Patterns Influencing Acceptance of Large Scale Pig Production in Rural Areas

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Abstract:

The paper deals with the attitude of rural population in Germany concerning construction of large pig production units. Especially two points are of interest: Which factors influence peoples' attitude towards the pig plants and what kind of decision making process in the communities promotes the investment plans. For that purpose in nine rural municipalities, where the construction have been under discussion, people were asked to state by a questionnaire their preferences as well as the degree of information and participation in the process of negotiations. Results show that a majority of the inhabitants was against large pig production units. However, there are four largely homogeneous groups of individuals with different attitudes towards the investment. The council's decision in favour for this investment was negatively correlated with the amount of public involvement. From the chosen arguments labour generation by pig production explains individual attitudes best, followed by protection of nature, income generation and plant size. Animal welfare and bad smell, which are often cited in the literature, did not affect significantly peoples' attitude. However, the positive effects are only perceived as small and uncertain while disadvantages seem to be more realistic. The solution of this dilemma may be an reduction adjustment of plant size, a change to more labour input and more public relations for pig production.

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1.   Introduction

It belongs to the fundamental knowledge of economists that structural change is a prerequisite to maintain competitiveness. That is especially true in the case of agriculture. Related to animal production, structural change occurs mainly by increasing the output volume per farm worker but also by changing the production technology, exploiting economies of scale and scope. But comparisons of the average herd size of pig production with the economical optimum in many industrialised countries show a significant gap (Hinrichs, 1983; Sharma *et al.*, 1999). The discussion about farm size in general (Balmann, 1994) confirms, however, that the gap between existing and optimal sizes is caused by a bundle of institutional, economical and social factors.

Several studies draw the clear picture that large-scale technologies often are not accepted by the public in developed countries, particularly when it comes to animal production (Blandfort *et al.,* 1999; Demeyer, 1997; Swanson, 1995). This lack of public acceptance is especially important because it also affects rural population and may hinder competitiveness. Ziche (1993) and Hamm *et al.* (1996) showed for Germany that half of the rural population calls for strict upper limits on the number of animals allowed in one farm.

The concept of integrated rural development requires to search for a suitable pathway neither neglecting voters' interest nor the development of an efficient agricultural production. Consequently, it is a crucial question what patterns really influence the acceptance or rejection of production technologies that favour economies of scale. This knowledge will help to understand attitudes towards large scale production, enhance technology adoption and improve public perceptions so that future investments will meet not only the goal of economic efficiency but also local preferences.

Recent attempts of a local government in Germany to canvass investors from abroad to install large pig production sites (8,000 to 10,000 pigs and 1,000 sows) provide the opportunity to study key attitude factors. Villages involved were located in the sparsely populated province of Mecklenburg-Vorpommern which has been a large pork importer since Germany's re-unification in 1989 due to a decrease in pig production of 60%. Fifty villages have been already considered by local government for an investment in pig production. For the purpose of that study, nine of those villages were chosen for further investigation. Municipality council issued a permit in three of the selected cases, showed interest in another three cases first and then rejected the investment opportunity and the rest rejected the investment from the beginning.

This paper tries to identify patterns responsible for both individuals' and the municipality councils' behaviour accepting or rejecting the investment offer. In Section 2, we elaborate hypotheses suited for an explanation of individual attitudes and local decisions. Section 3 outlines the methods applied for validating those influencing factors. Results are shown in Section 4 and interpreted in Section 5.

2.   What factors can influence acceptance?

It is well investigated how attitudes towards animal production influence the demand for meat (eg. Fawaz *et al.,* 1998). Concerning the acceptance of investments in pig production sites, less information is available about the role of individual preferences once the plan in the own community is introduced and an attitude towards this offer is formed. It is therefore suggested that the individual's attitude towards the investment bid can be traced back to attitudes toward agricultural production and rural development. It has as well to be checked what role socio-demographic characteristics may play in generating attitudes toward the investment decision. Moreover, it is assumed that individual attitudes can be measured by a linear utility function and by ordinal variables. From that assumption follows a limitation concerning the interpretation of the estimated parameters.

The decisions of the communities involved can be based on two different explanations. The obvious explanation according to the theory of democracy (eg. Leleux, 1997) would be that the residents' preferences shape the decision of the community council. An alternative hypothesis to be tested is that the community council decision could also be explained by the structures of the communication flow (Orth and Beck, 1998) and the varying level of involvement of groups within the community in the decision-making process (Crain and Rosenthal, 1967).

3.   Methods

A survey of all households with a public phone number (n=1,390) in the nine communities was conducted in July 1999, of which a response rate of 25.3 per cent (n=351) was achieved.

Consistent with the factors suggested above, the variables to be explained were the individual's attitude towards the proposed investment (Y1) and secondly outcomes of the decisions of the community council (Y2):

Y1 = f (S, D)

Y2 = f (I, Y1)

where **S** is the attitude towards single issues, **D** are socio-demographic characteristics of respondents and **I** is the level of individual involvement.

People' s attitude towards the investment in total (**Y1**) is measured on a five step Likert scale with help of the following question:

Table 1

Variable	Question:					
Y1	Please state on the scale below your attitude towards the investment in a large pig production unit in your community 1)					
	Very positive	Rather positive	Don´t mind	Rather negative	Very negative	Mean
	1	2	3	4	5	3.80 n=339

1) The original text was in German. Current statements represent an English translation describing each addressed issue

To reveal the attitude patterns in detail, the respondents were asked to evaluate different pros- and cons-arguments related to pig production (S1-S10). These arguments had been under discussion during the debate on the investments on the local level.

Table 2:

Variable	Question:					
S1-S10	Please state on the scale below, how you assess the following statements					
	Fully Disagree	Rather Disagree	Partially Agree	Rather Agree	Fully Agree	Don´t Know
	1	2	3	3	5	O

Variable S1-S10	Statement	Mean
1. SML	Pig production sites have a bad smell	3.89 n=335
2. NAT	Pig production sites ruin our nature	3.40 n=324
3. INC	Intensive animal husbandry will keep an important source of income in the countryside	3.21 n=331
4. HOL	In an industrial production site, no animal friendly farming is possible	3.48 n=324
5. HEA	A pig production site in the village has damaging consequences for people´s health	3.08 n=302
6. SIZ	Small pig production sites can rather be tolerated than large ones	3.71 n=325
7. REG	I prefer food that is produced in the region	4.22 n=339
8. BIA	Foreign investors can do more for the region than those from the community	2.16 n=306
9. TRA	Traffic will considerably increase with a production site	3.40 n=322
10. LAB	A new pig production site generates labor in the region	2.63 n=326

The socio-demographic characteristics (**D1-D8**) were measured by the following statements:

Table 3:

Variable	Question	Answer	Mean
1. SEX	Gender:	Male / female: 0 / 1	0.36 n=336
2. AGE	Age:	Years	50.0 n=284
3. EMP1	Employment	Employed/ not employed: 0 / 1	0.13 n=337
4 EMP2	Retired:	Yes: 1	0.33 n=337
5. EDU	Degree of education:	School until 9th grade/ until 10th grade/ high school/ university: 1 / 2 / 3 / 4 /	2.20 n=322
6. DIS	Distance of the own home to the planned pig production site:	< 1km / 1-5 km/ > 5 km: 1 / 2 / 3	1.92 n=310
7. FAR	Being a farmer:	Yes / no: 1 / 0	0.29 n=334
8. CHI	Having children below 18 years:	Yes / no: 1 / 0	0.42 n=337

The individual involvement was measured by the three following statements (**I1-I3**).

Table 4:

Variable I1-I3	Question:				Mean
1. INV1	Did you know about this discussion?	Yes: 3	Hardly: 2	No: 1	2.28 n=351
2. INV2	Did you participate in this discussion?	Yes: 3	Hardly: 2	No: 1	1.60 n=350
3. INV3	Do you know, which result the discussion in your community had?	Right Answer: 1	Wrong answer or don´t know: 0		0.59 n=346

Y2 is measured by numbering the nine villages with 1 (agreeing), 2 (first showing interest, finally refusing), 3 (refusing from the beginning). Mean of Y2 is 1,82 (n=351).

The interference between the dependent (Y1, Y2) and the independent variables (I, S, D) was then estimated by OLS.

Based on these findings two supplementary steps prove to be helpful for a broader understanding of influencing factors.

In order to test the homogeneity of the respondents in relation to their behaviour toward the investment offer (Y1) and the independent variables (I, S, D), respondents were grouped by the variables S1-S10 with help of Cluster Analysis (Ward's Minimum Variance approach). For all variables (I, S, D) the group means are compared by Variance Analysis.

In addition to the quantitative analysis, in-depth-interviews were carried out with the mayors of four of the nine communities to receive additional information about the decision making process and the central arguments of the local debate. These interviews were only loosely pre-structured in order to allow for differences in regional circumstances and evaluated in respect to additional explaining factors for the municipality councils' decision.

4. Empirical Results

4.1. Regression Analysis

The linear regressions for Y1 and Y2 were carried out by two different ways, firstly by enclosing all variables, secondly by a stepwise procedure using F-statistics to decide whether or not a certain variable should be included .

In order to avoid too much independent variables in one single equation the impact of S- and D-Arguments on Y1 has been tested by two separated equations:

Y1 = f (SML, NAT, INC, HOL, HEA, SIZ, REG, BIA, TRA, LAB)

Y1 = f (SEX, AGE, EMP1, EMP2, EDU, DIS, FAR, CHI)

Finally using the stepwise procedure:

Y1 = f (S1-S10, D1-D10)

Table 5: Impact of attitudes and socio-demographic characteristics on the acceptance of large scale pig production units (* = significantly different from zero at the 5 per cent level of significance; ** = significantly different from zero at the 1 per cent level of significance)

Equations	R2; F	Durbin Watson
Y1= f (S) Enclosing all variables: 1. Y1 = 5.014** - 0.127 BIA* - 0.079 HEA + 0.067 HOL – 0.165 INC** - 0.487 LAB** + 0.079 NAT – 0.144 REG* + 0.157 SIZ** + 0.122 SML + 0.050 TRA	0.695 50.598 **	2.153
Stepwise (increase in F at the α=0,05 level): 2. Y1 = 4.884** - 0.475 LAB** + 0.177 NAT** - 0.198 INC** + 0.121 SIZ* - 0.117 BIA*	0.679 95.987 **	2.081
Y1= f (D) Enclosing all variables: 3. Y1 = 5.241** - 0.001 AGE – 0.146 CHI – 0.624 DIS** - 0.062 EDU + 0.399 EMP1 + 0.032 EMP2 – 0.322 FAR + 0.170 SEX	0.083 2.562 *	1.837
Stepwise: 4. Y1 = 5.043** - 0.635 DIS**	0.054 13.414 **	1.713
Y1 = f (S, D) Stepwise: 5. Y1 = 4.226** - 0.420 LAB** + 0.224 NAT** - 0.241 INC** + 0.180 SIZ**	0.670 85.42 **	2.097

Testing the impact of involvement and public agreement on the governmental decision (Y2 = f (I, Y1)) was done in one step because of the low number of the independent variables:

$Y2 = f (INV1, INV2, INV3, Y1)$

Table 6: Impact of involvement and attitude of the population on the governmental decision

Equations	R2; F	Durbin-Watson
Enclosing all variables: 6. $Y2 = 1.219** + 0.053$ INV1 $+ 0.034$ INV2 $+ 0.494$ INV3** $+ 0.034$ Y1	0.135 12.799 **	1.690
Stepwise procedure: 7. $Y2 = 1.463** + 0.597$ INV3**	0.127 48.464 **	1.687

The applied functions (see Table 5 and 6) lead to the conclusion that the individuals' attitude could be explained to a larger extent than the council's decision. The belief in generation of income and labor by pig production as well as preference for local food and foreign investors improve significantly the overall attitude towards an investment in a new pig production site (equations no. 1 and 2). Of the negative arguments, the attitude that small holdings are to prefer against large ones and – as stepwise regression shows – general environmental concerns significantly influence the overall attitude. Socio-demographic variables hardly play a role but show the importance of being affected personally: The nearer respondents are living from the planned site, the more they tend to be against the investment (equations no. 3 and 4). However, this effect is apparently weaker than key attitude factors like labor and environment. Due to problems of multicollinearity the variables BIA and DIS loose significance when the S and D variables are combined in a single equation (no. 5).

Obviously, the council's decision could not be brought in connection with the attitude of the municipality's inhabitants – there was no statistic correlation detectable (equations no. 6 and 7). There was, however, a significant influence of the level of public involvement . The more people were informed about the outcome of the discussion, the more likely it became that the municipality council would refuse the investment permission. This is understandable if one takes the overall negative attitude (3.80 on a 1 to 5 scale) towards the investment into account. It has to be mentioned, however, that all three involvement variables are for themselves significantly correlated with Y2. They show again the problem of multicollinearity.

4.2. Cluster Analysis

Clustering becomes sometime crucial, because one has to decide which cluster variables, how many classes and what algorithm should be used. For that study it appeared to be useful to work with attitude patterns (S1-10) which showed the highest impact on individual attitudes. The results gained by using the variables D1-8 for clustering showed only weak differences between the obtained classes. Having this in mind it is assumed that the "optimal" number of

classes will be derived from an iterative procedure, which takes into account the degree of significance between class means of all variables (I, S, D) and the obtained information.

Table 7 reports the final results which was received by using four classes. The denotation of the four classes makes it easier to understand the obtained information:

Cluster 1, called "strong critics" is the largest group, containing respondents with a very negative attitude towards the planned investment and consequently negative attitudes towards modern animal production. This is the group showing the greatest homogeneity because it remains stable during the whole iteration process.

Cluster 2, called "skeptics" represents people, who are also against the investment, but denying the arguments in favor as well as against pig productions. However, their attitude towards foreign investors is very negative. They are significantly the oldest group with a low educational level and live close to the investment site.

Cluster 3, called "moderate critics", is second in size (n=108). Their attitude towards the investment is relatively near to indifference. The statements of respondents in this cluster concerning single issues of animal production and their socio-demographic characteristics usually lie in between the extremes.

Cluster 4, the "strong supporter", represents about 20 per cent of respondents. They agree that animal production would generate labor and an important source of income in the countryside. They strongly oppose environmental and health concerns. Strong supporters show to typically be well educated men, living rather far away from the planned investment site.

Table 7: Results of Cluster Analysis (means denoted with * are significantly different on the 95% level from all other means)

Variables; for understanding look to table 2	Cluster 1 "strong critics"	Cluster 2 "sceptics"	Cluster 3 "moderate critics"	Cluster 4 "strong supporter"
N	144	33	108	64
Y1	4.70*	4.63*	3.55*	1.80*
SML	4.81*	1.63*	4.02*	2.62*
NAT	4.71*	1.52*	3.27*	1.43*
INC	2.54*	1.41*	3.72*	4.59*
HOL	4.67*	1.53*	3.32*	1.93*
HEA	4.52*	1.34*	2.75*	1.41*
SIZ	4.41*	3.13*	3.78*	2.33*
REG	4.20	3.33*	4.22	4.70*
BIA	1.80*	1.23*	2.57	2.75
TRA	4.12*	1.79*	3.36*	2.59*
LAB	1.76*	1.35*	3.07*	4.44*

4.3. Mayor interviews

Four of the nine mayors involved in the decision process agreed to be interviewed, the mayor of Tinbergen that accepted the investment bid, of Nidow that showed interest first and then refused to issue a permit and the mayors of Dragendorf and Gniesen that outright rejected the investment (the names of the villages have been encrypted). Issues of the interview were the structure of the decision making process in the village and the question under which conditions a new pig production site would have been acceptable.

The office in charge, Land Society, started the procedure in all four villages with a phone call in which they made an appointment with the mayor. However, the first informal differences already appeared at this stage. In Tinbergen that eventually accepted the investment the Land Society was already well known to all council members, which was not the case in the other three municipalities. In Gniesen, for example, the first appearance of two members of the Land Society was already seen partly as a threat, partly as foolish amateur play:

"Two young men from the Land Society arrived with a field map and a title-deed and were like 'We want to build a new pig production site in Gniesen. We are not gonna ask anybody.' I almost felt sort of pity for them. I mean, they had their instructions, their map, some figures about low levels of animal production in our region, and that was about it."

Another distinguishing factor in Tinbergen was their experience with foreign investors. As stated by the mayor, this investor engaged himself in communal fire-brigade festivities and other regional events so that skepticism in respect to foreign investment had vanished. This statement was confirmed by the fact that Tinbergen had the relatively highest approval rate (2.55) on the statement "Foreign investors can do more for the region than locals."

The argument that dominated the debate in Tinbergen was the necessity to have animal production in the countryside. "If you don't build pig production sites in the countryside, where do you want to build them? If everybody resists, was is going to happen? You don't want your pigs to be breeded down in Bavaria."

These seemingly altruistic statement did not play a role in Nidow, where the option to create some additional jobs dominated the positive attitudes in the beginning. Here it was the fact that the Land Society had to correct their optimistic estimations regarding the labor potential of the site downwards as well as a case of pig-fever in a village nearby that changed attitudes significantly to the worse.

The dominating arguments in Gniesen and Dragendorf that outright opposed the investment were bad experiences with animal production in the past (the region belonged to the German Democratic Republic which engaged strongly in animal production and subsequently suffered environmental problems), possible competition with local farms, smell and environmental problems connected with slurry disposal in the soil.

Nidow and Dragendorf decided during the decision-making process to involve all local citizens which is reflected by the two highest values for the level of information in these municipalities. Nidow called in a plenary session of all locals in which an election found 45 people against and five people in favor of the investment. In Dragendorf, council members collected signatures against the production site with only two people refusing to undersign.

Of the three communities that were not realizing a pig production site, two denied heftily the possibility to realize a similar investment in the future. Only the mayor of Dragendorf stated:

"Yes. Agriculture has to play an important role. People aren't against agriculture in general, basically they are open. I guess the main condition for a pig production site in Dragendorf would be that the holding wasn't so big. And outdoor farming would be a good possibility as well." When asked to define "not so big", the mayor suggested numbers up to 2,000 pigs per holding.

5. Summary and Conclusions

The different behavior of nine municipalities which were approached to realize a new pig production investment provided the possibility to measure quantitatively and qualitatively patterns that determine different attitudes towards modern large-scale animal production. A survey among all available households in the municipalities was evaluated by regression and cluster analysis. In addition, interviews with mayors who were available were carried out.

By this combination of methods, significant patterns how attitudes towards modern farming were formed could be determined. Regressions showed two important factors. The first is that arguments in favor of pig production apparently count at least as much as negative arguments. Judgements on the potential of pig production sites to create labor and income and the abilities of foreign influence the individual attitude towards animal production as strong as environmental and animal welfare concerns.

The municipalities under investigation showed different ways of decision-making which seemingly influenced the decision for or against the production site much more than preference structures of local inhabitants. As attitudes towards the investment were negative on average, it is an understandable finding that an increased level of involvement led to a smaller probability that the investment was realized. On the base of public choice theory, it can be assumed that low levels of involvement were at least partially a conscious strategy of municipality councils which knew that their interest differed from the majority's interest.

Cluster Analysis showed that 40 per cent of the sample was very critical towards the investment for the reason that were assumed, such as smell, environmental consequences and health. Another 30 per cent were more indifferent, but mildly argued in the same direction as strong critics. It can be assumed that people belonging to this cluster would be most susceptible for political campaigning for animal production. One fifth of respondents saw

primarily income and labor opportunities in the investment and therefore had a very positive attitude towards a new pig production site. Another smaller cluster of mainly elder respondents had a negative attitude towards the investment but statements in this case could mainly be traced back to a strong bias against foreign investors.

Qualitative analysis rounded off the picture by a few additional aspects. Hence, the utter importance of factor endogenity of the investment showed also in the interviews with the mayors. Exogeneous investors and middlemen seem to have a lot more barriers to overcome in order to realize the investment compared with local actors. It could be confirmed that the labor argument was a very strong one which is not surprising in a region with unemployment up 17 per cent. As soon as it became clear that intensive animal production relies on capital much more than on labor, even well-meaning partners lost interest in the project.

It will be a central issue of future Agricultural Policy and Research to bring public image together with efficient farming systems. Adaptations in plant size, in labor input and in communication policy as well as a strong emphasis of a broad participation on benefits of production plans will be of help for that process.

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