

# Critical masses in the decollectivisation of post-Soviet agriculture

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## Summary

Decollectivisation in post-Soviet agriculture has generally been slow except for islands of complete individualisation. Our model interlinks two types of critical mass phenomena that can explain these outcomes. First, positive network externalities reshape decollectivisation incentives after a sufficient number of reform pioneers shift to private farming. Second, workers have preferences for behaving in conformity with their social reference group. This allows collective farm managers interested in cementing their own power to manipulate reference groups by limiting workers' horizons. We provide empirical support with a threshold regression based on a unique data set of regional reform outcomes in Moldova.

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**JEL classification:** D23, O18, P32, Q15

## 1. Introduction

After more than one and a half decades of agricultural transition in the former Soviet Union, economists continue to be puzzled by the lack of change in farming organisation in many important successor countries. Former collectives changed their sign on the door, but kept the former management and engaged in very little internal restructuring (Lerman *et al.*, 2004). This persistence is surprising to those who expected that privatisation was the key to

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efficiency and income improvements in agriculture. But equally surprising is a sharp variation in the extent of decollectivisation even within relatively narrow geographic areas. For example, collectives were completely dismantled in *some* of the Soviet successor countries, such as Albania or the Trans-Caucasus. In Russia and Moldova, there emerged islands of full privatisation in a sector dominated by collective farm successors. In the latter regions, socialist farms were split into smaller units and individual operators became residual claimants.

Standard explanations for the lack of restructuring rely on a core set of economic factors. Some authors argue that the existing farming technology was relatively capital-intensive and was not suitable for individualisation, so that it was highly dependent on a web of input and output channels and high disorganisation costs were to be expected. Furthermore, decollectivisation would have meant the end of subsidies and governmental protection, and would thus have increased the risk for private farmers (Swinnen and Rozelle, 2006). While these explanations are no doubt important, they cannot explain variation within relatively homogenous countries or regions where these conditions do not vary.

In this article, we suggest that a full understanding of decollectivisation requires a model that admits multiple equilibria. Based on recent evidence on the farm restructuring process, we argue that the interlinkage of two types of critical mass phenomena can provide such a model. The first is the existence of a network externality. It captures the idea that the development of a supportive political and economic framework, for example in terms of public services and the emergence of suppliers and processors geared to small-scale producers, requires a sufficient number of reform pioneers in order to become viable. At the same time, mutual learning and skill acquisition reduce uncertainty for reforming farmers. Our second argument is related to the often overlooked personal interests of the collective farm director. Directors benefit from the pre-reform status quo, because it assures them access to income, local power and prestige. Assuming that workers have preferences for behaving in conformity with peers, managers may find it expedient to manipulate their workers in a way that they reject any organisational change as being not conform with the norm. Following Schaffner's (1995) analysis of Latin American land reform, we call this 'limiting the horizon of farm workers'.

In the sequel, we motivate our hypotheses more thoroughly (Section 2) and develop a formal model of the two counteracting network effects (Section 3). It applies to countries with redistributive de-collectivisation policies, as opposed to countries that opted for restitution to former owners.<sup>1</sup> A regional equilibrium is derived in which either all corporate farms in a homogeneous

1 In a simplifying view, asset redistribution, at least formally, provided a fairly large but well-defined group of rural residents the option to appropriate a share of formerly socialised assets. It was practised in all countries of the Commonwealth of Independent States (CIS) and in some Central European countries, notably in Albania. Restitution, on the other hand, restricted the group of eligible recipients and introduced former and possibly absentee owners or their heirs

agricultural area remain intact or all farms are dissolved (Section 4). We use threshold regression methods based on a unique data set of regional reform outcomes in Moldova to provide empirical support for our propositions (Section 5). More conclusive testing between the two mechanisms will require additional empirical work, as we discuss in the final section of the paper.

## 2. Network effects and limited horizons in the decollectivisation of post-Soviet agriculture

Evidence on the presence of network effects comes from one of the few regions in Russia where an almost complete transition to private farming took place. As described by Pallot and Nefedova (2007: 176–183), the Lysye Gory district in Saratov oblast has been dominated by private farms since 1991. As an exception to the rule, the former state farm director was the initiator of the farmer movement there, as he had not been on favourable terms with the local Communist party in the 1980s. Together with the shares of other family members, he set up the first private farm. Two further specialists from the former state farm followed suit in establishing independent enterprises. All were able to exploit their previous contacts to obtain inputs and loans. Farming practices were adjusted to technological and economic constraints, which meant the widespread abandonment of commercial animal husbandry. Cereal yields on private farms soon equalled or exceeded those of the former state farm and new brick-built farmhouses were erected in the middle of the farms. In turn, 70 former employees of the state farm followed these examples and set up peasant farms. Pallot and Nefedova (2007: 182) comment on these developments as follows:

The withdrawal of key personnel from *kolkhozi* and *sovkhozi* shifted the balance from the old-style Soviet collectivist enterprises to new farm businesses until a tipping point was reached when new farm formation became a mass movement. . . . In the early days, workers were reluctant to quit agricultural enterprises for private farms because of loyalty to their parent farm and, probably more importantly, because they lacked confidence that the reforms would not be reversed. By the middle of the 1990s as private farms bedded down and agricultural enterprises defaulted on wages, these inhibitions began to be overcome and work on private farms became sought after.

According to this description, in the absence of a sufficient number of reform pioneers, private farming would never have become a ‘mass movement’. However, if there is such economic potential in individualised agriculture, why is this critical mass so rarely emerging?

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as additional stakeholders. This mode of restructuring prevailed in most other European transition countries (Lerman *et al.*, 2004: 85–93).

To address this puzzle, our second argument is related to a strategy of limiting horizons of farm workers. Managers keep away the image of an independent peasantry from their workers' minds in overt and subtle ways, for example by withholding information concerning privatisation rights, preventing political organisation of reformers, not allowing outsiders to invade the village or start businesses with defecting workers, and by stressing the necessity of 'collective solutions' to problems.

A recent monograph by Allina-Pisano (2008) on decollectivisation in Ukraine and Russia argues that collective chairmen signalled apparent compliance with reform legislation to the national government but locally shielded workers from any meaningful change. The study provides extensive evidence for what we call limiting of horizons. The author reports how reform-willing farm workers were deliberately excluded from public meetings or denied meeting space (p. 67), how agenda setting by managers in these meetings prevented discussions of independent farming as a viable alternative (p. 69), how land ownership certificates were kept in the collective farms' safes rather than handed out to workers (p. 71) and how managers intervened through back room deals with local state officials to prevent land distribution to individuals (p. 86). The author describes how chairmen of collective farm successors and other local authorities were attempting to turn public opinion against private farming by launching critical articles in the local press, publicly belie it as something strange, suspicious and worthy of ridicule, up to acts of open violence against family members of private farmers. Furthermore, it is shown how authorities used the notion of the stranger and outsider as an instrument to drive a wedge between the (loyal) rural population and private farmers. The fact that many of these independent farmers emerged from marginal groups of the rural society, such as single women or members of ethnic minorities, was publicly denounced, and representatives were insulted and called 'Gypsies' (pp. 102–110). In addition, Allina-Pisano (2008) mentions the difficulties national governments or international agencies had in administering reform-related surveys to farm workers, as managers were attempting to direct the enumerators to those who were instructed to give 'correct' answers. The author herself was regularly denied the opportunity to talk to workers about their access to individual land shares: 'one farm director "categorically objected" because he did not want members of his collective to "get any ideas"' (p. xxii).

Given this evidence, the central hypothesis of the article is that successful decollectivisation depends on whether or not a critical mass of reform willing workers exits from the collective. This critical mass has a material and a psychological implication: it allows newly independent farmers to reap network externalities *and* establishes a new conformity-inducing norm. While the material network effect establishes the necessary conditions for large-scale individualisation, it is not sufficient to set this process in motion. Workers must also be willing to enter it, which they are unlikely to do if the farm director systematically limits their horizons in order to alienate them from the reform alternative.

### **3. A model of organisational choice in post-Soviet agriculture**

This section puts forward a formal model in which the strategic choices of collective farm managers interact with workers' loyalty decisions to determine the organisational structure of agriculture. The model captures two forces that make workers' decisions interdependent, one material or objective, and the other preference-based or subjective. We show that the interdependence created by these forces can create multiple regional equilibria, one characterised by a predominance of large-scale collective farms, and another characterised by small-scale family farms. We use the model to develop specific testable hypotheses that we empirically explore in Section 4.

#### **3.1. Collective farm loyalty and social utility**

Introspection and casual empirical observations confirm that a human tendency for conformity is ubiquitous in everyday life. According to Aronson (1992: 13–33), conformity is reinforced if the majority of the group has an unanimous opinion, if the other group members are important and comparable with the individual or if the individual fears social punishment by peers. Schaffner (1995: 249) hence argues that it is particularly strong in rural communities where the individuals' work, kinship, social and religious groups are almost coincident. In addition, people have a tendency for conformity if the environment of the individual becomes increasingly uncertain, so that the behaviour of others provides guidance on what is the right thing to do (Aronson, 1992: 28). In the transitional context of farm restructuring in the CIS, this is likely to be a relevant factor. It is therefore not surprising that a number of studies have found evidence in favour of deeply rooted preferences for group conformity in rural areas of the former Soviet Union. Leonard (2000) gives a summarising account of the tradition of communal land ownership and management in pre-Soviet Russia. The strong social consensus on the rules of the contemporary Russian village is described by Paxson (2002), who mentions the moral obligation to work together and to help each other in the village community; and a generally strong emphasis of reciprocity. She also reports that the subordination of one's own will to that of the group is a virtue explicitly endorsed by villagers.<sup>2</sup>

Despite its intuitive plausibility, economists have only recently paid attention to the formal modelling of social interaction effects (e.g. Brock and Durlauf, 2001). One approach is to split the utility function into a standard material component and an additively separable social component, where the latter rewards conformity (penalises deviance) from socially normal

2 Schmemmann (1997: 314) writes, based on experiences in a central Russian village: 'The communal mentality of the prerevolutionary countryside was only strengthened by collectivisation, and those peasants who stayed on the land stayed there precisely for the sense of collective security offered. To grab a large piece of land for oneself and to milk it for money was to spit in the face of the collective and to lose its protection'.

behaviour. Furthermore, it is commonly assumed that deviations far from normal or group average behaviour are penalised more strongly.

Workers in our model must make a binary choice whether to remain loyal to the collective farm ( $\lambda = 1$ ) or to withdraw their resources from the collective and enter private, small-scale farming ( $\lambda = 0$ ). Workers are assumed to act to maximise the expected value of their well-being as given by the composite utility function  $V$ :

$$V \equiv u(y(\lambda)) - \alpha v((\lambda - \bar{\lambda})^2), \quad (1)$$

where  $u(\cdot)$  is conventional individual material utility and  $v((\lambda - \bar{\lambda})^2)$  is social utility. The term  $\bar{\lambda}$  measures average or normal behaviour in the individual's social reference group. We assume that  $u', v' > 0$ , and the parameter  $\alpha \in [0 \dots 1]$  denotes how much the individual cares about group conformity. Individual income,  $y(\lambda)$ , is given by:

$$y(\lambda) = \begin{cases} w & \text{if } \lambda = 1 \\ \pi(\lambda^r) & \text{if } \lambda = 0 \end{cases}, \quad (2)$$

where  $w$  is the certain wage received as a collective farm worker, and  $\pi$  is the stochastic net income the individual receives as a private farmer. As will be discussed in Section 3.3,  $\pi$  depends on  $\lambda^r$ , the fraction of local farm workers who remain loyal to the collective.

Equation (1) formalises the idea that if  $\alpha > 0$ , individuals have preferences for conformity with their peers and in doing what is the normal thing to do in a given social reference group. Both increasing positive or negative deviations from group average cause increasing discomfort, but there is no discomfort if everybody in the group behaves identically and chooses the same  $\lambda$ . As a result, outcomes will likely be homogenous within a social reference group, but may be radically different between groups.

### 3.2. The geography of social reference groups

We distinguish two groups that may constitute the social reference group and influence the behaviour of villagers. We denote these as *regional* and *national* groups. The regional reference group is the community of people living in geographical proximity to the individual. We pragmatically identify this with the district or *raion*, which has been the lower level of the two-tiered administrative system throughout the former Soviet Union. In most rural regions of Ukraine and Russia, each collective farm forms the economic and social centre of a village, and a *raion* contains a dozen or so collective farms. Sociological field work in rural Russia has shown that there has been some mobility within localities, for example because villages were abandoned by the government and the population forced to relocate to nearby places. However, most rural people spend their entire life in a certain area, where they are surrounded by their relatives (O'Brien *et al.*, 2000: 95). People

living in a region are more likely to meet in person on a regular basis and hence form a natural social reference group.<sup>3</sup> Social interaction within this reference group, and information flow in particular, is hard to manipulate by local authorities.

As a second potential reference group we posit a wider, potentially non-rural population that provides an alternative blueprint for what is the right thing to do and how to behave. Russian language has adopted the anglicist term *fermer* for this group, as used in public discourse and official statistics. It identifies the vision of an independent peasantry with a reform-oriented, urban majority, and with family farms in Western Europe or North America, which are presented as a model for agricultural restructuring. With regard to de-collectivisation in agriculture, the mode of behaviour of this social reference group is codified in the national reform legislation, which gives an individual worker the right to leave the collective and withdraw his/her assets. In countries with a strong tradition of individualised farming prior to collectivisation, the members of former generations may constitute part of the reference group. Information about this social reference group is primarily transmitted via the media, through television or newspaper, through tradition, but also via agents of change who enter a community, in village congregations, or by word of mouth.<sup>4</sup>

In contrast to the narrow reference group, interaction with the wide reference group can be influenced by the local farm manager. He may or may not 'limit the horizons' of his workers. As discussed in Section 2, managers may treat reform ideas (and those that live them) as strange, inappropriate and foreign. They may also withhold information concerning privatisation and other civil rights, prevent political organisation of farm workers, exclude outsiders ('change agents') from the village, inhibit the creation of support networks or businesses for private farmers, frighten defectors and stress collective identity and local 'collective solutions' to problems. The degree to which the manager keeps horizons limited determines how strongly farm workers identify themselves with the wider, reform-minded reference group or whether they identify their regional compatriots as their appropriate reference group.

Any individual's social reference group will thus be a weighted average of the loyalty norms of both the regional and national groups:

$$\bar{\lambda} = \theta\bar{\lambda}^r + (1 - \theta)\bar{\lambda}^n, \quad (3)$$

3 In addition, many regions are homogenous in ethnic terms, some of them officially recognised as autonomous areas subject to the ethno-territorial principle of both the former Soviet and the current Russian constitutions (Stadelbauer, 1996: 42–49).

4 In Russia, this reference group has been represented by the reform-oriented Association of Peasant Farms and Agricultural Cooperatives of Russia (AKKOR). According to Wegren (1995: 28–29), AKKOR had a network of branches in every oblast by the mid-1990s. Since its foundation it has held annual congresses and publishes an own weekly newspaper, *The Russian Farmer*. It supports private property and freedom of land use. Although its primary constituents are private peasant farmers, it appears to have more support in urban than in rural areas. Similar movements exist in other CIS countries, see Section 5 on Moldova.

where  $\bar{\lambda}^r$  is the fraction of the regional group that maintains loyalty to the collective,  $\bar{\lambda}^n$  is the loyalty norm of the national reference group and the weight  $\theta$  is a term that can potentially be manipulated by the collective farm manager as discussed in Section 3.4. In what follows, we will assume that the national reference group is at least moderately reform-minded on average, so that  $\bar{\lambda}^n < 0.5$ .

### 3.3. Positive network externalities in private farming

In the context of farm restructuring, positive network externalities mean that as more workers of a given locale turn to private farming, the easier will be the access to technology suitable for these new types of farms as well as to supportive suppliers and processors. These effects can be interpreted as reflecting economies of size in reorganisation. If a collective ceases to function and smaller farms emerge, this involves substantial fixed disorganisation costs for the shareholders: large machinery can no longer be used, up- and downstream market channels are disrupted and the organisational knowledge to run a different way of farming may not be there. However, as more farms of a new type emerge, the more likely is it that alternative solutions which are viable for small farms will develop.<sup>5</sup> Also public services, including appropriate extension, are more likely to adjust to the needs of private farmers, and mutual learning and cooperation among these entrepreneurs will be possible.

In the model, ‘disloyal’ workers who opt to become farmers receive an uncertain net income from private farming,  $\pi(\bar{\lambda}^r)$ , where  $\bar{\lambda}^r$  is the share of loyal workers in region  $r$  who have not taken up private farming and have loyally remained on the corporate farm. Individual income  $\pi$  is a random variable with mean given by  $\bar{\pi}(\bar{\lambda}^r)$  and variance  $\sigma(\bar{\lambda}^r)$ . Reflecting network externalities, we assume that  $\pi' \leq 0$ ,  $\sigma' \geq 0$  so that  $Eu(\pi)$  unambiguously increases as  $\bar{\lambda}^r$  increases. We further assume that each individual takes  $\bar{\lambda}^r$  as given and allocate other variable inputs to maximise expected utility, but abstract from explicitly including this decision into the model.

### 3.4. Workers’ and managers’ choice

Against this backdrop, farm managers allocate the labour force of their collective farms,  $N$ , and other assets to produce composite farm revenue, by using a given technology. A collective farm’s assets are the sum of all the individual asset shares that have not been withdrawn by disloyal workers. Loyal workers receive an annual wage,  $w$ . Labour contracts can be enforced costlessly by the corporate farm manager and there is no other employer in reach for farm

5 Gorton *et al.* (2003) report the growth of a new cluster of local food processing firms in response to the emergence of peasant farms in Moldova and Ukraine. These firms process products that are specific to small farms and offer complementary services to them.

workers than the local corporate farm.<sup>6</sup> The manager is assumed to be the residual claimant of farm profit.<sup>7</sup> The manager is also the political authority of a village and therefore benefits from the loyalty of farm workers, who support him politically, perpetuate the existence of the collective farm and thus secure his income and local power. Although not modelled formally here, benefits for the manager may also be of a psychological nature.<sup>8</sup> In the following, we focus only on the loyalty decision of workers and simply assume that all other production factors available to the manager are allocated in a standard profit-maximising way, hence generating a (certain) gross profit of  $\Pi$  for the manager.

In order to maintain loyal workers, managers must assure that the utility a worker can attain as a loyal collective farm member,

$$V(\bar{\lambda}^r, \theta, \alpha | \lambda = 1) = u(w) - \alpha v((1 - \bar{\lambda})^2), \quad (4)$$

is no less than the expected utility that the worker could attain as a private farmer,

$$V(\bar{\lambda}^r, \theta, \alpha | \lambda = 0) = E[u(\pi(\bar{\lambda}^r))] - \alpha v((0 - \bar{\lambda})^2). \quad (5)$$

The requirement that (4) exceeds (5) can be used to define a minimum participation wage,  $\tilde{w}$ , defined as:

$$\tilde{w}(\bar{\lambda}^r, \theta, \alpha) \equiv \{w | u(w) = E[u(\pi(\bar{\lambda}^r))] - \alpha [v((0 - \bar{\lambda})^2) - v((1 - \bar{\lambda})^2)]\}. \quad (6)$$

Note how the level of  $\tilde{w}$  is influenced by both the certainty equivalent of private farm income and the adjustment for social utility. For a high level of  $\bar{\lambda}$ , the latter term is negative for a prospective non-conformist private farmer, and positive for a non-conformist loyal worker. Thus, the loyalty preserving wage level can be lower if all workers in the social reference group remain loyal, while it must be higher if all individuals in the group leave the collective.

As expression (6) makes clear, the participation wage the manager must offer to attract workers decreases if workers' social reference group can be restricted to a group of largely loyal, collective farm supporters. Being aware of social reference group effects among his/her workers, a manager

6 Migration as an alternative option is hence not considered. In the mid-1990s, as living standards in urban centres often declined faster than in rural areas, urban-rural migration in fact was a common trend in Russia (O'Brien *et al.*, 2000).

7 Little is known about the remuneration of the core management of corporate farms. Koester (1999: 216) reports that many of the farm chairmen appear to enjoy a respectable living standard despite the poor economic situation of agriculture. It is hence assumed that they are the *de facto* residual claimants of profits.

8 Psychological benefits may arise because managers enjoy being the 'head of a commune' (Amelina, 2000: 503). The manager may also have a preference for seeing agricultural production organised in corporate farms. This could be the case if he/she has professional concerns that the farm's dissolution will be economic mischief and lead to a food crisis.

can deliberately keep the horizon of farm workers limited by sheltering them from the national reference group and by exerting explicit or implicit political and social pressure on them, as described above.

Formally, we assume that at some cost, the manager can manipulate the local reference group weight,  $\theta$ , given in expression (3).  $\theta$  takes on the value of one if the manager fully limits workers' horizons so that they evaluate their behaviour against the typical behaviour of all other workers in their region – i.e.  $\bar{\lambda} = \bar{\lambda}^r$ . If managers do not attempt to limit workers' horizons, then we assume that media and other influences push workers' social reference group towards that of the national reference so that  $\bar{\lambda} = \bar{\lambda}^n$ .

The cost function  $C^\theta = C^\theta(\theta, R)$  gives the costs associated with limiting horizon. Costs may arise from own political activity of the manager to turn down reform-minded influences from outside the region, or bribes to public authorities who might stand up for civil rights of workers. This function depends on a vector of regional characteristics,  $R$ , that includes the existence of conservative versus reform-oriented political networks in a given region, strength of collective versus individual traditions, distance to urban centres, climatic and technological dimensions of agricultural production, etc. (such differences are discussed, for example, by Amelina, 2000). It is assumed that  $C_1^\theta > 0$  and  $C_{11}^\theta > 0$ , implying that it is marginally costlier to achieve higher levels of sheltering. The survival of the corporate farm in a given village depends on the ability of its manager to assure loyalty of a sufficient number of workers in that village, subject to a budget constraint.

Assembling these pieces, the optimisation problem for a manager in village  $j$  in region  $R$  is:

$$\text{Min}_{\theta, w} C^m = wN_j + C^\theta(\theta, R), \quad (7)$$

subject to:

$$w \leq \frac{\Pi - C^\theta}{N_j} \quad (8)$$

$$w \geq \tilde{w}(\bar{\lambda}^r, \theta, \alpha) \quad (9)$$

where constraint (8) defines the corporate farm's budget constraint and constraint (9) defines the loyalty participation constraint (LPC). Equations (7)–(9) thus determine least-cost loyalty elicitation for the manager.<sup>9</sup> Managers cannot maintain the collective farm if the spending on wages plus limiting of horizons exceed farm profits.

9 Minimising the cost of loyalty elicitation yields the first-order condition:  $C_w^m/C_\theta^m = LPC_w/LPC_\theta$ . The left-hand side describes an isocost curve of securing loyalty. The right-hand side describes a loyalty indifference curve, that is the locus of all  $\theta, w$  combinations where the joint effect of  $\theta$  and  $w$  just suffices to make  $V(\lambda = 1)$  as high as  $V(\lambda = 0)$ . Given our assumption about the costs of limiting the horizon, the isocost curve has a concave shape. Formally, this resembles the standard least cost allocation of factors in the theory of the firm, whereby the manager's task here is to minimise the cost of keeping workers loyal.

#### 4. Regional reform equilibrium with critical mass effects

The prior section has laid out the basic structure that determines workers' and managers' choices. However, these choices are not independent, and this section considers the distinctive types of regional equilibria that can emerge.

The effects of modifying the three parameters  $\bar{\lambda}^r$ ,  $\theta$  and  $\alpha$  can be studied in Figure 1a–c. It displays the wage workers require to remain loyal as a function of the regional share of loyal workers,  $\bar{\lambda}^r$ . The downward sloping line in each graph hence denotes the participation wage  $\tilde{w}$  defined by (6).

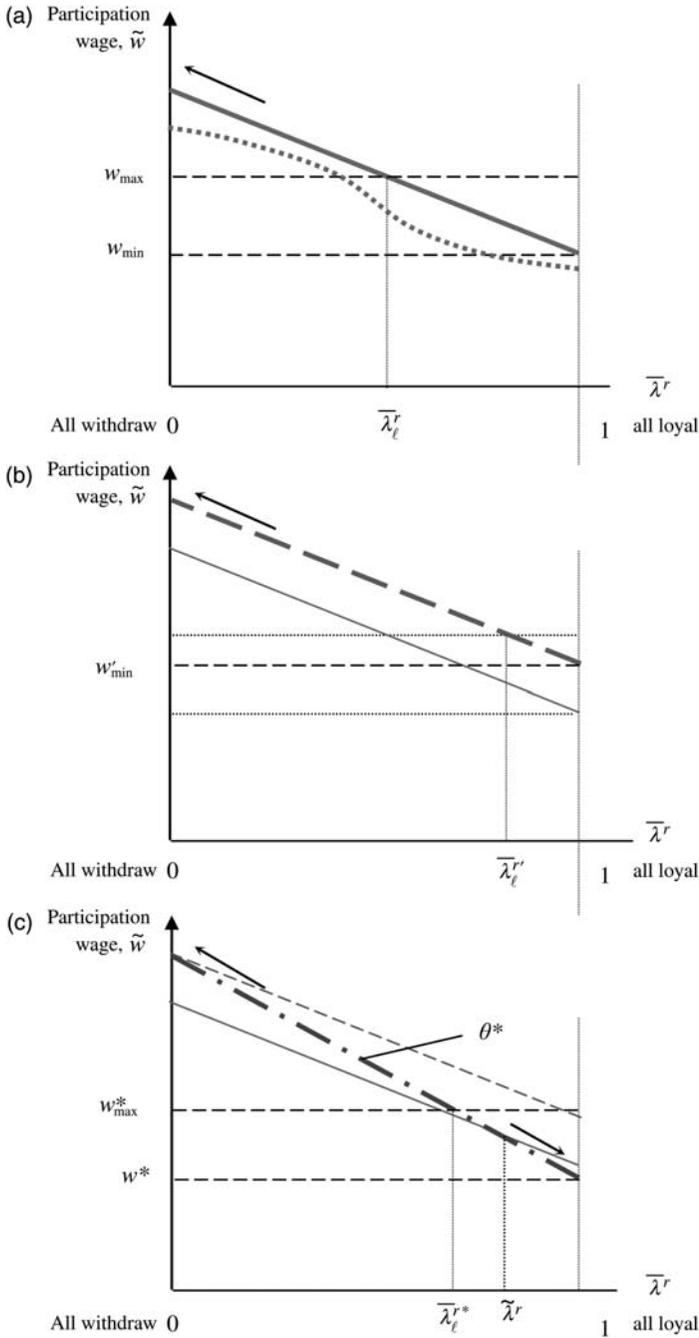
Figure 1a assumes that there is no social utility effect and no limiting of horizons (i.e.  $\alpha = 0$ ,  $\theta = 0$ ). The solid line shows the pure positive externality effect of each worker's loyalty decision, driven by the productivity of private farming,  $\pi$ . It illustrates how positive network effects from establishing independent private farms lead to higher pay-offs if more workers choose to exit. Wage payments higher than  $\pi$  imply that workers remain loyal, whereas payments lower than  $\pi$  lead workers to withdraw.

The term  $w_{\min} = \{w | u(w) = E[u(\pi(\bar{\lambda}^r = 1))]\}$  denotes the minimum wage that the manager must offer if all workers in the locale are loyal. Note that this is the circumstance when private farming is least productive. The term  $w_{\max} = \Pi/N$  indicates the maximum wage that the manager can afford to offer, given the productivity of the collective farm. The intersection of  $w_{\max}$  with the solid line defines a regional lower threshold of loyal workers,  $\bar{\lambda}_\ell^r$ . If  $\bar{\lambda}^r$  falls below this lower threshold, corporate farming will no longer be sustainable in the region and the only institutional equilibrium for the region will be complete agricultural privatisation.<sup>10</sup>

We thus see the sense in which this model has a tipping point at  $\bar{\lambda}_\ell^r$ . At loyalty levels above  $\bar{\lambda}_\ell^r$ , corporate farming will be retained. But once a critical mass of reform-minded workers is reached, the reform equilibrium is self-reinforcing, as indicated by the solid arrow. For this reason, even though independent farming yields higher pay-offs, external forces, for example an information campaign, may be necessary to reach this equilibrium. How likely it is that private farms emerge depends on the location of  $\bar{\lambda}_\ell^r$ . The further this is on the left, the higher the probability that collective farms remain intact.

Drawing the solid line straight is subject to the assumption that both  $u$  and  $\pi$  are linear. Dropping this assumption may lead to a different shape. Consider the following modifications. First, a concave utility function would imply risk aversion on the side of workers. It leads to a downward shift of the participation wage, as uncertain income from private farming is reduced by a risk premium. This shift is stronger for lower levels of  $\bar{\lambda}^r$ , as the marginal utility of additional profit diminishes. Second, fixed set-up costs for private farmers, for example due to the establishment of appropriate up- and downstream industries, make private farming less profitable if these costs have to

10 If the collective's budget constraint is soft, for example because it is subsidised by the regional government, loyalty equilibria are of course more likely to persist.



**Figure 1.** The impact of critical mass effects on regional loyalty equilibrium. (a) Network externality only ( $\theta = 0$ ,  $\alpha = 0$ ). (b) Network externality and conformity ( $\theta = 0$ ,  $\alpha > 0$ ). (c) Network externality, conformity and limiting of horizons ( $\theta > 0$ ,  $\alpha > 0$ ).

be borne by a few reformers only. The more workers individualise, the lower is the cost per farmer. As a result,  $\pi$  becomes locally convex for high levels of  $\bar{\lambda}^r$ . Finally, if all workers leave the farm, network externalities may diminish due to crowding effects. For example, it may become harder to find buyers for additional farm products. This makes  $\pi$  locally concave for low levels of  $\bar{\lambda}^r$ . We have drawn an alternative dotted line into Figure 1a that takes these effects into account. If this was the true shape of the participation wage line,  $\bar{\lambda}_\ell^r$  would shift to the left and privatisation became less likely. For simplicity, we will ignore these non-linearities in the discussion to follow. Our findings are not affected by the shape of the curve as long as it remains strictly decreasing in  $\bar{\lambda}^r$ .

We consider now what happens when we reintegrate social utility in the model,  $\alpha > 0$ . Initially, we assume that horizons are not limited such that social norms are set by the national level reference group, i.e.  $\bar{\lambda} = \bar{\lambda}^n < 0.5$ . Under this assumption, workers are influenced by pro-reform groups and feel uneasy about behaving loyally. The participation wage line shifts upwards, presented in dashed notation. Loyalty is now more expensive to elicit, the threshold point,  $\bar{\lambda}_\ell^r$ , shifts to the right, and  $w_{\min}$  shifts upward (both denoted with a prime). The range over which a regional loyalty equilibrium obtains thus shrinks, making it more likely that the region will shift to the full reform or privatisation equilibrium.

While social effects thus are a threat for the existence of the collective farm (and hence the income base and power of the manager), they also provide a mechanism that the manager can use to avert this 'farmer threat' (van Atta, 1993). In our model, the manager can either make loyalty more attractive by increasing wages, or influence the social reference group of workers by actively limiting their horizon. The latter effect is displayed in chart (c), where  $\theta > 0$ . The dot and dash participation wage line in Figure 1c is assumed to represent  $\theta$  at the optimal level for some relatively high level of  $\bar{\lambda}^r$ . For that optimal level  $\theta^*$ , the participation wage line will cut from below the corresponding line for the no social effects case, as loyal workers feel less irritated by the pro-reform behaviour of the wide reference group. The given level of  $\theta^*$  defines a  $\bar{\lambda}^r$  as the critical value of  $\bar{\lambda}^r$  such that  $\bar{\lambda} = 0.5$ . It also defines  $w_{\max}^*$ , the maximum wage the manager can pay net of expenses for limiting horizons. At  $\bar{\lambda}^r$ , the individual worker's disutility from choosing either loyalty or disloyalty is just equal, and  $v((0 - \bar{\lambda})^2) - v((1 - \bar{\lambda})^2) = 0$ . For  $\bar{\lambda}^r > \bar{\lambda}^r$ , managers can elicit loyalty by offering a wage lower than that required to elicit loyalty in the absence of social effects. For  $\bar{\lambda}^r < \bar{\lambda}^r$ , a higher wage must be paid to elicit loyalty. However, this wage will still be less than that required to elicit loyalty when managers do not limit horizons in the presence of social effects (assuming  $\bar{\lambda}^r > \bar{\lambda}^n$ ). Note that  $w_{\max}$  and the budget available to pay wages diminish when managers choose  $\theta > 0$ . But despite this offsetting effect, the capacity of the manager to limit horizons will always shift the threshold loyalty level,  $\bar{\lambda}_\ell^r$ , re-expanding the range over which corporate farming can be sustained, as shown in Figure 1c.

By changing the pay-offs, keeping the horizons limited has another profound effect on the regional equilibrium which is very much in the interest of the manager: it establishes a second polar equilibrium for average regional loyalty levels to the right of  $\tilde{\lambda}^r$ . Once the majority of workers has decided to remain loyal, this process is self-reinforcing, as indicated by the additional solid arrow. By stressing the collective identity of workers and keeping away any reform-minded attitudes from villagers, the manager can establish a stable equilibrium that guarantees the existence of the collective farm. Because workers feel comfortable with doing what is, in the community, the normal thing to do, they have an incentive to choose loyalty if the majority did so already. With regard to workers' pay-off given by  $w^*$ , however, the polar loyalty equilibrium as drawn in chart (c) is inefficient when compared with the full de-collectivisation outcome. Even so, because limiting the horizon shifts the threshold loyalty level  $\bar{\lambda}_l^r$  back to the left, it makes it even more likely that a loyalty equilibrium occurs.

It follows that within a pool of regions with comparable social and geographical characteristics, there are either regions which totally de-collectivise, so that there are no loyal farm workers and a widespread establishment of private farms, or regions which keep collectives completely intact, so that there are only loyal farm workers and a 'loyalty culture' persists. Because only polar reform equilibria are stable, there will be no intermediate or mixed restructuring outcomes, *ceteris paribus*. If managers keep horizons limited, marginal improvements in the relative returns to independent farming have no effect on workers' loyalty. Where keeping horizons becomes exceedingly costly because widespread access to information and unambiguous reform policies ease coordination on a de-collectivisation equilibrium, collective farms will dismantle as private farming become more profitable unless managers are able to offer higher wages.

## 5. Exploring bipolar land reform regimes in Moldova

We now explore what our model contributes to understand farm restructuring patterns in Moldova. In the following, we show that conventional factors of restructuring, such as regional price and productivity levels, are not sufficient to explain variation in decollectivisation outcomes. In particular, bipolar privatisation regimes coexist and outcomes within these regimes differ in distinct ways that are consistent with our model predictions.

Contrary to most other countries that emerged from the former Soviet Union, Moldova underwent a slow reform process that took several years, but nevertheless produced a significant number of individual farms.<sup>11</sup> This gives the researcher a unique source of data to study the regional evolution

11 Moldova adopted a relatively liberal land reform legislation in 1991. However, conservative forces had gained political power when it came to its implementation in the following years. It was only under pressure from international organisations such as the International Monetary Fund (IMF) that a more comprehensive land reform programme was rolled out nationwide after 1997. See Lerman *et al.* (1998) and Gorton and White (2003) for details.

in relative reform progress, showing considerable variation across regions. Detailed figures on the number of individuals entitled to land and the actual recipients of land were collected by the Moldovan Department of Statistics at the district (*raion*) level.<sup>12</sup> The privatisation rate, PR, is the share of land recipients in all individuals with a right to land, in per cent per district. While most rural beneficiaries had obtained provisional land titles on paper by the end of 1996, they had to actively apply to local authorities to receive a physical plot of land in exchange for their paper titles (Lerman *et al.*, 1998: 15). PR is the complement to  $\bar{\lambda}^r$  in our model, the share of loyal workers in a region, in the sense that  $\bar{\lambda}^r = 100 - \text{PR}$ .

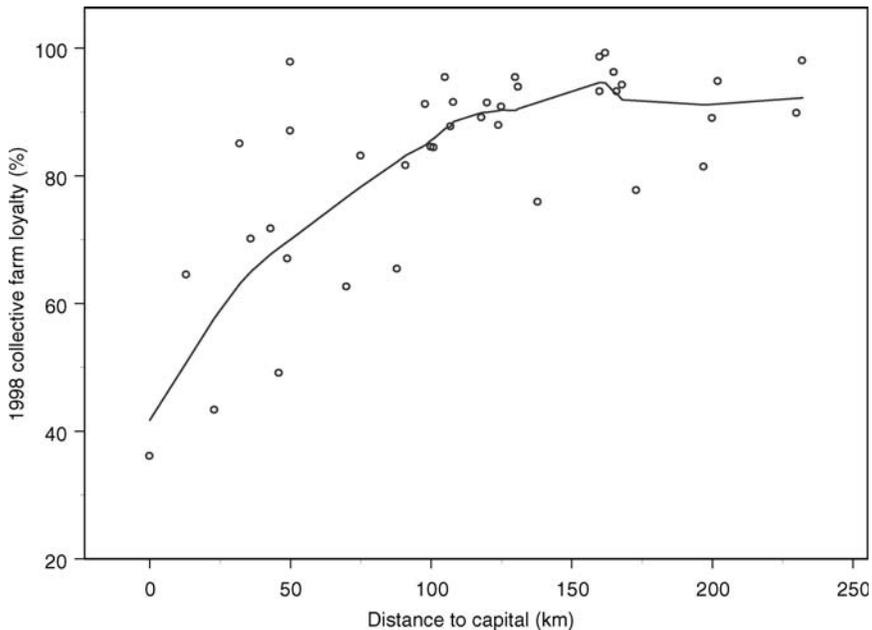
Geographically, Moldova is predominantly flat with about 75 per cent of land used for agriculture, mostly covered by fertile black soils (Petrick, 2009). Population and infrastructure are spread more or less evenly across the 40 administrative districts of the country, each including a medium sized town with the seat of the local government. Natural conditions are relatively homogeneous and infrastructure is only polarised to the extent that there is a clear administrative and economic centre of the country, the capital Chisinau. In the light of our theoretical model, the distance to the capital could be used to measure how costly it is for managers to shelter their villages from pro-reform influences. Similar to the situation in other post-Soviet countries, pro-reform groups of politicians and farmers have primarily been active in the capital. In the terminology of our model, they represent the national reference group.<sup>13</sup> Opposed to this have been the predominantly rural districts of the Moldovan hinterland, where directors of collective farms attempted to inhibit individualisation. Qualitative evidence on the strategies employed to prevent restructuring of collectives strikingly resembles the reports from Ukraine and Russia quoted above (Csaki *et al.*, 1997: 10, 24). These authors also report that local authorities' resistance to decollectivisation was particularly pronounced in the eastern and southern peripheral districts (p. 11). Holding other factors constant, farms further away from the capital should therefore exhibit higher loyalty rates, as managers are more likely to limit the horizons of workers.

To explore the latter hypothesis, Figure 2 displays the relationship between the *raion* loyalty share (in per cent) in 1998 and the distance in kilometres (km) between *raions* and the Moldovan capital city of Chisinau. To visually capture the tendency in the data, a kernel regression curve is included. As can be seen, there is a strong positive relationship in the data. Moreover, more distant *raions* exhibit relatively little decollectivisation.

These different patterns of decollectivisation could of course be explained by other factors, including differential incentives for private farming.

12 The data were published by Moldovan Economic Trends (MET) (1998). No data are available for the seceding districts east of the river Nistru. The districts forming the autonomous region of Gagauzia are treated as one spatial unit and the two biggest cities, Chisinau and Balti, were excluded.

13 Reform attempts were backed by the newly founded National Farmers Federation, the Christian Democratic Popular Front, which is a centre-right political party, as well as by the US Agency for International Development and the World Bank (Gorton and White, 2003: 308).



**Figure 2.** Loyalty in Moldovan districts versus distance to capital.

*Source:* Authors' calculations based on MET (1998) for loyalty rates; International Foundation for Electoral Systems (1994) for distance between district capital and Chisinau.

To explore this possibility, we specify a regression model that posits  $\bar{\lambda}_i^r$  to be a function of the standard economic factors hypothesised to explain decollectivisation:

$$\bar{\lambda}_i^r = \beta_d d_i + \beta'_x x_i + e_i, \quad (10)$$

where  $\bar{\lambda}_i^r$  is the share of loyal workers in *raion*  $i$ ,  $d_i$  is distance to capital,  $x_i$  is a vector of control variables, the  $\beta$ 's denote parameters to be estimated and  $e_i$  is an identically and independently distributed error term.

Our set of controls includes a regional price index of agricultural goods produced by private farmers in 1997;<sup>14</sup> the average potato yield in 1993–1995, in dt/ha;<sup>15</sup> the average profit of collective farms in the region in 1997, in thousand lei; and the average industrial wage in 1997, in lei/month.<sup>16</sup> The first two indicate the competitiveness of private farms. The third measures the

14 Price notations were taken from EU-Tacis (1997, 16) and were aggregated according to an average production basket of private farms reported by Lerman *et al.* (1998: 75–76). All other data are from Department of Statistics of the Republic Moldova (var. issues).

15 Potatoes turned out to become the major crop grown by peasant farms and in household gardens. Due to its labour-intensive production, collective farms begun to specialise in other crops. We use data for 1993–1995 to measure productivity that is undistorted by the onset of restructuring.

16 End of 1997, the exchange rate stood at 4.60 lei/USD.

economic and technological viability of large-scale farming in a given region. More profitable farms provide more leeway to keep workers loyal, either by limiting of horizons or by offering higher wages; this indicator should therefore be positively correlated with loyalty. High non-farm wages may prevent workers from applying for a physical land plot and look for industrial employment opportunities instead. This implies a positive effect on loyalty. Mean values of the covariates are given in the most right column of Table 1. Given the limited availability of variables and the small number of observations, the following results should be considered as exploratory.

The first column of Table 1 presents ordinary least-squares estimates of our basic regression equation. Interestingly, the standard explanatory variables reflecting the profitability of collective farming and alternative opportunities are not significant. Distance from the *raion* to the capital city is the only significant explanatory variable.

While the insignificance of these results may simply be a reflection of measurement or other problems, they may also reflect the more complex reality suggested by the multiple equilibrium model put forward here. While we lack the data to fully test our model, we can explore whether there are other patterns in the data that are consistent with our theory and are at the same time hard to explain by conventional factors of restructuring. We focus on two predictions of our model. First, it implies that restructuring tends towards bipolar equilibria. Second, it says that private farm profitability and hence individualisation is driven by price and productivity differentials only if managers do not limit horizons of workers.

While we have no direct statistical evidence on whether or not farm managers limit workers' horizons, our theoretical model suggests that horizon-limiting investments are more likely in *raions* that are physically more distant from the capital city. Letting  $\tilde{d}$  denote the critical distance at which horizon limiting becomes optimal, we employ Hansen's (2000) threshold estimator to test whether there are two different restructuring regimes and to what extent decollectivisation follows different incentives within these regimes. Formally, we generalise our regression model to:

$$\bar{\lambda}_i^r = \begin{cases} \beta_d^c d_i + \beta_x^c x_i + e_i^c, & \text{if } d_i < \tilde{d} \\ \beta_d^p d_i + \beta_x^p x_i + e_i^p, & \text{otherwise} \end{cases} \quad (11)$$

where  $\tilde{d}$  is the critical or threshold value of distance where a *raion* shifts from the high loyalty equilibrium to the low loyalty equilibrium. The superscripts on the parameters indicate that we will now permit the parameters to vary between close-in, centre *raions* (superscript *c*) and more distant or peripheral *raions* (superscript *p*). Hansen's method allows us to estimate  $\tilde{d}$ , test its significance and also to see if the two parameter vectors differ from one another.

The second two sets of columns in Table 1 present the results from this threshold estimation, identifying a threshold at a distance of 88 km from the capital. It is highly significant with a 5 per cent confidence estimator not

**Table 1.** Regression estimates of collective farm loyalty in Moldovan districts

Explanatory variable	Basic model		Centre regime (distance $\leq$ 88 km)		Periphery regime (distance $>$ 88 km)		Mean (total sample)
	Coefficient	<i>p</i> -value	Coefficient	<i>p</i> -value	Coefficient	<i>p</i> -value	
Intercept	77.28***	0.001	126.09***	0.001	41.48***	0.006	
Distance to capital (km)	0.18***	0.002	-0.08	0.224	0.06*	0.061	115.7
Price index of private farm output 1997 (Chisinau = 100)	-0.06	0.761	-0.29**	0.016	0.38**	0.023	77.5
Average potato yield 1993–1995 (dt/ha)	-0.19	0.105	-1.14***	0.001	0.02	0.643	41.1
Average collective farm profitability 1997 (1,000 lei)	0.39	0.293	0.80**	0.028	0.20	0.287	-5914.9
Average industrial wage 1997 (lei/month)	<0.01	0.991	0.11**	0.037	0.08*	0.093	166.2
Number of observations	34		11		23		
$R^2$	0.56		0.96		0.25		
Confidence interval for threshold (at 5%)			88–88 <sup>a</sup>				
Joint $R^2$ of threshold model			0.91				

*Note:* Dependent variable: regional share of loyal farm workers in January 1998 (in per cent). \*, \*\* and \*\*\* indicate significance at 10, 5 and 1 per cent levels, respectively. Threshold model results are based on Hansen's (2000) procedure.

<sup>a</sup>Distance = 88 is the only observation within the confidence interval.

different from 88 km. We therefore have evidence that regions follow distinctive paths of restructuring, as suggested by our theoretical model.<sup>17</sup>

In addition, the individual parameter vectors vary considerably between the two regimes and the base model which implicitly imposed the restriction of equality between the two parameter vectors. In the centre regime, the core drivers of privatisation are the regional price level for individual farm products and the regional potato productivity as a key output of private farms, whereas the existence of profitable collective farms delays restructuring. Furthermore, higher industrial wage levels reduce privatisation rates. Interestingly, distance is no longer a significant explanatory factor for loyalty within the centre regime, though it explains the shift between regimes. All this is consistent with the view that, close to the capital, decollectivisation strongly reacts to economic incentives because limiting of horizons is too costly. In the course of the reform process, some regions may individualise slower because collective farms are more profitable and thus retain their workers for a longer time. But in general, in this centre region, decollectivisation is driven by the conventional material factors discussed in the literature.

In contrast to the centre region, the standard factors explain little about farm restructuring in the peripheral *raions*. Within the periphery regime, slight differences in decollectivisation are still weakly correlated with distance. While there is also a small and only weakly significant wage effect, price and productivity incentives for individual farming no longer have any negative impact on loyalty. Loyalty is even stronger in regions with higher prices for private farm products. This result is again consistent with our theory which suggests that responses to marginal changes in returns to privatisation are muted by social forces in the peripheral area. There may be alternative explanations for these patterns and our empirical analysis does not provide direct evidence on positive network externalities. However, the fact that distinctive sub-regional patterns appear within the confines of a fairly homogenous agricultural area supports our model's contention that critical mass phenomena must be part of understanding the puzzling pattern of decollectivisation.<sup>18</sup>

17 While the theoretical model predicts that  $\bar{x}^i$  will assume either 0 or 1 in equilibrium, reality will not instantaneously adjust from one equilibrium to the other. In our Moldovan data, a fraction of regions supposedly is in the process of reaching the individualisation equilibrium, while the other fraction remains in the loyalty status-quo. More variation should thus be expected in the regime that is on its way to the individualisation equilibrium. As districts were concentrated into nine larger administrative units after 1998, the disaggregated data were no longer published, and it is hard to track individualisation empirically. However, it is clear that by 2003, the central regions were dominated by small private farms, whereas the northern and southern peripheral regions of Moldova were still characterised by unstructured successors of former collectives (Matei *et al.*, 2003: 157).

18 As suggested by a referee, we also used population density as a proxy for the costs of limiting horizons, rather than distance to capital. The results confirm the existence of two separate regimes, whereby loyalty is significantly higher in regions with lower population density. Furthermore, restructuring goes along with higher prices only in the more densely populated regions. The results of Table 1 are hence supported by this alternative specification.

## 6. Conclusions

The presence of critical mass phenomena has implications for the design of policies aiming at the establishment of independent farms. Given a loyalty equilibrium, it is not sufficient to improve managerial resources and relax factor market constraints for prospective individual farmers, as argued, for example, by Rizov (2003). The effect of marginal improvements in the profitability of individualised farms on the loyalty equilibrium in our model will be nil. Crucial for reform in the present model is the formation of a sufficient number of workers who are willing to establish independent farms, such as in the Russian case portrayed by Pallot and Nefedova (2007). This could possibly be achieved by support programmes that make loyal farm workers aware of the fortune of successful non-loyal workers, which lead to the emergence of individual consciousness raisers among the group of loyal farm workers (and not only to the spread of disembodied ideas), or which make it more costly for farm managers to keep the horizons of workers limited. In other words, a 'big push' in reform attitudes among workers is a precondition for reaching the full de-collectivisation equilibrium, which may be induced by a sufficient number of positive examples of independent farming in a region. Whether more than 15 years of stagnation in the non-reforming countries have reinforced or eroded the existing norms of collective production may be an interesting issue for empirical research.

Such research may also help to further disentangle the two critical mass phenomena we were suggesting. For the case of Moldova, we showed that privatisation increased with better price and productivity incentives in regions close to the capital. A more complete test of network externalities would demonstrate that individual farm profitability increases if more workers exit the collective. Direct evidence on social preferences is difficult to obtain and would require additional qualitative and/or individual-based psychological methods, such as those used in Allina-Pisano (2008) or Aronson (1992). Alternatively, detailed data on individuals, including their risk preferences, could be used to compare private farm income with wage levels in the collective to check whether residual differences can be explained by social effects. In this way, even a money metric conformity premium could be quantified.

Following Schaffner (1995), our theoretical model represents a subtle departure from the traditional assumption of exogenous preferences. By keeping horizons limited, a manager can shape the social reference group of workers and thereby influence what they regard as the normal thing to do. Moreover, the manager can, for his or her own benefit, deprive workers of a more productive reform option. Workers then evaluate individual farming by referring to their current reference group, although they would be exposed to a different reference group if they left the collective farm. Workers who for some reason escape the limited horizon find themselves better off than they thought they would be, and better off than they had been.

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