	33.84	23.33	38.4	45.1
Häme	25.20	24.00	32.49	22.25	35.4	46.0
Mikkeli	26.31	24.34	30.52	25.17	25.4	21.2
Viipuri	25.44	24.97	29.02	23.42	16.2	23.9
Kuopio	26.87	26.74	30.76	25.03	15.1	22.9
Vaasa	25.00	24.30	30.73	22.10	26.5	39.0
Oulu	28.11	27.64	33.42	25.98	20.9	28.6
Mean	26.04	25.14	31.66	23.70	...	...
Standard deviation	.963	1.236	1.548	1.408	...	...

NOTE.—Rise1 = [(1867–68) − (1859–64)]/1859–64; Rise2 = [(1867–68) − (1870–73)]/1870–73; all prices converted to Finnish marks.

before and after the famine, prices were normally highest in the northern provinces of Oulu and Kuopio, with the mean price in Oulu being on average 10%–15% higher than that in Vaasa or Häme. However, during the famine years (1867–68) the proportionate price rises were greatest in the southwestern provinces of Uusimaa, Turku, and Häme, with the result that levels in those provinces were exceeded only by those in Oulu. The severe harvest shortfalls in Uusimaa, Turku, and Häme in 1867–68 (see table 2) may account for the increases, and the poverty of Kuopio and Oulu for the failure of prices in those provinces to rise in tandem. Put another way, in Kuopio and Oulu an ''entitlements'' failure may have compounded the problem caused by poor harvests. However, the widening gap between prices in Uusimaa-Turku-Häme and in Viipuri in 1867–68 leaves unresolved the question why more grain did not flow west from Viipuri during the famine.

The 1870–73 data suggest that the earlier pattern reestablished itself in the wake of the famine. This suggests that in normal times small interprovincial movements in grain seem to have been enough to maintain the pattern observed before and after 1867–68. At the height of the crisis, however, I can only speculate that interprovincial trade or imports from outside Finland were insufficient to maintain the kind of equilibrium price vector assumed in my model. Indeed some interprovincial flows may have been reversed. However, the lack of data on internal trade and the cost of transport preclude firm conclusions here.[18] Two other perspectives on the same grain price data prove more promising.

III. An Error-Correction Approach

The Law of One Price is about the presence of an equilibrium price vector. However, prices will typically deviate from their equilibrium values. The arrival of a grain shipment in region A, for example, might cause a temporary drop in prices there relative to other regions, while merchants arrange the trades that restore the equilibrium price vector. In the notation of Section II, it will take time for trade to change $P_F(2)'$ or $P_F(3)'$ to $P_F(2)$ or $P_F(3)$. If markets are functioning properly, however, significant deviations from equilibrium prices will be quickly arbitraged away. Did markets in Finland in the 1860s function in this manner? The question suggests an error-correction model (ECM) approach to the hypothesis that the speed of reaction was slower during the crisis than either before or after. My choice of model was governed by the nature of my data but it is a simpler variant of one widely applied in the agricultural economics and development literature.[19]

Before estimating an ECM the individual price series must be tested for stationarity. I accordingly applied the augmented Dickey-Fuller unit root test to each price series to be used. In no case could the null hypothesis of a unit root be rejected at the 5% significance level. When testing for cointegration between the relevant series using the residual-based

augmented Dickey-Fuller method, only in two cases (Viipuri-Vaasa, Uusimaa-Vaasa) could the null of a unit root in the residuals be rejected. While my results for those two pairs are reported with the rest, they must be treated with due caution.

I estimate a version of the following simple and extremely familiar representation of the error-correction model:[20]

$$\Delta P_{i,t} = a_t + b\Delta P_{\mathrm{A},t} + c(P_i - P_{\mathrm{A}})_{t-1} + e_{it}, \quad (1)$$

where P is price, A is Region A, and i is any other region. Writing the model in this way offers the intuitive interpretation that agents adjust to $P_{i,t}$ from $P_{i,t} - 1$ in response to changes in P_{A} (with b measuring the short-run effect) and the previous disequilibrium $(P_i - P_{\mathrm{A}})_{t-1}$. The coefficient c captures the error-correction feedback element; it measures the speed of adjustment of P_i to a discrepancy between P_i and P_{A} in the previous period. Representing the years of severest harvest failure and famine, 1867 and 1868, by interaction dummies is an amended version of equation (1):

$$\Delta P_{i,t} = a_t + b\Delta P_{\mathrm{A},t} + c(P_i - P_{\mathrm{A}})_{t-1} + d\mathrm{FAM1} + e\mathrm{FAM2} + e'_{it}, \quad (2)$$

where

$$FAM1 = FAMDUM\Delta P_{A,t-1}$$
$$FAM2 = FAMDUM\alpha(P_A - P_i)_{t-1}.$$

This includes a new variable, FAMDUM, which is set equal to unity for each month in 1867 and 1868 and zero otherwise. The interaction terms FAM1 and FAM2 allow us to see whether markets behaved differently during the crisis than they did in more normal times. An outcome of $d > 0$ would indicate that contemporaneous price movements were more synchronized during the crisis than normally; $e > 0$ would suggest that markets adjusted more slowly during the famine than either before or after.

The data refer to the price of rye, by far the most important of Finland's grain crops from October 1858 to December 1872. Three sets of results, using log values of prices throughout, are reported below. First, I examine the response of the other seven provinces to price movements in the provinces of Vaasa and Viipuri, respectively. The results of this

exercise are summarized in table 5. Second, I look at the reaction of prices in the northern province of Oulu to price movements in the other seven provinces (table 5). Vaasa and Viipuri were chosen as likely market leaders because they were coastal provinces or, as was also in the case of Viipuri, located next to Russian markets. Therefore, they were most likely to be the channels for outside market influences, while prices in remote and sparsely populated Oulu were likely to react to, rather than lead, those elsewhere.

Table 5 describes the response of movements in the other provinces to rye prices in Vaasa and in Viipuri. Note first that in all cases the estimated values of *b* and *c* coefficients bear the expected signs and are statistically significant.[21] The spatial pattern of the responses is also plausible. In the case of Vaasa, comovements (reflected in values of *b*) were most synchronized and the speed of adjustment (reflected in values of *c*) was fastest in neighboring provinces and slowest in Uusimaa and Viipuri to the south. In this respect Oulu and Häme followed Vaasa most closely. Viipuri's prices were replicated best in the provinces of Häme, Mikkeli, and Kuopio to its north and west; these three provinces were also quickest to erode gaps between their prices and those obtaining in Viipuri.

Table 5 also describes how the price of rye in Oulu province responded to contemporaneous movements in prices elsewhere and to disequilibrium gaps in prices. The outcome suggests that over the period as a whole prices in Oulu responded fastest to movements in the provinces of Vaasa, Turku, Häme, and Kuopio (in that order). This is broadly plausible as three of these provinces either shared an extensive border with Oulu or were located next to the coast.

Table 5 also describes how the famine affected comovements and the speed of response in those three provinces. It reports the estimated values of the *d* and *e* coefficients in equation (2). In all cases the estimates of *d* were positive, and the size of *b*, the coefficient on P_A, was reduced by the inclusion of FAM1. This suggests that prices were more synchronized during the famine than in other periods. Including FAM2 produced more mixed results. In Oulu and Kuopio prices adjusted faster to gaps between the prices in these provinces and those in neighboring Vaasa (table 5), but otherwise there was no consistent pattern to this ''famine effect.'' The mostly positive signs on *e* in table 5 are consistent with slower reactions at the height of the crisis to emerging gaps between prices in Viipuri province and those obtaining in other provinces. However, the coefficients were small and always statistically insignificant. In the case of Oulu (table 5) a markedly quicker response to disequilibria in Vaasa, Turku, and Uusimaa is indicated.

IV. Seasonality and Storage

In a study published in 1984, D. N. McCloskey and J. Nash ingeniously sought to infer storage costs and interest rates in medieval and early

TABLE 5

ESTIMATING MARKET RESPONSE

	COEFFICIENTS			
	b	*c*	*d*	*e*
Vaasa as market leader				
Adjustment in:				
Oulu	.637	−.272	.893	−.332
	(.092)	(.054)	(.213)	(.097)
Kuopio	.499	−.086	.861	−.134
	(.084)	(.031)	(.191)	(.105)
Turku	.684	−.152	.223	.053
	(.076)	(.049)	(.185)	(.113)
Viipuri	.340	−.049	.334	−.067
	(.079)	(.028)	(.178)	(.066)
Mikkeli	.669	−.139	.267	.095
	(.106)	(.041)	(.246)	(.083)
Uusimaa	.452	−.023	.357	−.075
	(.076)	(.032)	(.165)	(.067)
Häme	.973	−.231	.015	−.026
	(.149)	(.056)	(.318)	(.150)
Viipuri as market leader				
Adjustment in:				
Turku	.367	−.096	.221	.054
	(.087)	(.042)	(.196)	(.070)
Uusimaa	.380	−.118	.437	−.017
	(.079)	(.050)	(.158)	(.100)
Kuopio	.413	−.193	.819	.029
	(.087)	(.049)	(.175)	(.091)
Mikkeli	.429	−.218	.553	.110
	(.108)	(.050)	(.223)	(.187)
Vaasa	.328	−.064	.241	.054
	(.075)	(.027)	(.163)	(.068)
Häme	.539	−.209	.640	.014
	(.150)	(.053)	(.313)	(.151)
Oulu	.418	−.118	.636	−.114
	(.108)	(.047)	(.233)	(.080)
The response in Oulu				
Adjustment in:				
Uusimaa	.262	−.158	1.033	−.098
	(.104)	(.044)	(.178)	(.094)
Häme	.096	−.192	.840	−.192
	(.049)	(.036)	(.120)	(.098)
Mikkeli	.319	−.110	.266	−.057
	(.079)	(.055)	(.190)	(.094)
Turku	.265	−.259	1.059	−.264
	(.082)	(.052)	(.190)	(.134)
Kuopio	.401	−.168	.803	−.450
	(.083)	(.046)	(.147)	(.128)

modern Europe from the seasonality patterns observed in grain prices.[22] Their argument was built on the simple premise that those who store grain must in equilibrium be rewarded for the opportunity cost of tied-up funds and for losses from wastage during the storage period. A saw-toothed price seasonality pattern is indicated, with low prices in the wake of the harvest giving way gradually to a maximum before the new harvest comes in. The more important were fixed costs such as storage facilities and security, the less sensitive would be seasonal increases to the quality of the harvest. Abstracting from other complications, this means that in a well-functioning market, seasonality would mean at most the same proportionate increases in prices in bad years as in good ones.

In reality this presumption is complicated by the presence of carry-over stocks from one harvest to the next, and in practice there is considerable variation, or ''noise,'' in the month-to-month and seasonal movements.[23] Nevertheless, in a contribution on the role of markets in the Great Irish Famine of the 1840s, I found that potato prices before the crisis were subject to marked seasonality, and I exploited that regularity to argue that strong deviations from the established pattern might be interpreted as evidence of hoarding or panic selling.[24] If, on the one hand, the seasonal rise in prices during the crisis was less than normal, this might indicate that producers were holding on to potatoes in hopes of much higher prices at the end of the season. If, on the other hand, potato prices rose much faster than usual early in the season, this could reflect either the fears of producers that their stocks of potatoes might succumb to the potato blight or the desperation of consumers.

Here I compare the average rises in rye and barley prices between September in year t and June in year $t + 1$ in ''normal'' years and in the famine year of 1867–68 in rural districts in the provinces of Oulu, Uusimaa, Vaasa, Kuopio, and Mikkeli. The results, which refer to the period 1859–73, are summarized in table 6.[25] The outcome shows the seasonality pattern noted by McCloskey and Nash. Both rye and barley

TABLE 6

THE SEPTEMBER–JUNE RISE IN RYE AND BARLEY PRICES

	Oulu	Uusimaa	Vaasa	Kupio	Mikkeli
Rye:					
Mean increase (%)*	9.6	8.1	11.3	12.2	13.8
Standard deviation*	13.0	9.2	8.3	11.9	13.1
Increase in 1867–68 (%)	22.9	31.5	29.0	38.1	43.7
Barley:					
Mean increase (%)*	14.6	7.2	15.1	12.2	13.0
Standard deviation*	14.4	7.0	10.9	10.0	7.3
Increase in 1867–68 (%)	40.9	30.4	56.4	38.1	39.9

* Excluding 1867–68.

prices were about 10% higher in June than in the previous September, though the increase was subject to considerable year-to-year variation. Nevertheless, the increases during the famine year of 1867–68 were exceptional: 2–3 times the average, and 2–4 times the SD of price rises in other, nonfamine years. These sharp increases do not rule out the possibility that farmers or others hoarded early in the season in the hope that prices would rise later, but surely the increases make the hoarding scenario less likely.

V. Conclusion

The behavior of food markets during famines is an important yet underresearched subject. Recent analyses of the role of markets in the Indian subcontinent by Sen and Ravallion support the case for markets exacerbating famines.[26] My results offer limited support for the view that market responses in Finland were dulled by the famine. First, a spatial perspective on grain prices produced an outcome consistent with increased segmentation of markets during the famine. Second, an error-correction approach to regional price movements showed that in all cases the short-run effect captured by the comovement of grain prices was more powerful during the famine than in other times. It also yielded evidence in most cases of a quicker-than-normal response to emerging disequilibria. In the case of gaps between prices in Viipuri and other provinces, those provinces were slower to adjust, but here the differences in speed of adjustment were always small and statistically weak. Third, the data failed to support the claim that hoarding was more common during the famine than in normal years. Such results do not rule out a further role for markets in exacerbating the crisis; the fall in purchasing power in the worst-affected regions could well have aggravated the famine because markets were so well integrated. This is an issue worth further exploration. Still, it appears that the backwardness of Finnish agriculture coupled with the lack of an adequate policy response from the authorities, rather than poorly functioning grain markets, were primarily responsible for the Great Finnish Famine.

Notes

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1. It is in this sense that Jean Drèze and Amartya Sen (*Hunger and Public Action* [Oxford: Oxford University Press, 1989], p. 22) write of ‘‘English consumers attract[ing] food away, through the market mechanism, from famine-stricken Ireland to rich England, with ship after ship sailing down the river Shannon with various types of food’’ in the 1840s. Compare Martin Ravallion,

''Trade and Specialization: Another Look at India's Controversial Foodgrain Exports,'' *Explorations in Economic History* 24, no. 4 (1987): 354–70.

2. See, e.g., Salim Rashid, ''The Policy of Laissez-Faire during Scarcities,'' *Economic Journal* 90, no. 3 (1980): 493–503; Amartya Sen, *Poverty and Famines: An Essay on Entitlement and Deprivation* (Oxford: Oxford University Press, 1981); Martin Ravallion, *Markets and Famines* (Oxford: Oxford University Press, 1987), and ''Famines and Economics,'' *Journal of Economic Literature* 35, no. 3 (1997): 1219–21; Cormac Ó Gráda, *Black '47 and Beyond: The Great Irish Famine in History, Economy and Memory* (Princeton, N.J.: Princeton University Press, 1999), chap. 4.

3. John Lefgren, ''Famine in Finland 1867–8,'' *Intermountain Economic Review* 4, no. 2 (1973): 17–31; Yrjö Kaukiainen, ''Harvest Fluctuations and Mortality in Agrarian Finland (1810–1870),'' in *Pre-industrial Population Change: The Mortality Decline and Short-Term Population Movements,* ed. Tommy Bengtsson, Gunnar Fridlizius, and Rolf Ohlsson (Stockholm: Amlqvist & Wiksell, 1984), pp. 235–54; B. R. Mitchell, *European Historical Statistics* (London: Macmillan, 1975), p. 20; Antti Häkkinen, Vappu Ikonen, Kari Pitkänen, and Hannu Soikkanen, *Kun Halla nälän tuskan toi: Miten Suomalaiset kokivat 1860-luvun nälkävuodet* (When the frost brought the agony of hunger: Finland and the famine of the 1860s) (Helsinki: WSOY, 1991); Antti Häkkinen, ''On Attitudes and Living Standards in the Finnish Countryside in the Years of Famine 1867–68,'' in *Just a Sack of Potatoes? Crisis Experiences in European Societies, Past and Present,* ed. Antti Häkkinen (Helsinki: Societas Historica Finlandiae, 1992), pp. 149–66; Kari Pitkänen, *Deprivation and Disease: Mortality during the Great Finnish Famine of the 1860s* (Helsinki: Finnish Demographic Society, 1993); Kaarina Vattula, ed., *Suomen taloushistoria 3* (Finnish economic history 3) (Helsinki: Kustannusosakeytiö Tammi, 1983), pp. 39, 43.

4. Kaukiainen, p. 236; Vappu Ikonen, ''Kyse oli ennen kaikkea leivästä'' (It was a question above all of bread), in Häkkinen et al., p. 83.

5. In normal years only a small part of the oats harvest was destined for human consumption. During the famine the poor fell back on oats as food, though reluctantly, as it was coarse and a difficult grain to grind.

6. Vattula, p. 81.

7. Pitkänen, *Deprivation and Disease,* p. 43.

8. Naomi Mitchison, ''The Movement of Scottish Corn Prices in the Seventeenth and Eighteenth Centuries,'' *Economic History Review* 18, no. 2 (1965): 278–91; A. J. S. Gibson and T. C. Smout, *Prices, Food and Wages in Scotland* (Cambridge: Cambridge University Press, 1995).

9. Most of the Viipuri province was lost to the Soviet Union in 1940.

10. The output and labor force estimates (in Auvo Kiiskinen, ''Regional Economic Growth in Finland, 1880–1952,'' *Scandinavian Economic History Review* 9, no. 1 [1961]: 100) imply that output per worker in Uusimaa, the richest province, was nearly 1.4 times the Finnish average, while output in a central region encompassing Kuopio and Mikkeli was less than 0.8 times the average. Labor productivity in Oulu was 0.9 times and in Häme 1.15 times the national average; productivity in the remaining provinces was very close to the mean.

11. Kaukiainen, pp. 245–46; Kari Pitkänen, ''The Road to Survival or Death? Temporary Migration during the Great Finnish Famine in the 1860s,'' in Häkkinen, ed., pp. 111, 116; Häkkinen, p. 151. Figures 1A and 1B are based on maps in Pitkänen, ''The Road to Survival or Death?'' p. 111; and Häkkinen, p. 151.

12. N. C. Frederiksen, *Finland: Its Public and Private Economy* (London: Arnold, 1902), pp. 58–59; W. R. Mead, *An Historical Geography of Scandinavia* (London: Academic, 1981), p. 225.

13. Frederiksen, p. 59.

14. The kilogram-hectoliter conversion rate depends on the grain in question. I assume 1 hectoliter = 100 kilograms, reflecting the importance of oats in Finnish output. See Brian R. Mitchell, *International Historical Statistics: Europe 1750–1988,* 3d ed. (London: Routledge, 1992), p. 310.

15. Cited in Elizabeth Hoffman and Joel Mokyr, ''Peasants, Potatoes and Poverty: Transactions Costs in Prefamine Ireland,'' in *Technique, Spirit and Form in the Making of the Modern Economy: Essays in Honor of William N. Parker,* ed. Gary Saxonhouse and Gavin Wright (Greenwich, Conn.: JAI Press, 1984), p. 132.

16. Kaukiainen (n. 3 above).

17. This example is taken from C. Ó Gráda, ''Markets and Famines: A Simple Test with Indian Data,'' *Economic Letters* 57 (1997): 241–44.

18. An alternative scenario is also plausible (cf. Mette Ejrnaes and Karl Gunnar Persson, ''Market Integration and Transport Costs in France, 1825–1900: A Threshold Error Correction Approach to the Law of One Price,'' *Explorations in Economic History* 37, no. 2 [2000]: 149–73). The interprovincial differences in grain prices before 1867 seem to have been much smaller than those suggested by transport costs, perhaps because in normal years other goods and labor were less expensive to move than grain and were substituted for grain shipments between the provinces. If so, a crisis-induced increase in grain shipments between regions might well have increased the spatial variation in prices.

19. See, e.g., Francesco Goletti and Suresh Babi, ''Market Liberalization and Integration of Grain Markets in Malawi,'' *Agricultural Economics* 11, no. 2–3 (1994): 311–24.

20. For a good introduction to ECMs, see George Alogoskoufis and Ron Smith, ''On Error Correction Models: Specification, Interpretation, Estimation,'' in *Surveys in Econometrics,* ed. Les Oxley, Donald A. R. George, Colin J. Roberts, and Stuart Sayer (Oxford: Blackwell, 1995), pp. 139–70.

21. The results are reported in full in C. Ó Gráda, ''Markets and Famines: Evidence from Nineteenth-Century Finland,'' Centre for Economic Research Working Paper no. 98/8 (University College Dublin).

22. D. N. McCloskey and J. Nash, ''Corn at Interest: The Extent and Cost of Corn Storage in Medieval England,'' *American Economic Review* 74, no. 1 (1984): 174–87.

23. See, e.g., Karl Gunnar Persson, *Markets, Crowds, and Liberalism: Market Integration and Deregulation of Grain Markets in Europe, 1500–1900* (Cambridge: Cambridge University Press, 1999).

24. C. Ó Gráda, *Ireland Before and After the Great Famine: Explorations in Economic History,* 2d ed. (Manchester: Manchester University Press, 1993), pp. 116–21.

25. Full details are given in Ó Gráda, ''Markets and Famines: Evidence from Nineteenth-Century Finland.''

26. Sen (n. 2 above); Ravallion, *Markets and Famines* (n. 2 above).