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ABSTRACT

Macroeconomic Asymmetry in the European Union: The Difference Between New and Old Members*

We study the degree of output and consumption asymmetry for the ten new and fifteen original European Union members during the period 1994–2001. We establish basic stylized facts about macroeconomic asymmetry from correlations of GDP and consumption growth rates with corresponding aggregates. In addition, we determine which countries would potentially gain the most from international risk sharing within the European Union employing a utility-based measure suggested by Kalemli-Ozcan, Sørensen and Yosha (2001). We find much higher potential gains for the new members compared to those for original EU-15 countries. In particular, economies with the most volatile and counter-cyclical output growth – Czech Republic, Slovak Republic, and the three Baltic states – might benefit the most. We show that EU enlargement would not reduce the welfare of EU-15 members. If these countries move towards full risk sharing their potential welfare gains after enlargement would be virtually unchanged.

Keywords: asymmetry of GDP, consumption insurance, EU enlargement and risk sharing

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1 Introduction

On May 1, 2004, ten more countries became members of the European Union (EU).[1] In addition to political unification, economies of the new member-countries are expected to become an integral part of a larger unified market with a joint economic policy and a single currency, the Euro. There are indisputable large gains from joining the EU for these economies. The gains include the complete elimination of barriers to the flows of goods, labor, and capital, and, as a result, cost reduction, growth of efficiency, knowledge and technology transfer, financial sector development, sustained growth and convergence to the living standards of advanced economies.

There are some concerns, however, that the new members should address. They have to comply with some stringent criteria regarding the implementation of economic policy. These include, for example, limits on the inflation rate, government spending, and internal and external imbalances. For the countries using the Euro as their currency, an additional major concern is the inability of individual members, or a smaller group, to use monetary policy to eliminate the adverse shocks to their economies. In the Union, the monetary policy is subject to the overall EU goals which might contrast with the priorities of an individual country. Such shocks, that hit only one or a few countries, are called *idiosyncratic* (or state-specific) shocks and, if idiosyncratic shocks are prevalent, the economies are said to exhibit *asymmetry* of Gross Domestic Product (GDP). In the face of significant GDP asymmetry, monetary union may lead to a loss of welfare due to the lack of independent monetary policy, unless mechanisms for achieving international income insurance and consumption smoothing ("risk sharing") are in place.[2]

The integration process itself would affect the degree of output asymmetry.[3] Currently,

[1] Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovak Republic, and Slovenia.

[2] International risk sharing may materialize in two ways: through central fiscal institutions and market institutions. *Fiscal institutions* use a tax-transfer system to provide inter-country income insurance, typically, by lowering taxes and increasing transfers to individuals and grants to governments of countries that experience an economic hardships. *Market institutions* include developed capital markets through which the members of a union can share risk by smoothing their income via cross-ownership of productive assets (portfolio diversification). Alternatively, consumers may smooth their consumption (given their income) by adjusting their savings rate; i.e., adjusting the size of their asset portfolio in response to shocks.

[3] Frankel and Rose (1998), Alesina, Barro and Tenreyro (2002), Rose (2000), and Kalemli-Ozcan, Sorensen and Yosha (2001, 2003a) are examples of the studies describing the cannels through which integration might

it is hard to determine the dynamic effect of integration on new and current members since the integration process has just started. The purpose of this paper is to study the degree of output asymmetry for new EU member-countries and current members. The asymmetry is measured by GDP per capita correlations and by the utility-based measure suggested by Kalemli-Ozcan, Sørensen, and Yosha (2001, 2003b, and 2003c).[4] The latter measure also allows determination of the countries which would gain the most from joining the EU and what are the unexploited gains from the international income insurance for the members of larger 25-country Union. Total potential gains are calculated by comparison of the autarky consumption to its full risk sharing level.

Our findings show that gains for the new member-countries are much higher than for the original 15 EU members. Economies with most volatile and counter-cyclical output growth—the three Baltic states, Czech Republic, and Slovak Republic—would benefit the most. There seem to remain much smaller, but non-nil, potential gains for the original members. We show that for EU-15 country-members the potential gains after enlargement would virtually be the same as without it. The overall potential gains for all 25 members of a larger European Union might be substantial provided that the larger Union moves to greater economic integration.

The paper is organized as follows. We briefly review the literature on economic integration and synchronization of macroeconomic fluctuations across countries in Section 2. Section 3 describes two methods of measuring the output asymmetry, addresses the basic characteristics of the GDP and consumption data, and presents the results of calculation. Section 4 concludes.

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affect the asymmetry of shocks.

[4]This measure of asymmetry quantifies the potential loss of welfare due to asymmetric GDP fluctuations in the absence of risk sharing mechanisms. It is independent of the amount of risk sharing actually obtained. To construct such a measure Kalemli-Ozcan, Sorensen and Yosha (2001) use a simple model of risk sharing among countries inhabited by representative agents. For the sample of OECD countries, they represent potential gains from risk sharing as the difference between the welfare that each country would obtain if it were constrained to consume its own GDP and the welfare that each country would obtain if output were pooled across the entire OECD. The more a country can gain from sharing risk with other countries in a group, the more asymmetric are its GDP shocks relative to the group.

2 Economic Integration and Risk Sharing: Some Evidence

Much of the debate on the desirability of economic integration focuses on the degree of synchronization (symmetry) of macroeconomic fluctuations across countries. Countries with synchronized business cycles are claimed to be better candidates to form a successful monetary union. If a country's GDP is asymmetric to a group's GDP, then idiosyncratic shocks to output might lead to significant welfare losses in that country due to lack of independent monetary policy, unless mechanisms for achieving international income insurance and consumption smoothing ("risk sharing") are in place.

Backus, Kehoe and Kydland (1992) examine international risk sharing for the countries in the Euro area. They compare the correlation of country level consumption with world consumption and the correlation of country level GDP with world GDP. Under perfect risk sharing conditions, country level consumption should correlate one-to-one with world consumption. However, it was found that these consumption correlations are much lower than correlations of output with world output. This is a so-called consumption/output anomaly, or the international quantity anomaly. Stockman and Tesar (1995) argue that taste shocks to consumption may explain such anomaly. In relation to our settings, Sorensen and Yosha (1998) show that the regression-based measures of risk sharing—as opposed to correlation based—are immune to taste shocks to consumption.

It has been noted, however, that the economic integration process itself will affect the symmetry of macroeconomic fluctuations. The literature, started by Cohen and Wyplosz (1989) and Weber (1991)—who studied output growth rate correlations for European countries—generated a debate, and there is no consensus regarding the implications of integration for country-level GDP. While some studies suggest that economic integration will result in less symmetric shocks (De Grauwe and Vanhaverbeke (1993)), others show that the degree of asymmetry will not be affected at all (Forni and Reichlin (1997)) or will result in more asymmetric shocks (Clark and van Wincoop (1999); Frankel and Rose (1998))[5].

Frankel and Rose (1998) found a positive significant effect of economic integration on the symmetry of business cycle due to higher bilateral trade intensity. A higher level of trade

[5]See Kalemli-Ozcan, Sorensen, and Yosha (2001) for a more detailed survey.

will allow demand shocks to spread more easily across national borders. They further mention that economic integration will render policy shocks more correlated and that knowledge and technology spillovers will increase (Coe and Helpman (1995)). Alesina, Barro and Tenreyro (2002) and Rose (2000) stress the importance of currency unions with indirect effect via increased trade. These factors should also contribute to fluctuations becoming more symmetric following economic integration. Kose, Prasad and Terrones (2003) study correlations of an individual country's output or consumption with the corresponding world aggregate and document some evidence for the proposition that trade and financial integration enhance global spillovers of output but not consumption fluctuations. Trade linkages with G7 countries, financial openness, and lower volatility of terms-of-trade shocks increase cross-country output correlations.

Krugman (1993), on the other hand, claims that lower barriers to trade will induce countries to specialize more, thus rendering output fluctuations *less* symmetric. Imbs (2001), Clark and van Wincoop (2001) and Kalemli-Ozcan, Sorensen and Yosha (2001) document a significant impact of specialization patterns in empirical studies. If sector-specific shocks are important, then higher inter-industry specialization would lead to greater asymmetry of shocks.[6] Frankel and Rose (1998) and Kalemli-Ozcan, Sorensen and Yosha (2001) express per capita GDP growth as the sum of different shocks in a simple stylized model. They show that the less correlated shocks to GDP in different countries are, the less correlated GDP growth rates are (the less synchronized the economies are).

Kalemli-Ozcan, Sorensen, and Yosha (2001) suggested a "structural" approach for measuring output asymmetry. They calculate the increase in utility obtained by a representative consumer of each country from consuming a fraction of aggregate GDP rather than domestic GDP. In other words, they evaluate the increase in per capita discounted expected utility that would be achieved by moving from financial autarky (where each country consumes the value of its GDP) to full insurance (each country consumes a fixed fraction of aggregate GDP)[7]. Such utility gain is interpreted as a measure of fluctuations asymmetry. The more a country

[6] Imbs (2004) assesses the relative magnitude of these channels going both directly and indirectly from trade integration, specialization and financial integration to business cycles synchronization. He estimates a three-equation system with three endogenous variables—pairwise GDP correlations, bilateral trade, and industrial specialization. His results are generally in line with previous research.

[7] In the next section we provide a more detailed discussion of the model.

gains from sharing country-specific risk with other countries in a group, the more asymmetric are its GDP fluctuations relative to the group.

3 Fluctuations Asymmetry and Gains from Risk Sharing for the Old and New EU Members

3.1 Measuring Fluctuations Asymmetry

In this paper we consider two measures of GDP asymmetry. The first measure is a conventional correlation coefficient of a country's output growth with the aggregate growth of a group which includes this country. This measure was used in the original Backus, Kehoe and Kydland (1992) paper and, for example, by Kose, Prasad and Terrones (2003) in a study of an impact of increased trade and financial integration on international business-cycle comovements.

The second measure we use is suggested by Kalemli-Ozcan, Sørensen and Yosha (2001). Their measure builds on the following counter-factual thought experiment.[8] Consider a group of stochastic endowment economies each inhabited by a representative risk averse consumer who derives utility from consumption of a homogeneous non-storable good. It is well known that under commonly used assumptions—symmetric information, no transaction costs, and identical CRRA utility and rate of time preference for all countries—perfect risk sharing among the countries in the group implies that $c_t^i = k^i gdp_t$.[9] Here c_t^i is the per capita consumption in country i, gdp_t is the aggregate per capita GDP of the group of countries under consideration, and k^i is a country-specific constant that does not vary with economic outcomes or over time.

For each country, we compare the expected utility of consuming the allocation under perfect risk sharing ($k^i gdp_t$) with that of consuming the output of the country (gdp_t^i) under

[8] This subsection draws heavily on Kalemli-Ozcan, Sørensen and Yosha (2003c)

[9] The CRRA utility function, which includes the logarithmic utility function as a special case, is commonly used in macroeconomics and is generally considered as having good properties. The critical assumption here is that all countries or states are assumed to have the same attitude towards risk. If one region were less tolerant of risk than others it would be optimal for it to invest in international assets that would help lower the variance of consumption below that of "world" output in return for a lower average level of consumption. Note that we here abstract from investment, depreciation, etc. and simply assume that world consumption equals world output—our regressions are not affected by this short-cut that is made to simplify the discussion.

autarky. The difference represents *potential* gains from risk sharing that we will use as the basis for constructing our measure of fluctuations asymmetry. The logic is that the more a country can gain from sharing risk with other countries in a group, the more asymmetric are its GDP shocks relative to the group.

To quantify these gains one must make distributional assumptions. Let the natural logarithm of the per capita GDP of the group and the per capita GDP of each country be random walks with drift. Further suppose that, conditional on gdp_0^i and gdp_0, the joint distribution of the log-differences of these processes is stationary, iid, Normal: $\Delta \log gdp_t \sim N(\mu, \sigma^2)$, $\Delta \log gdp_t^i \sim N(\mu^i, \sigma_i^2)$, and $\text{cov}(\Delta \log gdp_t^i, \Delta \log gdp_t) = \text{cov}^i$ for all t.[10] With these assumptions Kalemli-Ozcan, Sørensen and Yosha (2001) derives closed form solutions for the potential gains from risk sharing assuming identical CRRA utility functions for all countries. We will here use the solution for log-utility, which yields simple and intuitive expressions.[11]

The potential gains from risk sharing are expressed in terms of consumption certainty equivalence. The gain in utility (of moving from autarky to perfect risk sharing) equals the gain in utility that would be achieved by increasing consumption permanently from GDP_{i0} to $\text{GDP}_{i0} \cdot (1 + G_i)$. G_i is our country-by-country measure of fluctuations asymmetry and, for log-utility, is given by the expression:

$$G_i = \frac{1}{\delta}\left(\frac{1}{2}\sigma^2 + \frac{1}{2}\sigma_i^2 - \text{cov}^i\right), \tag{1}$$

where δ is the intertemporal discount rate. The intuition for this formula is straightforward. First, the gain from sharing risk is higher for countries with a lower covariance between $\Delta \log gdp_t^i$ and $\Delta \log gdp_t$, cov^i. The interpretation is that countries with "counter-cyclical" output provide insurance to other countries by stabilizing aggregate output and such countries are compensated accordingly in the risk sharing agreement. Second, the higher the variance of country i's GDP, σ_i^2, other things equal, the more it will benefit from sharing risk with other countries. Third, the higher the variance of the aggregate gross product of the group, keeping the variance of country i's GDP constant, the more other countries would be willing

[10] This assumption involves an approximation since the aggregate GDP cannot, in general, be strictly log-normally distributed if each country's GDP is log-normally distributed.

[11] Kalemli-Ozcan, Sørensen and Yosha (2001) show that the empirical results are not very different for general CRRA utility.

to "pay" country i for joining the risk sharing arrangement.

3.2 Data and Estimation

In the empirical part we calculate the correlation- and the utility-based asymmetry measures for 10 EU new member-countries referred to as NEWEU further in the text and for 15 original European Union members, referred to as OLDEU.[12] We refer to the new 25-country European Union as TOTEU thereafter.

We work with yearly GDP and final consumption expenditures data on the country-level and aggregate for 25 old and new EU members during the period 1994–2001. The data we use is available from the World Bank (2003) *World Development Indicators* and Eurostat (2000) *NewCronos 2000* database. For the Eastern European new members the reliable data starts from 1993 when the macroeconomic stabilization packages implemented in the beginning of the 1990s brought results.[13] The nominal GDP and consumption spending data from the original sources is expressed in per capita terms and deflated by the Consumer Price Index.[14] Additionally, data is transformed into PPP US Dollars using the exchange rate in 1995. The yearly GDP and consumption levels are expressed in natural logarithms and first-differenced to calculate the growth rates.

3.3 Empirical Results and Discussion

3.3.1 Output and consumption growth rates: Basic stylized facts

Table 1 reports the summary statistics for GDP per capita growth rates of individual countries for the period 1994-2001. The new member-group consists of the developing economies with

[12]The group of new member-countries includes Cyprus, Malta, and 8 Eastern European economies: the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic, and Slovenia. Old EU members are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and United Kingdom.

[13]Due to missing data we linearly extrapolated consumption data for Cyprus (in 1993), the Czech Republic and Greece (both in 1993–1994).

[14]When using a utility based measure of fluctuations asymmetry, output must be measured in consumption-equivalent terms. Therefore, Kalemli-Ozcan, Sørensen, and Yosha (2001) recommend deflating by the CPI rather than by a GDP-deflator. Since this measure is utility based, we want measured output to reflect consumption in autarky (with countries consuming the *value* of their GDP). Thus, we want to translate GDP to the amount of consumption that it can buy. This is obtained by deflating using the CPI. For a parameter δ we assume a value of 2 percent, similarly to the authors mentioned above.

higher and more volatile growth rates than those of current EU members. This may have some important implications for the stability of the future Union. The more volatile a country's GDP is, other things being equal, the more this country will benefit from joining the Union, i.e. from sharing its idiosyncratic risks with other countries. Overall, the growth rate for NEWEU is on average 3.6% per annum versus 3.0% for OLDEU (median growth rates are 3.4% and 2.6% correspondingly)—the difference is not statistically significant at conventional levels. However, the variability of the growth rate, measured by the standard deviation in NEWEU, is three times that of OLDEU and statistically different, which suggests much higher benefits from joining the Union for NEWEU countries than for original 15 EU countries.[15] Even if we split the 15 EU members by the median growth rate to make the growth rate of 7 smaller current EU members (Ireland, Finland, Luxembourg, Portugal, Sweden, Greece, and Spain have an average growth of 4.3%) comparable to that of the new member-group, we still see that the variability of their GDP is much smaller.

Individual utility depends on consumption rather from income per se. Theoretically, with perfect risk sharing the consumption of a country comoves with world consumption and is not affected by country-specific shocks to income or output. It is useful to compare the properties of consumption and output for two groups of countries to get an idea about the current extent of consumption smoothing achieved. Table 2 reports the summary statistics for growth rates of individual countries total consumption expenditures for the period 1994-2001.[16] Both rate of consumption per capita growth and its variability are statistically and economically higher for NEWEU countries than for OLDEU. the average growth rate for the first group is 4.0% versus 2.5% for the latter group; the corresponding group averages for the standard deviations are 4.3% and 1.2%.[17]

[15] t-statistics for the hypothesis testing for a difference between mean growth rates is equal to 0.9 with 23 df which does not allow rejecting the null hypothesis of equal means at all conventional levels of significance. The difference of the standard deviations is statistically significant at 1% judging from t-statistics of 3.8 with 23 df.

[16] It is important to concentrate on the total consumption expenditures consisting of private consumption and services from government expenditures since potentially consumption risk sharing may be achieved through an international tax-transfer system and saving as discussed in Sorensen and Yosha (1998) for example. Kose, Prasad and Terrones (2003) show that for the sub-samples of more financially integrated developing and OECD countries in the period 1960–99 total consumption is on average less volatile than private consumption, the evidence of additional smoothing achieved by government taxes and transfers.

[17] t-statistics for the hypothesis testing for a difference between mean growth rates is equal to 2.5 with 23 df; in the test of the difference of the standard deviations the t-statistics is equal to 6.8 with 23 df. Both

Table 3 summarizes basic stylized facts about consumption and output across two groups of countries. With respect to risk sharing, there is a noticeable difference between old and new EU members. The ratio of the volatility of total consumption to that of income can be considered a measure of the efficacy of consumption smoothing, at the national level, relative to output volatility. Consumption growth is less volatile than output for the old EU members which implies presence of some consumption smoothing by these countries which is in line with Kose, Prasad and Terrones (2003). In contrast, for the new EU members the ratio is greater than unity—evidence of potential room for further consumption insurance that might be facilitated by economic integration. But relative volatility of consumption and output growth is approximately equal for the pooled 25-country group. Table 4 uncovers differences in consumption smoothing between individual countries. Again, simple and population weighted averages of the ratio is above one for new members and roughly equal or below one of the original EU members.

We calculate the correlation coefficients of each country's output growth with the aggregate growth of 25 TOTEU countries. The calculated values are reported in Table 5. According to this measure, average GDP growth of the ten new members is less synchronized with the group's aggregate than that for the current members. The average correlation coefficient for OLDEU is 0.50 and for NEWEU—0.13. To control for the relative size of the economies in the groups we calculate the average correlations of per capita GDP growth rates for each group weighted by an individual country's population within the total group's population. There is not much difference for the OLDEU group, but the average correlation for the new members is much larger since the smaller economies with negative individual correlations get smaller weights. There are important in-group differences too. For the United Kingdom the correlation was very low during the 1990s compared to that of countries participating in the European Monetary Union (EMU), probably suggesting the synchronization effect of the common European exchange rate policy shown by Alesina, Barro and Tenreyro (2002) and Rose (2000), among others. In the NEWEU group, Poland, Malta, and Slovenia have the correlation comparable to the current EU members. We hypothesize that these countries would gain relatively less from EU membership than, say, the Baltic countries whose GDP is

differences are statistically significant at 1%.

very much asynchronous to the aggregate growth.

Table 6 reports similar calculations for the consumption per capita growth rates. The average correlation coefficient for OLDEU is 0.44 and the population-weighted is 0.59. For the NEWEU both values show zero correlation of consumption growth with grand total, mostly due to large negative correlations offsetting positive correlations within the group. We conjecture that these negative correlations might result from taste shocks to consumption incurred by these countries as the result of the transition to the market economy. Their influence on risk sharing was stressed by Stockman and Tesar (1995). Average correlation of country level consumption with world consumption (Table 6) is lower than the corresponding correlation of output (Table 5) for both groups of countries. This is evidence of the lack of international risk sharing or the international quantity anomaly documented by Backus, Kehoe and Kydland (1992).

3.3.2 Potential gains from international risk sharing

The results of the casual data analysis imply greater output and consumption asymmetry for the new EU members compared to the old ones. This means that potential gains from the economic union should be larger for the latter group. Additionally, the old EU members seem to be closer to the perfect risk sharing situation but have not reached it yet. Therefore, EU enlargement should produce welfare gains for all the member-countries of the larger union.

To test the validity of these claims more formally we calculate the utility-based measure of GDP asymmetry described in Section 3.1. The results, presented in the first column of Table 7, corroborate our assertion of between-group differences in potential welfare gains. The *total* potential utility gains generated by moving from autarky consumption to consuming a part of the overall group's output (full risk sharing consumption) are much larger for the new members as the group in general, and for the Baltic countries, Czech Republic, and Slovak Republic in particular.[18] These are the countries with the largest GDP asymmetry, and they would gain the most from joining the European Union and from the risk-sharing opportunities it offers. The estimate of the gains for the other 5 NEWEU countries (Cyprus,

[18]The estimate of average welfare gain for the ten new members is equal to 4.4 versus 0.5 for the fifteen old EU member-countries.

Hungary, Malta, Poland, and Slovenia) are comparable to the values of the original EU members.

The gains for the old EU members are much smaller. These findings are consistent with the results of Massmann and Mitchell (2003), Sørensen, Wu and Yosha (2002), and Kalemli-Ozcan, Sørensen and Yosha (2003c) who report a significant decline of GDP asymmetry for European countries in the late 1990s compared to the previous periods.[19] Still, there are unexploited potential gains from risk sharing for these countries, especially for Luxembourg, Ireland, Finland, and Greece. It is worth mentioning that asymmetry of output is obviously a determinant of income asymmetry, but this asymmetry is directly mitigated if inter-country risk sharing is significant. Usually the measure of risk sharing has the simple interpretation of measuring the percentage of country-specific shocks to output (in percent growth terms) that is passed on to income. For example, in the United States, Kalemli-Ozcan, Sørensen and Yosha (2003c) have found that less than 50 percent of output shocks are reflected in income shocks (which are further smoothed through federal taxes and transfers). It is possible that the risk sharing in TOTEU would reach similar levels of risk sharing since our results indicate that this process is currently gaining momentum (even though in this paper we do not measure risk sharing directly as opposed to measuring the potential gains from it).[20] It is also worth noticing that the degree of risk sharing in the United States is still increasing in spite of having already reached a high level.

Column four of the Table 7 reports the correlations of the individual country GDP growth with total GDP growth. Comparison with the welfare-based measure reveals the consistency of our findings: countries with small and/or negative correlation coefficients have the largest value of the asymmetry.[21]

Explanation of the discovered differences in potential welfare gains is beyond the scope of this paper. We can try, however, to reveal some forces driving the results by looking at the components of the asymmetry measure in (1). Columns two and three in Table 7 report

[19] For example, Kalemli-Ozcan, Sørensen and Yosha (2003c) calculate the same GDP asymmetry measure as in this paper for 14 EU economies (excluding Luxembourg) and report its decline from 1.23 in the 1983–1991 to 0.61 in the 1991–1999.

[20] The U.S. results are not directly comparable since they also include within-state income smoothing through earning retention (dividend payout).

[21] The correlation between the two measures of asymmetry is 0.67 for 25 countries.

the variance of real per capita GDP growth, σ_i^2, and its covariance with aggregate GDP growth, cov^i. Consistent with the discussion of the summary statistics presented earlier in this section, our findings show that the welfare gains for new member-countries are primarily driven by a higher volatility of their GDP growth rates. Countries with the highest values of asymmetry measure (the three Baltic countries, the Czech Republic, and the Slovak Republic) also have the largest variance of output growth. Therefore, they would contribute the most to the smoothing shocks in other countries. The Baltic countries (Estonia, Latvia, and Lithuania) have also highly counter-cyclical output as measured by the covariances cov^i. These economies should be "compensated" most in the risk sharing agreement since they provide insurance to the rest of countries in the Union by stabilizing aggregate output. The other members of the NEWEU group have both lower variance and positive covariance of individual output growth with total output growth—the pattern generally observed in the group of older EU members. Their covariances and variances are generally smaller and have approximately the same order of magnitude. This explains the lower potential gains from risk sharing for these countries. The exceptions are Ireland, Finland, and Luxembourg which have high GDP growth volatility.

The average gains for each of the two groups, both unweighted and population-weighted, mimic the general pattern of the in-group economies. The average gain for the new member-countries is larger than that for the current EU members. Table 7 shows that welfare gains are normally larger for the smaller economies. When we control for the size of economies, the average gains decrease, but the gain difference between the old and new EU members still remains. On average, NEWEU countries' *potential* benefit is about 13 times higher than that of OLDEU countries. This does not, however, imply that OLDEU countries will be worse off in case of enlargement. If EU-15 members move towards full risk sharing conditions, their potential welfare gains after enlargement would virtually be the same as without it.[22]

So far, we reported estimates of the potential welfare gains provided by moving from theoretically asserted autarky consumption of individual GDP, gdp_t^i, to full risk sharing consumption equal to a portion of the pooled GDP, $k^i gdp_t$. The utility-based measure of

[22] Average potential welfare gains for OLDEU countries if they were to remain in EU-15 is equal to 0.50. In Table 7 we see that this number is almost equal to welfare gains calculated for EU-15 in enlarged 25-country European Union (0.51).

asymmetry is general enough to also estimate *consumption* asymmetry between countries. In order to do this the asymmetry measure described in Section 3.1 is to be calculated in terms of the moments of actual consumption c_t^i. We can speculate this measure may be used to evaluate the *unattained* welfare gains a representative consumer would achieve due to moving from his actual consumption level c_t^i (which is normally different from autarky consumption) to the same final point, i.e., full risk sharing consumption level. If countries have already made some risk sharing efforts towards the full risk sharing, the unattained gains would be smaller than those reported in Table 7. There is a caveat however making such interpretation somewhat problematic. Asymmetry measure calculated in this fashion is *not* independent of the actual extent of risk sharing attained and may be subject to the influence of all factors affecting the diversification process. One example is taste shocks to consumption pointed out by Stockman and Tesar (1995).[23] Further research is needed to provide a deeper insight on the influence of the taste shocks on the unattained gains estimates.

4 Conclusions

In this paper we use several asymmetry measures available in the literature to compare synchronization of GDP and consumption per capita growth rates for the original EU members and for the ten new member-countries. In particular, we concentrate on a measure suggested by Kalemli-Ozcan, Sørensen and Yosha (2001), which allows estimation of the potential gains in expected utility of consuming a portion of a group's GDP (under the conditions of full risk sharing) compared to consuming its own GDP (under financial autarky).

We found that potential gains for the new member-countries are much larger than those for old EU members. They are especially large for Czech Republic, Slovak Republic, and the

[23] We estimated the asymmetry measure of Kalemli-Ozcan, Sørensen and Yosha (2001) on the consumption data. In general, the pattern discovered in the measure based on GDP per capita growth was also observed there: asymmetry is larger for the new members of EU compared to the EU-15 group. The larger value of the gain is primarily attributed to the large volatility of consumption spending. For the EU-15 counties as a group, consumption-based estimates of asymmetry are smaller than GDP-based reported in Table 7. These countries presumably attained some consumption insurance compared to the autarky case. In the case of the new EU members, the consumption-based estimates are strictly larger than GDP-based ones, with the exception of the Baltic countries. We can speculate taste shocks and other factors do influence these results and make them hard to interpret. It is possible that the transition process from planned to market economies in these countries actually caused some dissmoothing of consumption—possibly because the state provided a great deal of smoothing under previous system.

three Baltic countries. It is the higher volatility and sometimes counter-cyclical pattern of their output that creates large potential gains from risk sharing for the countries entering the European Union. The fifteen original EU members also have some unexploited gains from insuring their output risks in a larger Union, however their individual benefits are generally smaller. The overall gains to all 25 members of the larger European Union are potentially substantial provided the larger Union moves to greater economic integration.

We expect to see risk sharing between EU countries increasing. This should lead to more specialization[24], and a resulting increase in the asymmetry of GDP fluctuations to have smaller welfare costs, as better risk sharing lowers the asymmetry of income fluctuations.

It should be emphasized again that the utility gains reported here are *potential* gains from moving from consumption under autarky to full risk sharing consumption. Indirectly we show that even old EU members have not reached the full risk sharing level of integration when the idiosyncratic output shocks are completely diversified.[25] The further process of integration within enlarged European Union would most likely lead to further synchronization of the output and income across member-countries with further depletion of risk-sharing opportunities. If economic integration continues and TOTEU economies successfully move towards full risk sharing conditions, we expect substantial welfare gains for *all* members of the European Union after its enlargement. For new member-countries, though, the potential welfare gains are expected to be much higher than those for the EU-15 group whose potential welfare gains after enlargement would virtually be the same as without it.

[24]Kalemli-Ozcan, Sørensen and Yosha (2001) show that economic integration will lead to better income insurance through greater capital market integration which will, ceteris paribus, induce higher specialization in production and more trade-rendering fluctuations less symmetric.

[25]Kalemli-Ozcan, Sørensen and Yosha (2001, 2003c) claim that asymmetry of *output* (GDP) may not be important for the members of the EU if there is substantial risk sharing between members of the Union. Rather, the asymmetry of income and of consumption are, arguably, the relevant indicators of potential losses of welfare. Kalemli-Ozcan, Sørensen and Yosha (2003c) show that despite the greater degree of risk sharing achieved in the EU during the past decade, GNP is more asymmetric than GDP. They conjecture that a further rise in risk sharing in the EU will reverse this result.

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Table 1: **GDP per capita growth, 1994-2001. Summary statistics**

	Mean	Standard Deviation	Min.	Max.
		EU-15 Countries		
Austria	1.62	0.98	0.07	3.02
Belgium	2.03	1.10	0.13	2.99
Denmark	2.39	1.19	0.98	4.75
Finland	4.28	2.38	0.02	6.66
France	1.80	0.98	0.23	3.28
Germany	0.88	1.08	–0.76	2.15
Greece	3.18	1.15	1.41	4.55
Ireland	8.58	2.79	4.73	11.92
Italy	1.95	0.50	1.17	2.53
Luxembourg	4.11	3.49	–2.07	8.62
Netherlands	2.38	1.09	0.56	3.87
Portugal	3.71	1.10	2.03	5.27
Spain	2.82	1.09	1.4	4.53
Sweden	3.20	1.37	0.53	4.56
United Kingdom	2.62	0.60	1.68	3.25
Average	3.04	1.39	–	–
Median	2.62	1.10	–	–
		New members		
Cyprus	3.63	2.15	0.01	5.90
Czech Republic	2.77	3.36	–1.48	7.00
Estonia	5.26	5.31	–5.51	11.10
Hungary	2.93	1.82	–0.16	4.98
Latvia	4.65	5.08	–7.01	8.81
Lithuania	2.69	8.30	–15.90	11.62
Malta	3.15	1.76	–0.12	5.80
Poland	4.26	2.66	–0.14	7.35
Slovak Republic	2.36	3.59	–3.09	5.99
Slovenia	4.08	2.15	–0.39	6.40
Average	3.58	3.62	–	–
Median	3.39	3.01	–	–
Overall Average	3.25	2.28	–	–
Overall Median	2.93	1.76	–	–

Notes: All numbers are multiplied by 100. Overall average and median are calculated for the 25-country sample.

Table 2: **Consumption per capita growth, 1994-2001. Summary statistics**

	Mean	Standard Deviation	Min.	Max.
		EU-15 countries		
Austria	1.68	0.95	–0.02	2.85
Belgium	1.90	0.68	0.95	2.67
Denmark	1.58	1.74	–0.87	5.11
Finland	3.07	0.98	1.50	4.32
France	1.53	0.74	0.57	2.54
Germany	1.12	1.04	–0.24	2.91
Greece	2.14	1.08	0.47	3.51
Ireland	5.97	1.97	3.04	9.46
Italy	2.05	0.99	0.67	3.24
Luxembourg	3.12	1.28	1.48	5.61
Netherlands	2.31	1.08	0.46	3.48
Portugal	3.33	1.69	1.00	5.40
Spain	2.31	1.34	0.38	4.28
Sweden	2.58	1.59	0.53	4.46
United Kingdom	2.73	1.18	1.09	4.70
Average	2.49	1.22	–	–
Median	2.31	1.08	–	–
		New members		
Cyprus	6.47	4.64	0.48	13.63
Czech Republic	3.68	4.15	–3.52	9.92
Estonia	5.23	2.47	1.57	8.44
Hungary	0.83	4.83	–7.90	5.00
Latvia	7.38	3.26	3.87	12.84
Lithuania	2.25	8.57	–17.08	9.93
Malta	3.85	2.68	0.26	8.50
Poland	4.84	3.52	0.91	12.21
Slovak Republic	2.18	4.14	–2.55	8.56
Slovenia	4.16	5.06	–1.19	15.94
Average	4.09	4.33	–	–
Median	4.01	4.15	–	–
Overall Average	3.13	2.47	–	–
Overall Median	2.58	1.69	–	–

Notes: All numbers are multiplied by 100. Overall average and median are calculated for the 25-country sample.

Table 3: **Output and consumption per capita growth: Basic stylized facts, 1994-2001**

	Output (Y)	Consumption (C+G)	Ratio (C+G)/Y
		EU-15 countries	
Average Level	3.04	2.49	0.81
Average St.Dev.	1.39	1.22	0.88
		New members	
Average Level	3.58	4.09	1.14
Average St.Dev.	3.62	4.33	1.20
		EU-25 countries	
Average Level	3.25	3.13	0.96
Average St.Dev.	2.28	2.47	1.08

Notes: Moments are calculated from from corresponding individual countries' values in Tables 1 and 2.

Table 4: **Relative volatility of consumption to output, 1994-2001**

New members		EU-15 countries	
Cyprus	2.16	Austria	0.97
Czech Republic	1.24	Belgium	0.62
Estonia	0.47	Denmark	1.46
Hungary	2.65	Finland	0.41
Latvia	0.64	France	0.76
Lithuania	1.03	Germany	0.96
Malta	1.52	Greece	0.94
Poland	1.32	Ireland	0.71
Slovak Republic	1.15	Italy	1.98
Slovenia	2.35	Luxembourg	0.37
		Netherlands	0.99
		Portugal	1.54
		Spain	1.23
		Sweden	1.16
		United Kingdom	1.97
Arithmetic Mean	1.45	Arithmetic Mean	1.07
Weighted Average	1.28	Weighted Average	0.97

Notes: Numbers represent ratio of the standard deviations of consumption per capita growth rates to that of output per capita. Mean and weighted averages are calculated on individual countries' ratios. Weighted average is calculated as average correlation across countries weighted by their average population.

Table 5: **Correlation of individual countries GDP per capita growth with EU-25 GDP per capita growth, 1994-2001**

New members		EU-15 countries	
Cyprus	0.28	Austria	0.88
Czech Republic	–0.05	Belgium	0.70
Estonia	–0.37	Denmark	0.38
Hungary	0.10	Finland	0.59
Latvia	–0.25	France	0.55
Lithuania	–0.45	Germany	0.91
Malta	0.69	Greece	–0.26
Poland	0.74	Ireland	0.43
Slovak Republic	0.13	Italy	0.32
Slovenia	0.44	Luxembourg	0.58
		Netherlands	0.41
		Portugal	0.53
		Spain	0.46
		Sweden	0.91
		United Kingdom	0.11
Arithmetic Mean	0.13	Arithmetic Mean	0.50
Weighted Average	0.38	Weighted Average	0.49
	Overall Arithmetic Mean	0.35	
	Overall Weighted Average	0.48	

Notes: The entry for GDP correlation is calculated as a correlation of each country's GDP growth with the total EU-25 GDP growth, i.e., $corr^i = corr(\Delta \log \text{GDP}^i, \Delta \log \text{GDP})$. Weighted Average is calculated as average correlation across countries weighted by their average population. Overall mean and weighted average are calculated for the 25-country sample.

Table 6: **Correlation of individual countries consumption per capita growth with EU-25 consumption per capita growth, 1994-2001**

New members		EU-15 countries	
Cyprus	–0.47	Austria	0.73
Czech Republic	–0.08	Belgium	0.45
Estonia	–0.35	Denmark	–0.31
Hungary	0.19	Finland	0.23
Latvia	–0.33	France	0.66
Lithuania	0.01	Germany	0.84
Malta	0.16	Greece	0.02
Poland	–0.01	Ireland	0.60
Slovak Republic	–0.16	Italy	0.24
Slovenia	0.07	Luxembourg	0.17
		Netherlands	0.54
		Portugal	0.55
		Spain	0.57
		Sweden	0.59
		United Kingdom	0.72
Arithmetic Mean	0.01	Arithmetic Mean	0.44
Weighted Average	0.01	Weighted Average	0.59
	Overall Arithmetic Mean	0.23	
	Overall Weighted Average	0.56	

Notes: The entry for Consumption correlation is calculated as a correlation of each country's Consumption growth with the total EU-25 Consumption growth, i.e., $corr^i = corr(\Delta \log \text{CONS}^i, \Delta \log \text{CONS})$. Weighted Average is calculated as average correlation across countries weighted by their average population. Overall mean and weighted (by population) average are calculated for the 25-country sample.

Table 7: **GDP asymmetry for individual new members and EU-15 countries, 1994-2001**

	Asymmetry G_i	Variance σ_i^2	Covariance cov^i	Correlation $corr^i$
		New members		
Cyprus	1.06	4.61	0.39	0.28
Czech Republic	2.97	11.26	–0.10	–0.05
Estonia	7.80	28.22	–1.28	–0.37
Hungary	0.87	3.31	0.12	0.10
Latvia	6.97	25.81	–0.82	–0.25
Lithuania	18.55	68.95	–2.42	–0.45
Malta	0.49	3.11	0.79	0.69
Poland	1.24	7.06	1.27	0.74
Slovak Republic	3.18	12.88	0.30	0.13
Slovenia	0.96	4.64	0.62	0.44
Arithmetic Mean	4.41	–	–	0.13
Weighted Average	2.73	–	–	0.38
		EU-15 countries		
Austria	0.06	0.95	0.56	0.88
Belgium	0.16	1.21	0.50	0.70
Denmark	0.31	1.41	0.29	0.38
Finland	1.07	5.68	0.90	0.59
France	0.17	0.96	0.35	0.55
Germany	0.08	1.16	0.64	0.91
Greece	0.53	1.33	–0.19	–0.26
Ireland	1.66	7.77	0.77	0.43
Italy	0.12	0.25	0.10	0.32
Luxembourg	2.50	12.17	1.30	0.58
Netherlands	0.26	1.18	0.29	0.41
Portugal	0.22	1.21	0.38	0.53
Spain	0.24	1.20	0.33	0.46
Sweden	0.17	1.88	0.81	0.91
United Kingdom	0.18	0.36	0.04	0.11
Arithmetic Mean	0.51	–	–	0.50
Weighted Average	0.19	–	–	0.49

Notes: First column is the asymmetry measure, calculated over the period of 1994-2001 as $10^2 \cdot \frac{1}{\delta}$ $(\frac{1}{2}\sigma^2 + \frac{1}{2}\sigma_i^2 - \text{cov}^i)$, where $\sigma_i^2 = \text{var}(\Delta \log \text{GDP}^i)$, $\text{cov}^i = \text{cov}(\Delta \log \text{GDP}^i, \Delta \log \text{GDP})$, σ^2 is the variance of the total EU-25 GDP growth, i.e. σ^2=var($\Delta \log \text{GDP}$), $10^4 \cdot \sigma^2 = 0.42$, and $\delta = 0.02$. The entry for asymmetry is interpreted as the potential *welfare gain* that a country would obtain from fully diversifying any country-specific variance in output expressed in terms of the percent permanent increase in GDP that would result in the same utility gain. Column 2 is $10^4 \cdot \sigma_i^2$, and Column 3 is $10^4 \cdot \text{cov}^i$. Column 4 is a correlation of each country's GDP growth with the total EU-25 GDP growth, i.e., $corr^i = corr(\Delta \log \text{GDP}^i, \Delta \log \text{GDP})$. Weighted averages are population-weighted.