The Seven Lean Years, Elasticity Traps, and Intervention in Grain Markets in Pre-Industrial Europe

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The seven lean years, elasticity traps, and intervention in grain markets in pre-industrial Europe

By KARL GUNNAR PERSSON

Research on modern famines has shown that they can be provoked by a very small decrease in the supply of food. The important policy implication is that the food shortage is manageable, provided there is good government protecting the entitlements of the poor, and no speculative bubbles. This has led economic historians to similar conclusions on pre-industrial Europe. This article shows that the policy implication is plausible but its premise is not: local harvest failures created large reductions in food supply because inventories, i.e. grain carried over from one harvest to the next, were small and high transport costs impeded inter-regional trade. The first part, sections I-IV, looks into the conflicting views of contemporary authors regarding the magnitude of output variations and then presents a series of new empirical assessments. In the second part, sections V-XI, it is argued that market failures and high costs and risks in transport and storage prevented the desired inter-temporal and inter-spatial redistribution of grain. Government intervention in the early modern period can be interpreted as a rational means of coping with the recurrent price shocks following temporary shortages.

I

Local harvest failures were known to generate proportionally larger price increases. The important question is how much larger the price response was. Davenant was one among many contemporaries who was intrigued by the issue. In his Essay upon the probable methods of making a people gainers in the balance of trade (1699) a precise answer was attempted using an example of the proportionate ‘defect’ of the grain harvest and its consequent effect on price, again measured as the proportionate increase from the ‘common rate’. What is identified is an inelastic demand with regard to price, i.e., an increase (decrease) in price generates a much smaller decrease (increase) in quantity. This is a property normally associated with necessities. However, strictly speaking the elasticity of demand with regard to price

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1 This article was written while I was a visiting fellow at the Research School of Social Sciences, Australian National University and benefited from a grant from the Danish Social Science Foundation. Computer support by W. Naughton, editing by B. Howarth, and research assistance by M. Ejrnaes are gratefully acknowledged. I have received stimulating comments from L. Epstein, C. O Grada, D. McCloskey, G. Snooks, and anonymous referees. I am also indebted to P. Malanima who has allowed me to use his unpublished dataset on Pisan prices.

2 Sen, Poverty.
measures the response of demand to a price change, and it is only under special circumstances that it is also a good guide to the response of price to a change in the local quantity harvested. In the case of Davenant and his contemporaries the focus was on the price response from a deficient harvest. Modern scholars have reversed the order of causation and have made attempts to estimate harvest outcomes from observed price changes. As long as the economy is little affected by international trade and changes in stocks the price elasticity of demand predicts reasonably well the change in output from an observed price change. In an open economy, however, fluctuations in trade mean that the price variance is only vaguely related to the local harvest because local production is a varying proportion of aggregate supply and demand. This ambiguity is worth bearing in mind when discussing the differing estimates of the elasticities reported below. My approach differs since I have chosen to estimate harvest outcomes directly from yields and then made inferences about the price elasticity of demand. However, output series must be adjusted for inventory changes and trade to be used for that purpose.

Davenant's particular example is of dubious value but survived him and was transformed into something of an economic law by Jevons, who developed a precise formula based on the alleged empirical relations found in Davenant's example. Jevons's interest lay primarily in exploring the utility attached to the 'necessaries of life', but he did not hesitate to express his confidence in the actual numbers suggested by Davenant. Modern economic historians have followed Jevons in using slightly modified formulas to infer output from observed grain prices, although the problems of inventory adjustments and trade have not been dealt with adequately or at all. However, the accuracy of the quantified relation between harvest and price in Davenant's example has too often been taken for granted. The elasticities inferred from Davenant's figures are of the order of \(-0.4\), and, indeed, there are modern scholars, the most prolific being Fogel, who consider that this is an overestimate of the response of quantities to prices, arguing that the appropriate figure would instead be between \(-0.1\) and \(-0.2\) for the early modern period. It is clear that with elasticities of the order implied by Davenant, or even lower as tentatively suggested by Fogel, the severity of the 'defects' in the harvests has been grossly overstated both by contemporaries and by modern historical research. A price elasticity of demand of, say, \(-0.5\) would imply that a 10 per cent increase in price was

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3 According to Jevons prices varied inversely as the square of the supply: *Political economy*, pp. 165-71. Jevons, like other, later commentators, was preoccupied with whether Davenant here spoke his own mind or whether he was just echoing Gregory King, whose work Davenant quoted at length in his *Essay*. There are no references to King in this particular section, so Jevons is probably right in suggesting that the 'law' is derived from Davenant.

4 Wrigley, 'Reflections on corn yields', has critically examined these attempts, which included Thorold Rogers and Slicher van Bath. Hoskins adopts a more cautious strategy when he infers wheat harvests from wheat price variations in England. He does not quantify the harvests precisely but establishes an ordering from 'abundant' to 'dearth', the latter being the case if the wheat price deviated more than 50% from a moving average. See his 'Harvest fluctuations, 1480-1690' and 'Harvest fluctuations, 1620-1759'.

5 Fogel, 'Second thoughts'.

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triggered by a 5 per cent quantity defect, while an elasticity of \(-0.1\) implies a defect of only 1 per cent.

II

Fogel has been in the forefront of those playing down the magnitude of quantity shocks in early modern agriculture. He relies on an optimistic assessment of stocks and on the particular example used by Davenant—although he neglects to say that Davenant and his contemporaries usually thought of shortages as being of the order of 30 to 40 per cent of a normal harvest. Before investigating the empirical foundations for these claims it is worth examining what some of Davenant’s illustrious contemporaries were saying.

Half a century after the publication of Davenant’s *Essay*, Quesnay, writing for the *Encyclopédie*, constructed an example similar in structure to Davenant’s but different in content.6 It set out to demonstrate the effects of positive and negative deviations from mean harvest on prices in France. The irony is, however, that Quesnay argued that the main reason for large swings in prices was that France, as opposed to England, was a closed economy. He then continued by constructing a hypothetical case in which prices varied in a range he found to be typical of an open economy, specifically mentioning England, but subject to the same local output shocks as France. Price responses to these local shocks were believed to be much smaller because England was open to internal and foreign trade. Quesnay’s purpose was polemical, but so was Davenant’s. The former advocated a trade regime similar to the English because he believed it would stabilize prices, and his favoured ‘English’ case served to prove that. Trade could stabilize prices, it was argued, because harvest outcomes among trading partners differed: a bad harvest in one country was balanced by an abundant harvest in another.

A third view, that of Turgot, is worth mentioning in this context, because it is an implicit recognition (probably the first in the history of economic ideas) of the fact that point elasticities change along a downward sloping demand curve. Turgot, long-serving French civil servant with an intimate knowledge of the grain markets he was set to administer, showed in his example that when wheat became scarce and prices soared, demand would ultimately become less inelastic, perhaps even elastic as he believed. The reason we would now give for such a development is that as wheat becomes more expensive there is an intensified search for substitutes, say rye or chestnuts. Turgot, like Quesnay, was a fervent advocate of free trade. His aim was to convince his contemporaries that stable prices were good for consumers because consumption was stabilized, and good for producers because average total revenue increased over an extended period of output variations. If the point elasticities along the demand curve became less inelastic when a bad harvest drove prices up, income did not increase.

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6 The discussion referred to here is found under the entry ‘Grains’ in vol. 7, published in 1757. Also in Oncken, ed., *Œuvres*. 

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sufficiently to offset the decline in income from a good harvest. The producers’ total revenue curve across a sequence from bad to good harvests would be concave, resembling an inverted U. Producers were in a sort of elasticity trap; they were helped neither by harvest failures, nor by bumper harvests.\(^7\)

### Table 1. Elasticities and prices implied by examples from Davenant, Quesnay, and Turgot

<table>
<thead>
<tr>
<th></th>
<th>Davenant</th>
<th>Quesnay</th>
<th>Turgot</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>France</td>
<td>England</td>
<td>France</td>
</tr>
<tr>
<td>Price (normal harvest)</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Price (bad harvest)</td>
<td>2.60</td>
<td>1.60</td>
<td>1.09</td>
</tr>
<tr>
<td>Elasticity</td>
<td>-0.37</td>
<td>-0.74</td>
<td>-4.06</td>
</tr>
</tbody>
</table>

**Sources:** Davenant, *Essay;* Quesnay, *Grains;* Turgot, ‘Quatrième lettre’.

If we now look more closely at the elasticities implied by the three authors just discussed, it turns out that Davenant’s example implies the most inelastic responses. From the other side of la Manche, England seemed to be in a more favourable position than Davenant will have had us believe. In table 1 the elasticities have been estimated from prices given by the three authors as a consequence of a bad harvest, which sometimes meant 60 and sometimes 70 per cent of a normal harvest. The prices in the table are implied by the elasticities thus derived, but a bad harvest has been normalized to one of 70 per cent of the average. ‘France’ and ‘England’ under the names of Quesnay and Turgot refer to the examples they constructed, which reflected French and English conditions, i.e. a closed and an open economy respectively. Thus, it would be unwise to take the views of contemporaries at face value.

### III

Formally, the price elasticity of demand is expressed as

\[ Q^* = -eP^* \]  

\(^7\) Turgot wanted to show that over a sequence of good and bad harvests total revenue would be smaller in a segmented market than in an open economy with stable prices. It is not necessary to assume elastic demand at high prices to obtain that result. It is a sufficient—and plausible—condition that demand is less inelastic at high prices than with low prices of grain. Turgot developed his view in a series of letters from his provincial office to Abbé Terray, then Minister of Finance, during the autumn of 1770. It is the fourth of these (‘Quatrième lettre’) which is of particular interest. The original has been lost but there was a summary in Dupont de Nemours’ first edition of Turgot’s work published in the early nineteenth century, and that summary was reproduced in the Schelle edition. To my knowledge no doubts as to the authenticity of Turgot’s tables have been voiced, although Schumpeter accused Dupont de Nemours of making Turgot more of a Physiocrat than he was. Dupont was primarily a vulgarizer of physiocratic thought, a devoted disciple but not an original thinker. When he reflected independently on these matters in *De l'exportation*, he merely reproduced Quesnay’s tables, which are quite different in content and implication from Turgot’s. However, he later adopted the views of Turgot: see *Ephémérides du Citoyen*, 6 (1770), pp. 114-5. I have discussed these issues elsewhere in some detail: Persson, ‘On corn’.

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where ε is elasticity, Q is quantity, P is price, and an asterisk denotes the proportional change of the variable. Assuming that the correlation between the two variables is negative and perfect, the elasticity can be expressed as the ratio of the standard deviation of Q*, σ_q, over the standard deviation of P*, σ_p:

\[ \varepsilon = - \frac{\sigma_q}{\sigma_p} \]  

Data on either prices or quantity deviations for a given region in the early modern period are scarce. In fact there are no available series at all on aggregate output, trade or inventories for the early modern period. What we do have are yields, i.e. output per unit of land or seed corn. Treating variations in yields as an approximation of output variations presupposes that the short-term changes in planned output are negligible, i.e. changes in yields and output are both driven by natural accidents. If producers made short-term compensatory adaptations of planned output, for example by varying the area under the plough, as a response to unanticipated shocks in yields the standard deviation of output would be greater than that of yields. This implies that estimates of elasticities based on yields will have a downward bias, i.e. the degree of inelasticity is exaggerated. However, there is an implicit assumption here that the demand curve does not move inwards when the supply curve does. If it does, there is an upward bias in the estimates. Table 2 presents a menu of different estimates. The way they have been obtained is explained in the notes and sources, where there is also reference to the periods and regions to which the data apply.

Table 2. Estimates of price elasticity of demand for grain, sixteenth to nineteenth century, Europe

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>σ_q</td>
<td>0.04</td>
<td>0.25</td>
<td>0.16</td>
<td>0.15</td>
<td>0.19</td>
<td>0.13</td>
<td>0.19</td>
</tr>
<tr>
<td>σ_p</td>
<td>0.22</td>
<td>0.25</td>
<td>0.25</td>
<td>0.27</td>
<td>0.21</td>
<td>0.22</td>
<td>0.22</td>
</tr>
<tr>
<td>ε</td>
<td>-0.18</td>
<td>-1.00</td>
<td>-0.64</td>
<td>-0.55</td>
<td>-0.90</td>
<td>-0.59</td>
<td>-0.86</td>
</tr>
</tbody>
</table>

Col. (3): as col. (2), but the yield series has been adjusted for carry-over and trade. See text for details.
Col. (6): price deviation from col. (1) combined with the lowest standard deviation of output found in the French dataset, which was in north-west France. See cols. (1) and (4) for sources.
Col. (7): price deviation from col. (1) combined with the highest output deviation found in the French data, which was in south-west France. See cols. (1) and (4) for sources.

Columns (1), (2), and (4)-(7) are comparable and share the characteristic that the quantity variations are not corrected for trade and inventory adjustments, and we cannot therefore interpret the implied elasticities as elasticities of demand with regard to price. As will be argued below, the effect of inventories is negligible, but the impact of trade is not. A comparison between columns (4) and (5) illustrates this point. The reason why the implied figure in column (5) reveals less inelasticity is that the
Bordeaux region was more open to trade than central France, which means that the yield variations are less adequate as an indicator of the quantity shocks. To infer the elasticity of demand with regard to price it is necessary to adjust the output figures with respect to trade, which would imply that quantity variance is smaller than yield variance. In column (3), which relates to southern Scandinavia, quantities have been adjusted for trade and carry-over. The difference between the standard deviation of the quantities in columns (2) and (3) is generated by an assumed export (import) of 25 per cent of the output above (below) average, which imposes a maximum foreign trade exposure slightly below 10 per cent of the output. If we also add carry-over so that stocks knock off 10 per cent of the yield variations, the elasticity will be $-0.64$. Had the other output series been adjusted accordingly, the relative order of the different elasticities would, of course, have remained, and the likely interval, ignoring column (1), would be between $-0.6$ and $-0.4$, i.e. about 65 per cent of the quoted figures.\(^8\) The odd result in table 2 is clearly the one from column (1) with an elasticity below $-0.2$. The number generating this particular estimate is the standard deviation of output, which differs markedly from all other quantity deviations, but the series used dates from a period before the First World War. Price variation is more uniform across time and regions. It is important to note that yield fluctuations were very large (compare $\sigma_q$), well into the nineteenth century. Combining $\sigma_p$ from column (1) with the highest and lowest estimate of $\sigma_q$ found in the rich French dataset gives a more likely range of values of $\varepsilon$, which are reported in columns (6) and (7) respectively. It seems that the burden of proof has shifted to those claiming very inelastic demand.

IV

The principal conclusions from the analysis so far are that the recorded price variations were responses to large, rather than small, variations in supply. The plausible price elasticity of demand is around $-0.5$ ($\pm 0.1$) when foreign trade exposure and inventory adjustments have been taken into account. Does this imply that the natural accidents that caused harvest failures were unmanageable? To answer that question it is more rewarding to look at long sequences of harvest failures. The seven lean years in the period covered by the southern Scandinavian series were 1645-51. The rye harvests were all well below average, varying between 50 and 80 per cent of a normal harvest, but barley yields performed very well except in a single year. The prices of both rye and barley increased dramatically. It can be useful to look at the problem of manageability of supply during the seven lean years by introducing an account of the stock of grain accumulated during the period. The stock is defined as the accumulated difference between observed yield and the average yield of both rye and barley, assuming that the average yield is consumed each year. Consumption

\(^8\) If output shocks are local and independent, deviations from trend in output will diminish in inverse proportion to the area from which output data are collected. That might explain part of the large gap between the estimates used by Fogel and myself.
includes seed corn, animal fodder, and human food. Assuming first a carry-over of 40 per cent—an assumption that has been suggested in the secondary literature—in the initial year will imply that in the seventh lean year the accumulated stock is negative for rye. The initial inventories have thus been wiped out, but the stock is positive for barley. By converting the accumulated stock of barley to rye-equivalents, which is done by multiplying it by the ratio of barley to rye prices, the aggregate deficit expressed in rye-equivalents amounts to half a year's consumption of rye. If we assume zero initial inventories, which is more plausible than the previous assumption, this accounting exercise amounts to the loss of a full year's consumption of rye. From the point of view purely of inter-temporal accounting, the difficulties would seem manageable, in the sense that adjustments in trade and livestock consumption and an equitable decline in human consumption would not generate severe social and demographic consequences. However, markets reacted quite dramatically to these events, doubling the prices of rye and barley, a fact which, given the distribution of income, was bound to have severe consequences. The impact of the decline in human consumption fell on those who were already living close to the subsistence level. What were the options?

V

Trade and carry-over would stabilize prices but not to the extent that price fluctuations disappeared, because transport over time, and space, was costly. It can easily be demonstrated that, if storage and transport costs were high, large swings in prices would necessarily occur, unless output shocks were merely local. In that respect, technological constraints affected prices, real wages, and welfare. Consider the stylized case in which there is a uniform world market price and a single market small enough not to influence world market price. The larger the transport cost to the 'world market' from that single market, the more prices would vary in that market before it would become worthwhile to trade. There is a minimum price that will motivate export, and that minimum price is the world market price plus transport costs. Likewise, there is a maximum price in the single market, which will attract imports from the 'world market'. It thus appears that, given the technological constraints, not much could be done to dampen price volatility within the range defined by transport and storage costs. However, that having been said, prices would fluctuate even more in the absence of trade and carry-over. Furthermore, a decline in transport and storage costs would cause price fluctuations to decline, if output shocks were geographically independent across a large region such as Europe. A way of illustrating this is to compare at one point in time the variability of prices for different types of grain. In this particular case wheat, rye, and barley have been chosen. Although nominal transport and storage costs are about the same for different grades of grain the relative costs are smaller for the most expensive variety, i.e. wheat, and then in descending order, rye and barley. The expectation that price fluctuations are smaller for wheat
and highest for barley with the highest relative transport costs are confirmed by the figures in table 3.

Table 3. Standard deviation of the residuals in a random walk model of grain prices, per cent

<table>
<thead>
<tr>
<th></th>
<th>Pisa, 1550-1684</th>
<th>Vienna, 1692-1802</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>6.2</td>
<td>5.7</td>
</tr>
<tr>
<td>Rye</td>
<td>11.0</td>
<td>7.9</td>
</tr>
<tr>
<td>Barley</td>
<td>12.2</td>
<td>9.4</td>
</tr>
</tbody>
</table>

Method and sources: The price data for Pisa and Vienna consist of monthly market prices. The model used in predicting price movements is a random walk, i.e. expected price tomorrow is equal to price today, with seasonal dummies which catch the seasonal price pattern. Pisa prices are from an unpublished source based on prices collected by Pisa’s subsistence bureau which I have had the opportunity to use thanks to P. Malanima, who originally collected the data. Vienna prices were published by Pribam in Materialien.

Apart from the high costs of inter-temporal and spatial transport there are market imperfections which affected the performance of grain markets in the period scrutinized in this study, namely market power and externalities. The first of these is related to the great risks in speculative hoarding and trade. It is well known that the price of grain usually comes down to a low at harvest time and that it then tends to increase until the next harvest, but that this pattern is subject to large forecasting errors. Samuelson was the first economist to investigate this empirical fact in a rigorous way. His was a model of perfect foresight and no unexpected disturbances in the size of the harvest from year to year. As a consequence a pattern of prices rising at a constant rate during a harvest year only to fall to the initial level at the next harvest was predicted to be repeated year after year. A harvest year normally begins in August and continues to July of the following year. The peculiarity of grain is that it is produced once a year but consumed throughout the year. Price increased at a constant rate over the harvest year because of the costs of ‘transporting’ the grain over time, i.e. storage costs, waste, and deterioration of the grain, and the interest rate on the value of the stocks. There would be no carry-over from one harvest year to another under the specified assumptions because harvest prices were identical from one year to another. If future output shocks were expected, they might make carry-over profitable, but only if next year’s shortage was expected to make the price at next year’s harvest time cover the costs of carrying the grain to the next period. Samuelson conjectured that the uncertainty of the real world would make speculative hoarding and trade very risky, which might favour large-scale merchants with a sizable capital so that they could endure the inevitable losses now and then. The selection bias in favour of the few and wealthy might foster market power.

Samuelson’s prediction of no carry-over in the steady-state perfect foresight model was based on the observation that there were positive costs in storage but zero expected returns. It seems as if a similar conclusion can be reached for the world of uncertainty. The systematic empirical enquiry into the returns from storage of grain was begun by McCloskey and Nash in an
Figure 1. *Expected gross return and its standard deviation from storage of wheat in Siena, Cologne, and Pisa, 1550-1700*

Notes: The first two bars in each cluster of six refer to Siena, bars three and four to Cologne, five and six to Pisa. The first column for each city shows the expected gross returns and the second exhibits the standard deviation of the gross returns. The returns and standard deviations have been expressed in annual terms. Note that the standard deviation is about twice the expected returns which makes a straightforward interpretation of the expected returns impossible. Sep refers to the returns from storage from August to September, Oct indicates returns from August to October, and so on. Thus, Aug refers to carry-over from August in one harvest to August in the next.

Sources: Siena: Parenti, Prezzi. Cologne: Ebeling and Irzigler, Getreideumsatz. Unpublished series based on prices collected by the subsistence bureau in Pisa (see notes to tab. 1).

analysis of Thorold Rogers's English price data.\(^{10}\) I share their view that carry-over was negligible, say around 5 per cent of a normal harvest. McCloskey and Nash estimated the storage costs by looking at the monthly increase in prices in the harvest year. The number of observations they used was fairly small, so I have replicated their approach with a much larger set of observations. My results are reported in figure 1. This describes the implied gross returns, which are conceptually identical to what McCloskey and Nash call 'cost of grain storage', from holding (buying) grain in August and holding it through to (or selling it in) September, or from August to October, and so on, and finally from August to August in the next harvest year. Three markets, Siena, Cologne, and Pisa, were analysed over a period of 150 years and have been normalized to returns on an annual basis. The gross returns should equal storage costs including the waste of grain, the income forgone by holding stocks, i.e. the prevailing interest rate, and a risk premium.

As is clear from figure 1, the most striking fact is the huge standard deviation of the gross returns, the second, fourth, and sixth bar in each cluster of bars; and the disturbing fact that returns were not uniform over

\(^{10}\) McCloskey and Nash, 'Corn at an interest'.
the year. In fact the size of the standard deviation—two to three times the average or expected returns for most estimates, and somewhat smaller for Pisa—does not make the idea of a positive expected return on holding inventories at all meaningful. McCloskey and Nash concluded that an observed decline in the gross returns from medieval to early modern times was attributable to a decline in interest rates, but that conclusion seems fragile. We know from other sources that the cost of holding stocks was in the range of 20 to 30 per cent per year of the initial value consisting of an interest rate of some 5 to 15 per cent, a rate of wastage of at least 10 per cent, and a cost of storage at around 3 to 5 per cent.\textsuperscript{11} A possible, but rare, outcome in a carry-over operation, i.e. from August to next August, can be defined as the sum of the expected gross return and its standard deviation and amounts to a mere 23 per cent for Cologne, 28 per cent for Siena, and 32 per cent for Pisa, with an average, i.e. expected, return around 3 to 4 per cent.\textsuperscript{12} Even if speculators were rewarded not by the zero expected returns predicted by theory but by irrationally optimistic expectations, there was not much of a profit, since this rare outcome hardly covered the costs of storage. We have to admit returns at twice the standard deviation to get potential and sizable profits at all. In a world of uncertainty carry-over based on expectations of this sort cannot be excluded. But in such a process of carry-over speculation only a few will survive since such expectations will only rarely be fulfilled. A substantial financial reserve and exceptional luck or exclusive information or market power would be needed to be able to survive for longer periods.

Short time speculation, i.e. from August to September, October, and November, generates much larger potential profits (or losses). The huge variance revealed in figure 1 must be related to the great initial uncertainty about the harvest outcome on location and in export and import markets. It is safe to conclude that exclusive information in these early months after the harvest offered great rewards. Variance also differed between markets. If we transform the returns estimated by McCloskey and Nash to annual returns, the levels they found typical of medieval England are almost identical to the results for early modern Pisa. But Siena and Cologne differ from Pisa, both displaying a smaller variance. Two markets such as Siena and Pisa, which we know were well integrated in the sixteenth and seventeenth centuries, should not have such large differences in variance.\textsuperscript{13} The differences are more apparent than real, however. The reason is probably that the data for Pisa are prices quoted for the first market day each month, while Cologne and Siena report monthly averages. The data used by McCloskey and Nash are similar to the Pisa series in that they also rely on single observations each month.

The analysis of the variance of returns in holding inventories of grain does not support the supposition that carry-over was substantial. The best

\textsuperscript{11} Ibid., p. 182, advancing some evidence for the quoted storage costs.

\textsuperscript{12} Since the price in August is the price of new grain and not of the grain carried over, the likely expected return for carrying over old grain is negative.

\textsuperscript{13} A formal co-integration test has been applied and accepted. It reveals a rather fast convergence to a constant price ratio in between the cities after exogenous disturbances.

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guess is that inventories were held primarily as a sort of insurance against unexpected events, to cover private consumption in the current harvest year, and for short-term speculation. The process of speculative storage favoured large-scale operators with potential market power and there were huge profits in exclusive information and insider trading, as was revealed by the potential profits in the early phase of the harvest year. These conclusions suggest market imperfections.

There is, however, an important additional reason why markets would not automatically generate the desired level of carry-over and trade and that is the positive externalities in price stability. If, for example, the crime rate goes down as a consequence of price stability, it falls for all, and in that sense we can talk about a non-exclusive property in price stabilization. A sharp fall in real wages imposed by price increases has been shown to have had effects on the state of health because vagrancy increased, diffusing contagious diseases. Nuptiality and mortality were also affected by price volatility, and as an ultimate effect it could cause a breakdown, albeit temporary, in the social order. Price stability would consequently bring a variety of social benefits, but these improvements are non-exclusive and therefore, technically speaking, externalities. While merchants involved in competitive carry-over speculation and trade can be expected to generate price stability, they were motivated by the expected private gains in these ventures alone. But, since there were also social gains inherent in price stability, the efficient volume of trade and carry-over would not obtain, since these social gains were not internalized as private gains by the merchants and corn-factors. Apart from this, the efficient level of carry-over and trade would often fall short of being the morally and socially tolerable level. Even in the unlikely situation where a Pareto-efficient state obtained, the prices and consumption possibilities which characterized that state would not necessarily stop some people from starving. In its own right or because a subsistence crisis posed a threat to the social order, it would be possible to argue that redistributive policies were considered desirable by all. If so, the income distribution or the distribution of consumption possibilities must be considered a pure public good, i.e., the desired distribution will not obtain in a market process since the non-exclusive nature of the benefits that a given distribution of consumption will bring can be expected to invite free-rider behaviour.

VI

We have here the traditional rationale for public intervention provided by economic theory. But did actual policies stem from a desire to stabilize prices and consumption? And if so, were they good at accomplishing that aim? Did the nature of the public intervention conform to the expectations provided by the theory? For example, one would expect that public subsidies

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14 That the incidence of petty theft of food was related to price instability is shown by Walter and Wrightson, 'Dearth'.
15 See Walter and Schofield, 'Famine'.
16 See Thurow, 'Income distribution'.
would be paid to grain merchants as compensation for the social gains they
generated and that the public sector would provide the services, carry-over,
and trade not adequately provided by the private traders. On the other
hand, the potential market power of corn-dealers provided a rationale for
supervision and control in order to stop their cornering the market. We
would also expect to be policies that redistributed consumption over
time and between income groups. These contradictory claims on public
policies inevitably make an interpretation of public institutions difficult.
There ought to have been both a carrot and a stick, and indeed there were.
In the process of tackling these questions another one constantly surfaces:
can it be that the political interventions were themselves the real cause of
the poor performance of the markets? Although that question is finally
answered in the negative, it is one that should not be brushed aside.

The structure of the argument that will be pursued here is summarized
in table 4. This identifies important characteristics of markets, and there is
subsequently an attempt to relate specific institutional responses to the
potential market failures. The specific relation between market characteristics
and institutional responses is developed in the text.

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Public intervention in grain markets was practised from the very beginning of urban resurgence in medieval Europe. Although the scale of these operations, and the priority and coherence of specific programmes, differed from city to city and from country to country, the striking fact is the large similarities across time and within Europe. That makes it worthwhile to

17 The medieval origin of the regulation and its subsequent development in the early modern period are discussed in a series of monographs covering major countries or regions, e.g. Tits-Dieuade, Formation; Usher, History of the grain trade; Kaplan, Bread, politics and political economy; Barnes, History of the English corn laws; Chartres, ed., Agricultural markets; Amark, Spannvolkshandel; Peyer, Getreidepolitik; dal Pane, Commercio dei grani; Pult Quaglia, Provevade ai popoli; Naude, Die Getreidehandelspolitik. A large number of monographs were produced early in this century on 'Lebensmittelpolitik' in the major

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consider whether the interventions can be regarded as a response to a similar set of considerations and perceptions of identical problems.

Let us first look at how cities and countries coped with the presence, perceived or real, of market power and insider trading. The imperfect integration opened up prospects for large merchants to exploit insider information and to corner the market, and this they did if possible and if not deterred by the crowd or the police. A large variety of public regulations and instructions can be seen as a way of restricting the potential abuse of market power, although some of these measures, rather than being highly efficient in their own right, probably served to give the urban crowd the assurance that something was being done.

There was an ever present fear of collusion and of insider trading—not surprising given the slow and erratic ways in which not only grain but information flowed. The quest for transparency in transactions and information must be seen in this light. The rules for accomplishing transparency and combating collusion were practically identical throughout Europe during the ancien régime, and were codified in, for example, the Books of Orders, worked out in the troubled last decades of Tudor England. These rules had little practical significance—or at least diminishing importance—in England from the last third of the seventeenth century, but rules identical to those in the Books of Orders survived for another century or so in many parts of continental Europe. Authorities always suspected collusion and the exploitation of insider information or any other measure to 'enhance the common price'. The quest for transparency implied that dealings should not be made before or outside markets, and that markets should be held in public places, and at regular hours, publicly known. These rules were strictly adhered to only in periods of restricted supply, and sometimes only when popular protest alarmed the ruling elite. The ideal market was supposed to involve a large number of buyers and sellers; farmers should bring their corn to the market individually so that they could not 'combine'. Large-scale dealers and middlemen were not allowed access to the market in the early hours, i.e., not until the general public, or the poor, had had the opportunity to make their purchases. However, corn-factors increasingly stepped in—much to the relief of peasants who were thus not forced to travel long distances. The size of the city mattered greatly here. Small urban centres were serviced by peasants coming in from the nearby villages to the weekly markets, while the big cities had to rely on corn merchants. From time to time the activities of large-scale dealers were looked into, however. The types of restrictions found in the Books of Orders were then invoked, always at the height of a crisis, allegedly to halt speculative abuse. But in the public mind the middlemen were never loved, being instead suspected,

German cities: see, e.g., Herzog, Lebensmittelpolitik. For a contemporary appraisal of this vast literature, see Franz, 'Geschichte'.

18 Browne, Laws against engrossing.

19 The liberal reformers of the eighteenth century tried to convince the public that collusion in the grain market was impossible, implicitly admitting the need for transparency. Collusion would require 'immense purses, and would be visible': Anonymous, Appeal to the public.

20 Everitt, 'Marketing'.

21 Cf. Hertner's comparison between Strassbourg and Marburg in 'L’approvisionnement des villes'.

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especially in times of dearth, of masterminding the price increases by collusion and false rumours.\textsuperscript{22}

In most continental cities the authorities were keen to control and register the stocks held by their citizens. They sometimes established an upper limit on the volume of the stocks that households were permitted to have, and that limit was approximately what the household needed to get through to the next harvest. Some public granaries were open for private deposits, which had the dual effect of increasing transparency and improving the conditions for storage. By diminishing waste, the cost of storage to the public would fall and, all other things being equal, increase the propensity to stock grain. However, in general there was suspicion of large private inventories as long as the authorities had no say in their future use. A plausible interpretation of this paradoxical animosity towards private prudence is that the authorities acknowledged the prohibitively high risks of carry-over and suspected that hoarding was primarily short-term speculation undertaken when prices were already high but in anticipation of further increases in what could turn out to become a speculative bubble.

Even if there was a spirit of suspicion in the way the corn dealers were viewed both by the public and the political authorities, regulation and control did not prevail completely. There were very few attempts to control prices as such by dictating a maximum price, and for good reasons. There was a firm reliance on markets to provide most of the food for current needs. To keep prices down by decree was simply counter-productive, since it was known that outside supply dried up immediately. Instead, there were attempts to encourage and subsidize corn-factors in order to overcome risk aversion and uncertainty. For example, when in the middle of or in expectation of a supply crisis, city councils would promise to pay merchants a minimum future price for the grain, and in addition they would give the merchants the right to profit from the ruling market price, if they so wished.\textsuperscript{23} In other instances, the city could simply pay the merchant some of the transport and transaction costs. Given the social gains created by price stability, this policy was well founded, but it also reflected the reluctance of the business community to become involved without some insurance against risks.

The near self-sufficiency of many countries under normal conditions (see section X) also hampered the development of a suitably large class of merchants, in whose absence the state or a city council had to act as a substitute when unexpected local harvest failures occurred.\textsuperscript{24} Cities, however, could not be self-sufficient in food and relied on private traders and developed in the course of history a commercial network, with its members coming out against restrictions on trade. But it was often the case that local governments, as well as representatives of the crown, were actively involved

\textsuperscript{22} This view was challenged increasingly by early liberals: see, e.g., Smith, \textit{Short essay}, Dickson, \textit{Causes of the present high prices} for the liberal argument. But others warned of the market power and inside information of the forestallers, engrossers, and their like: see, e.g., Anonymous, \textit{Some arguments}.

\textsuperscript{23} Aymard, \textit{Venise}, pp. 80-1, 100. For the medieval origins of public purchases see, e.g., Stouff, \textit{Revitallement}, pp. 73-5.

\textsuperscript{24} See, e.g., Johansen, 'Staten som kornhandler'.

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in the grain trade, sending their agents to markets far away to contract supplies. This practice emerged in medieval times, when the commercial networks were unreliable, and survived into the early modern period. It was increasingly a matter of emergency operations when ‘normal’ trade links were insufficient for the unexpected needs of a specific crisis.

VII

The argument advanced above was that the private rewards were insufficient to induce the desired volume of carry-over and trade, since there were externalities in price stability. There is therefore a rationale for public ‘production’ of price stability. There is evidence that governing elites were concerned about price stability, that they were aware (or were reminded by the angry crowds) of its effects, and, finally, that the policies pursued actually achieved stabilization of consumption over time and across social classes. There was also an element of equitable redistribution. Some of the adopted measures did not target the price of grain as the essential variable, but rather the price of bread. Throughout Europe there was a fairly uniform system in which prices were held constant, while the weight of bread varied according to the market price of grain, regulated by the assize of bread. Some cities practised a fixed weight/variable price regime for all or some types of bread. However, the point was that the price per weight unit of bread changed with the variations in the price of grain. In some places the price/weight ratio was constantly and automatically changed, allowing bakers a constant mark-up on costs. However, the assize of bread was normally used as a price stabilizing method. In Venice, for example, bakers actually took most of the burden of the price variations of grain through fluctuations in their mark-up, since the assize of bread was only changed when there were substantial and long-lasting changes in grain prices and to a lesser degree than the changes in grain prices. Ideally this worked both ways, with below average mark-up in periods of high grain prices, for which bakers were compensated by above average mark-up when grain prices were low. The idea was to dampen both seasonal and stochastic fluctuations.

Another city which practised these policies for a long time and with considerable skill and persistence was Cologne. For a period of about 100 years we have both the grain prices and the bread prices prescribed by the assize of bread. That makes it possible to compare the variability in the latter with fluctuations in the price of the constituent grain. If these policies were effective, we would expect the price variability of bread to be smaller than that of grain. To verify that prediction we must decide how to measure the price fluctuations in both bread and grain. As pointed out above, price movements in grain markets are well predicted by a random walk model, i.e., the best prediction of price in the next period will be the present price.

25 Mattozzi et al., ‘Il politico e il pane’. Similar methods were used in Modena and sometimes in Antwerp, Brussels, and Cologne. This policy created an endemic friction between city officials and the bakers’ guild, with the latter pressing for compensation by delaying an increase in the weight of bread when the price of grain declined, and the former being nervous of the anger of the consumers. See Basini, L’uomo e il pane; Craeybeck, ‘Brod en levenstandard’.

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when the seasonal effects have been taken into consideration. The price volatility is defined as the prediction error. I have used monthly observations of the log of both wheat and rye prices in Cologne and three types of bread: white, rye and ‘malter’. The chosen measure of price fluctuations is the standard deviation of the error term, \( e_t \), and the results indicate that the volatility of prices of bread in Cologne was about three-quarters of what the fluctuations would have been if bread prices had varied in proportion to grain prices.

![Graph showing residual variation of bread prices as percentage of the residual variation in rye prices, Cologne, 1660-1760 (rye = 100)](image)

Figure 2. Residual variation of bread prices as percentage of the residual variation in rye prices, Cologne, 1660-1760 (rye = 100)

*Sources: Prices are monthly averages based on weekly market prices from Ebeling and Irziger, Getreideumsatz. The standard deviation of the residual has been obtained in a random walk model with seasonal dummies. The estimates are based on overlapping periods of 20 years each, starting in 1659.*

Figure 2 demonstrates that bread prices persistently fluctuated less than grain prices, when rye bread and ‘malter’ are compared to rye grain. The same results apply to white bread as compared to wheat, although this is not shown explicitly in the figure. To the extent that there were fixed production costs we would always expect bread prices to fluctuate less than grain prices. However, fixed costs were small, not only because the raw material consisted of grain but also because wages were paid partly in kind. In Cologne this institution contributed not only to a stabilization of bread prices over time but also to a redistribution between rich and poor consumers.
The assize of bread permitted a higher mark-up on the luxury varieties of bread, for example Semmelgin, while there was little or no profit in the Malterbrot, the latter being an important element in the diet of the poor.26 Cologne authorities were known as being efficient in their bread policies. Almost alone among European cities of its size, Cologne did not experience a single bread riot in the seventeenth and eighteenth centuries.27

VIII

Letting the bakers shoulder part of the burden of price stabilization was not without its problems. Sometimes bakers, or some of the less wealthy of them, were forced out of business unless they were provided with grain below market price by the public granary. Public sales of grain at subsidized prices helped bakers to keep to the prices ascribed by the assize of bread and counteract sudden price increases. The way the state or the city council financed these tasks contained an element of inter-temporal stabilization of real income, or redistribution from rich to poor, or both. Taxes could be raised on luxury goods, ‘voluntary’ subscriptions from the rich were asked for, or the operation was financed by credits.28 Some city authorities were only alerted by the advent of a crisis while others relied on a network of agents and merchants as well as on their own officials, who travelled widely to buy grain and dampen price increases at home.29 As long as this was a temporary measure, the strains put on public finances were not insurmountable. Debt had to be repaid, of course, presumably at a date when real income was not squeezed by high prices, and so in this way an inter-temporal redistribution of consumption was accomplished. The second half of the eighteenth century proved fatal to these schemes, however, because prices continued to increase for about half a century. The agencies responsible for grain supply accumulated huge debts as a consequence of their attempts to keep prices down through subsidies to the bakers, and to consumers. This was most evident in eighteenth-century Rome, where the generous subsidies were made permanent in the latter half of the eighteenth century. Consumers suffered less from grain price increases in Rome than elsewhere in the Mediterranean area, and Roman bakers paid less for their grain, which made them comply with the low price policy. In the end the subsidies had to be abandoned because the accumulated public debt became too large, and because of the more liberal outlook of the early nineteenth-century pope, Pius VII.30 However, Rome was not the only public granary that experienced problems in this period; the highly efficient Kornhasse of Cologne, for example, had to halt its operations for the same reason. In fact, very few public granaries survived the first decades of the nineteenth century.

26 Ebeling and Irzigler, Getreideumsatz, p. xxii.
27 See Ebeling, ‘Versorgungskrisen’.
29 See the detailed account of the ambitious policies of sixteenth-century Cologne in Ebeling, ‘Versorgungskrisen’.
30 See Revel, ‘Grain de Rome’.

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IX

Inadequate inventories for carry-over have been shown to be related to the excessive risks and zero expected earnings inherent in carry-over speculation, and to the externalities associated with price stability induced by carry-over. But why would public granaries and their carry-over be more profitable than private speculation? The answer is, of course, that they were not. With few exceptions, public granaries were unable to remain financially solvent over long periods. They relied on public funds raised from taxation and credit. The idea was to buy grain when and where it was cheap and sell when it was expensive, to increase the price level when it was depressed and to depress the price level when it was too high.\textsuperscript{31} Grain is a perishable product and the risks of fermentation, rot, damage by insects and rats, and so on, were always present forcing managers to sell prematurely, sometimes without even covering the purchase price. Time and again the public granaries had to apply for financial aid from city authorities or central governments. If the memory of a recent dearth was still alive, the resources usually came forward. But a series of good harvests made it difficult for the granary to renew its stocks. Bakers and consumers did not want to buy old grain, often of inferior quality, when there was plenty of new cheap grain around. As a consequence, the public granary made losses. The chances of getting the necessary funds for its deficits depended on how strong the memory of the preceding dearth was. But that memory was often short. Therefore, public granaries could be half empty, or insufficiently stocked, at the beginning of a dearth. Import subsidies to merchants, and other \textit{ad hoc} means, were then tried in order to improve the supply and dampen the hausse of price.

Needless to say, bakers did not turn down the opportunity to buy grain below market price from the public granary. When the public granary had to cover its costs, accumulated when subsidizing bakers and consumers, and tried to charge bakers and consumers a price above the ruling market price, there was little understanding or enthusiasm.\textsuperscript{32} The key to success for a local public granary, therefore, relied on its ability to establish a monopoly in supplying the bakers, or at least to force them to buy predetermined quantities of public grain when the granary had to renew its inventories. The \textit{Chambre des blés} in Geneva came close to operating a monopoly over supply to bakers.\textsuperscript{33} Ordinary consumers were free to buy grain in the public market, but since a large proportion of them lacked facilities to bake, they had to buy bread. The \textit{Chambre} operated continuously from the end of the seventeenth century to the French Revolution, when Geneva was occupied. The basic principle was that bakers bought (part of)

\textsuperscript{31} Fredrick the Great of Prussia, in echoing his predecessor, expressed it this way: 'Die Bestimmung ist..., das Gleichgewicht zu halten zwischen den Städten und dem Platten Lande, in den Städten zu verkaufen wenn das Getreide zu teuer, auf dem Lande zu kaufen wenn es zu wohlfel ist.' Quoted in Naudé and Stalwiet, \textit{Getreidehandelspolitik}, p. 179.

\textsuperscript{32} The managers of the moderately successful public granary in Lyons experienced this, and time and again the city authorities had to subsidize its activities, which they did, but with decreasing enthusiasm: Rambaud, \textit{Chambre d’abondance}.

\textsuperscript{33} Blanc, \textit{Chambre des blés}. But see also Pieu and Zumkeller, ‘Stocaggio dei grani’.

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their grain from the *Chambre* below the market price in times of hausse and above market price when prices were low. That the activities of the *Chambre* actually stabilized prices is evident, considering that frequent attempts were made to export bread from the city when it was relatively cheap and to import bread when prices were lower in the surrounding area. Maintaining control of the supply line to bakers was thus the most critical element for most public granaries. They all had to rely on some element of forced supply when prices were low. But only in a few cases was it possible to retain this authority over long periods of time. A similar experiment in nearby Lyons was only moderately successful.34

When public granaries also served military purposes, for example, to feed a standing army, and had the backing of a strong and determined state—as in Prussia in the eighteenth century—they became important participants in the market for grain. Although Prussia developed granaries both for civilian and military purposes, the military granaries were used occasionally in the Scandinavian countries to regulate supply. The sheer dimension of these operations—the public stocks in Prussia amounted to some 10 per cent of the normal harvest—and the accurate timing of buying and selling makes it probable that they contributed to price stability.

There was a peculiar ambiguity towards private speculative stockbuilding, as has been pointed out above, but a more assertive attitude towards institutional carry-over. Religious institutions were encouraged to do this, and so also were corporations. In some cities they were ordered to keep stocks, in exchange for the monopoly they had been granted. These were not public granaries in the strict sense of the word. However, the livery companies in London were compelled to contribute to a granary managed by the Corporation of London, and it was in operation at least until the end of the seventeenth century. In Copenhagen, and in many continental cities, a similar system operated for another century, but with the bakers’ guild as the ‘public’ granary. In London the corporation set up a market to distribute its grain below the ruling market price, but mainly to the poor.35 These institutions, semi-private in nature but a substitute for public granaries, raise the issue of whether it is reasonable to talk about public sector crowding-out of private speculation. The livery companies in London cannot be seen as strangers to trade and commerce, and it is therefore tempting to suggest that their efforts to establish a granary were a response to, rather than a cause of, recurrent failures of the grain market to deliver. Of course, it can be argued that the Corporation of London was concerned about the political externalities generated by price volatility, and that the lives and activities of the grain dealers, and commerce in general, became so threatened in times of dearth that ‘business as usual’ was not an option. But this interpretation is not necessarily at odds with the general thrust of the argument advanced here: externalities caused by price stability called for concerted action, although in this particular case a cooperative but binding obligation to the Corporation of London was the device used.

34 Rambaud, *Chambre d’abondance*, pp. 86, 158-9. Although Rambaud is fairly hostile to the idea of public granaries, he concede a price stabilizing effect in their activities.

35 Outhwaite, ‘Dearth and government intervention’.

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So far it has been possible to offer an interpretation of the long-lasting institutions governing grain markets as a rational response to the problems faced by local and national economies. When we turn to the regulation of external trade, it is not so easy. Most countries had a system of quantitative trade restrictions affecting, at different points in time, either exports or imports, or both. Even grain surplus regions, such as the Baltic area, resorted to export prohibitions in times of severe harvest failures. It can be argued, of course, that this was a rational strategy from the point of view of a single country, in a ‘prisoner’s dilemma’ type of context, where the outcome was globally and individually inefficient. Endemic international conflicts would make a reliable flow of grain highly unlikely, and certainly impeded the development of international trade. Given the possibility that other countries could resort to trade restrictions without notice, the best response would be to try to attain self-sufficiency in food. More importantly, this lack of international order made the quest for autarchy almost universal. From the viewpoint of a single country, import restrictions therefore became the obvious way of attaining a sufficient internal supply of grain, thereby extending favours to the rural interests by causing an increase in the level of prices. However, these restrictions were lifted when prices threatened consumers. Export prohibitions were used mainly in periods of insufficient supply and were always suspended when prices fell, which alarmed urban interests. Given the quest for self-sufficiency imposed by the uncertainty of the flow of merchandise, the ruling elites tried to balance the conflicting interests by extending favours to both, but in different phases of the price cycle.

In the more centralized countries, such as Prussia, there were repeated negotiations in the Landtage sessions between the concerned parties. The rural interests pressed for export permits and got them when prices were low. The urban interest agitated for import permits when prices were high, and often these permits were granted. Urban interests were not necessarily against free trade. In seventeenth-century Denmark, the wealthy merchants in Copenhagen and the landed interests represented by the aristocracy lobbied for the lifting of the temporary export restrictions which were sometimes introduced. In fact, the aristocracy had secured for itself a say in all matters concerning trade policy. In England the outcome of the bargaining between conflicting interests clearly turned against the urban interests when the bounty on export was introduced, which probably increased the price of grain. From the late seventeenth century there were also constitutional barriers against frequent changes in trade policy. At the

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36 Danzig imposed export bans (frequently short-lived) as often as once every 10 years in the sixteenth century: Naudé, Getreidehandelspolitik, p. 18.

37 There is a rival interpretation suggesting that grain regulations favoured urban interests against rural: see, e.g., Romani, Populazione, mercato e prezzo. In Italy a straightforward distinction between urban and rural interests is very difficult to make since the urban elite were landowners. Vandenbroeke, on the other hand, suggests that governments were seeking compromises between landed interests and the demands expressed by the urban consumers: Agriculture, pp. 154-5.

other extreme was France, which regulated not only external trade but regional trade as well. In the rest of Europe, however, more often than not, policies were designed to strike a balance between the two interest groups: to stop prices from falling too much by easing exports, and to limit the increase during periods of scarcity by encouraging imports.

XI

Did the public granaries and interventions in supply deter the private traders from bringing grain, that is, can we talk about a case of public crowding-out? To the extent that the public supply lowered prices, which it was meant to do, it could, of course, affect private trade negatively. Merchants reacted on the basis of expected earnings and the larger they were, the larger the trade would be. However, as was demonstrated in figure 1, the huge standard deviation attached to the expected returns implies that it would be practically impossible to identify the effects of public policies from other types of 'noise'. Furthermore, we here encounter the problem that the price which will give private traders sufficient insurance against the risks may not be a socially tolerable one, taking into consideration the consequences for those with low incomes, and more generally the externalities generated by inflated price levels. The issue of the public crowding-out of private initiative then misses the whole point as regards the rationale of public intervention. In the first place the existence of positive externalities in price stability makes claims as to the efficiency of market outcomes unsustainable per se. Equally important is the fact that efficiency was not a sufficient ambition for public policy. On moral grounds or for the preservation of social order a 'fair' distribution, in the sense that the worst consequences of subsistence crises were avoided, was sought. Efficiency carries no implications as to fairness or survival of the destitute, but a fair distribution preferred by all is a public good which will also call for public action.

Since the consequence of an increase in prices on consumption is measurable only in relation to the level of income and its distribution, it cannot be taken for granted that the only (or best) way to protect real income was through intervention in food markets. Entitlement protection through income support might in principle do the job without any need to intervene directly in the supply of grain or pricing of bread. What emerges here is a choice between a selective way of securing consumption at a desired level with entitlement protection, which will be targeted to specific vulnerable groups, and a more general policy relying on market intervention. The historical record suggests an evolution away from intervention in markets and towards selective entitlement protection. The fact that the decline of comprehensive grain policies occurred comparatively early in England and with the development of the poor laws is striking and probably not accidental. There were also attempts outside England in the eighteenth century to introduce selective policies. There were, for example, efforts to divert crowding-out effects of price stabilizing measures by establishing a two-tier price structure. The subsidized grain was primarily sold to the poor.
at below market prices, while the rest of the population had to rely on the free market. The rationing system could be either informal—the well-off would feel ashamed of getting their supplies from this market—or based on explicit controls over those making their purchases in that market.

But what finally opened the possibilities for selective means in the nineteenth century was that price volatility decreased as markets became more integrated and that income levels were improved. As a consequence large groups previously affected by the poor performance of grain markets were no longer at risk and those still exposed to the whims of the market were better helped by entitlement protection. Policies could become more selective, and so they did.

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