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Reforms, Globalization, and Endogenous Agricultural Structures

Johan F.M. Swinnen

LICOS Centre for Institutions and Economic Performance
& Department of Economics
University of Leuven (KUL)

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Abstract

In this paper I draw lessons from two quasi-natural experiments (the transition process in former Communist countries and the rapid globalization of food chains) on the optimality of farms and agricultural structures more generally. I argue that (a) the farm structures that have emerged from the transition process are much more diverse than expected ex ante; (b) this diversity is to an important extent determined by economic mechanisms which are influenced by initial conditions (eg technology) and reform policies; (c) non-traditional farm structures have played an important role during transition since they were optimal to address the specific institutional and structural constraints imposed by the transition process; (d) there is more diversity than often argued in the farms that are integrated in global food chains; (e) endogenous institutional (contracting) innovations in food chains may lock existing farm structures in a long-run institutional framework; and (f) indicators based on farm structures are not a good measure of welfare effects of the globalization of food chains.

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Quiz :
Which country has the following farm structure characteristics ?[1]

More than 50% of farmers are older than 55 years.
75% are part-time farmers.
96% are family farms.
59% of farms cultivate less than 5 hectares
3% of farms cultivate more than 100 hectares

Introduction

There is an extensive literature on the optimality of farms and agricultural structures more generally. In this paper I attempt to contribute to this literature by drawing lessons from two important global changes in food and agricultural systems over the past 25 years which have major implications for farm structures and which can be interpreted as quasi-natural experiments to study the optimality of farm structures. The first is the transition process in former Communist countries from a centrally planned and government organized system to one organized by individual agents and the market. This process affected more than a billion people, many of them farmers, and a important share of the world's productive area. The second change is the rapid globalization of food chains which has integrated consumers, food companies, and farmers and has lead to important restructuring in production, trading and marketing systems across the globe and in particular in high value markets which have been spreading to transition and developing countries.

These two changes were not unrelated. The spread of modern and international food supply chains has been very intense in transition countries after these countries opened up for

[1] The answer is given in appendix.

foreign investments and trade. Inversely, many developing countries which are not usually classified under the umbrella of "transition countries" experienced processes of liberalization and privatization in their food and agricultural systems in the 1980s and 1990s which contributed to the spread of modern and global food supply chains in these markets as well. However, for the purpose of this review we will consider the two processes and changes as separate.

In this paper I draw lessons from these changes on the optimality of farms and agricultural structures. The paper draws strongly on my past research work on these issues with various co-authors and I will refer to specific papers and books for more elaborate arguments and detailed analyses than is possible in the short space of this paper. The paper makes several key arguments. First, the farm structures that have emerged from the transition process are much more diverse than expected ex ante. Second, this diversity in farm structures is to an important extent determined by economic mechanisms which are influenced by initial conditions (eg technology) and reform policies. Third, "non-traditional" farm structures have played an important role during transition since they were optimal to address the specific institutional and structural constraints imposed by the transition process. Fourth, regarding the impact of the globalization of food chains, there is more diversity than often argued in the farms that are integrated in global food chains and, fifth, endogenous institutional (contracting) innovations in these food chains may lock existing farm structures in a long-run institutional framework. Finally, the paper argues that indicators based on farm structures are not a good measure of welfare effects of the globalization of food chains.

The paper is organized as follows. The first section describes how farm structures have evolved and emerged in the transition countries. The second section gives a brief overview of the literature on the optimality of farm structures. I build on the existing theories to provide a series of hypotheses to explain structural developments in transition

agriculture and provide evidence on this. The next section of the paper reviews how institutional changes, such as the emergence of contracting and vertical coordination, have been endogenous in the globalization of supply chains, and what the implications are for small and large farms, and for welfare; as well as for future structural developments.

The Development of Farm Structures in Transition

Ex ante, there were two sets of arguments forwarded on the development of farm structures in transition countries after land reform and liberalization. The first argument posited that farm workers in transition countries had so little required human capital, managerial expertise and entrepreneurship for managing a farm that they would not start farming on their own. This argument predicted that the large farms would continue to operate, albeit in an adjusted mode reflecting different environments.

The second argument predicted the opposite. It argued that, since communist-designed collective and state farms were very inefficient, liberalization and removal of state control would lead to their collapse, and therefore there would be a total shift to family farms (or "individual farming").

When looking at what happened in reality, a first remarkable observation is that none of these arguments were correct, or both, depending on the way one looks at it (see figure 1). A large diversity of farm structures has emerged in the transition world, incorporating both extremes and everything in between.[2] Farms vary widely in size and organization, from small household plots, over family farms, to large co-operatives or farming companies. One extreme is Slovakia where almost all land is used by large farming corporations. The other extreme is in countries such as Albania, Azerbaijan, China, etc. where land use by individual

[2] See also Lerman, Csaki and Feder (2004) on this.

farms grew rapidly during transition and where almost all land is used by small individual farms.

A second interesting observation is that there are also important differences within countries. In fact, many countries have a mix of large and small farms. Some of these differences reflect differentiations by region or commodity. For example, in Kazakhstan the northern regions are dominated by vast grain producing farming corporations, sometimes using hundreds of thousands of hectares, while the cotton areas in the south are dominated by very small household farms (Gray, 2000). In Russia, around 60% of agricultural output is produced by household plots (see figure 2). However, the vast majority of the land is used by large farms, sometimes organized in huge agro-holdings. One example of such agro-holding is the Orel Niva holding, which controls 337,000 hectares of land and employs 16,000 workers. It processes 200-300,000 tons of wheat. Its activities include 102 large farms, 28 processing plants, 100 trade organizations, 32 service enterprises, etc. (Gataulina et al, 2006).

Third, within the diversity of farm structures that could be observed, there were a remarkable number of "non-traditional" farm structures, meaning that many farm structures observed in these countries were not the ones we typically observe in Western market economies. Examples include the Russian vertically integrated farming companies mentioned above, but also farm partnerships in former East Germany, farm production associations and networks of former collective farms and household plots in various countries (see further).

Fourth, studies estimating the efficiency of the various farm structures yield mixed results, and their findings often are not consistent with the simple premise that family farms are the most efficient farm structures. In an excellent review of the studies on this issue, Davidova and Gorton (2004) conclude that there are no clear and consistent conclusions on

the optimality of specific farm structures across the studies that they reviewed.[3] In particular they conclude that there is no clear evidence of corporate farms being inherently less efficient than family farms and that even when family farms are on average more efficient, some corporate farms also perform as well as the best family farms.

Finally, another remarkable variation between countries concerning farm structures is in how farms have adjusted labor use during transition. In some countries, farms absorbed labor, while in other countries farms massively shed labor, even in the early years of transition (figure 3). The differences are huge: from a strong increase in some of the Central Asian countries to a dramatic decline of more than 50% of official employment in Central Europe (see figure 3a). We do not only observe such large difference between very different regions, but also within regions and even within countries. For example, on average the outflow of labor in Poland was much lower than in neighbouring Slovakia and Czech Republic (see figure 3b), but within Poland there are huge differences between regions (see figure 3c). Another reason why these variations are so remarkable is that the variation in adjustments of other inputs was much less: in all the European transition countries, land use was roughly constant and capital inputs declined strongly during the first years of transition.

A Brief Review on the Optimality of Farm Structures

There is an extensive literature on the optimality of farm sizes and structures. Most of the literature of farm efficiency finds that there are relatively few economies of scale in farm operations, albeit it with some important modifications. The main argument relates to relative imperfections in the labor markets versus the capital and product markets (Eswaran and Kotwal, 1985; Feder, 1985; Pollak, 1985). The essence of the argument goes as follows.

[3] See Davidova and Gorton (2004) for a list of reference on studies on farm efficiency in transition.

Farming is characterized by important supervision costs because in most circumstances farm workers' true efforts are not easily observable, due to the specific characteristics of agricultural production. Such imperfections imply that wage workers have limited incentives to exert effort, and either need to be supervised at a cost or be offered contracts that provide higher incentives, such as sharecropping.

Family members have higher incentives to provide effort than hired labor. They share in output risk and can be employed with no or less supervision costs. This is the main advantage of family farming over wage-labor based farming.

These advantages may be offset by disadvantages of family farms in accessing credit and other markets. It is well known that rural credit markets are notoriously imperfect and that especially poor and small farmers are constrained in formal credit markets. Larger and richer farms may have easier access to credit, either because their initial wealth is larger (for self-financing) or because their transaction costs in credit markets are lower. Another reason is access to output or input markets. Small farmers in remote areas may not be able to sell their products to urban markets, or they may get lower prices from traders. Small farmers may be less likely to access (quality) inputs for their production. Hence, in such cases, imperfections of the input, output, and credit markets have the opposite effect of labor market imperfections in determining the optimal farm size.

The combination of these theoretical arguments are used to explain the findings of empirical studies, which often find an inverse U-function between size and efficiency. Efficiency grows with size for the smallest farms, but beyond a certain size, typically coinciding with larger family farms, there is a declining relation between size and efficiency.

However, not surprisingly, these relative effects, and hence the "optimum" depends on the nature of the farm activity (livestock, crops, …), on the available technology, on relative factor abundance, on market imperfections, and on existing regulations and

institutions. To understand the farm restructuring during transition, we need to explicitly look at these factors and to how they vary between countries.

Technology, Endogenous Farm Restructuring, and the Nature of Productivity Gains

Technology and factor abundance have an important impact on the relative efficiency of different farm organizations, and thus on the incentives for farm restructuring. They affect both the costs and benefits of the shift to individual farming, as summarized in Figure 4.

As explained above, an important factor in the optimal scale of farming is transaction costs in labour management. Large operations in agriculture face transaction costs because of principal agent problems and monitoring costs in labour contracting, which are typically large in agriculture (Pollak 1985). Hence, a shift to individual farming will improve labour effort and a farmer's control over farm activities and this will lead to efficiency gains. However, the importance of these efficiency gains vary with specialization and technology (Allen and Lueck 1998). Since the greatest improvement in efficiency from farm individualization is attributable to rising effort from better incentives, the benefits will be relatively greater for systems in which labour plays a greater role.

However, there are also costs that are incurred when collective or corporate farms are broken up into individual farms. In many cases there are two major types of costs. First, there is one set of costs that could arise due to the loss in scale economies. As in the case of the incentive effects, the impact on scale economies will be sensitive to the nature of the technology. The economy of scale losses may be considerable in the case of capital intensive production systems, systems in which we would expect economies of scale to be relatively significant since there are many fixed expenses and many large assets used in farming activities. In countries in which farming is labour intensive and few capital inputs are used, however, such losses could be minimal.

Second, there also may be costs associated with disorganization that will occur with the restructuring of farms (Blanchard and Kremer, 1997; Roland, 2000). The costs will arise from the mismatch that can occur between the farm's needs for inputs, services and equipment and the infrastructure that has been set up to provide those inputs and services. Initially designed for large scale farming, the inputs and services that the nation's agricultural input supply chain are set up to provide are not always suitable for individual farms. Hence, newly formed individual farms may require an entirely different set of inputs, services and equipment. The disorganization and economies of scale costs could be high (initially) if such inputs, services, and equipment play an important role in the local farming systems. Again, this is affected by technology. These disruption costs are more likely to be lower in labour intensive systems than in more advanced, integrated and capital-intensive agricultural systems.

There is substantial empirical evidence that these factors have indeed played an important role, in inducing so-called "patterns of transition" with different adjustment processes occurring in labor intensive countries than in land or capital intensive countries (Macours and Swinnen, 2002). There were very large differences in pre-reform technology and relative resource scarcity. The pre-reform land/labor ratio in, for example, Russia and Kazakhstan was many times higher than in, for example, China, Vietnam, Albania, Azerbaijan, Moldova or Romania.

The importance of initial technology/factor intensity in the growth of individual farming is illustrated empirically by Figure 5, which shows a strong positive relationship between the pre-reform labour intensity of farming and the importance of individual farming five years after the start of transition for regional averages. As such, the farm restructuring process, in particular the growth of individual farming, is at least partially endogenous in this transition process.

In countries with labour-intensive technologies there is a strong shift from large-scale collective farming to small-scale individual farming and with it strong gains in technical efficiency with relatively small losses in scale efficiency, as we explained above. For example, in countries such as China, Vietnam, Albania, Armenia, Georgia, and Romania, significant gains in productivity came mostly from the shift to household farming when land was distributed to rural households. In all these countries the man/land ratio was over 0.2 persons per hectare and total factor productivity increased strongly during early transition (between 4 per cent and 9 per cent annually) when individual farming grew from 8 per cent of total land use on average to 84 per cent on average (Rozelle and Swinnen, 2004).[4]

In contrast, in capital and land intensive regions, large-scale corporate farming remained important and productivity gains came primarily from large farms shedding labour with privatization of the farms. For example in the Czech Republic, Slovakia and Hungary, countries in which farming was more capital and land intensive (man/land ratio of 0.14 or less), gains in labour productivity came primarily from large farms shedding labour with privatization of the farms. During the first five years of transition, labour use declined by 44 per cent on average in these three countries (figure 3), yielding an annual increase in labour productivity of 7.5 per cent on average, while individual farms used only 15 per cent of the land.

Another implication of these differential adjustment patterns is that the labor adjustments, as we discussed them above (see figure 3), were strongly correlated with the farm restructuring process; and that both these elements should be seen as parts of a joint

[4] A further argument that can be made on this, pushing the endogeneity argument even further, is that in labor intensive economies, ultimately a land reform process emerged that was conducive to farm individualization. This land reform procedure, i.e. distribution of land in kind to households, often came about only after changes were made to the existing policies, such as in Azerbaijan, Kyrgyz Republic, Moldova, etc., reflecting changes in governments and political economy pressures (Swinnen and Rozelle, 2006).

farm/labor adjustment process.[5] Individual farms often absorbed labor, while large farms, where they survived and faced hard budget constraints, such as in Central Europe, laid off surplus labor. These processes contributed to different restructuring patterns as is illustrated in figure 6. In countries such as in Slovakia, Czech Republic, Hungary and Estonia, this contributed to a massive outflow of labor from agriculture with limited shift to family farming (the CEH pattern in Figure 6). In other countries, such as in Romania and some of the Baltic countries, it contributed to an inflow of labor with a strong shift to family farming (represented by the RLL pattern in Figure 6).

Land Reform and Farm Fragmentation and Concentration

Initial technology and resource abundance were not the only factors that affected farm restructuring. A very important element of the transition process was the reform of property rights, including land reforms. The most important land reform choices were: restitution, distribution in kind (in actual plots), distribution of land shares, and a combination (sequence), e.g. first distribution in shares, then in kind. These differences in land reform choices had also important implications for farm restructuring.

The dominant land reform procedure in Central Europe, the Balkans, and the Baltic countries was restitution of land to the former owners that had lost their rights during the collectivization movement in the past. If the original owners were not alive, reformers restored ownership rights to their closest heirs. Typically land reform laws restituted land to the historical boundaries. If restitution to the original boundaries was not possible, former

[5] See Swinnen, Dries and Macours (2005) for detailed cross-country evidence and an econometric analysis to estimate the role of various factors in this joint process; Dries and Swinnen (2004) for a theoretical model and an empirical analysis of regional variations in Poland; and Macours and Swinnen (2005, 2008) for an analysis of the role of migration in this process and its implication for rural poverty.

owners received rights to a plot of land of comparable size and quality.[6] Distribution of land has been done by allocating physical plots (such as in Albania) or in shares (such as in Russia and Kazakhstan) or first in shares and later in physical plots (such as in Azerbaijan).

There is a complex impact of the land reforms on farm restructuring. Here I limit the discussion to a few important effects. I first argue that land restitution, such as implemented in most of Central and Eastern Europe contributed to the consolidation of large farms, instead of to its fragmentation – as was mostly argued. Second, I argue that the distribution of land in-kind contributed to individualization, and third, that shares distribution has contributed to farm consolidation and, more recently, to a concentration of land ownership, and thus inequality.

Land distribution, labor market constraints and farm fragmentation

Fragmentation of land due to the restitution process is often cited as a constraint on farming. However, evidence suggests that labor market constraints may be a more fundamental cause of fragmentation.

First, fragmentation of ownership may have contributed more to consolidation than to fragmentation of land use. Fragmentation of ownership is very strong in Central Europe (eg Slovakia, Czech Republic and Hungary) while this has not led to a fragmentation of land use, but the contrary is true: farm land is very consolidated through rental agreements. Mathijs and Swinnen (1998) explain how the nature of transaction costs in land markets actually led to a consolidation of land. Restitution in many countries gave land back to individuals that were no longer active in agriculture, most commonly to either former farmers or their heirs. Except for the case in some of the poorer countries, the new landowners did not return to farming and primarily were interested in renting their land. Because the search and

[6] In several countries restitution was combined with other land reform programs, for example, voucher privatization (Hungary), distribution of state land (Romania) or the leasing of state-owned land (Czech Republic).

negotiations costs of identifying individuals that were willing to rent the land were so high, the easiest way for the new land owners to find a renter was to contact those that were already using the land. Consequently, in most cases the new renters became those that had been involved with farming on the large pre-reform farms.

Transaction costs also favoured the large farmers from the point of view of their search for land to rent. Almost all of those that farmed after reform were those that were active in agriculture prior to reform. Most were farm workers or cooperative members. Since land was restituted to people outside agriculture, if they wanted to stay in farming, they were forced to search for the owners of the land and strike a rental contract. However, since the management of the large farms was closely involved in the restitution process, they had an information advantage in identifying the new owners. Transaction costs on both the supply and demand side gave an advantage to large farms. As a result, after restitution, farm size did not fragment as much as had been feared. Although a small farming class did emerge everywhere, many large farms did not disappear and the agricultural sector in several CEE countries remained characterized by a dual farm structure.

Second, a closer look at the fragmentation of land use across Eastern Europe suggests that fragmentation has less to do with the land market than with the labour market. Figure 7 illustrates that land use fragmentation is strongly correlated with the employment structure of the economy. In the mid 1990s there was an almost perfectly linear relationship between the share of land used by very small farms and labour employed in agriculture. Land use fragmentation was a problem mostly in countries where too many rural households had to rely on agriculture.

In-country survey data also confirm that within countries fragmentation of land and small plots are essentially associated with old, often retired, and part-time farmers. For example in Hungary, both larger family farms and large corporate farms in Hungary use

large and consolidated land plots. Commercial farms rent a large share of the land they operate (Vranken and Swinnen, 2006). Hence, this evidence is consistent with the earlier conclusion that if there is a fragmentation problem, it is primarily caused by labour market constraints.

In several countries (eg. Moldova, Bulgaria, Albania) rural households have tried to cope with labor market constraints by migrating to urban areas or to other countries (Macours and Swinnen, 2005). Migration and the associated remittances have contributed to the growth of farming, and to a lesser extent of rental markets, by allowing households to obtain a more productive labor/land ratio, by reducing credit constraints, and by stimulating the supply of land in labor intensive agricultural systems.

Distribution in kind and farm individualization

The distribution of land in specific plots (boundaries) created much stronger property rights for the new owners than with share distribution. The distribution of shares has often implied uncertain property rights and high transaction costs.[7] The stronger rights and lower transaction costs (with distribution in plots) allowed a stronger growth of family farms as it was easier for these new farms to access their land. For example, the distribution of land in kind lead to the rapid growth of family farming in China in the late 1970s, in Vietnam in the 1980s, in Albania in the early 1990s, in Azerbaijan, Kyrgyz Republic, and Moldova in the second half of the 1990s. In all countries, within a few years after the start of the land reform, a large share of agricultural land shifted to family farms. In contrast, where land shares were distributed (e.g. Russia, Kazakhstan and pre-2000 Ukraine), the shift of land use to family farms was much less.

[7] Individuals usually had to declare their intention to start up their own farm in order to take physical possession of their land. However, the barriers to exit were severe as leaving the farm was often discouraged by farm managers and local officials. In addition, in several countries, the share distribution system was accompanied by continued soft budget constraints for the large farms (eg in Ukraine, Russia and Kazakhstan), further reducing incentives for restructuring of the farms.

Land shares and the growth of mega-farms

Another effect of the land share distribution system is that it has allowed a concentration of land ownership, much more so than the other types of land reform. Shares were exchanged without being linked to specific plots. In several cases, workers transferred their land shares to the corporate farm, for example in exchange for employment. When farms were sold, often after bankruptcy, the land shares were now part of the farm assets, and investors who took over the farm became land owners. This process led to the concentration of land ownership, e.g. in parts of Russia and Kazakhstan, with vertically integrated companies owning now hundreds of thousands of hectares of land. In contrast, land distribution in plots and restitution[8] has led to more egalitarian land ownership distributions.

The Role of Factor Market Imperfections and Institutions

Imperfections in output and input markets and existing institutions are particularly important in transition countries, where there are substantial market imperfections and where traditional institutions, for e.g. product marketing and input supplies, have been designed to serve large scale farms. In the absence of such institutions for small scale farms, it is not surprisingly that large scale farms have remained more prominent than would have been predicted based on models from countries where institutions were much more targeted to smaller farms. In countries with a more supportive institutional environment for small-scale farming, the family farms should be expected to be more efficient relative to large corporate farms than in countries where small family farms are a relatively new phenomena.

[8] The ownership distribution following the restitution process depends on the pre-collectivization ownership distribution. This distribution was relatively egalitarian as it was typically preceded by a Communist-imposed land reform which distributed land from large landowners and institutions (such as the Church) to landless peasants and small farmers. The main exception is Albania where the pre-collectivization was very inegalitarian (feudal). This was one of the reasons why restitution was heavily opposed in Albania and the government distributed the land equally to rural households (Cungu and Swinnen, 1999; Swinnen, 1999).

Furthermore, non-traditional farm structures have turned out to be well fitted for this specific environment. For example, at the end of the 1990s in Romania the most efficient farm organization for resource-constrained small farmers were "family societies" in which farmers collectively share in the provision of mechanized services (Sabates-Wheeler, R. 2002). In East Germany, "partnerships" (small groups of farmers in that pooled their effort in certain production and marketing tasks) outperformed all other forms of farm organization between 1992 and 1997 (Mathijs and Swinnen, 2001). In Russia the most successful household farms refrained from registering as "private farms," instead choosing to remain connected in some fashion to large farm enterprises. Such producers use their connections to gain access to inputs, marketing channels and other services in an environment where traditional markets, if any, function poorly (O'Brien, D. and S. Wegren, 2002). Even in Turkmenistan, producers in the early 2000s begun to shift to family-based leasing within the nation's highly regulated environment while at the same time remaining linked to the large farms in order to be able to access basic inputs, services and output channels through the state marketing order system (Lerman Z. and K. Brooks. 2001).

The most extreme version of large corporate farms are in the grain producing regions of Kazakhstan and Russia. There, huge farms have developed as part of vertically integrated agribusiness companies, sometimes owning and operating more than 100,000 hectares have emerged. Scale economies are more important in extensive grain production than in, e.g. vegetable or dairy production. However, the main reasons appear to be transition-specific (Gray, 2000).

A first element is access to inputs. In a very tight capital market these companies control a large part of the liquid financial resources in the regions concerned making it possible for them to farm when many other farm types are not assured access to inputs. They have access to bank lending, apart from their own liquid resources, on the basis of non-

agricultural assets with higher collateral value. Their vertical ownership in the grain market allows them to purchase inputs at the source (e.g., the refinery for fuel) and to avoid barter terms.

A second factor is access to output markets. In northern Kazakhstan, land is not the most critical input in the farming process. It is not surprising that the organization of farming in the north is evolving in a way in which land ownership is almost irrelevant. The new successful farms comprise a set of property and contractual relationships in which land ownership is a peripheral issue. The greatest difference between the large-scale investor-led farms and smaller individual farms and partnership farms lies in the difficulties experienced by the smaller farms in marketing their output.

Third, bargaining power with the (local) authorities, who still intervene in many ways, also played a role. The oblast authorities continued to play a highly interventionist role in agricultural commodity markets, in spite of the greatly reduced role of the state in procurement. In practice such interventions were open to abuse, with favored (large) operators allowed to export grain to neighboring oblasts or to Russia while smaller producers are prohibited, often until all outstanding debts for inputs are paid. Moreover, there was a widespread practice until the mid 1990s whereby local authorities continued to require farms, even after they became producer cooperatives, to engage in production activities which were well-known to be loss-making, especially livestock production. The continued dominance of the seed industry based on state farm production (in the grain sector) tends to perpetuate the single channel system and places farms under the control of the local authorities which continue to determine the physical flows of seed grains (especially when it crosses oblast boundaries). Most farms continue to depend on the local authorities to supply key inputs and for finance for these inputs through the issue of local authority guarantees for the provision of seed and fuel by supplies on a barter basis against the season's production. The increased

size and financial wealth of the large, integrated, grain companies protects them against these state interventions.

Each of these factors affected the relative efficiency of different production structures. While these examples and arguments are specific to the situation we discuss here, the overall arguments appear to be more generally valid and relevant for many other countries and regions in the world where market imperfections are significant and (local) public authorities are not (only) interested in fostering economic development but (also) in extracting some of the rents.

Farm Structures and Vertical Coordination in Global Supply Chains

So far we have mostly drawn lessons from the transition of a planned system to a market based economy in former Communist countries. The second driver of change we will look into is the rapid globalization of food chains which has integrated consumers, food companies, and farmers and has lead to important restructuring in production, trading and marketing systems across the globe and in particular in high value markets which have been spreading to transition and developing countries.

These changes have had important impacts on the types of product that have been demanded and the way the production takes place, and the organization of exchange within the supply chains. In particular, contracting and vertical coordination in supply chains has grown strongly as part of this process. For example, at the end of the 1990s, in the Czech Republic, Slovakia and Hungary, 80% of the corporate farms, who dominated farm production in these countries, sold crops on contract, and 60-85% sold animal products on contract; numbers which are considerably higher than on commercial farms in the US or the EU. A survey by White and Gorton (2006) of agri-food processors in five CIS countries (Armenia, Georgia, Moldova, Ukraine and Russia) found that food companies which used

contracts with suppliers grew from one-third in 1997 to almost three-quarters by 2003. Similarly, contracting and vertical coordination has grown strongly in some of these supply chains in Asia and Africa (Gulati et al 2007, Minten et al, 2009; Swinnen 2007).[9]

Part of these vertical coordination initiatives include the provision of farm assistance programmes to the farms. These farm assistance programmes include a variety of measures, such as credit, transportation, physical inputs, and quality control. However also investment loans and bank loan guarantees are provided in several cases.

A 2005 comparative study by the World Bank came to the conclusion that such vertical coordination programs were important in transition countries for several commodities, and growing in several cases (World Bank, 2005). The study concluded that, for example, in the *dairy* sector, extensive production contracts have developed between dairy processors and farms, including the provision of credit, investment loans, animal feed, extension services, bank loan guarantees, etc. In the *sugar* sector, marketing agreements are widespread, but also more extensive contracts, including also input provisions, investment loan assistance, etc. In both the dairy and sugar sectors, the extent of supplier assistance by processors also goes considerably beyond some of the trade credit and input assistance provided by agribusiness to farms in some developing countries. In *cotton*, cotton gins typically contract farms to supply seed cotton and provides them with a variety of inputs. This model, which is common in Central Asia, resembles that of the gin supply chain structure in developing countries, such as in Africa. However, the extent of contracting and supplier assistance seems to be more extensive in Central Asia, with credit, seeds, irrigation, fertilizer, etc. being provided by the gins. In *fresh fruits and vegetables*, the rapid growth of modern retail chains with high demands on quality and timeliness of delivery is changing the supply chains. New supplier contracting, which is developing rapidly as part of these retail

[9] An exception is China where most of the exchange of food commodities in supply chains is based on spot market exchanges (see Wang et al 2009).

investments, include farm assistance programs, which are more extensive than typically observed in Western markets. They resemble those in emerging economies, but appear more complex in several cases. Finally, in *grains* there is extensive and full vertical integration in Russia and Kazakhstan, where large agro-holdings and grain trading companies own several large grain farms in some of the best grain producing regions.

Exclusion of small farms ?

A key concern is that the process of vertical coordination will exclude a large share of farms, and in particular small farmers. There are three important reasons for this. First, transaction costs favor larger farms in supply chains, since it is easier for companies to contract with a few large farms than with many small ones. Second, when some amount of investment is needed in order to contract with or supply to the company, small farms are often more constrained in their financial means for making necessary investments. Third, small farms typically require more assistance from the company per unit of output.

The concern of the exclusion of small farmers is voiced often and raised in many studies, in particular also in the emerging literature on the impact of the growth of modern supply chains, which emphasize the shift to larger preferred suppliers and the exclusion of small farms (e.g. Reardon et al 1999; Reardon and Barrett, 2000).

However, the early claims on the exclusion of small farms from vertically integrating supply chains were based on limited empirical evidence. Triggered by a vigorous academic and policy debate on these issues a series of new empirical studies have come out that look into this issue using much better empirical evidence than was available a few years ago.[10]

The new empirical evidence from a variety of countries show a largely consistent and much more nuanced picture. The studies generally confirm the main hypotheses that

[10] Sets of empirical studies include case studies in Swinnen (2006) on transition countries and in Swinnen (2007) for a global set of countries; a forthcoming special issue of World Development edited by Tom Reardon, Chris Barrett, Julio Berdegue and myself; and the Regoverning Markets project.

transaction costs and investment constraints are a serious consideration in these chains and that processing and retailing companies express a *preference* for working with relatively fewer, larger, and modern suppliers. However, empirical observations also show a very mixed picture of *actual* contracting, with much more small farms being contracted than predicted based on the arguments above.

For example, surveys in Poland, Romania and CIS find no evidence that small farmers have been excluded over the past six years in developing supply chains (Dries and Swinnen, 2004; van Berkum, 2005). In the CIS, the vast majority of companies have the same or more small suppliers in 2003 than in 1997 (White and Gorton, 2005). Studies on high value export vegetable chains in Africa find in some cases that production is fully organized in small farms (Legge et al, 2006; Minten et al 2009) or fully in large farms (Maertens et al 2008) or mixed in small and large farms (Jaffee, 2003; Maertens and Swinnen, 2009). Also in India small farmers play an important role as suppliers in growing moderns supply chains (Gulati et al 2007). In China, production in the rapidly growing vegetable chains (and in many other commodities) is exclusively based on small farmer production (Wang et al 2009).

There may be variation in the nature of contracts going to different farm structures. Often, supplier programs differ to address the characteristics of these varying farms. For example, in case studies of dairy processors investment support for larger farms include leasing arrangements for on-farm equipment, while assistance programs for smaller dairy farms include investments in collection units with micro-refrigeration units (World Bank, 2005).

Motivations to source from small farms

Hence, despite the apparent disadvantages noted earlier, the empirical evidence suggests that vertical coordination with small farmers is widespread. Furthermore, empirical evidence indicates that companies in reality work with surprisingly large numbers of suppliers and of surprisingly small size. This then begs the question: why, or under which circumstances, do companies work with small farmers despite the costs as indicated above ? From the studies, there appear to be several reasons.

First, the most straightforward reason is that companies have no choice. In some cases, small farmers represent the vast majority of the potential supply base. This is, for example, the case in the dairy sector in Poland and Romania, where the vast majority of farms only have a few cows, and in many other sectors in transition countries. Similarly, in parts of Africa where land is an important major constraint (such as in vegetable producing regions of Madagascar) contracting is mostly with small farms who are the owners or users of the land, while in other regions were land is much less a constraints (such as in part of Senegal) export companies work more with their own farms which are established on easily accessible plots of land. Similarly, in many part of East and South Asia, including China, with a high population pressure on the land, sourcing is often from small farmers.

Second, company preferences for contracting with large farms are not as obvious as one may think. While processors may prefer to deal with large farms because of lower transaction costs in *e.g.* collection and administration, contract enforcement may be more problematic, and hence costly, with larger farms. For example, Van Berkum (2006) concludes that processors repeatedly emphasized that farms' "willingness to learn, take on board advise, and a professional attitude were more important than size in establishing fruitful farm-processor relationships".

Third, in some cases small farms may have substantive cost advantages. This is particularly the case in labor intensive, high maintenance, production activities with

relatively small economies of scale, such as dairy or vegetable production.[11] A fourth reason is that processors may actually prefer a mix of suppliers in order not to become too dependent on a few large suppliers.

Finally, processing companies also differ in their willingness to work with small farms. Some processing companies continue to work with small local suppliers even when others do not. These companies have been able to design and enforce contracts which both the small firms and the companies find beneficial. This suggests that small-scale farmers may have future perspectives when effectively organised.

Endogenous Vertical Coordination and Farm Structures

The evidence presented here suggests an interesting paradox. With the demand of modern supply chains, small farmers may not be able to make the necessary upgrades by themselves without support packages by processors or agribusiness. If there are sufficient (quality) supplies available for processors, they will not be willing to introduce such vertically coordinated (VC) support packages. If there are not sufficient supplies, VC will be forthcoming. Hence, we have the paradoxical situation that small poor farms may be best off (in the perspective of "supply chain driven development") if they are in an environment which is dominated by small poor farms.

There is some empirical evidence for this hypothesis. Companies seem to be most likely to reach out to small farms when they face a supplier base which is dominated by small farmers not able to supply the commodities they want, and least likely when there is a

[11] For example, Key and Runsten (1999) present evidence that small farmers' production costs in Mexican vegetable contract production were 45% lower than that of specialized farms owned by the processing companies. Small farmers had significantly lower labor costs because of access to unremunerated family labor for which markets are missing, and much lower costs of supervising, transporting and recruiting labor input; and because they did not pay any government benefits. And also pest control costs were lower due to better crop monitoring and thereby lower chemical use. Further, small farmers yields in vegetable production were 20% higher than on the firm's own farms.

heterogeneous farm structure with some farms able to deliver the desired supplies. For example, some international dairy companies and foreign investors target larger farms as their preferred suppliers and only reach out to smaller suppliers if they need them to secure supplies.[12]

These developments have major implications for the development of agricultural structures in these countries. As private-sector-driven institutions develop to address these different supplier bases, these institutions will in the longer run have an important impact on the resulting and evolving agricultural structures, with the initial structure having an important impact on the one evolving in the medium term. Hence, the existing differences are not necessarily a transitional (temporary) phenomenon, but are likely to have long-lasting impacts on the agricultural structures, because institutional innovations which are emerging to address the constraints and opportunities posed by the current structures, are "locking-in" the existing structures in a long-run institutional framework.

Farm Structures and Poverty in Global Supply Chains

So far we have concentrated solely on the question whether small farms are able to participate in global supply chains. We have not addressed the issue whether if they are integrated they are able to capture part of the surplus which is created in these global supply chains. Neither have we addressed the issue whether rural households are necessarily better off by participating as small farmers in these modern supply chains than as employees on large scale farms. This particular, and admittedly quite narrow, focus is representative of much of the debate that has taken place on this issue over the past decade, both in academic and policy circles.

[12] It should be noted that "large" is a relative concept, even in neighbouring countries and within a single sector. For example, in Hungary, large dairy farms are farms with a few hundred or thousands of cows, in Poland farms with more than 20 cows, and in Romania farms with more than five cows.

While there was regular mention of the rent distribution issue, very few studies have actually formally analysed or empirically measured the welfare effects for small farms in these chains.[13] Moreover, the issue of potential benefits for rural households through labor markets from large farm employment has been generally ignored.

As far as I know, the only studies which have actually empirically measured income and poverty effects and/or studied the impact of large farm employment are by Maertens and Swinnen (2009) and Maertens et al (2009). These studies find that for the case of vegetable exports in Senegal, rural households benefit strongly from participation as either contract farmer or as worker on large farms. Moreover, the poorest households appear to benefit at least as much, or more, from household members working on the large farms and in the processing facilities. These findings are very important as they put the welfare implications of the small farmer issue in a very different perspective, and they suggest that whether small farms are included in these chains, or not, is unlikely to be a good indicator in itself of the welfare implications.

Conclusions

In this paper we draw lessons from two important global changes in food and agricultural systems over the past 25 years as quasi-natural experiments on the optimality of farm structures. The first is the transition process in former Communist countries from a centrally planned and government organized system to one organized by individual agents and the market. The second change is the rapid globalization of food chains which has integrated consumers, food companies, and farmers and has lead to important restructuring in production, trading and marketing systems across the globe and in particular in high value markets which have been spreading to transition and developing countries.

[13] Some other studies have tried to measure effects on investment and product quality (Dries and Swinnen, 2004) and on indicators of income shortfalls (Minten et al 2009).

The first conclusions are that farm structures that have emerged from the transition process are much more diverse than expected ex ante and that this diversity is to an important extent determined by economic mechanisms which are influenced by a combination of different reform choices and exogenous factors, in particular relative factor endowments, technology, scale economies, market imperfections and existing (pre-reform) institutions.

Relative factor endowments and technology are important. These differ enormously across countries. In relatively labor intensive agricultural systems, the benefits of shifting to family farms (from corporate farms) are larger while the disruption costs are lower. That is why we observe a strong correlation between factor intensities and the growth of family farming: corporate farms remain much more important in land and capital intensive farming. In countries with labour-intensive technologies the shift from large-scale collective farming to small-scale individual farming caused dramatic gains in technical efficiency with relatively small losses in scale efficiency. In capital and land intensive regions, gains in labour productivity, if any, came primarily from large farms shedding labour with privatization of the farms.

Scale economies matter and vary by commodity. For example, grain production tends to have more economies of scale than, e.g. dairy or vegetable production. Therefore, within a country one may observe strong differences in farm organizations. The most extreme example is Kazakhstan where the northern grain belt is dominated by huge farms, while in the southern part of the country one finds much more small farms, e.g. in cotton production.

Third, imperfections in output and input markets and existing institutions are important as existing institutions, for e.g. product marketing and input supplies, have been designed to serve large scale farms. This institutional framework affects the relative

efficiency of family farming and the incentives for household to leave the large scale framework.

Another conclusion is that "non-traditional" farm structures have played an important role during transition since they were relatively efficient organizational forms to address the specific institutional and structural constraints imposed by the transition process. Such organizations may allow farmers to gain access to inputs, marketing channels and other services in an environment where spot markets, if any, function poorly. In summary, corporate farms and "non-traditional" large farming organizations are more likely to be (relatively) efficient in the specific institutional environment and structural conditions of transition. However, the extensive use of land by corporate farms in several transition countries is also influenced by significant transaction costs in the land market, monopoly power in the regional land markets, and property rights imperfections.

Yet, while these structures are strongly influenced by transition conditions, they may have long lasting effects for the development of agricultural structures in these countries. As private-sector-driven institutions develop to address these different supplier bases, these institutions will in the longer run have an important impact on the resulting and evolving agricultural structures, with the initial structure having an important impact on the one evolving in the medium term. Hence, the existing differences may not necessarily a transitional (temporary) phenomenon, but are likely to have long-lasting impacts on the agricultural structures, because institutional innovations which are emerging to address the constraints and opportunities posed by the current structures, are "locking-in" the existing structures in a long-run institutional framework.

Such private sector institutional innovations have come in various ways, but have been important elements of the globalization of modern food chains. These processes have had important impacts on the types of product that have been demanded and the way the

production takes place, and the organization of exchange within the supply chains. In particular, contracting and vertical coordination in supply chains has grown strongly as part of this process. Where these chains have emerged they have introduced vertically coordinated systems to help to overcome production constraints of their suppliers and as such enhance the quantity and quality of their supply base. Examples of these are extensive and interlinked contracting systems.

Partly as a result of these initiatives there is more diversity than often argued in the farms that are integrated in global food chains. A series of recent empirical studies which are based on more rigorous data collection and analysis show that there are both large and small farms involved production for these chains. A substantial share of the suppliers in these globally developing supply chains are small farmers, but there are regions and sectors where large farms are the dominant suppliers of produce in these chains.

A final conclusion relates to the welfare and poverty effects of the farm structures in these supply chains. Emerging evidence suggests that arguments using farm structures as an indicator of the welfare or poverty effects of the globalization of food chains may be misleading and that the very poor may benefit as much or more from working on large scale farms than from their potential role as small farmer in these chains.

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Appendix

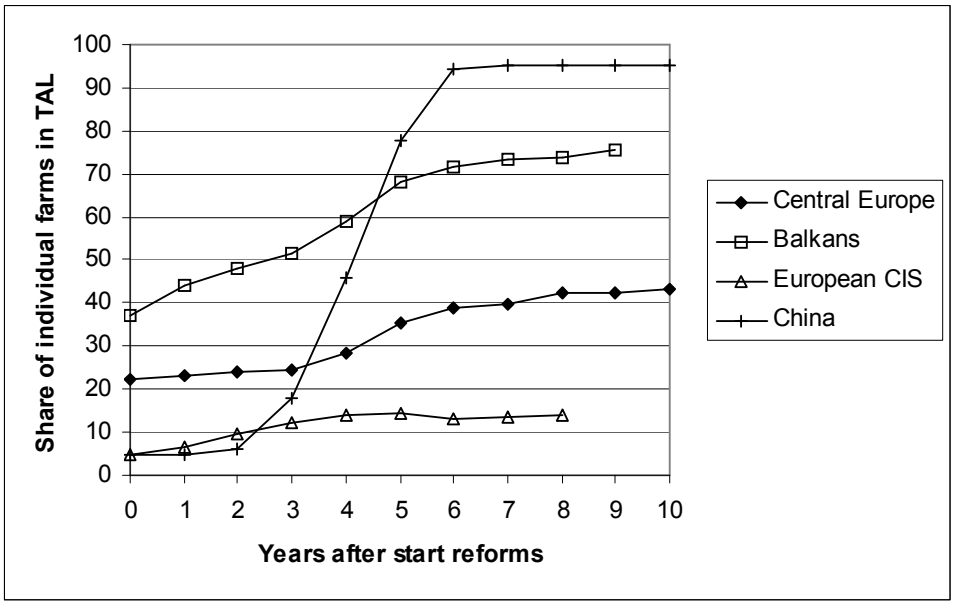
Some farm characteristics of the EU-15

More than half of farmers are older than 55 years.
Three quarters are part-time farmers.
96% are family farms.
59% of all farms cultivate 5 hectare or less.
3% of all farms cultivate more than 100 hectares.
75% of all Mediterranean farms cultivate 5 hectare or less.
75% of Portuguese cattle herds have less than 5 cows.

Source: Eurostat

Figure 1. Transition and farm structures

a. Change in the share of agricultural land used by individual farms (%) over first 10 years of transition by region



b. Importance of corporate farms (% land use) after 10 years of transition

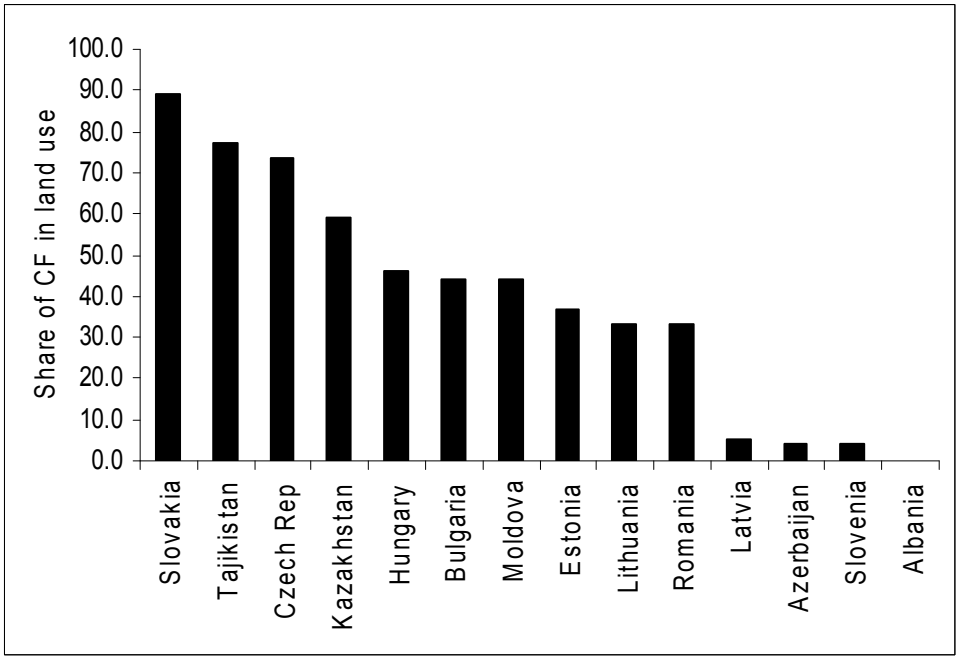


Figure 2. Agricultural output by farm organization in Russia, 1989-2002 (%)

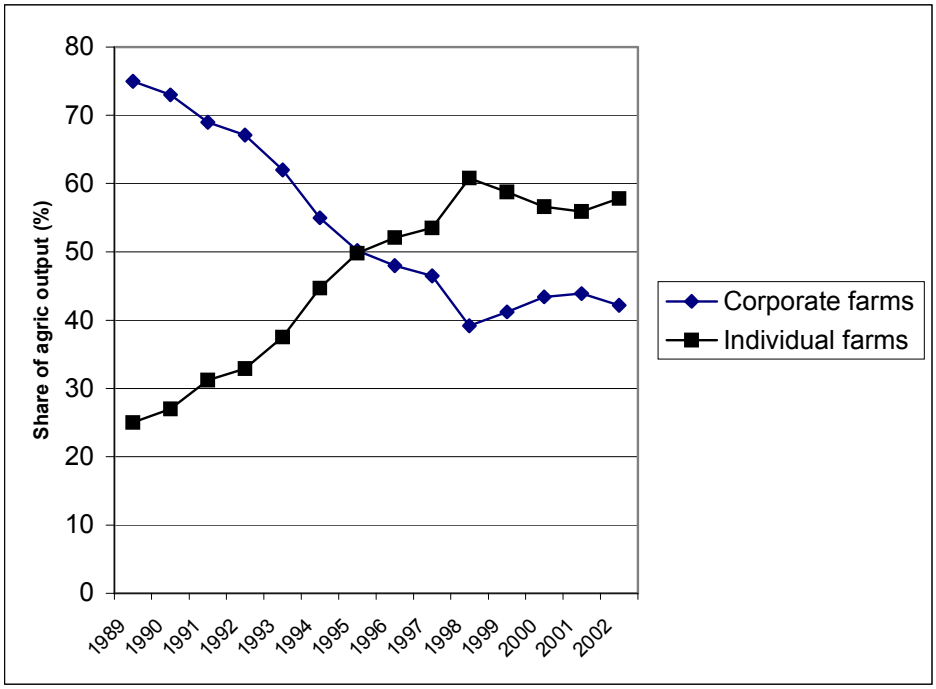
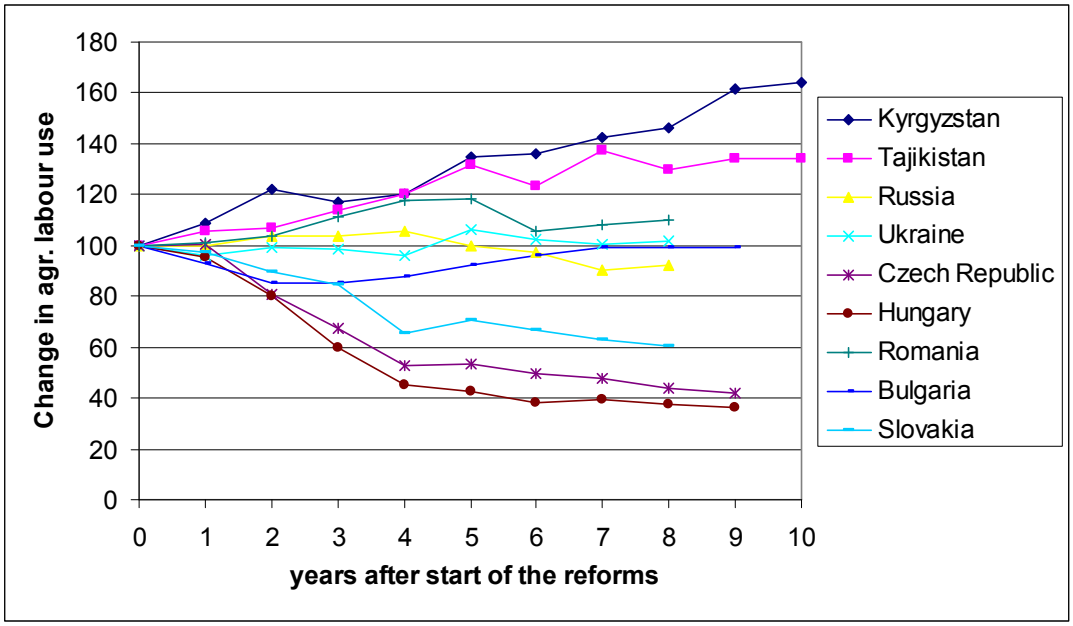


Figure 3: Labor adjustment and farm restructuring in transition

a. Country variations



b. Regional variations within Poland

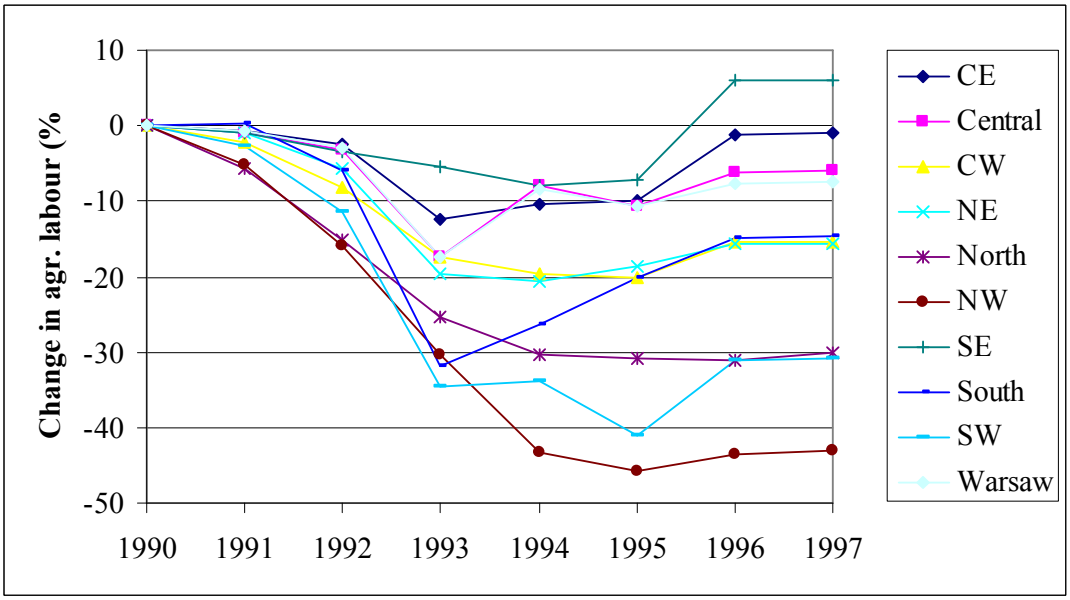


Figure 4. Costs and benefits of the shift to individual farming

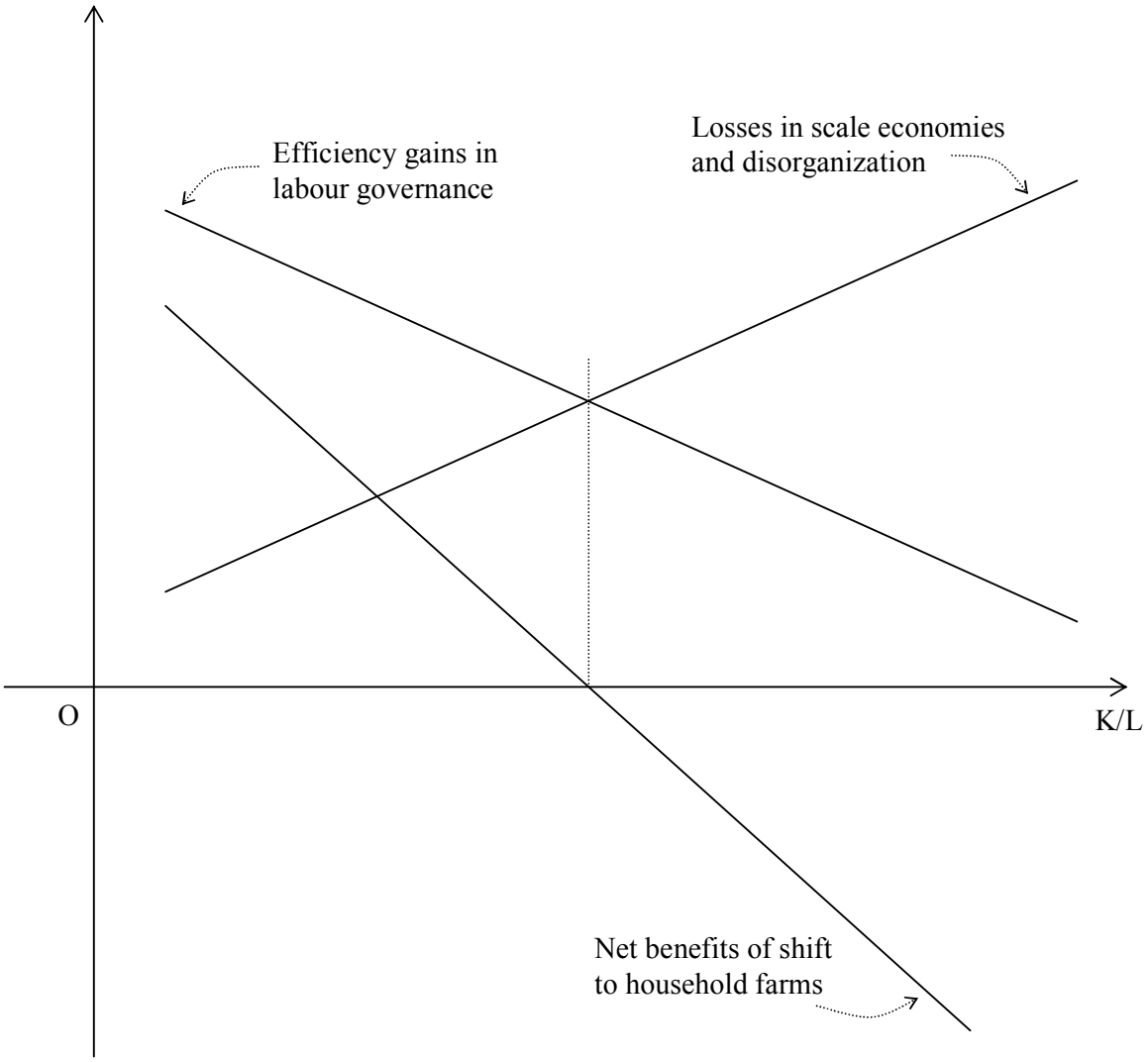
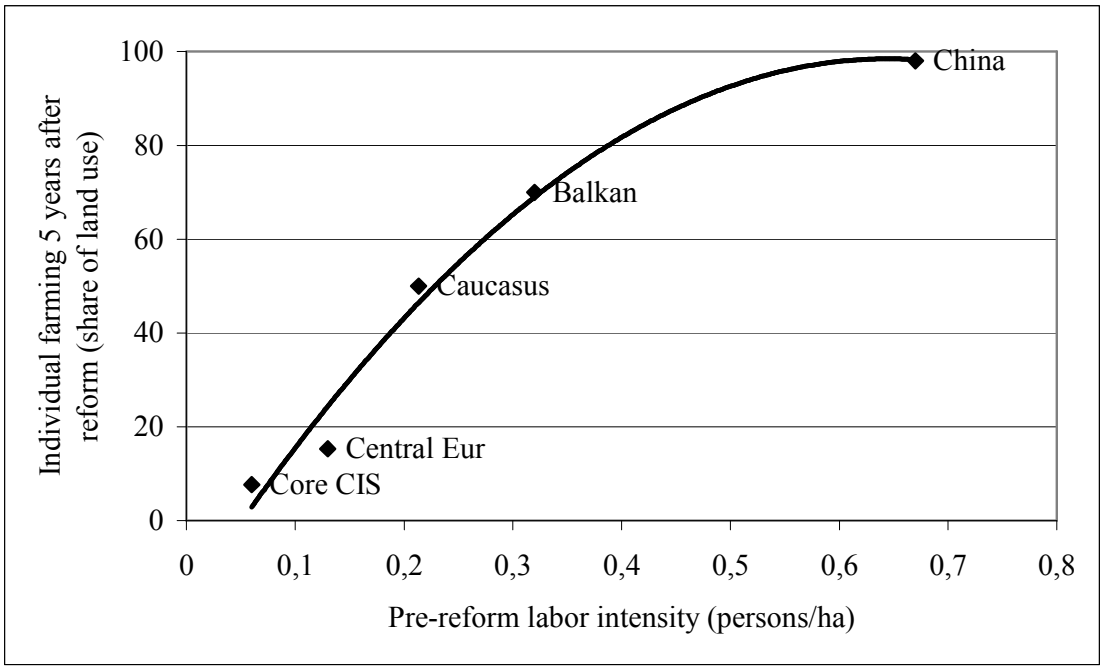
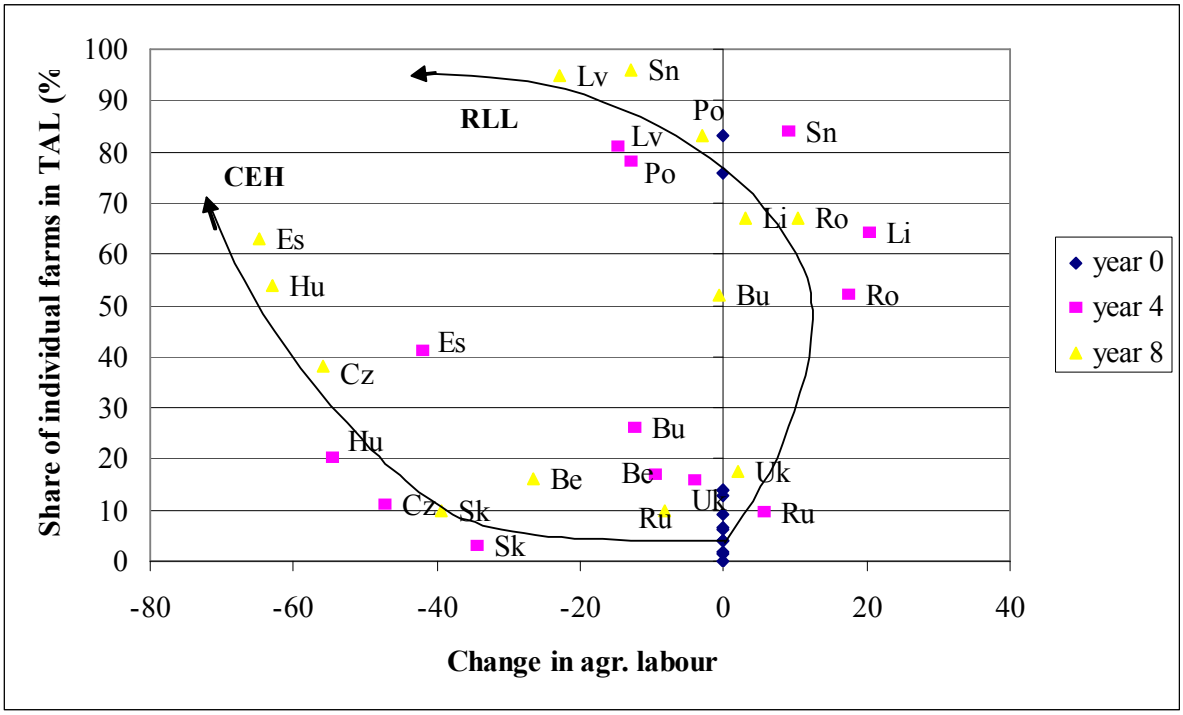


Figure 5 Pre-reform technology and the growth of individual farming



Source: Swinnen and Rozelle (2006)

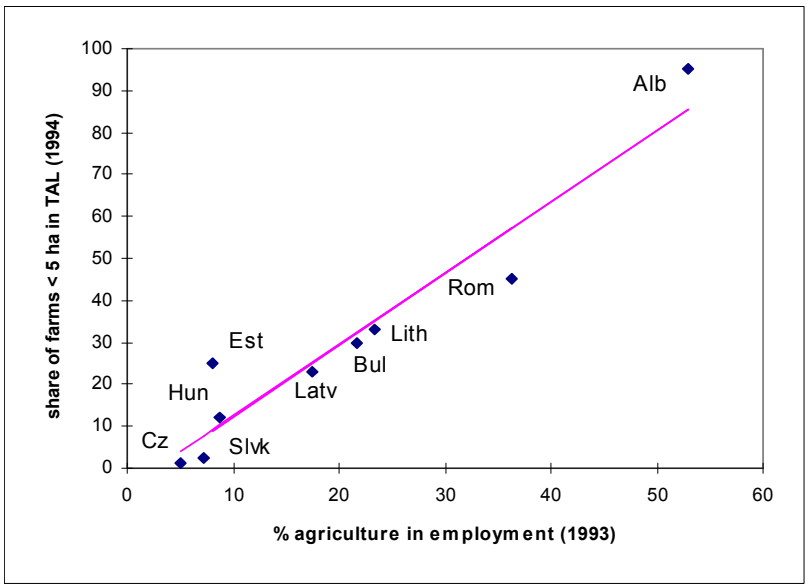
Figure 6 : Patterns of joint labor adjustment and farm restructuring in Central and Eastern Europe



Notes:
- CEH is average of Czech, Estonia, Hungary, RLL is average of Romania, Latvia, Lithuania
- 8 years after reforms is 1997 for CEEC, except Slovenia (1996), and 1998 for FSU
Source: Swinnen et al (2005)

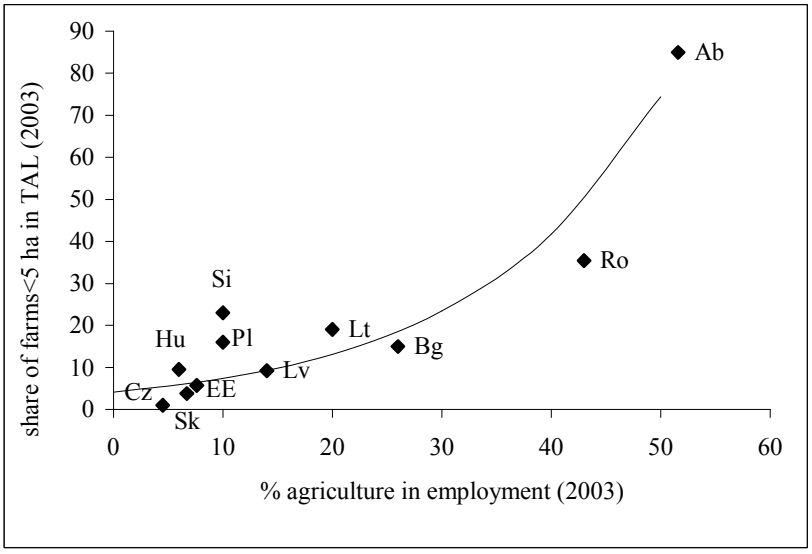
Figure 7. Farm fragmentation and the share of agriculture in employment

A. in 1993



Source: Mathijs and Swinnen, 1998

B. in 2003



Source: Swinnen and Vranken, 2005