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MULTATIONALS AND BACKWARD LINKAGES IN POLISH AGRO-FOOD PRODUCTION SYSTEMS

The paper tests for the backward linkage hypothesis of multinational firms in developing host economies. The empirical case is the Polish food industry which is expected to be a highly relevant European case as the largest magnet of FDI in the accession countries over the last decade. Combining the case study, descriptive and econometric evidence suggests that backward linkage creation has failed in terms of upstream high-technology suppliers in food machinery, but succeeded in low-technology linkages with Polish farmers. However, the latter effect only results for those multinational linkages from the food industry to agriculture involving firms of non-EU origin. This result confirms the proximity hypothesis about backward linkages and geographic distance as forwarded by Rodriguez-Clare (1996). However, it could also reflect the bias that the Common Agricultural Policy introduces on backward linkage creation in the Polish food industry. The concluding discussion suggests that Poland's accession to the EU may push multinational firms to forge more local linkages even though there can also be negative effects.

Keywords: European integration, food industry, multinational firms, backward linkages

INTRODUCTION

One of the features of multinational firms which has received considerable attention in the more descriptive literature is the issue of backward linkage creation that is often critical to the impact of multinational activity in the process of development (UNCTAD, 2001). But empirical evidence is still scant on the question of backward linkage creation and especially with respect to questions of when and why a virtuous process of industrialization and learning takes place in lesser or differently developed environments compared to those home environments from which multinational firms originate. The descriptive theoretical literature is largely divided on the issue of spillovers as is the empirical literature, however, with the strongest evidence available now on intra-industry types of spillovers (Fan, 2002, Jensen, 2002).

With increased geographical dispersion of production within the same firm there are arguments for locating parts of value added chains within the

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multinational network in environments offering higher productive efficiency, lower cost and optimal resource availability. Hence backward linkage creation may not always be beneficial in the perspective of individual host nations to multinational firms.

At the same time the increasing integration between Eastern and Western Europe also confirms the large impact that international trade policy continues to have on the location of production within politically sensitive sectors and industries such as textile, food and steel and with the possible detrimental effects that these policies may have for the competitiveness of production in less developed market environments.

This paper seeks to add to the literature on backward linkage creation departing from a specific industry case and by testing some of the propositions from recent theoretical literature on the issue.

The Polish food industry is taken as a central case in this aspect. Being the largest magnet for foreign direct investment since the introduction of transition and economic reform in Eastern Europe (PAIZ, 2001), it is a likely industry to hold promise for a positive developmental process induced by multinational participation in the transition economies. Furthermore, the food industry should be a likely case of local linkage creation due to its large dependency on both low- and high-technology inputs. However, the food industry is also a case of globalization as many other industries with increased specialization and cross-border trade in increasingly sophisticated and differentiated inputs with high quality demands that local farmers may not always be able to meet (Bonanno et al., 1994).

The paper investigates the impact the entry of multinational firms in the Polish food industry has had on two types of upstream linkages: the part of Polish machinery specialized in equipment for the agro-food production systems and agricultural sales from Polish farmers.

The paper sets out with a brief literature review in Section 2 focusing on individual theoretical and empirical contributions deemed relevant to the present research and questions. Section 3 introduces the available data on the Polish agro-food production systems followed by an initial analysis based on descriptive statistics in Section 4. Section 4 also discusses specific features of the Polish agro-food production system that may pose specific opportunities and obstacles to this type of inquiry. Section 5 introduces the models for econometric testing along with the results from this exercise. The paper is rounded off by a discussion of results against the existing theories

and positions in the literature and conclusions are offered with respect to the likely impact of EU enlargement on the agro-food production system.

1. LITERATURE REVIEW

This section provides for a review of literature relevant to the hypothesis of multinational firms and backward linkage creation in host countries. First the central theoretical literature is visited followed by a review of empirical papers related to the research question and subsequent empirical investigation.

1.1. Theory

The theoretical literature on multinationals and linkages focus on contexts of multinationals investing in less developed countries where there exists a large potential for technology transfer through the establishment of pecuniary linkages with local suppliers. One should in principle distinguish between a purely local production capacity effect and a more dynamic technology transfer effect. For example, that multinationals and local firms in cooperation improve the value added of local firms over time due to the learning and knowledge externalities provided by multinational firms because of their experiences in international markets.

Rodriguez-Clare (1996) provides for one of the first theoretical models describing the problem of multinationals and linkages in the process of economic development. Based on a general equilibrium framework of two countries, three goods (two final and one intermediary which enters as a factor of production in the final goods sectors) and one additional production factor (labor) and assuming that specialized inputs exhibit a love of variety in demand and increasing returns in their production. Specialized inputs are by assumption non-tradable except if trade takes place within the multinational firm. This is the source of ownership advantage. The other immediate incentive of firms in country A to go multinational in the model is the access to cheap labor in host location B deriving from assumptions about initial specialization in the model. The implications of the model for the linkage effect rest on exogenously given factors deciding the optimal choice of supplier source for intermediate goods among potential suppliers in country A and B. Linkages according to Rodriguez-Clare's model (1996, p. 867) should be measured as new employment generated in upstream industries per unit of labor employed directly by the multinational.

Increasing communication cost (transportation and differences in culture, legislation etc.) will favor suppliers in country B. This may also be interpreted as the transfer cost of relying on home country inputs when tastes and technology are specific to the host country market. Hence a larger geographical distance between host and home country should result in more local linkages being developed. This is referred to as the proximity hypothesis in the remainder of the paper. The more intensive the production of final goods is in intermediate goods the more likely that local linkages will generate and is therefore an industry-specific effect. But the prior level of intermediate goods available in host country B is also very decisive to the developmental outcome for local linkage creation. This implies that multinational production is more likely to result in positive linkage creation effects in host countries that are more similar in their prior level of development with the home country. Some specialized inputs may not be available due to resource-dependency or technological specificity in which case local linkages will be absent. (But if there exist perfect local substitutes in terms of price, quality and availability, the multinational firm should always chose the local supplier over foreign suppliers.)

Markusen and Venables (1999) present a somewhat different model based on a partial equilibrium framework for a given host country, where there are two types of goods: final and intermediate, and three types of firms: domestic firms producing both types of goods and multinational firms only producing final goods. Markusen and Venables model both a horizontal and vertical spillover effect, where this review concentrates on the latter. By assumption the multinational firms create demand for domestically produced intermediate goods. Assuming that the intermediate goods sector is imperfectly competitive the increase in demand caused by entry of multinationals into the final goods sector has two implications: increases in supplier profits and entry of new domestic suppliers in the upstream sector. Hence, in the longer run, prices will decline in the upstream sector and improve the competitiveness of downstream final goods producers. The overall output produced by domestic suppliers specializing in intermediate goods is hence destined to increase upon the entry of multinational firms. This is the backward linkage effect in the model and it has the increasing returns feature that the improved competitiveness of the supplies may also crowd-in demand from the domestic final goods producers in downstream sectors.

Opposite to the model of Rodriguez-Clare (1996), the Markusen and Venables (1999) model does not include the situation of multinational firms perceiving substitution possibilities between local and home country suppliers of intermediate goods. Hence the Rodriguez-Clare model provides for a somewhat greater space of likely outcomes it is bound to be realistic in practice due to 1) the great variety in multinational strategies and motives and 2) the great divide in technological opportunities across different host countries to multinational firms. However, the Rodriguez-Clare model does not distinguish between local market and export oriented multinationals where in the former case there may be a greater need for local adaptation of products. The two models are complementary in the sense that one is more appropriate for testing in a cross-country framework while the other better fits a cross-industry or simple industry framework. But features of both models are relevant even at the industry level to the extent that multinational investors from a large variety of home countries affect the industry.

1.2. Empirical literature

Only a few selected papers are reviewed in this section departing from a very broad and general empirical literature on multinationals and spillovers. Evidence in this literature is particularly scant with regard to multinationals and backward linkage effects. However, the review concentrates on this specific literature. For general overviews on the literature about multinationals and spillovers see Blomström et al. (2001) or Fan (2002).

Some empirical papers were identified which all find a positive linkage effect from multinational activity in the host environment. Very few papers were identified reporting a negative backward linkage effect and these are mainly associated with case study evidence as reported at the end of this section. However, the measures of linkages or the performance variable used to identify the linkage effect vary a lot in this literature.

Görg and Strobl (2002) in a general manufacturing study of Ireland, use net and gross entry rates as linkage indicator. Their results show a rather large effect of multinational activity in downstream sectors on entry of Irish firms in upstream sectors and across a variety of industries. However, they also conclude that other indicators such as employment effects in upstream sectors are necessary in order to render stronger conclusions about the linkage effects of multinational firms in the Irish economy.

In a somewhat different vein, two papers on transition economies follow a production approach to linkage creation. The paper on Polish

manufacturing industry by Altomonte and Resmini (2001) directly tests the Markusen and Venables model. They analyze the changes in the level of local Polish firms' sales in both upstream and downstream sectors as dependent on the relative concentration of multinational firms in particular industries while controlling for general input-output conditions. Altomonte and Resmini's study reveals that multinational actors are higher performing in terms of linkage creation compared to domestic firms and hence conclude that multinational firms appear particularly decisive to spillovers and long-term growth in transition environments where the pre-existing industrial structures have broken down.

Table 1

Summary of empirical (econometric) studies on multinationals and spillovers through backward linkages

Authors	Host country and period	Industry focus	Performance variable	Results
Görg and Strobl (2002)	Ireland 1974-1995	no	entry	linkage creation upstream
Altomonte and Resmini (2001)	Poland 1995-1998	no	level of sales	linkage creation upstream and downstream
Kugler (2001)	Colombia	no	productivity	linkage creation
Castellani and Zanfei (2002)	Various 1984-95	electronics	linkages	linkages increase with experience
Smarzynska (2002)	Lithuania	no	productivity	linkage creation upstream, they are localized and market-seeking firms create more linkages

Source: Own adaptation

In a somewhat more rigorous production function framework Smarzynska (2002) estimates for backward linkages across a variety of Lithuanian industries. The performance variable is total factor productivity. The paper also provides for other comparative statistics such as motives of investor (local market oriented vs. export oriented) and the extent to which linkages appear to be localized or anchored within particular regional boundaries. Smarzynska (2002) shows that there are backward linkages combining information about multinational presence in sectors downstream to domestic firms and standard information about input-output coefficients in Lithuanian manufacturing. Furthermore, the study on Lithuania reveals that linkages appear stronger in a localized perspective, e.g. the proximity

between users and producers do matter to the externality effect. This study also shows that local market-seekers may have stronger linkage effects than the more export oriented multinational firms.

Using the cointegration method for a very long panel, Kugler (2001) also finds strong evidence of inter-industry linkages through multinational activity in Colombian manufacturing industries by similarly focusing on productivity developments in upstream and downstream industries. But also note that experiences are not comparable across performance variables, as in fact higher productivity may reflect weeding out among the worst suppliers.

Castellani and Zanfei (2002) approach a similar question departing from somewhat different literature. Taking outset in the theory on market entry modes they test for the likelihood of multinational firms in electronics to cooperate with local firms in upstream and downstream industries against the market entry theories. Castellani and Zanfei (2002) suggest that the international business literature based on transaction cost theory is counterintuitive to the fact that linkages tend to evolve over time as subsidiaries become established in foreign markets and gain experience. The authors show that no matter of the original entry modes and type of host environment, experience or subsidiary age has a strong effect on linkage creation with domestic firms. Their study is the only one to use actual linkage counts as the performance variable, where it should also be noted that linkages there refer to more than just backward linkages, but equally to forward and horizontal linkages e.g. through entering into strategic alliances with competing host country firms.

Finally, there is a somewhat larger literature of case studies on backward linkages of which there is only a very few made reference here. The studies looked at are those adding in some way to the explanatory factors behind the presence or absence of backward linkage effects in host countries. Moran (2000) suggests and demonstrates with case study evidence from the automobile and electronics industries, that policies designed with the specific intent to increase local linkages e.g. by forcing multinationals to enter joint ventures or by stipulating local content requirements are likely to fail in rendering the hoped for effects on upstream suppliers.

Farina (2002) compares the impact that the entry of multinationals in the Brazilian food industry has had on the horticulture and dairy production systems in Brazil. The case study evidence vividly shows how the entry of multinationals create a dual consumption and production structure where upstream suppliers must significantly upgrade their technology in order to

cater for supermarkets and other producers in the multinational segment. For growers in the horticulture system, and especially those capable of scaling up and introducing fresh-cut production methods, experiences have been very positive. Brazilian growers have even become global suppliers to some international supermarkets. However, experiences in dairy systems were more negative and often multinationals have undertaken backwards integration themselves. There has been a large reduction in the number of dairy farms resulting in more concentration and foreign dominance also in supplier ranks. Similar negative experiences are reported in a case study from Sri Lanka and the lack of linkages developing from the textile to the garment industry there. Kelegama and Foley (1999) suggest that potential local producers of garments are too weak in terms of capital and size to enter into the battle for supplying the local textile producers. Also the study shows that multinational textile producers are the least likely to enter into commercial relationships with local suppliers.

There may be a reasonable explanation for why the case studies reported here point in various directions whereas the econometric studies tend to report a positive backward linkage effect. This is because the econometric studies typically capture an average effect that may cover very diverging individual cases, depending on factors such as multinational sourcing strategies in the specific activity, country of origin, motives with the specific investment and level of technological development and sophistication of the individual host country within the specific activity.

2. DATA AND DESCRIPTIVE STATISTICS

Data on the Polish agro-food industries is collected via the Polish data bureau Effect specialized in dissemination of Polish statistical data originating from the Polish National Statistical Office (GUS). Effect provided data on agricultural sales by Polish regions (new voivodships) and subregions (old voivodships) covering the period 1995-2000, and aggregate data on food industry and food machinery industry sales and employment covering the period 1993-2001. Some additional data is also obtained on the number of Polish farms for the years when GUS undertook official surveys (1996 and 2001).

Unfortunately, it was not possible to obtain the same level of richness and detail in the data on the food machinery industry, but since there are less

than 50 establishments of this kind today it was deemed less important to the research.

Specific regional data on the location and ownership structures in Polish food industry was obtained through a sample of firms derived from the Amadeus database. Hence an estimate of food industry sales by ownership and foreign origin is obtained through a bottom-up design from individual firm-level records.

Table 2 provides some estimates on the quality of this bottom-up data in view to the overall population it refers to. Observations in the Amadeus data are few and representation is low, especially for the first two years of sampling: 1993 and 1994. This is not too unfortunate since the agricultural data is only available for 1995 and after. Subsequently the number of firms or potential number of observations stabilise around 550.

Table 2
Descriptive statistics for Amadeus sample firms

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	1,294	1,313	1,406	1,435	1,482	1,587	1,578	1,610

Source: Amadeus and Effect

In terms of number of firms approximately one-third of all firms are represented with the sample. A more accurate estimation of data representation in the whole population is also given in Table 2. It shows the median and variation in the sample's turnover to global turnover at the branch-level (3-digit) 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.

The same may be true for the regional distribution of the sample, however, the real regional distribution of the population of firms in the food industry is unknown. Several other factors are unknown in regard to representation why it was decided to omit observations in those cases where this data leads to the conclusion that food industry sales is zero. This is necessary since it is impossible to conclude if the sample is a correct mirror of the population of firms in the food industry and it is suspected that the sample may be biased in

several aspects (for a more elaborate discussion of the Amadeus data see also Jensen, 2002).

Based on the obtained data, several variables are constructed for subsequent statistical manipulation. However, the data on the food machinery industry is only subject to descriptive analysis in Section 4 and hence referred to only in that section.

Every variable is estimated at two levels: according to Poland's old voivodships (which is approximate to EU regional level nuts 3) and to Poland's new and simplified voivodship structure (approximate to nuts 2). Estimates of Polish agricultural production, or more exactly agricultural sales, according to these two regional structures are given by Effect. Transforming the data on agricultural sales into current prices using the logarithm and the price index for global agricultural output in GUS (2001) renders the variable *AS*. However, some inaccuracy occurs in regard to the assignment of agricultural production after 1998 to the old voivodship structure. Some cities jump between voivodships at both levels. These changes in the Polish administrative structure occur as late as 1998, which is why Effect provides for comparative estimates of assignment to the old voivodships and the new subregional level for the year 1998. The new subregional level is similar to but not identical with the old voivodship structure. The percentage difference is used as a 'fixer' for forcing the new subregional data into the old voivodship structure. Of the old voivodships there is a total of 44 units, of which some are irrelevant as they are strictly city voivodships (or were until 1998) without any agricultural activity which is why they are not included in the regression. Further missing observations will result in those cases where there is no food industry production by either type of ownership.

Next the Amadeus firm-level data is assigned through the city codes to the old and new voivodship structures. This was done with a reasonable level of accuracy using a Polish online database containing information about individual cities' assignment under the old voivodship structure. Subsequently the firms data can be aggregated up to the old and new voivodship structure using different selection criteria. Food industry production, or more exactly food industry sales, is calculated separately for domestic and multinational firms (transformed using the logarithm and deflated by using the price index for food manufactures in GUS (2001)): *FISDOM* and *FISMNC*. Furthermore, it is possible to distinguish that portion of foreign firms originating from within the EU: *FISMNCEU*. Finally, regional *GDP* is included as a control variable for general demand conditions to avoid observing a spurious effect between agricultural production and food industry sales.

Table 3

Summary of data variables used in the statistical analysis

Variable	Description
AS	Regional agricultural output in 1995-prices, log transformed
FISDOM	Regional food industry sales in 1995 prices, log transformed, only firms under domestic ownership
FISMNC	Regional food industry sales in 1995 prices, log transformed, only firms under foreign ownership
FISMNCEU	Regional food industry sales in 1995 prices, log transformed, only firms under foreign ownership from the European Union
FISMNCB	Regional food industry sales in 1995 prices, log transformed, only firms under foreign ownership from bordering or near bordering countries (Germany, Austria and Russia)
GDP	Regional GDP in 1993-prices, log transformed

Source: Amadeus and Effect

3. STYLIZED FACTS ON BACKWARD LINKAGES AND CASE STUDY EVIDENCE

This section first presents some descriptive statistics on the evolution of the food industry, food machinery industry and agriculture respectively.¹ Aggregate growth levels in the three sectors are then compared and juxtaposed with the inflows of FDI into the food industry. Finally, the section is rounded off with a case study of Nestlé and this company's backward linkage effects in Poland.

3.1. Descriptive statistics

Table 4 presents some aggregate statistics on the Polish food industry including information about material inputs and employment. The food industry represents 21% of Polish Gross Industry Product and the largest specialized labour market (PAIZ, 2001). The growth rate is positive for all years except 1999 where Polish food industry sales are strongly negatively impacted by the Russian crisis and particularly high during the period 1995-97. At the same time the phasing out of tariffs according to the Europe Agreement between Poland and the EU, means that the general level of protection against import competition is declining throughout the period analyzed here. The Europe Agreement establishes a specific trade regime between Poland and the EU, where tariffs are phased out asymmetrically in

favour of Poland. This happened over the period 1992-99 after which there were few remaining industries significantly impacted in terms of their competitiveness by any tariff protection between Poland and the EU. According to the WTO (2000) both agriculture and food are exceptions however in this respect with tariff protection ranging up to 20% for imports from the EU. But in the machinery industry oppositely tariffs with the EU are nil.

Table 4

Descriptive statistics, the Polish food industry, 1995 prices

	PLN million							
	1993	1994	1995	1996	1997	1998	1999	2000
Sales revenue in food	34,380	35,838	39,921	44,791	49,356	51,940	51,331	52,702
- growth rate	-	4.2	11.4	12.2	10.2	5.2	-1.2	2.7
Cost of materials	-	-	21,331	24,384	28,375	30,468	30,057	30,547
Input coefficient	-	-	0.53	0.54	0.57	0.59	0.59	0.58
Number of employees	-	-	317,785	336,913	339,499	336,325	321,672	300,051
Labour productivity (sales per employee, PLN thousand)	-	-	126	133	145	154	160	176

Source: Effect and GUS (2001): *Statistical Yearbook of the Republic of Poland*, Główny Urząd Statystyczny, Warsaw

Table 5

Descriptive statistics, the Polish food machinery industry, 1995 prices

	PLN million							
	1993	1994	1995	1996	1997	1998	1999	2000
Sales revenue in the food machinery	230.5	210.4	290.8	327.2	378.9	366.1	347.0	324.0
-growth rate	-	-8.7	38.2	12.5	15.8	-3.4	-5.2	-6.6
Share in total investment outlays in machinery*	-	-	0.77	0.47	0.49	0.64	0.61	0.66
Number of entities	-	56	52	53	50	55	47	47
Number of employees in the food machinery industry	-	-	7,974	7,682	7,553	6,659	5,584	5,184
Labour productivity (sales per employee, PLN thousand)	-	-	36	43	50	55	62	63

* Estimated under the assumption that there are no exports of food machinery from Poland

Source: Effect, GUS (2001): *Statistical Yearbook of the Republic of Poland*, Główny Urząd Statystyczny, Warsaw and MARD (2001): *Agriculture and Food Economy in Poland*, Ministry of Agriculture and Rural Development, Warsaw

The input coefficient is increasing throughout the period, indicating that firms are becoming more specialized, e.g. by sourcing more or higher quality inputs from external suppliers and/or that multinationals located in Poland import a larger share of final goods from the home countries. The level of employment is stable though with some restructuring taking place over the period resulting in consecutive improvements in labor productivity up to 2000 in the order of 40%.

Similar figures are calculated for the food machinery industry (NACE 29.53) with Table 5. The growth rate is particularly high here for the same years of 1995-97 as in the food industry. However, comparative data on total investment outlays on machinery suggest that import competition is relatively high and increasing, though with Polish value added shares recovering somewhat after 1997. Employment is more rapidly declining compared with the food industry, labor productivity almost exhibiting a 100% recovery over the six-year period for which data is available. This suggests that the food machinery industry is undergoing a more rapid and significant restructuring compared to the downstream food industry; possibly because of significant import competition from suppliers in Germany and the rest of the EU and the new buying patterns that multinational investors institute through investments in food industry activities.

Table 6

Descriptive statistics, Polish agriculture, 1995 prices

	PLN million							
	1993	1994	1995	1996	1997	1998	1999	2000
Sales revenue in agriculture	-	-	18,982	19,391	19,728	20,007	18,988	16,719
-growth rate, %	-	-	-	2.2	1.7	1.4	-5.1	-11.9
Number of farms in agriculture, 1000	-	-	2,048	2,041	-	1,989	-	1,881
Average farm size in agriculture, PLN thousand			9.2	9.5	-	10.0	-	8.9

Source: Effect and GUS (2001): *Statistical Yearbook of the Republic of Poland*, Główny Urząd Statystyczny, Warsaw

Finally, Table 6 presents the scarce aggregate statistics available on agricultural output. Growth rates here are small or negative. According to the available data on farm size, farms are slightly increasing in size but then start to go down again after 2000. However, the aggregate statistics are likely to cover over a significant polarization process, where the countryside in Poland is being impacted by two types of contradictory developments:

industrialization and impoverishment. While some farmers introduce large-scale production systems, a significant share of production is based on subsistence farming (UNDP, 2002). The regional size distribution of farms under the new voivodship structure varies a lot from 24.7 ha in Zachodniopomorskie located in the North-Western part of Poland to 3.4 ha in Malopolskie located in the South-Eastern part of Poland (MARD, 2001).

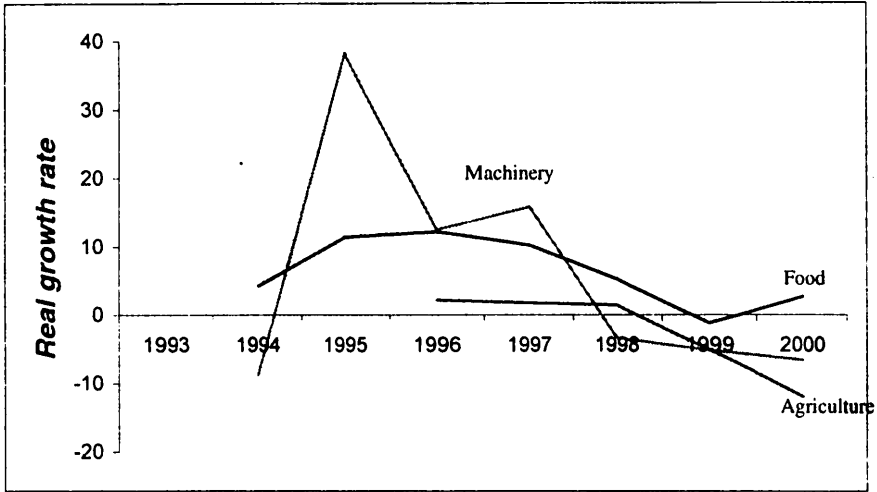


Fig. 1 Growth rates in sales revenue in Polish agro-food production system

Source: Effect and GUS (2001): *Statistical Yearbook of the Republic of Poland*, Główny Urząd Statystyczny, Warsaw

Figure 1 compares the growth rates in the food industry with growth rates in machinery and agriculture. Based on the aggregate data there appears to be little crowding in of the food industry's suppliers located in Poland. In part, the analysis in this section suggests a negative or 'competitive squeeze' scenario for backward linkages from the food industry to high-technology suppliers of inputs of machinery. This may be due to the arrival of multinational firms in the food industry, the peak years being 1996 and 1998 according to Figure 2 for the build up of foreign capital in local productive capacity.

The subsequent case study also renders support to the scenario of multinational firms in Polish food processing often choosing standard

machinery and equipment from their traditional suppliers abroad. On the other hand it is too early to offer strong conclusions about backward linkages between the food industry and machinery suppliers to this industry as the data presented here covers only nearly one full business cycle. Furthermore, the arrival of multinational firms in downstream branches may have speeded up the quite fast and necessary restructuring of the Polish machinery industry.

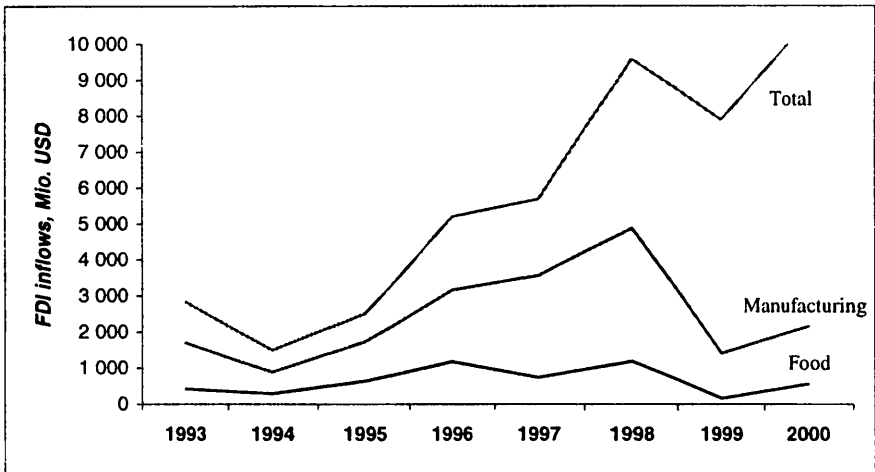


Fig. 2 Total foreign direct investment and into the food industry, 1993-2000

Source: PAIZ (2002): *The List of Major Foreign Investors in Poland*, Polish Agency for Foreign Investment, Warsaw

3.2. The Nestlé case

This case study is based on an interview with Nestlé Poland's Public Relations Manager, Agnieszka Wasak, in April 1997, including several press releases from Nestlé Polska Holding, general information material on the company, and Garztecki (1998).

Nestlé was among the first major multinational entrants to Poland subsequent to 1989. As a historical curiosity Nestlé reacquired one of its own pre-1945 plants located in the North-Western part of present day Poland. In addition to the production of culinary foods branded under the name of Winiary in this plant, Nestlé is also involved in a dairy plant on the Baltic sea coast, and a joint venture (now a fully owned subsidiary) with

Goplana which, after Wedel, is the largest confectionary company from Poland's socialist period. Together with a US, partner Nestlé is also involved in the acquisition of a processing plant and holds a minority stake in a mineral water production facility.

Total investments up to 1997 amount to over US\$ 300 million. Nestlé typically follows an external growth strategy and is known for being a very locally oriented company by acquiring brands well established with local consumers and by making large investments into viable local sourcing strategies. Following an external growth strategy, it holds major advantages such as access to existing local distribution and supplier networks, advantages that are much more difficult to create with a greenfield investment.

Most of the final goods are targeted for local markets with only 5% going to exports meaning that the local market-seeking motive is dominant in this case.

It is exactly on the supply-side or through backward linkages that a great impact can be traced on the local economy. 85% of all raw materials are being sourced in Poland. In relation to the dairy facility a modernization program was targeted at local suppliers of milk – involving up to 1,300 local farms. The program resulted in quality improvements of over 200% and the scale of intake of milk has at the same time increased more than threefold. In relation to other types of farmers, different support structures are also being developed: credit guarantees, introducing new products and production methods, materials handling information and improvement of storing facilities. A specialized division under the parent firm (Agricultural Services) helps setting up these local support structures. Only some products and raw materials (such as coffee and chocolate) related to global brands are imported along with all machinery from the home country or other Western countries.

4. TESTING FOR THE IMPACT OF MULTINATIONAL SOURCING STRATEGY ON BACKWARD LINKAGES CREATION

4.1. Model

Owing to the nature of the data, it is chosen to undertake a fixed effect estimation taking outset in those factors that are specific and relatively

constant to the individual region such as resource availability, production opportunities including farm size, governance structures and consumption of own produce. Another set of factors should be expected to dynamically affect the competitive situation of Polish agriculture over time in quite a uniform way. Progress with privatization is one of those factors expected to positively impact on competitiveness, however, within the period analyzed progress has been relatively slow in most transition countries (EBRD, 2002) and privatization of farms is not a decisive factor in Polish agriculture which, opposed to other transition countries, tends to suffer from a fragmented production structure (UNDP, 2002). Hence the transformational process in this case should conform more to that experienced by Western European countries over the last decades.

In other areas Polish agriculture suffers from staggering competitiveness because of the dismantlement of the planning system and subsidized production. Most transition countries have suffered from declining internal terms of trade in agriculture also known as the 'price squeeze', e.g. input prices have increased more than output prices in the perspective of farmers (MARD, 2001, Csaki and Lerman, 1999). Furthermore, competitiveness in agriculture is also strongly affected by differential levels of subsidies in the EU and Poland, where MARD (2001) estimates that Polish subsidies on average represent only $\frac{1}{4}$ of those given to EU farmers. (Hence there is not likely to be any immediate accession effect when Poland joins the Common Agricultural Policy, as Polish subsidies have been negotiated to approximately their current level 25% of current EU farmers' subsidies).

The combined decline in internal and external terms of trade should have a natural depressive effect on agricultural sales during Poland's transition.

Aside from these regionally specific and time factors the explanatory variables in the model are the localized level of food industry sales at the plant level. One model distinguishes only plants by ownership, while an extended model includes an additional term for multinational firms originating from within the EU. Hence the hypothesis of Rodriguez-Clare (1996) is tested, expecting that firms facing a lesser transportation and transfer cost being more naturally accustomed to European tastes, will have a smaller effect on agricultural sales. However, to control for the possible influence of the Common Agricultural Policy a variant distinguishes between multinationals from the EU operating in Poland and more specifically those originating from the (near) bordering countries active in food processing in Poland: Austria, Germany and Russia.

The way the model is constructed, linkages are measured approximately in accordance with the definition by Rodriguez-Clare (1996), however, taking output in sales rather than employment. Sales is a better indicator during transition due to the inheritance of overemployment in the post-socialist enterprise. The general form of the equation tested looks as follows, where the subscript v denotes voivodship (old or new structure) and T denotes a vector of t time dummies. AS stands for agricultural sales, FIS for food industry sales and GDP for value added reflecting potential demand. (One problem with a model of immediate effects is that a simultaneity bias may be the cause of any positive correlation between agricultural sales and food industry sales, e.g. changes in demand factors alone could explain the correlation. Hence GDP is included to control for this.) All variables are measured at the regional level of the Polish economy:

$$AS_{vt} = \alpha_v + \beta_0 GDP + \beta_1 FISDOM_{vt} + \beta_2 FISMNC_{vt} + \lambda T_t + \varepsilon_{vt} \quad (1)$$

The coefficient estimated for food industry sales directly shows the linkage effect of a 1% increase in the regional level of food industry sales on agricultural sales. Hence the expectation in accordance with the *weak hypothesis* of multinational firms creating backward linkages that render increasing returns over and above those of domestic producers is confirmed if coefficients are significant, positive and: $FISMNC > FISDOM$. The *stronger hypothesis* requires that the production replaced by multinational firms in the direct activity (food production) is less than the production created through the pecuniary spillovers or its indirect effects (on agricultural production). Hence the estimated coefficient for the impact multinational food production has on agricultural sales should be greater than one (Rodriguez-Clare, 1996, p854): $FISMNC > 1$.

4.2. Results

The results from introducing this equation on the data are shown in Table 6, where an immediate effect is tested for, e.g. food industry sales in the present has an immediate effect of raising present year's agricultural sales. The data conforms well to the fixed effect model rendering high explanation in data variation within both types of voivodship structures (results for the more aggregate new voivodship structure are shown with Table A1 in the Appendix). The reason for using the fixed effect model rather than the

random effects model is that all regions rather than a sample of regions are analyzed in which case the fixed effect model is often the appropriate. Furthermore, to use the random effects model requires that the fixed effects and other explaining variables such as GDP and food industry sales are strictly non-correlated which is not likely to be fulfilled in this case which is why the random effects can result in biased parameter estimates.

Table 7

Regression results, fixed effect estimation, old voivodship structure

Independent variables	Equation 1a	Equation 2a	Equation 3a
Regional dummies	Old V***	Old V***	Old V***
Time dummies	Yes***	Yes***	Yes***
GDP	0.701*** (3.17)	0.704*** (3.22)	0.720*** (3.29)
FISDOM	-0.015** (-2.16)	-0.012* (-1.77)	-0.012* (-1.72)
FISMNC	0.027*** (3.13)	0.032*** (3.63)	0.032*** (3.65)
FISMNCEU	-	-0.021** (-2.12)	-0.018* (-1.82)
FISMNCB	-	-	-0.008 (-1.22)
N	222	222	222
R ² (adj.)	0.99	0.99	0.99

Dependent variable: Sales from agriculture AS

(t-statistics in parenthesis)

* Significant at the 10 percent level, ** Significant at the 5 percent level, *** Significant at the 1 percent level

Source: Own calculations

Note that the explanatory power of the model is very high because a panel analysis is used for a data set with a relatively large number of cross-sections (37) compared to a short time series (6). If the variation between regions is large compared to the variation within regions, the regional dummies will pick up a rather large share of the total variation in the data, as is the case here, and hence is the cause of the unrealistically high R². In interpretation of the model emphasis should be on the individual effects and t-statistics.

Time is at all instances significant and the dummies have a positive sign though at a decreasing rate which conforms to the hypothesis of declining terms of trade. Equation 1a renders the expected results according to the hypothesis that multinational firms have a distinct positive effect on agricultural sales by forging backward linkages resulting in increased agricultural sales, albeit the effect is small. (A one percent increase in food industry sales by multinational firms increases agricultural sales by 0.03 percent.) On the contrary, domestic food industry sales have a negative or neutral effect on agricultural sales. In equation 2a a control is introduced for multinational firms originating from within the European Union. This renders a positive confirmation of the proximity hypothesis proposed by Rodriguez-Clare as the backward linkage effect is strongly reduced or close to zero for those plants with home countries reported inside the EU. However, the Common Agricultural Policy within the Union may also be an intervening factor that tends to favour agricultural producers inside the community. Therefore a control is introduced with equation 3a to see if the backward linkage effect is further reduced with respect to multinational firms from bordering home countries. Although the inclusion of this control reduces the negative impact on backward linkages from multinationals originating within the Union it is found that more than geography would appear to be at work. Perhaps the Common Agricultural Policy in combination with the European cumulation area in the EU rules of origin according to the free trade agreement with Poland does work as a disincentive for multinational firms to forge backward linkages to agriculture. In Poland's perspective it is therefore highly relevant to know how enlargement may affect the present situation as discussed in Section 6.

To check the robustness of the above results, and to further ascertain that the simultaneity bias does not give cause to a spurious effect between agricultural and food industry sales and hence could be the underlying reason for the obtained result, different estimation strategies could be adopted. A lagged model can be obvious (agricultural sales is a function of the last period food industry sales). However, since backward linkages of multinationals to agriculture are likely to be demand driven (last period agricultural sales is a function of present day food industry sales) there may be major problems involved in assuming the reverse lag structure. In fact a lagged structure for the independent variables gave little result (not shown). Instead and as the strongest test of robustness a first difference equation is adopted to test whether in fact there is a positive correlation between

changes in agricultural sales and *changes* in food industry sales. The results are shown below with Table 8. The results are again of such an order that the multinational linkages only pass the weak hypothesis of linkage creation but not the strong hypothesis which would necessitate a significantly larger effect than that measured with these equations.

Table 8

Regression results, for the lagged and first-difference variations

Independent var.	Equation 1c	Equation 2c	Equation 3c
Time dummies	Yes (-)*	Yes (-)*	Yes (-)*
Δ DEMAND	1.073*** (3.96)	1.094*** (4.06)	1.085*** (4.03)
Δ FISDOM	-0.011* (-1.75)	-0.011* (-1.78)	-0.011* (-1.73)
Δ FISMNC	0.014 (1.56)	0.021** (2.12)	0.021** (2.14)
Δ FISMNCEU	-	-0.019* (-1.83)	-0.017* (-1.67)
Δ FISMNCB	-	-	-0.005 (-1.00)
N	185	185	185
R ² (adj.)	0.19	0.21	0.21

Dependent variable: Changes in sales from agriculture Δ AS

(t-statistics in parenthesis)

* Significant at the 10 percent level, ** Significant at the 5 percent level, *** Significant at the 1 percent level

Source: Own calculations

5. CONCLUSION AND DISCUSSION OF POLAND'S ACCESSION TO THE EU

The objective of the paper is to test the hypothesis about multinational firms and linkage creation in the process of economic development. The case of the Polish agro-food production system is investigated. The food industry has been the largest magnet of multinational activity in Eastern Europe and hence it is relevant to test for backward linkage creation of these investors in high-technology upstream linkages with the food machinery industry and in low-technology upstream linkages with Polish agriculture.

The paper represents the first empirical endeavour to test the proximity hypothesis about backward linkage creation and the first to provide more systematic evidence in the case of the food industry in a developing and transition context.

Available theory and empirical evidence is largely in agreement concerning a number of hypothesis or expectations about backward linkage creation in host countries to multinational firms, even though there is a tendency in the empirical literature to focus more on firm-specific issues such as motives and strategy.

The theoretical literature is especially pronounced with the model of Rodriguez-Clare (1996) proposing a number of hypothesis that are relevant in a cross-country framework or an industry framework where investors of various nationalities participate. This theory prescribes that linkages are more likely to develop the higher the communication cost between host and home country. Furthermore, linkages may be more apt to develop in industries relying intensively on inputs sourced from external suppliers. Finally, Rodriguez-Clare's model suggests that linkages should be more likely to develop the more similar are host and home countries in their level of development, e.g. the smaller the technology gap between the two countries.

The empirical literature supports the theoretical literature, to the extent that backward linkages are found to develop but also to vary by industry and the relative level of development in the host country. Complementary to the theoretical literature, the empirical literature proposes that factors such as motives and years of experience in the host country are relevant determinants also of when linkages are likely to develop. Furthermore, linkages may also be greater among users and producers located in the vicinity in the host country.

Regarding the high-technology inputs of food machinery, the descriptive evidence provided in the paper suggests a general depressive effect of multinational firms in the food industry on the Polish food machinery industry. This is supported by anecdotal case study evidence, but it is still too early to make strong conclusions in this case since investment in food machinery is also strongly influenced by business cycles.

Regarding agriculture, results are oppositely positive. The study is in accordance with earlier evidence that backward linkages may be localized. This is not surprising due to the nature of the industry and its natural resource dependence. The results are largely supportive of the proximity

hypothesis, even though the Common Agricultural Policy may be an intervening factor in the present results since multinationals from the EU are found in particular to have a depressive effect on backward linkage creation from the food industry to Polish agriculture. While other multinationals have a significant effect compared to domestic firms in terms of crowding in local agricultural sales, the effect that EU multinationals have is small or close to zero.

Poland's accession to the EU may have at least five effects on linkages in the analytical framework drawn up here. First of all, accession will mean the immediate termination of all remaining Polish tariffs (1) in the area of food and agricultural products vis-à-vis the Union. In certain areas this may mean that both Polish food producers and their suppliers face somewhat more competition. Secondly, accession will push Polish producers including agricultural producers to adopt common standards (2) prevailing in the Internal Market. This should have a positive effect on the backward linkages. However, quite parallel at the same time the accession of Poland will also mean a decline in communication cost (3), such as differences in institutions, standards and consumer culture, which in fact may be to the advantage of suppliers from the multinationals' home countries as predicted by the Rodriguez-Clare model. Fourthly, the passing of time in itself including the commitment effect (4) that enlargement may have on multinational behaviour can result in these firms becoming increasingly embedded in local supply chains. And closely related at the same time there may also be more commitment from third country multinationals choosing Poland as their future sub-regional or regional EU headquarters. Finally, Poland's accession will also mean inclusion into the Common Agricultural Policy (5) whereby the level of subsidies will gradually increase in Poland from the present 25% and gradually decrease in the existing member countries until farmers compete on more equal terms. However, the way the accession to the Common Agricultural Policy has been negotiated makes it the least likely factor to have any immediate impact on the strategy of multinational firms in terms of forging backward linkages with Polish agriculture. Unless gradual accession to the Common Agricultural Policy could make users of agricultural products aware of the future increasing competitiveness of Polish suppliers, that is why they may already now decide in investing further in their backward linkages with Polish agriculture. Even though there may be both positive and negative effects from Poland's accession, it is estimated that the gains in terms of linkages will far outweigh any losses. If

multinational firms commit to local suppliers while maximizing their long-term profits combined with Polish farmers being able to adapt to common standards on the Internal Market.

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APPENDIX

Table A1

Regression results, fixed effect estimation, new voivodship structure

Independent variables	Equation 1b	Equation 2b	Equation 3b
Regional dummies	New V	New V	New V
Time dummies	Yes***	Yes***	Yes***
GDP	0.954* (2.57)	0.859** (2.33)	0.814** (2.20)
FISDOM	-0.020 (-0.33)	-0.019 (-0.32)	-0.022 (-0.37)
FISMNC	0.056* (1.81)	0.079** (2.40)	0.078** (2.39)
FISMNCEU	-	-0.024* (-1.88)	-0.024* (-1.85)
FISMNCB	-	-	-0.011 (-1.08)
N	96	96	96
R ² (adj.)	0.99	0.99	0.99

Dependent variable: Sales from agriculture AS

(t-statistics in parenthesis)

* Significant at the 10 percent level, ** Significant at the 5 percent level, *** Significant at the 1 percent level

Source: Own calculations

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