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LABOR MIGRATION AND AGRICULTURAL TRADE LIBERALIZATION

*Marianne Kurzweil**

1 Introduction

Problem Statement

With regard to the forthcoming EU Eastern enlargement a lot of Computable General Equilibrium (CGE) studies aiming to assess the economic impacts of the integration process on the countries and regions involved have been carried out. Mostly the focus of those analyses was put on interregional trade liberalization and the resulting consequences for trade flows, production as well as for the development of a country's GDP and welfare. But while the implications of the enlargement process on trade in goods is already discussed at length, CGE based analysis concerning its impacts on interregional labor movement has proceeded much more slowly. Even though migration is not just another minor insignificant additional aspect to be considered in the whole big apple "EU enlargement". According to ILO estimates there are currently 30 million migrants all over Europe. With 10 Central and Eastern European Countries (CEECs) accessing the EU, it is expected that migration flows among the countries of the enlarged EU will even increase.

In the case of an enlarged EU it is important to focus particularly on the role of the agricultural sector. Since in the candidate countries there is still a high share of workers employed in agriculture it can be assumed that there exist strong interdependencies between the development of agricultural trade and production on the one hand and the development of migration flows on the other hand. Thus, regarding the forthcoming heavy adjustments of Eastern agriculture to the EU's Common Agricultural Policy (CAP) strong impacts not only on agriculture itself but also on the international movement of labor are likely to occur.

With this background the purpose of this paper is to point out the coaction between agricultural trade liberalization and migration flows in the light of the EU enlargement process. For the quantitative assessment of this problem a CGE analysis was conducted with the Global Trade Analysis Project (GTAP) model. According to the requirements the model was extended by a novel approach for the depiction of migration in a CGE model.

Structure of the Paper

The subsequent chapter handles the methodological part providing a brief introduction to GTAP and a detailed explanation of the methodological extension of the model. In the third chapter the model design including data, aggregation strategy and shocks used for the enlargement experiment is explained. After the interpretation of the corresponding simulation results the paper ends with some concluding remarks and qualifications.

2 Theoretical Framework

With people migrating being an issue scientists are engaged in since a long time this topic already has also been considered in CGE modeling. In order to take into account the development of labor flows and its economic impacts in economic analysis there exist some migration approaches in CGE models. Among others there are FRANCOIS and NELSON (1997) analyzing North-South migration in the context of a Mexico-US free trade area or BANSE (1998) who implemented rural-urban migration in a study assessing the impacts on employment in the course of an EU enlargement scenario. A documentation of literature concerning migra-

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tion and CGE analysis is provided in Kurzweil and Brockmeier (2003). The second and the third part of this chapter introduce the methodological instrument and its novel extended version used for an analysis of an EU enlargement scenario under the particular consideration of migration flows.

Standard GTAP Model

GTAP is a comparative-static multi-regional CGE model. It provides an elaborate representation of the economy including the linkages between farming, agribusiness, industrial, and service sectors of the economy. The use of the non-homothetic constant difference of elasticity (CDE) functional form to handle private household preferences, the explicit treatment of international trade and transport margins, and a global banking sector which links global savings and consumption is innovative in GTAP. Trade is represented by bilateral trade matrices based on the Armington assumption (Armington, 1969). Further features of the standard model are perfect competition in all markets as well as a profit and utility maximizing behavior of producers and consumers. Usually policy interventions are represented by price wedges. They lead to different prices according to different market stages. Price differentiation adjusts via introduction or change of taxes and subsidies respectively. Quantitative restrictions or quantitatively induced price adjustments do not exist in the standard version. The framework of the standard GTAP model is well documented in the GTAP book (Hertel, 1997).

Extension of GTAP

The standard version of the GTAP model allows for the bilateral exchange of industrial and agricultural products as well as for trade in services. Thus, these components are not only demanded by domestic firms, private households and the government but also by foreign firms, private households and governments. However, in contrast to that the remaining input factors - capital, natural resources, land and also labor – are assumed to be regionally fixed. Since the following analysis aims to examine the impacts of the forthcoming EU enlargement on migration pattern and the interdependencies between agricultural trade and migration the model had to be adjusted according to those requirements.

In order to mimic migration the standard GTAP structure was modified in a way that enables the extended model to allow for bilateral movement of labor. Unlike in the standard GTAP model the factor labor is now able to cross boarders and take part in the production process of foreign firms in different regions similar to production commodities. This migration mechanism generates a country's labor in- and outflow endogenously driven by the different regions' labor demand and supply, and the interregional wage differentials. According to the interregional differences in labor demand and wage level representing the driving forces of migration, this way of modeling follows the classical migration theory inspired by Adam Smith and the approach of Harris and Todaro (1970).

For the implementation of this new feature the 'nested' production structure of the standard GTAP framework was expanded by an additional 'nest' (Figure 1). This component is responsible for the split-up of a country's total labor force into foreign workers on the one hand and domestic workers on the other hand. Thus, in contrast to the standard model firms do now have the possibility to employ both nationals and foreigners.

Figure 1:   Extended GTAP production structure
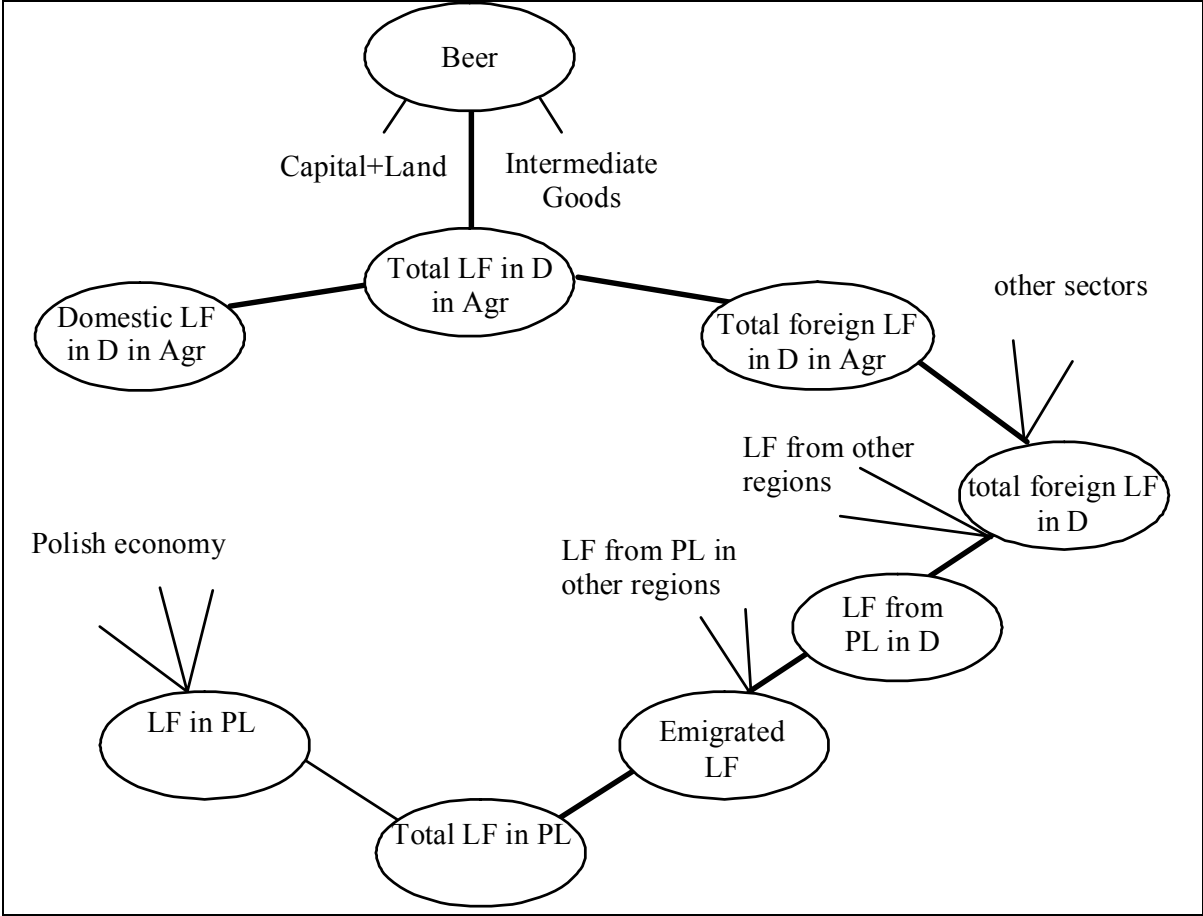
Source: own illustration.

Figure 1 represents the basic mechanism regulating the distribution of workers across countries considering the situation of Polish workers employed in German agriculture as an example. At the bottom of the circle Poland's total labor force (total LF in PL) is divided into workers who decide to stay in their home country (LF in PL) and are employed in the Polish economy, and on the other hand workers who decide to emigrate (emigrated LF). At that point the workers' decision making is regulated via a CET (Constant Elasticity of Transformation) function (Box 1). The corresponding parameters reflect the intensity of the workers' reactions to different developments of wage level across regions.

Box 1:   Constant elasticity of transformation function

$$X_{i,r} = (shr_{dom} * Y_{i,r}^{1/\eta-1} + shr_{for} * Z_{i,r}^{1/\eta-1})^{-1/(1/\eta)-1}$$

where

$X_{i,r}$	*total labor force in r*
shr_{dom}	*share of domestic labor in r*
$Y_{i,r}$	*supply of domestic labor in r*
shr_{for}	*share of foreign labor in r*
$Z_{i,r}$	*supply of foreign labor in r*
η	*elasticity of transformation*

The next decision the emigrated persons have to take is to choose their destination. According to this example one part of the emigrants moves to Germany (LF from PL in D), while the remaining migrants scatter across the other destinations (LF from PL in other regions). At this step a CES (Constant Elasticity of Substitution) function (Box 2) comes into play and determines the migrants' decision behavior. The elasticity of substitution ensures a distinction between the different nationalities of migrant workers and the resultant different preferences regarding the choice of a host country. A Polish worker, for example, might rather move to Germany than to the US even though the expected wage level is lower in Germany. The reason for such preferences can be found in social factors like geographical and cultural nearness, tradition etc. Of course, there are not only the Polish workers who have chosen Germany as their working destination. Thus, in Germany together with immigrants stemming from countries all over the world a pool of foreign labor emerges (total foreign LF in D). The German firms now have the opportunity to employ national or foreign workers. Since they are now spoiled for choice, they have to take a decision concerning the domestic-foreign employee ratio in their production process. In the model the determination of this ratio is based on the Armington theory.

Armington states that firms and also private consumers distinguish between domestically produced and imported products as well as between commodities imported from different origins. The reasons for corresponding preferences can mainly be found in differences with respect to quality, inputs, production process etc. In the case of labor this kind of differentiation also applies whereas here the determining reasons might be interpreted as e.g. difficulties due to language problems, education, cultural background etc. Thus, the producers' decision taking is influenced by more or less the same factors like the decision process of the migrants described above. E.g. regarding the situation at hand a German farmer might on the one hand prefer a foreign worker because he accepts to work for less, but on the other hand may also have doubts due to communication or language problems. Regarding one step further ahead the producer is not totally indifferent among foreign employees either because they are all of different nationality so that employers might show preferences for workers with a similar cultural background in order to avoid disharmonies. Again, in the model structure this distinction is dealt with via a CES function including corresponding Armington parameter.

Box 2:   **Constant elasticity of substitution function**

$$X_{i,j,r} = (shr_{dom} * Y_{i,j,r}^{1-1/\eta} + shr_{for} * Z_{i,j,r}^{1-1/\eta})^{1/(1-(1/\eta))}$$

where

$X_{i,j,r}$	*total labor force in j in r*
shr_{dom}	*share of domestic labor in j in r*
$Y_{i,j,r}$	*supply of domestic labor in j in r*
shr_{for}	*share of foreign labor in j in r*
$Z_{i,j,r}$	*supply of foreign labor in j in r*
η	*elasticity of substitution*

According to the resulting ratio the German workers represent the other part of the labor force employed in agriculture (Domestic LF in D in Agr). The remaining production decisions taken are conducted in the "old fashioned" CGE/GTAP manner. Together with land and capital labor flows into the production process and builds the value-added nest. The last step to the final product (here: beer) is the combination of value-added and other intermediate commodities.

3   Modeling EU Eastern Enlargement

With regard to the EU Enlargement scenario the main purpose of this chapter is to provide an overview of the model design including an explanation of the data situation, scenario set-up, regional and sectoral aggregation.

Data

For the following simulations the GTAP data base version 5.1 with the base year 1997 was used. This version comprises 76 regions with all EU-15 member countries as well as all candidate countries being represented individually. Furthermore the database includes 57 sectors providing a very detailed picture of the agricultural sector. In the GTAP database the agricultural sector consists of 20 primary and 8 processed food sectors.

Since the GTAP database does not provide for any migration related information those data had to be collected from some other external sources. Data regarding the share of foreign workers in a country's total labor force, migration flows by home and host country and even information about the migrants' skill level were obtained from the OECD. The shares of foreign workers according to sector were – at least for some countries – very well documented by the Labor Force Surveys of the ILO, Eurostat and IBV.

Nevertheless, the data situation particularly with respect to the transition countries of Central and Eastern Europe imposes strong restrictions on modeling.

Aggregation

In order to capture labor flows and economic impacts in the EU-15 and in the candidate countries as detailed as possible both regions are represented rather disaggregated.

Figure 2:   **Regional and sectoral aggregation**

Regions		Sectors	
Austria	AUT	Cattle	cattle
Belgium	BEL	Beef	beef
France	FRA	Pigs etc.	pigetc
Germany	DEU	Pork and Poultry	pandp
Italy	ITA	Milk and Dairy	mandd
Luxembourg	LUX	Cereals	cereals
Netherlands	NLD	Oilseed	oilseeeds
Sweden	SWE	Fruits and Vegetables	fandv
Rest of EU-15	REU15	Sugar	sugar
Denmark, Finland, Greece, Irland,		Rest of Agricultural Products	restagric
Portugal, United Kingdom, Spain		Rest of Food Products	restfood
Poland	PL	Construction	constr
Czech Republic	CZE	Other Primary Products	othprimary
Hungary	HUN	Manufactures	mnfcs
Rest of CEEC	RCEEC	Services	svces
Bulgaria, Cyprus, Estonia, Latvia,		Capital Goods	cgds
Malta, Romania, Slovakia, Slovenia			
Rest of the world	ROW		

Source: own illustration

However, the regional aggregation strategy was mainly dictated by data availability regarding migration flows. Therefore, some EU-15 countries as well as some CEECs are treated as single individual regions while other countries were put together as rest of EU-15 and rest of CEECs, respectively.

Concerning the sectoral aggregation the 57 industries included in the GTAP database were aggregated to 16 sectors comprising 11 agricultural sectors (see Figure 2).

Scenario

The experiment at hand corresponds to a classical EU enlargement scenario. Various adjustments with regard to the countries trade regime have taken place. In the first step all trade distorting instruments, like tariffs and subsidies were fully abolished between the EU-15 and the candidate countries as well as among the CEECs themselves. Furthermore the CEECs' trade policy with respect to other third countries was adjusted to an EU level.

4   Results

With regard to the actual state of work particularly concerning data availability only some selected results will be presented in this chapter. The focus of this chapter rather lies on a re-presentation of new analysis opportunities arising through the extended instrument than on a traditional discussion of simulation results. Furthermore, since the focus of this study lies on the influence of an EU Eastern enlargement on migration flows, the decisions of workers and its interactions with trade liberalization the results only provide for a basic overview of the enlargement's impact on the agricultural sectors. The main emphasis is given to the interpretation of migration movements and labor market impacts.

As a result of the heavy trade liberalization trade between the EU-15 and the CEECs gets enhanced in every sector. However, with agriculture accounting for extremely high protection rates the by far strongest impacts can be observed regarding trade with agricultural commodities. In particular animal products, like beef, pork and poultry, show a strong increase in trade volume. Thereby trade flows show a prosperous development in either direction – from the CEECs to the EU-15 as well as vice versa. However, while the CEECs are able to strengthen their trade relations to the EU-15 and among each other, intra-EU trade decreases. For the EU-15 this leads to heavy export losses because the intra trade accounts for the largest share in the EU's export volume.

Table 1:   Change in production output (in %)

Region / Sector	AUT	BEL	DEU	FRA	ITA	LUX	NLD	SWE	REU15	PL	CZE	HUN	RCEEC
cattle	-3.64	-2.20	-1.24	-3.60	-5.71	-0.88	-2.05	-4.88	-1.08	26.03	2.35	17.39	3.88
beef	-1.60	-0.89	-1.18	-0.54	-1.22	-0.55	-3.57	-4.91	-0.78	17.20	0.04	53.44	10.67
pigsetc	0.94	0.36	0.60	-0.09	-0.05	0.67	1.11	-0.12	0.26	-11.56	2.12	8.71	-1.92
pandp	0.75	-0.18	-0.61	-0.40	-0.38	0.04	-0.59	-0.15	0.00	-13.02	1.32	31.59	-7.50
cereals	13.15	-0.66	-0.14	-0.39	-0.76	-0.20	-0.73	2.82	-0.18	-6.04	1.34	11.15	-0.03
oilseeeds	2.09	1.41	0.85	0.78	0.20	1.47	2.40	0.77	0.16	-10.15	-4.94	-21.05	-4.45

Source: own calculations

Resulting from this strong export decrease production output (Table 1) shrinks especially in the EU's cattle and beef sector. In contrast to the situation of the EU-15 in several CEECs production is expanded in line with their booming export performance. In Poland and Hungary particularly the beef and the cattle sector shows heavily increased outputs. Additionally, there is also a strong expansion in Hungary's pork and poultry industry while this sector accounts for an output decline in the Polish economy. The main reason for the CEECs expansion in the animal sectors can be found in the abolishment of the EU's formerly high import tariffs applied on those product categories. In the EU-15 only the cereals and oilseeds sectors

show increasing tendencies whereas especially Austria's cereals sector expands significantly. Besides Hungary and the Czech Republic the CEECs reduce their output in plant production. The different picture concerning plant production sectors is caused by a relatively high initial level of protection and low export performance in the CEECs in addition to the strong competition arising through the EU-15 countries.

Obviously with labor representing an input factor in the production process the development of the labor market situation tends to be strongly influenced by the performance of a country's production sectors. Thus, in accordance with their production changes after the enlargement process the regions' demand for workers in the different sectors adjusts (see Table 2). In the case of the EU-15 countries this means a decline in labor demand in most of the sectors. Particularly the cattle and beef sectors account for strong employment decreases of up to almost – 6 %. Thereby Sweden represents the country with the most significant impacts. With regard to the CEECs it is particularly Poland and Hungary experiencing a strong growth effect in the cattle and beef sectors which causes an increase in demand for agricultural workers in those growing sectors. In the case of Hungary the situation of an increased labor demand also applies to the pig and poultry sector while these sectors show a strong downward movement with respect to employment in Poland and in the rest of the CEECs. Similar to the output performance plant production represents a different picture with increases in labor demand in the EU-15 particularly in Austria. In the candidate countries except for Hungary and the Czech Republic labor demand declines.

Table 2:   **Change in demand for unskilled labor (in %)**

Region / Sector	AUT	BEL	DEU	FRA	ITA	LUX	NLD	SWE	REU15	PL	CZE	HUN	RCEEC
cattle	-3.41	-2.31	-1.31	-3.71	-5.85	-0.94	-2.13	-4.89	-1.12	27.64	3.59	22.17	4.39
beef	-1.64	-0.82	-1.19	-0.53	-1.22	-0.43	-3.53	-4.91	-0.78	17.26	-0.05	52.86	10.25
pigsetc	1.30	0.31	0.58	-0.12	-0.08	0.64	1.09	-0.02	0.26	-12.74	3.33	12.33	-1.85
pandp	0.71	-0.11	-0.62	-0.40	-0.38	0.16	-0.56	-0.14	0.00	-12.96	1.23	31.11	-7.85
cereals	13.88	-0.75	-0.18	-0.43	-0.80	-0.25	-0.79	3.00	-0.19	-6.90	2.49	15.08	0.19
oilseeeds	2.48	1.37	0.84	0.77	0.18	1.46	2.41	0.90	0.16	-11.25	-4.35	-20.55	-4.56

Source: own calculations

With regard to wage development the importance of the agricultural sector and its role on the labor market in the different economies is reflected (see Table 3). Thus, with agriculture accounting for a very high employment share the improved demand situation influences the wage level which hereupon strongly increases in the CEECs. In contrast, the wage situation in the EU-15 countries remains almost unchanged. Furthermore the different developments reflect general differences between the economies of the CEECs and of the EU-15 countries. In the transition economies the agricultural sector is still characterized by labor-intensive production processes. Nevertheless, labor only accounts for a rather small share in a firm's cost structure because of the economy-wide low wage level. This is why, for example in the case of Hungary's cattle production, the change in demand for labor is even stronger than the increase in output even though at the same time labor becomes significantly more expensive.

Table 3:   **Change in wages for unskilled labor (in %)**

Region / Wage for	AUT	BEL	DEU	FRA	ITA	LUX	NLD	SWE	REU15	PL	CZE	HUN	RCEEC
total labor force	0.56	-0.30	0.22	-0.01	0.26	-0.39	0.08	0.02	-0.04	9.52	8.65	17.53	8.32

Source: own calculation

Besides the analysis of the general labor market developments the extended GTAP framework now allows for an insight into the processes occurring on the markets for domestic as well as for migrant labor. As already mentioned above the data base underlying these calculations is

still very meager. Thus, in order to avoid confusion due to distorted results the interpretation solely considers results which are calculated from an adequate data base.

Table 4:   Change in demand for domestic and foreign labor in %

Region / Sector	AUT	DEU	CZE	HUN	AUT	DEU	CZE	HUN
	Change in Demand for Domestic Labor				**Change in Demand for Foreign Labor**			
cattle	-3.41	-1.31	3.57	22.12	-3.01	-1.35	6.05	28.83
beef	-1.65	-1.19	-0.07	52.79	-1.23	-1.23	2.32	61.19
pigsetc	1.30	0.59	3.32	12.28	1.73	0.54	5.79	18.46
pandp	0.70	-0.62	1.22	31.06	1.13	-0.66	3.64	38.27
cereals	13.88	-0.18	2.47	15.03	14.35	-0.22	4.92	21.36
oilseeeds	2.48	0.84	-4.36	-20.59	2.91	0.79	-2.08	-16.22
Source: own calculation								

As the results presented in Table 4 indicate the employment development for domestic and migrant workers shows some differences. In Austria and Germany the changes in demand for domestic workers strongly correlate with the situation regarding the demand for foreign workers with basically every animal sector showing slight demand declines and some demand expansions in the cereals and oilseeds sector. But even though the developments in the two countries seem to be similar there is one significant difference: In Austria sectors accounting for an increased labor demand post a stronger demand increase for migrant labor than for domestic labor, while sectors with an employment decline rather hire less domestic workers than reducing their stock of foreign workers. In Germany the situation is exactly vice versa. The reason for these differences can be found in the countries' wage developments (see Table 5). While wages for domestic and foreign workers to be employed in Germany experience almost the same change, the wage development for nationals and foreigners in Austria looks quite different. Here hiring domestic labor becomes 0.57 % more expensive compared to an only 0.36 % wage change for migrant workers. This results in a stronger competitiveness of the foreign labor force.

Obviously in the Czech Republic and Hungary the impacts on both employment markets are definitely more significant and more divers. For a better classification of these results it is necessary to mention that the initial migrant stock employed in the Czech Republic's and Hungary's economy was very small. Thus, even though relative changes might seem high the absolute change is still very small. In general it can be stated that compared to the demand for national workers the demand for migrant workers rises stronger or decreases less respectively. It is remarkable that in some sectors like in the Czech beef sector domestic and foreign labor demand even show antidromic developments. In this case for example employment of domestic workers slightly declines while the demand for migrant workers increases. This situation arises as a result of a divers wage development (see Table 5).

Table 5:   Change in wages for unskilled labor in %

Region / Wage for	AUT	DEU	CZE	HUN
total labor force	0.56	0.22	8.65	17.53
domestic workers	0.57	0.22	8.70	17.67
foreign workers	0.36	0.24	7.43	17.67
Source: own illustration				

Similar to the situation in Austria, migrants become more competitive because wages for domestic workers rise stronger than wages for foreign labor even though the wage level for domestic as well as for foreign workers shows increasing tendencies.

Of course these labor market adjustments resulting from the enlargement process also show their impacts on migration flows. A detailed representation of migration movements by home and host country is also a part of the newly implemented migration mechanism in GTAP. But due to imperfect data no results of migration flows are shown here. Nevertheless, the results obtained show a general tendency that the enlargement process particularly influences labor movements from the CEECs while labor migration from EU-15 countries rather stays constant.

5   Conclusion

The results show that the enlargement process predominantly affects agricultural trade. This is because before the enlargement the protection applying to the agricultural sector was much higher than for other sectors like manufacturers or services. Since agriculture still represents an important economic sector in the CEECs the impacts for those countries are very significant while the effects in the EU-15 states are less strong. This pattern also applies to the labor market situation. With some exceptions labor demand remains more or less unchanged in the EU-15 countries whereas this is the case regarding the demand for domestic as well as for foreign workers. The reason for this parallel development is the meager share of migrant workers in agriculture combined with the generally low labor demand adjustments in the EU-15. With respect to the situation in the CEECs significant increases in the demand for foreign as well for domestic workers can be observed. The strong demand is accompanied by a very strong increase of wage levels. Neither in the EU-15 nor in the CEECs the labor movement shows significant effects on the composite wage level since the absolute number of migrant workers is not large enough to have a real influence on the overall wage situation. The coaction between agricultural trade and migration strongly depends on the economic role of agriculture in an economy but also on the role of the country as immigration country. Thus, the interdependencies are very strong in the CEECs because here the agricultural trade liberalization leads to significant employment changes which then directly determine migration behavior.

6   Qualifications

As already previously mentioned data availability imposes major problems on the modeling opportunities. Basically the main problem is that in a CGE model framework the simulation results achieved closely depend on the base data since they represent the basis from which changes are calculated. Data collection regarding the share of foreign workers in a country's labor force, migration flows by home and host country etc. turned out to be particularly difficult for the CEECs. Due to this lack of data some simulation results may be distorted. Besides the availability of base data another difficult task was the introduction of adequate parameters. Since migration has never been estimated via the Armington approach before there exist no corresponding parameters reflecting the elasticity of substitution between domestic and foreign labor in the literature. Thus, for the experiment at hand the labor parameters were adjusted to the Armington parameters applying to commodities in GTAP. Further research demand is also necessary with respect to the adjustment of demand and income structure. Since the share of remittances in a worker's income varies depending on her country of origin corresponding distinctions have to be drawn between migrants. The implementation of corresponding information may strongly influence regional income and thus the demand situation in some countries. It is also important to consider technological progress and therewith the development and/or advance of labor-saving production processes particularly with regard to transition countries. Last but not least labor market imperfections, like unemployment play a very important role particularly in Germany. It is essential that further research focuses on those topics. Obviously, these changes are likely to cause labor market effects and as a consequence also may lead to adjustments in interregional labor movement.

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