Institut für Wirtschaftsforschung Halle
Halle Institute for Economic Research

International Trade Patterns and Labor Markets – An Empirical Analysis for EU Member States

Götz Zeddies

June 2010 No. 15

IWH-Diskussionspapiere
IWH Discussion Papers

International Trade Patterns and Labor Markets – An Empirical Analysis for EU Member States

Götz Zeddies

June 2010 No. 15

Author: *Götz Zeddies*

Department of Macroeconomics

Email: Goetz.Zeddies@iwh-halle.de

Phone: +49 (0) 345 7753-854

Editor:
HALLE INSTITUTE FOR ECONOMIC RESEARCH – IWH
Prof Dr Dr h. c. Ulrich Blum (President), Dr Hubert Gabrisch (Research Director)
The IWH is a member of the Leibniz Association.

Address: Kleine Maerkerstrasse 8, D-06108 Halle (Saale), Germany
Postal Address: P.O. Box 11 03 61, D-06017 Halle (Saale), Germany
Phone: +49 (0) 345 7753-60
Fax: + 49 (0) 345 7753-820
Internet: http://www.iwh-halle.de

International Trade Patterns and Labor Markets – An Empirical Analysis for EU Member States

Abstract

During the last decades, international trade flows especially of the industrialized countries allegedly became more and more intra-industry. At the same time, employment perspectives particularly of the low-skilled by tendency deteriorated in these countries. This phenomenon is often traced back to the fact that intra-industry trade, which should theoretically involve low labor market adjustment, became increasingly vertical in nature and might thus entail labor market disruptions. Against this background, the present paper investigates the relationship between international trade patterns and selected labor market indicators in European countries, with a focus on vertical intra-industry trade. As the results show, neither inter- nor vertical intra-industry trade do have a verifiable effect on wage spread in EU member states. As far as structural unemployment is concerned, the latter increases only with the degree of countries' specialization on capital intensively manufactured products in inter-industry trade relations. Only for unemployment of the less-skilled, a significant impact of superior vertical intra-industry trade seems to exist. However, the link between unemployment of the lower qualified and inter-industry specialization on labor intensive goods as well as parts and components imports is considerably higher.

Keywords: intra-industry trade, trade and labor market interactions, unemployment

JEL classification: F12, F16, J64

Internationale Handelsmuster und Arbeitsmärkte – Eine empirische Analyse für EU-Mitgliedstaaten

Zusammenfassung

In den zurückliegenden Jahrzehnten waren die internationalen Handelsmuster grundlegenden Veränderungen unterworfen. Insbesondere in den Industrieländern gewann der intra-industrielle Handel zusehends an Bedeutung. Gleichzeitig verschlechterten sich in diesen Ländern die Beschäftigungsaussichten gering qualifizierter Arbeitskräfte. Diese Entwicklung wird häufig der Tatsache zugeschrieben, dass der intra-industrielle Handel zunehmend vertikaler Natur ist und damit, ähnlich wie der inter-industrielle Handel, mit Rückwirkungen auf die Faktormärkte verbunden sein kann. Vor diesem Hintergrund untersucht die vorliegende Studie die Wechselwirkungen zwischen internationalen Handelsmustern und ausgewählten Arbeitsmarktindikatoren europäischer Länder. Der Fokus liegt dabei auf dem vertikalen intra-industriellen Handel. Im Ergebnis zeigt sich, dass weder vom inter- noch vom vertikalen intra-industriellen Handel Rückwirkungen auf die Lohnspreizung in den EU-Mitgliedstaaten ausgehen. Die strukturelle Arbeitslosigkeit wird zwar über die Spezialisierungsmuster der Länder im inter-industriellen, nicht aber im vertikalen intra-industriellen Handel erklärt. Lediglich zwischen der Arbeitslosigkeit gering Qualifizierter und dem vertikalen intra-industriellen Handel besteht ein signifikanter Zusammenhang.

Schlagwörter: intra-industrieller Handel, internationaler Handel und Arbeitsmärkte, Arbeitslosigkeit

JEL-Klassifikation: F12, F16, J64

1. Introduction

The last decades were characterized by substantial increases in international trade flows all over the world. At the same time, international trade became more and more intra-industry, especially between the industrialized countries. Although for intra-industry trade the smooth adjustment hypothesis would predict low labor market disruptions, in many highly developed countries unemployment especially of the lower-skilled workforce increased. The reason for this might be traced back to the fact that intra-industry trade (IIT) became more and more vertical in nature, either due to vertical specialization or due to international fragmentation of production. In the first case, final goods within single industries or product groups are differentiated by quality and prices as a result of differing factor endowments in trading partner countries, whereas in the latter case, for the same reason, labor intensive parts of production chains are relocated to labor abundant countries. Intra-industry trade relations of this type might entail labor market pressure.[1]

In the present paper, the relationship between the composition of international trade flows and selected labor market indicators in European Union (EU) member states shall be analyzed empirically. The analysis differs from most existing studies in two important facts: First, intra-industry trade is disentangled in horizontal and vertical IIT and only the latter is regarded in the empirical analyses. Second, contrarily to other studies, the present study does not examine the relationship between changes in exports and imports and simultaneously observed changes in employment. Instead, different indicators depicting labor market situation are explained by countries' patterns of international trade. Basically, the focus is on the structure of unemployment. The paper is structured as follows: Whereas section 2 contains a review of the relevant literature, in section 3, methodological issues concerning trade patterns of EU member states are presented. In section 4, an empirical model is developed for testing the interdependencies between countries' international trade patterns, especially vertical intra-industry trade, and labor market situations. Afterwards, the empirical results are presented in section 5. Finally, section 6 closes with some concluding remarks.

1 In the following, vertical intra-industry trade is considered as a result of vertical specialization, but not of international fragmentation of production, since the latter should theoretically show up in inter-industry trade. However, in empirical analyses, intra-industry trade caused by different factor endowments must not be limited to trade in qualitatively differentiated final goods, as assumed by traditional theories on international trade, but might also result from international fragmentation of production, where producers shift individual elements of the production chain to different locations in order to exploit factor price differences (see for example *Feenstra* 1998, *Hummels et al.* 2001, *Yeats* 2001). Since not all product groups can be clearly subdivided in either final or intermediate goods, price differentials of exported and imported goods within the same product group might also result from the exchange of higher priced final goods and lower priced intermediates. Although strictly speaking, such trade relations should be classified as inter-industry, in empirical analyses, the limited potential of disaggregation would let them appear as vertical intra-industry trade.

2. Review of the Literature

In recent decades, highly developed countries, especially in Europe, experienced increases in unemployment particularly of the low-skilled. This phenomenon is often traced back to the integration of the Newly Industrializing and Eastern European economies into the international division of labor. In this context, highly developed countries increasingly specialized on (human-)capital intensive goods, which is, according to neoclassical trade theories, unfavorable for the less-qualified workforce. Against this background, in highly developed countries, international trade should have lead either to a downward shift in wages of the lower qualified or, depending on wage flexibility, to higher unemployment of the less-skilled (Krugman 1994). Whereas especially in Europe, unemployment of the low-skilled rose considerably during the last decades, in the United States, the comparatively low unemployment rates of the less-qualified were dearly bought by rising inequality (Davis 1998, Feenstra and Hanson 2001). In this regard, the question arises whether the developments described above can only be explained by traditional trade theories. Interestingly, increasing unemployment of the low-skilled and wage disparities, respectively, were apparently accompanied by augmenting intra-industry trade, whereas inter-industry trade diminished more and more in highly industrialized economies. Thus, the determinants of intra-industry trade should be considered in more detail. Whereas inter-industry trade is mainly explained by differences in relative prices emerging either from different factor-productivities (Ricardo) or factor endowments between countries (Heckscher-Ohlin), or by different patterns of demand, the causes of intra-industry trade are quite manifold.

Originally, intra-industry trade was, unlike inter-industry trade, supposed to involve little labor market adjustment (*smooth adjustment hypothesis*, Balassa 1966). But in the course of time, intra-industry trade was further subdivided into two different classes: Horizontal intra-industry trade, i.e. two-way trade in products of similar quality, which are manufactured with similar technologies and/or factor endowments in trading partner countries and differ only in product attributes, and vertical IIT, comprising the exchange of goods of the same product group differentiated with respect to quality and prices. The original theoretical strand dealing with intra-industry trade focused on horizontal IIT. The theoretical basis for this kind of intra-industry trade traces back to Krugman (1979), Lancaster (1980) and Helpman (1981), who ascribe this type of trade to monopolistically competitive markets and increasing returns to scale. The latter provide especially producers in larger countries the opportunity to realize competitive advantages through specialization even before entering into foreign markets. Combined with the monopolistic competition approach, which assumes a love of variety of consumers, horizontal intra-industry trade should be positively associated with the diversity of preferences and economies of scale. Further analysis about the impact of product differentiation on foreign trade goes back to Linder (1961). Accordingly, there is a positive correlation between product-quality, prices and the income levels of consumers. Thus, each country specializes on quality standards mainly preferred by domestic consumers. Consequently, differences in per capita incomes and income distributions between countries

would imply diverging consumer preferences with respect to quality and prices and should thus reduce horizontal IIT. Therefore, horizontal IIT should occur mainly between high-income countries with similar levels of development.

Over time, vertical intra-industry trade gained more and more interest. In the approach of Falvey (1981) and Falvey and Kierzkowski (1987), vertical IIT follows traditional endowment-based models. Other than in the Heckscher-Ohlin approach, capital is sector-specific, whereas labor is assumed to be mobile between sectors. In the two-country-two-goods case where each country produces a capital-intensive and a labor-intensive good, the capital-intensive good is vertically differentiated, i.e. produced in different qualitative varieties, whereas the labor-intensive good is homogeneous. The model suggests that higher-quality varieties of a product require comparatively high (human-)capital-intensities in production, whereas lower-quality varieties of a product are manufactured more labor-intensive. As a consequence, (human-)capital abundant countries will produce and export high-quality varieties of the (human-)capital-intensive good and in return import lower-quality varieties of the capital-intensive as well as the labor-intensive good. Subsequently, the share of vertical intra-industry trade in total bilateral trade should be the higher, the greater differences in factor endowments between trading partner countries are. As a consequence, not only inter-industry, but also vertical intra-industry trade could be associated with labor market adjustment, and the smooth adjustment hypothesis must not hold. Another vertical intra-industry trade model developed by Flam and Helpman (1987) is in line with the Ricardo approach for inter-industry trade and says that the source of quality differentiation is not the capital-intensity of production, but the technology used. Consequently, technologically advanced countries have comparative advantages in higher-quality varieties of a product. Hence, beside differences in factor endowments, per capita incomes and income distributions, vertical IIT should be driven by differences in technologies between trading partner countries.

With respect to international trade and technology, the question emerges whether unemployment of the lower-qualified workforce in highly-developed countries is rather caused by international trade or by technological progress (‘trade vs. technology’ debate, see e.g. Deardorff 1998). A majority of empirical analyses finds that technology has a larger impact on inequality and/or unemployment of the low-skilled than international trade (e.g. Berman et al. 1994, Lawrence and Slaughter 1993, OECD 2005a, International Monetary Fund 2007). However, in these studies, international trade and technological progress are considered as independent, and potential relationships and dependencies between them are neglected. But this is probably a crucial shortcoming, since, on the one hand, technological change, like for instance the emergence of telecommunication technologies, increased international trade. But on the other hand, the increasing openness of countries and international competition in the course of globalization induced labor-saving technological progress, especially in high-wage countries (e.g. Dluhosch 2006). Empirically, the causality between international trade and technological progress is difficult to overcome (Hagemann and Rukwid 2007). Hence, it is

problematic to identify whether labor market effects are directly linked to international trade or to technological progress resulting from increasing openness of countries. However, it is widely accepted that international trade and technological change depend on each other. Thus, the question is only whether international trade affects labor markets directly or indirectly by fostering technological progress.

As far as linkages between intra-industry trade and labor markets are concerned, empirical analyses for different countries exist. So far, these analyses used marginal intra-industry trade, i.e. the change in intra-industry trade within a period as explanatory variable for labor market adjustments. Thereby, it is assumed that increasing imports entail job losses, whereas new jobs are created with increasing exports. If imports and exports in industry i increase to the same extent, net employment change and thus labor market adjustment is expectedly minimized. However, due to several reasons, this approach can be considered as problematic (Lovely and Nelson 2002). For instance, many of these country-studies just focus on correlation coefficients between marginal IIT and industry or employment performance, respectively (Smeets 1999, Rossini and Burattoni 1999). As far as empirical analyses are applied, the majority of studies just use net employment changes as dependent variable (e.g. Fertö and Soos 2008, Brülhart and Elliott 2002, Erlat and Erlat 2003, Brülhart an Thorpe 2000). But thereby, export induced employment creation is also captured as adjustment costs. In general, net employment changes are probably insufficient for analyzing labor market pressure, since worker moves between industries or occupations are neglected. Additionally, empirical results of these studies are, in most cases, sparsely robust and partially even highly volatile with respect to the time-lag between dependent and independent variable (e.g. Faustino and Leitao 2009, Fertö and Soos 2008, Brülhart 2000). This is hardly surprising, since it is questionable whether increases or decreases in exports and imports lead to labor market adjustments in the same period already. Especially worker moves between industries and occupations probably only take place in a longer-term perspective, since in many countries, labor market policy instruments are presumably postponing adjustment processes. On this account, short-term models might be inappropriate, especially if they are refraining from time-lags. More recently, studies based on individual worker data accounting for worker movements between industries and occupations were introduced (e.g. Brülhart et al. 2006, Cabral and Silva 2006). However, these analyses neglect workers moving into unemployment. Moreover, individually motivated worker moves cannot be distinguished from unvoluntarily induced job changes.

Overall, the great majority of the above mentioned studies find support for the smooth adjustment hypothesis, since net employment changes or worker movements are comparatively lower if exports and imports change simultaneously. But the most striking deficit of almost all studies is the missing distinction between horizontal and vertical IIT. This is a crucial deficit, since only the latter should theoretically encounter structural adjustment. Hence, in the present study, another approach is chosen focusing on vertical intra-industry trade, which, in contrast to classical horizontal IIT, should be associated with labor market pressures. Moreover, the analysis is overall more long-term orientated

and examines the interrelationship between countries' trade patterns on the one hand and wage structure and unemployment on the other. Thereby, dependencies between well-established foreign trade structures and the labor market can be analyzed. Additionally, the relationship between the composition of international trade flows and labor market situation of different skill groups is considered.

3. Identification of Countries' International Trade Patterns

As mentioned above, intra-industry trade for a long time referred to the exchange of goods stemming from the same product groups differentiated by attributes, but manufactured with similar factor intensities. But with the analyses of Falvey (1981), Falvey and Kierzkowski (1987) and Flam and Helpman (1987), intra-industry trade was partly ascribed to endowment and productivity differences between countries, respectively. Empirically, international trade flows are subdivided in inter- and intra-industry trade by the Grubel-Lloyd Index (Grubel and Lloyd 1975), which takes the following form:

$$IIT_{kl} = \frac{\sum_{i=1}^{n}\left(X_{ikl} + M_{ikl}\right) - \sum_{i=1}^{n}\left|X_{ikl} - M_{ikl}\right|}{\sum_{i=1}^{n} X_{ikl} + M_{ikl}} \tag{1}$$

Whereas IIT_{kl} stands for intra-industry trade coefficient between country k and a set of partner countries l, X_{ikl} and M_{ikl} represent exports and imports, respectively, of country k to/from its trading partner countries l in product group i. By summing up over all product groups i, the Grubel-Lloyd index depicted in formula (1) quantifies the intra-industry share in total trade between country k and its trading partners l. If all trade between country k and countries l would be intra-industry, the Grubel-Lloyd index would equal one, and if all trade would be inter-industry, the index would equal zero.

For the following empirical analysis, intra-industry trade has to be disentangled into trade with horizontally and trade with vertically differentiated products. Again, the first component represents the exchange of commodities originating from the same product group and differentiated only by attributes, whilst the latter represents trade in commodities of different quality. It is assumed that differences in quality are reflected by differences in prices, which can be proxied by unit values. The generally applied indicator for quality differences are thus unit values calculated per ton (Abd-el-Rahman 1991, Greenaway, Hine and Milner 1994). In the following, horizontal intra-industry trade will be defined as the simultaneous export and import of a 5-digit-SITC (*Standard International Trade Classification*) item where the unit value of exports relative to the unit value of imports is within a range of ±15%, denoted as α. This range is generally used for disentangling horizontal and vertical intra-industry trade, because it seems to be feasible that other factors than quality differences, like for instance transportation and other freight costs, are unlikely to account for a difference in unit values of more

than 15% (Blanes and Martin 2000). Hence, the formula for identifying horizontal intra-industry trade takes the following form:

$$1-\alpha \leq \frac{UV^{X}_{ikl}}{UV^{M}_{ikl}} \leq 1+\alpha \tag{2}$$

UV^{X}_{ikl} stands for the calculated unit value per ton of the exported commodities in product group i from country k to its trading partners l, whereas UV^{M}_{ikl} denotes the calculated unit value per ton of country k's imports in product group i from trading partner countries l. On the other hand, intra-industry trade in product group i is considered vertical if the relative unit value of exports and imports is outside this range, whereas equation (3) denotes superior vertical intra-industry trade ($SVIIT_{ikl}$).

$$\frac{UV^{X}_{ikl}}{UV^{M}_{ikl}} > 1+\alpha \tag{3}$$

If unit values of country k's exports in product group i exceed unit values of imports by more than 15% (equation (3)), the quality of country k's export commodities is assumed to be considerably higher than the quality of imported goods in the same product category. On the other hand, if unit values of country k's export commodities in product group i deceed unit values of imported commodities by more than 15%, (equation (4)), inferior vertical intra-industry trade ($IVIIT_{ikl}$) is

$$\frac{UV^{X}_{ikl}}{UV^{M}_{ikl}} < 1-\alpha \tag{4}$$

at hand, meaning that country k's exports in product group i are of lower quality than its imports. With these subdivisions, total intra-industry trade (IIT_{kl}) between country k and its trading partner countries l is the sum of horizontal IIT ($HIIT_{kl}$) and vertical IIT over all product groups i ($VIIT_{kl}$), whilst the latter consists of inferior vertical intra-industry trade ($IVIIT_{kl}$) and superior vertical IIT ($SVIIT_{kl}$).

$$IIT_{kl} = HIIT_{kl} + VIIT_{kl} = HIIT_{kl} + SVIIT_{kl} + IVIIT_{kl} \tag{5}$$

Against this background, a panel data model shall be applied in order to identify the dependencies between international trade patterns and selected labor market indicators in EU member states. In the following section 4, the dependent and independent variables entering into the model are described and some stylized facts are presented.

4. Empirical Analysis

4.1 Dependent and Explanatory Trade Variables

For the empirical analyses, a panel data approach is chosen in order to determine the possible impact of international trade on labor markets of EU Member States. Generally, international trade might affect the labor market in two different ways: From the neo-classical point of view, countries specialize according to comparative advantages, whereas the latter depend on international endowment or productivity differences. As a consequence, trade-induced reallocation will divert resources between sectors. Accordingly, in each country, the price(s) of the abundant production factor(s) should increase, whereas compensation of the scarce production factor(s) should reduce, provided that factor prices are sufficiently flexible. Alternatively, in case of factor price rigidity, unemployment of particular skill-groups should occur (Brülhart 1999). This might not only hold for inter-, but also for vertical intra-industry trade. In order to depict these effects, three different dependent variables are chosen indicating labor market situation probably resulting from international trade: Wage spread ($WSpr_{kt}$), long-term unemployment ($UELT_{kt}$) and unemployment of the lower-qualified ($UELS_{kt}$) in country k and period t. Since long-term unemployment rates should depend on total unemployment, the share of long-term unemployed persons[2] as a percentage of total unemployment was calculated. The same holds for unemployment of the lower-qualified: Of course, unemployment ratios of the less-skilled are not independent from countries' total unemployment rates. Therefore, for this variable, unemployment rate of persons with pre-primary, primary and lower secondary education (ISCED 1997, levels 0-2) adjusted by total unemployment rate of country k were calculated. As a proxy for wage spread, decile ratios of gross earnings (decile 9/decile 1) were chosen. Data for wage spread and long-term unemployment were sourced from the EUROSTAT database, figures on unemployment by skill-groups were drawn from the International Labor Organization (ILO).

With respect to the composition of international trade flows, superior vertical intra-industry trade coefficient of country k in period t ($SVIIT_{kt}$) acts as explanatory variable. Since superior vertical intra-industry trade is detrimental for low-qualified labor, also long-term unemployment could probably rise, since especially less-qualified workers are difficult to re-integrate into the labor market if once set free. Likewise, the share of lower-qualified in total unemployment or, alternatively, wage spread should be the higher, the larger the share of superior vertical *IIT* (Davis 1998).[3] Against this back-

2 Unemployment duration exceeding one year.

3 Theoretically, a negative impact of $SVIIT_{kt}$ on the dependent variables is imaginable. Due to the fact that $SVIIT_{kt}$ is part of total intra-industry trade of country k, an increase of $SVIIT_{kt}$ should increase total *IIT*. As a consequence, inter-industry trade would decrease. Since, according to theory, trade-induced structural adjustment and sectoral reallocation is more severe with inter-industry trade, an increase in superior vertical *IIT* could, by diminishing inter-industry trade, even reduce labor market pressure.

ground, a significantly positive impact of the $SVIIT_{kt}$-variable would disprove the smooth adjustment hypothesis. Beside superior vertical intra-industry trade coefficient, an indicator depicting countries' specialization patterns in inter-industry trade relations is developed. This is done by integrating an additional explanatory variable displaying labor content of production in sectors where countries k do have comparative advantages ($FCInter_{kt}$). The indicator is calculated by the following formula:

$$FCInter_{kt} = \sum_{j=1}^{n} RCA_{jkt} * \frac{\left(\frac{Empl_{jkt}}{GVA_{jkt}}\right)}{\left(\frac{Empl_{Mkt}}{GVA_{Mkt}}\right)} * \frac{T_{jkt}}{T_{Mkt}} \quad \text{for j with } \mathrm{RCA_{jkt}} > 0 \tag{6}$$

Whereas RCA_{jkt}[4] stands for revealed comparative advantage coefficient in industry j of country k in period t, $Empl_{jkt}$ and $Empl_{Mkt}$ represents country k's employment in industry j and total manufacturing (M), respectively, in period t. GVA_{jkt} and GVA_{Mkt} stand for gross value added in industry j and total manufacturing (M), respectively, in country k and period t. Hence, the medial term shows labor intensity of production in industry j in relation to total labor intensity of production in country k. Finally, T_{jkt} and T_{Mkt} represent turnover in industry j and total manufacturing (M). Thus, the last term represents the weight of industry j in total manufacturing of country k. The indicator is calculated by summing up over all industries j where country k possesses, according to RCA_{jkt}, comparative advantages. Hence, the indicator is the higher, the higher labor-intensity of production in industries j where country k possesses comparative advantages (compared to labor-intensity of production in total manufacturing of the respective country), the higher RCA-coefficients in these industries are (i.e. the higher the extent of inter-industry trade), and the higher the share of these industries in turnover of total manufacturing. Thus, a negative impact of this variable on all dependent variables is expected: The higher a countries comparative advantages in labor-intensive production, the lower unemployment-share of lower-qualified as well as long-term unemployment should be.

4 RCA_{jkt} = *Revealed Comparative Advantage Coefficient* of country k in industry j and period t. RCA_{jkt} is obtained from the following formula:

$$RCA_{jkt} = \left(\frac{\frac{X_{jkt}}{X_{kt}}}{\frac{M_{jkt}}{M_{kt}}} - 1\right) \Bigg/ \left(\frac{\frac{X_{jkt}}{X_{kt}}}{\frac{M_{jkt}}{M_{kt}}} + 1\right)$$

X_{jkt} represents exports of country k in industry j and period t, X_{kt} stands for exports in total manufacturing of country k in period t. On the other hand, M_{jkt} represents country k's imports in industry j and period t, whereas M_{kt} stands for country k's imports in total manufacturing in period t. RCA_{jkt} reaches a value of +1 if country k does only export in industry j, and −1 if country k does only import in industry j.

Additionally, wage spread should be lowered if a country specializes on labor-intensive production.

Additionally, country *k*'s import quota of parts and components ($ImQPC_{kt}$), measured by parts and components imports in relation to GDP, acts as explanatory trade variable. During the last decades, especially Western European high-wage countries increasingly sourced labor intensively manufactured parts and components from lower-wage countries. Hence, it could be expected that international fragmentation of production is unfavorable especially for the lower-qualified workforce (Feenstra and Hanson 2001). Therefore, an increasing import quota of parts and components is expected to exert labor market pressure and to raise unemployment of the less-skilled, but probably also long-term unemployment. In the estimations where wage spread acts as dependent variable, instead of $ImQPC_{kt}$, countries' total openness to international trade, measured by exports and imports in relation to GDP, serves as explanatory variable (OTr_{kt}). According to the Heckscher-Ohlin approach, the effect of openness to trade on wages is ambiguous, since increasing openness should lead to higher wage spread in capital abundant and to lower wage spread in labor abundant countries (Wood 1994). But apart from factor endowments, openness to trade, not only in parts and components, but also in final goods, should reduce the bargaining power especially of the lower-qualified workforce and should thus shift their wages downwards (Onaran and Stockhammer 2006).[5] Hence, the impact of openness on wage spread especially in industrialized countries should be positive. In the following sub-section, some stylized facts about the dependent and explanatory trade variables in EU Member States are presented.

4.2 Some stylized Facts

Table 1 depicts international trade structure of 14 selected European countries in 2007. Data were drawn from the EUROSTAT-database and contain international trade flows in SITC product groups 5 to 8 (these contain chemicals and related products, machinery, transport equipment and other manufactured goods). As can be seen from table 1, inter-industry trade coefficients are lowest in France, Germany and Austria. These results correspond to the propositions of New Trade Theories, postulating that especially trade flows of high-income countries are to a large degree intra-industry,

5 Due to the high correlation between $ImQPC_{kt}$ and OT_{kt} it is impossible to integrate both variables into the model.

Table 1:
International Trade Structure of 14 Selected European Countries in 2007[6]

Country	*Inter-industry trade coeff.*	*IIT*	*HIIT*	*VIIT*	*SVIIT*	*IVIIT*
France	0,276	0,724	0,142	0,582	0,296	0,286
Germany	0,316	0,684	0,235	0,449	0,350	0,099
Austria	0,339	0,661	0,302	0,359	0,222	0,137
Spain	0,356	0,644	0,117	0,527	0,130	0,397
United Kingdom	0,376	0,624	0,234	0,390	0,295	0,095
Czech Republic	0,419	0,581	0,152	0,429	0,154	0,275
Netherlands	0,419	0,581	0,118	0,463	0,241	0,222
Italy	0,443	0,557	0,111	0,446	0,145	0,301
Hungary	0,476	0,524	0,134	0,390	0,186	0,204
Poland	0,501	0,499	0,141	0,358	0,137	0,221
Portugal	0,538	0,462	0,178	0,284	0,099	0,185
Slovakia	0,582	0,418	0,137	0,281	0,159	0,122
Romania	0,694	0,306	0,044	0,262	0,098	0,164
Bulgaria	0,737	0,263	0,05	0,213	0,074	0,139

Sources: EUROSTAT, own calculations.

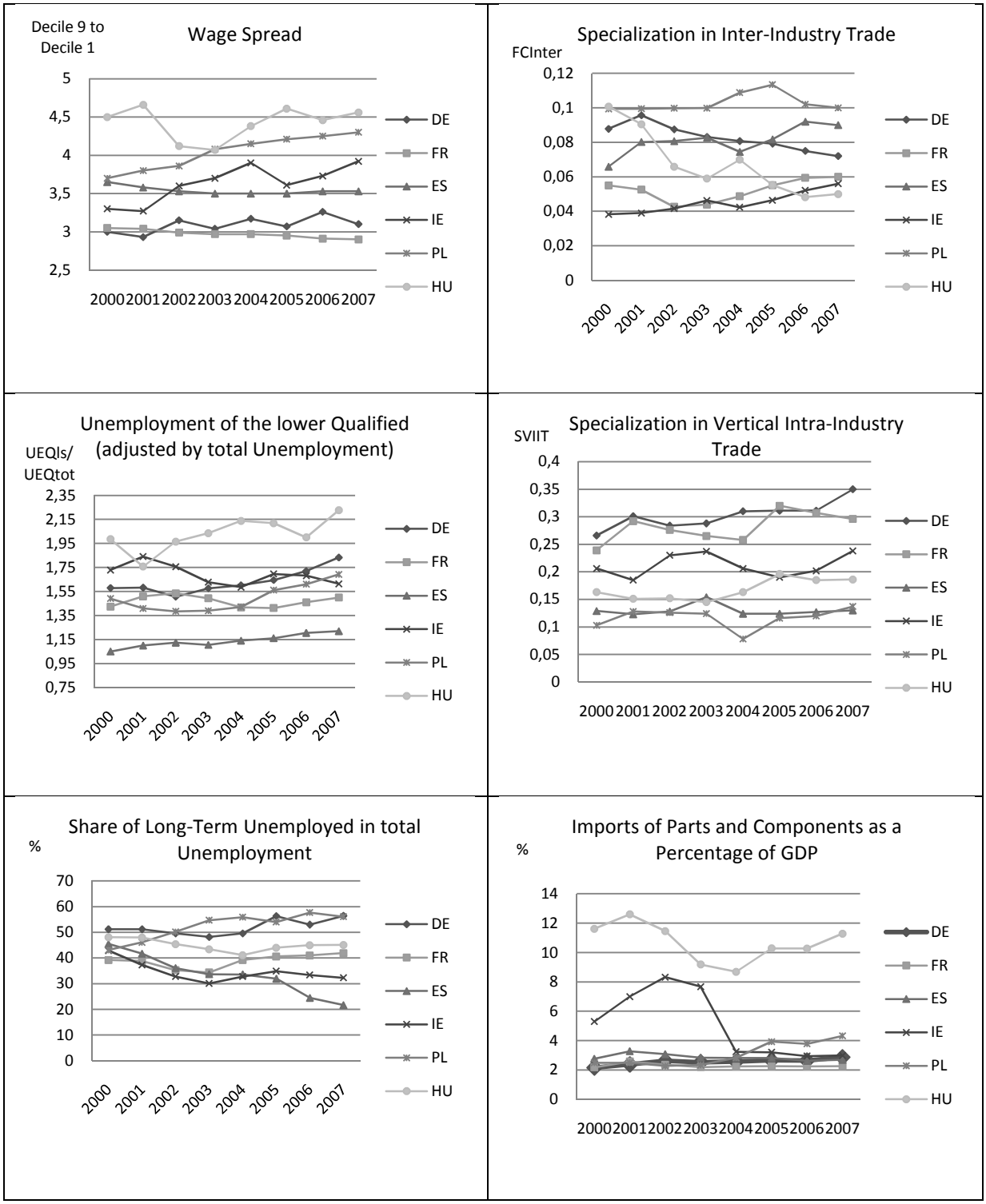
since differentiated goods emanating from the same product groups are traded due to a greater love for varieties of consumers. Hence, Eastern, but also Southern European countries show lower degrees of intra-industry trade. Only in Spain and the Czech Republic, intra-industry trade coefficients are, compared to per capita incomes of these countries, comparatively high. But overall, on the 5-digit level of aggregation, intra-industry shares in countries' total trade are quite low, since even for Austria and Germany *IIT* coefficients are below 0.7. A closer look on intra-industry trade shows for all countries that *IIT* is largely vertical (see also Gabrisch and Segnana 2001). With the exception of Austria, Germany and the United Kingdom, classical horizontal intra-industry

6 Calculated on the basis of 5-digit SITC trade data (except SITC groups 1 (Food and Live Animals), 2 (Beverages and Tobacco), 3 (Mineral Fuels, Lubricants and Related Materials) and 4 (Animal and Vegetable Oils, Fats and Waxes)).

trade only accounts for about 10 to 15 per cent of total trade, in the least developed countries Bulgaria and Romania, horizontal *IIT* is even lower. In reverse, at least 85 per cent of international trade, namely inter- and vertical intra-industry trade, might be associated with adjustment costs in all countries except Germany, the United Kingdom and especially Austria. But even in Austria, this share amounts to 70 per cent. With respect to vertical intra-industry trade, the results show that in (human-)capital abundant high income countries, vertical *IIT* is largely superior, especially in Germany and the United Kingdom, but also in Austria and the Netherlands. Contrarily, in labor abundant lower income countries of Southern and Eastern Europe, vertical intra-industry trade is rather inferior. This reveals that these countries specialize on differentiated goods which are more labor intensively manufactured and, in reverse, do seemingly import (human-) capital intensively manufactured varieties of the same product group. Hence, in high-wage countries, vertical intra-industry trade should favor the higher-qualified, since these countries mainly export (human-)capital intensively manufactured product varieties of higher quality and, in return, do import more labor intensively manufactured varieties of lower quality.

With respect to possible interdependencies between trade patterns and labor markets, countries' specialization in inter- and intra-industry trade matter. Additionally, imports of parts and components might be relevant. For this reason, the development of these trade indicators as well as of the dependent variables is depicted for selected countries in figure 1 below. With respect to the trade indicators, Poland and Spain strongly specialize on labor intensively manufactured goods and varieties, respectively, in inter- as well as in vertical intra-industry trade. Interestingly, this was also the case for Germany, but the *FCInter*-Indicator depicting the degree of specialization in inter-industry trade relations decreased in course of time. Also in vertical intra-industry trade, Germany as well as France increasingly specialized in more capital intensively-manufactured, higher-quality varieties.

Figure 1:
Trade and Labor Market Indicators in selected EU Member States



Sources: EUROSTAT, International Labour Organization, own calculations.

The results for Hungary seem somehow surprising, since specialization on labor-intensively manufactured products in inter-industry trade decreased tremendously and specialization on higher-quality varieties in vertical intra-industry trade increased, although on a low level.[7] At first sight, the development of countries' import quotas of parts and components are less convincing, since, with the exception of Hungary, data do not substantially differ. Referring to the dependent variables (*WSpr*, *UELS*, *UELT*), the interdependencies between the trade indicators and wage spread are rather noticeable. Whereas for instance Ireland, specializing on more capital-intensively manufactured products in inter-industry trade relations and on higher-quality varieties in intra-industry trade, experienced an increase in wage spread, the same was the case in Poland, although the latter country does, according to the labor-market indicators, seemingly have comparative advantages rather in labor-intensively manufactured products, be it in inter- or in vertical intra-industry trade relations. In contrast, the relationships between trade and unemployment indicators seem to be more clearly. Especially in Poland and Spain, specializing on more labor-intensively manufactured goods in inter-industry and on lower-quality varieties in vertical intra-industry trade relations, unemployment of the lower qualified is comparatively low. On the other hand, in Germany and Hungary, revealing adverse specialization patterns, the opposite is the case. As far as long-term unemployment is concerned, the former is comparatively high and increased in Germany, but, as could be expected from the specialization patterns, is comparatively low and decreased in Spain and Ireland, which increasingly specialized on labor-intensively manufactured goods in inter-industry trade. However, for other countries, the results are less conclusive, indicating that, beside trade patterns, labor-market situations do depend on additional factors. In order to control for the latter, some additional non-trade variables will be integrated into the model.

4.3 Additional Explanatory Variables

Beside the above mentioned trade variables, labor market performance should depend on total labor force qualification. Empirical analyses for several countries show that unemployment rates of different skill-groups as well as long-term unemployment are the lower, the higher the level of education, since the higher-qualified are more mobile between tasks and sectors and are thus much easier to place on the labor market (Hartog 2000). On the other hand, the share of lower-qualified in total unemployment and/or wage spread, but also long-term unemployment could especially be high in countries with high tertiary enrolment ratios, since, according to neo-classical trade theories, these countries should specialize on (human-)capital intensively manufactured goods, which

7 These developments are probably caused by high FDI inflows from Western Europe to Hungary. On the one hand, labor-intensities are comparatively low in these production sites. On the other hand, export orientation of these affiliate companies of Western European firms is above average, leading to an increase in capital-intensive exports over time.

is detrimental for the less-skilled. To test for these hypotheses, tertiary enrollment ratio ($TertEnr_{kt}$) in country k and period t is added as explanatory variable.

The explanatory variable $VAEmpl_{kt}$, representing gross value added per employee in total industry of country k, is integrated for several reasons: First, a high labor productivity is an indicator for (human-)capital-intensive production, which is unfavorable for the less-qualified. In this context, the variable is a supplement to the tertiary enrolment indicator above. Second, this variable can be seen in conjunction with the trade vs. technology debate, since technological progress is associated with labor demand shifts unfavorable to low-qualified workers (Manacorda and Petrongolo 1999). Thus, if higher labor productivity is due to capital-augmenting technological progress, it is expected to involve unemployment, especially of the less-qualified and should consequently also increase wage spread.

Moreover, an indicator containing protective labor market measures is integrated in order to depict labor market flexibility ($LabProt_{kt}$). The variable consists of three different subsets: One indicator depicting strictness of employment protection legislation (EPL), developed by OECD (Labour Force Survey (OECD 1999)) and referring to the protection of regular workers against dismissals as well as the regulation of collective dismissals and temporary work. In addition to this OECD indicator, rates and average duration of unemployment compensation in countries k are added. Since all three indicators differ in units and scales, they were transformed in the way that each of them is set to one in country k where the indicator reaches the maximum value, and to zero in the country with the lowest absolute value. Afterwards, for each country k, these three parameters ranging between zero and one were averaged. Consequently, a higher value of $LabProt_{kt}$ means higher labor market protection and, in reverse, lower labor market flexibility. With respect to unemployment benefits, the impact of $LabProt_{kt}$ on long-term unemployment as well as on unemployment of the less-qualified should rather be positive, i.e. increase the latter, since incentives to work are lowered. With respect to wage spread, the impact of employment protection and especially unemployment compensation should be negative, since higher unemployment benefits reduce the risks of unemployment and should thereby increase the minimum wage level. Moreover, employment protection legislation should strengthen the bargaining position of employees, which should also lead to a reduction in wage spread. However, the impact of $LabProt_{kt}$ on the dependent variables could be weakened by the effect of employment protection legislation, which is rather inconclusive. With respect to unemployment, the jobs of the 'insiders', especially of vulnerable groups, might become more secure in a short-term perspective, since redundancies are more costly for employers (e.g. due to severance pays or other obligations in favour of redundant workers). Otherwise, 'outsiders' face more difficulties in accessing regular jobs, resulting in higher unemployment. Hence, whereas some authors found a positive impact of employment protection on labor market performance (e.g. Nickell and Layard 1999, Nickel et al. 2003), other analyses showed an insignificant or even a negative impact (e.g. Elmeskov et al. 1998, Belot and van Ours 2000, Belot and van Ours 2001).

In the estimations where wage spread acts as dependent variable, union membership is added as additional explanatory variable, which is said to be an important determinant of wage spread, since trade unions aim for less dispersed wage structures for several reasons. For instance, noticeable wage differentials may reduce consensus among workers and the force of union's collective voices (Freeman 1980). Furthermore, since the main objective of unions is to increase pay levels of workers covered by collective bargaining agreements, wage dispersion should decrease if wages of workers covered are below average, which is normally the case (Hirsch and Addison 1986). Hence, an increasing union membership, measured by union members as a share in total employees ($UNION_{kt}$), should lower wage spread. In the estimations where the share of long-term in total unemployment as well as unemployment of the low-skilled act as dependent variable, total unemployment rate ($Unempl_{kt}$) is added as additional explanatory variable. It is quite obvious that the extent of structural unemployment largely depends on the total level of unemployment. Moreover, it is imaginable that rising unemployment is primarily borne by the low-skilled. Finally, in all estimations, dummy variables accounting for time-dependent effects influencing labor market performance and developments, for instance in conjunction with the business cycle, are introduced.

Data on employment protection legislation and union membership were sourced from the OECD-database, whereas information on employment benefits stem from the MISSOC-database of the European Union. Data on all other explanatory variables were drawn from the EUROSTAT-database.

4.4 The Empirical Model

On the basis of the precedent considerations, the following econometric panel data model can be derived:

$$\ln X_{kt} = \alpha + \beta_n \ln Y_{kt} + \gamma_m \ln Z_{kt} + D_t + \mu_{kt} \tag{7}$$

whereas X_{kt} stands for the set of dependent variables (wage spread ($WSpr_{kt}$), the share of long-term unemployed in total unemployment ($UELT_{kt}$), and relative unemployment rate of the low-skilled ($UELS_{kt}$), respectively) in countries k and period t, Y_{kt} is the set of n trade variables ($FCINTER_{kt}$, $SVIIT_{kt}$, $ImQPC_{kt}$, OTr_{kt}), Z_{kt} is the set of m non-trade explanatory variables ($TertEnr_{kt}$, $VAEmpl_{kt}$, $LabProt_{kt}$, $UNION_{kt}$), D_t is the vector of dummy variables and μ_{kt} represents the error term. The emerging panel data set covers 20 countries[8] and eight periods (2000 to 2007). Altogether, three different models will be estimated: Model (1) with wage spread, model (2) with the share of long-term unemployment in total unemployment, and model (3) with the relative unemployment rate of

8 Austria, Belgium, Bulgaria, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, the Netherlands, Poland, Portugal, Romania, Slovakia, Spain, Sweden, and the United Kingdom (the country sample entering into the regression was selected according to data availability).

the low-skilled as dependent variable. In each of the estimations, a pooled OLS regression technique will primarily be used. But a problem of the simple OLS estimation could be individual, in this case country-specific effects leading to biased estimates. To eliminate this shortcoming, fixed effects models are a suitable instrument, since these permit to consider unobserved heterogeneity of individuals. In the fixed effects model, the latter is assumed to be constant over time for each individual. In the empirical analysis at hand, the pooled OLS model of equation (7) would change to a fixed effects model of the following form:

$$\ln X_{kt} = \alpha + \beta_n \ln Y_{kt} + \gamma_m \ln Z_{kt} + D_t + \delta_k + \mu_{kt} \tag{8}$$

As in equation (7), X_{kt} represents the set of dependent variables for countries k in period t. Y_{kt} is, as above, the set of n trade variables, whereas Z_{kt} represents the set of m non-trade variables, and D_t the vector of time-dummies. δ_k represents the country-specific fixed effects of countries k. Whether a fixed effects model is superior to the pooled OLS regression can be derived from the likelihood-ratio test. But in addition to fixed effects, another option should be tested, namely the application of a random effects model.

Contrarily to the fixed effects approach, random effects models act on the assumption that heterogeneity of observations is not based on individual fixed effects, but is instead randomly distributed. In the random effects model presented in equation (9), v_k represents the random effects, which should be normally distributed.

$$\ln X_{kt} = \alpha + \beta_n \ln Y_{kt} + \gamma_m \ln Z_{kt} + D_t + v_k + \mu_{kt} \tag{9}$$

The assumption that individual differences are now considered as random disturbances requires that the regressors and the v_k are uncorrelated. To control for this assumption, the Hausman-Test will be applied.

5. Estimation Results

5.1 Model 1 (wage spread)

In the first model, beside others, the impact of openness to trade as well as specialization patterns in inter-industry and vertical intra-industry trade on wage spread shall be analyzed. According to the Stolper-Samuelson theorem, in highly-developed capital abundant countries, international trade should increase compensations for capital and high-skilled workforce and reduce wages of the low-skilled. In this context, international fragmentation of production, i.e. the tendency that producers in high wage countries are more and more sourcing labor intensively manufactured parts and components from low wage countries, shifted demand away from low wage activities while raising demand and wages of the higher-skilled (Feenstra and Hanson 2001). However, globalization seemingly increased wage spread especially in the U.S., whereas in most Western

European countries, wage spread is said to have increased only slightly, and international trade allegedly rather caused unemployment.

With respect to the estimations in model (1) likelihood ratio tests suggest the superiority of the fixed effects estimation over the simple OLS model. Moreover, the Hausman-Test statistics are in favour of a random effects estimation. According to the random effects estimation results, the *SVIIT*- and *FCINTER*-variables are both insignificant. Theoretically, superior vertical *IIT*-coefficient as well as the *FCINTER*-variable, indicating the degree of country *k*'s comparative advantages in labor-intensively manufactured products in inter-industry trade relations, should have a significant impact on wage spread, provided that wages are sufficiently flexible. This is seemingly not the case in European countries. In contrast, the significantly positive impact of countries' openness to trade on wage spread supports the hypothesis that growing international competition increases the pressure especially on wages of the less-skilled in industrialized countries.

With respect to the non-trade variables, tertiary enrolment ratio is significantly negative, suggesting that wage differentials are the lower, the higher overall qualification level. On the one hand, higher tertiary education should theoretically increase wage premiums and should thus also increase wage spread. Moreover, skill biased technological change modifies factor shares in production by increasing the number and compensations of highly educated workers (Machin and Van Reenen 1998). But on the other hand, increasing tertiary education shifts the supply curve of highly qualified workers and thereby reduces the return to tertiary education (Katz and Murphy 1992). In European OECD member countries, the share of population with tertiary education rose from 5% in 1960 to 25% in 2003 (OECD 2005b). Theoretically, this development might have contributed to a supply surplus and a fall in relative wages of the higher qualified. The positive impact of gross value added per employee ($VAEmpl_{kt}$) is as expected: The higher labor productivity, the higher (human-)capital-intensity of production and the lower demand for unskilled labor should be. As a consequence, wage differentials should increase. According to the estimation results, labor market protection does neither increase nor decrease wage differentials. As commonly expected, wage spread is the lower, the higher union membership as an indicator for bargaining power of trade unions. The time dummies are largely insignificant. Overall, the estimation results suggest that in Europe, wage spread is mainly determined by union density, factor intensity of production and the extent to which a country competes with other nations on international markets. Additionally, wage spread decreases with a growing share of population with tertiary education. But, in contrast to total openness to trade, no interdependence between countries' patterns of international trade and wage dispersion could be verified. This result is in accordance with the hypothesis that globalization did increase wage spread especially in the U.S., but in Europe only in a few countries, if any. Instead, the integration of low wage countries into the world economy is said to have raised (structural) unemployment especially in Western Europe. The latter hypothesis shall be tested in the following sub-section.

Table 2:
Estimation results of model (1)

expl. variables	OLS-Estimation	FE-Estimation	RE-Estimation
Const.	1,100*** (6,32)	0,134* (1,67)	0,181** (2,46)
$SVIIT_{kt}$	0,088** (2,38)	0,014 (0,89)	0,017 (1,07)
$FCINTER_{kt}$	0,011 (0,55)	0,006 (0,76)	0,007 (0,89)
OTr_{kt}	-0,003 (-0,14)	0,129*** (3,55)	0,112*** (3,47)
$TertEnr_{kt}$	-0,233*** (-8,60)	-0,132*** (-3,92)	-0,128*** (-4,88)
$VAEmpl_{kt}$	0,049*** (3,04)	0,024* (1,88)	0,027** (2,22)
$LabProt_{kt}$	-0,022 (-1,18)	0,029 (1,12)	0,024 (1,02)
$Union_{kt}$	-0,102*** (-5,71)	-0,229*** (-5,67)	-0,198*** (-6,74)
D00	-0,009 (-0,26)	0,008 (1,63)	0,006 (1,20)
D01	-0,013 (-0,40)	0,001 (0,18)	-0,001 (-0,21)
D02	-0,005 (-0,14)	0,006 (1,35)	0,004 (1,00)
D03	-0,008 (-0,24)	0,006 (1,40)	0,004 (1,04)
D04	0,004 (0,14)	0 ,011*** (2,72)	0,010** (2,41)
D05	-0,011 (-0,33)	0,004 (1,06)	0,003 (0,77)
D06	-0,001 (-0,04)	0,005 (1,46)	0,004 (1,25)
Adj. R^2	0,66	0,58	0,52
No. Obs.	120	120	120
LR-Test:		433,97	
Hausman-Test:			12,93

Significance levels: *** (1%), ** (5%), * (10%)

5.2 Model 2 (Long-term unemployment)

In model (2), the impact of international trade patterns on countries' long-term unemployment, i.e. structural unemployment, shall be investigated. Contrarily to the estimation above, the explanatory variables will be partially changed. Instead of openness to trade, the import quota of parts and components ($ImQPC_{kt}$) is integrated as independent trade variable. It is assumed that parts and components are manufactured more labor-intensive than final goods and that increasing fragmentation of production is unfavoura-

ble especially for less-skilled workers, which are difficult to re-integrate into the labor market if once dismissed (Feenstra and Hanson 2001). Hence, the impact of import quota of parts and components on unemployment, especially on unemployment of the lower qualified, is even more obvious than that of a countries' total openness to trade, since the effect of openness to trade on long-term unemployment or unemployment of the less-skilled should theoretically depend on countries' factor endowments and patterns of specialization. Since the share of long-term unemployed persons presumably depends on total level of unemployment, unemployment ratios of countries k in period t ($Unempl_{kt}$) act as an additional explanatory variable. It can be assumed that with higher unemployment, more hysteresis effects are at hand raising structural unemployment. The union membership variable is removed from the equation. Of course, higher union density might lead to higher long-term unemployment due to insider-outsider problems. But on the other hand, trade unions should be supposed to have an interest in reducing long-term unemployment.

Similarly like in model (1), the likelihood ratio test suggests the superiority of the fixed effects estimation over the simple OLS model. Additionally, the Hausman-Test statistic is again in favour of a random effects estimation. The estimation results are presented in table 3 below.

As the results of the random effects estimation show, countries' patterns of specialization in inter-industry trade, resulting from factor endowments, do affect long-term unemployment. This is confirmed by the significantly negative $FCINTER_{kt}$-variable, representing the extent of countries' comparative advantages in labor-intensively manufactured goods, implying that inter-industry trade leads to lower long-term unemployment if countries specialize on the production of labor-intensive goods. However, superior vertical *IIT*, which should be harmful particularly to the less-skilled workforce, does not show the expected positive impact on structural unemployment. The same holds for import quota of parts and components, which is also insignificant with respect to the share of long-term unemployment in total unemployment.

As far as the non-trade variables are concerned, the results show that the share of long-term unemployed persons is the lower, the higher tertiary enrolment ratios are. As expected, higher labor force qualification seemingly reduces long-term unemployment, since employability increases with the level of qualification. Moreover, the share of long-term unemployed in total unemployment increases with value added per employee. Since value added per employee acts as an indicator for (human-)capital-labor ratios in production, labor demand should be the lower, the higher the degree of specialization on capital-intensively manufactured goods and hence value-added per employee. The estimation results for the labor-protection variable are quite surprising, since one could expect that labor protection measures should reduce long-term unemployment only in a short- and medium-term perspective, for instance due to dismissal protection. But in a longer-term perspective, job protection and level and duration of unemployment bene-

fits should rather promote long-term unemployment.[9] Finally, long-term unemployment rises disproportionate to total unemployment. It is quite plausible that the higher total unemployment, the more hysteresis effects are at hand rigidifying the former.

Table 3:
Estimation results of model (2)

expl. variables	OLS-Estimation	FE-Estimation	RE-Estimation
Const.	2,41*** (4,83)	0,751*** (3,33)	0,832*** (4,12)
$SVIIT_{kt}$	0,036 (0,36)	0,110 (1,49)	0,104 (1,52)
$FCINTER_{kt}$	-0,001 (-0,01)	-0,067** (-2,06)	-0,064** (-2,05)
$ImQPC_{kt}$	0,098** (2,12)	0,066 (1,06)	0,065 (1,19)
$TertEnr_{kt}$	-0,320*** (-3,64)	-0,274* (-1,97)	-0,320*** (-3,04)
$VAEmpl_{kt}$	0,085* (1,81)	0,104* (1,80)	0,105** (2,07)
$LabProt_{kt}$	-0,054 (-1,11)	-0,293** (-2,55)	-0,207** (-2,31)
$Unempl_{kt}$	0,350*** (5,65)	0,403*** (6,07)	0,390*** (6,45)
D00	0,026 (0,30)	0,021 (1,19)	0,018 (1,10)
D01	0,028 (0,33)	0,023 (1,33)	0,020 (1,24)
D02	0,012 (0,14)	0,012 (0,74)	0,010 (0,63)
D03	-0,031 (-0,36)	-0,012 (-0,77)	-0,014 (-0,92)
D04	-0,047 (-0,55)	-0,020 (-1,33)	-0,020 (-1,42)
D05	-0,040 (-0,47)	-0,020 (-1,34)	-0,020 (-1,40)
D06	-0,032 (-0,37)	-0,020 (-1,38)	-0,020 (-1,39)
Adj. R^2	0,54	0,50	0,45
No. Obs.	160	160	160
LR-Test:		291,83	
Hausman-Test:			11,41

Significance levels: *** (1%), ** (5%), * (10%)

Overall, the estimation results do not provide evidence that countries' international trade structure affects the share of long-term unemployment in total unemployment in gen-

9 These results might probably be traced back to an endogeneity problem. It is imaginable that high and persistent long-term unemployment motivates governments to relax employment protection legislation, as could be observed during the last years.

eral. Seemingly, the impact of international trade on structural unemployment depends on countries' factor endowments and thus on their patterns of specialization in inter-industry trade relations. This can be derived from the significant $FCINTER_{kt}$-variable, suggesting that inter-industry trade does foster long-term unemployment all the more, the higher a countries' specialization on capital-intensive goods. However, superior vertical *IIT* coefficient, indicating a countries' specialization on higher-quality, more capital- and/or human-capital-intensively manufactured varieties of differentiated goods, is insignificant. Instead, the share of long-term unemployment in total unemployment largely depends on labor force qualification, (human-)capital-intensity of production and on total level of unemployment. Since superior vertical *IIT* has seemingly neither an impact on wage dispersion nor on long-term unemployment, it shall be examined whether $SVIIT_{kt}$ affects unemployment of different skill groups.

5.3 Model 3 (unemployment of the low-skilled)

In model (3), where the unemployment rate of the low-skilled, adjusted by total unemployment ratio, acts as dependent variable, the test statistics also vote for a random effects estimation. The estimation results are depicted in table 4. Theoretically, demand for low-qualified labor should be the lower, the higher superior vertical intra-industry trade and the more countries specialize on capital-intensive goods in inter-industry trade relations. With respect to the latter, the variable $FCINTER_{kt}$ is highly significant, indicating that comparative advantages in labor-intensively manufactured products go hand in hand with lower unemployment of the less-qualified. However, superior vertical intra-industry trade coefficient ($SVIIT_{kt}$) is only slightly significant. Hence, the impact of intra-industry trade on unemployment of the low-qualified is, although significant, apparently lower than that of inter-industry trade. These results are in line with other studies focusing on the short-term impact of intra-industry trade on labor market performance. Nonetheless, a greater interrelationship between superior vertical IIT and unemployment of the less-skilled could probably be expected, since in many high-wage countries, both simultaneously increased in recent years. The third trade indicator, i.e. parts and components imports as a percentage of GDP, significantly increases unemployment of the lower-skilled workforce. Seemingly, the hypothesis that imported parts and components are comparatively labor-intensive and thus reduce domestic labor demand is confirmed.

With respect to the non-trade variables, a higher total labor force qualification, measured by tertiary enrolment ratios, significantly increases relative unemployment rate of less-skilled workers. This could indicate that producers in human-capital abundant countries specialize on (human-)capital-intensive products and, as a consequence, demand for unskilled workers is lower. But surprisingly, unlike in models (1) and (2), value added per employee as an indicator for capital-intensity of production is now insignificant. The labor protection variable is, as before, highly significant with a negative

prefix. According to these results, employment protection legislation seemingly reduces unemployment of vulnerable groups on the labor market. Although this result is in line with findings of other studies (e.g. Bellmann 1997, Belot and van Ours 2001, 2000), the endogeneity problems already mentioned in the context of model (2) might be at hand, since many countries reduced labor protection, especially dismissal protection, in order to improve unemployment prospects especially of the lower-qualified. Finally, total unemployment is insignificant with respect to relative unemployment of the lower qualified. Hence, the hypothesis that particularly the low-skilled are affected if total unemployment increases is not confirmed.

Table 4:
Estimation results of model (3)

expl. variables	OLS-Estimation	FE-Estimation	RE-Estimation
Const.	0,320 (1,38)	-0,199* (-1,84)	-0,167* (-1,85)
$SVIIT_{kt}$	0,116* (1,89)	0,069* (1,77)	0,064* (1,72)
$FCINTER_{kt}$	-0,036 (-0,82)	-0,093*** (-2,71)	-0,080*** (-2,60)
$ImQPC_{kt}$	0,213*** (7,37)	0,179*** (4,71)	0,199*** (5,83)
$TertEnr_{kt}$	0,235*** (6,01)	0,097** (2,37)	0,098*** (2,81)
$VAEmpl_{kt}$	-0,080*** (-3,52)	0,067* (1,91)	0,022 (0,77)
$LabProt_{kt}$	-0,220*** (-7,12)	-0,130 (-1,62)	-0,210*** (-3,69)
$Unempl_{kt}$	0,006 (0,16)	0,003* (1,72)	0,002 (1,35)
D00	-0,128** (-2,41)	-0,032*** (-3,03)	-0,037*** (-3,67)
D01	-0,117** (-2,20)	-0,039*** (-3,89)	-0,044*** (-4,53)
D02	-0,120** (-2,31)	-0,036*** (-3,71)	-0,040*** (-4,16)
D03	-0,088* (-1,66)	-0,032*** (-3,30)	-0,034*** (-3,58)
D04	-0,071 (-1,38)	-0,020** (-2,12)	-0,023** (-2,46)
D05	-0,042 (-0,81)	-0,010 (-1,13)	-0,012 (-1,37)
D06	-0,014 (-0,26)	-0,006 (-0,64)	-0,005 (-0,56)
Adj. R^2	0,67	0,53	0,52
No. Obs.	160	160	160
LR-Test:		306,55	
Hausman-Test:			18,60

Significance levels: *** (1%), ** (5%), * (10%)

6. Conclusions

During the last decades, international trade of the industrialized countries allegedly became more and more intra-industry. At the same time, these countries experienced increases in unemployment especially of the less-skilled labor force. At first sight, this development might be traced back to the fact that intra-industry trade became increasingly vertical in nature, since the latter kind of *IIT* is, according to theory, associated with adjustment effects on factor markets. However, empirical estimations show that superior vertical *IIT*, where (human-)capital-intensively manufactured high-quality variants of differentiated goods are exported and, in return, more labor-intensively manufactured low quality varieties are imported, is only slightly significant with respect to unemployment of low-qualified labor, but can neither explain long-term unemployment nor wage spread. In contrast, inter-industry specialization on labor-intensively manufactured goods is more detrimental for employment prospects of the less-skilled than superior vertical *IIT* and does significantly increase long-term unemployment.

Thus, according to the estimation results, interdependencies between the labor market and intra-industry trade are lower than between the former and inter-industry trade. This does even hold for vertical *IIT*, which is prevalent in total intra-industry trade of the industrialized countries. Against the background of high labor market pressures on the lower-qualified in industrialized countries, these results might seem astonishing. However, this might be explained by a striking fact: Labor market problems in highly developed countries are often ascribed to international fragmentation of production, which is often said to have contributed to the increase in vertical intra-industry trade. However, this is empirically only the case on higher aggregation levels, where parts and components and final goods are allocated to the same product groups. But strictly speaking, bilateral exchanges of parts and components against final goods should not be classified as intra-industry trade, as is the case in most empirical analyses. In fact, these exchanges are inter-industry. At the 5-digit-SITC level selected in the present analysis, parts and components and final goods are, to a large extent, captured separately. Interestingly, at this level of aggregation, inter-industry trade in some high-income countries even increased in the sample-period, like for instance in Belgium, France, Ireland, the Netherlands and in the United Kingdom. In the remaining high-income countries (Austria, Denmark, Finland, Germany, Sweden), inter-industry trade remained nearly constant, and only in the Eastern European countries, a reduction in inter-industry trade coefficients is observable. Hence, in the present analysis, the effect of international fragmentation of production on international trade flows shows up in an increase in inter-industry trade, which is theoretically proper. Thus, increasing imports of labor intensively manufactured parts and components by high wage countries in the course of international fragmentation of production are mainly captured by the variable $FCINTER_{kt}$ and of course the $ImQPC_{kt}$-indicator. And the latter two variables are highly significant with respect to unemployment of the less-skilled.

References

Ando, M. (2005), Fragmentation and Vertical Intra-Industry Trade in East Asia, North American Journal of Economics and Finance, Vol. 17, No. 3, pp. 257-281.

Baltagi, B.H. (2005), Econometric Analysis of Panel Data, 3rd Edition, Wooldridge, Wiley&Sons.

Bellmann, L. (1997), Lohndifferenzierung und Langzeitarbeitslosigkeit im internationalen Vergleich, in: Sadowski, D. and M. Schneider (eds.), Vorschläge zu einer neuen Lohnpolitik: Optionen für mehr Beschäftigung I, Frankfurt, Campus.

Belot, M. and J.C. van Ours (2000), Does the Recent Success of some OECD Countries in Lowering their Unemployment Rates lie in the clever Design of their Labour Market Reforms?, IZA Discussion Paper No.147, Bonn.

Belot, M. and J.C. van Ours (2001), Unemployment and Labour Market Institutions: An Empirical Analysis, Journal of the Japanese and International Economies, Vol. 15, No. 4, pp. 403-418.

Berman, Eli, John Bound and Zvi Griliches (1994), Changes in the Demand for Skilled Labour within US Manufacturing: Evidence from the Annual Survey of Manufacturers, Quarterly Journal of Economics 109, No. 2, pp. 367-397.

Brülhart, M. (1999), Marginal Intra-Industry Trade and Trade induced Adjustment: A Survey, in: Brülhart, M. and R.C. Hine (eds.), Intra-Industry Trade and Adjustment – The European Experience, London, Macmillan Press.

Brülhart, M. (2000), Dynamics of Intra-Industry Trade and Labor Market Adjustment, Review of International Economics 8, No. 3, pp. 420-435.

Brülhart, M. and M. Thorpe (2000), Intra-Industry Trade and Adjustment in Malaysia: Puzzling Evidence, Applied Economics Letters 7, pp. 729-733.

Brülhart, M. and R.J. Elliott (2002), Labour-Market Effects of Intra-Industry Trade: Evidence for the United Kingdom, Review of World Economics, Vol. 138, No. 2, pp. 207-228.

Brülhart, M., R.J. Elliott and J. Lindley (2006), Intra-Industry Trade and Labour Market Adjustment: A Reassessment using Data on Individual Workers, Review of World Economics, Vol. 142, No. 3, pp. 521-545.

Cabral, M. and J. Silva (2006), Intra-Industry Trade Expansion and Employment Reallocation between Sectors and Occupations, Review of World Economics, Vol. 142, No. 3, pp. 496-520.

Davis, D.R. (1998), Does European Unemployment prop up American Wages? National Labour Markets and Global Trade, American Economic Review, Vol. 88, No. 3, pp. 478-494.

Deardorff, Alan V. (1998), Technology, Trade, and Increasing Inequality: Does the Cause matter for the Cure?, Journal of International Economic Law, Vol. 1, No. 3, pp. 353-376.

Dluhosch, Barbara (2006), Intra-Industry Trade Exposure, Fragmentation, and Labor Adjustment, Journal of Economic Integration, Vol. 21, No. 2, pp. 318-339.

Elmeskov, J., J.P. Martin and S. Scarpetta (1998), Key Lessons for Labour Market Reforms: Evidence from OECD Countries' Experiences, Swedish Economic Policy Review, Vol. 5, No. 2, pp. 205-252.

Erlat, G. and H. Erlat (2003), Intra-Industry Trade and Labour Market Adjustment in Turkey, Topics in Middle Eastern and North African Economics, Electronic Journal, Vol. 5.

Falvey, R. (1981), Commercial Policy and Intra-Industry Trade, Journal of International Economics, Vol. 11, pp. 495-511.

Falvey, R. and H. Kierzkowski (1987), Product Quality, Intra-Industry Trade and (Im)Perfect Competition, in: H. Kierzkowski (ed.), Protection and Competition in International Trade, Oxford/New York, Basil-Blackwell.

Faruq, H. (2006), New Evidence on Product Quality and Trade, CAEPR Working Paper No. 19/2006, Indiana University, Bloomington.

Faustino, H.C. and N.C. Leitao (2009), Intra-Industry Trade and Labor Costs: The Smooth Adjustment Hypothesis, Working Paper No.17/2009, Department of Economics, Technical University of Lisbon.

Feenstra, R.C. (1998), Integration of Trade and Disintegration of Production in the Global Economy, Journal of Economic Perspectives, Vol. 12, No. 4, pp. 31-50.

Feenstra, R.C. and G. Hanson (2001), Global Production Sharing and Rising Inequality: A Survey of Trade and Wages, NBER Working Paper No. 8372.

Fertö, I. and K.A. Soos (2008), Marginal Intra-Industry Trade and Adjustment Costs – A Hungarian-Polish Comparison, Hungarian Academy of Sciences, Institute of Economics, Discussion Paper No. 2008/15, Budapest.

Flam, H. and E. Helpman (1987), Vertical Product Differentiation and North-South Trade, American Economic Review, Vol. 77, No. 5, pp. 810-822.

Freeman, R.B. (1980), The Exit-Voice Tradeoff in the Labour Market: Unionism, Job Tenure, Quits, and Separations, The Quarterly Journal of Economics, Vol. 95, pp. 643-673.

Freeman, R.B. and J.L. Medoff (1984), What do Unions do?, New York, Basic Books.

Gabrisch, H. and M. L. Segnana (2001), Trade Structure and Trade Liberalization: The emerging Pattern between the EU and Transition Economies, MOCT – MOST, Vol. 11, pp. 27-44.

Greenaway, D., M. Haynes and C. Milner (2002), Adjustment, Employment Characteristics and Intra-Industry Trade, Review of World Economics, Vol. 138, No. 2, pp. 254-276.

Hartog, J. (2000), Over-Education and Earnings: Where are we, where should we go?, Economics of Education Review, Vol. 19, pp. 131-147.

Hirsch, B.T. and J.T. Addison (1986), The Economic Analysis of Unions, Boston, Allen&Unwin.

Hummels, D., Ishii, J. and K.M. Yi (2001), The Nature and Growth of Vertical Specialization in World Trade, Journal of International Economics, Vol. 54, No. 1, pp.75-96.

International Monetary Fund (2007), Globalization and Inequality, World Economic Outlook 2007, Washington, pp. 31-65.

Katz, L.F. and K.M. Murphy (1992), Changes in relative Wages, 1963: Supply and Demand Factors, Quarterly Journal of Economics, Vol. 107, pp. 35-78.

Krugman, Paul (1994), Past and Prospective Causes of High Unemployment, Economic Review, Federal Reserve Bank of Kansas City, Vol. 79, No. 4, pp. 23-43.

Lawrence, Robert Z. and Matthew J. Slaughter (1993), Trade and US Wages: Great Sucking Sound or Small Hiccup?, Brookings Papers on Economic Activity, No. 2, pp. 161-226.

Lovely, Mary E. and Douglas R. Nelson (2002), Intra-Industry Trade as an Indicator of Labor Market Adjustment, Review of World Economics 138 (2), pp. 179-206.

Machin, S. and J. van Reenen (1998), Technology and Changes in Skill Structure: Evidence from Seven OECD Countries, Quarterly Journal of Economics, Vol. 113, pp. 1215-1244.

Manacorda, M. and B. Petrongolo (1999), Skill Mismatch and Unemployment in OECD Countries, Economica, Vol. 66, pp. 181-207.

Moore, Mark P. and Priya Ranjan (2005), Globalisation versus skill-biased Technological Change: Implications for Unemployment and Wage Inequality, The Economic Journal, Vol. 115, pp. 391-422.

Nickel, S. and R. Layard (1999), Labor Market Institutions and Economic Performance, in: Ashenfelter, O. and D. Card (eds.), Handbook of Labor Economics, Vol. 3, Amsterdam, Elsevier, pp. 3029-3084.

Nickel, S., L. Nunziata, W. Ochel and G. Quintini (2003), The Beveridge Curve, Unemployment and Wages in the OECD from the 1960s to the 1990s, in: Aghion, P., R. Frydman, J. Stiglitz and M. Woodford (eds.), Knowledge, Information and Expectations in Modern Macroeconomics: In Honor of Edmund S. Phelps, Princeton/Oxford, Princeton University Press, pp. 394-431.

Onaran, Ö. and E. Stockhammer (2006), The Effect of FDI and Foreign Trade on Wages in the Central and Eastern European Countries in the Post-Transition Era: A Sectoral Analysis, Vienna University of Economics and B.A., Working Paper No. 94.

OECD (2005a), Trade-Adjustment Costs in OECD Labour Markets: A Mountain or a Molehill?, OECD Employment Outlook 2005, Paris, pp. 23-72.

OECD (2005b), Education at a Glance 2005, Organization for Economic Cooperation and Development, Paris.

OECD (1999), Employment Outlook, Organization for Economic Cooperation and Development, Paris.

Rossini, G. and M. Burattoni (1999), Italy, in: Brülhart, M. and R. Hine (eds.), Intra-Industry Trade and Adjustment, London, Macmillan Press, pp. 213-224.

Smeets, H.D. (1999), Intra-Industry Trade, European Integration and Adjustment – The German Experience, in: Brülhart, M. and R. Hine (eds.), Intra-Industry Trade and Adjustment, London, Macmillan Press, pp. 151-167.

Wood, A. (1994), North-South Trade, Employment, and Inequality: Changing Fortunes in a Skill-Driven World, Oxford, Clarendon Press.

Yeats, A.J. (2001), Can Vertical Specialization explain the Growth of World Trade?, Journal of Political Economy, Vol. 111, No. 1, pp. 52-102.