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RISK SHARING AND EMU

BY

JACQUES MÉLITZ

UNIVERSITY OF STRATHCLYDE, CREST-INSEE & CEPR

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DEPARTMENT OF ECONOMICS
UNIVERSITY OF STRATHCLYDE
GLASGOW

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Jacques Mélitz

University of Strathclyde, CREST-INSEE, and CEPR

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Abstract: What are the prospects that risk-sharing in the EMU will ever attain the levels in the U.S.? So far as the risk-sharing in the U.S. depends on interregional transfers through the budget of the federal government, those prospects are poor. So far as the risk-sharing in the U.S. takes place though market channels, they are much better. The paper addresses the theory and evidence on the subject. Asdrubali, Sørensen and Yosha provide a general framework of analysis. One issue is the adequacy of the framework. With respect to the evidence, the EMU still lags far behind the U.S. as regards the pooling of risks through portfolio diversification. But there already seems to be little to distinguish the euro zone from the U.S. concerning the ability to borrow to smooth shocks. Thus, the extent of risk-sharing via credit – a matter that Asdrubali, Sørensen and Yosha raise – is of special interest. Further, the empirical evidence indicates that the progress of European economic and monetary integration over the last decade has increased the symmetry of business cycles. However, this could be a sign of remaining capital-market imperfections, though that is only one interpretation.

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In rich countries, the separate regions share risks with one another to an important degree. On the other hand, the member countries of the EMU do not pool risks nearly as much as regions within countries do. The main point of comparison is always the United States. When a region of the U. S. suffers an adverse shock, its tax contributions to the federal budget diminish and it receives federal help in other ways. Federal transfers and grants stay up, and some of them may even rise. The region thereby obtains relief. In the case of an EMU member in difficulty, no similar assistance will come from the EU budget. In this respect, the member countries of the EMU are at a distinct disadvantage relative to the regions of the U.S. Short of an unforeseen reform in the EMU, this will continue.

However, Americans also share risks in other ways that Europeans can hope to emulate in the future. There is a significant cross-ownership of claims to property in the U.S. When an adverse shock hits a U.S. region, the residents will share the damage with the non-residents to some extent because many holders of the income claims to the output live in different regions. By promoting capital market integration, EMU may encourage risk-sharing of this sort. In addition, the residents in a region in the throes of a recession will find it easier to borrow from their compatriots in other sections because of a single money. EMU should clearly encourage risk-sharing of that sort too. Many theorists would not refer to risk-sharing in this last instance. They would reserve the term for insurance coming from portfolio diversification (while occasionally allowing the term to cover also aforementioned transfers through the central-government budget). However, under autarchy, residents would not be able to smooth shocks via credit. Therefore, there is little harm in broadening the concept of "risk-sharing" to encompass credit transactions as well.

An important contribution by Asdrubali, Sørensen and Yosha (1996) (hereafter ASY) proposes a framework that is capable of analyzing all three previous mechanisms of risk-sharing in an integrated way: namely, (1) transfers through the upper-government budget; (2) insurance or cross-ownership of income claims to output; (3) credit or borrowing and lending. The authors estimate the risk-sharing via these three mechanisms to be, respectively, 13, 39, and

23 percent in the U.S. The last two of these numbers – those regarding the risk sharing through market channels – add up to 62 percent, implying considerable smoothing of output shocks. If these estimates can be taken seriously, the prospects for risk-sharing in the EMU are much better than they otherwise appear. Thus, the logic and the accuracy of ASY's estimates are important.

In the first section, this paper will consider the extent of risk-sharing via the federal budget in the U.S. Some basic related questions still remain open on this subject. The next section will proceed to examine the risk-sharing in the U.S. via cross-ownership of claims to output and via credit. The discussion will then take up the prospects for higher risk-sharing through the two market mechanisms in the EMU. The final section will move on to examine the impact of EMU on the total insurable risks. This next matter will bring us into familiar territory, concerning the degree of asymmetry of the shocks.

The major conclusions – at least a few of them – may be mentioned at once. First, the broad differences in the literature in the estimates of risk-sharing via the federal budget in the U.S., going from 40 percent to only 10, are still ill-understood. These differences really have little to do with the use of levels or first differences in the econometric analysis, or redistribution as opposed to stabilization. They stem from the accounting instead. However, the accounting raises some basic and neglected conceptual issues. The smoothing of regional shocks coming from this public source is around 12-15 percent overall. With respect to the market channels of risk-sharing, ASY's numbers for the U.S. are probably exaggerated. The pooling of risks in the EMU still lags behind the U.S. and will do so for a long time to come. But there already seems to be little to distinguish the euro zone from the U.S. in regard to the ability to borrow to smooth shocks. Thus, the extent of risk-sharing via credit – an issue that ASY do very well to raise – is of considerable importance. Finally, the empirical evidence indicates that the progress of European economic and monetary integration over the last decade has increased the symmetry of business cycles. But this poses a general conceptual problem. With the advance of capital market integration, people should be willing to accept more output risks since they

can share the risks more easily. From this perspective, the increase in the symmetry of business cycles in the EMU could be a sign of remaining capital-markets imperfections. This is not the only reading, but it is a possible one. The interpretation would mean that the increasing symmetry of business cycles in the Euro zone signals a poor allocation of the risks between individuals.

I. Risk-sharing via the central government budget in the U.S.

General downturns in economic activity in a country tend to raise deficit spending by the central government. Such responses by the government obviously say nothing about the smoothing of regional shocks, or the smoothing of movements in the output of some regions relative to others. All relevant studies of regional stabilization through the federal budget in the U.S. necessarily try to control for this problem. They do so either by introducing a separate fixed effect for each period (von Hagen (1992), ASY (1996)) or else by using ratios of regional values to national averages (Sala-i-Martin and Sachs (1991), Bayoumi and Masson (1995)). Either procedure comes to about the same. The studies also proceed mostly by regressing a regional output variable or a regional income variable following net federal transfers on the same regional variable, prior to net transfers. Sala-i-Martin and Sachs (1991) (hereafter SiMS), who opened the discussion, measured both the aforementioned dependent and independent variables in levels. These two authors also used personal income figures. They reported 40 percent stabilization. An influential contribution by von Hagen (1992) then followed quickly, and used first differences and real gross product figures. von Hagen got 10 per cent stabilization instead. He also ascribed the enormous difference in his results to his use of first differences rather than levels. Further, he suggested that his choice of first differences is the appropriate one in studying stabilization, whereas SiMS's choice of levels pertains more closely to redistribution instead. This diagnosis has made a lasting impression. To the contrary, however, the use of levels or first differences is not central. Moreover, there is little difference between redistribution (properly measured) and stabilization in the U.S.

I will now briefly display the validity of these conclusions. Let X_{it} be either per capita per-

sonal income in region i in year t divided by per capita personal income across the nation in year t, or else per capita gross product in region i in year t divided by per capita gross product in the nation. In either instance, the weighted sums of X_{it} values across the regions, based on population weights, equal one. Let Y_{it} be the corresponding values of X_{it} after the addition of net transfers per capita by the national government. Consider next equations (1) and (2), containing a disturbance term (μ_{it} or ν_{it}, as the case may be).

$$Y_{it} = \alpha_i + \beta_s X_{it} + \mu_{it} \qquad (1)$$

$$\Delta Y_{it} = d_i + \beta_s \Delta X_{it} + \nu_{it} \qquad (2)$$

Equation (1) reflects SiMS's choice in analyzing stabilization in the U.S. Equation (2) reflects von Hagen's. In both cases, β_s relates to stabilization. If we take equation (1) in first differences, all the regional constants α_i drop out. Therefore, equation (2) does not follow exactly from equation (1), but rather supposes a possible regional drift or trend, d_i, in the X_{it} values over time. However, in the absence of such drifts or trends in the X_{it} terms (if $d_i = 0$), equation (2) is simply equation (1) in first differences (with $\Delta\mu_{it} = \nu_{it}$). Further, if, in addition, the disturbances μ_{it} possess certain well-known statistical properties, then the estimates of equations (1) and (2) will yield identical estimates of β_s. Suppose that a rise (fall) of \$1 in X_{it} always yields a rise (fall) of Y_{it} of 90 cents. Then β_s is 0.9, and stabilization is 0.1. The measure of stabilization is therefore $1-\beta_s$.

Table 1 provides separate estimates of $1-\beta_s$ for equations (1) and (2), and reports these estimates separately in case of SiMS's measure of X_{it} and von Hagen's. In all the estimates, the U.S. is broken up into 48 regions: the 50 states minus Alaska and Hawaï. The interpretation of transfers from the central government is always the same: namely, direct taxes plus social insurance plus transfers to persons and grants to states. As can be seen, in the event of the gross product measure (von Hagen's), the estimates in levels and first differences are virtually identical. In case of the personal income one, the two estimates differ by 7 percent or less than half of the total (whether 0.2 or 0.27). But the differences between the two measures of X_{it} look important on the whole. We will come back to this last point shortly.

There is a third estimate in the table resting on a separate equation, owing to Bayoumi and Masson (1998):

$$(3)\ \overline{Y}_i = \alpha_d + \beta_d \overline{X}_i + \eta_i \qquad (3)$$

In this next example, $\overline{X}_i$ and $\overline{Y}_i$ represent averages of X_{it} and Y_{it} over the whole study period. Consequently, unlike β_s, the coefficient β_d does not reflect any movement over time, but relates strictly to cross-sectional differences between regions over the entire study period. Accordingly, the coefficient can be seen as pertaining to redistribution.[1] The idea of separate coefficients β_s and β_d, for stabilization and redistribution, also makes perfect sense.

It is easy to imagine countries where taxes would be moderate yet highly progressive, redistributive spending would be high, and there would be no unemployment compensation, no temporary subsidies, no temporary tax breaks. Consequently, redistribution (β_d) would be strong and stabilization (β_s) weak. Alternatively, we can imagine the opposite: countries with strictly proportional taxation, lots of temporary aid in case of disasters but no permanent assistance to the poor. Then β_s would be high and β_d low. It is clear from the table that the U.S. belongs to neither of these two instances. For this country, β_s and β_d are much the same. Therefore, not only is there little notable difference in levels and first differences for stabilization in the U.S., but there is little indication of higher redistribution than stabilization.

On the other hand, depending on personal income or gross product data, the stabilization and redistribution estimates in Table 1 do differ widely. They go from 12 to 14 percent to 20 to 27 percent. The major contributors to the discussion of stabilization in the U.S. also divide right down the middle about the right measure to use. Bayoumi and Masson (1995) and Obstfeld and Peri (1998) follow SiMS in adopting the personal income measure, while Goodhart and

[1] As noted by Mélitz and Zumer (2002), equations (1) and (3) can be jointly derived from the more general hypothesis:

$$Y_{it} = \alpha_d + \beta_d \overline{X}_i + \beta_s (X_{it} - \overline{X}_i) + \varepsilon_{it}$$

(The sum of equations (1) and (3) gives rise to this last equation with α_i equal $\overline{Y}_i - \beta_s \overline{X}_i$ and $\eta_i + \mu_{it}$ equal ε_{it}.) As is also well known from panel data econometrics, estimates of this more general equation or separate estimates ("within" and "between") of equations (1) and (3) yield identical estimates of β_s and β_d.

Smith (1993) and ASY (1996) opt for von Hagen's gross product one. There is also an occasional difference in the measure of net transfers. Those accounting choices are the critical ones. The combination of a narrow measure of net transfers and a wide measure of regional activity (gross product) leads to low estimates of stabilization, while the combination of a wide measure of net transfers and a narrow one of regional activity leads to high estimates of stabilization. Table 2 makes the point.

The top half of the table relates to stabilization, the bottom one redistribution; the left-hand side relates to personal income, the right-hand one to gross product. In the case of either top or bottom half, lower rows (numbered 1, 2, 3) concern successively larger measures of net transfers. If we look down to lower rows, we find that the estimates of β_s and β_d successively rise. As regards the differences left and right, the figures for gross product are far higher than those for personal income. If we compare the columns on the left with the corresponding ones on the right, we find the estimates of β_s and β_d on the right consistently lower. SiMS combined the highest measure of net transfers (rows 3) with the lower measure of X_{it}. von Hagen combined a lower measure of net transfers (rows 2) with the higher measure of X_{it}. That is the key to the difference in the estimate.

It might seem that the critical choice is really that of X_{it}, and the measure of net transfers is subordinate as long as we limit the choice to rows 2 and 3. But that is an accident of the U.S. example. With regard to Canada, for instance, including or excluding federal grants to the provincial governments (choosing between rows 2 or 3) makes as much difference as choosing personal income instead of gross product accounting. In the case of gross product accounting (von Hagen's choice), the estimate of β_s is only 3 to 4 percent for Canada under the narrower measure of net transfers in rows 2, while adding the federal grants to the provincial governments raises the estimates of β_s to 13 or 14 percent (depending on levels or first differences). Likewise, when we pass from the measure of net transfers in rows 2 to the wider one in rows 3, β_d goes from 16 to 30 percent in Canada (see Mélitz and Zumer (2002)).

What then is the right choice of accounting? We can think of regional income as the production in the region. Then the income belongs partly to the residents of other regions. Or else we can think of regional income as the income of the residents. Then some of the income stems from production in other regions. It is difficult to see why one choice or the other should be the only right one. For example, consider a state like Louisiana where the population is poor but the output per head is high relative to the rest of the U.S., or another like Florida where much of the population is retired and living on income coming from elsewhere. To focus exclusively on gross product is to put the emphasis on the activity in the region: the productivity of firms, employment, infrastructure, etc. But that glosses over the issue of the welfare of the residents. Why not consider the stabilization and redistribution in the region from the standpoint of smoothing and equalizing these people's revenues and their consumption instead? Investigators take one view or the other, but there is much to be said for either view, and it may therefore be best to keep both of them in mind. The next question is whether regardless of the choice of measure of X_{it}, the same measure of net transfers should serve.

If the issue is the redistribution and stabilization of the disposable gross product of the regions, it seems clear that all the central-government net transfers are relevant. Regardless whether the transfers are direct or indirect, all of them support local activity. However, if the question relates to the redistribution and stabilization of the disposable personal income of the residents, then including the transfers to the regional governments is not necessarily correct. True, the residents of a region derive benefits from central-government subsidies to their local governments as well as such direct subsidies to themselves, since the ones to the regional governments provide them with better services of transportation, recreation, communication and so forth. But so do tourists, transients and commuters. More important, if the net transfers to the regional governments are to be included in the residents' disposable income, the question is why the entire flow of similar services that the residents get from local firms is not incorporated there as well (but only in so far as those services correspond to payments of wages and interest to residents). Much of the capital in a region belongs to the residents. Therefore, the retained earnings of local firms belong disproportionately to them too. Yet

those earnings do not enter into their personal income. If there are to be any imputations for transfers, should not those retained earnings be imputed to them too? Finally, it seems incontestable that if purchases from local firms by municipal and state governments are included in the residents' disposable income when the central government subsidizes them, those purchases must always be included there.

In other words, the issue is one of coherence in accounting: the concepts of income before and after net transfers must agree. The choice of a broad measure of net transfers requires a correspondingly broad measure of income. As already shown, combining a broad measure of net transfers with a narrow measure of income will systematically swell the estimates of β_s and β_d. On these grounds, the proper measures of β_s and β_d would seem to be those in rows 2 in case of personal income accounting and in rows 3 in case of gross product accounting. If we also accept the usual preference for the estimates of stabilization in first differences, that puts the estimates for the U.S. in the range of 12 to 15 percent for β_s and 14 to 18 percent for β_d.[2]

II. Interregional risk-sharing via credit and cross-ownership of property in the U.S.

High estimates of interregional risk sharing via the federal government in the U.S. possibly dash any hope that risk-sharing in the EMU will ever attain the U.S. level. However, similarly high estimates of risk-sharing through market channels can even kindle such hope. Let us then examine the basis for ASY's estimate that the U.S. regions share over half of the insurable

[2] Decressin (2002) raises an important separate issue. National governments make many payments to national civil servants, and public and private firms rather than households and lower-level governments. These payments do not always show up in the official regional accounts – less so in centrally organized countries than federally organized ones. Furthermore, some of the spending in question may be on private goods, such as health and education, and those goods (or services) may be distributed based on a principle of equal access by everyone. Consequently, some redistribution may result from the relevant spending and possibly some stabilization too. But without a special decomposition of the relevant national spending by region, the analyst will miss the associated regional redistribution and stabilization. Decressin makes the right correction for Italy. He also thinks that the correction argues in favor of gross product accounting. The latter is difficult to see. Sicilians benefit greatly from education and health services that they receive privately from teachers and medical workers at national expense. Why should this lead us to favor analyzing the stabilization and redistribution of Sicilian output per head rather than Sicilian personal income?

risks to output with one another via private channels.

Consider a panel of regional data consisting of per capita output Y_i, per capita personal income PI_i, per capita disposable income DI_i, and per capita consumption C_i, all stated in real terms. The index i refers to the region. ASY start with the identity

$$Y_i = \frac{Y_i}{PI_i}\frac{PI_i}{DI_i}\frac{DI_i}{C_i}C_i \qquad (4)$$

Next, they take logarithms and first differences:

$$\Delta \log Y_i = (\Delta \log Y_i - \Delta \log PI_i) + (\Delta \log PI_i - \Delta \log DI_i) + (\Delta \log DI_i - \Delta \log C_i) + (\Delta \log C_i) \qquad (5)$$

Then they multiply both sides of equation (5) by $\Delta \log Y_i$, and subsequently subtract the means of all five terms over the study period, the one on the left and the four in parentheses on the right. Following, they take expected values. The result is the variance of the change in the log of Y_i on the left and the sum of the covariances of this term with, respectively, $\Delta\log Y_i - \Delta\log PI_i$, $\Delta\log PI_i - \Delta\log DI_i$, $\Delta\log DI_i - \Delta\log C_i$, and $\Delta\log C_i$, on the right. Finally, they divide both sides of the last equation by the variance of $\Delta\log Y_i$. This yields:

$$1 = \beta_K + \beta_G + \beta_C + \beta_U \qquad (6)$$

The covariance/variance β terms in equation (6) correspond exactly to OLS estimates of the following regressions:

$$\begin{aligned}
\Delta \log Y_i - \Delta \log PI_i &= \alpha_K + \beta_K \Delta \log Y_i + \mu_{iK} \\
\Delta \log PI_i - \Delta \log DI_i &= \alpha_G + \beta_G \Delta \log Y_i + \mu_{iG} \\
\Delta \log DI_i - \Delta \log C_i &= \alpha_C + \beta_C \Delta \log Y_i + \mu_{iC} \\
\Delta \log C_i &= \alpha_U + \beta_U \Delta \log Y_i + \mu_{iU}
\end{aligned} \qquad (7)$$

Consequently, ASY estimate all four equations. Before doing so, they introduce a fixed effect for each year in order to take account of the general growth rate in per capita output over all of the regions at each date. Then as a final and separate step, they assign a specific empirical interpretation to β_K, β_G, β_C and β_U. They interpret β_K as a measure of the smoothing of regional shocks to per capita regional output through the cross-regional ownership of claims to output; β_G as a measure of the smoothing of these shocks through the central government

budget; β_C as a measure of the similar smoothing coming from interregional credit; and β_U as a measure of the unsmoothed portion of the regional shocks. The value of the whole exercise evidently depends on these last interpretations.

Upon consideration, it is clearly possible to question the interpretations. Take the equation for PI_i/C_i, concerning household saving. Suppose there are changes in the age structure of households between regions. This is only reasonable since ASY's study covers 37 years (1963 to 1990). Those demographic changes may well induce changes in PI_i/C_i independently of any movements in Y_i. Subsequently (and as a separate point), those changes can also have some reverse effects on Y_i. So far as this happens, the estimate of β_C will evidently not concern smoothing of output shocks at all. As regards Y_i/PI_i, suppose that firms sometimes make investment decisions based on anticipated changes in relative demand for their produce. Once again, Y_i/PI_i may change independently of changes in Y_i and, additionally, there may be reverse effects on Y_i. Then a similar problem as before arises: the estimate of β_K will not reflect any smoothing by firms. Yet ASY do provide notable support for their interpretation.

First, as regards β_G, their procedure evidently nearly reproduces the one described before for estimating risk-sharing through the federal government budget based on gross product accounting (and the use of first differences). Quite apart from this mere issue of precedent, the difference between personal income and disposable income is indeed likely to reflect essentially the rules governing taxes and transfers.[3] The problem of interpretation is far more severe with respect to β_C and β_K. As regards these two coefficients, underlying ASY's interpretation is the idea that all risks associated with asymmetric shocks to output should be possible to pool since they are perfectly negatively correlated with one another. However, as ASY explicitly point out, so far as such risks are not pooled and remain uninsured, it should be eas-

[3] Nonetheless, there does remain a possibility of reverse causation or simultaneity bias in estimating β_G based on equations (7) the way ASY do, just as there was before (unmentioned) in estimating β_s based on equations (1) or (2) like earlier authors. As a result, both SiMS and Bayoumi-Masson used instrumental variables to correct for the problem. But Mélitz and Zumer (2002) found that the correction makes hardly any difference.

ier to obtain credit for smoothing those of the associated shocks to output that are temporary. Hence, less persistent shocks should lead to higher estimates of smoothing via credit. Based on this logic, ASY use the Campbell-Mankiw (1987) index to distinguish the persistence of shocks affecting different states. They also employ averages over successively longer periods to do the same. In addition, they classify the U.S. states according to the degree of the sensitivity of their industrial structure to cyclical movement and therefore their proneness to short swings. These tests generally confirm ASY's hypothesis that more persistent shocks increase β_K relative to β_C. This would then seem to indicate that higher values of the ratio β_K/β_C signify greater reliance on insurance relative to credit in smoothing regional output shocks. On this ground, ASY's estimates of risk-sharing through market channels in the U.S. deserve serious attention.

Nonetheless, there are two reasons why those estimates are too high. First, ASY understate β_U. Second, they neglect the fact that β_K and β_C partly reflect autonomous smoothing within the regions themselves having nothing to do with risk-*sharing*.

On the first point, the importance of β_U in assessing $\beta_K + \beta_C$ should be clear. Based on the identity (6), $\beta_K + \beta_G + \beta_C + \beta_U$ equals one, and therefore every percentage point of β_U means a percent less risk sharing. In order to estimate β_U, as mentioned, ASY simply regress the fourth equation in the set (7). However, to do so is to treat the extent to which regional consumption responds to output shocks as a structural parameter. In effect, it supposes that there is a structural tendency to smooth shocks from which deviations yield a random term averaging zero. But this is a strong assumption (compare Athanasoulis and van Wincoop (2001)). Most of the discussion of unsmoothed output shocks in the literature simply draws inferences directly from the correlations between the series for consumption and output or else from the ratios of the variances or standard deviations between the two series. Proceeding in this manner, the lowest figure that Mélitz and Zumer (1999) obtain for β_U in ASY's data series is

0.39.[4] This then implies a maximum of 0.61 interregional smoothing. Del Negro (2002) devotes an entire study to the calculation of interregional smoothing of output shocks by individual states based on factor analysis, in which he tries to identify taste shocks separately. Consequently, when he uses ASY's data set, his figure for β_U is .68 (see his Table 3). In sum, only by treating β_U as a structural parameter rather than as a mere statistical feature of the data is it possible to come up with a figure for β_U as low as ASY's.[5]

The other reason why ASY overestimate risk-sharing through the market is their assumption that $\beta_K + \beta_C$ solely reflects risk-sharing between states. But a state can obviously smooth an idiosyncratic shock by saving or dissaving, without any commerce with other states or independently of any crisscrossing of outstanding property claims. Indeed, in the international application of ASY's framework, Sørensen and Yosha (1998) make a good deal of this very point. There they introduce a new term β_S, relating to smoothing via domestic saving. Yet they never return to the issue how much of $\beta_K + \beta_C$ in their U.S. study with Asdrubali truly represents risk-*sharing* as opposed to smoothing via within-state (or "domestic") business and household saving.

It is interesting to go further and to ask whether there is possibly also some confusion of insurance and smoothing of uninsured shocks through credit in ASY's estimates of β_K and β_C. Take the extreme case of perfect risk sharing: that is, suppose the pooling of all risks associated with asymmetric (regional) shocks to output. ASY would then assume β_K equal $1–\beta_U$, and β_C and β_G equal zero. But is this what theory says? Not necessarily. According to the Modigliani-Miller theorem, the use of dividends policy by firms to smooth shocks is entirely irrelevant. In the present context, such policy by firms could be super-irrelevant. Not simply

[4] The figure obtains by taking the ratio of the variance of regional consumption (not the log) to the variance of regional product (not the log) for each year and then averaging over the years during the study period. Despite Mélitz and Zumer's (1999) emphatic departure from ASY on this score, Del Negro (2002) manages somehow to treat them not only as supporting ASY's procedure, but even as "confirming" their figure of 0.25 for β_U (p. 274).

[5] This low figure could well result from the fact that a regression yields a positive constant term, which then reduces the slope of the regression line in a univariate regression.

might shareholders not respond to dividends *policy* because the policy has no impact on their present wealth, but because the policy does not even affect their present income. The dividends, as such, could be sufficiently diversified for this outcome. Let us assume, in line with much evidence, that the business sector does systematically stabilize dividends (uselessly according to the ordinary theorem, super-uselessly in the event of perfect risk sharing). And suppose also that dividends are not sufficiently diversified to prevent an impact of the dividends policy on regional personal income. Under this pair of circumstances, there must be some inverse correlation between business and household saving, since household consumption stays the same independently of the dividends policy.

In fact, many region-specific risks are not insured. The risks pertaining to labor income cannot be so since the proper contracts cannot even be written. To that extent, the irrelevance theorem itself is irrelevant. In addition, even as concerns capital income rather than labor income, we know that the diversification of asset portfolios is imperfect within regions (see Hess and van Wincoop, eds. (1999)). Still, so far as the irrelevance theorem holds and there is any impact of dividends *policy* on regional personal income, there must be some inverse correlation of risk smoothing between firms and households. ASY's estimate of β_K must be too high.

Mélitz and Zumer (1999) offer some relevant evidence. Table 3 shows ASY's aforementioned estimates of β_K, β_G, β_C and β_U in the first column. These estimates rest on pooling of equations (7) and generalized least squares. The next three columns provide revised estimates by Mélitz and Zumer (MZ) based on the identical data. There are four notable differences. First, instead of time fixed-effects, MZ use ratios of regional values to national values to correct for movements in the aggregates. Second, they add regional fixed effects (to allow for possible drift or trend in regional ratios). Thus, the equations are not the same. Nevertheless, these first two departures yield no difference of note in estimates for the U.S. Third, MZ suppose β_U equal to 0.39, as mentioned before. Consequently, they estimate only the first three of the equations (7) as a system, and impose the cross-equation restriction $\beta_K + \beta_G + \beta_C = 1–0.39$.

Last, and most relevant at present, they add a few variables to reflect influences that condition the effects of the regional output shocks. (Conformably, they impose a separate cross-equation restriction requiring the trio of coefficients associated with each of the influences to sum to zero, so that the restriction $\beta_K + \beta_G + \beta_C = 1–0.39$ still remains the right one.) The table reports the results concerning two of the extra influences: the Campbell-Mankiw index of persistence of the asymmetric shocks (P); and the degree of asymmetry of the individual-state business cycle (Z) (as inferred with the use of a Hodrick-Prescott filter).[6] The results relating to Z, or the smoothing of short run shocks, imply some offsetting behavior by households in response to dividends policy. Therefore, these results confirm the possibility that ASY over-estimate β_K and the smoothing by firms. But this requires some explanation.

The last column in Table 3 (concerning Z) shows that in the event that shocks reflected strictly the (state-specific) business cycle, household saving would explain 7 percent more of the smoothing (7 percent less would be done by firms). This in itself could simply issue from the fact that the only uninsured shocks that households are able to smooth through credit are transitory ones (ASY's interpretation). But as is not directly inferable from the table, omitting the variable Z from the analysis also raises β_K relative to β_C by the full 7 percent. In other words, the failure to isolate short run influences in any way leads to a greater attribution of smoothing to firms relative to households. That suggests more: namely, the earlier interpreta-

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[6] The estimated system is:

$$\Delta \log y_i - \Delta \log pi_i = \alpha_K + \beta_K \Delta \log y_i + \gamma_{K,j}(\log X_{j,i})\Delta \log y_i + \mu_{iK}$$

$$\Delta \log pi_i - \Delta \log di_i = \alpha_G + \beta_G \Delta \log y_i + \gamma_{G,j}(\log X_{j,i})\Delta \log y_i + \mu_{iG} \quad (5)$$

$$\Delta \log di_i - \Delta \log c_i = \alpha_C + \beta_C \Delta \log y_i + \gamma_{C,j}(\log X_{j,i})\Delta \log y_i + \mu_{iC}$$

$$\text{subject to } \beta_K + \beta_G + \beta_C = 1 - \beta_U, \quad 0 < \beta_U < 1$$

$$\text{and for all j, } j = 1, \ldots, n, \ \gamma_{K,j} + \gamma_{G,j} + \gamma_{C,j} = 0$$

where the X_j variables are new influences in the econometric analysis. The use of lower-case letters instead of the upper-case ones in equations (7) serves to indicate that the variables are no longer per capita values, as before, but ratios of per capita values to per capita national averages (adding up to one with appropriate weights). Table 3 only reports the results for P and Z, but there are two other X_j variables in the study.

tion: that households offset some unnecessary smoothing of shocks by firms via dividends policy.[7]

As seen by comparing columns 1 and 2, the sum outcome of MZ's revisions is to lower β_K and to keep β_G and β_C unchanged. Because of these changes, the regional smoothing of shocks via adjustments in the income households receive from firms no longer seems larger than the regional smoothing of shocks via household saving.

In short, two basic conclusions emerge: first, ASY exaggerate the extent of risk *sharing*; second, they ascribe too much of the smoothing of output shocks to portfolio diversification and to firms and too little to household saving. In the international application, further doubts will set in about the proper measure of risk-sharing via credit as such.

III. Risk-sharing via credit and cross-ownership of property in the EMU

In the case of international evidence, ASY's method becomes easier to apply. The data are superior. ASY even needed to infer consumption by individual state in the U.S. from retail sales. On the international front, the national accounts provide the required series for consumption. Moreover, the current account statistics offer figures for net foreign lending or the accumulation of claims on foreigners. In addition, the difference between gross national product and gross domestic product yields net income on foreign property claims. Accordingly, we can begin from the following identity:

$$Y_i = \frac{Y_i}{GNP_i}\frac{GNP_i}{A_i}\frac{A_i}{C_i}C_i \qquad (8)$$

where Y_i is gross domestic product (as before), GNP_i is gross national product, A_i is home

[7] With respect to P, column 3 shows, in conformity with earlier discussion, that if all the shocks were persistent, the smoothing via business saving would be about 35 percent greater. However, very significantly, removing P, and thus treating all shocks indifferently without regard to degree of persistence, does not affect the respective estimates of β_K and β_C. There is therefore no evidence that households offset the smoothing of persistent shocks by firms. In terms of Modigliani-Miller, this means that the smoothing of persistent shocks via business saving may reflect optimal policy and may be in the shareholders' best interests. If so, the households would have no cause to offset the smoothing of the permanent shocks by firms.

absorption, $Y_i - A_i$ is therefore the export surplus on current account, and finally, C_i is the sum of private and public consumption. Proceeding as ASY did before, we then have:

$$\begin{aligned}
\Delta \log Y_i - \Delta \log GNP_i &= \alpha_K + \beta_{K1} \Delta \log Y_i + \mu_{iK} \\
\Delta \log GNP_i - \Delta \log A_i &= \alpha_C + \beta_{C1} \Delta \log Y_i + \mu_{iC} \\
\Delta \log A_i - \Delta \log C_i &= \alpha_S + \beta_S \Delta \log Y_i + \mu_{iS} \\
\Delta \log C_i &= \alpha_U + \beta_U \Delta \log Y_i + \mu_{iU}
\end{aligned} \tag{9}$$

In this case, β_{K1} concerns much more precisely what ASY intended before by β_K, and the same may be said for β_{C1} with regard to β_C. But, of course, a separate term must enter, β_S, relating to smoothing of output shocks via strict domestic saving, some of it by firms, some of it by households. There is one basic qualification to this general idea of the superiority of equations (9) to equations (7) in analyzing risk-sharing. The differences between GDP and GNP may cover income flows, but they do leave out capital gains and losses on international claims. Therefore, any smoothing of output shocks that would be associated with such gains and losses would not enter in β_{K1}, where in principle it belongs. It would affect β_S instead. In addition, equations (9), as they are now stated, ignore any term for β_G, thus any role for stabilization by a super-government. True, the EU Commission has a budget, but it is small in relation to GDP, and the EU structural funds program relates essentially to redistribution rather than stabilization.

Table 4 provides estimates of equations (9). In this case, the sources are Sørensen and Yosha (1998) (hereafter SY) and MZ. In both instances, the table reports the results relating most closely to the current EMU members: namely, the EU8 (Belgium, Denmark, France, Germany, Ireland, Italy, the Netherlands and the UK) in the case of SY and the EU15 in the case of MZ. In both cases, the reported results also cover the period that compares best with the one in ASY (1964 to 1990). Like ASY, SY estimate β_U by running the last of the regressions in equations (9) while MZ impose β_U based on the same ratio of variances as was noted before in discussing their work (footnote 4). SY also deal with β_{C1} strictly in the context of a separate decomposition of $\beta_S + \beta_{C1}$. For SY, 22 to 43 percent of the asymmetric output shocks are smoothed; for MZ only 23 percent. For SY, the smoothing is entirely domestic, and there

is no risk-sharing. For MZ, there is some risk-sharing, 8 percent, coming from the cross-ownership of claims to property, but most of the smoothing is domestic. In both studies, current account balances explain nothing: there is no international smoothing of asymmetric shocks via credit.

These results about risk-sharing may seem reasonable on the surface. We would not expect much crosscountry insurance against asymmetric shocks in light of the importance of home preference in portfolios of equities. Ratios of foreign direct investment to total home investment are also generally small. Even MZ's estimate of 8 percent for insurance via international portfolio diversification may look high. In addition, the Feldstein-Horioka puzzle speaks precisely about the small contribution of foreign saving to the financing of domestic investment. Correlations between domestic saving and domestic investment (both as percentages of GDP) over periods of five to seven years or over are much higher than we would expect under perfect risk sharing. Feldstein and Horioka (1980) found those correlations to be close to one in the OECD in their initial study, covering the 60s to mid-70s. The correlations have dropped since. But as Obstfeld and Rogoff (2000) stress, the correlations are still 60 percent in the OECD over 1990-97; and nothing resembling similarly high numbers exists in corresponding studies of regions within countries (Helliwell (1998)). Thus, it seems reasonable too that β_{C1} would be negligible in table 4.

However, there are other sources of evidence about risk-sharing in the EMU. The system now exists since 1999. What are the other indications thus far?

I cannot pretend to do justice to the question. That would require a separate study. One volume of the recent report of the British Treasury (2003) about entry into EMU, titled EMU and the cost of capital, provides a summary of the evidence. Some increase in the diversification of equity portfolios has occurred in the membership since the run-up to EMU. Cross-country correlations between returns on equities have risen. The total variance of equity returns in the EMU now seems to depend less on country-specific factors and more on common industry

factors. There have also been a number of cross-country mergers and acquisitions, though fewer than expected. To all evidence, though, as regards the diversification of property claims, the EMU still has a long way to go before approaching the degree of capital market integration in the U.S.

On the other hand, with respect to the availability of credit from the rest of the membership, the closing of the gap between the euro zone and the US has gone very far. The bond market in euros took off as soon as it appeared. Gross international issues of bonds and notes in euros just about tripled between the end of 1997 and the end of 1999 (H.M. Treasury (2002), chart 4.1), as compared with issues in predecessor currencies. Before the appearance of the euro, bond issues by firms and public agencies in the euro zone had been predominantly triple A and double A (80 percent of them as late as 1998). Since then, single A and triple B issues have become a high percentage of the total: over 40% in 2001 (*ibid.* table 4.1). Evidently, numerous borrowers in the euro zone who had previously relied exclusively on banks now issue bonds in euros. Holdings of bonds of the major governments in the euro zone are also now widely held in the membership and internationally. Most significant of all perhaps, little remains of the Feldstein-Horioka puzzle. Blanchard and Giavazzi (2002) report a value of 0.14 for the relevant coefficient in the regression for domestic investment for the euro area over 1991-2001, down from 0.41 in 1975-1990. In addition, the current account deficits of the two present members of EMU who are still in a catch-up phase, Portugal and Greece, rose to 10 and 6-7 percent of GDP, respectively, in 2000-2001.

How much more smoothing of asymmetric shocks has already come from this rapprochement with the U.S. in the euro zone and how much is still to follow? The very nature of the question is important: it poses the matter differently than we encountered it before. The issue is not how much of the risk-sharing already results or will result in the future from credit, but by how much credit already reduces or will reduce the fraction of the shocks that remain unsmoothed. We might think that we should get roughly the same answer either way. If a mechanism accounts for a particular percentage of the smoothing, its absence should reduce

the smoothing as much. As regards risk sharing through property claims, Athanasoulis and van Wincoop (2001)'s results go in this direction. These authors, in fact, approach the issue of insurance (or risk-sharing via asset diversification) precisely from the angle of a reduction in β_U. Despite some difference in their measure of β_U (in the same spirit as the one in MZ) and despite their strict focus on the long-term horizon (to eliminate transitory shocks), they get analogous figures for β_K in the U.S. (and for β_G too for that matter) to those in ASY.[8] But as regards risk-sharing through credit, some reflection will show that a focus on the negative impact on β_U is almost bound to make a difference: the very sign of β_{C1} is ambiguous.

In reasoning about β_C, in fact, ASY reason strictly about β_{C1}, since their analysis relates strictly to borrowing and lending. They conclude that the sign must be positive because a permanent asymmetric shock to output should have no effect on lending or borrowing, whereas a transitory one should raise lending if the shock is positive and borrowing if the shock is negative. Thus, in case of a mix of permanent and transitory shocks, positive values follow for β_{C1}. However, the examples of Portugal and Greece reveal the precariousness of this reasoning. Suppose that a positive permanent shock implies a rising profile of output in the future (catch-up). Then the country ought to borrow and β_{C1} can be expected to be negative. There is also a major difficulty in regard to transitory shocks. Assume a recession. The affected country should save less, or in terms of SY, the sign of β_S should be positive. However, imports will fall with the drop in income, and may do so more than exports (which might have dropped under the initial impact of the shock). Indeed, if the shock lowers the terms of trade enough and shifts demand sufficiently in favor of home goods, then a fall in imports minus exports is to be expected. Once again, the sign of β_{C1} will be negative. This last example actually fits well with usual macroeconomic modeling – better than ASY's logic

[8] Their estimates vary from 0.35, almost exactly ASY's figure, to 0.215, close to MZ's, depending on the presence (0.35) or absence (0.215) of interest and dividends in personal income. Athanasoulis and van Wincoop (2001) also consider those figures to pertain strictly to regional insurance, or β_{K1} rather than β_K. In so doing, though, they disregard the fact that many firms are owned entirely by state residents and operate strictly within state borders. These firms' saving behavior would affect their estimate but have nothing to do with insurance and the sharing of risks between states.

in favor of a positive sign for β_{C1}. Our models often say that recession yields a short run improvement in the current account balance in light of the size of the fall in imports. Thus, regardless whether shocks are permanent or transitory, the sign of β_{C1} is ambiguous.[9]

In sum, it is already a live issue today to know how much extra risk-sharing there is and how much is still to arrive in the euro area because of greater ease of borrowing and lending. But unfortunately, ASY, SY and MZ offer little guidance. Their method of investigation will not allow us to answer the question.

IV. The impact of EMU on total insurable risks

Discussion of EMU often focuses on the degree to which shocks are symmetric. In the present context, this concerns the extent to which the risks are insurable by the market. So far as risks are common and cannot be insured, of course, they can be managed through joint monetary policy. This is the usual emphasis. But it is important to consider the issue of the extent of common risks from the perspective of the potential for risk-sharing through market channels as well.

A frequent starting point is Krugman's (1991, 1993) prediction that EMU would lead to more region-specific shocks and thereby less scope for smoothing shocks through monetary policy. According to his assessment, the U.S. regions are more specialized than the EMU countries of comparable size, probably because of the closer approximation to a single market in the U.S. Hence, as impediments to trade diminish and capital markets become more integrated in the EMU, the members can expect to move toward greater industrial specialization. These countries will then experience increasing asymmetry of shocks.

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[9] In both of the previous examples of a negative sign of β_{C1}, credit is also likely to smooth consumption and therefore to reduce β_U. This is capital. In the example of a permanent shock yielding a rising profile of output over time, the borrowing permits a smaller upward tilt in consumption. In that of the adverse transitory shock, the lending abroad moderates the drop in output, and thereby may cushion the fall in current consumption. Repairing the problem in ASY's analysis in the latter case, pertaining to the transitory shock, would clearly mean removing their identification of the exogenous shock with the observed change in output.

Subsequent empirical investigation does not particularly agree with Krugman's analysis. He had compared U.S. data for 1977 with European data for 1985. But Kim (1995) shows that the trend in the U.S. has been going the other way for years beforehand: "regional specialization … fell substantially and continuously between the 1930s and 1987" (p.882).[10] According to Peri (1998), by 1986, regional specialization was already no higher in the U.S. than in the EU. Furthermore, Clark and van Wincoop (2001) report *lower* or equal specialization in the eight census regions of the U.S. than in the EU14 over 1981-1997.

Recent empirical work on the symmetry of business cycles sheds further doubt on Krugman's views. To go back a bit, test results indicate that monetary union promotes bilateral trade (Rose (2000)). Conformably, Micco, Stein and Ordoñez (2003)) show that EMU has already brought a certain increase in bilateral trade since 1998. In addition, Frankel and Rose (1998) display a tendency for business cycle correlations to rise with the intensity of bilateral trade in the OECD. Still more recent research by Engel and Rose (2003) and Clark and van Wincoop (2001) corroborates Frankel and Rose's results, in the case of the former based on a world-wide sample of countries, in the case of the latter, based on a narrower sample of countries and regions in the OECD. Taken together with the Rose evidence, the inference would be that EMU will tend to promote the symmetry of business cycles.

Studies by Firdmuc (2004) and Kalemli-Ozcan, Sørensen and Yosha (2001) are relevant too. Firdmuc (2004) offers econometric evidence that intra-industrial trade raises symmetry of business cycles, while inter-industrial trade does the opposite. This would imply that the previous evidence of the rise in the symmetry of business cycles with increasing trade reflects the influence of intra-industry trade. For their part, Kalemli-Ozcan, Sørensen and Yosha (2001) provide indications that industrial specialization reduces the symmetry of business cycles. This is true both for regions within countries and between countries. These three authors' re-

[10] Evidently aware of this evolution, Krugman (1993) put the evidence in doubt. See his note 4.

sult would seem to support Krugman's general intuition. But if we link the result to the evidence that greater bilateral trade increases the correlation of business cycles, the implication would be that with greater trade, regions and countries become less specialized.[11]

There is no difficulty explaining why EMU would promote intra-industry trade, reduce national specialization, and increase the symmetry of business cycles. As income rises, the new trade may well predominantly concern goods that are highly income-elastic and price-elastic in demand. This means more trade in differentiated products and increasing intra-industry trade. If the same industries take foot everywhere, countries become less specialized.[12] The rise in the symmetry of business cycles with advancing intra-industry trade can follow in many ways. As intra-industry trade goes forward, industry shocks will become increasingly common shocks. With greater market integration, all shocks may also spread more quickly, as Frankel and Rose (1998) stress, and this can raise the covariance of aggregate business activity.

Notwithstanding, the previous evidence does raise a certain difficulty of interpretation. According to standard microeconomic analysis, individuals should be willing to bear more production risks as capital market integration deepens. They can insure themselves better; and they can borrow more easily. Hence, production risks should be less of a concern to them. Based on a large literature, insurance opportunities encourage people to accept riskier, higher return projects. (See, among many others, Obstfeld (1994) and Kalemli-Ozcan, Sørensen and Yosha (1999, 2001).) How then do we reconcile this theoretical argument with a tendency of EMU to lead toward higher symmetry of business cycles? Does such a tendency fly in the face of theory?

There are two avenues of reconciliation. One is to ascribe the recent increase in symmetry of

[11] Kalemli-Ozcan, Sørensen and Yosha's own emphasis differs distinctly.
[12] But the diminished national specialization need not signify diminished regional specialization, since with a reduction in some border costs – say, multiple money ones – but not others, firms may move their production closer to their neighbors without traversing frontiers.

business cycles to low capital market integration, low international insurance, and limited international credit. On this view, as capital market integration advances and people pool their risks more efficiently and obtain larger, more secure lines of credit, they will undertake riskier output projects. Then the asymmetry of shocks in the euro zone will increase. Of course, this will also expose uninsured workers in the euro zone to an increasing share of the risks. It will therefore raise the urgency of increasing the flexibility of the labor market. The lack of any system of transfer payments through upper-level government in the EMU will also possibly become an increasing handicap. This line of reasoning evidently tends to take us back to Krugman's views and may underlie the appeal of his stand.

The other avenue of reconciliation is to argue that the euro has indeed already led to an increase in production risks. But the new risks are common, and therefore consistent with greater symmetry of business cycles. On this next view, there has been notable progress in capital market integration in the euro zone. But the move to a more efficient allocation of risks has not meant moving to greater specialization of output activities within national frontiers. Presumably, in this case, the new technologies simply do not require notable increase in individual plant size. Since the added risks are common, they are manageable through joint macroeconomic policy. Of course, if so, the burden of responsibility on the European Central Bank also rises. Consequently, greater flexibility of labor markets still helps, and may help a lot, in attenuating shocks. But macroeconomic policy at the EU level has a larger role to play in smoothing economic activity.

Evidently, the second view is far more optimistic. If the first view is right, then the euro zone has not advanced much toward an efficient allocation of risks. Instead, the zone has largely sought shelter against the winds of competition through increasing diversification at home. Not only does this limit welfare, but market forces will tend to work in the future toward a change in direction: that is, a move toward greater specialization on a national basis. The zone will then eventually need to face the associated problem of inability to extend market insurance to labor.

TABLE 1

STABILIZATION AND REDISTRIBUTION VIA FEDERAL TRANSFERS IN THE U.S. 1977-1992: 48 REGIONS

	STABILIZATION				**REDISTRIBUTION**	
	Level: eq. (1)		First difference: eq. (2)		Eq. (3)	
	$1-\beta_s$	$\bar{R}^2$	$1-\beta_s$	$\bar{R}^2$	$1-\beta_d$	$\bar{R}^2$
PERSONAL INCOME	0.272 (0.008)	0.922	0.20 (0.012)	0.846	0.213 (0.019)	0.974
GROSS PRODUCT	0.13 (0.004)	0.985	0.118 (0.006)	0.968	0.136 (0.02)	0.976

The standard errors in parentheses pertain to β_d or to β_s. Regional constants are omitted. Net transfers consist of direct taxes and social insurance, transfers to persons and federal grants to state and municipal governments. See Mélitz and Zumer (2002).

TABLE 2

STABILIZATION AND REDISTRIBUTION VIA FEDERAL TRANSFERS IN THE U.S. 1977-1992: 48 REGIONS

	STABILIZATION: PERSONAL INCOME Level Eq.(1)		First difference Eq. (2)		**STABILIZATION: GROSS PRODUCT** Level Eq.(1)		First difference (Eq. (2)	
NET TRANSFERS	$1-\beta_s$	$\bar{R}^2$	$1-\beta_s$	$\bar{R}^2$	$1-\beta_s$	$\bar{R}^2$	$1-\beta_s$	$\bar{R}^2$
(1) DIRECT TAXES AND SOCIAL INSURANCE	0.086 (0.007)	0.977	0.063 (0.012)	0.898	0.03 (0.003)	0.998	0.031 (0.006)	0.979
(2) DIRECT TAXES, SOCIAL INSURANCE, AND TRANSFERS TO PERSONS	0.234 (0.007)	0.941	0.149 (0.012)	0.878	0.097 (0.003)	0.99	0.089 (0.006)	0.974
(3) DIRECT TAXES, SOCIAL INSURANCE, TRANSFERS TO PERSONS AND GRANTS	0.272 (0.008)	0.922	0.20 (0.012)	0.846	0.13 (0.004)	0.985	0.118 (0.006)	0.968

	REDISTRIBUTION: PERSONAL INCOME Eq. (3)		**REDISTRIBUTION: GROSS PRODUCT** Eq. (3)	
NET TRANSFERS	$1-\beta_d$	$\bar{R}^2$	$1-\beta_d$	$\bar{R}^2$
(1) DIRECT TAXES AND SOCIAL INSURANCE	0.0863 (0.009)	0.996	0.04 (0.021)	0.98
(2) DIRECT TAXES, SOCIAL INSURANCE, AND TRANSFERS TO PERSONS	0.181 (0.016)	0.982	0.124 (0.016)	0.984
(3) DIRECT TAXES, SOCIAL INSURANCE, TRANSFERS TO PERSONS AND GRANTS	0.213 (0.019)	0.974	0.136 (0.004)	0.976

The standard errors in parentheses pertain to β_d or to β_s. See Mélitz and Zumer (2002).

TABLE 3

ESTIMATES OF THE ASY (ASDRUBALI-SØRENSEN-YOSHA) AND THE REVISED ASY MODEL

USA 1964-1990

(1) ASY	(2)	(3)	(4) MZ	
Eq. 1 $\beta_K = 0.39$ (13)	$\beta_K = 0.24$ (7.6)	$\gamma_K(P) = 0.346$ (10.2)	$\gamma_K(Z) = -0.067$ (– 5.06)	$\bar{R}^2 = 0.47$
Eq. 2 $\beta_G = 0.13$ (13)	$\beta_G = 0.13$ (7.8)	$\gamma_G(P) = 0.031$ (1.82)	$\gamma_G(Z) = -0.006$ (– 0.9)	$\bar{R}^2 = 0.20$
Eq. 3 $\beta_C = 0.23$ (4)	$\beta_C = 0.24$ (6.8)	$\gamma_C(P) = -0.377$ (– 10.04)	$\gamma_C(Z) = 0.073$ (4.97)	$\bar{R}^2 = 0.11$
Eq. 4 $\beta_U = 0.25$ (4)	**$\beta_U = 0.39$**			

Sources: Asdrubali, Sørensen and Yosha (1996); Mélitz and Zumer (1999). Student t's are in parentheses, as in the original ASY article. For the interpretation of $\gamma_K(P)$ and $\gamma_K(Z)$, see footnote 6 and the associated text.

TABLE 4

ESTIMATES OF THE ASY MODEL BASED ON INTERNATIONAL EVIDENCE

	(1)	(2)	(3)	(4)
	SY:EC8 1966-1980	**SY:EC8 1981-1990**	**SY:EC8 1966-1990**	**MZ:EU15 1960-1994**
β_{K1}	~0 (~0)	0.02 (0.67)		0.08 (4.77) $\bar{R}^2 = 0.01$
$\beta_S + \beta_{C1}$	0.42 (2-8)	0.16 (3-4)		
β_{C1}			–0.04 (0.8)	0.02 (0.71) $\bar{R}^2 = 0.03$
β_S			0.42 (8.4)	0.13 (6.22) $\bar{R}^2 = 0.02$
β_U	0.57 (9.5)	0.78 (11.1)		0.77

Notes: The sources are Sørensen and Yosha (1998) and Mélitz and Zumer (1999). The EC8 in columns 1 and 2 refer to Belgium, Denmark, France, Germany, Ireland, Italy, the Netherlands and the UK. The first two columns come from Sørensen and Yosha's Table 1. β_{K1} refers to their β_f, and $\beta_S + \beta_{C1}$ to their β_d and β_s combined. Column 3 comes from their Table 6. Column 4 relates to Mélitz and Zumer, table 10 (where β_S is denoted β_{K2}). Student t's are in parentheses.

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