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exploring the role of local externalities and global networks

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Spillovers in the Polish food industry - exploring the role of local externalities and global networks

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ABSTRACT

The objective with this paper is to test whether there are spillovers and agglomeration effects in the Polish food, beverage and tobacco industries. But while most studies on spillovers in developing and transition countries focus on unidirectional spillovers, this study assumes that spillovers may be multidirectional and instead could be based on any kind of 'community' related to a geographic cluster or industry. Transition countries in Eastern Europe often invite investors in with open arms and ample tax holidays based on the assumption that they create jobs and their technology spills over on domestic firms' own capabilities eventually. Preliminary results on horizontal spillovers in this paper show that this is not the case in the Polish food industry. It appears that foreign investors share their own 'glocal' network externalities, while production and productivity spillovers among domestic firms are confined to their own and often local networks. Preliminary results are robust in the sense that different analytical approaches (supply curve and production function) lead to a highly similar set of conclusions. The paper rounds of with a discussion of how then to justify the ample tax holidays that Poland offers to foreign investors in the special economic zones designated particularly to industrial development in a regional policy perspective. Future versions of the paper will test further the role of history, e.g. whether former state owned networks in fact could play a role to the formation of spillovers. Also the attempt will be to test for pecuniary spillovers in forward and backward linkages.

1.Introduction

As the largest and highly 'glocalised' manufacturing industry in the largest transition country, having attracted more than 5 bln EURO in foreign investment (PAIZ, 2001a), the Polish food industry is expected to be a very relevant case to the absence or presence of spillovers associated with multinational activity in transition countries. But the study of spillovers, from the technologically competitive foreign owned firms, is combined with a more general study of spillovers among local producer communities in Polish food industry. This is relevant since foreign investors are only one brick in the larger puzzle of transformation to a market and cluster-based economy. Offering the myriad of decentralised information streams leading to the externalities and spillovers that the socialist system's bureaucratic co-ordination mechanisms apparently failed to provide.

In a political economy perspective it is at the same time relevant to inquire into the role of multinational firms in the construction of a decentralised market economy. If foreign investors offer few benefits beyond those internalised in the multinational firm, how can tax holiday and other regional and national policies towards attracting foreign investors then be justified? Should CEE governments take a more active approach to foreign participation in combination with for example regional policy to optimise their benefits from foreign direct investment (FDI)?

Few of the available studies of transition countries are generally optimistic about the evidence and prospect for spillovers associated with FDI in the short to medium term (see Konings, 2001). This study takes the problems and questions identified in the literature one step further by testing for spillover at a much more particular level of the economy, and by discussing why spillovers only exist among certain quite closed communities and what must be done to improve the situation. The conclusions are not particular only to the Polish economy, but valid to any industrial upgrading context in transition and developing countries where similar national and regional policies (laissez-faire, relaxed taxation policy combined with special economic zones) towards foreign investors have been adopted.

Section 2 offers a short review of some literature on spillovers in the manufacturing industry in developed, developing and transition economies. The data on the Polish food industry is introduced in Section 3. Section 4 discusses the specific situation of the food industry in transition including the motives and impacts of foreign investors at the firm and industry level. Section 5 introduces the estimation strategies for testing the presence of spillovers. Results are reported in Section 6 followed by a discussion of Poland's regional policy in section 7 and a set of preliminary conclusions are given in Section 8.

2. Spillovers – myth or reality?

The question of spillovers is a pandoras box, discussion of which promises to lead to few easy conclusions. The main problem with spillovers is their intangibility and hence the question of their measurability. Any study of spillovers will have to struggle with a large number of methodological problems as testified by past studies on spillovers (Blomström et al., 2001). However, the great occupation with spillovers, owes to a shared concern in society that they can provide a significant competitive edge to business and make the difference between regional prosperity and ruin. Classical economists were the pioneers of perceiving the relevance of spillovers to the workings of the market economy and distinguished between pecuniary (money-related) and non-pecuniary spillovers (Marshall, 1879).

A major problem with spillovers is not only how we measure them, but also our perception of spillovers. Some studies of spillovers take a very narrow perspective, looking at unidirectional spillover, for example from better performing firms to poorer performing firms in terms of R&D and productivity levels (see e.g. Amir and Wooders, 1998 or Haddad and Harrison, 1994). This allows mathematical and methodological rigor. Other studies are much broader assuming that spillovers are multidirectional and could develop through many forms of economic 'communities' such as industries or clusters that are geographicly confined. Porter (1990) is the best well-known example of such broader approach to spillovers. The main assumption behind spillovers is that they should have some kind of 'catalysing cause', and be associated with a 'vehicle' that can transport or communicate the spillovers from one place to another or from one firm to

another. Finally, a shared 'language' may be the lowest common denominator for spillovers taking place in practice or not.

Typical catalysts could be multinational firms in developing countries or R&D performing firms in developed countries, with an obvious overlap between these two types of spillover catalysts. Other catalysts could be government policy, user-producer relations (linkages) (Lundvall, 1985) or simply proximity in physical space (geography). Where it could be added that the more catalysts the merrier – e.g. a multinational firm locating next to a domestic supplier would be the case of a combination of catalysts that increases the likelihood of spillovers taking place (Aitken et al, 1997).

The vehicle or the driving force behind spillovers is strongly related to its 'community'. Socialisation or interaction may often be necessary (Lundvall, 1985), why the classical economists viewed spillovers as geographicly confined. In a globalised world this is not necessarily the case, since communities can come into being beyond the confines of physical space. However, globalisation has not reduced the importance of local space and local differences, but perhaps even made differences more visible. Socialisation of managers and employees can lead to spillovers through demonstration effects and exchange of knowledge. Turnover of employees among firms in the same location or industry is another often exemplified vehicle. Or the professional relations in a community of users and producers (Lundvall, 1985). Or finally, exchange of knowledge among firms that are loosely connected in a network of a lesser kind than an actual ownership structure (in which case spillovers are internalised and hence can no longer be classified as a real externality).

Concerning the importance of a shared language it comes to no surprise that evidence from the spillover literature suggests that a large economic and technological distance between a multinational firm and its host country could decrease the likelihood of spillovers taking place (Teece, 1977). Most studies that find positive evidence of spillovers from multinational involvement are among OECD countries and firms (see e.g. Liu et al., 2000). However, there are also a few studies providing positive evidence for

developing and transition countries (see e.g. Blomström and Sjöholm, 1998). But even here authors have identified several cases of the importance of shared language (Kokko, 1994), most pronounced in studies where the beneficiaries of spillovers in developing countries are isolated to the host country community of multinational firms (see Feinberg and Majumdar, 2001). However, the lack of spillovers is not necessarily the 'fault' or result of a purposeful approach to the host country of the MNC. Some authors suggest that host country policies towards foreign investors may be to blame at least partially for the absence of spillover effects (Feinberg and Majumdar, 2001). The necessity for a shared language is taken one step further by what Cohen and Levinthal (1989) calls the second phase of R&D – learning from the R&D of other firms, which necessitates that the recipient firm is capable of understanding the information disseminated by other R&D performing firms through investment in 'absorptive' capacity. Some studies use the technology gap as a measure of shared language (see e.g. Kokko, 1994) while other studies have used new investments as a measure of desire to learn (see e.g. Jensen, 2001).

This study does not look in isolation on particular types of spillovers in terms of communities, catalysts or vehicles. For example, spillovers are assumed to take place within or between different types of communities. But the focus is on catalysts that are considered important: foreign firms and physical space. This does not mean that other possible catalysing forces are ignored such as privatisation (including new firms) or the former networks of state-owned firms. In terms of vehicles the broadest possible vehicle is chosen first, such as for example total output, rather than just foreign output. However, the methodology applied will set certain limits to the types of spillovers that it is possible to estimate. This paper version only looks at non-pecuniary spillovers while later versions also will attempt to estimate pecuniary spillovers or spillovers in the vertical linkages between firms.

3. The data

The data used in the present study is a sample that is not necessarily representative in terms of firm population distributions across various characteristics of ownership, branch and region in the Polish food industry. It is based on firm-level data extracted from the

Amadeus database confining the search to Poland and NACE industries 15 and 16. This data was subsequently combined with information on ownership and size of investment from PAIZ's list of major foreign investors. The original list extracted from Amadeus in May 2002 includes 749 firms of which more than 100 firms were immediately excluded because of insufficient information, or because the firms did not have food processing as primary activity. Observations for 1992 and 2001 were also removed initially because of their low number, limiting the time period of analysis to: 1993-2000.

Furthermore, some firms are late entrants into the sample, while other firms are slow to publish new data. This gives an unbalanced panel with variability in the firm population covered for individual years as shown in Table 1. Observations are few and representation is low especially for the first two years of sampling: 1993 and 1994. Subsequently number of firms or potential number of observations stabilise around 550. Presently the real number of firms in the population is not known. In actual estimations the number of observations are further reduced and depending on estimation strategy, because of missing observations for individual firm-specific variables (see also below).

TABLE 1: Data sample in population, estimated with turnover data

Year	1993	1994	1995	1996	1997	1998	1999	2000
Simple average, in %	**21**	**17**	**44**	**54**	**62**	**54**	**61**	**61**
Mean (Branch-level), in %	26	50	65	65	67	59	73	61
SD (Branch-level), in %	27	96	84	63	58	36	53	33
Sample firms, no. of	70	84	432	507	585	594	556	549
Population	?	?	?	?	?	?	?	?

Source: Amadeus and EFFECT/GUS.

As a second step, data will be obtained from the Polish Privatisation Agency to include more information about year of privatisation of individual firms and further ownership characteristics.

TABLE 2: Descriptive statistics by year, current prices

OBS: Mean (SD)	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Turnover, 1000 PLN	70: 84,042 (104,354)	83: 70,701 (118,254)	204: 95,543 (134,275)	355: 94,286 (184,640)	462: 101,728 (212,383)	458: 103,787 (237,154)	483: 113,448 (263,189)	435: 140,144 (286,942)
Labour, no. of employees	0	0	226: 272 (416)	491: 367 (403)	582: 350 (372)	591: 336 (338)	551: 340 (382)	547: 332 (363)
Fixed assets, 1000 PLN	42: 20,272 (24,233)	82: 20,250 (30,840)	204: 23,487 (33,530)	355: 22,478 (36,716)	429: 22,738 (40,133)	457: 28,718 (63,653)	484: 31,716 (76,005)	435: 38,491 (101,999)
FDI, mln USD	9: 100 (152)	16: 52 (125)	44: 49 (108)	52: 50 (102)	54: 55 (106)	50: 59 (109)	52: 58 (107)	55: 55 (104)
Taxes, 1000 PLN	13: 12,700 (27,222)	39: 22,687 (90,374)	203: 1,869 (4,017)	355: 1,833 (4,481)	430: 1,629 (5,679)	458: 1,526 (6,935)	483: 1,604 (8,247)	435: 1,209 (4,254)
Cost of mat., 1000 PLN	24: 18,378 (15,284)	46: 34,038 (45,906)	77: 56,776 (129,030)	104: 32,530 (35,406)	168: 41,609 (45,635)	168: 42,469 (50,041)	237: 39,568 (54,030)	216: 48,225 (53,342)
Wages, 1000 PLN	23: 4,283 (2,600)	46: 6,438 (6,678)	77: 5,023 (4,826)	104: 3,697 (3,325)	166: 5,462 (6,300)	167: 5,422 (6,669)	237: 6,817 (9,395)	216: 7,868 (10,336)
Value added, 1000 PLN	12: 22,172 (34,421)	24: 54,108 (138,907)	51: 13,187 (20,725)	66: 8,960 (11,388)	100: 14,650 (26,387)	115: 10,392 (19,858)	149: 14,969 (36,101)	159: 15,188 (27,336)
ROA, %	12: 27 (25)	36: 23 (24)	202: 8 (14)	353: 8 (16)	429: 4 (16)	456: 3 (19)	481: -1 (20)	431: 2 (17)
Age	70: 61 (56)	84: 45 (51)	432: 39 (52)	507: 38 (51)	585: 37 (50)	594: 35 (49)	556: 36 (51)	549: 37 (51)
Total no. of firms	70	84	432	507	585	594	556	549
No. of foreign firms	27	33	81	97	102	101	102	110
No. of new firms	21	35	186	221	270	285	270	259
No. of new foreign firms	9	16	41	52	57	59	59	63
No. of acquired firms	18	17	40	45	45	42	43	47
No. of state owned firms	?	?	?	?	?	?	?	?

TABLE 2: Concluded

No. of firms by branch	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
1511-Meat	7	10	51	57	60	62	58	55
1512-Poultry	1	4	19	21	24	24	24	23
1513-Meat and Poultry	3	2	20	25	26	28	26	30
1520-Fish	1	1	11	11	13	13	13	12
1531-Potatoes	0	0	7	7	9	9	8	9
1532-Fruit	1	2	7	11	11	13	9	8
1533-Fruit and Vegetables	3	6	29	37	48	49	48	42
1543-Margarine	1	1	1	1	1	1	1	1
1551-Dairy prod.	2	2	58	61	73	74	66	69
1552-Ice cream	0	0	5	6	6	7	8	9
1560-Milling	1	1	1	1	1	1	0	0
1561-Grain mill products	1	1	27	30	33	34	27	25
1562-Starch products	0	0	0	1	2	2	2	2
1571-Prep.animal feeds	1	3	10	14	18	21	19	18
1572-Pet foods	1	2	3	3	3	3	3	3
1581-Bread and pastry	0	3	21	25	29	29	27	26
1582-Biscuits and pastry	5	7	12	13	16	16	16	15
1583-Sugar	8	7	33	55	66	66	66	69
1584-Chocolate	5	8	24	29	33	34	30	28
1585-Macaroni	0	1	3	3	3	3	2	3
1586-Tea and coffee	0	2	7	7	7	7	6	6
1587-Condiments	2	1	5	6	6	6	6	6
1588-Dietic food	0	0	2	2	2	2	2	2
1589-Other products nes	2	0	8	9	12	12	12	11
1591-Dist. alcohol	8	0	16	16	16	13	16	17
1592-Ethyl alcohol	1	0	4	4	4	3	4	4
1593-Wine	0	0	1	2	2	2	1	1
1594-Cider	1	3	8	8	10	9	9	9
1595-Fermented beverages	0	0	1	1	1	0	1	1
1596-Beer	11	13	20	20	22	22	20	21
1597-Malt	0	0	0	0	0	0	1	1
1598-Mineral water	0	1	10	13	19	20	16	13
1600-Tobacco	4	2	7	8	9	9	9	10

Source: Amadeus and EFFECT/GUS.

An estimation of data representation in the whole population is given in Table 1. It shows the median and variation in the sample's turnover to global turnover at the branch-level for each of the years 1993-2000. Approximately 60% of branch-level turnover is covered with this data for most of the years, even though the standard deviation reveals quite large differences in coverage of individual branches (see also the second part of Table 2).

There are several apparent biases in the data, related to the data source. This type of database is biased towards the larger firms in the global population simply because they are more likely to publish an annual report. Furthermore, since Amadeus is based on the availability of such information, it is also likely that the sample shows a bias towards better performing firms or firms trying to attract outsider investors, and in particular towards firms listed on the stock exchange. Other possible biases include overrepresentation of firms in the more important regions and overrepresentation of firms that have been privatised to a final ownership group (terminal privatisation).

It is difficult to judge whether foreign investors generally seek less publicity in terms of annual reports and a database like Amadeus when operating in Poland. Typically the parent firm will already be registered in Amadeus. This could also make it easier for database researchers to obtain data on foreign subsidiaries. Compared to PAIZ's list of major investors it is obvious that some important investors are not included in the sample. According to PAIZ's list approximately 85% of major investments and 65% of large projects in food processing are covered with the sample detracted from Amadeus. The bias towards larger projects is obvious and further pronounced by the fact that PAIZ's list only includes 107 projects out of an estimated total of 489 foreign investors projects in the food processing industries (PAIZ, 2001a). Since smaller investors going in with less than 1 mln USD are not included in the PAIZ list.

Hence it is difficult to judge on the basis of the available information whether foreign investors are over- or underrepresented in the sample data.

Descriptive statistics for the Amadeus data are shown in Table 2. Some variables are scarcely available for the first two years, 1993 and 1994, most dramatically exemplified with zero observations for labour. Effectively meaning that as the analysis draws on this variable it only covers the years after 1994. This is not so unfortunate as it minimises potential problems associated with an unbalanced panel because the panel tends to stabilise after 1994. Other variables are avoided in the subsequent analysis because they register few observations across all years such as cost of materials, wages and value added.

Finally, a few other variables obtained from GUS through the firm EFFECT have been added to the database. Firstly the price indices of individual branches in food processing were obtained, whereby all data in current prices can be deflated to real value. Secondly a series of retail prices on various food products were obtained from EFFECT covering the period 1993-2000, information that is necessary towards the calculation of output and in the estimation of supply curves (see also Appendix Table A1). Thirdly as already mentioned above, the global value of production (turnover) in the population is known from the GUS data obtained. Hereby each observation can be juxtaposed with the aggregate turnover of the corresponding branch. This is important information towards the estimation of spillovers in later sections.

4. Dimensions of transition in the food industry

This section will discuss dimensions of transition that are considered salient to the future competitiveness of the food industry in the CEE region. Stylised facts introduced in this section will inform the analysis in later sections.

The first important dimension is the privatisation of enterprises in the food processing industries. In principle this dimension should also consider the privatisation of land. But opposite most other transition countries, Poland did not face problems of privatising land used in agricultural production since this was in most cases never nationalised. However, this also means that Poland faces more severe structural problems in agriculture due to the low intensity and small plot size employed by individual farms. These structural

problems are also likely to feed over to difficulties related to the linkages between agriculture and food processing and hence also the efficiency of the latter. For example, fragmentation of food processing in Poland relative to other CEE countries may be one symptom of this general problem (Duponcel, 1998). Privatisation in Poland has followed along two main lines: privatisation to outsiders including sales of enterprises to foreign investors and mass privatisation (Blaszczyk and Woodward, 1999). The SMEs have, however, often been privatised to insiders. In this sense the food industry is no exception from the general privatisation path in Poland (Duponcel, 1998), since one will typically find a mixture of both outsider owned, foreign owned, mass privatised (often being a non-terminal kind of privatisation which eventually will go over to other types of ownership including outsider dispersed shareholders) and management and employee owned firms. Few firms in the Amadeus sample are SMEs, and hence the influence of insider ownership on results is likely to be very small. The impact foreign ownership has on firm performance, including the general impact of privatisation methods employed and the emergence of a new private sector, are viewed as factors of particular importance to the tests of spillovers in later sections. Furthermore, privatisation including the new private sector is not only important to present day resources, management and corporate governance of the individual firm, but also important in the sense of informing us about the past history, former linkages and old networks of the firm.

Therefore, the second salient dimension of transition is the disorganisation or reorganisation of vertical linkages between firms in the value added chains of the food industry. Prior to transition, there was a very strong vertical integration of the value added chain in the food industry. Transition is therefore likely to bring about more focussed firms and catalyse the importance of external linkages between firms. Furthermore, the whole linkage process is being liberalised, as linkages between firms under socialism typically were shaped by vertical communication structures. Momentarily the changes caused by liberalisation led to a disorganisation of production and hold-up problems (Gow and Swinnen, 1998). These problems have been viewed as one of the most important explanatory factors of the resulting economic depression in the beginning of the 1990s. More optimistically, one may, however, view this process as one

of restructuring and reorganisation increasing the likelihood of the emergence of a more globally competitive food industry. Transition is therefore a period of tearing down old and building up new linkages, both horizontally and vertically between firms. The transition period should therefore likely be one that is potentially associated with vast opportunities for spillovers and learning across firms, and especially among firms having experienced terminal privatisation, including solving their resource constraints and managerial incentive problems.

The third important dimension is the question of changes in geographic concentration of the food industry due to the introduction of free-market forces, privatisation and the liberalisation of linkages between firms. However, the expected outcome of transition for changes in industry location depends very much on whether goals of regional self-sufficiency or goals of scale economies prevailed and informed the decisions of planners under the former socialist regime. This varies even for the food industry across individual transition countries. The food industry in Poland is in general claimed to have been more fragmented compared to other CEE countries (Duponcel, 1998), meaning that goals of regional self-sufficiency are likely to have prevailed over other goals. This is seen in some branches such as sugar processing where a high number of firms share the same name except a regional subtitle. However, in many other cases concerns over scale economies are also likely to have been prioritised by Polish planners. Unfortunately, it was not possible so far to obtain data for the regional distribution of food production prior to the transition. However, the available sample does give some indication about the tendencies in the changes introduced with the transition for geographic concentration. The impression is that the changes in the geographic composition of production in the food industry are quite high within a short time span of only 5 years (1995-2000). Figures rendering an estimate hereof are give in Tables 3 and 4, all based on the Amadeus sample and hence not necessarily representative for the global population of firms in Polish food processing. Estimates for the regional distribution of turnover in Table 3 suggests a stronger polarisation between regions over the years 1995-2000. Some regions gain, and in particular the hub around the capital. Other regions fall slightly back, most impressive in the case of the hub around Poznan.

TABLE 3: Estimated regional distribution of turnover in food processing

TURNOVER in 1000 PLN, current prices

Region	All firms, 1995	All firms, 2000	Foreign firms, 2000
1. Zachodnio-pomorskie	941,374 (5%)	2,338,778 (4%)	880,963 (3)
2. Pomorskie	641,884 (3)	1,696,682 (3)	670,367 (2)
3. Warminsko-Mazurskie	**783,884 (4)**	**3,806,128 (6)**	**3,167,868 (9)**
4. Podlaskie	867,317 (5)	2,152,029 (4)	231,723 (1)
5. Lubuskie	924,534 (5)	1,295,325 (2)	222,410 (1)
6. Wielkopolskie (Poznan hub)	**4,342,914 (22)**	**9,347,525 (15)**	**6,204,348 (18)**
7. Kujawsko-pomorskie	1,235,388 (6)	3,507,064 (6)	1,138,647 (3)
8. Mazowieckie (Warszawa hub)	**4,266,758 (22)**	**16,560,125 (27)**	**10,666,133 (32)**
9. Dolnoslaskie	823,416 (4)	1,705,624 (3)	238,532 (1)
10. Lodzkie	1,099,383 (6)	2,371,868 (4)	704,997 (2)
11. Lubelskie	870,130 (4)	2,156,358 (4)	330,647 (1)
12. Opolskie	153,701 (1)	813,958 (1)	229,821 (1)
13. Slaskie	**848,369 (4)**	**4,630,105 (7)**	**2,481,703 (7)**
14. Switokrzyskie	335,165 (2)	328,403 (1)	76,951 (0)
15. Podkarpackie	716,231 (4)	1,930,998 (3)	911,333 (3)
16. Malopolskie	**641,244 (3)**	**6,321,700 (10)**	**5,570,537 (16)**
TOTAL	19,491,692	60,962,670	33,726,980

Source: Amadeus.

The data in Table 3 also suggest, that in particular the foreign firms have a large impact on the geographic reorganisation of the food industry. Wielkopolskie (Poznan hub) is the only case where the whole region does not go forth in combination with a quite strong concentration of foreign activities in the same region. The immediate observation is therefore that transition has led to a stronger concentration of activities in Polish food processing.

But the picture looks slightly different when considering the data on the geographic concentration of individual branches as calculated with the Gini coefficients in Table 4 (on application of Gini coefficients to geographic concentration, see Shelburn and Bednarzik, 1993). A Gini coefficient close to 1, means that there is a very strong geographic concentration of a specific branch in one region, in fact a Gini of 1 means that the particular branch is only located in one region. Oppositely does a Gini coefficient close to 0 represent the opposite case of a branch dispersed exactly equal among all regions. Again the figures are estimates based on the available data from the Amadeus sample. Since the standard deviation for representation of individual branches in the

sample in 1995 is quite high, this may have some unintentional effects for the Ginis in Table 4 and hence reinforce the trend that is observed. Table 4 suggests that there are 13 branches experiencing declining geographic concentration, 6 branches with increasing geographic concentration and 7 branches with unchanged geographic concentration. In all cases except tobacco the foreign firms are more geographicly concentrated amongst themselves than is the case for all the sampled firms.

TABLE 4: Gini estimates for geo-concentration at four-digit branch level

Branch	**All firms, 1995**	**All firms, 2000**	**Foreign firms, 2000**
1511-Meat	0.319	0.338 (15)	-
1512-Poultry	0.673 (1)	0.471 (3)	0.796 (1)
1513-Meat and Poultry	0.486 (5)	0.371 (3)	0.646 (5)
1520-Fish	0.931 (1)	0.943 (2)	-
1531-Potatoes	0.929 (12)	0.547 (4)	-
1532-Fruit	0.974 (14)	0.665 (14)	-
1533-Fruit and Vegetables	0.406 (12)	0.541 (15)	0.675 (15)
1543-Margarine	-	-	-
1551-Dairy prod.	0.503 (4)	0.448 (12)	0.545 (12)
1552-Ice cream	0.777 (6)	0.907 (9)	0.959 (7)
1560-Milling	-	-	-
1561-Grain mill products	0.614 (14)	0.653 (7)	-
1562-Starch products	-	0.972 (9)	-
1571-Prep.animal feeds	0.896 (5)	0.675 (10)	0.854 (5)
1572-Pet foods	0.897 (7)	0.898 (7)	0.916 (7)
1581-Bread and pastry	0.795 (9)	0.489 (8)	0.546 (16)
1582-Biscuits and pastry	0.803 (16)	0.701 (10)	0.937 (10)
1583-Sugar	0.717 (11)	0.531 (14)	0.762 (14)
1584-Chocolate	0.557 (16)	0.520 (12)	0.591 (8)
1585-Macaroni	-	0.935 (2)	-
1586-Tea and coffee	0.742 (1)	0.812 (1)	-
1587-Condiments	0.733 (7)	0.677 (6)	-
1588-Dietic food	0.962 (2)	0.960 (2)	-
1589-Other products nes	0.925 (12)	0.597 (12)	0.886 (13)
1591-Dist. Alcohol	0.385 (2)	0.585 (4)	0.963 (2)
1592-Ethyl alcohol	0.866 (5)	0.890 (5)	-
1593-Wine	-	-	-
1594-Cider	0.867 (16)	0.792 (11)	-
1595-Fermented beverages	-	-	-
1596-Beer	0.565 (3)	0.609 (13)	0.677 (13)
1597-Malt	-	-	-
1598-Mineral water	0.745 (11)	0.511 (8)	0.981 (11)
1600-Tobacco	0.624 (6)	0.533 (16)	0.516 (16)

Source: Amadeus.

Combining the information obtained from Table 3 and 4 shows that:

1) the food industry as a whole is becoming more regionally concentrated, but that the location of individual branches in most cases not is getting more concentrated, hence suggesting the emergence of clusters based on linkages between firms in different branches.
2) foreign firms tend to locate amongst themselves and somewhat differently as a group compared to domestic firms, for example, they tend to concentrate more along the eastern or western borders of Poland than domestic firms, very likely because the foreign owned firms are much more trade intensive and oriented towards either the EU or Russian markets. (But also because they are impacted by regional policies in their location decision as discussed in Section 7.)

This leads us to the final dimension of transition salient to the development of the food industry: the liberalisation of FDI and foreign trade. FDI is viewed by most observers of the transition economies as most salient to fast and successful restructuring of ailing industries (Duponcel, 1998, Josling et al., 1997). Foreign investors potentially bring with them capital, new technology, terminal privatisation and effective corporate governance, market access, including training and spillovers through both horizontal and vertical linkages. The food industry is no exception and some case studies suggest that there are important spillovers in particular among communities of users and producers (Gow and Swinnen, 1998). Prospects for FDI and reintegration into the international trading system are therefore also strongly intertwined at the moment. A major challenge is, however, also to have domestic firms upgrade their export capabilities. It may be an easier strategy of Polish firms to be integrated into the value added chains controlled by multinational firms. However, the upgrading resultant hereof will depend on actual spillovers to domestic firms.

The Polish food industry is the greatest attractor of FDI among all industrial destinations in the CEE region. The industry has received 33% of all investments in Polish manufacturing or approximately 15-20% of total FDI in Poland since the outset of the transition (PAIZ, 2001b). Furthermore, the Amadeus sample in Table 3 above suggests

that up to 50% of turnover is produced by foreign owned entities at the end of 2000. The penetration of the food industry in Poland by foreign investors is only surpassed by Estonia and Hungary in terms of foreign market shares (Duponcel, 1998).

Studies by Walkenhorst (2000, 2001) on the motives and home country geopgrahy of foreign investors in Polish food processing suggest that they can be broadly placed in two groups:

1) strategic and market-seeking investors in monopolistic industries, from a quite diverse group of home countries, with high value added activities who concentrate upgrading efforts on the final value added stages of production,
2) cost-seeking, natural resource-seeking and export-oriented investors, which in terms of home countries tend to come from the EU, with activities in the more traditional staple food branches and hence in industries more likely to be characterised by perfect competition.

These different motives may also affect the investors' location strategy as discussed in Section 7. Furthermore, Walkenhorst (2000, 2001) finds evidence of complementarity between FDI and trade in the case of Polish food processing, suggesting an already quite high degree of integration between processing activities in Eastern and Western Europe. Investors from the EU, and especially neighbouring France and Germany are highly dominant investors (Walkenhorst, 2000, PAIZ, 2001b). This, however, also implies that food processing is typically quite import intensive in Eastern Europe and hence FDI does not necessarily have an overall positive effect on the Polish trade balance in food products.

Transition implies greater international involvement or globalisation of the Polish food industry, including a much stronger move to involvement in international trade and specialisation which should increase geographic concentration and hence also the potential for spillovers (Shelburn and Bednarzik, 1993).

5. Estimation strategy

There are various possibilities to estimate spillovers using regression analysis, where the two most traditional and theory-based approaches are the estimation of the firm's production function and the firm's supply curve derived from the profit maximising condition (Levin and Reiss, 1988). In both cases the spillover argument is based on the assumption that the firm's own production or supply decision is not uniquely decided by internal conditions, but dependent on the activities of other firms in the same or related branches of industry. In relation to the supply curve derivation, the spillover effect is assumed to go beyond the traditional output responses of firm in monopolistic competition. In relation to the production function specification, the spillover effect is related to the technology or total factor productivity, where the latter is assumed to be decomposable into elements associated with both firm internal and external influences on its technology and hence productivity performance. For example, in the original Solow specification technology is assumed to be a public good. This would be a case of no appropriation of technology at the firm-level. In practice, this can be a highly unrealistic assumption, depending on the type of industry, the prevailing economic system and the importance of firm-specific knowledge and technological leverage to competition. There is also a quite strong connection between the empirical literature on spillovers and that on learning-by-doing (for an overview see Madsen et al., 2002), however, the latter being based essentially on dynamic arguments which is not the case in the spillover literature. Recently more ad-hoc approaches are also adopted, especially because of the increasing availability of qualitative data based on innovation surveys (see Kaiser, 2002). In the literature on developing and transition countries the production function approach is dominant, possibly due to poor availability of reliable price information.

Here both approaches will be used as part of a common estimation strategy. Only using the supply curve estimations makes results highly vulnerable to pricing information that is somewhat imperfect for some of the branches. At the same time the availability of data on value added is so poor that the production function estimations are adopted on the second best assumption that cost of materials and other inputs asides capital and labour can be ignored, i.e. turnover must be used instead of value added in the estimations.

Estimation of the supply curve is derived from the profit maximising condition. As in Aitken et al. (1997) it is assumed that there are externalities associated with producing in the same branch as other firms (in Aitken et al. there is tested for externalities associated with exporting), however, no inference is made ex ante about who catalyses the spillovers. It is simply assumed according to the learning-by-doing literature that the firm's own production performance not only depends on its own output decision and internal conditions, but on the aggregate output decision of the whole branch or industry. No implicit assumption is made about the type of competition, as it may typically vary across the branches included under food processing, however, the standard output response to the output decision of other firms that goes through the price-output relationship is modelled by including the demand equation in a two equation system. The intuitive interpretation of the role of spillovers to the supply curve is that if there are spillovers an increase in aggregate output (so far only horizontal or in the same branch) will make the supply curve shift outwards. One can chose to assume that this is due to cost-reducing or demand-creating spillovers, with either type of spillover having the same effect on the supply curve. In practice the relevance of either argument will depend on the particular type of competition and whether firms produce goods that are differentiated by consumers. Thus the supply curve and a very simple demand curve is estimated using the following specification:

$$\log p_{it} = \chi + \delta \log HQ_{it} + \upsilon_{it}$$

$$\log q^*_{it} = \beta_1 \log p_{it} + \beta_2 \log L + \beta_3 \log HQ^*_{it} + \beta_4 \log age_{it} + \beta_5 \log age^2_{it} + \gamma_1 NEW_i + \gamma_2 FOR_i + \theta t + \alpha_j B_j + \lambda_r R_r + \vartheta_{it}$$

$$where\ HQ^*_{it} = \sum_1^n q_{it} - q^*_{it}\ , \quad i\ \varepsilon\ B^*_j$$

The first equation being a simple 'demand' curve expression, where price is expected to depend negatively on the aggregate output at the horizontal or branch-level HQ. The second equation is the supply curve, which is expected to vary positively with the real price p, firm size as estimated with number of employees L and positively with the corrected aggregate horizontal output HQ* (HQ deducted the firm's own output), the

firm's age, type of ownership and whether it is a new firm. Fixed effects are only specified down to the branch and regional level in this preliminary paper using dummies B and R for the 30 branches and 16 regions in the data, i.e. branches have individual intercepts. Future versions should try to adopt fixed effect for individual firms also. Testing for localised spillovers can easily be done with this specificiation through a narrowing down of the HQ* that one assumes belongs to the relevant community.

Estimation of the production function is based on Blomström and Sjöholm (1998) whom take outset in a derived form with labour productivity on the left-hand side and allowing for scale economies through the labour term on the right-hand side. Again the possible presence of spillovers is tested by inclusion of a variable accounting for aggregate horizontal production, but here captured with turnover instead of output.

The specification takes the following form:

$$\log(Y/L)_{it} = \alpha + \beta_1 \log(K/L)_{it} + \beta_2 \log L_{it} + \beta_3 \log HY^*_{it} + \log age_{it} + \log age^2_{it} + \gamma_1 NEW_i + \gamma_2 FOR_i + \theta t + \alpha_j B_j + \lambda_r R_r + \vartheta_{it}$$

$$where\, HY^*_{it} = \sum_1^n Y_{it} - Y^*_{it}\,, \quad i\, \varepsilon\, B^*_j$$

With Y/L and K/L standing for labour productivity and the capital-labour ratio respectively. Labour productivity is expected positively related to capital intensity. Labour L captures whether individual firms are producing on the part of the production curve that exhibits negative or positive scale economies. Except for these variables and the slightly adjusted spillover variable, all other variables are the same as used in the supply curve estimation discussed above.

6. Results

Table 1 shows results for the supply curve estimations. Results for the first equation in the system – the demand curve are not reported. R^2 is above 50% and the relationship between price and quantity is negative and highly significant as expected in all the versions of the demand curves corresponding to the supply curve equations reported here. The estimated supply equation (equation 1) suggests that supply in general is elastic (elasticity slightly below 1) with respect to Polish retail prices. A one percent increase in price increases supply with 0.9 percent. Firm size as measured with labour L also affects the supply response of the individual firm positively as expected. Furthermore, a dummy for foreign ownership was included. Presently, the analysis of ownership is not particularly deep since information on privatisation at this stage is insufficient. However, foreign ownership also has a positive effect on output response, and on top of size. This is because of the higher productivity per worker in foreign owned firms. However, since the transition literature indicates that new firms in general are doing better than the old firms struggling with their socialist past (WB, 2001), it was also chosen specifically to use a dummy to control for this influence both in relation to the age / inherited capabilities of the firm and other ownership controls such as foreign ownership. Results obtained for the age dummy and age variables in combination are intuitively straightforward. There is some advantage to being a new firm as seen both with a positive sign for the dummy and a negative sign for the age variable. However, the typical relationship that we would expect is not lost since despite the advantages of being new, age appears to do matter to supply capabilities also among firms with a socialist past. Thus we obtain both traditional results as we would expect for any firm (that firms accumulate capabilities over time) and further results consistent with the influence that transition has on reshuffling fortunes and misfortunes of firms with the likelihood of fortunes going more in the direction of the newly created firms.

It is somewhat a mistake in the initial supply curve estimations that a standard fixed effect model was not chosen. Since there are obvious differences between individual firms, such as the quality of their managers (Verbeek, 2000), which are suspected to vary for the cross-section. But less likely to vary over a short time series as the present one

where most of the firms in the sample are suspected to have experienced terminal privatisation.

REG. TABLE 1: Supply curve estimation (2SLS)

Dependent variable is firm-level output: log quantity

Explaining variables:	EQ 1	EQ 2	EQ 3	EQ 4 (FOR=1)	EQ 5 (FOR=0)
log PRICE (PER KG)	0.923	0.077	0.923	0.247	0.909
	(8.58)	(0.69)	(8.57)	(2.18)	(7.08)
log SIZE (LABOUR)	0.739	0.614	0.739	0.552	0.695
	(26.07)	(31.21)	(26.04)	(15.85)	(20.62)
NEW FIRM (D)	0.136	0.117	0.123	0.515	0.071
	(1.81)	(2.34)	(1.54)	(4.64)	(0.80)
log AGE	-0.142	-0.148	-0.145	-0.070	-0.111
	(-2.67)	(-4.16)	(-2.70)	(-0.91)	(-1.85)
log AGE^2	0.257	0.267	0.262	0.175	0.237
	(2.43)	(3.79)	(2.46)	(1.34)	(1.95)
FOREIGN (D)	0.525	0.389	0.527	-	-
	(9.07)	(9.97)	(7.91)		
BRANCH OUTPUT	0.501	0.084	0.501	0.149	0.506
	(33.51)	(1.75)	(33.46)	(5.75)	(26.15)
TIME TREND	0.034	-0.017	0.033	0.014	0.026
	(2.27)	(-1.39)	(2.23)	(0.87)	(1.55)
REGIONS (D15)	YES	YES	YES	YES	YES
BRANCHES (D29)	YES	YES	YES	YES	YES
Output concentration variables (localised spillover proxies):					
FOR-REG	-	0.103	-	-	-
		(1.87)			
NEW-REG	-	0.152	-	-	-
		(2.60)			
REG-BRA	-	0.341	-	-	-
		(20.84)			
FOR-REG-BRA	-	-	-0.000	0.542	-0.003
			(-0.06)	(17.81)	(-0.95)
NEW-REG-BRA	-	-	0.001	-0.007	0.003
			(0.47)	(-1.21)	(0.73)
R^{2} 1/	0.99	0.99	0.99	0.99	0.99
N	2148	2148	2148	441	1707

1/ The definition of R^2 is changed to 1-(Residual Sum of Squares/Uncorrected Total Sum of Squares)

The spillover variable which in the supply curve estimations is the aggregate horizontal output of other firms, renders results which are very good at the most aggregate level (the national level). However, since the demand curve is only stated in a very basic version, not taking into account income levels or consumer spending patterns, it is possible that

this variable captures such influence. This could in principle be anything that the same branch has in common and may explain some of the large size and significance obtained for this variable. Despite such possible error in the estimations, the result suggests, that firms equal on all the other variables included in the estimations, in fact enjoy a better output response in those cases where their branch is generally larger in terms of aggregate output. This effect is similar to that of a country having comparative or competitive advantage in some activities and comparative or competitive disadvantage in other activities. Note that R^2 is overshooted since the equation is estimated without an intercept as individual branches are assumed to have their own intercept. It was necessary to force the branch neutral equation through zero in order to get a supply curve with a positive slope. But the procedure of excluding the intercept has the implication that R^2 is redefined. The real R^2 (when including the intercept) lies around 0.60 for the supply curve. (Something to do with the price used in tobacco??)

After running the standard equation for national communities in food processing the attempt is to localise the spillovers in order to understand more about the underlying catalysts and vehicles of these spillovers. Equation 2 shows such attempt. In a way, however, equation 2 is even a stronger generalisation than equation 1. Generalisation is stronger because equation 2 tests for general spillovers from foreign firms no matter their branch affiliation. This has some unintentional effects on the stability of the equation. Several parameters such as the one for price and time trend change too much. The problem is that the change in specification of spillover variables may have introduced noise in the form of multicollinearity. For example, foreign owned firms may be concentrated in particular high value added branches, charging above average prices per unit of account. Or the foreign owned firsm may be exporting such a large share of their produce that they do not respond to Polish retail prices in the same way as Polish firms do. But one important result is obtained from equation 2: that the introduction of physical space appears to lift the explanatory power away from the national aggregate horizontal output variable to the same variable, but specified with the limitation of the regional affiliation of the firm.

With equation 3, further restrictions are introduced, implying among other that the general equation starts to behave normally anew. At the very specific level, and among the most commonly theorised spillover catalysts such as multinational firms and spillovers in combination we find no impact on the supply curve when pooling observations across all firms. Finally, separate supply curves were estimated for the foreign and domestic owned groups of firms shown with equations 4 and 5 respectively. From these estimates it appears that localised spillovers based on the influence of FDI are strongly concentrated among the foreign owned firms themselves. This specification did not render any results for the domestic owned group of firms, however, it should be rerun with the former more general spillover variables that gave results. Also, it may be suspected that inherited networks of the past – that are not necessarily associated with geography and instead associated with the older firms could render different results for the domestic group of firms.

Next a similar approach was undertaken in the estimation of the production function for the same firms. However, the two samples are not exactly identical owing to the differences in availability of specific variables. The production function estimates have the clear advantage over the supply curve estimates, that labour productivity is a more rigorous performance variable than merely output. Further compared with the supply curve estimates it is not necessary to assume that firms produce only one type of products, or that all firms on average charge the same price for their products. These obvious disadvantages in assumptions are avoided by a production function approach. But on the other hand, and as mentioned above, the way the production function is adopted here has some other types of short-coming, especially because of the lack of availability of important information such as value added. Hence the production function can only be estimated as an approximation to its real form by using turnover instead of value added.

Results for these tests, again following the same logic and steps as above are shown in Regression Table 2. Due to the striking similarity in results, and despite the choice of an entirely different performance variable (and albeit many of the explanatory variables are

the same under the two estimation strategies), most conclusions follow straightforward from the above, as the reader may also verify by comparing the results for the spillover variables in the two tables. The major difference between results in Regression Tables 1 and 2 is the fact that aggregate horizontal turnover at the national level is not an important explanatory variable towards labour productivity at the firm-level.

REG. TABLE 2: Production function estimation (OLS)

Dependent variable is firm-level labour productivity: log Y/L

Explaining variables:	EQ 1	EQ 2	EQ 3	EQ 4 (FOR=1)	EQ 5 (FOR=0)
INTERCEPT	7.240	3.862	7.280	1.320	7.541
	(11.43)	(3.44)	(11.45)	(1.51)	(9.35)
log KAP/LAB RAT	0.240	0.206	0.239	0.144	0.222
	(14.03)	(12.95)	(13.98)	(4.64)	(11.41)
log LABOUR	-0.272	-0.360	-0.272	-0.426	-0.303
	(-13.68)	(-18.99)	(-13.71)	(-13.37)	(-12.73)
NEW FIRM (D)	0.090	0.087	0.055	0.355	0.033
	(1.75)	(1.83)	(1.00)	(3.47)	(0.53)
log AGE	-0.070	-0.095	-0.077	-0.062	-0.071
	(-1.91)	(-2.80)	(-2.08)	(-0.91)	(-1.71)
log AGE^2	0.162	0.190	0.173	0.191	0.161
	(2.24)	(2.83)	(2.37)	(1.63)	(1.93)
FOREIGN (D)	0.355	0.269	0.368	-	-
	(8.57)	(7.00)	(7.74)		
BRANCH TURNOVER	-0.149	-0.063	-0.151	-0.010	-0.155
	(-3.61)	(-1.65)	(-3.66)	(-0.19)	(-2.97)
TIME TREND	0.049	0.023	0.047	0.011	0.045
	(4.62)	(1.54)	(4.48)	(0.75)	(3.71)
REGIONS (D15)	YES	YES	YES	YES	YES
BRANCHES (D29)	YES	YES	YES	YES	YES
Turnover concentration variables (localised spillover proxies):					
FOR-REG	-	-0.011	-	-	-
		(-0.23)			
NEW-REG	-	-0.036	-	-	-
		(-0.49)			
REG-BRA	-	0.303	-	-	-
		(18.84)			
FOR-REG-BRA	-	-	-0.002	0.460	-0.009
			(-0.59)	(15.08)	(-2.15)
NEW-REG-BRA	-	-	0.008	-0.007	0.010
			(1.83)	(-0.91)	(1.99)
R^2	0.48	0.56	0.48	0.77	0.44
N	2112	2112	2112	437	1675

The difference may also owe to that by using the production function approach the effect running counter to the spillover effect through the price mechanism is left uncontrolled for. But when going to the more specific level it is clear that the results are identical. Again it appears that physical space is what in particular matters for all types of firms in terms of catalysing spillovers. But the presence of foreign owned firms have little positive effect on the performance of domestic owned firms. Finally, there is again found clear indication of strong spillovers among a geographicly confined community of foreign producers.

7. Regional policy

Regional differences are currently one of the major developmental problems in Poland's transition process to a market economy (UNDP, 2002). Therefore, invitations to foreign investors towards purchasing old or establishing new firms in Poland, have often been combined with policies aiming at redistribution between the social classes and between Poland's highly disparate regions. The regional GDP per capita level is shown in Figure 1. In a regional policy perspective the food industry is strategic to the Polish economy since it is very much decentralised when looking at the industry as a whole. Furthermore, it holds the long-term promise of modernising and upgrading Polish agriculture. Many regions can potentially benefit from Poland becoming a country with strong comparative advantage and important value added activities in food processing. One major barrier to the development of the food industry is the difficult access to markets outside the CEE region both because of restrictive EU policies concerning market access and the impact the Russian crisis had on Polish exports. There are therefore many hopes that foreign investors can aid both in solving problems of upgrading the food processing industries, agricultural production methods and improving market access for Polish food products. The immediate aim is, however, typically employment creation in the poorer regions. So despite the lack of spillovers there may be a direct employment and export argument for attracting foreign investors. But is the creation of employment and exports sufficient to offer large tax rebates to foreign investors and how large are these rebates really?

FIGURE 1: GDP per capita by region, EU15=100

Source: EUROSTAT (2002): 'Regional GDP per capita in the EU and the candidate countries in 1999', *EUROSTAT news release*, STAT/02/13, Statistical Office of the European Union, Brussels.

A central tool in regional policy has been the creation of 15 special economic zones (SEZs) outside the main cities and industrial zones of Warsaw and Poznan. Almost every region today proud itself of a special economic zone that aims to attract foreign investors through particular benefits such as 10-20 years of tax holidays if certain targets are being met typically formulated as investment and/or employment targets. The individual regional government sets the particular targets. Such favourable tax policy is a short-term policy tool, unique to the SEZs and only temporary, since EU membership will imply that new tax holidays no longer can be negotiated. Table 5 shows the economic zones, their date of creation and the amount of FDI attracted. As is clear from the Table, there is today so many special economic zones that they tend to out-compete one another in their quest for FDI. As a consequence three of the more recently established SEZs have

already been terminated since they failed to attract any foreign investments. The most successful have been the earliest SEZs with a particular profile at the outset or having evolved towards specialisation in certain industries or activities.

TABLE 5: Special economic zones in Poland

Zone	**Opening date**	**FDI, mln PLN[1/]**	**Specialisation**
Mielec, Podkarpackie	June, 1995	1,400	Hi-tech
Suwalki, Podlaskie	Sept, 1996	375	Environment, SMEs
Katowice, Slaskie	1996	3,279	Cars
Legnica Dolnoslaskie	April, 1997	812	New industry
Lodz, Lodzskie	April, 1997	348	Chemicals, Food
Walbrzych, Dolnoslaskie	April, 1997	375	New industry
Krakow, Malopolskie	Sept, 1997	23	Hi-tech
Kamienna Gora, Dolnoslaskie	Sept, 1997	16	None
Kostrzyn-Slubice, Lubuskie	Sept, 1997	240	None (on German border)
Slupsk, Pomorskie	Sept, 1997	12	Food, Trad. industry
Starachowice, Swietokrzyskie	Sept, 1997	38	Engineering
Tarnobrzeg, Podkarpackie	1997	183	Engineering, Metals
Tczew, Pomorskie	1997	247	Food, Engineering
Olsztyn, Warminsko- Mazurskie	1997	25	Food, Wood, Electronics
Zarnowiec, Pomorskie	1997	31	None

1: As of third quarter 2001
2: At the end of 2000

Source: Internet homepages of the Polish SEZs, UNIDO (2001): *How to do business in Poland 2001*, United Nations Industrial Development Organization, Warsaw.

Some SEZs are also specialised in food processing. Cost- and natural resource-seeking greenfield investors in food processing are an obvious target to all these SEZs since they have important incentives to operate locally and especially when they source their inputs in Poland. Oppositely are multinational firms, specialised in differentiated food products, who mainly seek markets for their established products in Poland, less likely to locate outside the larger hubs of Poznan and Warsaw. As was mentioned already in Section 4, up to 50% of all investments in food processing are concentrated among these hubs that are also Poland's most highly populated regions.

TABLE 6: Paid in taxes by region and ownership

OBS: Mean (SD)	**Average taxes per employee, current prices, PLN, 1995-2000**		
Region / Voivod	***Domestic owned firms***	***Foreign owned firms***	***Joint ventures***
1 Zachodnio-pomorskie	104: 1,553	14: 3,492	5: 324
Capital: Szczecin	(3,180)	(3,762)	(641)
2. Pomorskie	**87: 8,941**	**23: 3,492**	**1: 0**
Capital: Gdansk	**(38,923)**	**(4,509)**	
3. Warminsko-mazurksie	53: 1,861	16: 6,844	7: 2,802
Capital: Olsztyn	(7,276)	(16,954)	(3,827)
4. Podlaskie	**37: 8,286**	**9: 1,833**	**0**
Capital: Bialystok	**(20,310)**	**(3,937)**	
5. Lubuskie	**54: 4,843**	**10: 2,668**	**0**
Capital: Zielona Gora	**(9,375)**	**(2,031)**	
6. Wielkopolskie	198: 4,650	99: 13,039	0
Capital: Poznan	(14,271)	(18,282)	
7. Kujawsko-pomorskie	166: 3,643	28: 6,453	0
Capital: Torun	(10,175)	(6,128)	
8. Mazowieckie	260: 7,101	106: 12,880	2: 2,152
Capital: Warsaw	(45,877)	(30,029)	(3,979)
9. Dolnoslaskie	**120: 2,922**	**10: 961**	**0**
Capital: Wroclaw	**(13,980)**	**(2,086)**	
10. Lodzkie	**120: 3,200**	**13: 551**	**5: 11,121**
Capital: Lodz	**(5,731)**	**(1,258)**	**(9,683)**
11. Lubelskie	106: 1,630	14: 22,420	0
Capital: Lublin	(2,615)	(21,574)	
12. Opolskie	57: 2,452	13: 5,106	0
Capital: Opole	(3,604)	(5,950)	
13. Slaskie	**140: 3,475**	**9: 565**	**5: 26,363**
Capital: Katowice	**(8,138)**	**(1,168)**	**(12,713)**
14. Swietokrzyskie	**40: 1,073**	**7: 717**	**0**
Capital: Kielce	**(2,337)**	**(1,897**	
15. Podkarpackie	**68: 2,180**	**20: -73**	**0**
Capital: Rzeszow	**(3,914)**	**(2,870)**	
16. Malopolskie	72: 2,638	35: 6,633	0
Capital: Krakow	(3,548)	(8,864)	

Source: Amadeus.

Table 6 demonstrates the consequences of the tax rebates given to foreign investors in the SEZs on their tax profile for the Amadeus sample. The relative tax contribution of domestic and foreign owned firms is measured in terms of paid in taxes per employee. The poorer regions with SEZs are clearly also those that receive the least tax contributions from foreign investors, with the most extreme example being Podkarpackie that receives on average a negative tax contribution from foreign investors and the most from domestic firms. Oppositely do regions without SEZs benefit from an on average much higher tax contribution because of FDI. Meaning that despite clauses of equal

treatment, it does not in practice result in equal taxation. Hereby, firms from the poorer regions are also placed in circumstances of unfair competition, simply because they came before the local SEZ. Based on the sample it does not appear that the regions offering tax concessions have been more successful in attracting foreign investors, neither compared to the hubs of Poznan and Warsaw nor to other poorer regions without SEZs. Furthermore, the latest regional employment statistics (see Appendix Table A2) suggest that outside the major hubs, unemployment is a general problem, rather than a problem isolated to particular regions in Poland.

Ex-post it is hence difficult to see reasonable political arguments for allowing tax concessions of this order to foreign investors. At the same time the regional policy may have had unintended effects of a much graver kind, since foreign investors because of this policy may become geographicly isolated from other Polish firms performing similar activities. In the SEZs it is much more likely that foreign owned firms become integrated into a community of equals – meaning foreign owned firms located for the same reasons in the same regional hub. Such regional policy that aims singularly to offer tax concessions without any performance criteria aiming at spillover effects, except very standard employment targets, may hence be one of the most direct causes of the poor performance of foreign investors towards creating spillovers in the Polish food processing industry.

8. Preliminary conclusions

The objective with the paper was to test for the presence of spillovers in the food industry, determine where spillovers are localized and discuss why there may be barriers to certain types of spillovers and how such possible barriers can be overcome.

Results so far indicate that there are spillovers, but that the spillovers may not be catalysed by the presence of multinational firms as normally assumed in both the theoretical and empirical literature on spillovers in developing and transition countries. So far, robust results and hence reliable conclusions have only been reached on the absence of horizontal spillovers from multinational to domestic firms. Initial results

suggest that inherited networks and in particular combined with physical space are the most dominant causes of spillovers in Polish food processing. However, the methodologically more challenging question about spillovers in vertical linkages has yet to be approached.

The paper has also identified several reasons for lack of spillovers between global and local actors in the Polish food industry. A major factor may be the lack of shared language in interaction between foreign and domestic firms. Other possible barriers could owe to particular policy and practices among multinational firms, or resistance to change and lack of desire to learn in the former state owned firms. But also the location strategy of Greenfield investors may matter due to the importance of geography for interaction and hence the presence of spillovers. There is a tendency for foreign investors to locate in proximity to other foreign investors. The regional policy and especially towards attracting FDI to the SEZs of Poland has several drawbacks which may be a direct cause of the dual nature of the present communities of firms in Polish food processing. However, the possible influence of such type of barriers was not tested for with the regressions. Therefore, results are also too preliminary to give any final recommendations on how to solve the problems identified.

To the author's knowledge, this paper is the first one to present a systematic statistical analysis of the impact of FDI on the geography and spillovers of the food industry in CEE. Given the importance attached to FDI for restructuring and industrial upgrading by the transition countries more research on FDI and how it affects both national and regional economic development seems to be needed. Furthermore, it is important to continuously follow development in industries having received large amounts of FDI in order to better understand the circumstances under which spillovers and hence virtuous circles of economic development are likely to take place.

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APPENDIX

TABLE A1: Information about retail prices used in estimations

Branch	Product stereotype	Unit of account	Retail price, PLN, 2000
1511-Meat	Pork meat	Kilo	13.49
1512-Poultry	Disembowelled chicken	Kilo	5.76
1513-Meat and Poultry	Pork ham, boiled	Kilo	18.89
1520-Fish	Fresh or frozen cod	Kilo	9.37
1531-Potatoes	Potatoes	Kilo	0.74
1532-Fruit	Apple juice	Litre	3.33
1533-Fruit and Vegetables	Green peas, canned	Kilo	4.77
1543-Margarine	Margarine 'Palma'	Kilo	4.88
1551-Dairy prod.	Cow's milk	Litre	2.15
1552-Ice cream	Fruit yoghurt	Litre	5.48
1560-Milling	Wheat flour	Kilo	1.60
1561-Grain mill products	Wheat flour	Kilo	1.60
1562-Starch products	Potato starch	Kilo	3.62
1571-Prep.animal feeds	Wheat flour	Kilo	1.60
1572-Pet foods	Liver sausage	Kilo	6.60
1581-Bread and pastry	Wheat-rye bread	Kilo	2.38
1582-Biscuits and pastry	Doughnut	Kilo	7.80
1583-Sugar	White sugar, crystallized	Kilo	2.97
1584-Chocolate	Milk chocolate	Kilo	23.2
1585-Macaroni	Egg macaroni	Kilo	8.25
1586-Tea and coffee	'Tchibo Family'	Kilo	26.88
1587-Condiments	Natural black pepper	Kilo	82.5
1588-Dietic food	Homogenised cheese	Kilo	9.33
1589-Other products nes	Tomato puree	Kilo	12.14
1591-Dist. Alcohol	Pure vodka 'polonaise'	Litre	49.24
1592-Ethyl alcohol	Pure vodka 'polonaise	Litre	49.24
1593-Wine	White grape wine	Litre	12.10
1594-Cider	White grape wine	Litre	12.10
1595-Fermented beverages	Pure vodka 'polonaise'	Litre	49.24
1596-Beer	Beer, full light	Litre	5.22
1597-Malt	Beer, full light	Litre	5.22
1598-Mineral water	Juice 'Bobofruit'	Litre	8.34
1600-Tobacco	Cigarettes 'Caro'	Carton	37

Source: EFFECT/GUS.

TABLE A2: Regional unemployment rates in Poland, 1999-2000

Region	1995	1996	1997	1998	1999	2000	2001
Dolnoslaskie					13.8	22.5	24.1
Kujawsko-Pomorskie					15.2	18.1	21.8
Lubelskie					12.6	13.7	14.7
Lubuskie					15.3	21.3	23.6
Lodzkie					12.7	16.2	19.6
Malopolskie					9.7	11.7	12.8
Mazowieckie					9.1	13.2	14.2
Opolskie					12.1	14.5	19.1
Podkarpackie					16.1	14.4	17.5
Poldaskie					11.4	15.7	15.7
Pomorskie					13.0	17.1	18.0
Slaskie					9.7	18.9	20.4
Switorkrzyskie					15.6	16.9	20.0
Warminsko-Mazurskie					21.3	22.5	22.3
Wielkopolskie					9.8	14.1	19.0
Zachodniopomorskie					14.9	20.5	21.5

Source: EUROSTAT (2002): 'Unemployment in the EU and the Central European candidate countries', *EUROSTAT news release*, No. 93/2002 – 5 August 2002, Statistical Office of the European Union, Brussels.