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Eastern Enlargement of the EU:
A Comprehensive Welfare Assessment

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Abstract

This paper takes a welfare-view on eastern enlargement of the EU, focusing on incumbent countries. Enlargement is decomposed into three elements: Single-market integration on commodity markets, budgetary costs from EU-expenditure policies, and single-market-induced migration from new to present member countries. I first use an analytical model to derive a welfare equation that identifies the principle channels for incumbent country welfare gains and losses from enlargement, including product differentiation, capital accumulation, and unemployment due to search-costs. I then propose a method that allows to extend welfare results obtained from a detailed calibrated version of this model for Germany to other incumbent countries. The approach relies on model elasticities extracted from the German model which are then applied to other countries' idiosyncratic "enlargement-shocks". Constructing detailed indices for such country-specific "enlargement shocks", I arrive at a characteristic inter-country pattern of enlargement-induced welfare effects for all EU15 countries. Aggregating these across countries reveals enlargement to be beneficial for the union as a whole, although several countries stand to suffer welfare losses.

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1 Introduction

In 1993, at a summit in Copenhagen, the European Union heads of state have issued a firm commitment to an eastern enlargement of the union. The Luxembourg summit of December 1997 marks the start of formal negotiations for accession, and in its summit of December 2002, again held in Copenhagen, the European Council has decided to endorse the negotiation results achieved to that date for as many as 10 countries. In an informal European Council meeting in Athens on April 16, 2003, the heads of state have signed an accession treaty, and membership of these countries is due to commence on May 1st, 2004.[1]

Although the primary driving force behind eastern enlargement has always been political in nature, its economic effects on incumbent and new members determine whether it will eventually also be seen as an economic success story, which will certainly shape the attitude towards future enlargements of the EU. The scenario is surely not a marginal one. Enlargement will increase the EU's geographic area by about 23 percent, its population will rise by about 20 percent, and its GDP (2001 at PPP) will increase by about 9 percent. Moreover, being relatively poor and more agricultural than most incumbent countries, new members are likely to draw significant sums from union agricultural and cohesion funds.[2] Hence, enlargement involves a direct budgetary cost for present member countries.

However, both old and new member countries expect further economic effects, over and above transfers payments, from enlargement. Most importantly, gains should arise from extending EU vehicles of market integration (Customs Union, Single Market) to a larger set of partner countries. From an *incumbent's perspective*, a crucial question is whether such gains are likely to outweigh the direct budgetary cost, so that the overall economic effect of enlargement is positive. There is a host of different effects that are often pointed out. Firms may find improved export conditions, boosting their profit opportunities and thus investment, growth and employment. They should also benefit through cheaper imports from new members, as will private households and government procurement. But, as always, such gains do not come without

[1]The new member countries are the Czech Republic, Estonia, Cyprus, Latvia, LIthuaniea, Hungary, Malta, Poland, Slovenia, and the Slovak Republic. Two further countries, Bulgaria and Romania, are expected to become members by 2007, while formal negotiations with Turkey, a further candidate country, have yet to begin.

[2]The expected strain for EU cohesion funds may be indicated by comparing GDP per capita. In 2001, the 10 acession countries overall have reached a GDP per capita which, at 10.700 Euro, is less than half the EU-15 figure of 23.210 Euro, measured in purchasing power parities. They show significant variation, ranging from 7.750 for Latvia up to 16.210 for Slovenia which has already overtaken Greece (15.020) and Portugal (16.059). The budgetary cost from EU common agricultural policy (CAP) is particularly evident from a high employment share in agriculture, which is 13.3 percent for accession countries, compared to 4.2 for the EU-15. For the agricultural share in gross value added the difference is much less pronounced, with 4.1 percent for accession countries and 2.1 percent for the EU-15. Again, the dispersion is quite large within accession countries, with most concern arising from a high agricultural employment share of 19.2 percent for populous Poland, whereas countries like the Czech Republic (4.9) and Hungary (6.1) are already quite close the the overall EU-15. See Eurostat, Statistical Yearbook on Candidate Countries, 5th edition, Luxembourg, 2003.

costs of adjustment. On labor markets, integration of commodity and factor markets is likely to entail both job displacement and job creation, with the net effect on the rate of unemployment being unclear a-priori. In addition to employment perspectives, domestic workers with low skill levels may be hurt in terms of wage income, due to import competition and immigration, particularly if migrant labor from candidate countries is a close substitute. Other types of labor and other factor owners may gain, if they are complementary to migrant labor. Thus, there are distributional implications, in addition to the overall welfare effect of enlargement.

Given such a vast array of effects, any overall assessment of enlargement faces two key challenges. First, can we develop a summary measure that may consistently be set against the direct budgetary cost of enlargement, for individual member countries and – ultimately – for the union as a whole? An obvious way to proceed is to look at *economic welfare* as a "bottom-line". Arguably, economic welfare is an important criterion for all economic policy, hence an assessment of enlargement against this criterion seems called for. But welfare is a concept which is notoriously difficult to grasp, particularly when a multiplicity of different effects is at work, as in the case of enlargement. It thus seems important to develop a unified framework, revealing how the various expected enlargement effects relate to economic welfare. The second challenge, of course, is *quantification*. Can we quantify the various economic effects towards a single net welfare figure for each and every incumbent and, ultimately, for the EU15 as a whole? Since the primary forces behind enlargement have always been political in nature, it was clear from the outset that the whole endeavor would not depend on a clear and convincing proof of an affirmative answer. Nevertheless, this is an important question worth trying to answer.

In this paper, I attempt to do two things. First, I develop a theoretical framework, based on normative theory of (preferential) market integration, that allows me to identify, in a unified way, the principal channels through which various enlargement effects influence economic welfare of an incumbent country. And secondly, I venture to quantify the welfare effect of enlargement for each of the 15 present member states of the EU, taking into account their idiosyncratic positions with respect to the enlargement scenario. The empirical quantification is based on two elements. The first is a numerical simulation model for Germany, which renders crucial elasticities for various parts of the enlargement scenario. The second is a calculation of country-specific "enlargement shocks" that allow us to apply the German elasticities to all other EU15 countries. Treating inter-country differences in a consistent way ultimately allows us to aggregate across countries, and to arrive at an EU15-wide welfare effect.

Eastern enlargement is treated as a "shock" to an incumbent country that emanates from extending the EU vehicles of *market integration* to new members, in addition to the direct budgetary cost from EU expenditure policies in an enlarged union. Market integration means preferential trade liberalization from tariff and non-tariff barriers, as well as free movement of capital and labor – the so-called Single Market of the EU. *Labor migration* is assumed to respond

to wage differences, whereby immigration from new members is determined for each incumbent on the basis of available evidence form migration models. As regards international *capital flows*, we assume perfect capital mobility, modeled by appropriate no-arbitrage conditions. *Trade* is assumed to take place in an environment of product differentiation based on the country of origin. Lower trade barriers boost export demand and cause substitution in favor of imports from new member countries, reflecting both trade creation and trade diversion. Enlargement also affects domestic production where we assume an environment of monopolistic competition with endogenous capital accumulation. Employment is subject to costly search with endogenous unemployment.

Section 2 first develops a theoretical framework for a welfare calculus of enlargement. The primary purpose is to show, in a single equation, how enlargement of the EU affects economic welfare of an incumbent country in a production and trading environment of the kind just outlined. The overall effect is decomposed into a) static gains from trade, including variety and scale effects in addition to the conventional effects of trade creation vs. trade diversion, b) dynamic effects from trade integration via capital accumulation with growth externalities deriving from product differentiation, and c) employment effects in labor markets characterized by unemployment due to costly search and matching. The equation proves useful, not only by revealing the essential ingredients of the benefits and costs of enlargement, but also by pointing out certain country-specific characteristics that need to be observed when attempting to quantify the overall welfare effect for all present member countries. The equation reveals an overall welfare effect which is ambiguous a priori, hence the empirical investigation in sections 3 and 4. Section 3 presents the approach pursued towards quantification which draws on welfare results obtained by means of numerical simulations with an applied dynamic general equilibrium model for the German economy. The approach involves a) extracting welfare elasticities from the German model, and b) applying these elasticities to country-specific "enlargement shocks" for all other incumbents. The section first develops the approach in general terms and then constructs appropriate measures for such shocks. Section 4 presents the results obtained from applying this approach to all EU15 member countries. In addition, the country-specific results are aggregated in three alternative ways to an EU15-wide overall welfare effect of eastern enlargement.

This is, of course, not the first attempt to quantify the incumbent country effects of an eastern enlargement of the EU. However, a large part of the existing literature lacks an explicit welfare focus in the sense proposed below. For instance, the study on enlargement by ECOFIN (2001), looking at both incumbents and candidate countries, boils down all enlargement effects to their influence on economic growth. But it is well known that, tempting as it may be, GDP- or growth-effects should not be equated with welfare effects. Indeed, the relationship between the two is far from straightforward, as will become apparent from the framework suggested below. The well-known study by the European Integration Consortium (2001) treats trade

effects, as well as FDI and migration effects, in great detail, but similarly lacks a unified welfare-oriented framework. Baldwin, Francois & Portes (1997) employ a computational model of market integration which comes very close to a welfare-oriented treatment of the kind envisioned above. But when looking at the EU15, they do not follow a country-by-country approach, thus ignoring all inter-country differences, which are surely important in this case. Among the single-country studies, Kohler & Keuschnigg (2000,2001) and Keuschnigg & Kohler (2002), focusing on Austria, as well as Keuschnigg, Keuschnigg & Kohler (2001) and Heijdra, Keuschnigg & Kohler (2002, 2003), focusing on Germany, feature a multiplicity of market integration effects, in addition to the direct budgetary cost, with a clear "bottom-line" welfare evaluation. These studies emphasize that eastern enlargement implies "shocks" that are highly county-specific, hence their results and conclusions should not be taken as representative for other incumbents, or the EU15 as a whole. However, this paper shows that they form a suitable basis on which to proceed towards a more comprehensive analysis looking at all incumbent countries of the EU.

2 A welfare calculus of enlargement

This section develops a framework for identifying the channels through which enlargement of the EU affects economic welfare of an incumbent country. The framework is quite ambitious in that it incoprorates several key aspects of the modern theory of integration, including scale economies and imperfect competition, as well as growth and unemployment. But it is still quite stylized, relying on a host of simplifications for the sake of analytical tractability. Many of these simplifications will be relaxed when turning to the empirical part in sections 3 and 4 below. Formally speaking, the analysis aims at a total differential of the indirect utility (or welfare) function, revealing the welfare effects of enlargement. A full reduced-form solution would have enlargement-related *exogenous* changes on "the right-hand side" of this welfare differential, with all endogenous changes "substituted out". We shall, however, be willing to accept (changes in) variables on the right-hand side that are actually *endogenous*, in particular goods prices. Instead of fully tracing these changes back to the exogenous elements of an enlargement scenario, we observe certain key "tangency conditions" that must be satisfied in the adjustment. Thus, the welfare calculus in this section effectively aims at an intermediate level of complexity where the key welfare channels are clearly identified, but where important endogenous variables are yet to be determined from appropriate equilibrium conditions. A full determination of all endogenous variables is left to the computational part in subsequent sections of the paper. The virtue of focusing on the welfare differential on such an intermediate level of complexity is that it reveals how the various effects of eastern enlargement often pointed out in policy discussions are related to economic welfare as a primary bottom-line criterion for economic policy. The analysis will focus on trade effects, product differentiation and growth effects, and on labor market and

migration.

2.1 A stylized model

The model used in this section features a single incumbent EU-country trading with old partner countries, new member countries, and the rest of the world. Production is characterized by product differentiation under monopolistic competition, with capital accumulation under perfect international capital mobility, and physical investment featuring an externality through a variety-effect. The domestic labor market features costly search and matching with equilibrium unemployment. Enlargement implies a preferential reduction of tariff and non-tariff trade barriers, as well as free movement of labor which is captured by labor inflow from new partner countries.

Let $C(\bar{\mathbf{c}}, \bar{\mathbf{c}}_U, \bar{\mathbf{c}}_E, \bar{\mathbf{c}}_R, \mathbf{n})$ be a quasiconcave utility function for a representative incumbent country household, where $\bar{\mathbf{c}}$ is a vector of sectoral consumption aggregates, $\bar{c}_j$, of domestic goods. Product differentiation by country of origin implies that there are corresponding aggregates for imported goods from other union countries, $\bar{\mathbf{c}}_U$, new eastern candidate countries $\bar{\mathbf{c}}_E$, and from rest-of-the-world countries $\bar{\mathbf{c}}_R$. Assuming product differentiation also on the firm level, $\bar{c}_j$ is quasiconcave in n_j differentiated varieties of good j; we call it a "Dixit-Stiglitz aggregate".[3] In the utility function, $\mathbf{n}$ is a vector representation of n_j. Indicating domestic consumer prices indices corresponding to the "Dixit-Stiglitz aggregates" of different origins by vectors $\bar{\mathbf{p}}, \bar{\mathbf{p}}_U, \bar{\mathbf{p}}_E$, and $\bar{\mathbf{p}}_R$, and assuming homothetic preferences, we may invoke a unit expenditure function $P = P(\bar{\mathbf{p}}, \bar{\mathbf{p}}_U, \bar{\mathbf{p}}_E, \bar{\mathbf{p}}_R, \mathbf{n})$. By Shephard's Lemma, optimal consumption levels per unit of welfare are given by $\bar{c}_j(\bar{\mathbf{p}}, \bar{\mathbf{p}}_U, \bar{\mathbf{p}}_E, \bar{\mathbf{p}}_R, \mathbf{n}) = P_{\bar{p}_j}(\bar{\mathbf{p}}, \bar{\mathbf{p}}_U, \bar{\mathbf{p}}_E, \bar{\mathbf{p}}_R, \mathbf{n})$. For goods from eastern candidate countries, we have $\bar{c}_{Ej} = P_{\bar{p}_{Ej}}(\bar{\mathbf{p}}, \bar{\mathbf{p}}_U, \bar{\mathbf{p}}_E, \bar{\mathbf{p}}_R, \mathbf{n})$, and analogously for origins U (present EU partner countries) and R (rest of the world). The type of preferences assumed here imply $P_{n_j} < 0$. By analogy, an increase in the degree of product differentiation also reduces the acquisition price for a unit of the capital good. The magnitude of this effect depends on the share of sector-j-type goods in overall consumption or investment, and on the elasticity of substitution between different brands of sector-j-type goods. We shall use $P_{\mathbf{n}}$ to denote the vector representation of P_{n_j}.

Assuming symmetry across all varieties, we define $c_j \equiv \breve{c}_j n_j$, with a vector representation $\mathbf{c}$, where $\breve{c}_j$ denotes consumption of a single differentiated variety of good j. Analogous definitions hold for $\mathbf{c}_U$, $\mathbf{c}_E$ and $\mathbf{c}_R$, respectively. In addition to consumption, domestic demand includes investment. Assuming for simplicity that there is a single capital good with an expenditure

[3] See Dixit & Stiglitz (1977). Throughout the paper, boldfaced symbols indicate vectors.

function identical to $P(\cdot)$, overall levels of domestic demand for domestic goods are

$$\mathbf{d} = \mathbf{c}(CL + I), \tag{1}$$

where L is the population size and I is the economy-wide level of investment demand.[4] By complete analogy, demand for imports from partner countries are $\mathbf{m}_U = \mathbf{c}_U(CL + I)$, and analogously for imports from outside the initial EU, $\mathbf{m}_E$ and $\mathbf{m}_R$.[5]

We now introduce a GNP-function to describe aggregate income and production:

$$\mathbf{p}'\mathbf{y} = G[\mathbf{p}, K, L_e]. \tag{2}$$

This function simply states that the overall value of domestic output, at domestic prices, depends on these prices and on the capital stock K as well as the amount of labor L_e effectively used in production. Domestic output level in sector j is measured by $y_j \equiv \breve{y}_j n_j$, where $\breve{y}_j$ is output of a single variety, and $\mathbf{y}$ is a vector representation of y_j. For the sake of simplicity, this stylized exposition assumes intersectoral mobility of both labor and capital.[6] Allowing for unemployment due to costly search, we have

$$L = L_e + L_u + L_v, \tag{3}$$

where L is the stock of domestic labor, and L_u unemployed labor, while L_v is labor employed for search on the labor market; see below.

The link between the GNP-function and outputs of the economy is not straightforward, due to market power associated with product differentiation and increasing returns to scale. We invoke the notion of monopolistic competition to jointly determine the number of varieties and output per variety, given the economy's resource base in the form of its capital stock K and its directly productive labor force L_e. All of this will be dealt with in somewhat more detail below.

Both production and demand respond to domestic prices. The extent of market integration determines how these are related to foreign prices. More specifically, there are policy-induced price-wedges which will partly disappear if enlargement extends the single market to new member countries. We use t_{Uj} to indicate formal barriers to external trade (common external tariff), and

[4]The computational model does, of course, take into account the different compositions of composite consumption and capital goods, as empirically observed. Moreover it makes a distinction between high-skilled and low-skilled components of the labor force L which is, in turn, composed of Blanchard-type overlapping generations; see Blanchard (1985). For the sake of simplicity, these features may be ignored in this stylized model.

[5]Notice the conceptual difference between $\bar{c}_j$ (a concave quantity aggregator for differentiated varieties of good j) and $c_j \equiv \breve{c}_j n_j$ which is simply a summary measure of good j consumption. If $\bar{p}_j$ is the dual price index for $\bar{c}_j$, and if p_j is the price of a single variety of good j, we have $\bar{p}_j \bar{c}_j = \breve{c}_j n_j p_j$.

[6]In the computational model, capital is sector-specific in the short run, but mobile across sectors in the long run since it is subject to depreciation and accumulation. Moreover, the computational model differentiates between labor with a high and low level of skills.

τ_{Uj} to denote the technical (non-tariff) barriers that are targeted by the EU's Single Market program. Then, expressing all barriers in specific terms, we have

$$p_{Sj} = \tilde{p}_{Sj} + \tau_{Uj} + t_{Uj}, \quad \text{and} \quad \tilde{p}_j^S = p_j + t_{Sj} + \tau_{Sj}, \quad \text{for } S = E, R \tag{4}$$

where a tilde denotes foreign market prices. Thus, prior to enlargement, all barriers equally apply for E and R. Note the difference between (producer) prices for goods from country S prevailing in that country, $\tilde{p}_{Sj}$, and prices paid by consumers in country S for goods exported by the incumbent country, $\tilde{p}_j^S$.

Following common practice of normative theory of economic integration, per capita utility C is determined by equating domestic expenditure on consumption and investment to the economy's aggregate income, plus redistributed tariff revenues, minus net budgetary transfers to the union, denoted by B.[7] Normalizing utility such that the marginal utility of income is equal to one initially, we have

$$P(\bar{\mathbf{p}}, \bar{\mathbf{p}}_U, \bar{\mathbf{p}}_E, \bar{\mathbf{p}}_R, \mathbf{n})CL = G(\mathbf{p}, K, L_e) - P(\bar{\mathbf{p}}, \bar{\mathbf{p}}_U, \bar{\mathbf{p}}_E, \bar{\mathbf{p}}_R, \mathbf{n})I + \mathbf{t}'_U\mathbf{m}_E + \mathbf{t}'_U\mathbf{m}_R - B, \tag{5}$$

where a prime indicates scalar vector multiplication, and $\mathbf{t}_U$ is a vector of common external tariffs of the union. Notice that $P(\bar{\mathbf{p}}, \bar{\mathbf{p}}_U, \bar{\mathbf{p}}_E, \bar{\mathbf{p}}_R, \mathbf{n})C = \bar{\mathbf{p}}'\bar{\mathbf{c}} + \bar{\mathbf{p}}'_U\bar{\mathbf{c}}_U + \bar{\mathbf{p}}'_E\bar{\mathbf{c}}_U + \bar{\mathbf{p}}'_R\bar{\mathbf{c}}_U = \mathbf{p}'\mathbf{c} + \mathbf{p}'_U\mathbf{c}_U + \mathbf{p}'_E\mathbf{c}_E + \mathbf{p}'_R\mathbf{c}_R$, where a bar indicates Dixit-Stiglitz aggregates, while $\mathbf{c}$ is a vector representation of $c_j \equiv \check{c}_j n_j$, where $\check{c}_j$ is consumption of a single variety, and similarly for goods of foreign origin. An analogous equality holds for investment demand $P(\bar{\mathbf{p}}, \bar{\mathbf{p}}_U, \bar{\mathbf{p}}_E, \bar{\mathbf{p}}_R, \mathbf{n})I$. To keep matters simple, this formulation ignores various elements of the computational, such as the role of intermediate inputs and all government policies other than the ones related to the single market. Notice that there are no tariffs on intra-union imports $\mathbf{m}_U$, and technical barriers $\boldsymbol{\tau}_U$, while importantly driving domestic prices, do not give rise to any revenue. Moreover, with trade policy being a common policy of the EU, all tariff revenue is direct EU revenue. Hence, B must include the tariff revenue collected by the incumbent on behalf of the EU.

Since equation (5) has the total labor force L appearing on the left-hand side (the expenditure side), whereas income on the right-hand side is determined by productive labor input L_e, we may treat C as *welfare per capita* of the labor force which is partly unemployed. The level of welfare is determined by a) the economy's endowment and its employment rate L_e/L, b) by the policy-wedges and the amount of transfers to be paid to the EU, and of course c) by the various goods prices determined on commodity markets. As indicated above, a full solution of the model is left to its computational version which incorporates goods market equilibrium

[7] See for instance Baldwin & Venables, 1995). A similar exposition which rules out unemployment is found in Kohler & Keuschnigg (2001).

conditions. Suffice it to say that market equilibrium for domestic goods require that domestic export supply, $\mathbf{x} = \mathbf{y} - \mathbf{d}$, is equal to the sum of export demand in all possible destinations, U, E, and R. Export demand, in turn, is subject to distortions analogous to import trade, as evidenced by (4).

We now proceed to a welfare calculus of enlargement by differentiating equation (5) above. With respect to the price wedges in (4), eastern enlargement reduces t_{Uj} and technical barriers τ_{Uj} for imports from new partner countries, $\mathbf{m}_E$, while retaining them for outside countries R. Similarly, barriers t_{Ej} and τ_{Ej} are abolished for exports to new partner countries, while retaining t_{Rj} and τ_{Rj}. Moreover, enlargement leads to an increase the domestic workforce L from inward migration caused by extending single market status to migrants from new partner countries. And finally, it implies a higher level of net-transfers B to the European Union.

Even if we are willing to leave aside how goods prices will evolve from the market equilibrium conditions, such a welfare calculus proves highly revealing if we duly take into account the relevant "tangency conditions" of adjustment. We fist look at a key static condition governing production adjustment. For distortion-free markets without product differentiation and fixed cost, and with a stationary resource base, we would have $G_{\mathbf{p}}\,\mathrm{d}\mathbf{p} = \mathbf{y}'\mathrm{d}\mathbf{p}$, plus the usual tangency condition $\mathbf{p}'\,\mathrm{d}\mathbf{y} = 0$. However, with growth and monopolistic competition, things look different. Assuming a mobile capital stock and mobile labor, with marginal value productivities in their variable input use equal to w_K and w_L, respectively, the relevant "tangency condition" is

$$\mathbf{q}'\,\mathrm{d}\mathbf{y} + \mathbf{f}'\,\mathrm{d}\mathbf{n} - w_K\,\mathrm{d}K - w_L\,\mathrm{d}L_e = 0, \tag{6}$$

where $\mathbf{q}$ is a vector of marginal cost in the different sectors, and $\mathbf{f}$ is a vector of fixed costs.[8] Based on condition (6), and taking into account Shephard's Lemma, we obtain a welfare change $\mathrm{d}C$ which satisfies

$$\begin{aligned} PL\,\mathrm{d}C \;=\; & -\mathbf{m}_E'\,\mathrm{d}\boldsymbol{\tau}_U - \mathbf{m}_R'\,\mathrm{d}\boldsymbol{\tau}_U + \mathbf{t}_U'\,\mathrm{d}\mathbf{m}_E + \mathbf{t}_U'\,\mathrm{d}\mathbf{m}_R \\ & +\mathbf{x}'\,\mathrm{d}\mathbf{p} - \mathbf{m}_U'\,\mathrm{d}\tilde{\mathbf{p}}_U - \mathbf{m}_E'\,\mathrm{d}\tilde{\mathbf{p}}_E - \mathbf{m}_R'\,\mathrm{d}\tilde{\mathbf{p}}_R \\ & +(\mathbf{p}-\mathbf{q})'\,\mathrm{d}\mathbf{y} - [(CL+I)\,P_{\mathbf{n}} + \mathbf{f})]'\,\mathrm{d}\mathbf{n} \\ & +w_K\,\mathrm{d}K - P\,\mathrm{d}I + w_L\,\mathrm{d}L_e - PC\,\mathrm{d}L - \mathrm{d}B. \end{aligned} \tag{7}$$

This equation must be interpreted as a change across steady states. Assuming a depreciation rate δ and perfect international capital mobility with a given world interest rate i^*, the change

[8] A somewhat more detailed derivation of this condition is given in Kohler & Keuschnigg (2001) where we rule out unemployment.

in investment demand and the capital stock are related according to

$$\mathrm{d}I = (i^* + \delta)\,\mathrm{d}K, \tag{8}$$

where $i^*\,\mathrm{d}K$ is the annuitized opportunity cost of increasing the domestic capital stock by $\mathrm{d}K$.[9]

Translating the enlargement scenario into formal modeling parlance, the *exogenous* changes in (7) are $\mathrm{d}\boldsymbol{\tau}_U = -\boldsymbol{\tau}_U$ for $\mathbf{m}_E$, and $\mathrm{d}\boldsymbol{\tau}_U = 0$ for $\mathbf{m}_R$. Moreover, there is a change $\mathrm{d}\mathbf{t}_U = -\mathbf{t}_U$ which is applied to $\mathbf{m}_E$, while $\mathbf{t}_U$ is left in place for $\mathbf{m}_R$. Similarly, we have $\mathrm{d}\mathbf{t}_E = -\mathbf{t}_E$ and $\mathrm{d}\boldsymbol{\tau}_E = -\boldsymbol{\tau}_E$, while $\mathrm{d}\mathbf{t}_R = \mathbf{0}$ and $\mathrm{d}\boldsymbol{\tau}_R = \mathbf{0}$. Moreover, since this model is obviously no migration model, we we must similarly treat the migration-induced change in the domestic work force $\mathrm{d}L > 0$ as an exogenous variable. In our computational analysis below, this will be specified by relying on extraneous econometric estimates. And finally, the scenario involves an exogenous change in net transfers to the union, $\mathrm{d}B > 0$, which we similarly specify from extraneous sources below. All other changes in equation (7) must be seen as *endogenously determined* by general equilibrium conditions. Although, as mentioned before, we leave a full solution to the computational part of the paper, several important insights may be obtained by looking more closely at the various components of equation (7).

2.2 Trade effects

Trade effects are the most conventional and most readily understood effects of enlargement. Nonetheless, equation (7) serves to highlight a few points worth mentioning. Thus, we first note that $\mathrm{d}\boldsymbol{\tau}_U$ appears as directly welfare-relevant, while $\mathrm{d}\mathbf{t}_U$, $\mathrm{d}\mathbf{t}_E$ and $\mathrm{d}\boldsymbol{\tau}_E$ do not. Single-market-induced reductions in real trade costs, $\mathrm{d}\boldsymbol{\tau}_U < \mathbf{0}$, are directly beneficial, in accordance with the incumbent's initial level of *imports* from new partner countries, as captured by the term $-\mathbf{m}'_E\,\mathrm{d}\boldsymbol{\tau}_U > 0$. They entail a savings in real resource use, without any loss in tariff revenues. Formally speaking, there is a positive first-order "rectangle-effect" on welfare. By way of contrast, reductions in pure distortions, such as $\mathrm{d}\mathbf{t}_U < \mathbf{0}$, involve a loss in tariff revenue, hence the corresponding welfare effects are "triangular", or second-order. In equation (7), they appear in the form of $-\mathrm{d}\mathbf{t}'_U\,\mathrm{d}\mathbf{m}_E - \mathrm{d}\mathbf{t}'_U\,\mathrm{d}\mathbf{m}_R$, with $\mathrm{d}\mathbf{t}_U = -\mathbf{t}_U$. These terms also remind us that enlargement involves preferential liberalization, with a risk of trade diversion. Any increase in $\mathbf{m}_E$ has a positive welfare effect on account of the initial distortion $\mathbf{t}_U > \mathbf{0}$ which gets reduced, but if it comes at the expense of third-country imports where barriers remain in place, then the welfare gain is eroded on account of the term $\mathbf{t}'_U\,\mathrm{d}\mathbf{m}_R$. As regards *exports*, "rectangular" single-market-effects would by analogy show up in a symmetric welfare calculation for new partner

[9] The computational model features sector-specific capital stocks and gradual adjustment through time, due to convex installation cost for capital.

countries. From an incumbent's point of view, the crucial point is that lower price wedges in partner countries boost demand for its exports, contributing to a positive terms-of-trade effect $\mathbf{x}'\,\mathrm{d}\mathbf{p}$. While any terms-of-trade improvement, $\mathrm{d}\mathbf{p} > \mathbf{0}$, affects domestic welfare on the basis of total exports, the extent of the price increase is determined by size of the export demand shift initiated by enlargement, which depends on the significance of new member counties' demand for an incumbent countries output. Moreover, equilibrating price changes $\mathrm{d}\mathbf{p}$ are, of course, also determined by the domestic supply response $\mathrm{d}\mathbf{y}$, which is driven by the resource base effect of enlargement through endogenous accumulation of capital, and through enlargement-induced immigration. These supply reactions, and their welfare relevance, will be taken up in the next two subsections. The final three terms in line two of equation (7) indicate terms-of-trade changes on the import side. These are determined from world market equilibrium conditions for the respective goods and do not warrant further comment here.

2.3 Product differentiation and growth effects

With monopolistic competition, supply responses have several direct welfare consequences. First, the third line in (7) highlights the typical variety vs. efficiency trade-off. With prices above marginal cost, $\mathbf{p} - \mathbf{q} > \mathbf{0}$, any output expansion, $\mathrm{d}\mathbf{y} > \mathbf{0}$, as such has a positive effect. This is further reinforced if output expansion comes in the form of additional varieties, $\mathrm{d}\mathbf{n} > \mathbf{0}$, since $P_{\mathbf{n}} < \mathbf{0}$, due to Dixit-Stiglitz-type "love of variety". However, this is potentially offset by the implied duplication of fixed cost $\mathbf{f}$, as highlighted by the term $-\mathbf{f}'\,\mathrm{d}\mathbf{n}$ in (7), and the net-effect seems ambiguous a priori. We can, however, say more by observing further "tangency conditions".

Profit-maximizing firm behavior implies a restriction on possible equilibrium outcomes. Suppose that each sector is characterized by monopolistic competition. Then, output response is governed by a zero-profit-condition. Moreover, output response needs to be considered jointly with changes in the productive resource base, $\mathrm{d}K$ and $\mathrm{d}L_e$, which importantly drive the zero-profit monopolistic competition equilibrium. More specifically, what shows up in the form of a scale-effect on the rate of growth in many endogenous growth models, may in this context be described as a positive influence of capital accumulation and and higher employment, , $\mathrm{d}K > 0$ and $\mathrm{d}L_e > 0$, on the degree of domestic product differentiation $\mathbf{n}$. We denote the reduced form derivatives of the numbers of varieties, within each sector, with respect to the overall capital stock and overall employment by $\mathbf{n}_K$ and $\mathbf{n}_{L_e}$, respectively. If the fixed cost technology and the

marginal cost technology are the same, then the change in the zero profit equilibrium satisfies[10]

$$(\mathbf{p}-\mathbf{q})'\,\mathrm{d}\mathbf{y}-[(CL+I)\,P_{\mathbf{n}}+\mathbf{f})]'\,\mathrm{d}\mathbf{n}=(CL+I)P'_{\mathbf{n}}[\mathbf{n}_K\,\mathrm{d}K+\mathbf{n}_L\,\mathrm{d}L_e]. \tag{9}$$

In this case, the product differentiation effect of a change in the resource base is the dominating element of adjustment. This establishes a link between lines 3 and 4 of equation (7). In the single-sector case n_K and n_L are clearly positive, but in a multi-sector environment this need not be true *for each sector*. For our purposes, though, it seems safe to assume $\mathbf{n}_K > \mathbf{0}$ and $\mathbf{n}_L > \mathbf{0}$, in which case both capital accumulation and additional overall employment have a positive first-order welfare effect. The remaining question is how K and L_e respond to enlargement.

It seems reasonable to assume that a single private investor treats P as given, thus ignoring $P'_{\mathbf{n}}\mathbf{n}_K\,\mathrm{d}K$ in her accumulation decision. The first-order condition on capital accumulation then requires that the steady state user cost of capital, $(i^*+\delta)P$, is equal to the marginal value productivity of capital, w_K, for a *given* price index P. This dynamic "tangency condition", together with the steady state relationship (8) implies

$$w_K\,\mathrm{d}K-P\,\mathrm{d}I=0. \tag{10}$$

This is not to say that enlargement has no accumulation effect. We need to bear in mind that the marginal value productivity of capital, w_K, depends on the capital intensity and on the final output price. Hence, with a given world interest rate i^*, any increase in output prices $\mathbf{p}$ relative to the acquisition price of capital P requires an increase the capital intensity to restore the afore-mentioned accumulation condition. It will, therefore, lead to capital accumulation. Indeed, this is a likely impact of enlargement, due to a higher export from new members, which contributes to higher $\mathbf{p}$, coupled with cheaper imported capital goods. Nor does equation (10) say that there is no distortion in the accumulation decision. Indeed, there is an investment externality which is captured by the first term on the right-hand side of (9), where $\mathrm{d}K$ is left in the welfare calculus, after the term $w_K\,\mathrm{d}K-P\,\mathrm{d}I$ in equation (7) has vanished due to condition (10).[11]

2.4 Immigration and labor market effects

The remaining terms to look at in equation (7) relate to the labor market effects of enlargement, and to the budgetary cost. Suppose, in line with Pissarides (2000), that within a certain industry at each point in time there is an exogenous rate of job separation equal to s, and hiring new

[10] This follows reasoning analogous to Kohler & Keuschnigg (2001).

[11] On this type of externality, see also Keuschnigg (1998).

workers requires that firms divert part of employed labor to recruiting activities. Thus, if employment is equal to $L - L_u$, then directly productive labor input is equal to $L - U - \kappa V$, where V is the number of vacancies and κ denotes the labor required to search for a posted vacancy. In terms of equation 3, $L_v = \kappa V$. Measuring the labor market tightness by $\theta \equiv V/L_u$, we may stipulate a hiring technology such that at any point in time the inflow into employment is equal to $q(\theta)V$, where $q' < 0$. Using $u \equiv L_u/L$ to denote the fraction of unemployed finding a job is then equal to $f(\theta) \equiv q(\theta)V/(uL) = q(\theta)\theta$, where it is assumed that $f' > 0$, i.e., the elasticity of $q(\theta)$ is less than one in absolute terms. Equating job separation with the number of people finding new employment, $s(1-u)L = f(\theta)uL$, we obtain a steady state rate of unemployment

$$u(\theta) = s\,/[s + f(\theta)]\ . \tag{11}$$

The unemployment rate shrinks with increasing labor market tightness, $u' \equiv \partial u/\partial\theta < 0$. In turn, labor market tightness is determined by an optimality condition on the number of vacancies V that firms wish to maintain at a given point in time. This condition requires that, at the margin of V, the opportunity cost of a vacancy, κw_L, is equal to the present value of this vacancy to the firm. If the wage rate is denoted by $\tilde{w}_L$, the steady state version of this condition is

$$(w_L - \tilde{w}_L)q(\theta)/(i^* + s) = \kappa w_L \tag{12}$$

This is analogous to the first order condition on capital accumulation, and it implies a wedge between the marginal value productivity of labor, w_L, and the wage rate equal to $\mu(\theta) \equiv w_L/\tilde{w}_L = q(\theta)/[q(\theta) - \kappa(i^* + s)] > 1$. It is clear from condition (12) that labor market equilibrium depends on the wage rate $\tilde{w}_L$. We follow the established literature in assuming Nash-bargaining between firms and employees. The bargaining outcome importantly depends on workers' outside option, i.e., on unemployment benefits. We shall return to this below.

We can now identify important channels of labor market effects from enlargement. As with capital accumulation, we must distinguish between two questions. One is whether enlargement affects labor market tightness, the other is whether this affects domestic welfare and, if so, in what direction. Any terms-of-trade improvement, $\mathrm{d}\mathbf{p} > \mathbf{0}$, implies a rise in the marginal value product of labor w_L, as does a more capital intensive production through capital accumulation, $\mathrm{d}K > 0$. For a given Nash-bargaining wage rate $\tilde{w}_L$, equilibrium then requires a rise in θ to restore condition (12), which in turn lowers unemployment according (11). Of course, depending on the bargaining process, such expansionary effects may be muted by offsetting increases in $\tilde{w}_L$. In particular, if unemployment benefits are indexed to nominal wages, then the outside option for workers has risen in line with w_L, and the expansionary effect is nullified.[12]

[12] See Heijdra, Keuschnigg & Kohler (2003).

Returning to the welfare calculus, we now need to explore how changes in labor market tightness, $\mathrm{d}\theta$, in connection with enlargement-induced changes in the labor force, $\mathrm{d}L$, jointly affect productive employment L_e and, thus, per capita welfare according (7), in connection with (9). The relevant term to look at is $\Delta \equiv (C+I)P'_{\mathbf{n}}\mathbf{n}_L\,\mathrm{d}L_e + w_L\,\mathrm{d}L_e - PC\,\mathrm{d}L$. From (3), and taking into account that $\mathrm{d}L_z = \kappa\,\mathrm{d}V = \kappa\,\mathrm{d}[\theta u L]$, we have

$$dL_e = (1-u-\kappa\theta u)\,\mathrm{d}L - (u'L + \kappa u'L + \kappa u L)\,\mathrm{d}\theta \tag{13}$$

$$\begin{aligned}\Delta &= \left\{\left[(CL+I)P'_{\mathbf{n}}\mathbf{n}_L + \mu(\theta)\tilde{w}_L\right](1-u-\kappa\theta u) - PC\right\}\,\mathrm{d}L \\ &\quad - \left[(CL+I)P'_{\mathbf{n}}\mathbf{n}_L + w_L\right](u'L + \kappa u'L + \kappa u L)\,\mathrm{d}\theta\end{aligned} \tag{14}$$

This term looks terribly complicated but it is actually quite straightforward to interpret. As emphasized by Dixit & Norman (1980, p. 147), under perfect commodity and labor markets, the direct per-capita welfare effect of immigration is equal to $(w_L - PC)\,\mathrm{d}L$. If domestic residents have non-labor income, then $w_L - PC < 0$, and an inflow of "pure" labor reduces welfare per capita. Here, there are three complications. First, there is a variety effect $(C+I)P'_{\mathbf{n}}\mathbf{n}_L$ raising the marginal welfare effect of domestic employment above the wage rate. Secondly, there is a wedge between the direct marginal value productivity of labor and the wage rate, due to the distortion $\mu(\theta)$ induced by job separation and hiring costs. These two effects imply that immigration is less detrimental to per capita welfare than in the standard case. The third effect works in the opposite direction, since only a share $1-u-\kappa\theta u = 1-u(1+\kappa\theta) < 1$ of the labor force is directly productive.

While higher labor market tightness, $\mathrm{d}\theta > 0$, always implies lower unemployment, its direct welfare effect is ambiguous. There are two partly offsetting effects. Lower unemployment is beneficial, but a tighter labor market also means that, for each unemployed worker, more labor is diverted from productive use towards labor market search and recruiting activities. If the net effect, given by the term $u'L + \kappa u'L + \kappa u L$ in (14), is positive, then the direct welfare effect of an increase in labor market tightness is negative. It is easy to show that this holds true, if and only if

$$|\sigma_u|\,(1/\theta\kappa + 1) < 1, \tag{15}$$

where $\sigma_u \equiv \theta u'/u < 0$ is the elasticity of the unemployment rate with respect to labor market tightness, according to (11). This elasticity captures the "matching-efficiency" of the labor market and the condition states a lower bound for this elasticity if an increase in labor market tightness is to be beneficial in welfare terms. Notice that the term $1/\theta\kappa + 1$ is equal to the initial ratio of unproductive labor (unemployed or engaged in recruiting) per unit of labor diverted for recruiting.

Putting pieces together we may obtain an overall view on the welfare effects of EU enlargement on an incumbent country. Assuming constant world prices for all imported goods, we

have

$$\begin{aligned} P \times (L\,\mathrm{d}C) \;=\; & \mathbf{x}'\,\mathrm{d}\mathbf{p} - \mathbf{m}_E'\,\mathrm{d}\boldsymbol{\tau}_U + \mathbf{t}_U'\,(\mathrm{d}\mathbf{m}_E + \mathrm{d}\mathbf{m}_R) \\ & + (CL+I)P_{\mathbf{n}}'\mathbf{n}_K\,\mathrm{d}K \\ & + \left\{\left[(CL+I)P_{\mathbf{n}}'\mathbf{n}_L + \mu(\theta)\tilde{w}_L\right](1-u-\kappa\theta u) - PC\right\}\mathrm{d}L \\ & - \left[(CL+I)P_{\mathbf{n}}'\mathbf{n}_L + w_L\right](u'L + \kappa u'L + \kappa u L)\,\mathrm{d}\theta \\ & - \mathrm{d}B. \end{aligned} \tag{16}$$

Notice that $\mathrm{d}C$ is in per-capita terms, hence $L\,\mathrm{d}C$ may be interpreted as a "Benthamite measure" of welfare change. The first line captures trade effects: terms-of-trade changes, the "rectangular" single-market effect and the "triangular" trade creation and trade diversion effects. The second line shows the variety effect arising from the growth, due to the investment externality. The third line captures the direct welfare effect of single-market-induced immigration, including a variety effect in addition to the search externality. And the fourth line shows the labor market effect that arises from job separation and costly search. The final line completes the story in subtracting increase net transfers to the union arising from the fiscal cost of enlargement, assuming that this is financed domestically in a non-distortive way.

As emphasized above, some of the terms on the right-hand side of (16) are exogenous changes directly related to the enlargement scenario: $\mathrm{d}\boldsymbol{\tau}_U = -\boldsymbol{\tau}_U$, $\mathrm{d}L$, and $\mathrm{d}B$. Although we have been able to identify key driving forces behind endogenous variables, such as the accumulation decision behind $\mathrm{d}K$ and the vacancy decision behind $\mathrm{d}\theta$, or the commodity market clearing condition behind $\mathrm{d}\mathbf{p}$, it becomes clear that much more detailed modeling is required to obtain a likely order of magnitude for the welfare impact of enlargement, $\mathrm{d}C$. Indeed, given the multiplicity of potentially offsetting effects, even the sign of this welfare effect is ambiguous a priori, which turns the question into an eminently *empirical* one. Moreover, any attempt to quantify $\mathrm{d}C$ must follow a *country-by-country* approach. And finally, given the complexity of the general equilibrium interactions behind the endogenous changes appearing in (16), a simulation approach based on calibration seems a natural route to follow. This allows calculating discrete changes in C, which is surely an important improvement upon the local "small changes approach" underlying equation (16). And, perhaps most importantly, it allows us to introduce further structural elements into the model that are crucial for the welfare effects of enlargement, such as a more realistic government sector including distortionary taxes and government procurement.

3 Indirect quantification based on CGE-results

Ideally, one would have a multi-country model which captures the above mentioned enlargement effects, and which is calibrated to all of the EU15 countries. Unfortunately, such a model is not

available. Indeed, it seems questionable whether one should be aiming for such an ideal model, given the huge opportunity cost of the necessary research efforts. Faced with a restricted set of models available, I propose an indirect approach.

3.1 The basic idea

The previous section has revealed three distinct exogenous elements of the enlargement scenario for an incumbent country. a) A single-market-induced abolition of trade barriers $\mathrm{d}\boldsymbol{\tau}_U$ and $\mathrm{d}\mathbf{t}_U$ for trade with new member countries from eastern Europe. b) Single-market-induced immigration flows from new member countries, $\mathrm{d}L$. And c), the budgetary cost of enlargement, $\mathrm{d}B$. Suppose we have at our disposal a fully specified model of the afore-mentioned kind, calibrated to a single significant EU15 country, which allows us to calculate $L\mathrm{d}C$ for this country. In our case this is Germany. We may then run separate simulations for each of these components of the scenario, giving welfare effects

$$\text{a: } \hat{C}_t \equiv (L\,\mathrm{d}C)_t/G, \quad \text{b: } \hat{C}_l \equiv (L\,\mathrm{d}C)_l/G \quad \text{and c: } \hat{C}_b \equiv (L\,\mathrm{d}C)_b/G, \tag{17}$$

respectively. The term $(L\,\mathrm{d}C)_t$ indicates the numerical welfare effect calculated for the trade component a) of the enlargement scenario, ignoring components b) and c), and analogously for labor migration, $(L\,\mathrm{d}C)_l$, and budgetary costs, $(L\,\mathrm{d}C)_b$. In our case, these are Hicksian equivalent per-capita measures of present wealth variations, which fully capture all future changes appearing in the dynamic model, taking into account the entire adjustment path, including forgone consumption in the process of capital accumulation. The measures are converted into a permanent annuity then expressed as fractions of benchmark GDP, to arrive at $\hat{C}_t$, $\hat{C}_l$.and $\hat{C}_b$ appearing in (17).

Suppose, next, that we have information on how the exogenous scenario components for other EU15 countries differ from the German components. Let $\tilde{t}_i$ be an aggregate GNP-based measure of the magnitude of the "trade-shock" from EU enlargement for incumbent country i, and analogously for "migration-shocks" and "fiscal-shocks", $\tilde{l}_i$ and $\tilde{b}_i$, respectively. We may then draw on the simulation results from the detailed computational model for Germany to calculate implied "model-elasticities" as follows:

$$\eta_t \equiv \hat{C}_t/\tilde{t}_G, \quad \eta_l \equiv \hat{C}_l/\tilde{l}_G, \quad \text{and} \quad \eta_b \equiv \hat{C}_b/\tilde{b}_G. \tag{18}$$

In (18), $i = G$ indicates Germany where we have full simulation results $\hat{C}_t$, $\hat{C}_l$ and $\hat{C}_b$, respectively, in line with (17) above. These elasticities can then be applied to the corresponding "enlargement shocks" of other countries, to obtain their welfare effects:

$$\hat{C}_{ti} = \eta_t \times \tilde{t}_i, \quad \hat{C}_{li} = \eta_l \times \tilde{l}_i, \quad \text{and} \quad \hat{C}_{bi} = \eta_b \times \tilde{b}_i. \tag{19}$$

Since, by construction, all figures are equivalent variations relative to GNP, an overall welfare effect may be obtained by simply adding the three components.

This approach, admittedly, rests on a bold assumption. While stressing inter-country differences when looking at enlargement-induced shocks, we assume that the elasticities η derived from a German CGE-model may be applied to all countries. It is obvious that the approach permits no more than approximate results. However, the degree of approximation may to some extent be improved by a careful construction of appropriate country-specific "enlargement shocks" $\tilde{t}_i$,, $\tilde{l}_i$ and $\tilde{b}_i$. Therefore, the following subsection, after briefly describing the computational model for Germany, turns to a detailed description of how these "enlargement shocks" have been constructed towards an empirical analysis for the full set of EU15 member countries. The results achieved from the approach described above will then be presented in section 4.

3.2 Country-specific "enlargement shocks"

Before turning to the country-specific "enlargement shocks", I should say a few words about the computational model used for Germany, which forms the basis of the empirical analysis undertaken below.[13] It should be thought of as a parameterized, multisectoral version of the model that underlies the welfare equation (16) above. It includes a number of details that I have deliberately ignored in the analytical section above. Thus, in addition to the sectoral structure, the model makes a distinction between high-skilled and low-skilled labor, and it includes a rich specification of the government sector, with several distortive taxes, as well as government procurement and government debt. The household sector features overlapping generations, as introduced by Blanchard (1985), with forward-looking consumption and savings decisions. On the production side, there are forward-looking investment decisions subject to convex installation costs. A novel feature of the model is the presence and empirical implementation of "search-unemployment" in a dynamic context with savings and investment. The model is calibrated to a 1996 benchmark data set. The solution assumes perfect foresight and traces out the full adjustment path to the new steady state. Unlike the stylized analytical model above, the welfare measure used for the empirical section below is not restricted to the steady state, but incorporates the full adjustment path, and it includes a vast array of endogenous variables.[14]

[13]The computational model used there extends on Keuschnigg, Keuschnigg & Kohler (2001) by adding search unemployment as indicated above. These new elements are described in more detail in Heijdra, Keuschnigg & Kohler (2002). The numerical results obtained for Germany are presented in detail in Heijdra, Keuschnigg & Kohler (2004).

[14]Available space precludes a more detailed description of the model structure and calibration. The interested reader is referred to Heijdra, Keuschnigg & Kohler (2002), and to Keuschnigg, Keuschnigg & Kohler (2001) for an earlier model without "search-unemployment". A similar model for Austria is presented and applied in Kohler & Keuschnigg (2001) and Keuschnigg & Kohler (2002). The interested reader may also wish to consult http://www.econ.jku.at/kohler/eu-new.htm.

However, in this paper we exclusively draw on the "bottom-line" welfare results.

Barring such a detailed model for other incumbent countries, how may we construct appropriate "enlargement shocks" for each of the EU15 countries that may be combined with the welfare-elasticities extracted from the German model, as described above? I first turn to the *trade component* of enlargement. Enlargement-induced trade integration will have different effects for each of the EU15 countries, depending on the volume and detailed commodity pattern of its trade with accession countries. Not only do some incumbent countries trade far less with accession countries than others, but some countries' trade with these countries is focused on goods where the barriers to be dismantled are particularly large, while other countries' trade may be concentrated in goods with relatively low barriers. A reliable country-specific measure of the trade shock from enlargement requires observations on both, the extent of bilateral trade with new members and the incidence of barriers. The measure used for the present purpose is based on averages of commodity specific trade barriers, weighted by imports of each commodity from accession countries. I have constructed such averages for tariff- and non-tariff barriers, and for exports and imports, in each case relying on the 6-digit level of the Harmonized System (HS) which comprises over 5,000 different commodities. Moreover, I have refined the measure by adjusting the resulting indices for the possibility of trade diversion. Full details regarding the construction and theoretical justification of these measures are presented in Kohler (2000).[15]

Extending the Single Market to new members from eastern Europe implies that workers may freely decide upon the country of residence and work, irrespective of their citizenship. Given the sizable wage gaps between incumbents and new members, and depending on the sensitivity of these locational decisions with respect to observed and expected future wage differences, enlargement may thus cause significant further *migration* from new to old member countries. These will, however, be vastly different for different incumbents, and they are likely to peter out as wage gaps disappear.

I construct country-specific measures of enlargement-induced migration, relying on estimates reported by the European Integration Consortium (2001). These are based on a time-series model which explains the change in the stock of foreign residents relative to the German home population by changes in German wages relative to foreign wages, as well as changes in the

[15]For instance, the average tariff barrier relating to an EU country i is $\sum_j \mu_j^i t_{Uj}$, where t_{Uj} is the common external tariff in commodity j, and μ_j^i denotes commodity-j-imports from accession countries into country i, expressed as a share in country i's GDP. Analogous calculations are made for non-tariff barriers, and for exports to accession countries. The data source is the OECD International Trade by Commodity Statistics (ITCS) data bank (on CD-DOM), and the corresponding OECD Indicators of Tariff and Non-tariff Barriers (on CD-ROM), as well as Finger et al. (1996). In terms of the notation used in Kohler (2000), the overall measure used for $\tilde{t}_i$ is composed of the indices $\bar{T}_O^i + \bar{K}_O^i + \bar{N}_O^i + \bar{X}^i$. There is no direct interpretation of this composite index, but this does not in any way harm its use in the approach described above, since that approach relies on a normalization such that the index value for Germany is 1.

unemployment rates in Germany and the foreign country, respectively. The underlying model thus stipulates an equilibrium relationship between the stock of foreign-born residents and the difference between German and foreign wages, foreign country in case meaning the group of 10 central and eastern European countries (CEEC). The econometric model allows projections for the number of people from these countries that will be living in Germany in the years up to 2030. Looking at how migrants from these countries living in the EU15 in 1998 were distributed within the EU15, one may extrapolate on the basis of the German projection, to obtain an estimated increase in the number or eastern migrants living in the EU15 from some 850 thousand in 1998 to roughly 3.9 Mio people in 2030[16]. The corresponding numbers for Germany are 550 thousand and 2.5 Mio, respectively. I take differences in estimated stocks vis a vis 1998, in order to obtain net migration flows. Following the European Integration Consortium (2001, p.101), I assume that 35 percent of that flow will enter the labor market.

Since our computational model emphasizes a distinction between high-skilled and low-skilled labor, I have attempted a corresponding breakdown also of the migration scenarios. Available evidence indicates that roughly 40 percent of the people from the 10 accession countries employed in the EU in 1995 had a formal education level corresponding to secondary education, or higher.[17] I therefore assume that 40 percent of the people migrating from east to west will fall into the model category of high-skilled labor. This gives us two separate flows of migrants entering EU15-countries' labor markets for high-skilled and low-skilled labor. In a last step, I express these inflows as fractions of initial stocks which are calculated using labor force data, plus an index of formal schooling for each EU15-country. More specifically, if L^i is the labor force of EU15-country i and S^i is that country's formal schooling index, then country i's low-skilled labor force is calculated as $L^i \times (S^G/S^i)/\lambda^G$, where λ^G is the share of low-skilled labor in the calibrated German model.[18] The resulting long-run rate of increase in the German labor force is 6.15 percent for unskilled and 0.84 percent of skilled labor; see table 1 below.

The final exogenous element of the enlargement scenario relates to the fiscal burden that an incumbent country faces from the *budgetary cost* of eastern enlargement. This is determined a) by the magnitude of transfer payments to new members under the EU cohesion and agricultural policies, and b) by the strategy that the EU adopts to accommodate these transfers, given the fundamental requirement of a periodic budget balance. For the present purpose, I rely on an econometric model of EU expenditure policy which explains payments received from

[16]See European Integration Consortium (2001), Part A, Table 7.11.

[17]See European Integration Consortium (2001), Part A, Table 5.6.

[18]This procedure simply takes $1/S^i$ to scale λ^G up or down to arrive at λ^i. S^i is calculated as the weighted sum of gross school enrollment rates, with weights equal to 0.1, 0.4 and 0.5, respectively, for primary, secondary and tertiary education. Labor force data are from European Integration Consortium (2001), Part A, Table 3.2. Data on formal schooling are from the Worldbank Development Indicators 2001 (obtained from www.worldbank.org).

EU agricultural funds as well as EU cohesion funds by key economic characteristics, such as agricultural and manufacturing shares in value added.[19] Based on the estimated coefficients of this model, the relevant expected economic variables of the accession countries yield an estimate of agricultural and cohesion expenditure to be allocated to new members. Subtracting accession countries' own contributions to the EU budget ("own resources"), one arrives at the cost of enlargement that EU15 countries have to share. For the so-called Luxembourg countries, the estimated total cost to incumbents is 0.184 percent of EU15 GDP.[20] According to the initial financial framework for 1999-2006, the corresponding figure projected by the European Commission (1997) for the year 2006 is somewhat lower, at 0.113 percent of EU15 GDP. The later revision of that framework in European Commission (2002), which includes all 10 candidate countries, seems to corroborate the somewhat higher figure from the econometric method.[21] Since incumbent countries are differently positioned within the EU financial framework regarding their receipts from agricultural and cohesion funds, their fiscal burden from this cost will differ, and it will depend on the financing strategy adopted. My budgetary "enlargement shock" is based on the assumption that the enlarged union will cut its cohesion expenditure, proportionally for all countries, in order to balance the budget.[22] The resulting fiscal burden for each of the EU15 countries, $\tilde{b}_i$, is expressed in percent of its GDP.

4 Empirical results

Table 1 first presents the welfare results obtained from a full solution of the German model with an appropriate scenario decomposition, and the corresponding welfare elasticities that are implied by these results, if compared with above country-specific enlargement shocks for $i = G$. For instance, the German welfare effect from the trade component of the enlargement scenario, according to the explicit solution of the CGE model, is 0.554 percent of GDP: $\hat{C}_t = 0.554$.[23] Confronting this with the German index value for the "trade shock", $\tilde{t}_G = 0.397$, we obtain an implied welfare elasticity $\eta_t = 0.554/0.397 = 1.394$. Analogous interpretations hold for the

[19] See Breuss (1995). More details can be found in Kohler & Keuschnigg (2001), and in Keuschnigg & Kohler (1999).

[20] Luxembourg group: Czech Republic, Estonia, Hungaria, Poland and Slovenia. This is the group that started negotiationg in 1998, after the Luxembourg summit of December 1997.

[21] For more details on the comparison between official Commission estimates and the ones used in our computational model, see Keuschnigg & Kohler (1999,2001), and – particularly regarding the later revision of the Commission estimates – Heijdra, Keuschnigg & Kohler (2002).

[22] For more details and alternative calculations, see Keuschnigg & Kohler (1999), as well as Kohler & Keuschnigg (2001).

[23] For data reasons, the trade scenario underlying the simulation reported on in Heijdra, Keuschnigg & Kohler (2002) is restricted to the so-called Luxembourg countries: Czech Republic, Estonia, Hungary, Poland, and Slovenia. But these countries together are by far the major part also of the actual accession countries of 2004.

Table 1

General equilibrium elasticities for a decomposed enlargement scenario

Scenario decomposition	trade	budget	migration (§)	
			low-skills	high-skills
$\hat{C}$: CGE-model result for Germany (#)	0.554	-0.091	0.357	0.335
"Enlargement shock" for Germany (*)	$\tilde{t}_G = 0.397$	$\tilde{b}_G = 0.070$	$\tilde{t}^l_G = 6.152$	$\tilde{t}^h_G = 0.840$
"Implied" GE-elasticity	$\eta_t = 1.394$	$\eta_b = -1.309$	$\eta^l_l = 0.058$	$\eta^h_l = 0.399$

(#): $\hat{C}$ is the welfare effect (Hicksian equivalent variation) in percent of benchmark GDP, obtained for the various subcomponents of the "enlargement scenario" from explicit solution of a detailed CGE model for Germany, fully taking into account all adjustment dynamics; see Heijdra, Keuschnigg & Kohler (2002,2004).

(*): The four "enlargement shocks" corresponding to these components, $\tilde{t}_G$, $\tilde{b}_G$, $\tilde{l}^l_G$ and $\tilde{l}^h_G$, are calculated as detailed in section 3, where $i = G$ indicates Germany. Superscripts l and h denote low- and high-skilled labor.

(§): The migration figures $\tilde{l}_G$ give accumulated long-run changes in the domestic labor force.

"budget shock" and the "immigration shock". Notice that we observe a pretty low fiscal burden equal to 0.07 percent of GDP: $\tilde{b}_G = 0.07$. This follows from the relatively low return flows to Germany from EU cohesion funds, relative to German GDP. Moreover, the immigration shock has a heavy bias towards unskilled labor. The welfare results from migration relate to the *initial domestic* population. Thus, they are conceptually equivalent to the oft-quoted immigration surplus. All welfare effects in table 1 must be interpreted as Hicksian equivalent variations in percent of German benchmark GDP. They are "bottom-line assessments" of a complex process of dynamic adjustment, incorporating all ingredients emphasized in section 2 above. It must be emphasized that they do not reflect a mere steady state comparison, but consistently take into account how welfare of overlapping household generations are affected throughout the entire adjustment path.[24]

Table 2 presents country-specific "enlargement shocks" for the full set of EU15 countries, with German values reappearing from table 1. They may now be combined with the model elasticities of table 1. For instance, the welfare gain from trade integration accruing to France is obtained by multiplying the French "trade shock", $\tilde{t}_F = 0.103$, with the aforementioned welfare elasticity. Thus, $\hat{C}_{tF} = 0.103 \times 1.394 = 0.103$. This is significantly lower than the German gain, due to a lower "natural" level of trade between France and new member countries. As a further example, we may look at the welfare effect from the budgetary cost of enlargement for the case or Portugal. For obvious reasons, Portugal stands to lose much more from lower cohesion funds

[24]See Keuschnigg & Kohler (1997) for a detailed description of the appropriate welfare measure to be used in computational models like this.

than does Germany: $\tilde{b}_P = 1.025$, compared to a value of 0.07 for Germany. Applying this to the corresponding welfare elasticity from table 1, we obtain $\hat{C}_{tP} = -1.025 \times 1.309 = -1.342$. Finally, we take an example for the migration component of the scenario by considering Spain, where migration flows from eastern enlargement are expected to be modest. The calculated "migration shock" for Spain is, indeed, a mere 5 percent of the German value. Applying the relevant elasticities, we obtain a welfare effect from low skilled immigration equal to $\hat{C}^l_{lS} = 0.312 \times 0.058 = 0.018$. For high-skilled migration we have $\hat{C}^h_{lS} = 0.037 \times 0.399 = 0.015$.

To save space, table 2 does not produce each component of the country-specific welfare result, but the final column gives the overall welfare effect from eastern enlargement for each incumbent country of the EU15. These are simply obtained by summing up: $\hat{C}_i = \hat{C}_{ti} + \hat{C}_{bi} + \hat{C}^l_{li} + \hat{C}^h_{ti}$. By construction, the interpretation of $\hat{C}_i$ is that of a Hicksian equivalent variation, expressed in percent of a country's GDP. Figure 1 visualizes the inter-country pattern of overall welfare effects, this time in conjunction with the various components reflecting trade, budgetary costs, and immigration.

A comparison of countries reveals a great deal of variation. The welfare gain from *trade integration* comes close to 1 percent of GDP for Austria and exceeds half a percent for Germany and Finland, while it is almost negligible for Portugal and Spain. The fiscal implications from the *cost of enlargement* are also quite uneven across present member countries. Specifically, when the budget of the union is balanced through cutting cohesion funds, several countries at the southern and western periphery of the EU stand to gain only little from integrated markets, but they nonetheless face a significant fiscal burden from enlargement. Notice also that the welfare elasticity is larger than one. The welfare loss of a country is higher than its share in the fiscal burden. The interpretation is that general equilibrium repercussions make net outward transfers to the union level a contractionary "policy" for an incumbent country's economy.

Inter-country differences are most pronounced when it comes to *migration*. Accumulated migration inflows vary from almost nil in countries like Spain and Portugal to as much 10 percent for unskilled labor in Austria, or 6 percent in Germany. From a policy perspective, a notable feature of the immigration scenario is that it yields both negative and positive effects. This is true even for the marginal welfare calculus summarized by (16) above. The welfare elasticities for migration reported in the final line of table 1 also reflect the so-called immigration surplus, deriving from infra-marginal units of labor. It is well known, that the immigration surplus typically comes at the expense of potentially troublesome distributional effects.[25] In the present case, given the asymmetric composition of the migration flow between high-skilled and low-skilled labor, redistribution appears in differential wage effects for these two types of labor.

[25]See, for instance, Borjas (1999).

Table 2

Welfare effects of enlargement for EU15 countries based on country-specific "enlargement shocks"

	"enlargement shocks" (§)				welfare effect (*)
	trade	budget	migration		
	$\tilde{t}_i$	$\tilde{b}_i$	$\tilde{l}_i^l$	$\tilde{l}_i^h$	$\hat{C}_i$
Austria	0.662	0.071	10.526	1.444	2.017
Belgium (#)	0.230	0.225	1.419	0.144	0.166
Denmark	0.276	0.070	1.481	0.182	0.452
Finland	0.454	0.135	2.543	0.268	0.711
France	0.103	0.076	0.390	0.049	0.086
Germany	*0.397*	*0.070*	*6.152*	*0.840*	*1.154*
Greece	0.084	0.756	1.858	0.274	-0.655
Ireland	0.167	0.684	0.052	0.007	-0.657
Italy	0.187	0.100	0.609	0.089	0.201
Luxembourg (#)	0.230	0.189	2.121	0.215	0.282
Netherlands	0.271	0.072	0.682	0.079	0.355
Portugal	0.032	1.025	0.072	0.010	-1.289
Spain	0.057	0.409	0.312	0.037	-0.423
Sweden	0.235	0.055	3.217	0.349	0.581
UK	0.090	0.068	0.689	0.077	0.107
EU15 – GDP-weighted average:					0.342
EU15 – population-weighted average:					0.303
EU15 – council-votes-weighted average:					0.200

(§): See the text for a detailed description of the different "enlargement shocks". The subscript index i denotes the 15 countries. German values reappear from table 1 above.

(#): $\tilde{b}_i$-estimate based on the assumption of a proportional increase in own resources. For all other countries the underlying assumption is a proportional cut in cohesion funds.

(*): Overall welfare effect $\hat{C}_i = \hat{C}_{ti} + \hat{C}_{bi} + \hat{C}_{li}^l + \hat{C}_{li}^h$ according to equation 19 in the text, where the corresponding *eta*-values are taken from table 1 above.

Moreover, the employment effects of immigration are also quite different for high-skilled and low-skilled labor. For lack of space, however, we have to restrict this presentation to welfare effects.[26]

Section 2 has revealed that the trade integration and migration components of the enlargement scenario have both positive and negative effects. In the German case, table 1 shows that the positive effects are clearly dominating. This, however, need not be the case – a priori – for other countries. But looking at the pertinent "enlargement-shocks" in table 2, we find that the index values for the trade and migration shocks are positive throughout. If applied to positive elasticity values taken from the German model, this effectively rules out negative welfare effects

[26]See Heijdra, Keuschnigg & Kohler (2004) for a more detailed account of these effects in the simulation results for Germany.

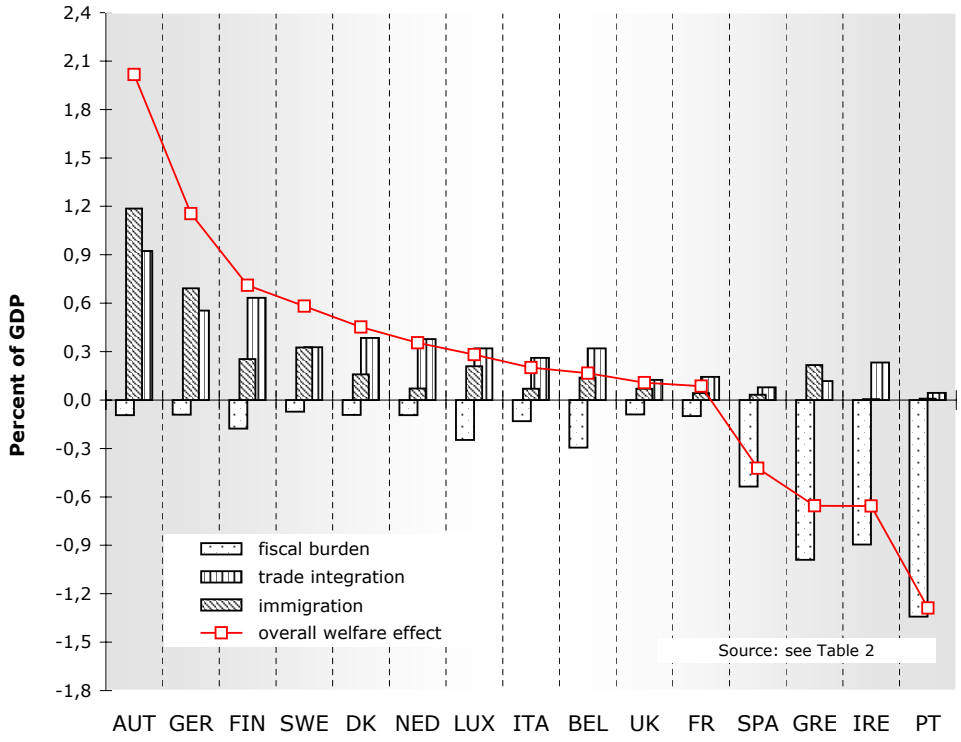

Figure 1: **Welfare effects of eastern enlargement for EU15-countries**

for any of the other countries. In other words, the approach pursued here effectively assumes, once our CGE model tells us that the trade-related and migration-related effects of enlargement exert positive net welfare effects on the German economy, that these effects will be positive also for other countries, but in a scaled-down or scaled-up way, depending on the relative position of the country-specific "enlargement shocks". Obviously, the validity of this procedure relies on an appropriate measurement of the "enlargement shocks".[27] In particular, the measures should duly capture those elements are responsible for negative integration effects. This would not be the case if we merely took ordinary trade shares, for instance. But, as I have already pointed out above, $\tilde{t}_i$ is defined in a much more elaborate way. Not only does it take into account the incidence of trade barriers. It also tries to correct for the likelihood of trade diversion. As regards migration, I have constructed measures that directly correspond to $\mathrm{d}L$ in equation (16).

We may finally wonder about aggregating the country-specific welfare effects to the EU15 as a whole. Table 2 gives three alternative summary measures, all defined as weighted averages. The first measure is perhaps the most interesting to look at. From equation (17) above, the country-specific measures must conceptually be interpreted as $\hat{C}_i \equiv (L_i\,\mathrm{d}C_i)/G_i$. Forming a

[27] Obviously, this problem does not arise with the enlargement-induced change in net budgetary transfers to the EU, $\mathrm{d}B$, which – as such – has an unambiguously negative welfare effect in equation (16).

GDP-weighted average gives

$$\sum_{i=1}^{15} \hat{C}_i \frac{G_i}{G_{EU}} = \frac{\sum_{i=1}^{15} (L_i \, \mathrm{d}C_i)}{G_{EU}}, \tag{20}$$

which is directly comparable to the single-country measure, and which has a "Benthamite" interpretation. While this measure and the population-weighted average are about the same, revealing a 0.3 percent gain for the EU15 as a whole, weighting with council votes reduces the aggregate figure to 0.2 percent. This is due to the relatively low voting-weight of large countries like Germany. Interestingly, pre-Nice and post-Nice voting-weights give aggregate numbers that are virtually the same. While Germany, a large beneficiary country receives a larger weight post-Nice, Austria, a small beneficiary, looses voting-weight from pre- to post-Nice. These two effects apparently cancel out.

Although the early results for the EU15 as a whole presented by Baldwin, Francois & Portes (1997) are based on a vastly different model and on a somewhat different enlargement scenario, it is worth comparing results. The BFP-results are in the vicinity of a 0.2 percent steady state real income gain for the EU15. The present result of 0.3 percent is somewhat higher. Three important points must be made with respect to this comparison. First, the BFP-result is a long-run *real income* gain, while the above result is a Hicksian-equivalent welfare measure. It is clear from section 2 above that long-run real income gains may not be equated to welfare effects, as they ignore forgone consumption from accumulation as well as steady state investment expenditure. Hence, conceptually speaking, the BFP-results overstate the effects. By way of contrast, our Hicksian-equivalent variation fully takes these into account. In a similar vein, the real income gain reported by BFP only relates to the market-integration-component of our enlargement scenario. It needs to be set against the budgetary cost. In this sense as well, the BFP-result overstates the welfare effect. On the other hand, the BFP-scenario does not include migration which, according to our model elasticities above, is a positive component in welfare terms. Including this in our scenario, we end up with a somewhat higher aggregate effect, at least if we look at the "Benthamite" or population-weighted measures.

5 Conclusion

Although this paper is firmly rooted in normative theory, its purpose is not to come up with policy advice. Indeed, the policy problem in the present case is of a somewhat special nature. There was an early commitment to eastern enlargement for reasons not directly related to economics, and the formal decision has already been made in 2002. Hence, policy advice in the true sense of the word does not appear to be called for. The challenge now – particularly in incumbent countries, but maybe even in accession countries – is one of "selling" the decision to the domestic electorate where anxieties still seem to prevail. This is all too often done by referring to some

isolated effect, sometimes blown up beyond proportions, and quite remote from quantification. By way of contrast, this paper attempts a sober "bottom-line" analysis, based on an explicit welfare calculus focused on market integration as a key economic ingredient of enlargement. It does so both in qualitative and quantitative terms. It is to be hoped that a comprehensive analysis of this kind proves a useful input for a well-balanced policy debate, notwithstanding the fact that it does not unambiguously portray enlargement as a clearly beneficial step for all countries.

While it is not too difficult to imagine that enlargement should affect trade as well as investment and employment in incumbent member countries, relating these effects in a coherent way to changes in national welfare requires substantial modelling effort. This paper first looks at enlargement by means of a differentiated indirect utility function which reveals the essential channels for positive and negative welfare effects for an incumbent country. Within a single equation, it identifies conventional effects from trade creation and trade diversion, as well as terms-of-trade changes, but also dynamic effects from capital accumulation, and welfare effects via labor markets characterized by search-unemployment. This proves helpful for a principal understanding of the forces at work, but it does not tell much about the likely magnitudes involved for different countries.

The paper therefore also attempts a quantification of welfare effects of enlargement for each of the present incumbent countries, pursuing an indirect approach based on empirical simulation results obtained with a complex dynamic model of general equilibrium for Germany. This allows to portray an approximate picture of what enlargement means, in terms of a quantitative summary measure of national economic welfare, for each of the EU15-countries. The paper then takes a natural next step in looking at the EU15 as a whole by explicitly aggregating the country-specific results.

The results obtained indicate significant inter-country variation, ranging from an estimated loss of 1.3 percent of GDP for Portugal up to a 2 percent gain for Austria. Further countries at the "loosing end" are Greece (0.6 percent), Ireland (0.6 percent) and Spain (0.4 percent). Other countries who expect benefits are Germany (1.1 percent), Finland (0.7 percent) and Sweden (0.6 percent). Aggregating across all incumbents using GDP or population as weights gives an overall gain of 0.3 percent of EU15 GDP. Using council votes as weights (pre- or post-Nice) instead, gives a somewhat lower gain of 0.2 percent.

We know from experience and theory, that welfare gains from market integration hardly ever come without potentially severe redistribution effects. This paper addresses distributional issues in an inter-country dimension, while all within-country redistribution is left beyond consideration. In direct applications of CGE models, welfare results for a single country are normally accompanied by detailed results on redistributive effects. The indirect approach pursued in this paper did not allow an extension of such redistributive effect, but it is important to bear in mind

that such effects are present behind the aggregate results presented for all EU15 countries. If they are deemed important, further modelling is required to complement the picture portrayed in this paper.

I closing, we should perhaps remember that eastern enlargement of the EU has been on the policy agenda for over a decade. It was probably perceived as a fairly credible policy proposal by the mid 1990s. Indeed, with the Europe Agreements and several years of pre-accession aid, several enlargement-related policy measures have actually been put into force long before the formal step of enlargement, due in May 2004. In an environment with forward-looking economic agents, all of this implies that by this time many of the effects highlighted in this paper have in fact already materialized. Hence, if we analyze the economic impact of enlargement, more than ten years on, we are probably dealing more with economic history, than with expected future effects.

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