

Multinationals and backward linkages in Polish agro-food production systems

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Paper submitted to the 30th Annual Conference of The European Association for Research in Industrial Economics, Helsinki 24-26 August, 2003.

ABSTRACT:

The paper tests for the backward linkage hypothesis of multinational firms in developing host economies. The empirical case is the Polish food industry expected to be a highly relevant European case as the largest magnet of ‘developing-oriented’ FDI 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.

1. Introduction

There is by now a large and rich theoretical and empirical literature on the impact of multinational firms in host countries. One of the features of multinational firms having received 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). However, only recently has this issue received attention through formal modeling and econometric testing.

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 so is the empirical literature, however, with strongest evidence now available on intra-industry effects (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 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 does the increasing integration between Eastern and Western Europe also confirm 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 a 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 some preliminary conclusions are offered.

2. 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.

2.1. Theory

The theoretical literature on multinationals and linkages focus on situations 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 pure local production capacity

effect and a more dynamic technology transfer effect, e.g. 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. Hence potential upgrading effects of the latter are an increasing returns feature of the former. The models presented here focus for simplicity on pure productive capacity effects though aspects of increasing returns are also of some direct or indirect relevance in these models.

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 2 countries, 3 goods (two final and one intermediary which enters as a factor of production in the final goods sectors) and 1 additional production factor (labor) and assuming that specialized inputs exhibit 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 a 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, p867) should be measured as the new employment generated in upstream industries per unit of labor employed directly by the multinational¹.

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

¹ But the model implicitly assumes full employment, in which case the backward linkage effect of the multinational firm should be held up against the backward linkage effect of the domestic firm that it replaces (Rodriguez-Clare, 1996, p854 and 867).

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 absent².

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 intermediaries, 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 specialized 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 that 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 opportunity across different host

² 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.

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 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.

2.2. 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 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 particular decisive to spillovers and long-term growth in transition environments where the preexisting 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
Castellani and Zanfei (2002)	Various 1984-95	Electronics	Linkages	Linkages increase with experience
Smarszynska (2002)	Lithuania	No	Productivity	Linkage creation upstream, they are localized and market-seeking firms create more linkages

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 reveal that linkages appear stronger in a localized perspective, e.g. proximity between users and producers do matter to the externality effect and furthermore this study also shows that local market-seekers may have stronger linkage effects than the more export oriented multinational firms.

Castellani and Zanfei (2002) approach a similar question departing from a 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 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 to use actual linkage counts as 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 made reference to a very few here. The studies looked at are those adding in some way to the explaining 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 intend 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 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. Oppositely were experiences in dairy systems 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 over 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. More studies are desirable shedding light on both the impact firm strategies and not least host and home countries policies have on inducing virtuous or vicious circles of development on host countries hoping for a positive backward linkage effect from FDI.

3. 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 voivods) and subregions (old voivods) 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 hereof (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 database Amadeus.

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 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
<u>Population</u>	<u>1,294</u>	<u>1,313</u>	<u>1,406</u>	<u>1,435</u>	<u>1,482</u>	<u>1,587</u>	<u>1,578</u>	<u>1,610</u>
Source:	Amadeus and Effect.							

In terms of number of firms approximately 1/3 of all firms are represented with the sample. A more accurate estimation of data representation in the whole population is also given in Table 1. 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 is chosen 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 voivods (which is approximate to EU regional level nuts 3) and to Poland's new and simplified voivod 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 in 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 voivod structure. Some cities jump between voivods at both levels. These changes in the Polish administrative structure occur as late as 1998, why Effect provides for comparative estimates of assignment to the old voivods and the new subregional level for the year 1998. The new subregional level is similar to but not identical with the old voivod structure. The percentage difference is used as a 'fixer' for forcing the new subregional data into the old voivod structure. Of the old voivods there is a total of 44 units, of which some are irrelevant as they are strictly city voivods (or were until 1998) without any agricultural activity 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 voivod structures. This was done with a reasonable level of accuracy using a Polish online database containing information about individual cities' assignment under the old voivod structure. Subsequently the firm data can be aggregated up to the old and new voivod 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*. A logarithmic transformed time scale *TIME* is also included in the data, starting with 1 in 1995 etc.

4. 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. 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.

4.1. Descriptive statistics

Table 3 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 labor 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 high in particular 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 here³.

TABLE 3 – *Descriptive statistics, the Polish food industry, 1995 prices*

Mio. PLN

	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
Labor productivity, 1000 PLN (sales per employee)	-	-	126	133	145	154	160	176

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

³ The Europe Agreement establishes a specific trade regime between Poland and the EU, where tariffs are phased out asymmetrically in favor of Poland. This is happening over the period 1992-99 after which there is 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 however exceptions 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.

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%.

TABLE 4 – Descriptive statistics, the Polish food machinery industry, 1995 prices

Mio. PLN

	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	45
Number of employees in the food machinery industry	-	-	7,974	7,682	7,553	6,659	5,584	5,184
Labor productivity, 1000 PLN (sales per employee)	-	-	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.

Similar figures are calculated for the food machinery industry (NACE 29.53) with Table 4. 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 more rapid and significant restructuring compared to the downstream food industry and 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 5 – Descriptive statistics, Polish agriculture, 1995 prices

Mio. PLN

	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, 1000 PLN			9.2	9.5	-	10.0	-	8.9

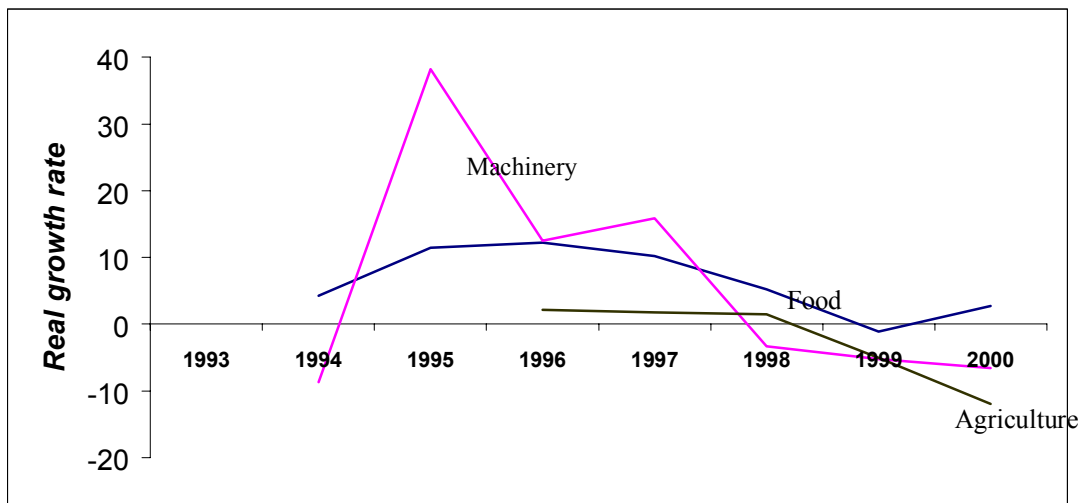
Source: Effect and GUS (2001): *Statistical Yearbook of the Republic of Poland*, Główny Urząd Statystyczny, Warsaw.

Finally, Table 5 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 starts to go down again after 2000. However, the aggregate statistics are likely to cover over a significant polarization process, where the country-side 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). Just the regional size distribution of farms under the new voivod 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).

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 owe 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.

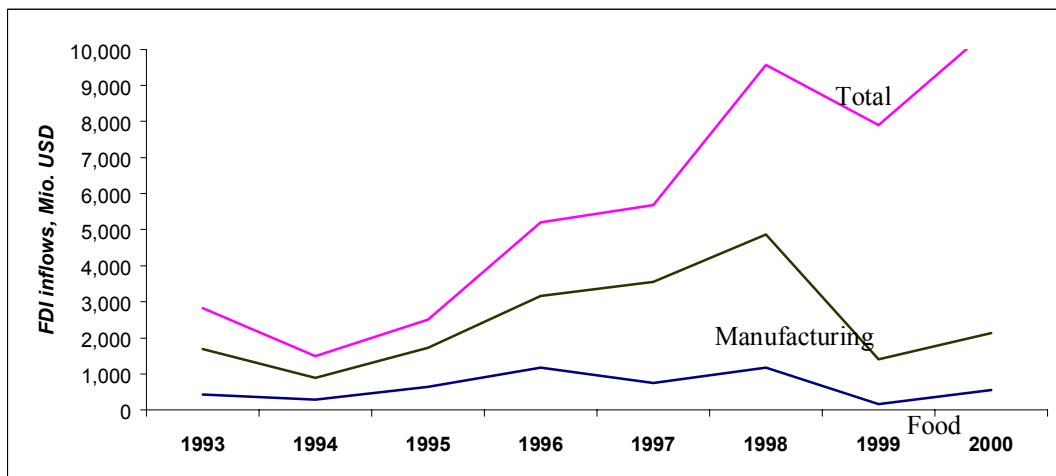
The subsequent case study also renders support to a scenario of multinational firms in Polish food processing often choosing standard machinery and equipment from their traditional suppliers abroad. On the other hand is it too early to offer strong conclusions about backward linkages between the food 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.

FIGURE 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 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. Warsaw.

4.2. The Nestlé case⁴

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 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 by 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 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 the 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 the local suppliers of milk – involving up to 1,300 local farms. The program resulted in quality improvements with 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 related to global brands are imported along with all machinery from the home country or other Western countries.

⁴ This case study is based on an interview with Nestlé Poland's Public Relations Manager Agnieszka Wasak in April 1997, including several press released from Nestlé Polska Holding, general information material on the company and Garzdecki (1998).

5. Testing for the impact of multinational sourcing strategy on backward linkages creation

5.1. 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 a quite uniform way. Progress with privatization is one of those factors expected to positively impact on competitiveness, however, within the period analysed progress has been relatively slow in most transition countries (EBRD, 2002) and privatization of farms is not a decisive factors in Polish agriculture which opposed to other transition countries tend 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 suffer from staggering competitiveness because of dismantlement of the planning system and subsidized production. Most transition countries have suffered from declining internal terms of trade in agricultural 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 combined decline in internal and external terms of trade should have a natural depressive effect on agricultural sales during Poland’s transition.

Asides 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 lesser transportation and

transfer cost being more naturally accustomed to European tastes will have a smaller effect on agricultural sales.

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 socialist enterprises. The general form of the equation tested looks as follows, where the subscript v denotes voivod (old or new structure) and t denotes year:

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

The coefficient estimated for food industry sales shows directly 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 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: $FISMNC > FISDOM$.

5.2. Results

TABLE 6: Regression results, fixed effect estimation
Dependent variable: Sales from agriculture AS

	Equation 1a	Equation 2a	Equation 1b	Equation 2b
Intercept	5.549*** (16.03)	5.265*** (12.01)	5.315*** (5.49)	5.941*** (5.91)
Regional dummies	Old V***	Old V***	New V***	New V***
FISDOM	-0.008 (-0.94)	0.014 (1.02)	0.083 (1.41)	0.047 (0.80)
FISMNC	0.054 (1.60)	0.121*** (3.16)	0.051 (1.47)	0.101** (2.48)
FISMNCEU	-	-0.08** (-2.54)	-	-0.086*** (-3.05)
Time	-0.067** (-2.44)	-0.079** (-2.37)	-0.101*** (-2.80)	-0.075* (-1.96)
N	153	111	91	82
R ² (adj.)	0.88	0.90	0.94	0.95

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

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 agricultural sales. The data conforms well to the fixed effect model rendering high explanation in data variation within both types of voivod structures. Time is at all instances significant and has the expected sign in accordance with the hypothesis of declining terms of trade. Equation 1a and 1b for the two types of regional structures render close to expected results for equation 1a but not for equation 1b. Furthermore the coefficients are not significant. In equation 2a and 2b controls are introduced for multinational firms originating from within the Union. This renders a positive confirmation of the backward linkage hypothesis, while in general this effect is strongly reduced or close to zero for those plants with home countries reported inside the EU. This would tend to confirm the proximity hypothesis proposed by Rodriguez-Clare. However, the Common Agricultural Policy within the Union may also be an intervening factor that tends to favor agricultural producers inside the community.

TABLE 7: Regression results, fixed effect estimation with lagged variables

Dependent variable: Sales from agriculture AS

	Equation 1c	Equation 2c	Equation 1d	Equation 2d
Intercept	5.263*** (14.62)	4.629*** (10.33)	6.090*** (16.91)	6.070*** (13.25)
Regional dummies	Old V***	Old V***	New V***	New V***
FISDOM (t-1)	0.020*** (3.37)	0.028*** (2.85)	0.017** (2.03)	0.015 (1.17)
FISMNC (t-1)	0.057 (1.54)	0.310*** (6.03)	0.067** (2.18)	0.081* (1.73)
FISMNCEU (t-1)	-	-0.229*** (-5.73)	-	-0.027 (-0.92)
Time	-0.133*** (-3.63)	-0.169*** (-3.80)	-0.132*** (-3.67)	-0.115** (-2.52)
N	145	99	89	77
R ² (adj.)	0.89	0.91	0.94	0.94

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

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. Another problem is that some time lag may be involved for externalities to occur and especially in relation to the transition economies where multinational firms only recently are being established. Hence to control for a possible simultaneity bias and investigate whether in fact a lagged model more appropriately describes the linkage creation process, the model is adapted to a time lag in the explanatory variables concerning food industry sales as reported in Table 7.

This latter test renders strong vindication of the backward linkage hypothesis as shown with the preferred specification of Equation 2c in Table 7. The old voivod and new voivod structures render very similar results, but since the coefficients on the important explaining variables of linkages are stronger within the old voivod structure suggest that linkages are highly localized as would be reasonable to expect in the case of agro-food production systems. Food producers that are strongly dependent on local agricultural inputs or which follow a local sourcing strategy are more likely to cooperate with local farmers in their vicinity. There is found to be a weak linkage effect in equation 2c for domestic or local Polish produces, whereas the linkage effect is quite strong in the case of multinational firms that specifically do not originate from within the European Union.

6. Discussion and preliminary conclusions

The objective of the paper is to test the hypothesis about multinational firms and linkage creation in the process of economic development. As a relevant case are chosen the Polish agro-food production systems. 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 endeavor to test the proximity hypothesis about backward linkage creation and the first to provide more systematic evidence on the case of the food industry in a developing/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 on more firm-specific issues such as motives and strategy.

The theoretical literature especially pronounced with the model of Rodriguez-Clare (1996) proposes 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 greater 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 (1996) model suggest that linkages should be more likely to develop the more similar host and home countries are 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 relatively 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 vicinity in the host country.

Regarding the high-technology inputs of food machinery the descriptive evidence provided in the paper suggest 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 come with 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 confirms in accordance with earlier evidence that backward linkages are strongly localized. This is not surprising due to the nature of the industry and its natural resource dependence. 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 large 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.

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