Agricultural Labour Adjustment and the Impact of Institutions

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Abstract

The economic transformation in countries of Central and Eastern Europe as well as Asia resulted in a diverse picture of change in agricultural labour use. Based on a measure of sectoral labour adjustment, the paper explores the determinants of occupational labour flows paying special attention to the impact of institutions. Annual rates of occupational migration between agriculture and non-agriculture over the period 1978-2005 are calculated for a panel of 30 transition countries. Annual migration from agriculture ranges from outflows of nearly 8 percent of the agricultural labour force to immigration into agriculture about 9 percent on average. Fixed-effects panel models are used to explain the annual intersectoral labour flow. The most important determinants of the migration rate are the relative income differences between non-agricultural and agricultural sectors, the relative magnitude of agricultural labour, the development of terms of trade and the level of unemployment. Furthermore, the speed of economic reforms and the way of land privatization affect occupational migration significantly. An increasing intersectoral income difference points to still existing mobility restrictions for agricultural labour in some of the countries analyzed.

Keywords: aggregated labour allocation, intersectoral income differential, institutions, transition economies

JEL classification: E24, J43, J62, Q18

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1   INTRODUCTION

Former socialist economies underwent tremendous changes since the start of the economic reforms. In most of these countries, agriculture was collectivized and intersectoral movement of labour was more or less restricted before the break-up of the economic planning system. Economic reforms implied decollectivization, privatization of land and assets, adjustment of relative prices and liberalization of labour markets. However, the speed and degree of reforms' implementation varied widely between the different countries (see for instance Rozelle and Swinnen, 2004).

A striking result is the significant divergence in agricultural labour productivity and agricultural labour use over the (post-) reform period. Whereas Central European and East Asian countries experienced an increase of labour productivity after reforms, the drop is highest for Transcaucasian and Central Asian countries. Figure 1 presents the relative change of agricultural employment since the beginning of economic reforms up to 2005. Countries are ranked following the index of agricultural liberalization by Csaki and Zuschlag (2003) and grouped into fast, medium and slow reformers. The steepest drop in agriculture's share on total employment is observed in the so called group of fast reformers. Similarly, China and Vietnam are examples of a very early decollectivization, and they experienced a comparable decrease of agricultural employment over a 10-years longer period. On the contrary, several moderately and slowly reforming countries show an increase in agriculture's share in employment. In Armenia, Georgia, Kazakhstan, Kyrgyzstan, Macedonia, and Tajikistan agriculture's share even increased by more than 50%.

Figure 1 around here

The adjustment of agricultural labour to new economic conditions seems to take different paths and to proceed at different speeds. Nevertheless, little remains known about the institutional determinants of those different adjustment processes. The primary goal of our paper is to examine institutional and policy-related reasons behind this almost unprecedented and diverse change in agricultural labour use. We use a measure to quantify the change in agricultural labour use for transition countries in Central and Eastern Europe (CEE) as well as South East Asia. Subsequently, the measure is regressed on macroeconomic variables and

indicators of the institutional environment. The paper's contribution to the literature is twofold. First, it goes beyond previous literature by including all European and Asian countries in transition. The analysis, second, centres around indicators of the institutional environment and ways of land privatisation as determinants of labour adjustment.

The remainder of this paper is organized as follows. Section 2 provides a brief overview of identified determinants of labour adjustment and motivates the relevance of the institutional environment. Section 3 introduces the measure of labour adjustment and the explanatory variables. The first part of section 4 presents the evolution of labour adjustment over time and the second sub-section presents the results of the econometric analysis. The paper ends up with a conclusion.

2   REVIEW OF LITERATURE

Agriculture has played two different roles in labour markets of transition countries. First, surplus agricultural labour has been shed from former state and collective farms after the removal of subsidies, central planning and mobility restrictions. Hidden unemployment in agriculture during the period of central planning has been observed in almost all countries. Brada (1989) and Jackman (1994), for instance, underline this finding with comparatively high figures of hidden unemployment in Poland and Czechoslovakia. Other studies emphasize the buffer role of agriculture, e.g., in form of subsistence farms, in periods of high unemployment and economic uncertainty (Sorm & Terrell, 2000). This buffer role will result in a reduced outflow of labour from agriculture or even an inflow into this sector. For instance, Seeth, Chachnov, Surinov, & von Braun (1998) describe how emerging private subsistence agriculture serves as an insurance against poverty and hunger using the example of Russia. Pallot & Nefedova (2003) put forward additional examples mainly from Russia. Similar evidence is reported by Bernabè & Stampini (2009) for rural Georgia, where inflow of labour into agriculture increased after the Russian economic crisis of 1998. However, they find an over-representation of retirement-aged as well as previously inactive people in agricultural employment.

Micro-economic empirical analysis of determinants of agricultural labour adjustment centres mainly on farm household decisions and studies analyze either cross-sectional or panel micro-level data (Bojnec & Dries (2005); Chaplin et al. (2004) and Buchenrieder et al. (2002) for CEEC; Glauben et al., (2008); Zhang et al., (2004); de Brauw et al., (2002); Brosig, Glauben,

Herzfeld, Rozelle, & Wang, (2007) for China).[1] Important determinants of agricultural labour adjustment that are identified in these studies are education of household members, household composition and regional characteristics. However, studies at the micro-level are of limited use to derive policy conclusions. Especially the impact of macroeconomic reforms and institutional change can only be quantified partially.

Determinants of intersectoral labour adjustment from a macro-economic perspective are extensively discussed and summarized by Larson & Mundlak (1997) and Bojnec & Dries (2005). In line with traditional theories of migration, like Todaro's (1969) seminal work, they highlight the differences in (expected future) incomes as the dominating force of flows. A number of empirical findings support these hypotheses. Butzer *et al.* (2003, 2002) find evidence that the income ratio between agricultural and non-agricultural sectors, the growth of non-agricultural employment, and the unutilized capacity in non-agriculture are the main determinants of labour flows out of agriculture.

Focusing less on outside conditions and more on factors inside the agricultural sector, Swinnen *et al.* (2005) show that important drivers of labour outflow from agriculture are decreasing agricultural prices and any development which will increase the reservation wage of agricultural workers. Furthermore, the authors find a significant and negative impact of the development of relative agricultural wages on agricultural employment. Dries & Swinnen (2002) observe a highly significant reduction of agriculture's share in employment in relatively more developed Polish macro-regions. This effect is found to be even stronger in regions with a better infrastructure as well as in younger and better educated farm populations.

Although the importance of institutions like property rights on land, hard budget constraints, the framework for contract enforcement and access to capital is widely acknowledged in the theoretical literature, its quantitative assessment in econometric studies is still quite limited. Overarching and effective property rights on land are seen as necessary requirement to raise efficiency of agricultural production (Lerman, Csaki, & Feder, 2004, Swinnen, 1999). Applying a more formalized theoretical framework, Swinnen, Dries, & Macours (2005) conclude that an effective privatization of old-style corporate farms and the break-up into profit-maximizing private family farms will reduce the employed labour in agriculture.

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[1] Additionally, interregional migration in China forms a widely discussed topic in the literature. Migrants move from rural to urban regions or from poor Western to rich Eastern Chinese provinces (Taylor & Rozelle, 2003). For recent and extended surveys on the general subject of migration see Massey et al. (1993) as well as Taylor & Martin (2001).

Furthermore, the reorganisation is expected to lower wages up to the equality with the value marginal product of labour. However, increasing labour efficiency might partially offset the latter effect.

Looking for empirical evidence, Swinnen, et al. (2005) discover three patterns of agricultural labour adjustment based on the organizational transformation of agriculture. In Estonia, Hungary and the Czech Republic, a fast decline of the share of agriculture in total employment together with a moderate increase in the share of individual farms in total agricultural land. On the other hand, agricultural employment decreased less rapidly or even increased in Poland, Romania, Lithuania, Latvia and Slovenia, countries with a significantly higher prevalence of individual farms. Finally, individual farming in Russia and Ukraine still exhibits only a minor share in total landholdings and the change in agricultural employment is at the same time limited. These patterns are confirmed in econometric analyses. Dries & Swinnen (2002) as well as Swinnen *et al.* (2005) find agricultural employment to be reduced significantly faster with an increasing share of privatized land. In contrast, the share of land used by individual farms has a significant and positive effect on agricultural employment. The authors conclude that the variable 'share of privatized land' captures the effect of the introduction of hard budget constraints. Furthermore, new agricultural employment is only created on private family farms.

Previous studies neglect the ways of land privatisation and measures of the institutional quality as potential determinants of labour adjustment. They are important for two reasons: tenure security on land is expected to facilitate land market development and farm specialisation. Functioning land markets ease the exiting of farmers. Similarly, a low quality of the institutional environment might hamper the general economic development and farmers might stick to agricultural production to assure household's food supply.

3 METHODOLOGY AND DESCRIPTION OF DATA

3.1 Measuring labour adjustment

In pursuing the theoretical base introduced by Mundlak (1978) and developed further by Barkley (1990), sectoral labour adjustments can be analyzed within a framework of occupational choice. Each individual is assumed to maximize an indirect utility function depending on personal characteristics, realised income or expected income in any other occupation, prices of consumption goods and costs of migration. The remaining life time

utility of any individual can be derived by discounting the stream of utility for each occupation up to his retirement age. Usually expected earnings and switching costs enter the maximization as most important determinants of life time utility (Mundlak, 2000). At a positive difference of the discounted indirect utility in any other occupation and the discounted indirect utility in agricultural employment a shift of occupation is expected to take place.

Under the assumption of an economy with two sectors, agriculture and non-agriculture, and a mutually exclusive character of occupations, aggregated shifts between sectors are defined as sectoral labour adjustment.[2] We quantify this movement by the difference of growth rates in total and agricultural employment and use this measure as dependent variable in the following econometric analysis. More specifically, the labour adjustment rate (m) is calculated as the difference between growth rates of total labour (L) and agricultural labour (L_A). The adjustment rate can be interpreted as relative to the size of the agricultural sector.

(1)
$$ m = \frac{L_t - L_{t-1}}{L_{t-1}} - \frac{L_{At} - L_{At-1}}{L_{At-1}} = n - n_A $$

where n is the growth rate of total labour and n_A designates the growth rate of agricultural labour. In the absence of migration, the natural growth rates of agricultural labour and total employment are assumed to be equal. This measure has been suggested first by Mundlak (1978) and has been used in econometric analyses by Butzer *et al.* (2003, 2002) focusing on Venezuela and Southeast Asian countries, respectively. The measure suffers from one limitation which has to be kept in mind. Due to the assumption of equal growth rates of agricultural and total employment, a drop in total employment leads per definition to a hypothetical migration into agriculture as long as $|n| > |n_A|$. As almost every transition country has been characterised by a higher shares of industrial employment under central planning compared to countries at a similar stage of economic development (Raiser, et al., 2004), (virtual) immigration into agriculture will be caused by the downsizing of the industrial sector.

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[2] Any aggregated approach neglects part-time farming represents which forms a non-negligible part of agricultural households' activities also in transition countries (Chaplin et al., 2004; Buchenrieder et al., 2002). That is, the measure applied in this paper will understate the 'true' sectoral labour allocation as long as off-farm occupations are not recorded as an individual's main economic activity in official statistics and overstate labour adjustment whenever households continue to engage on household plots besides any registered main non-agricultural employment. However, lack of individual employment data which are consistently comparable over all transition countries limits the use of other concepts.

In previous studies, labour market transformation is usually assessed using shares of sectoral employment. Based on the theory of structural change and economic development and the related empirical work by Chenery & Taylor (1968), Raiser, Schaffer, & Schuchhardt (2004) compare sectoral change in employment shares for 22 transition countries. Results by Raiser, et al. (2004) support the observation of over-industrialization during central planning. Interestingly, employment in agriculture at the beginning of the transition was clearly lower than predicted by the benchmark. However, the authors do not undertake any further econometric analysis of changes in the distortion index and its determinants. Dries and Swinnen (2002) as well as Swinnen et al. (2005) focus on the development of agricultural labour's share, more specifically the yearly percentage change of labour employed in agriculture since the beginning of economic reforms. Whereas the first study uses data from Polish macro-regions between 1990 and 1997, the second analysis concentrates on seven countries of Central and Eastern Europe over the period 1989-1998. In both studies, the measure is of cumulative nature and might create inconsistencies in a panel of countries with a different length of reform period. Raiser, et al. (2004) as well as Swinnen et al. (2005) assume implicitly a development of agricultural labour towards a similar share in all transition countries.

3.2 Determinants of agricultural labour adjustment

Previous literature provides a range of determinants that possibly impact the occupational choice at an aggregated level. Starting from the theoretical framework proposed by Larson & Mundlak (1997), labour flows are a function of the ratio of incomes in non-agriculture to that in agriculture, the size of the originating sector and the rate of population growth. The relevance of the income ratio is supported by earlier theoretical models of migration like Todaro's seminal work (Todaro, 1969, Harris & Todaro, 1970, Zarembka, 1970), where rural-urban migration is understood as a mechanism to equalize expected marginal earnings in agriculture (rural) and non-agricultural (urban) sectors. Institutions which limit intersectoral mobility may restrict this equalization. A very prominent example is the hukuo system in China which restricted people's move from rural areas, highly dominated by agricultural production at the end of the 1970s, to cities. Lack of individual and internationally comparable wage rates requires us to approximate wages by an average productivity measure. Thus, the ratio of value-added per worker originating from non-agricultural sectors to agricultural value added per labourer is expected to be one of the main determinants of

occupational migration in the empirical analysis below. Relatively high earnings in non-agricultural sectors will attract labour to flow out of agriculture.

Furthermore, following the theoretical literature one should expect migration to increase with the relative magnitude of agricultural labour, which constitutes the source of supply (Harris & Todaro, 1970, Zarembka, 1970). A higher share of agricultural employment constitutes a larger pool of potential labour moving to other sectors. Additionally, a high unemployment rate might on the one hand slow down structural change by lowering expectations with respect to potential earnings in non-agricultural sectors. On the other hand high unemployment imposes a threat towards new entrants into employment, implicitly absolutely increasing the presented measures above at a given growth rate of agricultural labour. Hence, the direct and indirect effect of unemployment has to be controlled for in the econometric analysis. Economic recovery proceeded at a different pace across sectors. For instance, growth rates in service sectors are on average higher than in agriculture or construction. As a substitute of sectorally differentiating unemployment rates, a measure of unutilised capacity in the respective sector is calculated identical to that suggested by Butzer et al. (2002) at economy level.

The main interest of this paper is, however, in the impact of a country's institutional environment and arrangements. It is widely acknowledged that laws, regulations, and contracts structure and / or constrain agents' daily behaviour and decision making. Obviously, the choice and timing of certain reforms influences the emerging new institutional environment. For instance, the establishment of full private property rights through privatization is expected to stimulate interest of the new owners to secure their property rights (Koester & Brümmer, 2006). To start with the (dominant) way of land privatization, full ownership of a production factor like land is characterized by the right to use it for production purposes as well as collateral and to sell it. Similarly, Koester & Brümmer (2006) interpret the strong persistence of cooperatives and collective farms on the one hand and the widespread existence of household plots in Belarus, Russia and Ukraine as an indication of an incomplete property rights transfer. In line with Deiniger (2003) it is argued that secure land rights support on-farm investments and increase productivity. To sum up, it is expected that a complete transfer of property rights via restitution will lead to a stronger shift of labour out of agriculture compared to the other two methods. On the contrary, the (in kind) distribution of land is expected to lead to a lower occupational migration.

At the same time, transition countries undertake reforms to change their total economic system from central planning to functioning market economies. In line with North (1991) it is assumed that transaction costs of exchanges will decrease with a proper establishment of property rights. Subsequently, lower transaction costs are expected to result in a higher employment of capital relative to labour and/ or a higher prevalence of long-term agreements if, for instance, property rights are clearly defined and effective. The hypothesis is backed up be a variety of empirical studies highlighting the economic growth and investment promoting effect of a high quality of the general institutional environment.[3] Summing up, faster reforms and a higher institutional quality are expected to foster occupational change.

Political intervention into agriculture before the introduction of the first economic reforms varied substantially across the previously centrally planned countries ranging from an implicit taxation of agricultural production in East Asia to an implicit subsidisation in the CEEC and countries of the Former Soviet Union (FSU). Additionally, liberalisation of prices proceeded very differently in the respective countries (Rozelle & Swinnen, 2004). As discussed above, relative competitiveness of agriculture depends on price relations. Therefore, it is controlled for the impact of relative prices' adjustment. Obviously, a more favourable development of agricultural prices should have a limiting effect on labour adjustment.

3.3 Econometric framework: Data and specification

Data

To calculate the measures of occupational migration, annual sectoral labour data are taken from World Bank (2010), FAO (2010), ILO (2010), and United Nations Economic Commission for Europe (2010) and are completed with information from national statistical yearbooks. Data are available for 30 transition countries from Europe and Asia.[4] Employment in agriculture refers to people who have their principle activity within agriculture, hunting, forestry and fishing.[5] Starting in 1989, most transition countries linked their national

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[3] For instance Aron (2000) provides a detailed critical survey.
[4] The countries are: Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, China, Croatia, Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Macedonia, Moldova, Mongolia, Poland, Romania, Russia, Serbia and Montenegro, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, and Vietnam. Rozelle & Swinnen (2004) include additionally Laos and Myanmar, but explanatory data for them are lacking.
[5] The categories correspond to the major divisions A and B in the third revised version of the International Standard Industrial Classification (ISIC) and major division 1 in the second revision of the ISIC. Processing of agricultural products beyond levels required for primary markets, marketing through cooperatives and field

classification to international standards. The ten new EU member states within the group of transition countries implemented EU regulations and aligned their national statistical systems over the 1990s. To conclude, possible measurement errors due to problems with the statistical system are expected to minimize with the passage of time.[6] Finally, Butzer, Larson, & Mundlak (2002; p. 246) show that measurement errors in agricultural employment have only very limited impact on the estimated migration series.

So far variables are not specifically focusing the transition country context. This will be done in subsequent stepwise extensions of the basis specification. Much of the debate in the literature focuses on the speed of economic reforms, contrasting gradualism (e.g., China) with shock therapy (e.g., Estonia). The EBRD transition indicator (*EBRD*) is used to control for the impact of the general economic reforms' speed.[7] An increasing occupational migration due to faster economic reforms would support the 'restructuring hypothesis'. The general level of institutional quality is approximated by two measures: An indicator of Contract-intensive money (CIM) first proposed by Clague, Keefer, Knack, & Olson (1999) and a composite indicator of good governance assembled by Kaufmann, Kraay, & Mastruzzi (2009). CIM is defined as the ratio of non-currency money to the total money supply and reflects the ability of firms to raise capital and the reliance on third-party enforcement. The composite governance indicator pools subjective indices for six dimensions of governance: voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, and corruption from various sources.

The way of land privatization is captured by introducing three dummy variables: distribution of land in shares (*Shares*), distribution of land in kind (*Distribution*) and restitution of land to the former owners (*Restitution*). Countries without a universal collectivisation of agriculture, Poland and all successor states of the former Yugoslavia, serve as reference.

With respect to intersectoral income differences, most authors use average sectoral income per worker instead of marginal income due to data limitations. Wages are thought to be less informative due to the existence of other additional pecuniary and non-pecuniary income components and uncertainty regarding the probability to find employment in the preferred sector. On the other hand, the use of sectoral income may suffer from politically induced price

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preparation involving construction work like terracing are excluded from agricultural activities in the ISIC nomenclature.

[6] For a more detailed description of changes in national statistics and reliability of data the interested reader is referred to World Bank (1996) and UNECE (2000).

[7] Unfortunately, the two Asian countries China and Vietnam have to be excluded from all specifications comprising the EBRD index due to data unavailability.

differences between agriculture and non-agriculture. Another source of measurement error may be a differing informal sector's share in both sectors. Finally, Schmitt (1989) points to a measurement error of sectoral labour productivity due to non-agricultural output produced by labour forces officially recorded as agricultural labour. Unfortunately, sufficient means of correction are lacking. However, it is assumed that the importance of the finally mentioned source of measurement error will vanish with the progress of decollectivisation and restructuring of old-type cooperatives. Hence, the income ratio between non-agricultural sectors and agriculture (*IR*) is calculated as the ratio of respective sectoral value-added per worker and is expected to have a positive impact on annual migration. The ratio of agricultural to non-agricultural labour force (*LR*) controls for the impact of the labour pool in agriculture as the sending sector. To approximate for a change of relative prices the ratio between the GDP deflators for agriculture and for the aggregated non-agricultural sector is interpreted as Terms of Trade (*TOT*).

To reflect the uncertainty with respect to finding a new employment outside agriculture, the unemployment rate (*Unemp*) is introduced as explanatory variable. However, as explained above the unemployment rate does not reflect sectorally differentiated developments. The variable unutilized capacity of the non-agricultural sector (*Uncap*) is included to take sectoral differences into account. In the case of market driven labour flows migration should increase if non-agricultural sectors enjoy cycles of boom. We follow a fairly simple approach proposed by Butzer *et al.* (2002, 2003) and define the highest real sectoral value added in services for each country as maximum. Unutilized capacity is calculated accordingly as current output relative to the maximum. All sectoral production data are from the National Accounts Main Aggregates Database of the United Nations (2010). A slowing down or even reversal of labour adjustment in times of economic downturns would support the 'labour shading hypothesis'.

Chenery & Taylor (1968) as well as Raiser, et al., (2004) show that economic wealth of a country is a significant determinant of structural change. Therefore, GDP per capita is included as explanatory variable (*GDPpc*) and expected to lead to a higher migration out of agriculture. Furthermore, this variable is thought to cover remaining unobserved characteristics that might affect labour adjustment.

Sources of all explanatory variables and descriptive statistics are presented in Table 1.

Table 1 around here

Specification

Turning to the appropriate econometric framework to analyze the determinants of labour adjustment, a panel data estimator seems to be appropriate for mainly two reasons. First, taking simple averages of the annual rate of adjustment will ignore important cross-country differences of this measure's development over time. Second, countries follow different economic as well as agricultural policies and they might use different technologies. Panel data estimators allow capturing all those hardly observable characteristics in a country-specific variable. The measure of labour adjustment, m_{it}, will be explained by a vector of explanatory variables X_{it}, the unobserved country-specific variable v_i and an error term ε (Equation 2). Depending on the assumption regarding the variable v_i, different estimators are available.[8] The so-called fixed-effects estimator (FEM) bases on the assumption of v_i as a time-invariant country-specific constant. Parameters of the fixed-effects estimator are identified from within-country variation. Thus, parameters of variables of initial and institutional conditions without any variation over time could not be estimated in this framework (Baltagi, 2005). The random-effects estimator (REM) treats the variable v_i as an additional country-specific error term. A Hausman test is used to decide which of the two frameworks is appropriate. The random-effects estimator will result in biased coefficients if there is a correlation between the explanatory variables and the individual effect. Therefore, the Hausman test compares the covariance matrix of the regressors in the FE model with those in the RE model to determine if there is a significant correlation between the explanatory variables and the unobserved effects. To take a possible delay in individual occupational decision following changes of macroeconomic conditions into account, all explanatory variables enter Equation 2 with their one-year lagged values (X_{it-1}).

(2) $$y_{it} = \beta X_{it-1} + v_i + \varepsilon_{it}$$

Two reasons lead to the limitation of the econometric analysis on the period after the start of economic reforms. First, measurement errors might be higher under central planning, for instance pre-transition data might suffer from the inclusion of social services provided by collectives for their employees. Political reforms lead, second, to the break-up of the Soviet

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[8] For a more detailed treatment of the different approaches to analyse such cross-sectional time-series data sets, the interested reader is referred to Baltagi (2005) and Greene (2000).

Union, Czechoslovakia and Yugoslavia. Most data concerning the successor states are only available after their emergence. The data covers up to 28 years with most of the countries starting in 1990.[9]

The econometric analysis starts from a base specification controlling for intersectoral income differences, the relative size of agricultural labour, development of relative prices, unemployment, unutilized capacity in non-agricultural sectors and a country's level of economic development. In a second step measures of the economic reforms, privatisation of land and quality of the institutional environment are added. Various interaction effects between the institutional variables and the intersectoral income ratio control for possible non-linear relationships.

4 RESULTS OF EMPIRICAL ANALYSIS

4.1 Descriptive analysis

Table 2 around here

Table 2 shows the average of the labour adjustment rate per annum in per cent of the agricultural labour force and the average income ratio for all countries over the sample period. The average adjustment rate varies between an outflow of up to 8 percent of the agricultural labour force (Estonia) and an inflow of up to 9 percent (Georgia).[10] The ranking is highly correlated with the change in agriculture's share on total labour (see Figure 1).[11] Comparing these estimates with averages over the second half of the twentieth century by Mundlak (2000) for a large cross-country sample shows a comparatively high adjustment rate for Estonia, Hungary, Czech Republic and Slovak Republic after the beginning of economic reforms. Annual rates above 5% of agricultural employment are quite uncommon on a global

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[9] Pre-reform data of sectoral employment are available for Bulgaria, Czech Republic, Hungary, Lithuania, Poland and Romania only.

[10] The average annual migration rate between 1989 and 2004 in the five federal states on the territory of the former GDR, as comparison, amounts to 6.2 % and the income ratio to 1.6. Therefore, East Germany fits better in the group of Estonia, Hungary, Slovak Republic and Czech Republic.

[11] The levels as well as country's ranking regarding the average annual migration over the post-reform period and the change of agriculture's share on total employment are correlated with coefficients of 0.92 (Pearson) and 0.77 (Spearman).

scale. However, labour flow into agriculture like in Armenia, Tajikistan, Kyrgyzstan or Bulgaria is even more outstanding.

A closer look reveals that the average rate masks significant temporal differences between and within countries as Figure 2 shows. Four countries, Czech Republic, Romania, Poland and China, are depicted as typical examples and their annual migration rates are plotted. The average adjustment rate of 4 per cent in the Czech Republic is highly influenced by the development after 1990 where up to 20 percent of agriculture's labour force left the sector in only one year. The period before (1981-1988) is characterised by an adjustment rate near zero. On the contrary, Romanian data indicate a flow from non-agricultural occupation to agriculture after 1989 amounting up to 10 percent of agricultural employment. Different ways of privatisation and speed of subsequent restructuring are acknowledged as one of the main reasons (Rozelle & Swinnen, 2004). Poland, as a third example, experienced increased labour flow out of agriculture but not such a sharp shift in the adjustment rate in the early half of the 1990s. Rates higher than 5 per cent of sector's labour force occurs only in the years 1994 to 1999. One possible explanation could be the quite different production structure in Polish agriculture already before the break-up of the planned economic system. Agricultural sector was already dominated by private farm households compared to large cooperatives in Czechoslovakia or Romania. Therefore, no immediate and large scale release of labour from collective farms like in Czech Republic or East Germany took place. Finally and as a last example in Figure 2, China shows a large decrease of agriculture's share on total employment since 1978 whereas the annual adjustment rate is mostly positive but comparatively low (2% of agricultural labour force). This might also be influenced by restrictions on regional movements which were quite pervasive in China. Summarising these findings, the occupational change might be driven by two different general developments: First, it encompasses the actual change of occupation of previous workers. Rapid restructuring of agricultural cooperatives or state enterprises and the imposition of hard budget constraints resulted in high dismissals of agricultural workers, which fits the situation in the Czech Republic in 1990-93. Contrary, the collapse of the non-agricultural sector and the access to agricultural land led to a high inflow of labour into agriculture in Romania over the first half of the 1990s. Second, the decision of new young entrants into an economy's labour force which eschew the agricultural sector and prefer to work in non-agriculture results in a more continuous sectoral change in employment. This is more likely to describe the development in

Poland and China where sectoral change is driven to a large extent by the demographic development (Pang et al., 2004).

Figure 2 around here

Based on the average agricultural liberalization index, the sample is divided into fast, moderate and slow reformers.[12] All of the six countries which were judged as fast reformers belong to the first European Union's acceding countries in 2004. The four countries judged as slowest reformers were Belarus and the three Central Asian countries, Tajikistan, Turkmenistan and Uzbekistan. Surprisingly, sectoral change already took place in the pre-reform period in the European countries were data are available. Looking at Figure 3 reveals that the group of fast reformers experience a sharp decline of agricultural employment right after the first reforms. Labour adjustment rates (Figure 3) increase sharply, hinting to the conclusion that a faster agricultural liberalization is linked to the 'restructuring hypothesis' mentioned above. The largest and very heterogeneous group of moderate reformers displays on average a sharp labour flow into agriculture. The same applies, although to a lesser extent, for the slowly reforming countries. Both groups fit the 'labour shading hypothesis', agriculture provides a pool for labour at times of economic turmoil. Increasing migration from agriculture starts only from the second half of the 1990s onwards. In those countries agriculture seems to play the role of a labour shading sector at the beginning of economic reforms and converts to a labour sending sector later on.

Figure 3 around here

A first look on the calculated income ratios shows an interesting picture. The variable varies within a broad range between 0.5 and 7.2. Whereas CIS's countries and Georgia exhibit income ratios below two in 1990 and 1991, it increases significantly over the sample period and reaches relatively high levels above three in Tajikistan, Georgia and Turkmenistan. Non-CIS countries show a higher variation of income ratios already at the beginning of the sample

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[12] To be consistent with the thresholds in Figure 1, fast reformers have an average index of agricultural liberalisation above 8, slow reformers an average agricultural liberalisation index below 5 and medium reformers lie in between.

period. Within the CEEC the ratios are below two over the last decade except for Poland, Bulgaria, Romania, Macedonia, Slovenia and Croatia. These countries, plus Albania, exhibit still the highest share of agricultural employment in this country group. Finally, Asian transition countries experience increasing income ratios already starting from a rather high level. Output per worker in non-agricultural sectors is more than four times the agricultural GDP per worker. These results are comparable with estimates from developing countries by Larson and Mundlak (1997) for Asia and Latin America. Only African countries show higher income differentials between the non-agricultural sector and agriculture.

4.2 Results of the econometric analysis

After the descriptive analysis the impact of potential determinants of labour adjustment is explored econometrically. Due to missing and potentially less reliable data in the pre-reform period, the econometric analyses covers the years after the first economic reforms only.[13] Relying on previous empirical analyses a base specification is estimated first. The specification controls for the impact of the intersectoral income ratio, labour ratio, an interaction term of income and labour ratio, terms of trade, unemployment, unutilized capacity in non-agricultural sectors and GDP per capita. Subsequently, institutional variables are included stepwise in the specifications to quantify their exclusive impact. Relatively high correlation between some of the explanatory variables would reduce their usefulness in one single specification. Results of all specifications are reported in Table 3.

The Breusch-Pagan test favours the panel approach in all specifications compared to a cross-sectional analysis. Additionally, the Hausman test leads to a rejection of the random-effects model. Therefore, in all specifications exists unobserved characteristics which are highly correlated with the labour adjustment rate. Additional controls for time-fixed effects turn out not to be jointly statistically significant.

Both variables, income ratio (*IR*) and labour ratio (*LR*), have a positive and statistically significant effect on labour adjustment. Similar results are reported by (Swinnen, et al., 2005)) for a much smaller sample of East European transition countries. However, the effect is not linear as shown by the interaction effect between both variables. The estimated coefficient suggests a decreasing influence of *IR* and *LR* for countries with a higher intersectoral income

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[13] It is followed the line of Macours & Swinnen (2002) and the relevant years are defined as 1978 for China, 1981 for Vietnam, 1989 for all CEECs, including Slovenia, and 1990 for countries of the FSU, Mongolia and former Yugoslavia except Slovenia.

difference given the labour ratio or countries with a higher share of agricultural labour force given the income ratio. A development of relative prices favourable to agriculture (*ToT*) as well as higher unemployment (*Unemp*) each reduces the labour adjustment process. Especially the last estimate supports the hypothesis of agriculture as a labour shading sector in times of high unemployment. The result is in line with findings by Mundlak, Cavallo, & Domenech (1989) as well as Mundlak & Coeymans (1993) who find a depressing effect of unemployment on migration for Argentina and Chile. Unutilized capacity within non-agricultural sectors (*Uncap*) show neither a statistically nor an economic impact on intersectoral labour flows. This result is contrary to findings by Butzer *et al.* (2002, 2003) where unutilized capacity reduces labour flows in developing countries significantly.

Table 3 around here

Turning to the impact of a changing institutional framework, column 2 of Table 3 presents results of the specification controlling for land privatisation strategies. Due to the time-invariant nature of the privatisation variables, only coefficients of interaction effects with the intersectoral income difference are estimated. The results in column highlight that countries which have opted for restitution of agricultural land to former owners (*Restitution*IR*) experience a significantly higher migration from agriculture. However, the estimated coefficient for the distribution of land shares (*Shares*IR*) has a positive sign and is statistically significant too. Thus, beside full restitution also the distribution of shares seem to enhance labour adjustment. The coefficient attached to distribution of land in kind (*Distribution*IR*) is smaller and fails to be statistically significant. Taking up the literature mentioned in the introduction, these results support the 'restructuring hypothesis'. However, other forms of privatisation without the re-establishment of full property rights are predicted to yield a similar effect.

Turning to the third specification controlling for the degree of economic reforms shows a positive and statistically significant effect. As expected liberalisation leads to a faster labour adjustment. However, the interaction effect with the income ratio (*EBRD*IR*) points to a lower effect of liberalisation with an increasing intersectoral income gap. The last two columns of Table 3 control for the quality of the institutional environment. Both variables

turn out not to be statistically significant determinants of labour adjustment. The same holds for the respective interaction effects.

5   CONCLUSION

Transition countries of Central and Eastern Europe as well as Asia have chosen different ways to transform their agricultural sectors from a planned to a market economy. The adjustment of agricultural labour force partly reflects these different approaches with increasing labour use in some countries and a sharply declining employment in agriculture in others. In this paper, a labour adjustment rate is calculated for a panel of 30 transition countries over the last two decennia. Very high annual rates of labour away from agriculture like in Hungary, Estonia or Czech Republic as well as significant flow of labour into agriculture like in Armenia, Kyrgyzstan, Tajikistan and Bulgaria are quite unique on a global scale. Subsequently, potential determinants of the labour adjustment rate are evaluated in an econometric panel data framework. Beside sector-specific characteristics, the speed of general economic reforms, the ways of land privatisation, and quality of the institutional environment are analysed.

Results of fixed-effects estimations reveal that annual labour adjustment is positively correlated with the income ratio between non-agricultural sectors and agriculture, the labour ratio between both sectors, the development of relative prices and the unemployment rate. Additionally, the existence of statistically significant country specific unobserved effects justifies the choice of panel data approaches. Among the institutional variables the way of land privatisation and the speed of economic reforms show a statistically significant impact on the labour adjustment process.

The finding of a robust and significant correlation between sectoral income differences and labour adjustment is in line with previous theoretical and empirical literature. People react to economic incentives and move out of the sector which delivers on average a lower income relative to other sectors. A relatively high and still increasing income ratio in Armenia, China, Croatia, Georgia, Kazakhstan and Tajikistan points to the existence of mobility restrictions in those countries. Although the detailed characteristics of these mobility barriers are unexplored here, an increased labour flow from agriculture to non-agriculture will be expected in the case of further economic liberalization in the future. Similarly, any policy which tries to restrict

labour adjustment and structural change will potentially increase intersectoral income gaps and will surely lead to a higher pressure on structural adjustments.

Governments and administration of countries with a still high agricultural employment should be aware of a relatively high rate of labour adjustment and subsequent faster structural change.

Surprisingly, both the restitution of land as well as the distribution of shares led to a higher adjustment rate than the distribution of land in kind. Such a result somewhat contradicts theoretical expectations that only the establishment of clear property rights will result in a faster structural change. Results of interaction effects between privatization strategies and the intersectoral income difference suggest an increasing relevance of the way of land privatisation with an increasing sectoral income inequality.

Furthermore, the results indicate that agriculture plays a labour shading role in countries which implement economic reforms more slowly as has been shown for instance for the CIS countries. However, agriculture's role might change over the course of economic reforms in releasing labour, supporting the 'restructuring hypothesis', as reforms progress. Potential for future research has been identified with respect to the determinants of the intersectoral income ratio and dynamic behaviour of structural change.

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Table 1: Definition and source of variables and descriptive statistics

Variable	Code	Mean (Standard deviation)	Source
Migration rate	*m*	0.0043 (0.085)	ILO, World Bank, FAO, UNECE, National statistics
Ratio between non-agricultural and agricultural GDP per worker	*IR*	2.158 (1.409)	UN (2010)
Ratio between agricultural and non-agricultural labour force	*LR*	0.639 (0.649)	ILO, World Bank, National statistics
Terms of trade	*TOT*	0.830 (0.448)	UN (2010)
Ratio of employment-to-population ratio and labour force participation rate [in %]	*Unemp*	12.86 (8.538)	ILO
Non-agricultural unutilized capacity (% of maximum non-agricultural GDP)	*Uncap*	29.524 (189.11)	UN (2010)
Log of GDP per capita	*GDPpc*	7.031 (1.079)	World Bank (2010)
Dummy for distribution of land in kind	*Distribution*	0.338 (0.474)	Rozelle & Swinnen (2004)
Dummy for distribution of land in shares	*Shares*	0.287 (0.453)	Rozelle & Swinnen (2004)
Dummy for restitution of land to former owners	*Restitution*	0.272 (0.446)	Rozelle & Swinnen (2004)
EBRD Transition indicators	*EBRD*	2.204 (0.810)	EBRD (2010)
Contract-intensive money	*CIM*	0.751 (0.144)	IMF
Composite indicator of quality of governance	*KKM*	4.508 (1.448)	Kaufmann, et al. (2009)

Table 2: **Average values of labour adjustment rate and income ratio**

Country	Migration rate (m)	Income ratio (IR)
Albania	-1.7	2.03
Armenia	*-7.9*	1.66
Azerbaijan	0.8	2.16
Belarus	*3.2*	0.84
Bosnia and Herzegovina	-1.4	0.33
Bulgaria	*-2.0*	2.44
China	*2.1*	4.06
Croatia	1.8	2.50
Czech Republic	*6.2*	0.57
Estonia	*7.6*	0.84
Georgia	-9.2	2.20
Hungary	*7.7*	1.75
Kazakhstan	-4.8	1.06
Kyrgyzstan	*-3.3*	1.35
Latvia	1.0	0.84
Lithuania	0.2	0.74
Macedonia	-1.2	2.57
Moldova	-2.1	2.33
Mongolia	-1.7	3.85
Poland	*2.1*	3.95
Romania	-1.4	2.16
Russia	1.0	0.81
Serbia and Montenegro	-8.3	1.03
Slovak Republic	*5.6*	1.58
Slovenia	-0.5	2.59
Tajikistan	*-3.4*	4.33
Turkmenistan	-1.1	3.34
Ukraine	-0.7	1.41
Uzbekistan	1.5	1.28
Vietnam	*1.4*	4.30

Source: Own calculations based on World Bank (2010), ILO (2010), FAO (2010), United Nations (2010) and national statistics

Note: Migration rate in per cent. Geometric means are calculated by adding a constant one to annual migration rates and subtracting afterwards. Italic values are significantly different from zero at a 5% level.

Table 3: **Determinants of labour adjustment**

	Base model	Land privatisation	Reform speed	Institutional environment	
Constant	1.02***	0.98***	0.89***	0.96***	0.93***
	(0.04)	(0.04)	(0.05)	(0.07)	(0.10)
IR_{t-1}	0.04***	0.05***	0.07***	0.03	0.06**
	(0.001)	(0.009)	(0.01)	(0.02)	(0.03)
LR_{t-1}	0.15***	0.19***	0.21***	0.22***	0.22***
	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)
$IR_{t-1}*LR_{t-1}$	-0.03***	-0.04***	-0.03***	-0.04***	-0.04***
	(0.01)	(0.008)	(0.008)	(0.01)	(0.01)
ToT_{t-1}	-0.06***	-0.05***	-0.03*	-0.06***	-0.04
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
$Unemp_{t-1}$	-0.66***	-0.53***	-0.73***	-0.51***	-0.66***
	(0.17)	(0.17)	(0.16)	(0.17)	(0.20)
$Uncap_{t-1}$	-3.5*E-6	1.5*E-5	-4*E-5	-8.1*E-6	7.5*E-6
	(4*E-5)	(3.9*E-5)	(2*E-4)	(4*E-5)	(4.8*E-5)
$GDPpc_{t-1}$	0.02	-0.1*	-0.003	0.01	0.01*
	(0.01)	(0.007)	(0.006)	(0.01)	(0.007)
$Restitution*IR_{t-1}$		0.12***			
		(0.03)			
$Distribution*IR_{t-1}$		-0.01			
		(0.03)			
$Shares*IR_{t-1}$		0.08***			
		(0.03)			
EBRD			0.03***		
			(0.005)		
CIM				-0.03	
				(0.08)	
KKM					-0.0003
					(0.02)
Interaction effect with IR_{t-1}			-0.01***	0.03	-0.002
			(0.001)	(0.03)	(0.006)
Hausman test	48.90***	101.94***	85.77***	101.45***	80.67***
$\beta = 0$	12.55***	10.82***	15.20***	10.30***	8.31***
R^2	0.17	0.20	0.26	0.19	0.19
ρ	0.64	0.66	0.64	0.68	0.75
N/ Countries	471/ 29	471/ 29	436/ 28	424/ 28	362/ 29

Note: Standard errors in parentheses. Coefficients significant at the 1%, 5%, and 10% level of significance are indicated with ***, **, and *, respectively. The row β=0 reports the test statistic of a F-test under the H_0 that all coefficients are equal to zero. The displayed R^2 (within) measures only the contribution of the explanatory variables without the unobserved country-specific effects. The ρ indicates the share of the explained variation due to the country-specific effects. Due to missing for the employment-to-population ratio sample without Serbia-Montenegro. EBRD indicator not available for China and Vietnam. CIM index not available for Uzbekistan.

Figure 1: **Change in agriculture's share on total labour since start of reform**
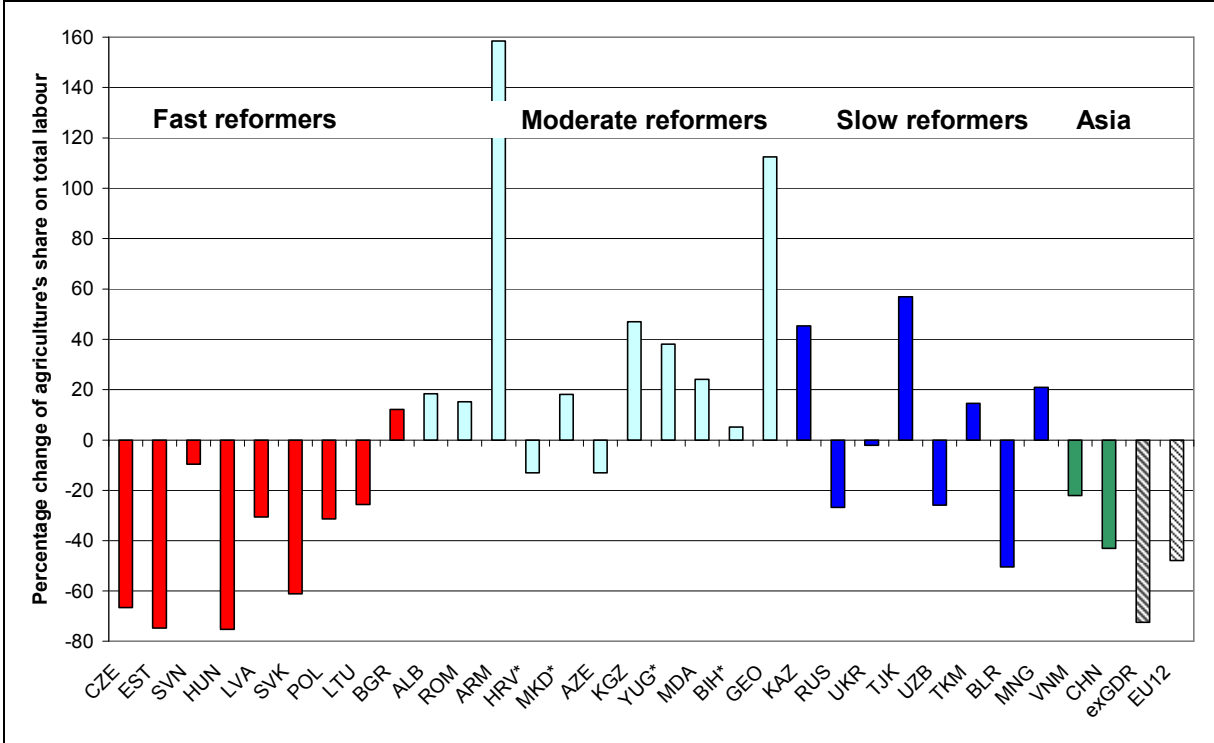
Notes: Percentage change between 1989 and 2005, except Bosnia and Herzegovina (1999-2005), China (1978-2005), Croatia (1996-2005), Macedonia (1991-2005), Serbia & Montenegro (1996-2005), Turkmenistan (1990-2004), Vietnam (1981-2005); all other countries of FSU and Mongolia (1990-2005); ranking according to the index of agricultural liberalization by Csaki & Zuschlag, (2003) in 2002
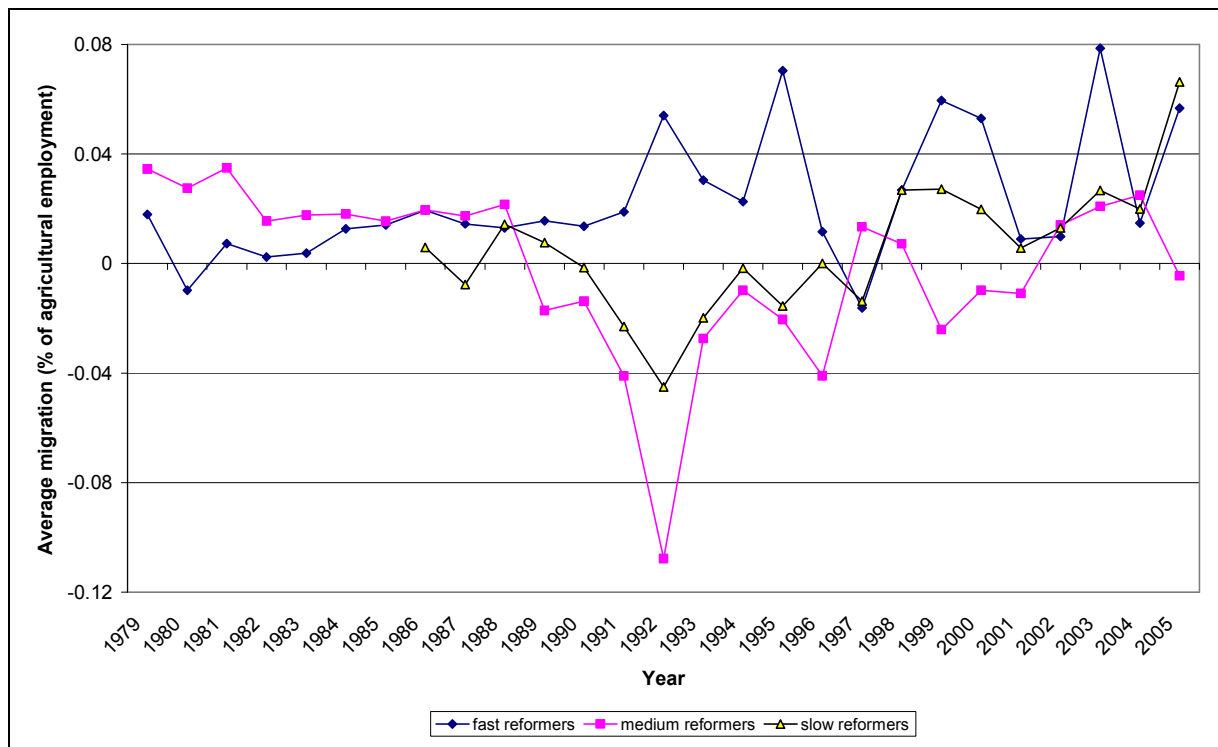
Source: Own calculations based on World Bank (2010), ILO (2010), FAO (2010) and national statistics.

Figure 2:   **Annual agricultural labour adjustment for selected economies (1979-2005)**
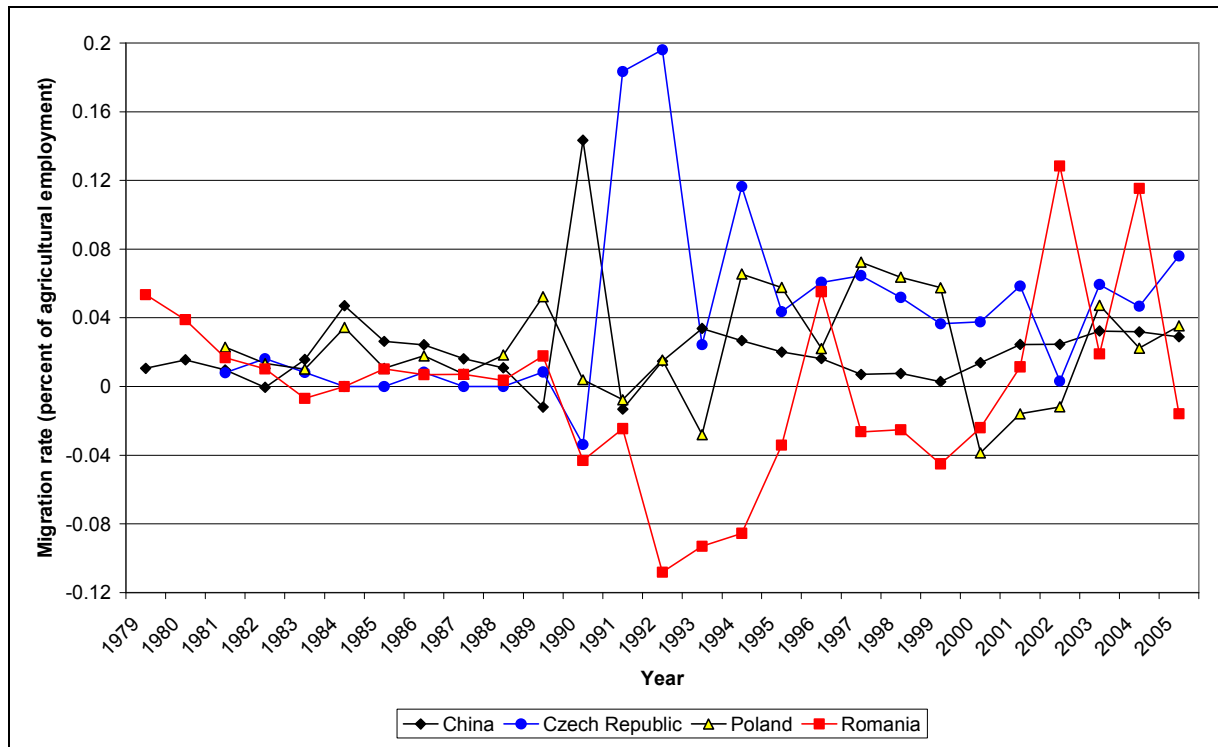
Source: Own calculations based on World Bank (2010), ILO (2010), FAO (2010) and national statistics

Figure 3:   **Average agricultural labour adjustment by index of agricultural liberalization, 1979-2005**

Notes: Ranking according to the average index of agricultural liberalization by Csaki & Zuschlag (2003)
Source: Own calculations based on World Bank (2010), ILO (2010), FAO (2010), United Nations (2010) and
national statistics