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HOW FOREIGN DIRECT INVESTMENT HAS STIMULATED GROWTH IN THE CENTRAL AND EASTERN EUROPEAN AGRI-FOOD SECTORS: VERTICAL CONTRACTING AND THE ROLE OF PRIVATE ENFORCEMENT CAPITAL

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ABSTRACT

Foreign Direct Investment (FDI) at the food processing level of the agri-food chain is well known to have important positive spillover effects, as it forces other competing processors across this level of the chain to raise their efficiency and productivity. In addition to this standard argument, we show that FDI in food processing industry produces substantial productivity, investment, and output increases at the primary production level through backward linkages. This is because FDI solves hold-up problems that have become pervasive across this section of the agri-food supply chain, causing sub-optimal resource allocations, reduced investment, and large output falls. Therefore, the impact of FDI on the overall productivity of the agri-food sector is significantly larger than is usually argued. This paper presents a theoretical model which explains how FDI at the food processing level produces these positive spillover effects at the production level through the provision of credible contractual arrangements and private enforcement capital. Case evidence from the Central and Eastern European countries is used to support the theoretical arguments.

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1. Introduction

Reform in the transition countries has been characterised by declining agricultural output and decapitalisation of the agricultural production system. Table 1 shows the dramatic decline in output and input use in Central and East European (CEE) agriculture. The causes include: declining terms of trade for agricultural producers, financing problems due to a reduced supply of agricultural credit, market uncertainty with high inflation, disruptions caused by farm restructuring, privatisation and land reforms, weather, and the disruption of traditional exchange systems within the agri-food chain with restructuring of the up- and downstream sectors (Jackson and Swinnen, 1995; OECD, 1997).

Insert Table 1 here

Changes in agricultural input use, resource reallocation and output were inevitable, as economic reform has removed many of the allocative distortions from the previous system, inducing beneficial structural adjustment. At times however, these structural adjustments have produced undesirable outcomes, as input and output changes have overshot the long-term levels.

An essential factor in this has been the break-up of the pre-reform system of contracting in the agri-food chain, which was strongly vertically integrated and centrally planned. In Gow and Swinnen (1998) we show how, with imperfectly developed market and legal institutions, contracting problems within the agri-food sector have caused disruption, production and investment decreases. In the absence of credible and enforceable contractual arrangements, the opportunity exists for one of the transacting parties to extract the appropriable quasi-rents accruing to the relationship-specific investment by renegotiating the contractual terms *ex post*, that is holding up the transaction (Williamson, 1985). These “hold-up” problems cause under-investment in relationship-specific investments (Klein et al., 1978). They are especially important in transition agriculture, due to a combination of agriculture-specific characteristics and transition-specific problems. Standard institutional solutions such as contracting, cooperatives and vertical integration all have problems in the short-to-medium term.

Empirical evidence indicates that foreign direct investment (FDI) in the food processing industry does provide a solution to the hold-up problems in the agri-food sector. Foreign direct investment in the food processing industry has produced positive spillover effects not only on farm production, but also on adjacent commodity sectors (Gow and Swinnen, 1998). A number of questions remain unanswered, such as: how and why have foreign affiliates been willing and able to correct the hold-up problems, while local firms were either unwilling and/or unable to? What factors or mechanisms have enabled foreign affiliates to correct the problem? Was it their reputation or greater financial resources or other factors? How did they solve the contractual credibility problems?

In this paper, we use a theoretical model, based upon Klein's (1996) probabilistic hold-up framework, to explain how FDI can correct the hold-up problems by altering producer(s) and processor(s) incentives, stimulating long-term contracting, investment, technology adoption, increased output, and ultimately increasing the competitiveness across the agri-food sector. In Klein's probabilistic hold-up framework is the idea that "hold ups" are not based upon opportunistic behavior, but are assumed to occur when a sufficiently large unanticipated event destabilizes a contractual relationship between two *ex ante* equally knowledgeable transactors. *Ex ante* contractual terms are chosen to get transactors close to the required performance, then reputation and private sanctions are used to reach the desired performance. That is, contractual terms economize of the use of private enforcement capital through redistributing the likelihood of hold-ups and define what is termed the self-enforcing range of the contractual relationship. It is the size and position of this self-enforcing range which determines where market conditions can move without causing a "hold-up" (Klein, 1996).

We argue that following the initial reforms transition-specific factors shifted contracting parties outside of the self-enforcing range, thereby making it beneficial for them to hold-up the transaction. This provides an explanation for why hold-ups have become so pervasive following the initial reforms in the transition economies. Foreign direct investment into the food processing sector has provided food processors with the ability and incentives to shift the self-enforcing range to better match the transacting parties expectations of future market conditions, thereby sustaining the contracts. In doing so, they have been able to reduce the probability of a hold-up occurrence through the provision of credible contractual arrangements and private enforcement capital and stimulate increased relationship-specific investment by producers.

We use a case study of FDI in a Slovakian sugar processor (Juhocukor a.s.) to illustrate our arguments. After the initial FDI by Eastern Sugar, Juhocukor was able to provide the required incentives to stimulate producers to enter long-term contracts and undertake relationship-specific investments in the production of a commodity, sugarbeets, which had traditionally not been grown in large quantities in the surrounding region. Juhocukor was later able to *ex post* renegotiate the long-term contracts with producers as markets conditions changed and the firms contractual credibility and reputation increased (or restored).

The paper is organized as follows: Section 2 discusses why contracts are inherently incomplete, how private sanctions are both a substitute and complement for court enforcement mechanisms, and finally, how the reallocation of private enforcement capital between transacting parties can reduce the probability of a hold-up occurrence. Sections 3-5 then apply these concepts to explain why hold-up problems occurred in agricultural transition and how foreign affiliates have been able to correct these problems. The last section discusses spillover effects on other sectors.

2. Contractual Enforcement Mechanisms and Klein's Probabilistic Hold-up Framework

2.1 Contractual Incompleteness and Hold-Ups

Contractual arrangements are naturally incomplete as agents find it difficult and expensive to foresee and plan for all possible contingencies, as well as enforce these contracts, especially when outcomes are unobservable or non-verifiable by a third party (Hart, 1995). Contractual incompleteness thus often results in parties exposing themselves to potentially large *ex post* costs and hazards related to their sunk investments in relationship-specific assets, that is the occurrence of hold-ups.

Hold-up problems are defined as “the general business problem in which each party to a contract worries about being forced to accept disadvantageous terms later, after it has sunk an investment, or worries that its investment may be devalued by others....” (Milgrom and Roberts, 1992, p.136). They occur when one of the trading parties has the correct incentives to initiate *ex post* renegotiations of the contractual terms in an attempt to extract a greater proportion of the appropriable quasi-rents accruing to the relationship-specific investment.¹ One can distinguish between two contract enforcement mechanisms to reduce the potential of a hold-up occurring: private sanctions and legal (court) enforcement.

Contractual terms and legal (court) enforcement

In principle, incentives and penalties can be inserted into contracts to correct for these problems and to specify the appropriate damages in event of non-performance, which if required can later be enforced by a court of law. It is however, often not viable to use legal dispute mechanisms due to a combination of litigation costs, ineffective contract law, poor third party verifiability, and finally, the potential loss of the only suitable trading partner for that commodity.

This is especially true in transition economies for two reasons. First, the agricultural processing sector is heavily characterized by large geographical monopsony processors. Therefore, the potential loss of their sole trading partner can impose high costs upon a production enterprise, especially when the relationship-specific investment has already been sunk. Second, the legal and judicial systems are still in their embryonic stages of development, hence outcomes of any court decision are highly uncertain and non-transparent.

Firms may also prefer incomplete contracts. Strict specification of the contractual terms may produce unwanted contractual rigidity. For example, once imperfect contractual terms are written down, one of the transacting parties may decide to hold-up the transaction by enforcing the imperfect contractual terms, even if these literal terms run against the initial intentions of the contract.² When contracts

¹ See Klein et al (1978), Williamson (1985), Milgrom and Roberts (1992), and Klein (1996) for a complete discussion of hold-up problems, relationship-specific investment, and quasi-rents.

² See Klein et. al. (1978) and Klein (1996) for a extensive discussion of these issues related to the Fisher Body - General Motors case.

have not been fully formalized, i.e. incomplete, contracting parties gain greater flexibility to opt out of the contractual arrangements if future market conditions deviate substantially from expectations.³ In this case they only lose the present value of the future quasi-rents accruing to the non-salvageable relationship-specific investment. Thus transacting parties may intentionally elect to leave many contractual specifications out of the contract, opting instead to use private sanctions to enforce the contractual arrangements as opposed to courts (Klein, 1996).

Private Sanctions

Transacting parties can also use private sanctions to enforce the unwritten terms of their contractual arrangements by penalizing the transacting party if they renege on the contract in one of two ways⁴. First, the future losses that can be directly imposed due to termination of the relationship. That is termination or nonrenewal of the contract or relationship can impose a loss equal to the present value of the future appropriable quasi-rents that would have accrued to the non-salvageable relationship-specific investments. Second, the potential damage to the reputation of the party holding-up the transaction within the market that result once other transacting parties, actual or potential, recognize that these contractual violations have occurred. Transacting parties may impose an increased cost of doing business on the reneging party by demanding more explicit and/or favorable contractual terms and preferring written contracts to verbal promises (Klein, 1996).

Each transacting party continuously weighs the benefits of contractual breach against the capital costs imposed by the private sanction. If the benefits are less than the capital costs of the hold up then the transacting party cannot credibly threaten a breach of the contractual arrangement. Thus, while the costs outweigh the benefits, transacting parties will not attempt to take advantage of the contractual incompleteness opting instead to complete the required tasks consistent with the initial mutually agreed contractual intent. If however the opposite holds, it maybe in the interest of one or both of the transacting parties to hold up the transaction.⁵

Thus as Klein (1996) notes it is “the magnitude of the private sanctions that can be imposed on each transactor who attempts a hold-up [that] defines what can be called the “self-enforcing range” of the contractual arrangement. The self-enforcing range measures the extent to which market conditions can change without precipitating a hold-up by either party. Changes in market conditions may alter the value of specific investments and, therefore, the hold-up potential, yet as long as the relationship remains within the self enforcing range where each transactor’s hold-up potential gain is less than the private sanction, a hold-up will not take place. Only when changes in market conditions move transactors outside the self-enforcing range so that the one-time gain from breach exceeds the private sanction will the hold-up threat ... become

³ This is one of the likely reasons for the popularity of spot markets for exchange markets in transition countries. Given the great uncertainty about future market conditions, transactors prefer the flexibility provided by spot markets, as they are not locked into an adverse situation.

⁴ The use of private enforcement mechanisms is initially developed in Klein and Leffler (1981) and later extended by Lott (1988) to include random changes in costs and demand.

⁵ For a formalized analysis of the conditions under which contracts are self-enforcing e.g. see Telser (1980) or Bull (1987).

credible. When this occurs the transactor will not be deterred from breaching even if the transactor expects to be terminated and knows that everyone in the market place will think he is a “cheat”” (p449).

Klein’s Probabilistic Hold-Up Framework

Traditional contract theory⁶ usually assumes that court enforcement and private enforcement are alternatives to each other. Klein’s (1996) probabilistic hold-up framework differs in that it emphasizes a fundamental complementarity between court enforcement and private enforcement. Court enforcement and private enforcement are “substitutes in demand”, in that if the cost of one increases, the demand for the other increases. At the same time, they are also “complements in production”, because as the quality of one increases the marginal product of the other increases. Klein emphasizes that court and private enforcement mechanisms should be used together. Hence, contractual terms are used “to economize on the amount of private enforcement capital necessary to make a contractual relationship self-enforcing by merely “getting close” to the desired performance in a wide variety of circumstances (without creating undue rigidity) and to let the threat of private enforcement move performance the remainder of the way to the desired level.” (p455-456)

In Klein’s framework, “hold ups” are not based upon opportunistic behavior, but are assumed to only occur when a sufficiently large unanticipated event destabilizes a contractual relationship between two *ex ante* equally knowledgeable transactors placing them outside of the self-enforcing range. A ‘hold up’ thus would never occur in a fully anticipated world. If the transactor had anticipated the possible occurrence of the present market conditions and recognized the potential for hold-ups to occur, it is unlikely that he would have undertaken the initial investment to begin with. Otherwise, he would have insisted upon different marketing structures or contractual arrangements prior to investment.

Insert Figure 1 here

To understand how Klein’s framework operates and the role of contractual enforcement mechanisms within this framework, consider Figure 1a which presents a graphical representation of the probability a hold-up occurring under *ex post* market conditions. Within this representation, $f(H)$ is the probability distribution of the hold-up potential which is assumed to be related to a scalar measure of the *ex post* market conditions along the horizontal axis.⁷ Zero represents the initial market conditions and additionally there is no reason to think that the distribution necessarily needs to be centered on zero. The downstream first-stage processors hold-up potential H_P is shown to the right of zero and the farmers’ hold-up potential H_F are shown to the left

⁶For a review of the theory of contracts see either Hart and Holmstrom (1987) or Salanié (1997).

⁷ A scalar measure of all market conditions which directly relates to a singular hold-up potential is unlikely to hold in reality where the increase in one transactors hold-up potential necessarily imply a decrease in the opposite parties hold-up potential. Thus, if one were to analytical model this situation they would likely have to use separate probability distributions for each transactor. However, for the requirements of this paper the simplistic formulation used suffices as it demonstrates how the fundamental economic forces are interacting.

of zero. K_P represents the level of private enforcement capital provided by the processor and K_F represents the level of private enforcement capital provided by the farmers. The distance between K_P and K_F represents the self-enforcing range of the contractual arrangement, the area to the right of K_P defines the probability of a processor hold-up, the area to the left of K_F defines the probability of a farmer hold-up, and the area between K_P and K_F represents the probability that the processor-farmer relationship remains in the self-enforcing range. If market conditions shift outside of the self-enforcing range to the right (left) of K_P (K_F), then by definition the benefits of a hold-up outweigh the costs making it beneficial for the processor (farmer) to hold-up the contract.

This means that contractual terms can be used by transacting parties to economize on the use of private capital in one of two ways. First, transacting parties can attempt to reduce the probability of hold-ups occurring, that is contractual non-performance, by setting and explicitly stating the contractual terms and requirements in a court enforceable manner. Thereby effectively “tying each others hands” in regard to legally minimizing the opportunities that each party has to manipulate variables in an attempt to extract a greater share of *ex post* appropriable rents accruing to the relationship-specific investment.⁸ Figure 1b represents this situation where the processor and farmer have negotiated a contract that attempts to controls for hold-ups and the expropriation of quasi-rents. By setting court enforceable contractual terms the majority of the distribution has been confined within the self-enforcing range.⁹ However, this also introduces a contractual rigidity that could be literally enforced in court against the initial intention if market conditions later change, thereby potentially adversely affecting one of the transacting parties.

Second, contractual terms can reduce the probability of a hold-up occurring by reallocating the level of private enforcement capital between transactors. This is depicted in Figure 1c where an amount X of private enforcement capital is transferred from the farmer to the producer through the contractual terms. This reallocation X shifts the self-enforcing range of the contractual arrangement from being situated between K_P and K_F to being situated between K_P^* and K_F^* which better matches the transactors expectations of future market conditions. Thus, the probability of a hold-up is reduced as a larger proportion of the distribution is now within the self-enforcing range, thereby ensuring a higher likelihood that both parties will perform as intended. The reallocation of private enforcement capital provides an alternative to directly attempting to reduce the probability of hold-ups through binding contractual terms (Klein, 1996). Later we explain how the guarantees provided by processor to farmers

⁸ Following the initial reforms within the transition economies firms have found that it is both difficult and expensive to legal enforce such contractual terms.

⁹ As Klein (1996) shows for the General Motors-Fisher Body case if you assume “that the rent-dissipating costs associated with hold-ups are proportionately related to the magnitude of the hold-up, transactors will attempt to minimize these costs when setting contract terms by minimizing the expected value of the hold-up, i.e., the sum of the expected hold-up values associated with the tails of the probability distribution” (p456). That is for this situation the processor and farmer can be considered to be minimizing $\int_{K_P}^{\infty} (H - K_P)f(H)dH + \int_{-\infty}^{K_F} (H - K_F)f(H)dH$

for input and machinery purchases effectively produce this form of reallocation of private enforcement capital.¹⁰

In conclusion, contractual terms are chosen to get transactors close to the required performance and private enforcement capital is used to reach the desired performance. In this way contractual terms economize of the use of private enforcement capital through redistributing the likelihood of hold-ups and the amount of private enforcement capital available defines the self-enforcing range of the contractual relationship, where the private enforcement capital is a combination of the reputation capital and the present value of the quasi-rents which accrue to the non-salvageable relationship-specific investment provided by each transacting party. Thus, it is the size and position of this self-enforcing range that determines where market conditions can move without causing a “hold-up.” (Klein, 1996)

Insert Figure 2 here

3. Hold-Up Problems in CEE Agricultural Transition

Prior to the initial reforms in CEE most of the agri-food supply chain was centrally planned and vertically integrated.¹¹ The central authority provided complete contractual enforcement, which meant that transacting parties faced an extremely low probability of being held-up as most of the probability distribution fell within the self-enforcing range (see Figure 2a). This changed when economic reforms, including privatization broke the agri-food chain into operationally and managerial autonomous processing and supply firms.¹² The removal of exclusive supply areas and price controls along with the weakening of the central authorities powers caused the probability of a hold-up occurrence to increase dramatically for two reasons (as illustrated in Figure 2b). First, the probabilistic hold-up distribution spread-out dramatically as contractual terms were no longer enforced by public authorities, i.e. the legal system or the central planning authority.¹³ Second, since the transacting parties

¹⁰ Klein and Murphy (1988) and Klein (1995; 1996) use the occurrence of exclusive territories in franchise contract to show this reallocation.

¹¹ For example prior to the initial reforms in the Slovak Republic, previously part of Czechoslovakia, both the up- and downstream industries were composed of large-state owned companies, one per sector and in certain cases the same firm on both sides of the market, e.g. the Agricultural Supplies and Procurement Organization (PZN). This enabled the state to gain total control of the sector and meant that producers effectively faced monopolies on both sides of the market. Additionally, all production and resource allocation decisions, as well as production and price targets, were all set centrally by the state. The artificially low and administratively set commodity prices required that agriculture had to be heavily compensated through an extensive range of subsidies. In addition, massive consumer subsidies were provided for basic foodstuffs. These factors stimulated excessive production and consumption of agricultural products, as well as the establishment of overcapacity in the processing sector (OECD, 1997).

¹² For example, beginning in 1991 the Czechoslovakian (later Slovak) government initially switched the previously vertically integrated agri-food processing sector comprising 30 firms and 188 processing plants into 197 separate and autonomous state owned enterprises. Later these firms were either privatized during the first voucher privatization or sold to selected strategic purchasers in the second stage (OECD, 1997).

¹³ Previously enforcement was provided by the central authority. Following the reforms, these powers were severely constrained and with no suitably developed legal system to use as a substitute “court”

had no previous experience or knowledge of hold-ups or their potentially severe consequences, private enforcement levels were left unchanged and producers continued making relationship-specific investments.

However, the reforms brought “unanticipated” shocks that dramatically changed market conditions shifting the processors outside of the self-enforcing range (to the right of K_P). Without the threat of litigation, loss of private sanctions, or free entry of outside competition, and knowing that producers had already sunk relationship-specific investment in previous periods, processors found it beneficial to hold-up exchange transaction with producers in an attempt to extract a greater proportion of the appropriable quasi-rents accruing to the previous sunk relationship-specific investments.

Within the agricultural sector these hold-ups have typically been characterized by excessively long payment delays for delivered product, i.e. accounts payable, by downstream processors. Effectively they have provided processors with an interest free loan for the length on the delay and caused additional financial strain on already distressed producers. For example, in the Slovak Republic the length of the delay is strongly negatively correlated with the profitability of the farm. In 1994, the average number of days of delays for collection of accounts receivables were 80.97 and 110.76 for profitable and unprofitable farm, respectively. The delays were similar in 1995, with averages of 82.15 and 112.70 for profitable and unprofitable farm, respectively (OECD, 1997).

Additionally, when hold-ups occurred as market conditions moved outside of the self-enforcing range, it still may not have been optimal for the adversely affected farmers to instigate legal proceedings due to the high uncertainty related to the possible court imposed outcome. For litigation to take place it is necessary, in addition to the parties being outside of the self-enforcing range, for the parties to have sufficient informational differences regarding what they have at stake and their probabilities of success in court (Klein, 1996). Given the lack of transparency and in some cases the complete absence of a suitable legal system, it is very likely that following a hold-up occurrence in a transition economy court enforcement will not be imposed, as the uncertainty and transaction costs are extreme.¹⁴

Hold-up problems became pervasive not only because of the lack of public enforcement, but also because the private enforcement capital of processors had dramatically declined from K_P to K_P^* as their reputation and non-salvageable relationship-specific investments decreased, further reducing the self-enforcing range in

enforcement was extremely difficult if not impossible. Many of the Central and Eastern European governments have drafted suitable legislation on contracting, e.g. prompt payment laws in the Slovak Republic and Slovenia. However it takes time for these laws to pass through parliament, thus until these laws are enacted transacting parties will have to rely upon other enforcement mechanisms.

¹⁴ For example, in Slovakia during 1994/95, delays in the payment for delivered milk by dairy companies of up to 6 months or more were not uncommon, yet farmers continued producing milk and delivering it to the processing plants without looking to take any legal action. The Slovak Ministry of Agriculture has recognised this problem and has begun the process of getting a prompt payment law passed through parliament that requires dairy companies to pay for delivered milk within 14 days. However, the jury is still out on if and how they will enforce this law.

figure 2c. Producers reacted by reducing their non-salvageable relationship-specific investments and either internalized their exchange transactions through vertical integration, shifted exchange to spot markets, or in the extreme terminated their activities waiting for better market conditions. Combined these factors have contributed to the large declines in gross agricultural output that have been observed across the region along with substantial reductions in the use of and investment in fertiliser, labour, livestock, and tractors, with minimal changes in the use of arable land (Table 1).

4. Solutions to Hold-Up Problems

Hold-ups are costly as they consume scarce resources and reduce trading partners abilities to realize the potential gains from trade because of their inability to negotiate suitable trading agreements and resulting misallocation of scarce resources (Klein, 1996). Additionally, the expectation of *ex post* bargaining can lead to inefficient *ex ante* prepositioning by trading partners as they attempt to extract a larger share of the distribution of quasi-rents accruing to the relationship-specific investments (Grossman and Hart, 1986). To the extent that institutional arrangements can minimize the probability or cost of these conflicts, the surplus from trading will increase with the adoption of the appropriate institutional arrangement (Masten, 1996). That is as Klein (1992) states, “given the dissipative, purely redistributive transaction costs associated with “hold-up” behavior, it will ... be efficient for transactors aware of potential hold-ups that are present whenever relationship-specific investments are undertaken to design contractual arrangement to avoid or reduce the probability of these hold-ups occurring.”

Standard institutional arrangements to hold-up problems, such as, long-term supply contracts, cooperatives, and vertical integration, have all been shown to have critical problems as short to medium term solutions in transition economies. These problems are primarily because of a combination of a lack of credible enforcement mechanisms, positive incentives for processors to attempt to extract quasi-rents, and a lack of financial resources (Gow and Swinnen, 1998).

Empirically, the factor that has been observed successfully reducing the occurrence of hold-up problems in the agri-food sector is FDI in the food processing industry. The next section presents a case study and explains why FDI has been a successful solution.

5. Foreign Direct Investment: Juhocukor a.s. and Slovak sugar sector.

5.1 Initial Situation

As in many CEE agricultural sectors, output in Slovak sugar production fell substantially after the reforms due to declining terms of trade and contractual disruptions. Total sugar beet production fell from 1.87 million tons in 1989 to 1.1 million tons by 1993. Sugar beet deliveries to Juhocukor, the largest sugar producer, declined from 315,000 tons in 1990 to 214,000 tons by 1993, its contracted hectares

7,800 ha to 6,000 ha, and its sugar production from 32,000 tons to 24,000 tons over the same period. After 1993, both production and sugar beet deliveries increased dramatically. As a result of the takeover of Juhocukor by Eastern Sugar BV, sugar output increased by 212% and sugar beet deliveries 157% between 1993 and 1997. The rest of this section discusses how Eastern Sugar's FDI in Juhocukor has reduced the probability of hold-up problems between farmers and processor and hereby induced dramatic increases in investments, productivity, and output at both the factory and farm levels.

In 1992, Eastern Sugar BV¹⁵ began negotiations with the Czechoslovakian government to purchase 51% of Juhocukor in the privatization program. This was accepted and finalized in June 1993, dependent upon the understanding that Eastern Sugar would begin a four year development program which included: a recapitalization and stabilization program of the firm production facilities; an injection of working capital; and an expansion plan to increase production from a daily slicing capacity of 4,000 tons to 6,000 tons, thereby fully balancing the plant's processing capacity and operations. To increase the daily slicing capacity of the plant, total plant throughput, factory productivity, and final product quality, Juhocukor needed to increase both the base hectares and tonnage of sugar beets under contract as well as the quality of the product delivered, which required increasing both the technical efficiency and the relationship-specific investment levels of their contract growers.

Juhocukor though faced a number of problems. Firstly, Juhocukor had gained an extremely bad reputation for holding-up producers by not paying their accounts payable on time (or within a reasonable time) after delivery following the initial reforms in 1990/91. This resulted in farmers attempting to limit their exposure by reducing contracted hectares and relationship-specific investments, thereby leading to dramatic reductions in both the tons and quality of delivered sugar beets. In addition, Juhocukor faced fewer producers willing to contract, severe financial constraints (both investment and working capital), underutilized processing facilities, poor final product quality (due to a combination of poor quality control, outdated processing equipment, and low quality inputs), and low productivity and technical efficiency of their remaining and potential contract producers.

Adding to these challenges was the fact that most producers faced severe financial constraints, both internally and externally. These constraints have resulted from a combination of transitional factors related to agrarian reforms, privatization programs and the general economic situation, as well as the pervasive hold up problems found across all commodity sectors which have significantly reduced farm cashflows and profitability (Swinnen and Gow, 1998).

Insert Figure 3

Figure 3a illustrate Juhocukor's position following the initial FDI by Eastern Sugar, where K_J and K_C represent the level of private enforcement capital for

¹⁵ Eastern Sugar BV is a 50:50 joint venture between Tate and Lyle and Saint Louis Sucre. Their goal is the development of sugarbeet production in the Central and Eastern European countries and they presently own processing facilities and operations within the Czech Republic, Hungary and Slovakia.

Juhocukor and the contracted growers, respectively, the areas to the right of K_J and left of K_C are the hold-up potentials for Juhocukor and the contracted growers, respectively, and the area between K_J and K_C is the self-enforcing range. Effectively, the amount of available private enforcement capital to Juhocukor diminished to minimal levels due to two factors: First, Juhocukor's reputation had been severely eroded due to persistently holding-up transactions. Second, these hold-ups had removed a large proportion of the present value of the quasi-rents that could have accrued to any previously sunk non-salvageable relationship-specific investments, as producers were no longer willing to contract with Juhocukor. Additionally, future producers were only willing to make the bare minimum of relationship-specific investments required to support their contractual arrangements. Thus, Juhocukor found itself trying to negotiate long-term supply contracts with producers, while effectively offering no private enforcement capital to support the contract. On the other hand, producers still had quite a lot of private enforcement capital available due to their relationship-specific investments and, generally, their reputation was still largely intact.

5.2 Grower Contracts and Supporting Programs

This presented Juhocukor management with a major problem: How to encourage producers to sign long-term contractual arguments under these conditions with Juhocukor possessing minimal private enforcement capital and court enforcement not being an alternative. The producers on the other hand had a great deal to lose by signing any contract, as they would have already made a serious investment in relationship-specific assets (i.e. the planting of the crop), prior to observing the market conditions or receiving any payment. Given the previous variability in market conditions, Juhocukor's limited private capital, and the constrained size of the self-enforcing range, future hold-ups by Juhocukor were considered highly likely by producers. Thus, Juhocukor needed to increase its own levels of private enforcement capital, and/or to redistribute the presently available private enforcement capital to expand the self-enforcing range, to induce producers to enter contractual agreements with Juhocukor or make the required relationship-specific investments. In an attempt to just that, Juhocukor implemented a number of corrective programs over a period of a few years:

- Pay contracts at the time when product is delivered to the factory and at fair prices, thereby attempting to correct Juhocukor's poor payment reputation and credibility problems (Juhocukor would be the only company providing timely payments).
- Initiate technology adoption and investment programs at both the processing and primary production levels. These programs were aimed at increasing both the processing facilities and primary producers productivity and technical efficiencies as well as stimulating the availability, adoption, and investment in high quality seeds, fertilizer, chemicals, and specialist machinery.
- Promote and sell these programs to farmers.

These programs were intended to increase and shift the self-enforcing

contractual range by both increasing the private enforcement capital and redistributing it between the transacting parties. Let us now consider each of the programs in detail.¹⁶

Initial Setting of the Contractual Terms for Custom Growers

The initial custom grower contracts offered by Juhocukor were structured such that the contracted grower must deliver a preset tonnage at a strictly set quality level. The contract indicated the tonnage contracted, hectares planted and quality requirements. Penalties were included in the contract for changes in tonnage delivered, i.e. over or under supply, however they were never enacted due to the firm wishing to restore their reputation and credibility with farmers. Additionally, the contract provide a base price of 1000 Sk per ton at 15 percent sugar content, with premium or penalty of 10 Sk for each 0.1 percentage points above or 0.07 percentage points below 15 percent. In an environment where contracts can be court enforced the setting of strict contractual terms, as above, would have helped confine the probabilistic hold-up distribution within the self-enforcing range (see, e.g. Figure 1b), thereby reducing the occurrence of hold-ups. Given however that court enforcement was effectively unavailable, the setting of these contractual terms likely had minimal impact on the probabilistic hold-up.

Insert Figure 4

Further, the contracts secure price seems to have effectively had minimal effect on output increases. As can be seen in Figure 4, the ratio of output prices over input price was stable during most of the period, indicating that it must have been other factors which were driving the large observed increase in output.

Insert Figure 5

Reallocation of Private Enforcement Capital

In an attempt to reallocate private enforcement capital between the producers and the firm, Juhocukor initiated two programs; an *input facilitation program* and an *investment and credit facilitation program*. The input provision facilitation program assisted farmers in the purchasing of inputs, such as seeds, fertilizer, chemicals, etc, specifically for the production of sugar beets. The program allowed for a set amount of inputs per hectare to be purchased, based upon technical standards, from a select group of specified suppliers whom Juhocukor had negotiated price reductions and guaranteed the repayment of the purchases. Additionally, Juhocukor provided a series of investment and financial facilitation packages that were initially provided on an ad hoc as required basis, but were formalized into a specific program developed with Polnobanka (the main bank lending to agriculture in Slovakia) in 1995 for the financing of machinery investment and working capital. The program provided Polnobanka with a guarantee for the repayment of both the principal and interest on each loan and provided the contract growers with a variable interest rate subsidy ranging between 3 and 7 per cent, which was dependent on a number of pre-specified factors. The large increase in contracted hectares following the programs' introduction in 1995 indicates

¹⁶ See Appendix A for a complete discription of the programs offered by Juhocukor.

its positive effect (see Figure 5).

Through accepting the residual claim on these investments via the guarantees Juhocukor effectively shifted the self-enforcing range of the contractual arrangements to the right by reallocating the private enforcement capital due to the growers non-salvageable relationship-specific investment on to itself. This is depicted in Figure 3b where an amount X of the producers' private enforcement capital is reallocated to Juhocukor. The producers' new level of private enforcement capital became $K_C^* = K_C - X$, Juhocukors new level of private enforcement capital became $K_J^* = K_J + X$, and the self-enforcing range shifted to the right, thereby better matching the transactor expectations of future market conditions. Thus in the event of a hold-up producers would only loose the present value of the quasi-rents accruing to the remaining non-salvageable relationship-specific investments for which producers hold the residual risk, i.e. human capital. Given the probability distribution, this reallocation reduces the probability of a Juhocukor hold-up occurrence with small changes in market conditions.

Enlargement of the Self-Enforcing Range

Two programs were used to enlarge the self-enforcing range of the contractual arrangement. First, Juhocukor also initiated a series of technical support and extension programs, which included agronomical support, soil testing, IPM, production and managerial advice, etc. These programs effectively expanded the amount of non-salvageable relationship-specific investment which Juhocukor had directly tied up in the contractual arrangement, thus increasing the amount of private enforcement capital Juhocukor had committed from K_J^* to K_J^{**} in Figure 3c.

Second, Juhocukor attempted to restore its damaged reputation through an extensive media and public relations campaign. Over time, the campaign had the effect of (a) informing potential producers about the contracts and related programs, (b) restoring their market reputation and credibility, and (c) most importantly it also indicating to current and potential producers that Juhocukor was willing to publicly risk its reputation to back these contracts. As their reputation increased over time so did the amount of private enforcement capital that Juhocukor had committed to the contract, represented a move from K_J^{**} to K_J^{***} in Figure 3d.

5.3 Changing Market Conditions and Program Renegotiations

These programs have been highly effective in achieving large increases in the production and technical efficiencies of growers as well as a substantial increase in the number of contracted hectares (see Figures 4 & 5). Average yields have increased from 33 tons per hectare with 13 percent sugar content in 1993 to an estimate 45 tons per hectare with 16 percent sugar content for the 1997 season.

However, by 1997, rapidly changing market conditions, unexpected excess supply following swift competitive contractual convergence (due to the contractual imitation by other competing processors, abide with a 1 or 2 year delay) and the continued increases in producers production and technical efficiencies, required

Juhocukor to attempt to renegotiate their original contractual agreements with producers.

Renegotiated Grower Contracts

The proposed new contractual arrangements for the 1998 season were designed as follows: The base price from 1000 Sk per ton for 15 percent sugar content was changed to 1000 Sk per ton for 16 percent sugar content with a premium or penalty of 10 Sk for each 0.1 percentage points above or below the based sugar content, respectively. The delivered amount was required to be within 10 percent of the contracted tonnage, otherwise penalties would be imposed if it was found that the producer had not delivered his total production or had reduced the hectares sown. Bonuses are provided for: quality of beets, signing the contract prior to August 31 of the previous year, signing a four year long-term contract; using irrigation, being located within 60 km of the plant, and for contracting new hectares. Additionally, the payment structure of the contracts was altered so that 30 percent was due on delivery with a percentage then due each two weeks after until full payment.

New Information Campaign

Coupled with the renegotiations Juhocukor implemented as extensive information campaign to support them. Effectively, Juhocukor recognised that they needed to provide their contract producers with a complete picture of future market conditions so as to allow producers to make a fully informed decision about the new contractual terms and assist in shifting the self-enforcing range to better match future market conditions. To do this Juhocukor initiated a series of group meetings where selected farmers from each region were invited to attend presentations at the factory on the general market conditions, present competitive situation, general implications for CEE and Slovak producers, specific implications Juhocukor and their contract growers, and the exact details of the new proposed contracts. These were followed up by an intensive public media and advertising campaign in the main agricultural newspapers. As of September 1997, 75 percent of the growers by contract tonnage had accepted the new contractual readjustments.

This renegotiation was only achievable because Juhocukors reputation had been substantially restored and strengthened, leading to an increased level of private enforcement capital available. This provided Juhocukor with the ability to reduce the use of strict contractual terms and other private sanctions, while still providing producers with a mutual beneficial contract. This is depicted in Figure 3e, where Juhocukor's private enforcement capital is reduced from K_J^{***} to K_J^{****} .

As we can see from the above case study, the foreign affiliates use of private sanctions has produced substantial direct benefits to the contracting producers, however the question remains what effect did this occurrence have upon the other firms within the directly affected sector and firms in adjacent commodity sectors.

6 Market Reactions and Contractual Convergence

It is well recognized that FDI can produce positive impacts on the level of competition, technology adoption, and investment through direct and indirect spillovers within the affected market (Dunning, 1993; Blomström and Kokko, 1997). What is usually not recognized however are the contractual convergence and spillover effects that have been observed occurring between competing firms, within and across adjacent commodity sectors, and related positive impacts backwards into the upstream production sector. Eggertsson (1990, p53-55) refers to these spillover effects within the neo-institutional economics literature as the concept of *competition among contractual arrangements*. Using a theoretical example drawn from agriculture he shows how different contractual forms will converge to a new equilibrium as firms begin imitating other firms (initially experimental) contractual arrangements, once they are seen to be successful. However, does this hold in practice and in particular does this hold for transition economies?

Insert Figure 6 here

Following the 1993 injection of FDI into the sugar beet sector one can observe a growing imitation of the Juhocukor's contractual arrangements by the competing firms, abide with a one or two year deal. As a consequence not only did Juhocukor's sugar production take off, substantially increasing from 24,000 tons in 1993 to an estimated 75,000 tons in 1997, but similar increases have been observed occurring with all of the other firms, abide with an initial one or two year response delay (see Figure 6). Note that the terms of trade have remained stable during this period, indicating that something else apart from price changes is driving these results (see Figure 4). Similar impacts can be observed in technical efficiency with substantial increases in yields, biological sugar percentages, and contracted hectares occurring across the sector.

This tends to indicate that FDI is potentially causing substantial positive spillover effects as firms competing for the same farm factor resources (e.g. land) are forced to offer similar contractual arrangements, thereby causing contractual convergence. The contractual convergence and subsequent investment and technology adoption at the upstream production level has not been confined solely to the directly affected commodity sector. The adoption of similar contractual arrangements has also been observed in the adjacent commodity sectors, as these firms have also had to compete for the same factor inputs (e.g. land), and has led to similar results.

Similar convergences and impacts have followed FDI in other sectors especially when there has been a requirement for high quality inputs by the downstream processing firms. For example, Palma Tumys (Henkel) in the oilseed sector started providing similar contracts and associated programs including credit and input facilitation packages at the same time Juhocukor did. These programs have been just as successful in oilseeds, as in sugar beets. Other sectors which have been similarly affected include the brewing barley sector with Zlaty Bazant (Heinekin), Corn starch and isoglycose with the Amylum group, and the dairy sector with Rajo (Schärdinger) and Majcichov (Farmco).

Another interesting occurrence is following the success of the contractual based lending that Polnobanka (the main agricultural bank) developed with Juhocukor

and Palma-Tumys, it has now developed a standard series of credit lines which enable downstream enterprises to provide farmers with advance payments for contracted supplies. The schemes use draft loans with the future harvest acting as the collateral and operate in a similar way to the previously scheme discussed (OECD, 1997).

7 Conclusions

In this paper we use Klein's probabilistic framework to show why hold-ups occurred in the agricultural sectors of the transition economies and how FDI and their foreign affiliates have been able to correct these problems through the use of private sanctions. These private sanctions have both increased and reallocated the private enforcement capital between the transacting parties, thereby matching the self-enforcing range of the contractual arrangement to the parties expectations of future market conditions and in so doing reducing the probability of a hold-up occurring.

Underlying this framework is the idea that "hold ups" are not based upon opportunistic behavior, but are assumed to occur when a sufficiently large unanticipated event destabilizes a contractual relationship between two ex ante equally knowledgeable transactors. Thus contract terms are chosen to get transactors close to the required performance, then reputation and private sanctions are used to reach the desired performance. That is, contractual terms economize of the use of private enforcement capital through redistributing the likelihood of hold-ups and define what is termed as the self-enforcing range of the contractual relationship (Klein, 1996). It is the size and position of this self-enforcing range which determines where market conditions can move without causing a "hold-up."

Following the initial reforms large unanticipated shocks shifted the producers outside of the self-enforcing range, therefore causing it to be beneficial for them to hold-up farmers. This has likely been an important factor driving the agricultural output declines in CEE. With no legal or private enforcement mechanisms available producers both reduced relationship-specific investment and moved resources out of the affected sectors. Interestingly though a few sectors across the region have seen large output increases. Why?

Using this framework we show how foreign firms operating within these sectors, through their local affiliates, have recognized these problems and then corrected them through the implementation of credible contractual arrangements coupled with the use of private sanctions. Combined these programs have been able to shift the self-enforcing range to better match the transacting parties expectations of future market conditions, thus providing the correct incentives for farmers to enter long-term contracts and undertake relationship-specific investments. The result have been dramatic, substantial increases in both quality and quantity have been observed following the introduction of these contractual arrangements.

More importantly, the introduction of these contractual arrangements has caused substantial spillover effects within the directly affected sector and across adjacent sectors. This has been due to what Eggertsson (1990) terms *competition among contractual arrangements*. Competing firms have imitated the other firms

contractual arrangements once successful, thereby moving all firms to a new contractual equilibrium. This seems to have had an extremely beneficial effect on the producers ability and willingness to undertake relationship-specific investments, as can be seen by the large yield and quality increases following there introduction even through the terms of trade have remanded stable.

The question however remains as to what is the optimal policy path for CEE government to follow in attempting to replicate these conditions across sectors. Although it is difficult to generalize from the initial case studies that have been conducted, it seems obvious that solving hold-up problems should become a priority for CEE governments. Without this problem being fixed other policy interventions, such as credit subsidies and guarantees, are unlikely to succeed. Additionally, due to the development and transparency lags that are inherent in the establishment of a legal system and the complementary and substitutability between legal and private enforcement, its seems that governments should attempt to develop policies that allow the development of these private sanctions and institutional innovations to occur. This includes bankruptcy laws, prompt payment laws, low cost adjudication systems and programs to stimulate FDI and similar forms of investments as in the short run these initiatives may provide the most benefits.

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Appendix A *Contract and Supporting Program Specifics*

Initial Custom Grower Contracts

The initial custom grower contracts offered by Juhocukor were structured such that the contracted grower must deliver a preset tonnage at a strictly set quality level. The contract indicated the tonnage contracted, hectares planted and quality requirements. Penalties were included in the contract for changes in tonnage delivered, i.e. over or under supply, however they were never enacted due to the firm wishing to restore their reputation and credibility with farmers. Specifically, the contract provides a base price of 1000 Sk per ton at 15 percent sugar content, with premium or penalty of 10 Sk for each 0.1 percentage points above or 0.07 percentage points below 15 percent.

This base contract was renegotiated in 1997 from 1000 Sk per ton for 15 percent sugar content to 1000 Sk per ton for 16 percent sugar content with a premium or penalty of 10 Sk for each 0.1 percentage points above or below the based sugar content, respectively. The delivered amount was required to be within 10 percent of the contracted tonnage, otherwise penalties will be imposed if volume short or reduced hectares sown. Bonuses are provided for: quality of beets; signing the contract prior to August 31 of the previous year; signing a four year long-term contract; using irrigation; being located within 60 km of the plant; and for contracting new hectares. Additionally, the payout structure of the contracts was altered so that 30 percent was due on delivery with a percentage then due each two weeks after until full payment.

Input Provision Facilitation Programs

Juhocukor also developed a number of input facilitation programs with a selected group of suppliers for their contract farmers. Given Juhocukor's stronger bargaining position, based upon the estimated total demand of the contracted farmers, they were able to negotiate large price discounts on selected inputs, including seeds, chemicals and fertilizer. The maximum amount that could be purchased through these programs was set at a pre-specified limit per contracted hectare. These limits were based upon the technical recommendations of the agronomy department and reduced the potential moral hazard problems that Juhocukor may face with farmers purchasing inputs through these programs for non-contracted crops. Juhocukor provided the input suppliers with financial guarantees for repayment and required that the inputs be delivered directly to the contracted growers following preverification of the transaction and approval by Juhocukor. On delivery in the spring, the input supplier would receive a payment for approximately 30% of the outstanding account from Juhocukor, with the balance being paid on 31 October at harvest (as due the standard market contractual terms). These payments are deducted directly from the growers initial sugarbeet receipts.

Extension, R&D and Technical Support

To assist contract growers increase their technical efficiencies Juhocukor provided free of charge a wide range of extension, R&D and technical support services, including agronomic support on soil preparation and testing, fertilizer needs

and use, seed selection, weed control and IPM etc. They also offered specialized field days showing the results of field trials of fertilizers, seeds and production technology, at one of their three field research facilities, one of each of three separate production regions. Specially prepared information leaflets, seminar and presentation on topical issues and new technology were provided, as well as occasional international field trips to Western Europe to see new technology.

Investment and Financial Facilitation Programs

Initially in 1993, Juhocukor purchased three sugarbeet harvesters from France to assist contract farmers with harvesting. They also provided on an ad hoc basis specific investment and working capital financing to individual as required. However, it was soon obvious that these *ad hoc* direct investments and financial facilitation programs were largely ineffective. Following discussions with growers, during 1995, they realized that there was still a need to provide farmers assistance in accessing financial resources from banks for both machinery and working capital investments. At the time banks were providing loans at interest rates ranging from 18 to 19 percent per annum on 1 year loans. Recognizing these difficulties Juhocukor began discussion with the local financial sector about how they would be able to facilitate the provision of financial support for farmers. Finally, a package was developed with Polnobanka where Juhocukor became the facilitator for the financing of machinery and working capital investments between farmers and the bank by providing a guarantee for both principle and interest payments, plus a variable interest rate subsidy to contract growers based upon the exact contractual terms with Juhocukor.

Specifically, the package required that all farmers must apply to the state investment support fund for both an investment subsidy and a low interest government guaranteed loan. Although actual acceptance into the government program was not required for the producer to be eligible for the financial support package, they were just required to apply. The variable interest rate subsidy ranged between 3 and 7 percentage points depending upon the following specific circumstances:

- all farmers received a 3 percentage point subsidy who signed an exclusive four year production contract with Juhocukor,
- an additional 1 percentage point if the contracted over 4000 tons or 100 hectares, and either
- 1 percentage point for a 105 yield increase compared the previous year or
- 3 percentage points for a new grower within 60 km of the Juhocukor plant.

The interest subsidy was provided upto a maximum of 14,600 Sk per hectare of contracted sugarbeets. The loans were usually for 1 year, which is the standard market arrangement, and could be used for the purchase of sprayers, planters, soil bed preparers and sugarbeet harvesters. As the harvester was the only unique to sugarbeet production, this package potentially provided spillovers for the other commodity sectors.

Extensive Information and Publicity Campaign

Finally, coupled with the introduction of these new custom production

contracts, Juhocukor invested in a substantial information, media and publicity campaign. They recognized that they had substantial credibility and reputation problems within the agricultural sector that required correcting if farmers were going to be willing to contract with them. Also as their reputation increased in the future, this would begin providing a substantial amount of the private enforcement capital that presently it did not, thus reducing Juhocukors dependency on other more expensive private sanctions. To achieve this a comprehensive public information campaign which included monthly newspaper articles, group presentations, multiple one-on-one individual farm visits, and information handouts and packages, was viewed as the most effective mechanism available.

The monthly newspaper articles discussed the benefits of growing sugarbeets including both general information and very firm specific data about the returns and support that they could expect to gain from Juhocukor. Firms would usually view providing this level of information freely and publicly as the equivalent to freely giving away all of their trade and competitive advantage to the competition. However, Juhocukor viewed these articles as a very important mechanism for convincing potential farmers to enter custom sugarbeet production contracts, as there was plenty of misinformation about the firm and the benefits of contract growing sugarbeet. These articles even showed the expected gross margins that producers could expect if the contracted with Juhocukor.

Additionally, these articles were designed to provide farmers with credible information and evidence about the company and show them how it was a different company from the previous one. Specifically, it was necessary to show that the firm was willing to publicly risk their reputation in an attempt to provide the required credibility to support these contractual arrangements.

These articles were supported by group presentations, where specific information handouts, pamphlets and packages were distributed that provided greater detail of the contractual arrangements and financial and investment facilitation programs being offered. These presentations provided producers with the complete details of the programs along with worked examples. They later were followed up with one-on-one visits by management to the individual farmers.

**Table 1: Change in Output and Input Use in CEEC Agriculture between 1989 and 1994
(in %)**

	<i>Change in Output</i>	<i>Change in Input Use</i>				
		Arable land	Labour	Tractors	Fertilizer	Livestock
Bulgaria	-38	4	2	-31	-75	-53
Czech Rep.	-23	-3	-46	-42	-70	-31
Hungary	-30	-6	-56	-28	-85	-41
Poland	-23	-1	-15	14	-65	-19
Romania	-12	-1	14	6	-73	-37
Slovakia	-29	-2	-50	-11	-83	-35
Slovenia	-19	-5	-11	-44	-39	-14

Source: Macours and Swinnen (1997)

Figure 1 Klein's Probabilistic Hold-Up Framework

Figure 1a Initial Situation (after relationship-specific investment, but prior to contract)

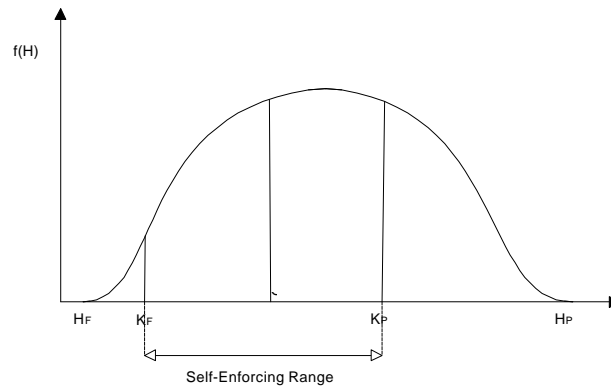


Figure 1b Situation following the setting of enforceable contractual terms

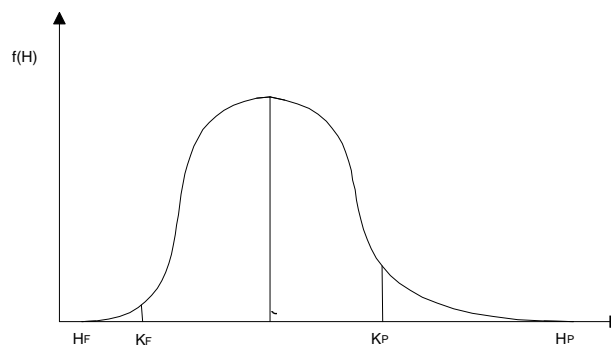


Figure 1c Situation following the reallocation of private enforcement capital (assuming no enforceable contractual terms are set)

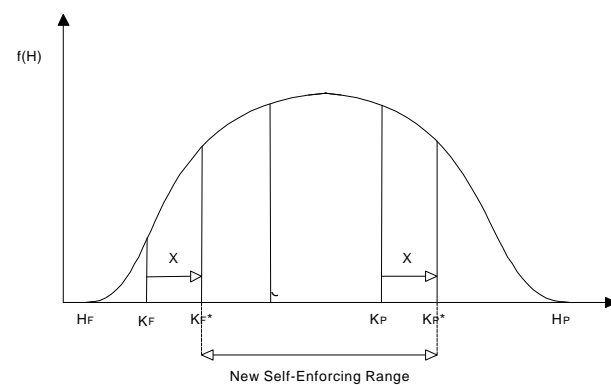


Figure 2 The Development of the Probabilistic Hold-Up Distribution During the Initial Reform Period.

Figure 2a Situation prior to the initial reforms

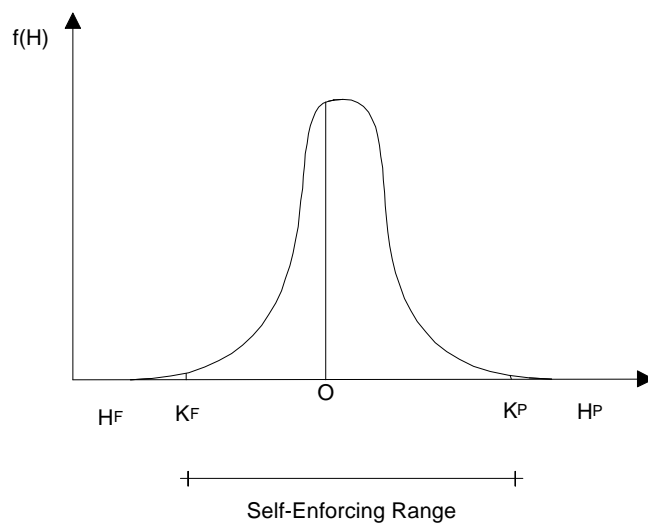


Figure 2b Situation immediately following the initial reforms

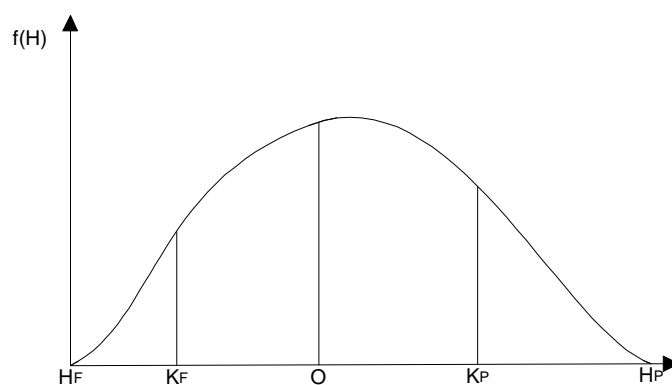


Figure 2c Situation following repeated hold-up occurrences

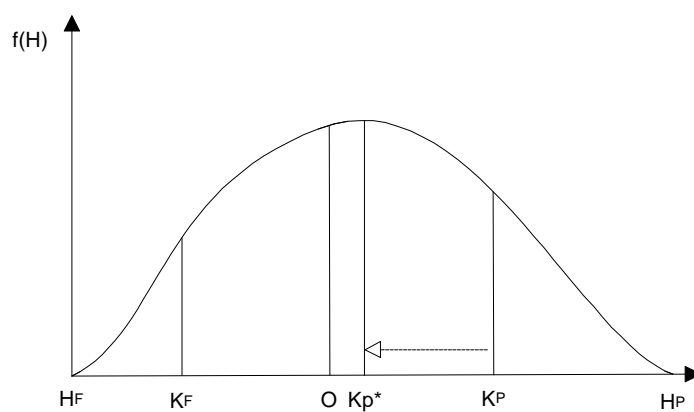


Figure 3. How Juhocukor Attempted to Realign the Self-Enforcing Range

Figure 3a Initial Situation

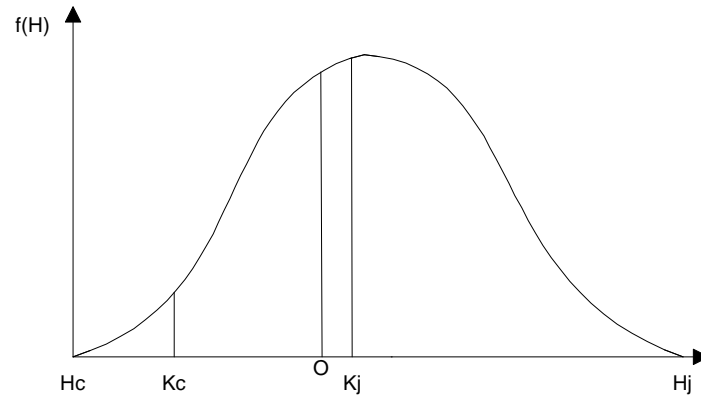


Figure 3b Impact of Input and Investment Facilitation Programs

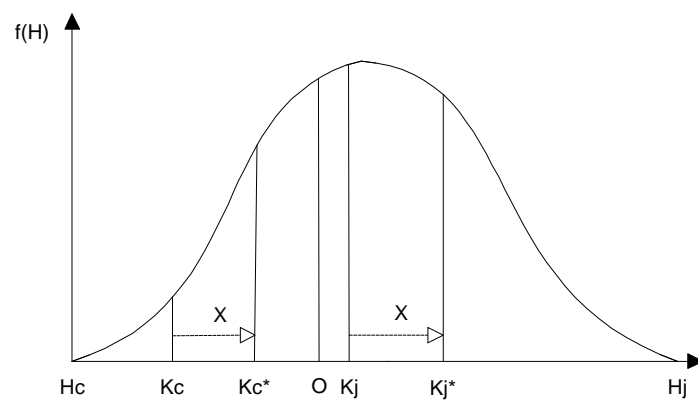


Figure 3c Impact of Technical Support Programs

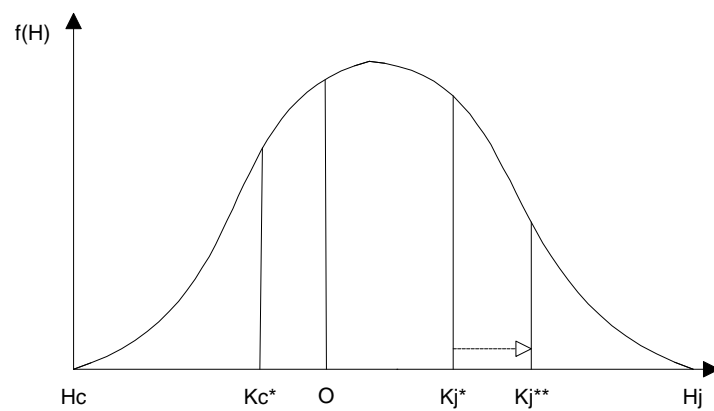


Figure 3d Impact of Restored Reputation

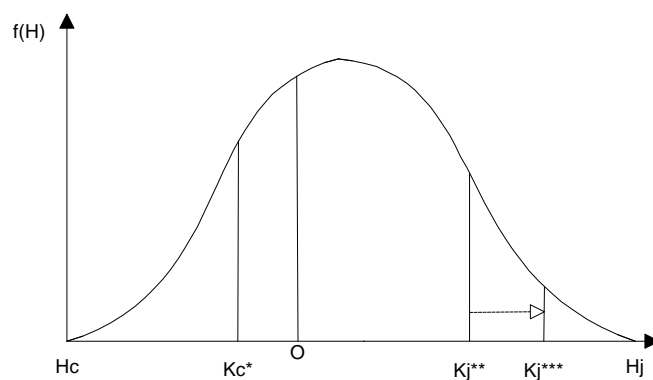


Figure 3e Impact of Contractual Readjustments

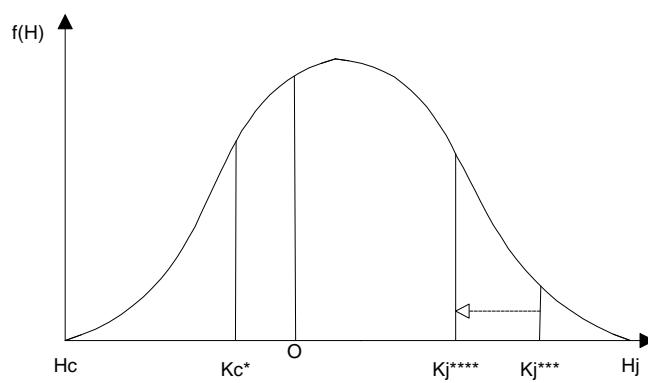
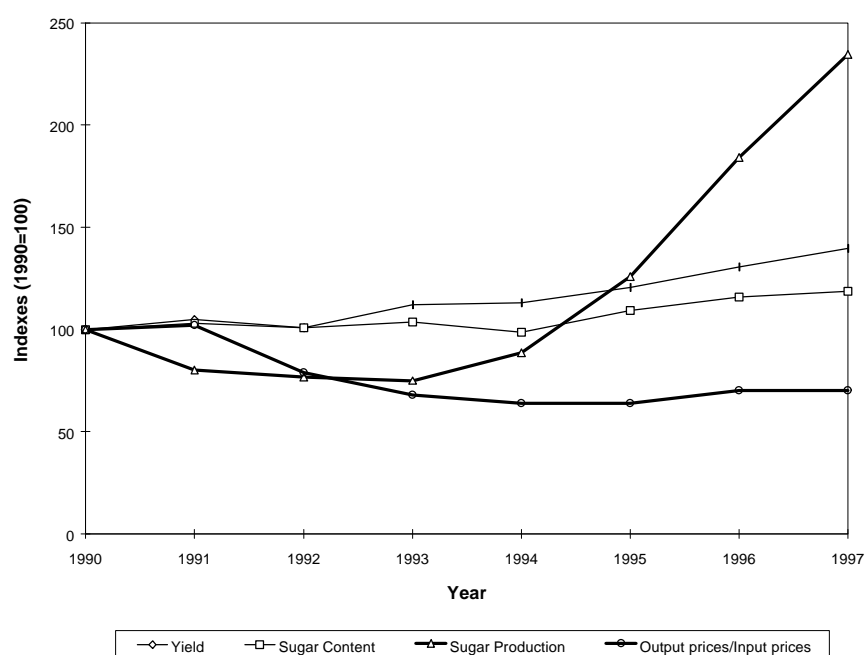
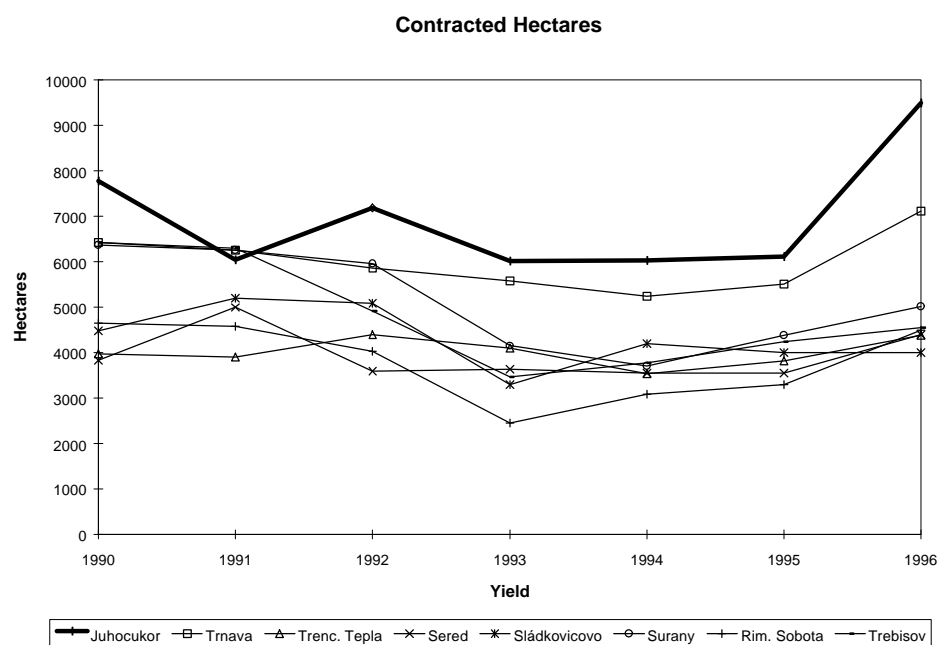


Figure 4. Production indicators for Juhocukor a.s. and their producers



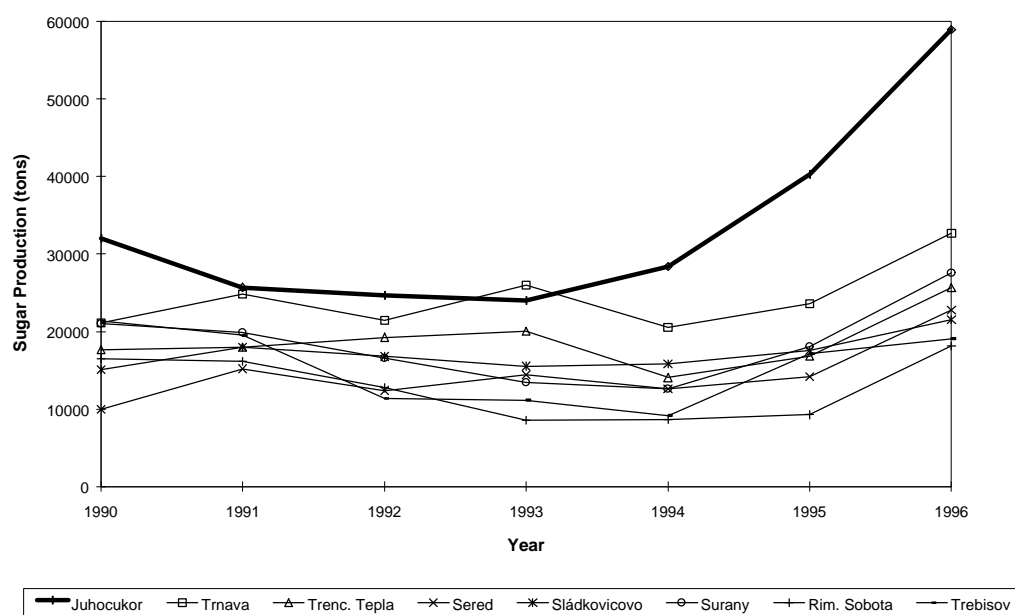
Source: Juhocukor a.s.

Figure 5 Contracted Sugar Beet Hectares in the Slovak Republic



Source: Slovak Sugar Producers Association

Figure 6. Slovakian Sugar Production



Source: Slovak Sugar Producers Association