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# THE ECONOMICS OF AGRICULTURAL DECOLLECTIVIZATION IN EAST CENTRAL EUROPE AND THE FORMER SOVIET UNION

Erik Mathijs and Johan F. M. Swinnen

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## ABSTRACT

*The break-up of large-scale agricultural production units into individually operated farms differs considerably across East Central Europe and the Former Soviet Union. Large-scale successor organizations to the former state and collective farms still dominate in Slovakia, Hungary, the Czech Republic, and in most states of the Former Soviet Union. In Albania, Armenia, and Latvia, a massive break-up of the collective farms resulted in a domination of smaller scale individual farms. Also within countries there exist wide variations in the decollectivization process between different regions and agricultural subsectors. We develop an economic model of decollectivization to explain these variations and derive a series of propositions regarding factors affecting the decollectivization process. Our empirical analysis presents correlations between decollectivization and our explanatory variables. Specifically, they suggest the importance of relative productivity, factor intensity and privatization and decollectivization procedures in explaining decollectivization differences between countries.*

JEL Classification Numbers: D2, P5, Q1.

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Policy Research Group, Department of Agricultural Economics, Katholieke Universiteit Leuven, Kardinaal Mercierlaan 92, 3001 Leuven, Belgium, Tel.: ++32 16 321618 - Fax: ++ 32 16 31996 - E-mail: erik.mathijs@agr.kuleuven.ac.be.

# **THE ECONOMICS OF AGRICULTURAL DECOLLECTIVIZATION IN EAST CENTRAL EUROPE AND THE FORMER SOVIET UNION**

## **1. INTRODUCTION**

In most East Central European (ECE) and Former Soviet Union (FSU) countries, agricultural production was organized in large-scale collective and state farms under Communist rule.<sup>1</sup> Economic reforms since 1989 include both the privatization of agricultural production assets and the restructuring of state and collective farms. Farm restructuring and more specifically the break-up of large-scale agricultural production units into individually operated farms – a process we define as “decollectivization” – differs considerably for the various ECE and FSU countries. Differences in decollectivization can be observed across countries, between regions within a country and over time. Are these differences random? We argue that they are not. This paper presents an economic model of decollectivization to explain the variations. We identify the factors that affect the decollectivization process and show how they are consistent with empirically observed differences in agricultural decollectivization in ECE and FSU countries.

We model the decollectivization process as the decision of collective farm members to leave the collective production framework and start up individual farms. As in Carter (1987) and Machnes and Schnytzer (1993), this decision is made by comparing the expected utility of collective farming with the expected utility of leaving and starting up an individual farm independent of the collective farm. Factors that affect this ratio are the expected productivity and profitability of individual farming relative to collective farming, and the costs for individuals to leave the collective farm and start up an individual farm. These costs are affected by land reform, privatization and decollectivization regulations.

The relative productivity of individual versus collective farming depends on the distribution of collective farmers’ productivity, the pre-reform average collective farm productivity, and the advantages and disadvantages of individual farming compared to collective farming. The literature identifies both advantages and disadvantages in collective production, some of which would not extend beyond the transition period. Disadvantages

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<sup>1</sup> The analysis includes Albania, Bulgaria, the Czech Republic, Hungary, Romania, and Slovakia as East Central European (ECE) countries, and Armenia, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Russia, Turkmenistan, Ukraine, and Uzbekistan from the Former Soviet Union (FSU). Poland and the republics that constituted Yugoslavia are not included in our analysis because individual farming already dominated their agriculture under Communism.

include high transaction costs associated with the monitoring of labor and inefficiencies due to the right of co-determination (Lin, 1988; Schmitt, 1991, 1993). Advantages of collective farms include economies of scale in risk management, the provision of information and credit, input purchasing, marketing and production (Putterman, 1985; Carter, 1987; Pryor, 1992; Machnes and Schnytzer, 1993; Deininger, 1995). Other factors that affect the expected utility of moving from collective to individual farming (and thus, the decollectivization process) are the general profitability of farming which in turn is determined by the economic environment, and asset privatization procedures.

This paper analyzes how all these factors influence a collective farm member's decision to start his own farm. Our model of the collective farm follows the tradition of the literature on agricultural producer cooperatives and labor-managed firms:<sup>2</sup> collective farms maximize dividend per member, assuming labor remuneration according to work rather than need (Bradley, 1971 and Israelsen, 1980). We extend the standard model by relaxing assumptions about fixed membership and homogeneous work force with identical labor productivity. Furthermore, we explicitly consider the exit costs of leaving the collective and analyze how these exit costs are affected by factors such as privatization and government regulations.

We draw several conclusions. First, transition risk has a negative impact on decollectivization with collective farms having scale advantages in dealing with risk. However, this advantage is to a great extent only temporary and is conditional on the transition period, which is characterized by uncertainty and missing markets. With the development of markets, differences in risk management disappear and the negative impact of risk on decollectivization is reduced. Second, price increases stimulate decollectivization, independent of risk, because the marginal income effects of an output price increase are larger for an individual producer than for a collective farm member, *ceteris paribus*. Third, the average initial productivity of the collective farm negatively affects the incentives of members to leave. Fourth, the property rights distribution of productive assets by the privatization process affect the decollectivization process. With high transaction costs and high opportunity costs for former owners who left agriculture during Communism, the common process of restitution of land property rights to former owners is more likely to consolidate the large-scale farm structure than distribution of land to farm workers, because former owners prefer to lease their land to the collective farm.

The last section of the paper presents empirical evidence, which is in general consistent with our hypotheses. A multiple regression analysis confirms the effects of productivity, land

reform, privatization, and decollectivization regulations on agricultural decollectivization in 18 ECE and FSU countries.

## **2. FARM RESTRUCTURING AND DECOLLECTIVIZATION: DEFINITIONS AND STYLIZED FACTS**

Since the beginning of reforms in 1989, farm restructuring in ECE and FSU countries has resulted in a broad mix of farm types. For example, tables 1 and 2 show that in Eastern Germany and the Czech Republic the transformation of state and collective farms has resulted in the establishment of cooperatives, limited liability and joint stock companies, limited and unlimited partnerships and sole proprietorships.<sup>3</sup> Cooperatives are the main form of successor organization of collective farms in both countries, and partnerships are more important in Eastern Germany than in the Czech Republic. Such a combination of farm types can be found in most ECE and FSU countries, but their relative importance differs considerably across countries. Moreover, especially in the case of cooperatives and companies, it is often uncertain whether these organizations have undergone effective change, that is, whether such successor organizations represent a clear enough break with the former institutions.

The most dramatic transformation of collective farms is their complete break-up into individually operated production units, which we define in this paper as *individual farms*. Such individual farms are characterized by the complete absence of collective property rights on production factors. In the statistics they show up as sole proprietorships, (single) family farms, and household plots.<sup>4</sup> We define the process of break-up of collective production units into individual farms as *decollectivization*. While this definition is narrow, it represents a clear distinction between collective forms of production – or production “in association” – and the individual way of farming. This distinction is justified because also new forms of farmers’ associations will have the same conflicts between collective and individual incentives that have troubled agricultural producer cooperatives throughout the world (Brooks, 1991).

To compare the importance of decollectivization between different countries and activities, we developed an index of decollectivization (DI) – based on the percentage of

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<sup>2</sup> This literature was initiated by the seminal works of Ward (1958), Domar (1966), and Vanek (1970).

<sup>3</sup> Consistent and detailed data for several consecutive years were available only for the Czech Republic and Eastern Germany.

<sup>4</sup> Some sources refer to individual farms as private farms. However, such a definition is confusing as other sources refer to all “transformed” farm organizations as private farms, including the new “private” cooperatives.

agricultural land used by individual farms in 1995, but corrected for the initial situation.<sup>5</sup> The DI is an imperfect measure of decollectivization: an index based on the share in output or added value would be more accurate, but only data on land use are available for all ECE and FSU countries.

**Observation 1.** *Considerable differences in decollectivization can be observed between countries.*

Table 3 shows that the DI varies between 0 and 94.2 percent for different ECE and FSU countries. It is low in countries where large-scale successor organizations to the former state and collective farms still dominate, such as Slovakia (3.1 percent), Hungary (17.3 percent), the Czech Republic (22.1 percent), and all FSU countries except Armenia and the Baltic states. The DI is highest in Albania (94.2 percent), Armenia (81.8 percent), and Latvia (80.2 percent), where a massive break-up of the collective farms resulted in a domination of individual farms.

**Observation 2.** *Considerable differences in decollectivization can be observed within in a country.*

Except for the ECE and FSU countries where all farms were decollectivized – such as Albania – or where almost none were decollectivized – such as Slovakia or Kazakhstan – important differences can be observed within a country. For example, while on average 29 percent of Hungarian collective farms were decollectivized by 1994, table 4 shows how important regional differences in decollectivization can be observed. Decollectivization of collective farms – induced either by transformation decisions (so-called “liquidation”) or through bankruptcy procedures<sup>6</sup> – was twice as large in Northern Hungary (42 percent), than in Transdanubia (21 percent). In Romania, the 1995 share of individual farms in total agricultural

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<sup>5</sup> Since we define decollectivization in a very narrow sense, i.e. the break-up of state and collective farms into individual farms, a common critique is that in this way the DI measures “fragmentation” rather than decollectivization. While fragmentation and decollectivization coincide in some cases (e.g. Albania), this is not the case in general. In most of the ECE and FSU countries we study, many individual farms cover 100 hectares and more.

<sup>6</sup> All collective farms had to be transformed before the end of 1992. The general assembly of each collective could decide the nature of the successor organization(s): a cooperative or a company. The members could also decide to break-up, i.e., liquidate, the cooperative and divide all the assets among themselves. The bankruptcy of a cooperative also led to the break-up of the cooperative. In both cases, there is no successor organization.

land also varies strongly between regions, ranging from 7.2 percent in Arges county to 97.2 percent in Sibiu county.

**Observation 3.** *Decollectivization increases over time, but at varying rates.*

Figure 1 shows that the decollectivization index evolved similarly in the Czech Republic and Eastern Germany between 1989 and 1995. There is little decollectivization in the first years of transition when legislation is being passed. In the next two years (1992 and 1993), the steepest increase in individual farming follows. Decollectivization slows down in 1994 and 1995. These evolutions reflect a gradual process. In other countries changes were more radical. For example, in Albania spontaneous decollectivization preceded legislation. As a result, the decollectivization index increased from 0 to 19 percent in 1991 and around 80 percent of the land was used in individual farms by the end of 1992, despite that legislation on privatization and farm transformation was not yet approved.

Are these differences in decollectivization between countries, within countries, and over time random or do they follow a certain pattern? We argue that they are *not* random and that they reflect different incentives for decollectivization. In the next section, we develop an economic model of decollectivization to identify these incentives and explain the variations.

### 3. A MODEL OF DECOLLECTIVIZATION

Assume that before the reforms production is organized in large-scale collective farms and small household plots. Collective farm members maximize expected utility by allocating their time between working for the collective farm, working on a private plot, and leisure. Their optimal labor allocation is determined by the marginal product of labor.<sup>7</sup> We relax the generally used assumption (e.g., by Ward, 1958; Domar, 1966; Sen, 1966; Bradley, 1971; Israelsen, 1980) of an homogeneous work force by assuming that collective farm members differ in productivity. Further, following Israelsen (1980), we define the income of a member in a collective farm as his share in total income, which is determined by the number of hours he contributes relative to the total for the collective farm.<sup>8</sup> Assuming that all members supply the same number of hours, they will each get the same income.

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<sup>7</sup> See Lin (1988) for an overview of the extensive literature on labor allocation on collective farms.

<sup>8</sup> See Sen (1966) and Putterman (1989) for the determination of labor supply under a mixed remuneration scheme according to work and needs.

Assume that at the beginning of the reform the collective farm is transformed into a producer cooperative. We assume that the only effective change resulting from this initial transformation is that each member is given the right to leave the collective farm, including withdrawing (part of) the assets s/he owns. Hence, the successor organization is still a “collective” farm, where farm production is carried out jointly under collective property rights. We define decollectivization as the process of individuals leaving the collective farm to start up their own individual farm. More specifically, we define the “degree of decollectivization” as the ratio of farmers who leave the collective farm over the total number of farmers. This change requires some “exit costs”, i.e., the costs involved in leaving the collective farm and setting up a new individual farm.<sup>9</sup> Exit costs include all real costs and transaction costs a member faces when s/he wants to leave, and the investment costs needed to start up a new farm (or enlarge an existing private plot).

A collective farm member will leave the collective farm if the expected utility from leaving, net of exit costs, is larger than the expected utility from staying in the collective farm (Carter, 1987; Machnes and Schnytzer, 1993), i.e. when

$$(1) \quad EU(Y_I) - C > EU(Y_C),$$

where  $EU(.)$  represents expected utility,  $Y_I$  is individual farm income,  $Y_C$  is individual income on a collective farm, and  $C$  are exit costs.<sup>10</sup> Decollectivization ( $D$ ) is therefore a function of the differences in expected income between collective and individual farming, net of exit costs:

$$(2) \quad D = D[E(Y_I) - E(Y_C) - C].$$

Factors that affect the expected profitability of individual farming relative to collective farming include the relative productivity of individual farming relative to collective farming and the economic environment (terms of trade and risk). Exit costs for collective farm members are primarily determined by land reform, privatization and decollectivization regulations. We will discuss the impact of these factors in more detail.

## 4. FACTORS INFLUENCING DECOLLECTIVIZATION

### 4.1. Labor productivity and economies of scale

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<sup>9</sup> Whether or not an individual farm is an extension of the private plots an individual cultivated before, or not, is not relevant for our analysis.

<sup>10</sup> Furthermore, a member will only set up an individual farm if the net expected utility of individual farming exceeds the opportunity costs of staying in agriculture.



A crucial factor that determines decollectivization is the ratio of the average labor productivity of an individual farm started up by an individual leaving the collective farm over the average labor productivity of the collective farm, which we define as the “outside over inside productivity ratio” (OIPR). It is easy to understand that, *ceteris paribus*, individuals with the higher potential individual farm productivity will leave the collective farm first.

This individual farm productivity depends on the skills of the individual for managing an individual farm. Human capital therefore plays a key role in the decision of a member to leave the collective farm. Individual farmers need to combine a broad range of skills to manage a farm individually. Many collective farm members were highly specialized in performing a specific task as a result of the extreme labor specialization that characterized Communist agriculture, such that they may not possess the necessarily skills to start up a full-time individual farm.

The second factor which determines the OIPR is the average productivity of the collective farm. High initial average collective farm productivity dissuades members to leave, because in relative terms they cannot improve their productivity to the same extent as members facing low initial average collective farm productivity. This productivity varies strongly between countries, regions, and subsectors within the country. Key factors affecting collective farm productivity are the labor intensity and technology use in production. These factors importantly affect (dis)economies of scale in production – and thereby the OIPR. Although, the existence of economies of scale in agricultural production *in general* has been rejected for both developing countries (Berry and Cline, 1979; Hayami and Ruttan, 1985) and developed countries (Kislev and Peterson, 1991; Peterson, 1997), scale economies vary strongly between subsectors. For example, crop farming displays greater economies of scale, and is hence better suited for mechanization, than fruit production or animal husbandry. Technology generates economies of scale primarily as a result of fixed assets. Both physical and human capital can be fixed assets and their importance increases with technological innovation. Technical change makes it possible for labor and management to specialize, while increasing the size of physical assets needed for cost-minimization.

On the other hand, sectors with diseconomies of scale in production are typically characterized by low technology and high labor intensity. Due to its biological and sequential nature and spatial dimensions (e.g., Binswanger and Rosenzweig, 1986), effort in agricultural

production is difficult to measure.<sup>11</sup> Collectively operated units have more difficulties to solve the resulting agency problems than individually operated units (Pollak, 1985; Schmitt, 1991, 1993). Diseconomies in scale in management and labor contracting increase with the labor intensity of production, which may result in an inverse relationship between productivity and size.

These arguments imply that one should expect lower decollectivization in countries, and within countries in regions and subsectors, where collective farm productivity was higher and where production was more capital intensive (e.g., in collective farms specialized in grain production operating on fertile plains compared to livestock and fruit farms in more hilly areas).<sup>12</sup>

### *Empirical evidence*

Figure 2 provides evidence for the impact of initial average collective farm labor productivity based on decollectivization. The decollectivization index (DI) is clearly negatively correlated with gross agricultural output (GAO) per farm worker in 1989 (as a proxy for average collective farm productivity) for the six ECE countries.<sup>13</sup> Countries with low productivity on collective farms, such as Albania, have a significantly higher degree of decollectivization than those where collective farm productivity was higher, such as Hungary. Furthermore, especially in those countries where productivity on collective farms is too low to provide for the basic needs of members, they will leave. The issue of relative productivity is thus related to consumption risk, or more generally, food security, reflected in the share of the budget spent on food. In countries characterized by a large share of the budget spent on food, food security is more critical. This factor appears to have been a key factor for countries such as Albania and Romania, where extremely low productivity of collective farms, in combination with government policy favoring state farms and taxing collective farms, caused very low incomes on the collective farms. In the case of Albania, where about 70 percent of income is

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<sup>11</sup> As Alchian and Demsetz (1972) noted, effort is difficult to meter in general.

<sup>12</sup> Economies of scale also increase the barriers of entry to set up a new farm, because initial investment costs are higher. It is difficult to start up a farm when a high degree of mechanization is needed in the individual farm. This can be due to the indivisibility of assets, as in the case of a combine-harvester. Where Machine-Tractor Stations were used, such as in Romania, the machinery was not owned by the collective farms, and decollectivization has been easier. The use of custom work – important in some Western European countries' agriculture – can also circumvent these problems.

<sup>13</sup> Disaggregated GAO data for the FSU countries are not available and therefore could not be included in figure 2.

spent on food, the situation was so extreme that food shortages and hunger resulted, causing a massive break-up of the collective farms after 1991 (Cungu and Swinnen, 1997).

Also regional (within country) differences in decollectivization are strongly correlated with productivity differences and scale economies in production. Decollectivization is found to be significantly lower in plains where crop production with scale economies is the main activity than in other regions. For example, 1995 Romanian data show a strong negative correlation between the percentage of plains in the total area of a county (“judet”) and the share of individual farms in total agricultural land: the Pearson’s correlation coefficient ( $r^2$ ) is  $-0.71$  for observations on 37 Romanian counties. The same relationship can be observed in Hungary. The percentage of decollectivized cooperatives shown in table 4 is negatively correlated with the share of fertile plains in the region. Decollectivization was twice as large in Northern Hungary, which is a hilly to mountainous area, than in Transdanubia, which consists primarily of plains.

#### **4.2. Terms of trade, market imperfections and risk**

In this section, we discuss the economic environment as a key determinant in the process of decollectivization. More specifically, we discuss the impact of prices, market imperfections, and risk on the decision of collective farm member to leave or to stay.

##### *Terms of trade*

An increase in agricultural terms of trade positively affects decollectivization if there is a positive correlation between the labor productivity of an individual in the collective farm and his productivity on the individual farm. Individual farmers therefore have higher levels of labor productivity, because high productive farm members left the collective farms, while low productive farm members remained. In this case terms of trade improvements will increase the incomes of individual farmers more than the income of collective farm members, increasing the incentives for leaving. This also implies that a decrease in the overall profitability in agriculture negatively affects decollectivization. Notice that this effect arises independently of the effect of risk on decollectivization. An important policy implication of this result is that government

interventions that increase farm output prices, e.g., through general price support policies, would stimulate decollectivization, *ceteris paribus*.<sup>14</sup>

However, in many ECE and FSU countries the input and output prices collective farms and individual farms face are not identical during transition. Individual farmers may face higher prices for inputs and lower prices for their output. It is evident that under such conditions, it is less attractive for a member to leave the collective farm.

There are several reasons collective farms might receive higher prices than individual farms, at least in the beginning of transition. First, some economies of scale in marketing, input purchasing, credit, and information provision initially cannot immediately be captured by individual farms. Large-scale farms can bargain for higher output prices (through their market power) and lower input prices (through bulk purchasing) (Deininger, 1995).<sup>15</sup> Particularly when monopolies persist, large-scale farms enjoy benefits in bargaining (Brooks and Meurs, 1994). Individual farmers can also make use of these scale economies by establishing new forms of co-operation, e.g., a marketing or service cooperative. In this way the advantages of the collective farm will gradually disappear.

Second, collective farm management has closer contacts with up- and downstream industries that provide them with better access to market information, particularly when these sectors are still monopolized. Collective farm management possesses certain organizational and networking skills required for successful farming (Lyons et al., 1994). For example, because it knows the appropriate channels and has close contacts with the administration, management is in a better position to acquire government subsidies, e.g., for getting credit. As up- and downstream industries are privatized, and to a certain extent demonopolized, this advantage to collective farms will gradually disappear and possibly accrue to individual farms which may be more flexible to react to market opportunities compared to the cumbersome collective farms.

Third, Communist agriculture was characterized by the absence of markets for production factors. The establishment of such markets is a long process. Some markets are still immature or even missing, e.g., markets for credit, land, machinery and other inputs. This situation provides the collective farm with a temporary advantage over the individual farms.

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<sup>14</sup> Direct income support will have the opposite effect (with concave utility functions). In general, Swinnen (1997a) shows that the impact of government subsidies on reform in agriculture is conditional on the institutional design of the reform implementation.

The development of these markets is therefore crucial for the emergence of individual farming. Brooks and Meurs (1994) report, based on the 1991 World Bank survey on Romanian farm restructuring, that the unavailability of appropriate machinery is one of the main factors that prevent individuals from leaving the collective production arrangements. One should expect this advantage to be temporary as machinery rental services (sometimes organized by the collective farm itself), custom work, and informal markets for land and credit develop.

### *Risk*

If the collective farm and individual farms can deal with risk in the same way, evidently risk does not affect decollectivization, *ceteris paribus*. This implies that external causes of risk (such as a drought or policy changes) should have no effect on decollectivization if all types of farms are can deal with risk in the same way. If collective farms can pool risk such that they have a scale advantage in risk management over individual farms, as argued by Carter (1987) and Machnes and Schnytzer (1993), this will reduce the incentive for collective farm members to leave the collective. Furthermore, this effect depends on the risk aversion of the members. Its impact will be stronger the more risk-averse members are.<sup>16</sup> The question whether risk affects decollectivization therefore boils down to whether there is a difference in how collective and individual farms deal with risk. Three sources of risk should be distinguished: covariate risk affecting prices, covariate risk affecting production, and non-covariate or individual specific risk affecting production.

Covariate price-related risk is caused by the erratic movement of prices on the market, and by government policy, such as uncertainty about policy changes (problems of credibility) or uncertainty about the enforcement of contracts, legislation and property rights (Stiglitz, 1993). Price stabilization (e.g., buffer stocks or guaranteed floor prices) is usually not a good cure, since it does not imply income stabilization. Hedging is impossible because the appropriate markets are missing in ECE and FSU countries. The only way to deal with this price related risk is self-insurance or self-protection.

Similar insurance problems arise in the presence of covariate production related risk. In this case the variability of weather and nature is the main source of risk. Yield risk arises from

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<sup>15</sup> Collective farms in principle have higher creditworthiness because they can pool non-covariate risk and may therefore have better access to credit (Deininger, 1995). However, uncertainty on their future situation, past accumulation of bad debts, and uncertain property rights in general may offset this advantage (Swinnen, 1995).

weather variability and/or insect infestation and disease. Timing uncertainties depend on farm-specific weather variations. Only when risks are specific and locally limited (e.g. hail, typhoon) insurance is easy to provide. According to Binswanger and Rosenzweig (1986) crop insurance is not feasible because of (1) asymmetric information, leading to problems of moral hazard, (2) incentive problems leading to efficiency losses and (3) the high covariance of risks. Hence, insurance substitutes are used rather than insurance contracts, such as holding reserves, diversifying prospects, use of conservative or excessive input levels, investing in creditworthiness and developing social ties.

Other sources of covariate risk, however, exist. Stiglitz (1993) adds three distinct sets of risk to the traditional risk problems discussed up to now: inadequate infrastructure, lack of government commitment and other transition risks associated with the ongoing institutional changes and immature markets. Ensuring clear property rights is a necessary condition to be able to decollectivize. When farmers are uncertain about which plot they will own or when they are uncertain whether there is uncertainty of tenure, they will not invest. Farmers will leave a collective farm only if property rights are certain and enforceable.

Machnes and Schnytzer (1993) contend that a collective farm's market power and its contacts with former central marketing organizations, provide it with the opportunity to self-insure. In contrast, both Carter (1987) and Deininger (1995) state that collective farms cannot deal with systemic risk better than individual producers in an environment characterized by high risk and incomplete insurance markets.

Non-covariate production related risk is a form of individual specific or personal risk. It has been called 'breakdown and life cycle risk' by Binswanger and Rosenzweig (1986). It applies to durable factors of production that may fail resulting in repair costs and/or reinvestment, or to individuals who can be temporarily or permanently absent from work because of illness, accidents or other life cycle risks. Carter (1987) argues that collective farms can self-insure against these risks as a collective is always self-insuring around its own mean. Deininger (1995) states that this insurance is likely to be more costly than that to be gained by alternative social arrangements. Cooperative risk pooling can, however, be important in a transitional stage where markets are ill developed and the necessary infrastructure is not yet available.

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<sup>16</sup> The age structure of the collective farm members plays an important role, as risk-aversion increases with members' age. In many collective farms, members are typically older people as younger and more dynamic individuals have often left agriculture for other activities prior to 1989.

In conclusion, there are arguments both in favor and against the statement that collective farms have positive scale economies in risk management. The argument that collective farms can deal better with risk than individual farms holds especially in an environment characterized by much uncertainty and missing markets. However, as this uncertainty is more characteristic for the beginning of economic transition in ECE and FSU countries, the relative advantage of the collective farms, if any, is likely to be only temporary and will gradually disappear when markets develop and macro-economic instability reduces.

### *Empirical evidence*

There are no consistent data to calculate the impact of prices and risk on decollectivization. However, two important observations can be made. First, agricultural terms of trade declined strongly in 1989-1991 throughout ECE and FSU countries, and have stabilized since 1991. For example, figure 3 shows how agricultural terms of trade declined dramatically between 1989 and 1991 in the Czech Republic, Hungary, Slovakia, Bulgaria and Romania, and stabilized afterwards. Only in Romania terms of trade recovered somewhat.

Second, the variability in prices was extreme in 1989-1991, but was considerably less since 1992. Even in a country such as Bulgaria where inflation was never brought fully under control, figure 4 shows that price variability declined strongly after 1992. Therefore, as price variation has reduced substantially since 1992 and agricultural producers generally getting a better understanding of the emerging market economy overall production risk, especially “transition-related” risk, has reduced.

These observations on terms of trade and risk evolution during transition offer an explanation why decollectivization was especially low in the 1989-1992 period and has increased afterwards in many countries (as reflected in figure 1). However, also other factors have most probably played a role in this, such as the fact that most privatization and decollectivization legislation was only passed in parliaments in 1991 and 1992 in most countries. In conclusion, available evidence is in general consistent with the hypotheses that negative terms of trade evolutions and high transition risk have reduced decollectivization in the beginning of transition, but other factor may have contributed to this effect.

### **4.3. Land reform, privatization and decollectivization regulations**

Decollectivization is negatively affected by exit costs. Exit costs include costs involved in the withdrawal of land and capital assets. Key elements affecting the costs of withdrawing assets from the collective farm are (1) the ownership of assets, which itself is determined by the asset privatization process, and (2) the withdrawal procedure.

#### *Land reform and privatization procedure*

Privatization of farm assets in ECE and FSU countries occurs through a variety of procedures. In most countries, land is restituted to former owners and/or distributed among farm workers. Non-land assets are distributed among farm workers and former contributors of land and capital to the former collectives (Swinnen, 1996). The privatization procedure affects the allocation of production factors and the farm restructuring in the presence of transaction costs. Especially in the beginning of transition in the ECE countries, many feared that restitution would induce major disruptions in the production system. One of the assumptions at the base of this fear was that land ownership would coincide with land use in the presence of imperfect markets. Restitution to former owners would therefore imply a break-up of the large-scale collective farms and the fragmentation of land use.

However, the opposite is more likely to happen: restitution of farm assets to outsiders (non-collective farm workers) will reduce decollectivization. To see why this is the case, consider two extreme (hypothetical) scenarios: (a) restitution to former owners, none of whom are currently involved in farming, and (b) distribution of assets to collective farm members. The argument that restitution to former owners will break up the collective farms is based on the assumption of a strong link between asset ownership and asset use. One cause of such a link could be high transaction costs in the asset exchange markets. However, this argument ignores (a) the existence of important transaction costs in the privatization process, (b) differences in transaction costs between insiders and outsiders, and (c) differences in relative incentives for starting up an individual farm. Taking these factors into account leads to a different conclusion.

First, the existence of transaction costs in privatization implies that property rights for outsiders are incomplete at best. The costs of monitoring and enforcing the correct implementation of the privatization and land reform procedures could be important when the implementing institutions had incentives not to implement the reforms, as was the case in several countries (Swinnen, 1997a). Moreover, these costs were obviously higher for



outsiders than for insiders because of their geographical and professional separation from the process. These costs reduce former owners' incentives to use the assets themselves for production. Moreover, because they lack farming skills, former owners have low labor productivity in individual farming, further reducing incentives to take the land out of the collective farm structure. Hence, many former owners show little enthusiasm to invest in strong property rights and decide instead to rent their land to others for farming the land.

Second, restitution to outsiders increases the transaction costs for members wanting to use the assets for setting up their individual farm. These members in any case face transaction costs. They need to monitor and control the privatization and asset distribution process when assets are distributed to themselves. If assets are restituted to former owners, the collective farm members face higher transaction costs as they need to control and monitor the restitution process to others. Furthermore, distribution to themselves, collective farm members may develop an informal contract with the collective farm in anticipation of the allocation of full property rights. This is more difficult when assets are restituted to former owners, because there is less insight regarding the location or condition of the assets.

Finally, when land is restituted to former owners, the individual member has to compete with the collective farm management in establishing rental contracts with the former owners. The individual is typically at a disadvantage in contracting with the former owner. The collective farm management, which typically plays an important role in privatization implementation, has an advantage in access to information and possibly also in resources available for dealing with transaction costs.

All these factors combined lead to the conclusion that in the case where former owners are no longer active in agriculture, restitution of assets to former owners induces a conservation of the collective farm structure, in contrast to a privatization procedure that allocates assets to the collective farm members.

### *Reform implementation and decollectivization regulations*

As exit costs reduce the income of a member who withdraws from the collective farm, and therefore decrease decollectivization, transaction costs linked to the withdrawal of assets are important. The withdrawal procedure is partly stipulated by law, but is partly determined by the reform implementation at the collective farm level. The reform implementation is complicated by the incentive problems of the agents responsible for the implementation in the presence of imperfect information and transaction costs. On the one hand, a member who

wants to leave has to see to it that he receives the appropriate amount of land of acceptable quality and adequate infrastructure to which he is entitled. He therefore faces the costs of supervising the managers and the members who control the allocation and implementation process. On the other hand, members with low productivity want to prevent high productive members from leaving to avoid a decrease in the average productivity, and hence the average profitability and income, of the collective farm. Managers also want to prevent the more productive members from leaving, because their income depends on the average productivity of the collective farm. Therefore, less productive members and management might increase exit costs (a) by influencing the regulations for privatization of property rights and factor allocation at the government decision-making level and (b) by slowing down and limiting the implementation of the registration at the farm level.<sup>17</sup>

Examples of (a) include cases in which governments, under political pressure from a collective coalition, have introduced amendments to the land law making it more difficult for individuals to withdraw their land. One such example is the introduction of co-ownership of land between private individuals and state farms in Slovenia (Bojnec and Swinnen, 1997). In Bulgaria, amendments to the original land law include the institution of an extended administrative procedure, the possibility of reviewing the restitution process, and several restrictions to sales of land (Swinnen, 1997b). Another example is Hungary, where members can still leave their cooperative after its transformation, but they cannot withdraw their land or non-land assets. They receive a compensation which is only a fraction of the real value of the assets (Mathijs, 1997). In Slovakia, cooperatives can issue vouchers instead of restituting assets to former owners, but these vouchers cannot be traded for seven years (Kabat and Hagedorn, 1997).

Governments in favor of decollectivization want to reduce exit costs and also reduce the ability of collective farm members and managers to influence these costs. An example of this is from Bulgaria. The 1991 Land Law passed by the ex-Communist government did not include detailed specifications about how to implement the law. Much leeway was given to local government and collective farm management to increase exit costs. After the 1991 elections, the law was amended by the new reformist government. Liquidation councils were installed to

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<sup>17</sup> Collective farm management might use another instrument to dissuade productive members from leaving. By firing less productive members, management could cause the average productivity of the collective farm to increase and hence decrease decollectivization. This is easier in state farms, where farmers are employees, than in collective farms organised as producer cooperatives. However, in the latter members can be laid off as workers, even though they remain shareholders of the cooperative.

oversee the liquidation of the collectives and keep managers from raising exit costs. Not surprisingly, the role and the composition of these institutions was changed when the ex-Communists came back to power (Swinnen, 1997b). The 1991 Sajudis government in Lithuania removed the existing management from its controlling positions and created new institutions, the Municipal Agrarian Reform Services, chaired by outsiders. Similarly to Bulgaria, the re-elected ex-Communist government changed the role and the composition of these institutions in 1993 (Rabinowicz, 1997).

Also in FSU countries, many obstructions to farm restructuring can be found. Private ownership of land has not been recognized in Kyrgyzstan and Uzbekistan, while in Belarus and Kazakhstan only private ownership of household plots is allowed. Nevertheless, user rights were made secure and marketable in Kazakhstan and Kyrgyzstan. In Georgia the buying and selling of land is only allowed since 1996; in Turkmenistan it is still not (Lerman, 1997).

### *Empirical evidence*

Table 5 presents various indicators of land reform, privatization and decollectivization legislation in ECE countries. Decollectivization is more important where (1) more of the land was distributed to farm workers instead of restitution to former owners, (2) the share of agriculture in employment is high, and (3) exit costs are low. It is remarkable to see how the two countries at the extremes of the spectrum are exactly opposite in these three factors. Albania, where decollectivization is highest, distributed all the land to farm workers, has a high share of agriculture in employment, and low exit costs. Slovakia, where decollectivization is lowest, restituted land to former owners, has a low share of agriculture in employment, and high exit costs.

A factor which affects the impact of land reform policies on decollectivization is the pre-collectivization land ownership distribution. A more fragmented pre-collectivization land distribution implies more transaction costs for potential farmers to set up a farm of a certain size.<sup>18</sup> This factor may also explain partially the difference in decollectivization between Slovakia and the Czech Republic. Historically, inheritance rules were different in both countries. In Slovakia, land inheritance was based on the Napoleonic code, that stipulates that all sons receive an equal piece of land upon their father's death. This resulted in a much

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<sup>18</sup> Swinnen (1996) argues that the pre-collectivization land distribution also affects the *choice* of land reform policies. For example, pre-collectivization land distribution was very concentrated in Albania inducing strong

stronger fragmentation of land ownership at the start of the collectivization process than in the Czech Republic where the eldest son inherited all the land. Former owners receive therefore on average much smaller plots in Slovakia than in the Czech Republic and their transaction costs relative to the potential benefits for taking out their land from the collective farm are higher.

Figure 5 shows the relationship between decollectivization and the share of agriculture in total employment for ECE countries.<sup>19</sup> Central European countries with more than 15 percent of active people employed in agriculture (Albania, Bulgaria, Latvia, Lithuania, and Romania) show a higher degree of decollectivization compared with countries where agricultural employment is less than 10 percent of the work force (Czech and Slovak Republics, Hungary).

Two factors can be the cause of this relationship. First, the share of agriculture in total employment is typically negatively correlated with the level of development and the use of technology in agriculture. A country with a high share of agriculture in employment is typically less developed and uses inferior technology compared to a country with a low share of agriculture where there was a substitution of labor by capital as a result of the technological progress. Second, the share of agriculture in employment also captures the number of outsiders versus insiders. A high share of agriculture in total employment is an indication that relatively few people have left agriculture and thus that the ratio outsiders to insiders is relatively low. Consequently, a low share of agriculture in total employment means that relatively many farmers left agriculture, resulting in a high ratio of outsiders to insiders. Recent World Bank surveys suggest that the overwhelming majority of individual farmers are former cooperative members or employees of state farms (Csaki and Lerman, 1996). Since in general outsiders lack the appropriate skills to start up a private farm, the number of farm workers, i.e., insiders, is a good reflection of the number of people actually interested in individual farming.

The figure indicates some additional regional biases: the Baltic countries all lie above the curve, while the southern Central European countries lie on or below the curve. This observation suggests that additional factors have stimulated decollectivization in the Baltic countries and especially in Latvia. Overall in the Baltics, becoming independent from Russia

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resistance against restitution to former owners, but it was very fragmented in Slovakia, where former owners are restituted their land.

<sup>19</sup> Official data show a substantial decline in agriculture's share in employment in ECE countries, but an important part of the changes are statistical effects. Many non-production activities, including services, rural

has been a key political strategy, also affecting their reform policies. Collective farms were partly seen as part of a system imposed on them by the Russian occupation. Decollectivization was thus part of their independence strategy (Rabinowicz, 1997). These additional factors have apparently stimulated especially the start-up of larger individual farms. This can be derived from comparing figures 5 and 6. Figure 6 shows an almost perfect linear correlation (regression  $R^2=0.92$ ) between the decollectivization index and the share of farms smaller than five hectares in total agricultural land. The comparison with figure 5 suggests that farms larger than five hectares have emerged more strongly in the Baltics and especially in Latvia than in ECE countries with a similar agricultural share in employment. One explanation is that land ownership in 1945 was less fragmented and more egalitarian than in many other countries. Another important reason is the active Latvian restitution and decollectivization policy, which was inspired by nationalistic motivations. Restitution of land allocated land property rights exclusively to native Latvians in a country with a very high share (46 percent) of ethnic non-Latvians in the population, most of whom were post-1945 Russian immigrants. Further, the Latvian reform regulations specify that individual farms are given the highest priority in land allocation. The lowest priority is given to reforming collective farms (quite unlike many other ECE and FSU countries, where collective farms receive a preferential treatment).

## 5. REGRESSION ANALYSIS

To quantify the separate impacts of several of the factors discussed above, we estimated a regression model with 1995 decollectivization index (DI) as dependent variable, using data from 18 ECE and FSU countries:

$$DI = \alpha_0 + \alpha_1 \text{ LAND/MAN} + \alpha_2 \text{ RESTITUTION} + \alpha_3 \text{ BALTICS} + \alpha_4 \text{ NOPRIVATE} \\ + \alpha_5 \text{ BULGARIA} (+ \alpha_6 \text{ SOVIET}) + \varepsilon.$$

LAND/MAN is the number of hectares arable land per farm worker. The land/man ratio captures the effect of factor intensity and technology. On average, a high land/man ratio reflects an agricultural sector characterized by high technology and/or low labor intensity, which is an indication for economies of scale in production. We therefore expect a negative influence of the land/man ratio on decollectivization.

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education, etc., were recorded under “agriculture” in the statistics, but are no longer (Jackson and Swinnen, 1995). We use 1993 employment data which are corrected for these statistical biases.

RESTITUTION is the share of the land which was restituted to former owners. As explained above, restitution of farm land is expected to contribute to the consolidation of large-scale collective farms, and therefore expected to have a negative influence on decollectivization.

BALTICS is a dummy variable which is 1 for Latvia, Lithuania and Estonia and 0 otherwise. The Baltic countries have been driven partly by ethnic and independence motives to pursue more radical decollectivization of their collective farms compared to other ECE and FSU countries. A dummy to capture this effect is therefore expected to be positive.

NOPRIVATE is a dummy variable which is 1 for Georgia, Kyrgyzstan, Turkmenistan and Uzbekistan and 0 otherwise. The southern FSU countries (Georgia, Kyrgyzstan, Turkmenistan and Uzbekistan) all have legislation increasing exit costs beyond levels that can be observed in other ECE and FSU countries. Georgia delayed the recognition of private ownership until 1996, while Kyrgyzstan and Uzbekistan do not allow for private ownership at all. In Turkmenistan, private ownership is recognized, but neither the ownership titles, nor the user rights are transferable (Lerman, 1997). Hence, a dummy variable for these four countries, characterized by a very restrictive policy with respect to land ownership, is expected to have a negative effect.

BULGARIA is a dummy variable which is 1 for Bulgaria and 0 otherwise. Bulgarian statistics on farm structures report only *arable* land instead of total *agricultural* land in all other countries. Therefore the share of individual farms in total agricultural land use, and thus the DI, is overstated in comparison to other countries (Davidova et al., 1997). Hence, we introduce a dummy variable for Bulgaria, expecting it to have a positive sign.

SOVIET is a dummy variable which is 1 if a country belonged to the Soviet Union before World War I (thus excluding the Baltics) and 0 otherwise. This variable is an indication of the difference in mentality and human capital between countries where collectivization occurred much earlier. FSU countries (excl. the Baltics) have been collectivized starting in the 1920s, while collectivization in ECE and Baltic countries starting after 1945. Many authors regard this difference as an important factor affecting decollectivization, i.e. decollectivization is expected to be more difficult in the FSU countries (e.g., Pryor, 1992). Hence, a negative sign is expected.

The results of the least squares regression analysis are summarized in table 6. All variables have the expected sign and most are highly significant. In addition, the model as a whole explains most of the variation in decollectivization among ECE and FSU countries

( $R^2=0.81$ ; adj.  $R^2=0.73$ ). This suggests that variables included in the model capture the most important factors affecting decollectivization in these countries.

The land/man ratio is strongly negatively related with the DI, confirming the very important impact of technology and factor intensity, which in turn are related with relative farm productivity and scale economies in production.

Land reform policies have an impact on decollectivization. First, land restitution to former owners has, *ceteris paribus*, a negative effect on the DI. This is consistent with our hypothesis that restitution increases the costs for individuals to start up their individual farm. Second, the lack of effective property ownership has a strongly negative impact on decollectivization: the DI is on average 55 percentage points lower in the FSU countries that did not recognize private ownership in 1995. The analysis confirms that, *ceteris paribus*, decollectivization is considerably higher in the Baltic countries (on average 54 percentage points higher DI), reflecting these countries reform strategy to decollectivize as part of their national independence strategy.

The positive coefficient for Bulgaria reflects the statistical bias in the Bulgarian data, causing the DI to overestimate effective decollectivization in Bulgaria vis-à-vis the other countries.

Finally, comparing Regression 1 and 2 shows that pre-1945 collectivization seems to have only a small additional effect on the DI. While the sign is consistent with expectations, its magnitude is less than expected based on the often stressed negative impact of cultural and human capital conditions in those FSU countries where collectivization started in the 1920s.

## **6. CONCLUSION**

Important differences in decollectivization can be observed both between and within ECE and FSU countries, and over time. This paper presented a model of the decollectivization process and identified several factors that affect decollectivization. These include general economic factors, such as prices, market imperfections and risk, and internal factors that result in differences between collective and individual farms, such as differences in output prices, risk management and productivity. Further, the exit costs a member faces when he wishes to withdraw assets from the collective farm are important factors influencing the decision of collective farm members to stay or to leave and start up an individual farm.

Empirical data are largely consistent with our hypotheses. A stabilization in terms of trade since 1992 and gradual reduction of price variability and transition-related risk coincide

with an increase in decollectivization. A regression analysis shows that a large share of the variation in decollectivization in 18 ECE and FSU countries can be explained by differences in factor intensity and reform policies. The analysis confirmed the negative influence of the land/man ratio on decollectivization, which reflects the combined effect of productivity, factor intensity and technology. The analysis also confirmed the negative effect of restitution on decollectivization. More specifically, restitution of assets to outsiders (former owners) leads to less decollectivization than asset distribution among farm workers and members. Also, the Baltic countries have actively stimulated decollectivization, while Georgia, Kyrgyzstan, Turkmenistan and Uzbekistan have done the opposite by restricting or forbidding private ownership of land. Finally, the additional effect of collectivization in the 1920s versus after the Second World War is negative but not significant.

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TABLE 1

RELATIVE IMPORTANCE OF FARM STRUCTURES IN EASTERN GERMANY, BASED ON THEIR SHARE IN TOTAL AGRICULTURAL LAND, 1992-1995

	1992	1993	1994	1995
<i>Cooperatives</i>	44.1	40.2	38.2	36.9
<i>Companies</i>	28.9	26.4	25.2	25.3
Limited liability company	25.7	24.2	23.1	23.4
Joint stock company	1.9	1.7	1.6	1.6
Other	1.3	0.6	0.5	0.4
<i>Partnerships</i>	13.8	18.8	21.9	23.5
Unlimited partnership	6.3	11.0	13.9	15.8
Limited partnership	7.4	7.7	7.9	7.6
Other	0.1	0.1	0.1	0.1
<i>Sole proprietorship</i>	12.7	18.3	21.2	22.3

*Source:* Beckmann and Hagedorn (1997).

TABLE 2  
RELATIVE IMPORTANCE OF FARMING STRUCTURES IN THE CZECH REPUBLIC, BASED ON THEIR  
SHARE IN TOTAL AGRICULTURAL LAND, 1989-1995

	1989	1991	1993	1994	1995
State farm	25.4	25.6	12.9	2.8	1.2
Collective farm	61.0	60.7	-	-	-
Cooperative	-	-	49.4	47.7	42.8
Company	-	-	14.6	20.5	25.0
Partnership	-	-	-	0.3	0.3
Sole proprietorship	0.3	3.3	13.4	20.4	22.3
Other	13.3	10.5	9.8	8.3	8.3
Total	100.0	100.0	100.0	100.0	100.0

*Source:* Ratinger and Rabinowicz (1997).

TABLE 3  
DECOLLECTIVIZATION INDEX (DI), 1995\*

	DI		DI
Albania	94.2	Georgia	21.2
Armenia	81.8	Hungary	17.3
Latvia**	80.2	Belarus	15.2
Lithuania**	60.4	Ukraine	14.1
Romania	55.2	Uzbekistan	13.1
Bulgaria	45.4	Russia	12.1
Estonia**	37.5	Turkmenistan	7.1
Kyrgyzstan	23.2	Slovakia**	3.1
Czech Republic	22.1	Kazakhstan	0.0

\* The DI is calculated by dividing the difference between the share of individual farms in total agricultural land in 1995 (IND95) and in 1989 (IND89) by 100 minus the share of individual farms in total agricultural land in 1989:  $DI = (IND95 - IND89) / (100 - IND89) \times 100$ . Data on land use are derived from a series of country studies in the EU-COST-network "Agricultural Privatisation, Land Reform and Farm Restructuring in Central and Eastern Europe", and Lerman (1997), all reported in Swinnen, Buckwell and Mathijs (1997). For all FSU countries except the Baltic countries, an initial share of individual farms equal to 1 percent is assumed.

\*\* 1994.

TABLE 4  
COOPERATIVES THAT HAVE BEEN FULLY DECOLLECTIVIZED (OR LIQUIDATED) AS A RESULT OF TRANSFORMATION OR BANKRUPTCY IN HUNGARY, 1989-1994

Percentage of decollectivized cooperatives			
Region	As a result of the transformation decision	As a result of bankruptcy proceedings	Total
Transdanubia	11	10	21
Great Plain	11	21	32
Northern Hungary	25	17	42
Hungary	13	16	29

Source: Tóth and Varga (1995).

TABLE 5  
VARIOUS INDICATORS OF LAND REFORM, PRIVATIZATION AND DECOLLECTIVIZATION REGULATIONS FOR ECE COUNTRIES

	Decollecti- vization index 1995	Share in total agricultural land (in %)			State-owned land 1994	Share of agriculture in total employment 1993	Exit costs due to government regulations (*)
		Individual farms 1989	Privatized land by restitution	distribution			
Albania	94.2	4	-	93	3	53	1
Latvia	80.2	4	64	30	2	17	1
Lithuania	60.4	9	69	21	1	23	2
Romania	55.2	14	43-58	15-30	13	36	2
Bulgaria	45.4	13	81	-	7	22	2
Estonia	37.5	4	74	22	-	8	2
Czech Republic	22.1	-	79	-	13	5	2
Hungary	17.3	14	62	19	5	9	3
Slovakia	3.1	-	74	-	20	7	3

*Source:* Own calculations based on European Commission, *Agricultural Situation and Prospects in the Central and Eastern European Countries* (Brussels: DG VI, 1995), OECD, *Agricultural Policies, Markets and Trade in Transition Economies: Monitoring and Evaluation 1996* (Paris: OECD, 1996), and Swinnen, Buckwell and Mathijs (1997).

(\*) Own estimate of exit costs induced by farm transformation regulations (1=Low, 2=Medium, 3=High), based on case studies in Swinnen (1997a) and Swinnen, Buckwell and Mathijs (1997).

TABLE 6  
RESULTS OF THE REGRESSION ANALYSIS WITH DI AS DEPENDENT VARIABLE

	Regression 1	Regression 2
INTERCEPT	92.77 (8.20) ***	99.36 (6.78) ***
LAND/MAN	-32.58 (-5.76) ***	-28.32 (-3.45) ***
RESTITUTION	-0.22 (-1.55)	-0.43 (-1.36)
BALTICS	54.12 (4.49) ***	52.20 (4.15) ***
NOPRIVATE	-55.29 (-4.87) ***	-47.85 (-3.10) **
BULGARIA	41.04 (2.29) **	41.80 (2.28) **
SOVIET	-	-16.82 (-0.73)
R <sup>2</sup>	0.809	0.818
adjusted R <sup>2</sup>	0.729	0.718
Number of observations	18	18
Degrees of freedom	12	11
F-statistic	10.16 ***	8.22 ***

t-values between are given between parentheses and statistical significance is indicated at the 1\*\*\* and 5\*\* percent level.

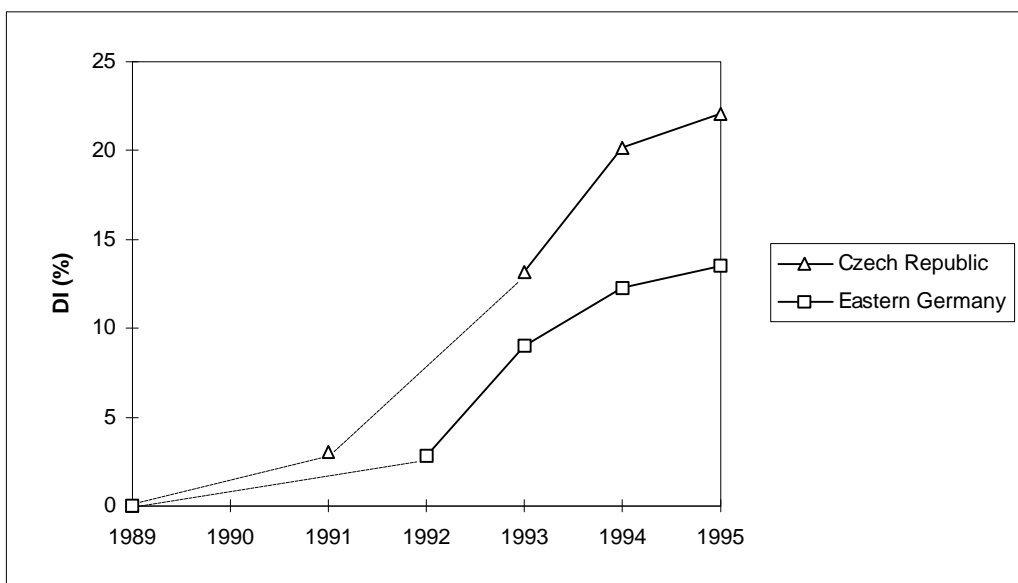


FIG. 1 - Decollectivization index for Eastern Germany and the Czech Republic, 1989-1995. Own calculations based on Beckmann and Hagedorn (1997) and Ratinger and Rabinowicz (1997).

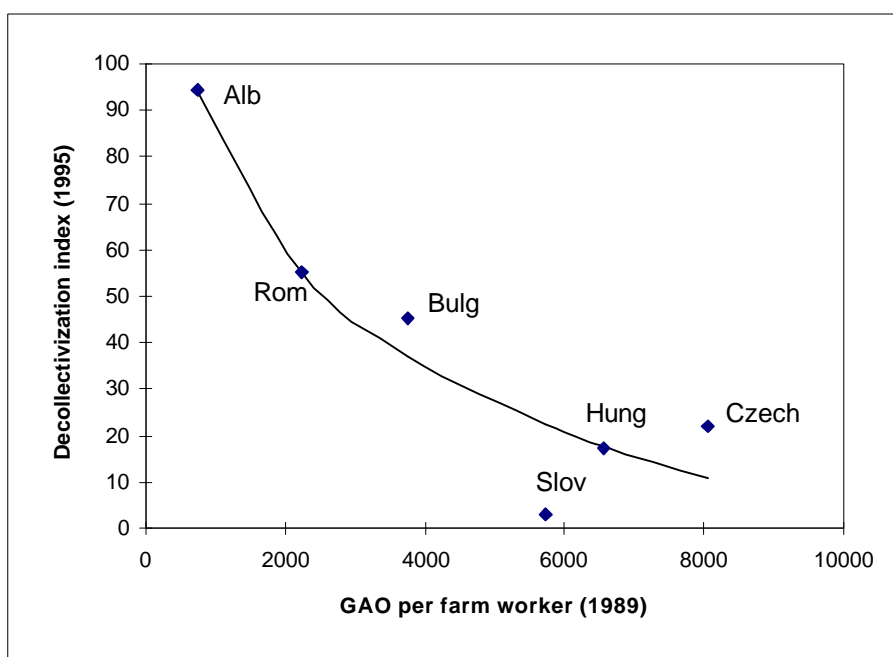


FIG. 2 - Relationship between decollectivization in 1995 and initial collective farm productivity in 1989 for six ECE countries. GAO is calculated using data from FAO, *Production Yearbook 1990* (FAO: Rome, 1991).

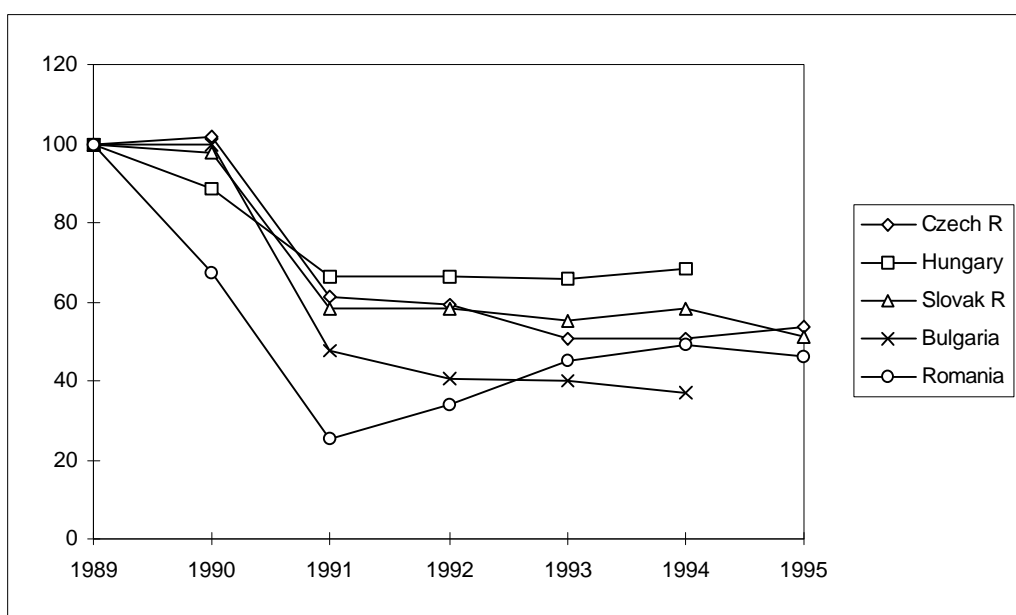


FIG. 3 - Ratio of output prices to input prices (1989=100) for five ECE countries, 1989-1995. Data are from OECD, *Agricultural Policies, Markets and Trade in Transition Economies: Monitoring and Evaluation 1996* (Paris: OECD, 1996).

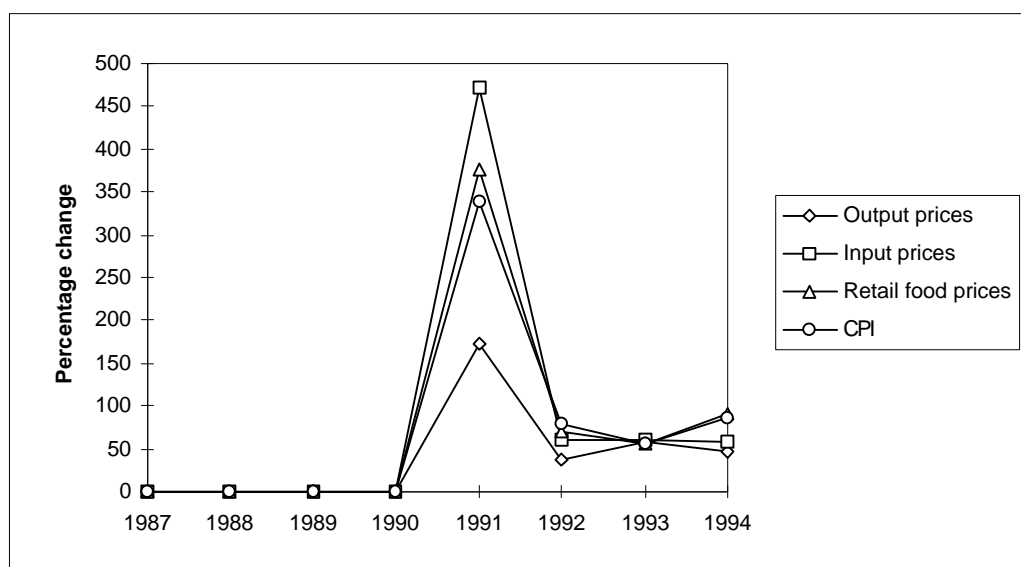


FIG. 4 - Percentage change in prices in Bulgaria, 1987-1994. Data are from OECD, *Agricultural Policies, Markets and Trade in Transition Economies: Monitoring and Evaluation 1996* (Paris: OECD, 1996).



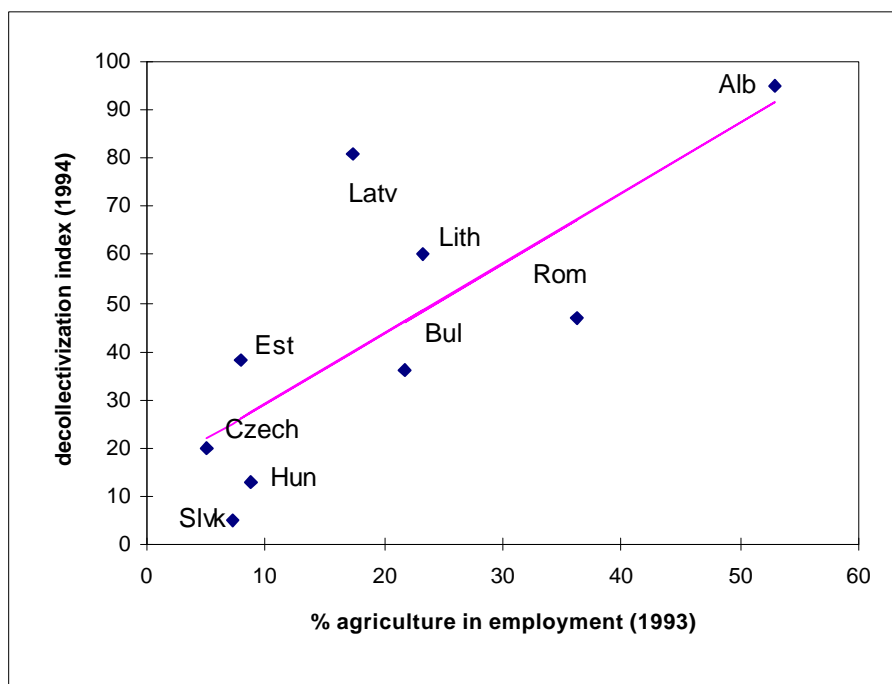


FIG. 5 - Relationship between decollectivization in 1994 and the share of agriculture in total employment in 1993 in ECE countries. The curve on the graph is based on a least squares regression. Data on the share of agriculture in total employment are from OECD, *Agricultural Policies, Markets and Trade in Transition Economies: Monitoring and Evaluation 1996* (Paris: OECD, 1996).

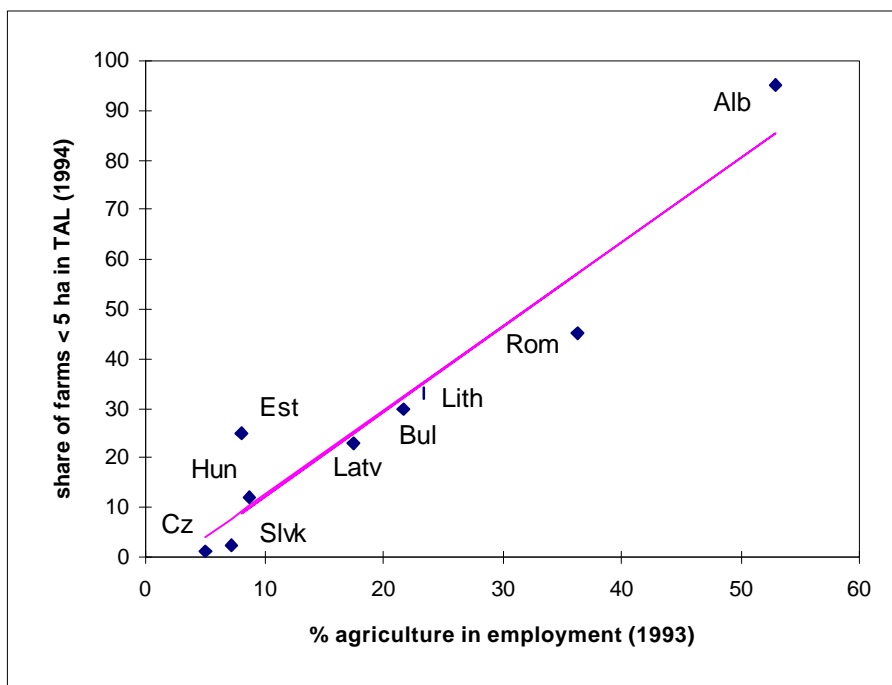


FIG. 6 - Relationship between the share of farms smaller than 5 hectares in total agricultural land (TAL) in 1994 and the share of agriculture in total employment in 1993 in ECE countries. The curve on the graph is based on a least squares regression. Data on the share of agriculture in total employment and on farms smaller than 5 hectares are from OECD, *Agricultural Policies, Markets and Trade in Transition Economies: Monitoring and Evaluation 1996* (Paris: OECD, 1996).