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EMU, EU, Market Integration and Consumption Smoothing

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EMU, EU, MARKET INTEGRATION AND CONSUMPTION SMOOTHING*

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Abstract
We take a new approach to the study of the impact of EMU on consumption smoothing. Rather than relying on inferences based on the behavior of consumption levels or growth, we focus on consumption volatility and therefore on smoothing more directly. Consequently, we find that even though EMU tends to smooth consumption, it is not through cross-country property and claims. Rather it comes through the promotion of the tradability of goods, capital in particular: specifically, the encouragement of price competition, contestable home markets, ability to borrow and buy insurance at home, and the harmonization of regulations. Some of the consumption smoothing may also depend on EU membership rather than EMU as such but EMU adds to it. As a fundamental part of the analysis, the paper uses a new index of currency union which focuses on the ratio of trade with other countries sharing the same currency relative to total foreign trade.

JEL: F36, F41, E00, G10

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This study examines the impact of EMU on consumption smoothing by proceeding differently than usual. Rather than base conclusions about the impact of EMU on consumption smoothing on its impact on the level or growth rate of consumption, we rely instead on EMU's impact on the volatility of consumption. The volatility is a more direct measure of consumption smoothing. The conclusions about consumption smoothing based on the usual inferences, we shall argue, may not hold. By centering on volatility of consumption (as Huizenga and Zhu (2004) largely do before us), we also allow more sources of influence of EMU to come into view. As a result of this change in methodology, we are able to show that EMU led to consumption smoothing in our study period, ending in 2006, but did so strictly through a different avenue of influence than the typical one. The effect comes, we claim, through the promotion of the tradability of goods, capital in particular: specifically, the encouragement of price competition, contestable home markets, ability to borrow and buy insurance at home, and the harmonization of regulations. It does not come through higher cross-country holdings of property claims or the typical focus in related analyses of the issue.

According to the usual approach, stemming from Asdrubali, Sørensen and Yosha (1998) (hereafter ASY), the impact of any capital market development on consumption smoothing depends on the development's impact on the response of a country's relative consumption to a movement in its relative output, where relative consumption is the ratio of the country's consumption per head to the consumption per head in a relevant set of other countries, possibly the rest of the world, and relative output is defined correspondingly. A tendency of the capital market development to smooth consumption should mean a tendency to weaken or break the tie of home consumption to home output. The underlying logic is that so far as a country shares risks with others in a group, its consumption relative to the rest in the group should be independent of its output performance in relation to the rest. In other words, asymmetric output shocks within the group should affect consumption among all the members evenly without particular repercussions on relative consumption between them. In their original contribution, which has proved extremely influ-

ential and fertile, ASY admitted three channels of influence on relative consumption: cross-country property claims, borrowing/lending and upper-level government transfers. But recent applications of the approach center on the channel of cross-country property holdings alone. See, as examples, Kalemli-Ozcan et al (2004), Sørensen et al (2007), Artis and Hoffmann (2007, 2008), Corcoran (2008), and Kose, Prasad and Terrones (2009) (hereafter KPT)).[1]

However, this approach is open to the same sort of doubt that Rodrik (1998) raised in regard to trade openness: namely, that while the relevant risk sharing may mean more insurance in some respects, it may also mean more risk exposure in other respects. The aggregate change in risk bearing is uncertain and whether consumption smoothing should rise or fall is uncertain too.

To elaborate, consider a relevant rise in cross-country holdings of property claims. This is not just any rise whatever but one that contributes to dissociating movements in relative gross national income from movements in relative gross domestic products (as, for example, a rise in foreign borrowing to finance home output would not do). The relevant sort of rise in cross-country holdings means heavier reliance on foreign economic activity for income. Clearly the change implies more protection of home income and home consumption from domestic output shocks, as the approach says. However, by the same token, the change also subjects home property owners to new shocks from abroad, geographically where depending on the particular pattern of foreign investment (which varies by country, as Lane and Milesi-Ferretti (2004), hereafter LMF, emphasize). This is the fundamental source of doubt. The relevance of this consideration in our sample period of 1980-2006 and in studying EMU should be fairly obvious. As it happens, a wave of trade and financial liberalization took place during this period starting in the mid- and late eighties that was followed by a surge of gross foreign investment in the nineties (see LMF (2008) and KPT (2009)). The ensuing surge of investment could well have been meant to take advantage of new profit opportunities and to protect against new competitive threats. Risk diversification might

[1] In a closely related approach, inspired by Backus et al. (1992, 1995) and Baxter (1995), the question is more simply to what extent EMU has divorced bilateral correlations in consumption from bilateral correlations in output. For an application, see Imbs (2004a), p. 23 and Table C2 (in sections that disappeared in the published version). See also Imbs (2004b). Obstfeld (1994) suggests a different but closely related and equally simple approach.

not even have been a primary objective. Suppose then that it is true, just as Sørensen et al (2007) and KPT (2009) would indicate, that the new capital market engagements in the nineties and since contributed to a divorce of idiosyncratic movements in home consumption from idiosyncratic movement in home income in the OECD or industrial countries or both. Nonetheless, might not consumers in the relevant countries still have become more vulnerable now to risk from output shocks in the aggregate? Therefore might not home consumption be less smooth not more so? Evidently, these same questions apply to EMU separately, apart from deregulation, since this particular form of capital market development itself opened up new profit opportunities and new competitive threats as well as more scope for insurance.

As another reason for studying consumption volatility directly, the increase in gross foreign investments in 1980-2006 could have modified the dynamics of price and wealth movements, particularly in view of some of the financial innovations like securitization and special purpose vehicles, and thereby could have modified the responses of consumption to all shocks, not only asymmetric supply ones. Furthermore, EMU could have contributed to all these developments (compare Lane (2001)).

For these reasons, we shall study the impact of EMU on consumption volatility directly.[2] A further ground for doing so is that the change in approach allows more sources of influence to come into view. Accordingly, we shall admit two more channels of influence of EMU on consumption volatility. The first one regards tradability. EMU could affect the line between tradable and non-tradable goods and affect consumption smoothing in that manner. It could do so by in-

[2] It should be noted also that traditional research on business cycles, with no particular focus on risk sharing, uniformly yields ambiguous results about the impact of international capital market integration via gross foreign investment on the volatility of output, and whenever this is a separate subject, on the volatility of consumption too; and these ambiguous results hold in the relevant period as well as earlier ones and for the same advanced countries that Sørensen et al (2007) and KPT (2009) treat. See Razin and Rose (1994), Sutherland (1996), Easterly et al (2000), Buch (2002) and Buch et al (2005), Evans and Hnatkovska (2007), Tharavanij (2007), and Kose, Prasad, Rogoff and Wei (2009). Further and quite significantly, when Sørensen and Yosha depart from their usual approach in joint work with Kalemli-Ozcan and compare the symmetry of shocks to incomes (GNPs) with those to output (GDPs) in the EU, they find significantly higher asymmetry of GNPs than GDPs in the group (Kalemli-Ozcan et al (2004)). As they recognize, this fits badly with the hypothesis that EU members get insurance against output shocks from the international diversification of their property claims and their response on this point (high volatility of financial returns) fits entirely with our argument.

creasing price competition, the contestability of home markets and the harmonization of regulations. Studies by Baele et al (2004) and Jappelli and Pagano 2008) point in this direction. Quite specifically, capital market integration in the EU could have made it easier to borrow and obtain insurance based on wealth consisting of domestic real estate, housing and plant and future labor income and could have made it easier to switch between lenders and insurers. These changes then might have increased the ability of EU households to smooth consumption apart from any diversification of property claims.[3]

In addition, EMU could also affect consumption smoothing through its effect on openness to trade. In his renowned contribution on this subject, Rose (2000) concentrated on the effect of currency union on bilateral trade between union members. But there might be a corresponding multilateral effect on trade or openness. Indeed, following Rose, experiments with the impact of currency union on trade with third-countries generally show a positive effect of currency union on outsiders too (see, for example, Micco et al. (2003) as well as Rose (2000), table 5c), which would then imply greater trade openness in general. In principle, the implications for consumption smoothing could go either way. The rise in openness might mean more insulation from output shocks at home and thereby more consumption smoothing. Yet it might also mean more vulnerability to foreign shocks and thereby less consumption smoothing. Rodrik (1998) famously emphasized the vulnerability to foreign shocks. In conformity, Karras and Song (1996) report a positive effect of openness on output volatility. KPT (2003) obtain this result for consumption volatility as well (compare Moser et al (2004) and Lane (2006b)).

Accordingly, we shall allow three separate avenues of influence of EMU on consumption volatility to enter the analysis. The first will be an indirect effect coming through an impact on cross-property claims. This first avenue will encompass the usual channel of influence in the ASY literature but it will be broader since it will not be confined to consequences of asymmetric output supply shocks. The second avenue of influence will be a direct effect of EMU on consumption smoothing through goods and capital market integration which is independent of cross-property

[3] We are highly indebted to a conversation with Oren Sussman for this line of thought.

claims. Since we control for the volatility of relative prices, we will interpret this direct influence as coming from a change in the tradability of goods in general and capital in particular. Thirdly, we will allow an indirect effect via trade openness. Throughout we shall also admit the possibility that EU membership rather than EMU is the factor at work.

We find that EMU contributed to capital market integration in Europe, just as others report using a variety of criteria and study methods (see Rajan and Zingales (2003), Baele et al. (2004), Lane (2006a), Aviat and Coeurdacier (2007), Jappelli and Pagano (2008), De Santis and Gérard (2009), Coeurdacier and Martin (2009) and Kalemli-Ozcan et al. (2010). However, as already indicated, so far as this increase in capital market integration takes the form of more cross-country property claims, no smoothing of consumption results, or at least no smoothing did so in the study period, and this is true regardless of the decomposition of the rise in cross-country claims between loans, equities and FDI, or between assets and liabilities. Thus, there is no evidence of consumption smoothing through the usual channel in the ASY-literature. Instead, the consumption smoothing happens through our second channel. EMU reduces consumption volatility by about .2 of one percent through this next channel. This last smoothing effect is also robust. It also follows in the presence of influences of relative prices. In addition, even though the effect depends partly on EU membership, EMU clearly adds to it. The effect of EMU on consumption smoothing through our third and last channel or trade openness is secondary. EMU increases trade openness, though it does so strictly by promoting cross-country property claims rather than directly touching trade (compare Aviat and Coeurdacier (2007)). However, if anything, there is less consumption smoothing as a result, since openness increases consumption volatility. This last adverse cross-effect, though, is too small to matter in an overall assessment.

There is one major associated departure from the literature. We define currency union differently. In the usual definition, a currency union is a binary variable that is either 0 or 1. However, this definition is problematic in analyzing multilateral behavior, since no country shares the same

currency with all of its trade partners. Thus, in order to study the effect of EMU on risk sharing based on the usual measure (using the ASY approach), Demyanyk et al (2008) limit themselves to a sample consisting of EMU members only and base their inferences about EMU either on the level or the trend in the members' behavior before and since membership. They also compare members' behavior with that of the larger EU membership. However, any welfare inferences about EMU based essentially on changes in the relationships within the membership or within the larger membership of the EU cannot be decisive, as the authors largely recognize, since the EMU itself may have increased the symmetry of shocks affecting the members (through common monetary policy if nothing else), and in this manner the system might call on the members to engage in disproportionate investment outside the group and outside the EU in order to stabilize their incomes. More generally, the welfare issue cannot be whether EMU smoothes consumption within the membership since this could be entirely at the expense of smoothing of asymmetric shocks with outsiders. It must be whether EMU smoothes consumption for the members on the whole or in relation to everyone.

As a result, we propose a multilateral measure of currency union as the percentage of total trade a country does with others sharing the same currency relative to its total foreign trade. This measure fits nicely with the theory of optimal currency areas, according to which the benefits of currency union for a country vary positively with its trade with the union membership relative to its total trade. A higher ratio of trade with other members of a currency union means that a country captures a higher share of the possible economies in transaction costs that are obtainable from a single currency. In addition, it may also mean that the country loses less from the abandon of independent monetary policy. Frankel and Rose (1998) have shown that greater trade between countries increases the symmetry of business cycles between them. Further, the measure yields no confusion with openness. In our sample, the correlation between the proposed measure and openness is around .05 for the world as a whole and .18 within the EMU. There is therefore no difficulty combining the measure with using openness as a separate variable in the analysis.

One might object to our measure, nonetheless, on grounds that it concerns breadth or ex-

tensiveness rather than mere presence or absence of currency union. But is this necessarily a drawback, especially in analyzing consumption smoothing? Suppose that EMU increases consumption smoothing. Why should the improvement per person be the same in all member countries regardless how much trade they do with one another, as the binary measure would suppose? Why should the improvement not be larger in a country that does an unusually large amount of trade with union members, therefore for Belgium than for Ireland in EMU for example, as our measure proposes instead?

As a final consideration, the proposed measure yields results that correspond closely with earlier ones for the effect of EMU on cross-holdings of foreign property claims and trade. To all appearance, therefore, the measure deals with the same phenomenon that others treat with a binary measure (and which we would continue to treat this way in a bilateral context).

The next section, II, sets forth our basic econometric model. The following section, III, discusses the econometric method. The one after, IV, explains our data sources. The succeeding one, V, presents our test results. Section VI offers some closing discussion.

II. **The econometric model**

a. General aspects

In order to provide some general intuition for our econometric model, we start from the principle that consumers in each country maximize an intertemporal utility function with diminishing marginal utility in consumption; namely:

$$U_t = \sum_{s=t}^{t+T} \beta^{s-t} u(C_s) \qquad u'(C_s) > 0 \qquad u''(C_s) < 0 \qquad (1)$$

where β is the personal discount rate of the future, $u(C_s)$ is the utility of consumption in period s, and t+T is the relevant time horizon starting from period t. Based on diminishing marginal utility, there is risk aversion: low volatility of consumption raises welfare. Suppose next that capital markets are imperfect. Information and contracting are costly; the enforcement of contracts is too; there are numerous interest rates at all maturities and there is credit rationing. Therefore, period-

consumption depends on current cash flows as well as wealth and the annuity value of wealth. In this context, assume a variety of shocks: shocks to output, tastes, and relative prices. How much destabilization of consumption results and thus how much utility loss follows will depend on international capital market integration, the level of trade, the sophistication of domestic finance and as we shall discuss further, multiple currencies. Accordingly, let us say:

$$CV = f(\boldsymbol{\sigma} \mid FI, OPEN, DC, CU) \qquad (2)$$

where CV is consumption volatility, $\boldsymbol{\sigma}$ is a matrix of the variances of the relevant shocks, FI is international capital market integration (F for foreign), OPEN is trade openness, DC is domestic credit development (D for domestic) and CU is currency union.

We then propose the following simple form of eq. (2) for estimation:

$$CV_{it} = a_{10} + a_{11}\, FI_{it} + a_{12}OPEN_{it} + a_{13}DC_{it} + a_{14}CU_{it} + X_{it}'a_{15} + a_{1t} + \varepsilon_{1it} \qquad (3)$$

In this estimation form, CV is the absolute percentage change in private consumption since the last period. FI is the average of the stock of gross foreign assets and gross foreign liabilities as a percentage of GDP, where foreign assets and liabilities are understood as the aggregate of portfolio equity investment, foreign direct investment, debt (including loans or trade credit), financial derivatives and reserve assets (excluding gold). OPEN is the average of imports and exports of goods and services as a percentage of GDP. DC is an index or several indices of domestic credit development, to be specified below. X comprises various indicators of the variances of the relevant shocks and other controls. i is a country index; t is a time index; and a_t is a set of time specific effects.

This specification calls for a series of comments. First, as a basic simplification, FI, OPEN, DC and CU appear only separately and not as joint products of the variances of the relevant shocks, which are all included in X. We shall return to this point subsequently.

Next, X must be understood to contain some measure of the volatility of output if eq. (3) is to make sense. Without controlling for output movement, there would obviously be little hope of discerning any smoothing effects of FI, OPEN, CD and CU on consumption. To measure output

volatility, we use the absolute percentage movement in GDP. Besides this volatility, the volatility of the relative price of consumer goods and the real exchange rates should enter too in principle, as we have already indicated they will. In addition, taste shocks should enter. Indeed taste shocks might be especially important since unlike other shocks, there is no reason to think that they would be smoothed, even if they were temporary and even if the capital market were perfect. The life cycle hypothesis would suggest a number of possible indicators of such shocks. Also, in the absence of perfect Ricardian equivalence, movements in the tax burden should affect CV too. All our measures of volatilities will be absolute percentage changes since the previous year. Alternatively, we tried standard deviations over 3 or 5 years instead of absolute annual percentage changes. This cost some observations without changing the results notably. So we stuck to absolute percentage changes.

The time specific effects a_t are crucial in eq. (3) too. They will absorb all symmetric movements in output growth in the entire country sample. By introducing them, we concentrate on the effects of asymmetric movements of output on consumption like the rest of the literature. Of course, in principle, a_t will capture all worldwide shocks, not only ones to output, like ones to saving preferences.

Some observations are also necessary about our measures of consumption and output. Sørensen et al. (2007) adjust their data for consumption and output for the consumer price index (CPI) and further use PPP-adjusted values of output. KPT (2009) apparently follow them. There is no fundamental difference here. We reflect the same issues by admitting the (volatility of the) price of consumption (the CPI) relative to the price of output (GDP) and the (volatility of the) PPP-adjusted real exchange rate as two separate controls. Thereby we allow shocks to both variables to enter the analysis separately, which we consider an advantage. Our procedure amounts to treating the value of consumption as depending on the value of output in different countries (in constant 1990 US dollar prices) without any attention to relative price movements and then admitting two major sorts of cross-country differences in relative price movements as separate influences. Significantly too, common relative price movements and rises in the general price level in

the world are reflected separately in our specification in the time specific effects. On our reading, our specification agrees with the fine analysis of the issue in Hoffmann (2008).

The simplicity of our measure of FI also deserves discussion. Most authors make some distinctions, say, between assets and liabilities and/or between equities, loans and FDI. On this point, we made numerous experiments and found that no decompositions of cross-country portfolios affected our conclusions about the impact of CU on consumption volatility. The separate parts of FI are always insignificant influences on CV and the decompositions never affect the results for CU.[4]

Finally, rather than study different country groups separately, as KPT (2009) do, we experiment widely with dummies for different country groupings in the sample as a whole in order to enter more influences than usual in ASY-type of analysis. We prefer this use of dummies to splitting up the sample because the impact of many of the influences in our analysis depends principally (some of them exclusively) on cross-sectional variation and it is useful to keep the joint presence of as many countries as possible in the analysis.

b. Completing the model

Eq. (3) by itself cannot yield the influence of CU on CV since CU might also affect CV via FI, OPEN and DC. This calls for separate study of FI, OPEN and DC. In fact, we never examine the possible effect of CU via DC, perhaps wrongly since the prospect of EMU and its arrival might have accelerated domestic financial development in Finland, Greece, Portugal and Spain, all of which figure in our index of EMU. However, we do pay much attention to the indirect effects of CU via FI and OPEN. In the end, though, as already presaged, our results show no effect of FI on CV and only a negligible effect of OPEN on it. Yet this must not be allowed to blur the essential character of FI and OPEN in our study. We know from others' work on these variables that we must expect a positive impact of CU on both of them. This impact would then matter with differ-

[4] The one notable outcome of our decompositions of FI is that separate consideration of equities (either on the asset or liability side) causes one of the domestic credit development variables in our analysis to bear a significant effect on consumption volatility.

ent results for CV. In addition, we use a different measure of CU and therefore our results for CU in the FI and OPEN equations cast essential light on the adequacy of our measure. This point is central too.

The following are our equations for FI and OPEN:

$$FI_{it} = a_{20} + a_{21}\, OPEN_{it} + a_{22}DC_{it} + a_{23}CU_{it} + X_{it}'a_{24} + a_{2t} + \varepsilon_{2it} \quad (4)$$

$$OPEN_{it} = a_{30} + a_{31}\, FI_{it} + a_{32}DC_{it} + a_{33}CU_{it} + X_{it}'a_{34} + a_{3t} + \varepsilon_{3it} \quad (5)$$

The theoretical basis for both equations is fairly well known. As regards the impact of OPEN on FI, one fundamental factor at work, which LMF (2004) develop, is the inducement of importers to hold foreign assets as a hedge against changes in the terms of trade and the inducement of exporters to hold foreign liabilities as a similar hedge. In addition, exporters and importers have an incentive to try to find home finance for their foreign clients and/or suppliers. Further, trade can spread knowledge of investment opportunities and thereby promote portfolio investment, both on the asset and the liability side. Portes and Rey (2005) emphasize this last point (without any particular concern with whether FI boosts OPEN or the influence works the other way). There is an earlier literature on the impact of geographical proximity on the composition of international portfolios (see Tesar and Werner (1995) and Ghosh and Wolf (2000)), which also clearly suggests a direct link going from trade to portfolio investment via first-hand knowledge and familiarity (cf. LMF (2003)).

As concerns DC in eq. (4), domestic financial development could easily affect FI in either direction. On the one hand, domestic financial development should promote asset diversification and profit-seeking investment outside of national frontiers and thereby increase FI. On the other hand, by making credit easier to find at home, domestic financial development might well reduce foreign borrowing and thereby reduce FI.

We would generally expect CU to promote FI on the usual grounds of lower transaction

costs, lower exchange risks,[5] and associated reductions in legal and institutional barriers to investment.

As for the controls X in eq. (4), legal interferences with the openness of capital markets should clearly enter. These interferences will plainly reduce FI, regardless what form they take (for example, minimal required holdings of home assets by home financial institutions). In addition, the status of some countries as international financial centers, like Ireland, the UK and Singapore, would evidently tend to magnify these countries' foreign engagements. Also, in principle, business cycle correlations should matter. Higher positive correlations in expected returns between home and foreign investments should discourage foreign capital market engagements since they limit the opportunities for welfare-improving reductions in risk via international diversification (both on the asset and liability sides). However, the volatilities of real and nominal exchange rates should work the other way and increase the incentive to cover and to spread exchange risk.

With regard to OPEN and eq. (5), the grounds for a reciprocal positive effect of FI on OPEN are narrower than those for a positive effect of OPEN on FI in eq. (4) but they exist. The only ambiguity surrounds foreign direct investment (FDI), which can reduce OPEN by causing production to shift abroad and thereby lower exports. Even this negative effect, however, need not prevail since FDI can also spur exports of intermediary goods (parts) and induce fresh imports of formerly home-produced goods. FDI may also generate trade through entry into new fields of economic activity (cf. de Sousa and Lochard (2009)). With respect to all other parts of FI besides FDI, no similar ambiguity exists: the rest should promote OPEN through the earlier information channel. Just as trade may breed foreign investment through learning, FI may breed learning of trade opportunities abroad.

As regards DC, the effect on OPEN is unambiguously positive. Even if DC should facilitate home finance of foreign trade and thereby reduce FI, it should still promote foreign trade and

[5]The reference to exchange risk calls for some qualification since the elimination of some exchange rates via currency union removes some opportunities to spread the risk and thereby may raise the risk. However, currency union reduces the number of the remaining independent sources of possible exchange losses and this factor should dominate.

have a positive effect on OPEN.

In principle, CU should also bolster OPEN, not only by lowering transaction costs and exchange risk, as is also true in connection with FI, but through higher price transparency and uniformity of prices and competition.

With regard to the controls X in eq. (5), the gravity model suggests a host of relevant country-specific factors, including geographical remoteness, output, population, land area, and geographical status as landlocked or an island. A high quality of roads, rails and telecommunications at home may also stimulate openness. Canning (1998) constructs a relevant index of infrastructure, which Carrère et al. (2009) have updated and show to be highly significant in promoting foreign trade, or at least, bilateral trade. Finally, literacy, linguistic diversity at home and the size of immigrant populations may also matter in curtailing the tendency of foreign languages and information costs to limit foreign trade (Melitz (2008)).

In general, we shall be most interested in the results about CU after dividing up the variable in two parts: EMU, or CUE, and the rest, or CUX. This will allow conclusions about EMU as such and the separate importance of the deeper monetary integration that this system entails. In the other numerous instances of CU, the adoption of a common currency is often unilateral and never signifies the presence of a joint central bank with considerable powers and political independence. In so far as CUE is a factor, it will also be important to check whether the true source of the influence is not really membership in the EU, since the provisions of the Maastricht Treaty could promote cross-holdings of assets and liabilities independently of a single money.

III. **Econometric Issues**

If we view eqs. (3), (4) and (5) as a system, the model poses some basic problems of estimation since the dependent variable in eq. (3), CV, can be expected to increase the variance of output or the business cycle, OPEN affects FI in eq. (4) and FI affects OPEN in eq. (5). We will deal with these problems in the econometric analysis by instrumenting the absolute percentage

change of output in eq. (3), OPEN in eq. (4), and FI in eq. (5). (We also ran tests without instrumenting and using lagged values instead.) Following, we will resort to single-equation GMM estimates of all three equations. This estimation method is efficient for arbitrary heteroskedas-ticity. (Specifically, we used the STATA routine ivreg2, owing to Baum et al. (2003).) That is the method's advantage over 2SLS. As for the instruments, we include the lagged value of the dependent variable in all 3 equations: specifically, the once-lagged value in eq. (3) (where the first lag already refers to data two periods earlier) and the twice-lagged values in eqs. (4) and (5). We will use rest-of-world output volatility as an instrument for output volatility in eq. (3) and the country-specific gravity variables will serve for various instruments for OPEN in eq. (4). All the instruments (and their lag lengths) are listed in the notes to the tables. These instruments include other variables (and their lags) besides the ones mentioned in this paragraph.[6]

It may be important too to explain our preference for GMM-IV over 3SLS since 3SLS is superior in taking into account the covariance matrix in the disturbances in the stochastic part of our model. We have two reasons for this preference. First, 3SLS would assume homoskedasticity (just as 2SLS does). Second, it would allow each equation to be affected by imprecision in the estimates of the other two. This last problem particularly impresses us since CV has no reciprocal effect on FI and OPEN in the structural part of our model. Therefore, we see no econometric ground for allowing errors in the estimates of FI and OPEN to affect the estimates of CV.[7]

In the subsequent presentation, we report results for as large a set of country-year observations as we can for our three equations. The coverage is not identical for all three equations mainly because of differences in the instruments but also because of greater data limitations for some explanatory variables than others. Therefore, we also examine what happens if we limit the dataset to

[6] Compare Aviat and Courdacier (2007) who estimated bilateral versions of eqs. (4) and (5) and who also consider cross-country holdings of claims a function of bilateral trade and bilateral trade a function of cross-country claims. They similarly use instruments to handle the resulting econometric issues (though they prefer 2SLS). Of course, the gravity variables that serve them as instruments for trade in the capital-market equation necessarily differ from ours, since these variables are necessarily bilateral ones: for example, distance rather than remoteness and common language rather than linguistic diversity.

[7] See also Hayashi (2000, pp. 273-274) for a detailed discussion of the advantages of single-equation GMM estimation.

a uniform set of country-year predicted outcomes. Regarding FI and OPEN, this cuts down the number of observations moderately whereas in the case of CV, it reduces the number of countries in the sample from 125 to 91 and curtails the number of predicted outcomes commensurably. For this reason, we shall present the results for CV separately (in an appendix). This separate presentation is not necessary for FI and OPEN, as the results hardly change. In all our estimates, we correct the standard errors for clustering by country.

Finally, a word is needed about our treatment of CU as an independent variable. As defined, CU varies over time with trade with currency union partners. Our model says that CU may affect aggregate trade. A fortiori, it may then affect bilateral trade with union partners. Consequently, CU may be endogenous. In response, we experimented with a constant value for CU by country for the positive values. We took this constant to be the average over the periods of consecutive positive values and zero for the rest of the time.[8] Regression results with the time-varying and time-constant versions of CU show that the two measures yield indistinguishable results in all three equations. Thus, the effect of our CU variable is entirely cross-sectional and not time-dependent in the estimates. Notwithstanding, we shall adopt the time-constant measure.[9] Finally, we found it useful to combine the use of CUE with a dummy variable for the EMU members for 1999, 2000, and 2001 in order better to distinguish the effect of EMU, which begins in 1999, from the effect of EU membership, which goes back earlier to 1993. (The dummy has no importance in any other connection.) It can also be argued that EMU only fully came with the arrival of the euro as a currency in 2002.

IV. **The data**

[8] In principle, this measure may be oversimplified since it fails to take into account the possibility of widely different orders of magnitude for positive values at different times. But France is the only example of note. For this country, CU is small and positive prior to entry into EMU in 1999 and high afterwards. We therefore adopted two separate positive averages of CU for France: a small positive one before 1999 and a large positive one afterwards. Indeed we had no choice since a single average for France over the entire study period would have muddied our measure of CUE.

[9] In addition, we performed a χ^2 C-test (or difference-in-Sargan) to see whether the data supports the null hypothesis of the exogeneity of this variable. (See Hayashi (2000, p. 220) for the definition of the test statistic.) For all our basic equations, the constructed CU variable is exogenous in our model.

We start with a large panel of data for the period 1980-2006 covering as many as 180 countries for some series. The basic source of our data is the World Bank *World Development Indicators* (WDI). The relevant series for output, private and public consumption and exports and imports in this dataset are in US dollars at constant 1990 prices. We also employ the data on international financial integration in the LMF (2006) dataset. The authors provided us an updated version of their data going through 2007. All relevant variables in this database are calculated as ratios of GDP. The Beck et al (2009) database on financial structure gave us our different measures of domestic capital market development. For the PPP-adjusted real exchange rates, we resort to the Penn World Tables.[10] As concerns restrictions on capital account, we choose the Chinn-Ito de jure index among the available measures (Chinn and Ito (2007)). The index is continuous and based on the information in the IMF *Annual Report on Exchange Arrangements and Exchange Restrictions.* Separate definitions and sources of the variables in the econometric analysis appear in Appendix A.

As indicated, only 125 at most of our 180 countries remain in our estimates and do so only in the case of eq. (3). In the other two equations, hardly more than 100 remain. Only 91 of these are uniformly present in all 3 equations. We list the 125 countries that enter in eq. (3) and signal the 91 that are uniformly present in Appendix B, where we also provide the data for CU for the EMU members and the corresponding data for EU (which will be explained shortly) for the countries that have been members of the EU since the onset of EMU in 1999.

V. Test Results

Tables 1, 2 and 3 provide the results of our GMM-IV estimates for FI, OPEN and CV respectively. In each case, we also present an OLS estimate for comparison. In discussing these results, we begin with eqs. (4) and (5) rather than eq. (3) for CV, since this ordering makes more sense as FI and OPEN enter as influences on CV while the reverse is not true. The instruments for

[10]Our reason for relying principally on the WDI rather than the Penn tables for GDP and related variables is that the LMF and Beck et al data, on which our FI and DC variables depend, use the WDI series in calculating ratios of GDP.

the different GMM estimates within any given table are always the same. The diagnostic tests for the validity and relevance of the instruments generally indicate that we do not face under-identification of our equations or suffer from weak instruments. As regards weak identification, we report the Wald F statistic for the first-stage regressions in all cases and we examined its value against those tabulated in Stock and Yogo (2005) (which we do not report) for different significance levels. There is never evidence of a problem.[11] The Sargan-Hansen J test of overidentifying restrictions serves us to evaluate the validity of our instrument set, i.e., whether the excluded instruments are independent of the error process. The results are reported in the tables, and the P-values indicate that we fail to reject the null hypothesis. We turn to the estimates next.

a. **Financial integration**

As seen in column 1, Table 1, the positive influence of OPEN on FI comes out clearly. Since both variables are in logs, the elasticity of influence is .65. This is a large effect, which we found to be persistent across different specifications. The next two influences in column 1 are those of the indices of domestic credit development that appeared consistently significant in our many earlier experiments with the financial variables in the Beck et al (2009) database. One of these is the (log of) the ratio of liquid liabilities of the financial sector (inclusive of banks, bank-like and non-bank financial institutions) to GDP and the other is the (log of) the ratio of deposit money bank liabilities to total bank (including central bank) assets. Both measures are also prominent in the work of the main architects, Beck et al. (2000, 2009). The former enters with a positive sign; the latter with a negative one. Both signs agree with theory since, as noted before, domestic financial development should promote foreign asset holdings while greater ability to borrow domestically should reduce foreign borrowing.[12]

[11] The results from the first-stage regressions are not reported but available from the authors upon request. The Wald F statistic is the Kleibergen-Paap (2006) 'rk' version and is robust in the presence of clustering, heteroskedasticity and autocorrelation.

[12] In order to confirm both interpretations, we made separate experiments with gross foreign assets and gross foreign liabilities as the measure of FI instead of the average of the two. As expected, in the estimate for assets, the ratio of liquid liabilities to GDP enters still more significantly with the same sign while the second measure becomes insignificant. In the estimate for liabilities, the precise opposite happens. Note also that the coefficients of the two indicators of financial development are not directly comparable with one another even though both of them

The next variable in column 1, ADVANCED, is a dummy for advanced countries for which LMF (2003, 2008) make a strong case. It yields nothing (the distinction between emerging and poor countries does not either). Yet if we restrict the sample to the more recent half of our study period, starting in 1994, ADVANCED does become extremely significant, as we will see below. Therefore, a fundamental evolution took place, in accordance with LMF (2008).[13] The next two variables in column 1 display the positive effect of financial centers and freedom of capital movements on FI. As regards freedom of capital movements, as mentioned, we use the de jure measure of Chinn and Ito (2006), which is continuous and time-varying (and where higher values mean more freedom). Both variables enter highly significantly.

The next two variables pertain to portfolio risk. The estimate in column 1 confirms the theoretical implication that countries whose output is highly positively correlated with output in the rest of the world have fewer opportunities for profitable risk diversification. The (log of the) correlation enters with the correct negative sign.[14] The last variable, real exchange rate volatility, also enters significantly with the right positive sign. We measure this volatility as the (log of the) absolute annual percentage change in the real exchange rate. But the same result holds if we measure it instead as the standard deviation of this rate of change over the current and 2 or 4 previous years. We lagged the last 2 variables, relating to portfolio risk; this matters for volatility but not for the correlation coefficient which is just as significant without a lag.[15]

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are ratios, since they have different denominators. If we set the averages of the two indicators the same (in the estimated form or in logs), so that they become of comparable dimension, the elasticity of influence of the first is about 1 and 2/3 as large as the second. At .19, the first one's elasticity of influence is also much smaller than that of trade openness (.65). These last two figures are directly comparable since both variables are divided by GDP.

[13] ADVANCED consists of the same 21 countries that KPT (2009) term 'industrial' plus Iceland: that is, Australia, Austria, Belgium/Luxembourg, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Switzerland, Sweden, the UK and the US. Note that if we use either output or output per capita – both continuous variables – instead of the dummy ADVANCED to control for level of development, nothing significant ever emerges, even for the 1992-2006 period.

[14] This result follows after limiting the measure of correlations to values of .80 and higher, which essentially means omitting some tiny and exceptionally poor places, or war-torn countries of Africa, or, finally, the newborn market economies following the collapse of the Soviet Union (compare Bai and Zhang (2007) and Kehoe and Perri (2004)). By thus restricting the analysis to correlations of .8 or higher, we only lose around 80 observations (less than 5 percent).

[15] It bears note that including the volatility of the real exchange rate means dropping the US from the estimate since all exchange rate movements are relative to the US dollar. We tested and found that if we exclude the exchange rate

We come at last to the variable of special interest, CU, which shows a highly significant effect of currency union. As this effect is a semi-elasticity, the elasticity of influence of CU on FI is the exponential of 1.31 minus one and is extremely high, around 2.7. It is interesting to compare this effect with those of Financial Center and the Chinn-Ito index. All three measures are semi-elasticities, but CU goes from zero to 1 (described as 0-1 in the tables), Financial Center is a binary 0,1 term, and the Chinn-Ito measure is a continuous one going from – 1.8 to 2.6. If we correct for these differences in units, currency union appears to have the same order of impact as freedom of capital movements, but the impacts of both are far smaller than that of status as a financial center. The latter's influence is about 4 times greater than that of the two former (all in terms of semi-elasticities).[16]

Column 2 provides a pooled OLS estimate of the previous equation. The coefficient of openness drops from .65 to .53, which is just what we would expect from negative bias coming from the positive reverse effect of FI on OPEN. Otherwise, the results are much the same except that the coefficients are less precisely estimated on the whole.

The remaining three estimates in column 1 probe more deeply into the impact of CU. The next one, column 3, shows that the influence of CU on FI stems more clearly from the EMU members than the rest. Once we divide CU between EMU members and the rest, the precision of the estimate of CU for the EMU members, CUE, doubles while the estimate for the rest, CUX, drops and remains barely significant at the 10% level. This suggests that the deeper monetary integration in EMU is important and leads to a larger, better defined positive effect. But the interpretation needs corroboration. With the Maastricht Treaty of 1993 and the arrival of EU, the earlier provisions of the Single Market Act of 1987 calling for more capital market integration (more factor mobility, the right of establishment and the absence of capital controls) became more firmly founded in law. This could then be the crux of the matter.

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variable and thereby restore the US in the estimate, the rest of the coefficients are virtually unchanged. The US will remain in the estimates of the other two equations that we report.

[16] In order to draw these comparisons, we add 1.8 to the Chinn-Ito measure to make it non-negative like the other two and then we compare the three coefficients at the means of the positive values (therefore for the respective averages of positive values for Chinn-Ito and CU and for 1 for Financial Center).

To investigate, we constructed an EU variable exactly on the same lines as the CU one: that is, based on the percentage of trade of members of the EU with the rest relative to total trade with everyone. We then introduced this next variable after the same use of averages as before for CU in order to mitigate the problem of endogeneity. The results are in column 4. The impact of CUE drops but remains high and very significant while CUX is not affected. This last result fits well with Kalemli-Ozcan et al. (2010) who similarly test the importance of EMU as opposed to EU membership in promoting capital market integration (based on bilateral evidence). If we base ourselves on the estimates of the influence of currency union in the previous column, 4, rather than column 1, as we are prone to do, the right single-value coefficient is around 1 rather than 1.31 (column 1) and the elasticity of influence of CU on FI is closer to 1.8, which is still high though lower than before (when it was around 2.7). This unitary coefficient also corresponds to a semi-elasticity of influence about 10% lower than that of freedom of capital movements and around one-fifth as high as that of status as a financial center.

The last estimate shows what happens if we limit the study period to the Maastricht period of 1994-2006 (where we lag the start of the period one year). For this sub-period, experiments show that CUE and EU cannot enter together and we retained CUE, the more important of the two both in size of influence and statistical significance. A number of the coefficients are notably affected. But the only significant influence that disappears is that of volatility of the real exchange rate. Further, as presaged, ADVANCED becomes highly significant. Of considerable note, the influence of CUE is unaffected.

In closing, let us emphasize our finding of the same impact of EMU on capital market integration that many others have reported. This is important support for the reliability of our measure of EMU and our measure of CU more generally. We clearly study the same influences.

b. **Trade openness**

Consider next the estimates of OPEN in eq. (5) in Table 2. In this case, we lag all of the financial stock variables since they are end-of-period values, and by lagging them one period, we

effectively use beginning-of-period values, or more exactly in the case of FI and the liquid-liabilities indicator of DC, a beginning-of-period one divided by previous-year GDP.

As seen, FI shows up with a significant positive effect on OPEN. Its coefficient is less than half as high as the one for the reverse effect of OPEN on FI in eq. (4), which accords with our theoretical discussion. This weaker effect of FI on OPEN than OPEN on FI also agrees with Aviat and Coeurdacier (2007), in whose work the size and relative order of the two influences looms large. Of the two indices of domestic credit development only the ratio of private bank deposits to total bank assets continues to enter significantly as before in the FI equation. Of note, though lowering foreign borrowing, this last ratio boosts foreign trade, in accordance with theory. The next variable, output, is a familiar one in trade equations, which is why we use it instead of ADVANCED (as the two clearly interfere with one another). Of interest, the introduction of output as an explanatory variable in eq. (5) can be interpreted as a test of the hypothesis of unitary elasticity of influence of home output on trade (since OPEN equals trade divided by output). In that case, the insignificance of output in the first column can be read as confirming an imposed restriction of a unitary elasticity of influence. We lagged output like the two financial variables for no fundamental reason; this makes no difference.

As regards the country-specific gravity variables, except for population, the only ones we show – namely, (log of) land area, literacy and linguistic diversity – enter significantly with the right theoretical signs. (Remoteness, landlocked, island and quality of infrastructure prove insignificant.) Land area (in logs) reflects internal distance and should reduce foreign trade. Literacy should promote foreign trade by increasing the ability to cope with the special linguistic problems associated with foreign trade, including translation. Linguistic diversity, in turn, should increase foreign trade by reducing the ability to avoid linguistic problems by trading at home. The one insignificant variable we retain, population (in logs), enters with the right negative sign. Larger population size implies wider opportunities to trade at home and avoid the costs of foreign trade. Including the population variable seems right since the sole reason for its insignificance in the equation is the presence of output, an insignificant variable. If we remove output, the negative coeffi-

cient of population becomes large and highly significant (as we do not show).

The next result of column 1 in Table 2 says that currency union has no direct effect at all on trade openness. This result holds for CUE as well as CUX. Theory led us to expect a significant positive sign. Quite notably, however, CU does raise trade in the model, but exclusively by increasing FI, which in turn raises OPEN. Based on column 4 of Table 1 together with column 1 of Table 2, the elasticity of influence of membership in the EMU on OPEN via FI is about .50 ($\exp(1.02)-1 \times .28 \cong .50$). This estimate is also statistically highly significant. Thus, widening membership in EMU sufficiently to increase trade with other members by one percent relative to total trade will raise openness in the membership by half of one percent.[17] As indicated before, the result has some wider interest since it implies that the positive impact of EMU on OPEN comes exclusively via capital markets and through international portfolio diversification and not via the channels that are usually taken for granted (without particular investigation) in the Rose literature: namely, reductions in trade frictions and increases in price transparency and competition in goods markets. In addition, the result emerges clearly only for EMU (for CUE), not for EU generally, and therefore only for the wider degree of monetary integration that this system entails.[18]

The next estimate, column 2, offers a pooled OLS estimate of the one in column 1. The results are little different except that the influence of literacy is no longer visible. In addition, the coefficient of FI is unaffected, contrary to the expectation that it would drop because of simultaneity bias.

In the last column of Table 2, we repeat the estimate in column 1 over 1994-2006 alone. It now appears that the influence of output on trade is mildly less than unitary. Otherwise little change of any note takes place.

c. **Consumption smoothing**

We come to the main part of our empirical results, concerning consumption smoothing.

[17] If we remove FI from column 1 and then re-estimate, the coefficient of CUE rises to .40 and becomes significant with an implied elasticity of $\cong .50$. Thus, we get the same result.

[18] True, it remains to be separately shown that the result holds for bilateral trade, or the focus of the Rose literature, though this is clearly implicit.

Let us observe at the start that we made some experiments with several more sophisticated formulations than eq. (3). Transitory movements in output should disturb consumption less than permanent ones, since it should be possible to smooth their effects on consumption through borrowing whereas it should not be possible to do the same for permanent movements (see inter alia, ASY (1996) and prominently in more recent work, Artis and Hoffmann (2008)). Therefore we tried distinguishing permanent and transitory movements of output. The permanent and transitory movements do prove separately significant and of the right relative order but the difference between the estimates of the two is not significant. Therefore we neglect the point. Next, we tried either adding cross-product terms for FI and DC and output volatility or substituting such product terms for FI and the two indicators of DC in eq. (3), in accordance with the general principle, in eq. (2), that both financial variables' effects on CV should be conditional on the business cycle. (In these experiments we instrumented output volatility in the same way as in the rest of the estimates of CV.) However, the results provide no more support for the hypothesis of cross-product effects than for the simplified formulation in eq. (3). In addition, using the product terms does not alter the rest of the CV equation or any of the conclusions. Therefore, we report strictly on the simplified eq. (3).

In our estimates in Table 3, we begin without introducing CU. Column 1 shows that a one percent movement in output results in about a 0.68 of one percent movement in consumption. This implies that .32 of the output movement has no repercussion on consumption and is certainly consistent with some major smoothing of output shocks. We will come back to this point. The next four variables in this equation, OPEN, FI and our two measures of CD appear with a one-year lag. Very significantly, the level of international financial diversification, FI, has no discernible tendency to stabilize consumption at all, and OPEN has the opposite one of destabilizing it. One percent of extra trade openness (lagged) increases CV by .007 of one percent. In addition, both of our indices of financial development are totally insignificant. Status as an advanced country, the next variable, arguably has some positive effect on consumption smoothing (a negative effect on CV) but below conventional significance levels (at 13%).

The next two variables in column 1 are the only two reflections of shocks besides output volatility that prove significant in our tests. We tried the other variables suggested by our theoretical discussion of the matrix of variances $\boldsymbol{\sigma}$ in eq. (2). Specifically, we experimented with movements in ratios of employment to labor, labor force participation rates, sex ratios in the labor force, and ratios of population 0 to 14 and 65 and over to total population. All of these variables emerge as insignificant. Our experiments with volatility of nominal and real exchange rates also failed (as Ravn (2001) and Kollmann (2009) would have led us to expect).

In the case of the first of our two volatility influences that gave satisfactory results, the one relating to government financing, our particular measure needs explanation. Of the available series, the most appropriate one, in theory, would seem to be the ratio of tax revenues to GDP. However, the series for this ratio in the World Bank database shortened in recent years and only begins mostly since 1995 and often only since 2000, whereas when Henisz (2004) made his broad international study of policy volatility not so long ago the same database permitted him to begin as far back as 1971. To the best of our ability to determine why, the answer lies in a switch of series for government finance from a cash basis to an accruals basis, beginning in the middle nineties in some countries, in the early 2000s in others, and still to come in the rest. On the other hand, the series for government consumption as a percentage of GDP remains unbroken. Further, for the limited period where we were able to use both series, the two give corresponding results and, if combined, clearly interfere with one another. It would seem therefore that the government consumption series is an acceptable alternative and all things considered the better choice.[19] As seen, a one percent movement in the government-consumption-output ratio will produce a movement in con-

[19] Fatas and Mihov (2008) also argue for favoring the government consumption measure to the one for total government revenues (or for government expenditures) in a broad international study of government influence, perhaps more strongly than we do. They maintain that the government consumption series are more comparable internationally and less subject to breaks and definitional changes (for periods where both series exist). Of interest too, in his early attempt to test the theoretical implication of perfect risk sharing by examining the extent to which domestic private consumption can be explained by aggregate world consumption and is independent of idiosyncratic movement of home output, Obstfeld (1994) argued for removing government consumption entirely from output, as well as private and public investment, on the grounds that consumers can only share risks of output changes for the remainder through portfolio diversification. Corcoran (2007) adopts Obstfeld's view. This would certainly argue for paying attention to government consumption in the analysis.

sumption of .17 of one percent.

The other volatility series that yields satisfactory results concerns the price of consumption (CPI) relative to the price of GDP. A one percent movement in this relative price raises CV by .l6 of one percent.

In column 2, we proceed to introduce CUE, the indicator of EMU, and CUX, the indicator of other currency unions. As seen, CUE emerges as significant with a negative sign, implying a stabilizing effect. The elasticity of influence is small, about .02, but the effect is robust, as we found through many trials with different specifications (omitting variables, adding variables and choosing different instruments for output volatility).

The following estimate, column 3, is a pooled OLS one of the preceding. The coefficient of output volatility goes down to .48, in line with expectations since we no longer correct for the positive reciprocal effect of consumption volatility on output volatility. Otherwise, little changes except that the influence of CUE rises perceptibly and becomes more significant while the influence of the volatility of the price of consumption relative to the price of output disappears.

The next three estimates are the most important ones in the table. In column 4, we add the index of the EU. Now CUE becomes totally insignificant, just like CUX, while EU appears as significant instead. Everything else is the same as in column 2. However, the dominance of EU over CUE could stem entirely from the pre-1999 period when EMU had not yet appeared since in the subsequent period the two influences partly merge. To investigate this matter, we break up EU into two parts, before and after 1999 (using separate averages of bilateral trade relative to total trade in the two sub-periods for the two measures), and we successively combine pre-1999 EU with post-1999 EU (column 5) and with CUE instead (column 6). As we see from column 5, in the first experiment EU is fairly equally significant pre- and post-1999. However, in column 6, where EMU (CUE) replaces post-1999 EU, the impact of CUE is more marked than that of post-1999 EU in the preceding column, and in addition the impact of CUE is stronger and better estimated than that of the EU pre-1999. Thus, the comparison favors EMU over post-1999 EU. We made a number of separate experiments with different specifications and instruments in columns

(5) and (6) to check the robustness of this result and these experiments clearly support CUE over post-1999 EU and the higher impact of CUE than pre-1999 EU. Thus, we conclude that while the EU may have promoted consumption smoothing prior to EMU, EMU bolstered this influence.

A couple of further robustness tests will close the analysis. In column 7, we repeat the estimate of our favored equation, column 6, for 1994-2006. There is remarkably little change though the significance of both EMU and EU membership drops mildly and the latter only remains significant at the .102 level. The last robustness test repeats all of the previous estimates of CV in table 3 for the smaller dataset yielding predicted values for a common set of country/years (or a common set over all three equations). As mentioned earlier, the number of countries in this case falls from 125 to 91. The predicted values of CV also drop commensurately. The results are in Appendix C. The estimates agree with the earlier ones rather well.

V. **Conclusion**

In this work, we adopt a different methodological approach to the study of the impact of EMU on consumption smoothing. Rather than relying on inferences based on the behavior of consumption levels or growth, we focus on consumption volatility and therefore on smoothing more directly. This research strategy overcomes a fundamental ambiguity in the usual approach. By promoting cross-country property claims, EMU may help disconnect consumption from idiosyncratic behavior of output and in this fashion smooth consumption, as the usual approach says. But by the same token, EMU may also tie consumption more closely to idiosyncratic output shocks in the rest of world, where elsewhere depending on the particular national investment pattern, and thereby it may destabilize consumption. Moreover, this ambiguity matters to a heightened degree in our study period of 1980-2006 since trade and capital market liberalization took place in the mid-eighties and was followed by a surge of gross foreign investment. This last surge might well have been aimed principally to exploit profit opportunities, even at the cost of higher risk, rather

than to diversify risks. Furthermore, output shocks are not the only ones to consider. The increase in international diversification could also have modified the dynamics of price and wealth movements and thereby the responses of consumption to all shocks, not only asymmetric supply ones. Evidently EMU could have contributed to all these developments. These are then our reasons for centering the analysis on consumption smoothing, and in close association, for admitting more sources of influence.

The results are interesting. We find that output volatility does not lead to corresponding volatility of consumption, in broad agreement with ASY-type of results. According to our estimates, about 32 percent of output movement has no repercussion on consumption. Thus, some significant smoothing of output shocks takes place. However, the cross-country holding of assets and liabilities, as such, does not contribute to stabilizing consumption. Accordingly, even though we also find the same strong effect of EMU on cross-country property claims that others' work had led us to expect, our estimates imply that no consumption smoothing follows. Yet EMU does show up as increasing consumption smoothing independently of cross-country property claims and trade. Since we control for real exchange rates and the price of consumption goods relative to other goods, we attribute this smoothing to an increase in the tradability of goods. In particular, EMU membership could have facilitated the acquisition of credit and insurance at home and increased the tradability of home capital (including the human form) through more foreign price competition, more contestable home markets and greater harmonization of regulations. In this way, EMU might have promoted consumption smoothing apart from any international portfolio diversification or trade in goods. This could also have happened partly through EU membership aside from EMU. But according to our results, EMU notably added to the effect. Obviously, further corroboration would be desirable. The crash of 2007-2009, if allowed to come in, would clearly raise new issues that may eventually need to be treated as well.

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TABLE 1 Financial Integration (log):

	GMM-IV (1)	Pooled OLS (2)	GMM-IV (3)	GMM-IV (4)	GMM-IV (5) 1994-2006
OPEN : Trade Openness (log)	0.651***	0.533***	0.649***	0.637***	0.601***
	(0.07)	(0.08)	(0.07)	(0.07)	(0.07)
Liquid Liabilities / GDP (log)	0.191***	0.151**	0.189***	0.195***	0.1094*
	(0.06)	(0.071)	(0.057)	(0.06)	(0.0636)
Deposits / Total Bank (incl. Central Bank) Assets (log)	-0.408***	-0.366***	-0.405***	-0.399***	-0.180***
	(0.07)	(0.08)	(0.07)	(0.07)	(0.053)
ADVANCED (0, 1)	0.057	0.027	0.056	0.016	.361***
	(0.09)	(0.11)	(0.09)	(0.09)	(0.094)
Financial Center (0, 1)	0.985***	1.040***	0.988***	0.945***	1.101***
	(0.18)	(0.16)	(0.18)	(0.18)	(0.10)
Chinn-Ito Index	0.111***	0.103***	0.108***	0.107***	0.176***
	(0.026)	(0.03)	(0.025)	(0.025)	(0.025)
Correlation of home output with ROW (.8-1) (log, lagged)	-2.95***	-2.373***	-2.940***	-2.986***	-3.822***
	(0.74)	(0.947)	(0.74)	(0.735)	(0.873)
Absolute value of exchange rate depreciation (log, lagged)	0.0136*	0.010	0.0134*	0.0128*	0.0045
	(0.0077)	(0.009)	(0.0077)	(0.0077)	(0.10)
CU: Currency Union (0-1)	1.31***	1.276***			
	(0.27)	(0.32)			
CUE: EMU (0-1)			1.340***	1.023***	1.060***
			(0.12)	(0.15)	(0.126)
CUX: CU outside EMU (0-1)			1.053*	1.060*	0.889*
			(0.63)	(0.64)	(0.535)
Maastricht Treaty (0-1)				0.358***	
				(0.13)	
Observations	1783	1975	1783	1783	981
Number of countries	91	101	91	91	91
Time dummy	Yes	Yes	Yes	Yes	Yes
Wald F-statistic (first-stage regression)	2621.87		2750.52	2777.39	1308.22
Sargan-Hansen J Statistic	14.4		14.3	14.57	12.09
(p-value)	(0.21)		(0.22)	(0.20)	(0.36)

Notes: The dependent variable is the measure of financial integration in LML (2007) and is computed from total assets and liabilities available in their study. The standard errors, reported in parentheses, are corrected for clusters across country observations, and robust to heteroskedasticity. GMM-IV is the generalized method of moments estimator. The instruments for OPEN are twice-lagged values of OPEN, once- and twice-lagged values of liquid liabilities and bank deposits ratios, lagged values of population, and remoteness, land area, landlocked, island, literacy and linguistic diversity. The Wald F statistic, from the first-stage regression, is a test of weak identification, and the tabulated values in Stock and Yogo (2005) (not shown) indicate the different significant levels. The Sargan-Hansen test is a test of over-identifying restrictions. Under the null, the test statistic is distributed as chi-square. P-values are reported in the parenthesis. The asterisks ***, **, and * indicate that the coefficient is statistically different from zero respectively at the 1% , 5%, and 10% level of significance.

TABLE 2 Trade Openness (log):

	GMM-IV (1)	Pooled OLS (2)	GMM-IV (3) 1994-2006
FI : Financial Integration (log, lagged)	0.277***	0.277***	0.223***
	(0.06)	(0.06)	(0.07)
Liquid Liabilities / GDP (log, lagged)	-0.011	0.099	0.017
	(0.07)	(0.09)	(0.08)
Deposits / Total Bank (incl. Central Bank) Money Assets (log, lagged)	0.431***	0.386***	0.417***
	(0.06)	(0.10)	(0.09)
Output (log, lagged)	-0.054	-0.055	-0.083***
	(0.035)	(0.06)	(0.03)
Population (log, lagged)	-0.053	-0.085	-0.036
	(0.04)	(0.06)	(0.04)
Area (log)	-0.087***	-0.061*	-0.078***
	(0.02)	(0.031)	(0.03)
Literacy rate (0-1)	0.573**	0.453	0.908***
	(0.24)	(0.39)	(0.24)
Language diversity (0-1)	0.185*	0.252*	0.281**
	(0.109)	(0.15)	(0.12)
CUE: EMU (0-1)	-0.229	-0.088	-0.096
	(0.17)	(0.20)	(0.18)
CUX : CU outside EMU (0-1)	-0.025	-0.060	-0.063
	(0.37)	(0.37)	(0.48)
Observations	1836	2241	1082
Number of countries	93	101	93
Time dummy	Yes	Yes	Yes
R-squared		0.54	
Wald F statistic first-stage regression	1107.80		941.14
Sargan-Hansen J Statistic	11.28		8.39
(p-value)	(0.26)		(0.50)

Notes: The dependent variable is trade openness as measured by the average of the ratio of exports and imports to GDP. The standard errors, reported in parentheses, are corrected for clusters across country observations, and robust to heteroskedasticity. GMM-IV is the generalized method of moments estimator. The instruments for (lagged) FI are twice-lagged values of FI, twice- and thrice-lagged values of liquid liabilities and bank deposits ratios, lagged values of output correlations and the Chinn-Ito index, and remoteness, landlocked and island. The Wald F statistic, from the first-stage regression, is a test of weak identification, and the tabulated values in Stock and Yogo (2005) (not shown) indicate the different significant levels. The Sargan-Hansen test is a test of over-identifying restrictions. Under the null, the test statistic is distributed as chi-square. P-values are reported in the parenthesis. The asterisks ***, **, and * indicate that the coefficient is statistically different from zero respectively at the 1% , 5%, and 10% level of significance.

TABLE 3 Consumption Smoothing:

	GMM-IV (1)	GMM-IV (2)	Pooled OLS (3)	GMM-IV (4)
Output Volatility	0.681***	0.657***	0.480***	0.659***
	(0.08)	(0.08)	(0.09)	(0.08)
OPEN: Trade Openness (log, lagged)	0.007***	0.007***	0.0076**	0.007***
	(0.0021)	(0.0021)	(0.0029)	(0.0021)
FI: Financial Integration (log, lagged)	0.000	0.001	0.002	0.001
	(0.003)	(0.002)	(0.003)	(0.003)
Liquid Liabilities / GDP (log, lagged)	-0.001	-0.001	-0.002	-0.001
	(0.002)	(0.002)	(0.003)	(0.002)
Deposits to Total Bank (incl. Central Bank) Assets (log, lagged)	-0.003	-0.004	-0.007	-0.004
	(0.006)	(0.01)	(0.008)	(0.006)
ADVANCED (0, 1)	-0.0051	-0.0041	-0.004	-0.002
	(0.0034)	(0.0033)	(0.004)	(0.003)
Volatility of Government Consumption	0.172***	0.174***	0.198***	0.174***
	(0.03)	(0.03)	(0.06)	(0.03)
Volatility of the ratio of CPI to GDP deflator (lagged)	0.162**	0.162**	0.151	0.162**
	(0.064)	(0.0643)	(0.126)	(0.064)
CUE: EMU (0-1)		-0.0229***	-0.031***	-0.0129
		(0.007)	(0.008)	(0.009)
CUX: CU outside EMU (0-1)		0.0173	0.011	0.017
		(0.023)	(0.023)	(0.02)
Maastricht Treaty (0-1)				-0.0125**
				(0.0058)
Observations	2248	2248	2397	2248
Number of countries	125	125	125	125
Time dummy	Yes	Yes	Yes	Yes
R-squared			0.27	
Wald F statistic first-stage regression	37.56	36.73		36.29
Sargan-Hansen J Statistic	6.57	6.80		6.89
(p-value)	(0.25)	(0.24)		(0.23)

Notes: The dependent variable is the absolute value of the % change in private consumption since the previous year. The standard errors, reported in parenthesis, are corrected for clusters across country observations, and robust to heteroskedasticity. GMM-IV is the generalized method of moments estimator. The instruments for output volatility (the absolute value of the % change in output since the previous year) are rest-of-world output volatility, lagged output volatility, twice-lagged values of liquid liabilities and bank deposit ratios, and twice-lagged values of volatilities of, both, government consumption-GDP ratios and the absolute value of GDP price inflation. The Wald F statistic, from the first-stage regression, is a test of weak identification, and the tabulated values in Stock and Yogo (2005) (not shown) indicate the different significant levels. The Sargan-Hansen test is a test of over-identifying restrictions. Under the null, the test statistic is distributed as chi-square. P-values are reported in the parenthesis. The asterisks ***, **, and * indicate that the coefficient is statistically different from zero respectively at the 1% , 5%, and 10% level of significance.

TABLE 3 Continued Consumption Smoothing:

	GMM-IV (5)	GMM-IV (6)	GMM-IV (7)
			1994-2006
Output Volatility	0.663***	0.659***	0.599***
	(0.08)	(0.08)	(0.10)
OPEN: Trade Openness (log, lagged)	0.007***	0.007***	0.0066**
	(0.002)	(0.002)	(0.0028)
FI: Financial Integration (log, lagged)	0.001	0.001	-0.001
	(0.002)	(0.003)	(0.003)
Liquid Liabilities / GDP (log, lagged)	-0.001	-0.001	-0.004
	(0.002)	(0.002)	(0.003)
Deposits to Total Bank (incl. Central Bank) Assets (log, lagged)	-0.004	-0.0038	-0.001
	(0.006)	(0.006)	(0.01)
ADVANCED (0, 1)	-0.0025	-0.0028	-0.0013
	(0.003)	(0.003)	(0.004)
Volatility of Government Consumption+	0.173***	0.173***	0.153***
	(0.03)	(0.03)	(0.03)
Volatility of the ratio of CPI to GDP deflator (lagged)+	0.162**	0.162**	0.220***
	(0.064)	(0.064)	(0.06)
CUE: EMU (0-1)		-0.025***	-0.024***
		(0.008)	(0.009)
CUX: CU outside EMU	0.016	0.017	0.005
(0-1)	(0.02)	(0.02)	(0.03)
Maastricht Treaty (0-1)			
Maastricht Treaty: Pre-1999 (0-1)	-0.0117**	-0.011**	-0.010*
	(0.0058)	(0.005)	(0.0059)
Maastricht Treaty: Post-1999 (0-1)	-0.0184**		
	(0.0071)		
Observations	2248	2248	1398
Number of countries	125	125	125
Time dummy	Yes	Yes	Yes
Wald F statistic first-stage regression	36.87	36.36	47.06
Sargan-Hansen J Statistic	6.94	6.82	7.96
(p-value)	(0.23)	(0.24)	(0.16)

Appendix A. Data Description

TABLE A1 Variable Definition

	Definitions and Sources
Trade openness	The average of export and import to GDP ratios. Source: WDI
Financial Integration	The average of total assets and total liabilities to GDP ratios. Source: Lane and Milesi Ferretti (2006) and update from the authors.
Liquid Liabilities/GDP	Liquid liabilities to GDP ratio. Source: Beck et al (2009).
Deposits to Total (including Central Bank) Bank Assets	Ratio of deposit money bank claims on domestic nonfinancial real sector to the sum of deposit money bank and Central Bank claims on domestic nonfinancial real sector. Source: Beck et al (2009)
Volatility of output	The absolute value of % change in GDP at constant US 1990 prices. Source WDI (2008)
Volatility of consumption	The absolute value of % change in household consumption expenditure. Source: WDI (2008)
Volatility of government consumption	The absolute value of % change in government consumption to GDP. Source: WDI (2008)
Volatility of the ratio of CPI to GDP deflator	The absolute value of % change in the ratio of CPI to GDP deflator. Source: WDI (2008)
Volatility of the real exchange rate	The absolute value of the % change in the PPP-adjusted real exchange rate. Source Penn World Tables 6.2 data
Currency Union	Trade with countries sharing the same currency relative to total trade. Sources: for trade, UN Direction of Trade Stats and WDI (2008); for currency unions, Glick and Rose (2002), updated with IMF International Financial Statistics.
CUE or EMU	Trade with other EMU members relative to total trade. Source: UN Direction of Trade Statistics and WDI (2008).
CUX or Currency Union outside EMU	Trade with other countries sharing the same currency relative to total trade whenever the currency is not the euro. Source: UN Direction of Trade Stats and WDI (2008)
Maastricht Treaty	Trade with other signatories of the Maastricht treaty relative to total trade. Source: UN Direction of Trade Stats and WDI (2008)
Financial Center	Lane and Milesi Ferretti (2006)
Chinn-Ito Index	De jure measure (continuous). Source: Chinn and Ito (2007)
Area	Source: CIA world factbook.
Literacy Rate	Source: CIA world factbook.
Language diversity	Source: Grimes (2000)
Population	Source: WDI (2008)

Appendix B. Countries, EMU and EU variables

Part A: Sample of countries:

1. Albania*, 2. Algeria, 3. Angola, 4. Argentina, 5. Armenia*, 6. Australia, 7. Austria, 8. Bahrain, 9. Bangladesh, 10. Belgium, 11. Benin, 12. Bolivia, 13. Botswana*, 14. Brazil, 15. Brunei Darussalam*, 16. Bulgaria*, 17. Burkina Faso, 18. Cambodia*, 19. Cameroon*, 20. Canada, 21. Chad, 22. Chile, 23. Colombia, 24. Congo (Dem. Rep.)*, 25. Congo (Rep.), 26. Costa Rica, 27. Cote d'Ivoire, 28. Croatia*, 29. Czech Republic*, 30. Denmark, 31. Dominican Republic, 32. Ecuador, 33. Egypt, 34. El Salvador, 35. Equatorial Guinea*, 36. Estonia*, 37. Ethiopia, 38. Fiji, 39. Finland, 40 France, 41. Gabon, 42. Georgia*, 43. Germany*, 44. Ghana, 45. Greece, 46. Guatemala, 47. Haiti*, 48. Honduras, 49. Hungary*, 50. Iceland, 51. India, 52. Indonesia, 53. Iran, 54. Ireland, 55. Israel, 56. Italy, 57. Jamaica, 58. Japan, 59. Jordan, 60. Kazakhstan*, 61. Kenya, 62. Korea (Rep.), 63. Kuwait, 64. Kyrgyz Republic*, 65. Lao PDR, 66. Latvia*, 67. Libya*, 68. Lithuania*, 69. Luxembourg*, 70. Macedonia*, 71. Madagascar, 72. Malawi, 73. Malaysia, 74. Mali, 75. Mauritius, 76. Mexico, 77. Moldova*, 78. Morocco, 79. Mozambique, 80. Myanmar*, 81. Nepal, 82. Netherlands, 83. New Zealand, 84. Niger, 85. Nigeria, 86. Norway, 87. Oman, 88. Pakistan, 89. Panama, 90. Papua New Guinea, 91. Paraguay, 92. Peru, 93. Philippines, 94. Poland, 95. Portugal, 96. Qatar, 97. Romania*, 98. Russian Federation*, 99. Rwanda*, 100. Senegal, 101. Singapore, 102. Slovak Republic*, 103. Slovenia*, 104. South Africa, 105. Spain, 106. Sri Lanka, 107. Sudan, 108. Swaziland*, 109. Sweden, 110. Switzerland, 111. Syria, 112. Tanzania, 113. Thailand, 114. Togo, 115. Trinidad and Tobago*, 116. Tunisia, 117. Turkey, 118. Uganda, 119. U. K., 120. U. S.*, 121. Uruguay, 122. Venezuela RB, 123. Vietnam, 124. Yemen*, 125. Zambia.

Notes: Listed are the 125 countries that serve in eq. (3). The asterisks signal the 34 of them that are not included in estimates of *both* eqs. (4) and eq. (5). Of these 25, the US is included in (5) not (4) and Germany in (4) not (5).

Part B: EMU and EU variables

COUNTRY	EMU	EU: post-EMU	EU: pre-EMU
Austria*	0.6291	0.7295	0.6490
Belgium*	0.6072	0.7249	0.7335
Denmark	0	0.6921	0.5635
Finland*	0.3381	0.5857	0.5304
France	0.5600	0.6847	0.5233
Germany	0.4222	0.5676	0.4543
Greece*	0.4567	0.5540	0.5782
Ireland	0.3294	0.6170	0.5880
Italy	0.4703	0.5701	0.5295
Luxembourg*	0.8830	0.9811	0.8408
Netherlands	0.5834	0.7322	0.5025
Portugal	0.7015	0.8013	0.7140
Spain	0.5546	0.6569	0.6494
Sweden*	0	0.6079	0.5552
United Kingdom	0	0.5292	0.4456

Notes: Part B only shows values for countries that were members of the EU prior to the entries of 2004. Therefore, there are no values for Czech Republic, Estonia, Latvia, Lithuania, Slovak Republic and Slovenia, even though these countries figure in EU post-EMU for all EU members over the years 2004-2006. As a rule, EMU values cover 1999-2006; EU: post-EMU values (which correspond exactly to Maastricht Treaty Post-1999) cover 1999-2006; and EU: pre-EMU values (which correspond exactly to Maastricht Treaty Pre-1999) cover 1993-1998. However, the asterisks mark exceptions. For Greece, EMU covers 2001-2006. For Belgium and Luxembourg, no separate trade figures exist prior to 1997, therefore EU: pre-EMU strictly concerns 1997-1998 (and both countries fall out of the

estimates for earlier years). Austria, Finland and Sweden only entered the EU in 1995.

Appendix C. Consumption smoothing for uniform country/years

Table C1

	GMM-IV (1)	GMM-IV (2)	Pooled OLS (3)	GMM-IV (4)
Output Volatility	0.582***	0.569***	0.567***	0.578***
	(0.10)	(0.10)	(0.11)	(0.10)
OPEN: Trade Openness (log, lagged)	0.011**	0.010**	0.0148*	0.011**
	(0.0046)	(0.0045)	(0.008)	(0.0044)
FI: Financial Integration (log, lagged)	-0.004	-0.004	-0.004	-0.004
	(0.003)	(0.003)	(0.004)	(0.003)
Liquid Liabilities / GDP (log, lagged)	-0.001	-0.001	-0.003	-0.001
	(0.003)	(0.003)	(0.004)	(0.003)
Deposits to Total Bank Assets (log, lagged)	-0.001	-0.001	-0.001	-0.001
	(0.004)	(0.005)	(0.008)	(0.005)
ADVANCED (0, 1)	-0.0045	-0.003	0.001	-0.001
	(0.0033)	(0.0034)	(0.006)	(0.004)
Volatility of Government Consumption	0.200***	0.198***	0.263***	0.198***
	(0.04)	(0.04)	(0.095)	(0.04)
Volatility of the ratio of CPI to GDP deflator (lagged)	0.154**	0.155**	0.183	0.155**
	(0.067)	(0.067)	(0.157)	(0.067)
CUE: EMU (0-1)		-0.0174**	-0.022**	-0.009
		(0.008)	(0.01)	(0.010)
CUX: CU outside EMU (0-1)		0.009	0.003	0.009
		(0.028)	(0.034)	(0.03)
Maastricht Treaty (0-1)				-0.009**
				(0.0044)
Observations	1598	1598	1706	1598
Number of countries	90	90	91	90
Time dummy	Yes	Yes	Yes	Yes
R-squared			0.27	
Wald F statistic first-stage regression	16.21	16.20		16.22
Sargan-Hansen J Statistic	5.45	5.57		5.52
(p-value)	(0.49)	(0.47)		(0.48)

Notes: The dependent variable is the absolute value of the % change in private consumption since the previous year. The standard errors, reported in parenthesis, are corrected for clusters across country observations, and robust to heteroskedasticity. GMM-IV is the generalized method of moments estimator. The instruments for output volatility (the absolute value of the % change in output since the previous year) are rest-of-world output volatility, lagged and twice-lagged output volatility, twice-lagged values of liquid liabilities and bank deposit ratios, and twice-lagged values of volatilities of, both, government consumption-GDP ratios and the absolute value of GDP price inflation. The Wald F statistic, from the first-stage regression, is a test of weak identification, and the tabulated values in Stock and Yogo (2005) (not shown) indicate the different significant levels. The Sargan-Hansen test is a test of over-identifying restrictions. Under the null, the test statistic is distributed as chi-square. P-values are reported in the parenthesis. The asterisks ***, **, and * indicate that the coefficient is statistically different from zero respec-

tively at the 1% , 5%, and 10% level of significance.

Table C1 (continued)

	GMM-IV (5)	GMM-IV (6)	GMM-IV (7)
			1994-2006
Output Volatility^{+}	0.581***	0.574***	0.470***
	(0.10)	(0.10)	(0.153)
OPEN: Trade Openness (log, lagged)	0.011**	0.011**	0.012*
	(0.0045)	(0.0045)	(0.006)
FI: Financial Integration (log, lagged)	-0.004	-0.004	-0.005
	(0.003)	(0.003)	(0.004)
Liquid Liabilities / GDP (log, lagged)	-0.001	-0.001	-0.004
	(0.003)	(0.003)	(0.004)
Deposits to Total Bank (incl. Central Bank) Assets (log, lagged)	-0.001	-0.001	-0.003
	(0.005)	(0.005)	(0.005)
ADVANCED (0, 1)	-0.0012	-0.002	0.0019
	(0.0035)	(0.004)	(0.005)
Volatility of Government Consumption	0.198***	0.198***	0.183***
	(0.03)	(0.04)	(0.04)
Volatility of the ratio of CPI to GDP deflator (lagged)	0.156**	0.155**	0.151**
	(0.067)	(0.084)	(0.076)
CUE: EMU (0-1)		-0.019**	-0.022**
		(0.0083)	(0.0095)
CUX: CU outside EMU (0-1)	0.009	0.0095	0.0042
	(0.03)	(0.03)	(0.04)
Maastricht Treaty (0-1)			
Maastricht Treaty: Pre-1999 (0-1)	-0.010**	-0.0092*	-0.0181***
	(0.005)	(0.0049)	(0.0062)
Maastricht Treaty: Post-1999 (0-1)	-0.0142**		
	(0.006)		
Observations	1598	1598	946
Number of countries	90	90	90
Time dummy	Yes	Yes	Yes
Wald F statistic first-stage regression	16.25	16.20	16.95
Sargan-Hansen J Statistic	5.51	5.53	6.19
(p-value)	(0.48)	(0.48)	(0.40)