Labour market institutions and country-level consumption fluctuations: OECD evidence

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ABSTRACT

This paper documents that the configuration of national labour markets is empirically relevant to the response of country-level consumption to country-specific income shocks when individuals within each country differ in their ability to access private markets. In a panel of 15 OECD countries observed over the 1971-2003 period, interactions of macroeconomic shocks with labour and credit market indicators are relevant to aggregate consumption behaviour, and robustly significant in a variety of specifications, with or without country effects and time-varying institutional indicators. Since the institutions considered would be redundant in a representative agent economy, their relevance to aggregate consumption can be interpreted in terms of within-country risk sharing provided by national institutions meant to reallocate risks that cannot be fully diversified on financial markets, such as labour income fluctuations.

JEL codes: E2; F4; J8.

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1. Introduction

Understanding whether people effectively share risk and insure against shocks to their income or wealth is a relevant concern on current policy agendas and a vexed issue in theoretical and empirical research. As the 2008-09 financial turmoil casted doubts on the benefits of financial market development and excited calls for some re-regulation of labour and credit markets, it is important to derive insights about the interactions between risk sharing on private financial markets, borrowing opportunities and the redistribution role of national policies. This paper documents that the mix of national labour market institutions matters to the response of country-level consumption to idiosyncratic (to a country) income shocks when individuals within each country differ in their ability to access private markets.

In theory, if markets were complete and there were no trade costs, optimizing agents should use markets in contingent claims to share consumption risk internationally and insure fully, and it would be hard to rationalize labour market institutions as risk-reducing devices. In practice, the data soundly reject the empirical implication that cross-country consumption movements should be the same and should not be affected by country-specific circumstances (see Lewis, 1999, and her references). A large literature has tried to reconcile the theory with the data. Authors have analyzed the impact of habit formation (Fuhrer and Klein, 2006) and other kinds of comparative behaviour; non-separable components in the utility function (Stockman and Tesar, 1995; Marrinan, 1998) and barriers to trade (Obstfeld and Rogoff, 2000; Lewis, 1996); limited insurance markets where people cannot write contracts contingent on the realization of future labour income (Heaton and Lucas, 1996, and related literature). A related strand of studies has moved from testing to measuring the amount of risk sharing between countries (Asrubali, Sorensen, and Yosha, 1996; Sorensen and Yosha, 1998), identifying three main channels through which risk can be shared (imperfectly) across borders, namely cross-border ownership of claims to output, lending and borrowing on credit markets, and super-national government redistribution, and also accounting for country-specific features (such as business-cycle position, size, shock persistence, home bias) influencing the decomposition of the smoothing through the different channels (Melitz and Zumer, 1999; Sorensen et al., 2007). Recent studies have showed that expropriation risk (Fratzscher and Imbs, 2009) and credit imperfections may decrease consumption risk sharing and amplify the effects of macroeconomic shocks (Wasmer and Weil, 2004; Nitschka, 2010 and his references). In independent work, Fidrmuc et al. (2007) explored the possibility that employment protection legislation may increase cross-country risk sharing by fostering bilateral consumption correlations.

While the contributions cited above model each country in terms of a representative agent, in reality individuals within each country differ in their ability to access private markets, and institutions that would be

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redundant in a representative-agent economy play an important risk sharing role. This paper tests whether country-specific features that may influence individuals' ability to smooth consumption within national borders, such as the mix of labor market policies and of the ease of access to borrowing and lending, matter to the response of aggregate consumption to country-specific income shocks.

As to borrowing and lending opportunities, intertemporal consumption smoothing via credit markets is a well-known alternative to consumption risk sharing (i.e. consumption smoothing across states of nature). When markets are incomplete, people smooth consumption over time in response to expected income changes (Cochrane, 1991), and the extent of workers' ability to trade riskless bonds and self-insure is limited by liquidity constraints and other credit market imperfections.

This paper contributes to the ongoing debate arguing that social insurance via labour market institutions such as job security provisions (Bertola, 2004), wage setting (Agell, 2002), and unemployment insurance benefits (Acemoglu and Shimer, 1999) is also a way to smooth income and therefore consumption. The idea that a wide array of institutional arrangements may introduce a social insurance component in disposable incomes, a well established feature in labour economics, is new but potentially relevant to international economics if income redistribution is relevant to country-level aggregate consumption, which is the case when it occurs across individuals who differ in their ability to access financial markets for consumption smoothing purposes (Bertola and Drazen, 1994).

The perspective is similar to the approach taken by Kocherlakota and Pistaferri (2007) to explain puzzling international evidence in terms of "within-country risk sharing". In their framework, perfect insurance is available against country-specific shocks, while uninsurable idiosyncratic (to an individual) shocks influence the prices of international assets. This paper's empirical specification is motivated by similar considerations on the effects of within-country risk sharing on international consumption responses to macroeconomic shocks. When people are heterogeneous in terms of access to financial markets for consumption smoothing purposes, labour market institutions are relevant not only to unemployment responses to shocks (Blanchard and Wolfers, 2000; Bertola et al., 2002; Nickell et al., 2005) but also to the character of deviations from perfect risk sharing, and country-specific indicators of credit market accessibility also shape the responsiveness of country-level aggregate consumption to income fluctuations.

The evidence presented in this paper supports the view that smaller employment and wage fluctuations, and the reallocation via benefit systems of income flows across labour incomes and internationally diversifiable capital incomes, are relevant to the response of aggregate consumption to shocks that affect a country as a whole, and that credit market imperfections amplify consumption volatility. Empirical estimation in a panel of

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15 OECD countries observed over the 1971-2003 period indicates that the configuration of labour and credit markets is a significant determinant of cross-country differences in consumption responsiveness to income shocks. The results are robust to several checks and provide interesting insights on the extent of within-country risk sharing, which differs across countries, and of the integration of OECD financial markets.

The paper is organized as follows. Section 2 presents the estimation strategy and the main sources of information on the macroeconomic variables and institutional indicators which will be included in the empirical specification. Section 3 discusses how structural features of labour and credit markets may be theoretically relevant to consumption smoothing by interacting with macroeconomic shocks. Section 4 reports the main set of results. Section 5 investigates the implications of the analysis for within-country and cross-country consumption risk sharing. Section 6 concludes.

2. Empirical specification and data

To test whether the effect of idiosyncratic income shocks on consumption depends on the configuration of national labour and credit markets, the paper estimates nonlinear specifications that allow macroeconomic shocks to interact with institutional indicators. The modelling strategy for estimating the interaction term is the one used by Blanchard and Wolfers (2000) to study the role of the interaction between shocks and institutional indicators in explaining unemployment dynamics. The basic specification, estimated by nonlinear least squares, is the following:

$$\Delta c_{jt} = \delta_t + \beta \Delta \tilde{y}_{jt} \left(1 + \sum_{i=1}^{I} \gamma_i \tilde{X}_{ij}\right) + \alpha_j + \varepsilon_{jt} , \tag{1}$$

where $\Delta c_{jt} = \Delta ln C_{jt}$ is the first difference of the natural logarithm of real consumption per capita of country j in period t, a measure for the growth rate of consumption. $\tilde{y}_{jt}$ is the country-specific shock variable, namely the idiosyncratic rate of growth of real output per capita. The expression in parenthesis accounts for the interaction between idiosyncratic shocks and (heterogeneous) national institutional settings. $\tilde{X}_{ij}$ is the value of institution i in country j, computed as the deviation from the mean value in the aggregate.

The first two terms on the right hand-side of (1) are the main determinants of interest of consumption growth rates. One is common across countries and is captured by the time dummy δ_t. The other is country-specific and depends on the interaction between the idiosyncratic change in income and a sum of institutional effects. The interaction term is interpreted as follows. The coefficient β represents the sensitivity of consumption growth to idiosyncratic income growth of a country displaying an average (with respect to the sample aggregate) institutional framework. The parameters γ_i capture the effect of the configuration of labour

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and credit markets, that is of the set of institutional features of economy j, on country-level shocks. Each institution is allowed to interact separately with the shock and each coefficient γ is expected to enter with a negative (positive) sign when institution i contributes to mitigate (amplify) the effect of the shock.

Besides these two determinants, country dummies (α_j) check for (potential) differences in the international distribution of assets over the period. A negative (positive) and significant country effect would indicate a current account deficit (surplus), thus signalling an increase (decrease) in a country's share in world tradable output over the period. The disturbance term, ε_{jt}, includes the time-varying component of individual and aggregate preference shocks, unexpected changes to permanent income, and potential measurement errors from consumption and income data.

This specification has most of all a descriptive relevance. It restricts the coefficient of the country-level income shock variable to be the same across countries and over periods, but allows its size to depend on the country-specific level of institutional intervention in the economy. Institutional indicators do not exhibit the time subscript t as they are time-invariant in the basic model (1). Section 4 will control for the evolution of institutions over time and report estimates from a model including institutional time-varying measures, too.[1]

Compared to previous analyses, the empirical strategy proposed in this paper aims at testing whether the difference – if any – in slopes may be explained by differences in country-specific institutional configurations. It fits well the purpose of offering insights on the relevance of the interactions between institutions playing a risk sharing role within country borders and macroeconomic shocks, without aiming at offering a structural model of the interactions of interest. If the key argument advanced in this paper will prove to be empirically sound, in future works it will be important to further explore the issue and develop a comprehensive theory of interactions between risk sharing across and within countries.

2.1. Macroeconomic variables and institutional indicators

The database compiled for this paper contains annual data on OECD countries and a set of institutional indicators. The analysis is conducted on the 15 countries for which data on potentially relevant institutional indicators (listed in the next section) are available, namely: Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Portugal, Spain, Sweden, the United Kingdom, and the United

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[1] Model (1) can collapse to a testing framework built on the null hypothesis of perfect risk sharing: if markets were complete, consumption would not depend on idiosyncratic income growth, institutions would be redundant and play no role, and the joint hypothesis $\beta = 0$ and $\widetilde{X}_{ij} = 0$ would hold true. This is not the case in reality. Previous empirical analyses have shown that the estimated β not only significantly differs from zero but is also country-specific (Lewis, 1999).

States. Countries are observed over the 1971-2003 time interval, and the resulting unbalanced panel includes 470 observations.

Data on national accounts are taken from the World Development Indicators online database of the World Bank. Income and consumption series refer to per capita annual real income and consumption, computed (respectively) as Gross Domestic Product and Household Private Consumption Expenditure, deflated by the Consumer Price Index, and divided by Population.[2] The main macroeconomic shock variable is a proxy for the idiosyncratic rate of growth of real output per capita, computed following Lewis (1996) and Asdrubali et al. (1996) as the difference between the growth rate of income in a country and the mean growth rate of income in the sample aggregate: $\Delta \tilde{y}_{jt} = \Delta \ln Y_{jt} - \Delta \ln Y_t^A$.

Institutional indicators are provided by OECD publications, several studies in the labour economic literature, and the author's calculations (see the Data Appendix for details). Comparable indicators are not available for all the OECD countries and, in past decades, data have not always been recorded on a yearly basis. Thus, information on time variation is sometimes scarce. Moreover, the available empirical counterparts are useful but imperfect measures of the institutional dimensions they want to represent. To capture the insurance features of national labour and credit markets, model (1) will be estimated using a set of nine time-invariant measures that, as discussed in what follows, may be expected to be theoretically relevant.

3.   Institutional features and consumption fluctuations

This Section briefly describes cross-country differences in institutional frameworks using available indicators, and discusses how structural features of labour and markets and credit constraints may be theoretically relevant to consumption smoothing by interacting with macroeconomic shocks.

3.1. Social insurance in the labour market

Labour market institutional indicators can be grouped in four main categories: employment protection legislation, passive and active labour market policies, characteristics of the wage bargaining process, and labour taxation.

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[2] The choice to use the CPI deflator (instead of the PPP index) and the focus on domestic income dynamics do not represent a problem for international data comparability in the present dataset. As discussed in Section 4, results indicate that shocks to exchange rates do not affect estimation outcomes.

Employment protection legislation (EPL) is the mix of all the mandatory measures that regulate hiring and firing with the aim of protecting employment. The OECD indicators in Table 1 account for several dimensions pertaining to laws governing regular and temporary contracts, and - in the more recently compiled, used to estimate model (1), the so-called "version 2" - collective dismissals' requirements. The high Spearman's rank correlation coefficient indicates that the information they provide is very similar. Across countries the variation of EPL is wide. Anglo-Saxon ones feature less stringent regulations; Continental Europe, despite a notable variety in provisions, grants a greater protection to workers; Denmark departs from the "Continental model", and constitutes a third way by combining low EPL and high social protection - the so-called "flexicurity" approach. Along with social protection, these policies are usually viewed as determinants of labour market "rigidity". However, the effect of EPL on employment and wages is quite ambiguous and closely related to the wage-setting process, and may be even beneficial for workers' welfare and productive efficiency when markets are incomplete (Bertola, 2004). The present analysis on EPL macroeconomic outcomes adds a new dimension to the ongoing debate. As outlined in labour economics, adjustment costs drive a wedge between the marginal product of labour and the wage that firms pay to employees and hence reduce labour income fluctuations across states of nature (Kessing, 2003). Thus, employment protection policies are expected to play a significant role in reallocating risks within national borders, shielding labour incomes and smoothing consumption fluctuations.

Passive and active labour market policies. Public unemployment benefit systems are passive policies meant to provide what moral hazard prevents private insurance companies from supplying: insurance against the risk of unemployment and social assistance to unemployed workers. Table 1 reports two OECD indicators of the level of benefits: Net replacement rates (NRRs), a measure of (net) in-work income maintained after a job loss taking into account the progressivity of the tax system and the impact of income redistribution policies; and an older raw measure of the generosity of the benefit system, Gross replacement rates (GRRs). These indicators provide remarkably different information, as indicated by the low rank correlation coefficient in the last row of Table 1. The insurance scope of unemployment benefits, the relevant dimension to the present analysis, is better captured by NRRs. The fifth column of Table 1 reports data on the maximum number of months of entitlement to benefits provisions. Anglo-Saxon countries, Japan, Italy, Spain and Belgium grant lower levels of benefits, while the duration of entitlement is short in Austria and all the above-listed countries with the exception of Spain and Belgium. In principle, the response of consumption to unemployment shocks may or may not be (relatively) amplified in countries where longer unemployment benefits and higher replacement rates are available, according to whether the cost of benefit systems is or is not fully shifted from uninsured

labour incomes to internationally diversifiable capital incomes. Another relevant dimension of institutional intervention is the amount of spending on all the social expenditures, other than education, meant to promote and increase the quality of employment for those enrolled in the so-called active labour market programmes (ALMPs). Table 1 reports a refined indicator built as spending on ALMPs per unemployed person as a percentage of GDP per member of the labour force. Countries with less generous benefits systems typically feature low values of ALMPs, maybe indicating that high ALMPs are meant to offset the adverse effects of unemployment benefit systems on the willingness to fill a vacant position and hence push unemployed individuals into work. In the present framework, ALMPs would represent a cost and thus reduce consumption smoothing if, as it is realistic, they are at least partially financed out of labour incomes.

Wage bargaining. The important aspects of the wage setting process are the power of trade unions and the extent of coordination in wage setting. Two complementary indicators of trade union power are trade union density - the percentage of wage-earners who are members of a trade union - and collective bargaining coverage - the share of workers actually covered by union bargaining. Table 2 shows that trade union density is quite low on average, with values below 30% in Anglo-Saxon countries, Japan, and half of Continental Europe, while collective bargaining coverage is high everywhere but in Anglo-Saxon countries and Japan. This gap is worth noting, as the degree to which union decisions affect workers who are not enrolled in their ranks may index the relevance of insider practices. When restrictive rules on union membership and the presence of turnover costs endow incumbent workers (insiders) with additional bargaining power with respect to outsiders, the implications of collective bargaining coverage for the stabilization of overall labour income and workers' aggregate consumption are ambiguous, depending for example on whether insiders exploit their power to allow marginal workers to be employed at lower wages or on temporary contracts (Fehr, 1990). As to the degree of coordination in wage bargaining on the part of both unions and employers, the corresponding indicator, reported in the third column of Table 2, measures the extent to which trade unions consider the consequences of wage setting for the whole economy (the higher the index, the wider the scope of coordination). Data indicate that coordination is high in all countries except Canada, France, the UK, and the US. To the extent that coordination makes wage bargaining more sensitive to cyclical conditions (Nickell and Layard, 1999), it may be expected to increase the responsiveness of aggregate consumption to country-specific shocks in the present setting.

Labour taxation. Taxes on labour income are mandatory contributions collected by the government to insure workers against shocks to their incomes. The OECD computes the effective tax burden, or "tax wedge", as the difference between the cost of labour borne by the employer and the net take-home pay. Table 2 reports the

average tax wedge, which captures the overall generosity of the social security system, and the marginal tax wedge, which accounts for the percentage of additional earnings that is taxed away. The Spearman's rank correlation coefficient is low, meaning that the different information content of the two measures generates a gap in country rankings. All the systems are to some extent progressive, as marginal tax rate exceeds the average rate, with Continental Europe exhibiting, with the exceptions of Portugal and Spain, marginal rates higher than Anglo-Saxon countries and Japan. As regards the response of consumption to shocks, progressivity (the marginal measure) is arguably the most relevant feature of this institutional dimension, as what matters for consumption insurance is the tax system's contribution to reducing the variance of net income across states of nature. When private markets are incomplete for exogenous reasons, progressive tax systems substitute for private insurance and increase consumption risk sharing (see Krueger and Perri, 2009).

3.2. Access to borrowing and lending

Workers' ability to smooth consumption over time and self-insure depends on the degree of development of credit markets; and higher credit constraints may amplify the response of consumption to income shocks (Lustig and Van Nieuwerburgh, 2010, and related literature).

The direct effect of liquidity constraints and other restrictions to borrowing and lending can be summarized by an indicator of credit supply conditions, the loan-to-value ratio (LTV). Table 2 reports two measures: the typical LTV can be interpreted as the fraction of house value that is financed, on average, by private intermediaries in a country; the maximum LTV accounts for the maximum access to financing that the mortgage market grants to households. The first measure is more informative in terms of overall limits to borrowing in a country, and thus better fits the present analysis, while the maximum LTV refers to collateralized mortgages provided to first class borrowers only. The Spearman's rank correlation coefficient is low, different definitions leading to different rankings. Turning to the data, maximum LTV ratios are similar and above 80% in all countries, while typical LTV ratios are very heterogeneous, with Austria, France, Germany, Italy, Spain and the UK exhibiting the lower ratios, equal to or below 70%.

3.3. Time series information

Time series information is available for eleven of the institutional measures listed in Tables 1 and 2 (all except ALMPs and typical LTV). The first column of Table 3 indicates that the time span for which observations are available differs substantially across the variables. Most indicators have records since the 1970s or the 1980s, while fewer observations are available for EPL version 2, the marginal tax wedge, and NRRs. To provide

insights on time variation, Table 3 reports changes in average (with respect to the country sample) levels of the time series indicators and Spearman's rank correlation statistics (see the Data Appendix for details on time series' compilation strategies). Average values indicate that institutions have remained quite stable over the different available time span. Changes in levels are smaller than 10% for most indicators, while more important variation is observed for EPL version 1 and trade union density, which decreased by 21% and 16% respectively, and GRRs and maximum LTV ratios which increased by 67% and 30%. The Spearman's statistics allow to understand whether these changes concentrate only in some countries, a high correlation coefficient indicating that country ranking has not changed very much and hence reflecting a common evolutionary pattern in the country sample. Correlations refer to country rankings at three points in time (1971, 1980, and 1990) with respect to the situation in 2003. Over the 1971-2003 period, institutional change in terms of relative positions has been small with the exceptions of GRRs, maximum LTV ratios, and to a lower extent coordination in wage bargaining.

In most cases the relative position of countries has not changed much over the last decades. Thus, empirical specifications with time-invariant institutional indicators should capture most of the information in the data. Using the available information on time variation within each country can offer additional evidence as to the robustness of the results.

4. Results

This Section analyses the interactions between shocks and institutions. It shows that the response of consumption to country-specific income shocks depends on the configuration of labour and credit markets.[3] The results are remarkably robust to the inclusion of alternative institutional indicators, time series information, and further robustness checks.

4.1. Does institutional heterogeneity matter?

Results from estimation of specification (1) by non-linear least squares reported in Table 4 indicate that allowing idiosyncratic macroeconomic shocks to interact with a set of time-invariant institutions captures important features of the data.

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[3] Results not reported confirm previous findings in international economics: the perfect risk sharing prediction of complete market models is rejected in the panel of 15 OECD countries over the 1971-2003 period. Moreover, by running a seemingly unrelated estimation of the impact of idiosyncratic income shocks on idiosyncratic consumption growth rates, the estimated β-s differ significantly across countries.

The coefficients of institutional indicators are jointly strongly significant. The adjusted R-squared shows that the overall fit is fairly good. Higher values of employment protection legislation, benefit replacement rates, trade union density, tax progressivity, and credit market development are associated with lower consumption responsiveness to income shocks (negative sign). Longer-lasting benefits, higher expenditures on ALMPs, higher collective bargaining coverage and coordination in wage bargaining contribute to amplify the effects of income shocks (positive sign).

The coefficient β, which relates the configuration of credit and labour markets to the impact of idiosyncratic income shocks on country-level consumption, is positive and significantly different from zero. Institutional heterogeneity significantly shapes consumption dynamics along six structural dimensions out of nine. In terms of broad institutional categories, the strictness of employment protection laws, the progressivity of the tax system, and the efficiency of credit markets mitigate the impact of income shocks. Unemployment insurance provisions are relevant not in terms of the level but of the duration, and together with expenses on ALMPs lead to relatively higher aggregate consumption volatility. As to systems of wage determination, trade union density dampen the response of consumption to shocks, while collective bargaining coverage and coordination in wage bargaining do not exert a significant effect. Country effects, added in column (2), are jointly not significant and indicate that the results of interest are robust to unobservable country-level heterogeneity.

So far, the discussion has focused on qualitative considerations on the role of institutional settings. Table 5 gives an idea of the magnitudes of the (estimated) effects of each institution. The central part of the table shows the range of values of the indicators in terms of deviations from the cross-sectional sample mean. To understand how to read the last two columns, consider the values in first row. They shows that, if countries differed with respect to employment protection legislation only, an idiosyncratic shock that would be worth one percentage point in a country with the mean values of all the institutions would lead to a 1.46 percentage point shock in the country which displays the lowest EPL value, and to a 0.59 percentage point shock in the country with the most stringent EPL provisions. According to this analysis, progressive labour taxation is the most effective policy in mitigating the effect of income shocks on consumption. Other institutions produce smaller and quite similar effects: EPL, trade union density, and LTV ratio by decreasing consumption responsiveness to macroeconomic shocks; unemployment benefit duration and ALMPs by increasing it.

An interesting feature of the results is that the shock-institution interaction terms are jointly significant also in models obtained by substituting, one at a time, the indicators of the benchmark specification with alternative measures for employment protection, replacement rates, labour taxation, and credit market efficiency (results not reported). The scope of any empirical analysis is, of course, limited and while it is possible to derive

insights on the relevance of cross-country differences in overall institutional frameworks, some caution is needed when evaluating the information content of individual institutional indicators which proxy imperfectly the phenomena of interest. Related studies have investigated interactions among labour market policies (e.g. Bassanini and Duval, 2006), as well as the relationship between labour and credit market structural features (Bertola and Koeniger, 2007), but the complementarities among institutions are complex and still poorly understood both in theory and empirically.

4.2. Accounting for the evolution of institutions over time

This Subsection investigates the implications of using time-varying institutional measures. To allow for more time variation without changing that much the information content of the indicators, the time-varying version of model (1) includes the EPL version 1 indicator and the maximum LTV ratios as measures for (respectively) employment protection and credit market efficiency.

The estimates reported in Table 6 confirm the main conclusions of the time-invariant model. The shock-institution interaction terms preserve their sign, that is, institutions contribute in the same way to dampening (negative sign) or boosting (positive sign) the impact of macroeconomic shocks. Moreover, even though coefficients decrease in size by almost one half, they are jointly significant.

As regards the role of each institutional dimension, a comparison with Table 4 is not straightforward as estimates refer to a slightly different set of indicators, but it is possible to discuss the main similarities and differences across the two sets of estimates.

The effect of employment protection, ALMPs, trade union density, labour taxation and credit market development is the same as in the time-invariant specification.[4] Collective bargaining coverage becomes a relevant institutional dimension and increases the impact of macroeconomic shocks on consumption. The significance of the stringency of employment protection decreases when country effects are added (column 2). Once institutional time variation is accounted for, the lack of joint significance of country dummies indicates that institutional reforms do not have different effects in different countries. Finally, macroeconomic shocks play the same role as in the time-invariant case.

What is remarkable when considering the evolution of institutions over time is the fact that their impact is very similar to that estimated from time-invariant cross-sectional specifications. Unlike studies by Blanchard

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[4] ALMPs is the only time-invariant indicator and absorbs any slope heterogeneity which cannot be accounted for by time-varying information in this specification.

and Wolfers (2000) and other authors, which have analyzed the interaction between shocks and institutions to explain unemployment dynamics, the present analysis finds basically the same results by using time-invariant and time-varying institutional indicators. As new information on time variation will be made available by the OECD or similar studies, there appears to be scope for further research on how mixes of policies have evolved over time.

4.3. Robustness

A few points are worth noting on aspects of robustness that have not been explicitly dealt with so far. Model (1), estimated by non-linear least squares, assesses the empirical relevance of labour market features as well as of limited borrowing opportunities. When people smooth consumption over time via credit markets instead than intratemporally via private or social insurance, predictability of income dynamics implies that consumption should respond to income shocks, even if only to their permanent component, and could lead to an upward biased β coefficient (Bayoumi, 1997). Instrumental variable (IV) techniques make it possible to explore the relevance of this mechanism. Since deviations from the sample's average income growth are only mildly serially correlated, however, estimation of model (1) by IV - using the first and second order lags of idiosyncratic income differentials as instruments - yields results similar to those reported in Table 4.

A minor concern may stem from the choice to track the common path of consumption across countries by using time dummies instead of the growth rate of consumption in the country aggregate (as for instance in Mace, 1991). A simple model allows to assess whether time dummies track well the average growth rate in the OECD sample:

$$\Delta c_{jt} = \delta_0 \Delta c_t^A + \beta \Delta \tilde{y}_{jt} \left(1 + \sum_{i=1}^{l} \gamma_i \, \tilde{X}_{ij} \right) + \alpha_j + \varepsilon_{jt} \tag{2}$$

where c_t^A is the natural logarithm of real mean aggregate consumption. In the specification above, perfect risk sharing is tested by the joint hypothesis $\delta_0 = 1$ and $\beta = 0$. Comparing estimates from the above equation (reported in the first column of Table 7) with those in Table 4, it becomes clear that the results are basically unaffected by the choice of using different measures of the common (to the country aggregate) consumption growth rate.

Finally, the choice to deflate consumption and income variables by using national Consumption Price Indexes (CPIs), motivated by the focus on the interaction between institutions and shocks to otherwise uninsurable domestic consumption components, does not allow to explicitly deal with the impact (if any) of cross-country price changes. Real (effective) exchange rate risks can affect estimation results only if they

cannot be traded on international financial markets and, thus, constitute an undiversifiable risk component for all the agents in the economy. To test for this possibility, the model in (1), where the incidence of risk sharing behaviour is captured by time dummies, can be modified as follows:

$$\Delta c_{jt} = \delta_t + \delta_2 \widetilde{RE}_{jt} + \beta \Delta \tilde{y}_{jt} \left(1 + \sum_{i=1}^{I} \gamma_i \tilde{X}_{ij}\right) + \alpha_j + \varepsilon_{jt} \tag{3}$$

where the variable $\widetilde{RE}_{jt}$ accounts for the aggregate, country j-specific, change in price levels, and the coefficient δ_2 captures the effect of (potentially) uninsurable exchange rate shocks.[4] Since the relative price deflator used to compute cross-country price changes is available from 1976 onwards, the model is estimated on data for the 1976-2003 period. Results in column (1) of Table 7 indicate that, as implicitly assumed in the previous Sections, real exchange rate risks are internationally diversifiable and thus do not affect risk sharing behaviour (i.e. $\delta_2 = 0$).

5. Insights on risk sharing

This Section considers the implications of the present analysis in terms of within-country and cross-country risk sharing, providing insights on which countries do a better job in mitigating country-level shocks internally, and on how close the integration of OECD financial markets is.

OECD countries differ along several structural dimensions and can be compared to assess the effectiveness of various mixes of policies in fostering within-country risk sharing in response to country-level shocks by running a simple exercise. Table 8 computes the magnitude of the (relative) effect that a specific institutional configuration exerts on country-level shocks. It shows the implied range of impact of a country-level shock which would increase consumption by 1% in a country with the average values of all institutions.

There is a notable variety in within-country risk sharing outcomes across countries. The most effective risk-reducing institutional configurations belong to Scandinavian countries, with the notable exception of Denmark. According to the present analysis, Finland and Sweden succeed in smoothing out a shock by more than one half (up to 0.45% and 0.49%, respectively), while the "flexicurity" Danish model, by combining lower degrees of employment protection and very generous benefits systems, amplifies country-level shocks (up to 1.19%).

The evidence on Continental Europe is mixed. Belgium, Germany, Portugal, and to a lesser extent Austria relatively mitigate the effect of idiosyncratic shocks. Italy performs almost as a country with a mean (in values) set of institutions would, smoothing a 1% shock only up to 0.99%. The Netherlands with relatively higher spending on ALMPs and lower trade union density, France with relatively lower values of wage-setting

indicators and higher spending on benefit systems, and Spain with less trade union power and less progressivity in the tax system, slightly amplify shocks (up to 1.03%, 1.04%, and 1.07% respectively).

Economies that rely more on financial markets and on private insurance schemes than on public social insurance, such as Anglo-Saxon countries and Japan, display a higher responsiveness of aggregate consumption to country-level shocks.

A second implication of the analysis relates to the degree of integration of global financial markets. The previous estimation strategy makes it possible to investigate whether OECD countries mainly trade consumption risk among themselves. So far consumption insurance has been tested against shocks which were idiosyncratic with respect to the prevailing conditions in the 15 OECD country sample. That is, under the implicit assumption that cross-border trade in contingent assets works more efficiently within the OECD countries than world-wide. The following analysis considers whether this is a reasonable approximation of how things work in reality.

To address the issue, consider the hypothesis that the 15 OECD countries trade the assets that hedge their relative consumption risk only among themselves. Thus, they constitute a macroeconomic entity and a simple testable implication follows: a common shock to all the components of such a macro-area should affect their consumption growth rates in the same way. Consider, for instance, the impact of a (supply) shock to the price of oil and estimate the following model:

$$\Delta c_{jt} = \delta_0 \Delta c_t^A + \delta_1 OILP_t + \beta \Delta \tilde{y}_{jt} \left(1 + \sum_{i=1}^{I} \gamma_i \tilde{X}_{ij} \right) + \alpha_j + \varepsilon_{jt} \tag{4}$$

To emphasize the behaviour of aggregate variables, the above specification includes the average growth rate of consumption in the macro-area (Δc_t^A) instead of period dummies. The variable OILP refers to changes in the real price of oil and, hence, the coefficient δ_1 captures the effects of the common shock to the world economy.

Table 9 (column 1) reports the results. The joint hypothesis $\delta_0 = 1$ and $\delta_1 = 0$ is not rejected, that is, the high significance of OECD aggregate income fluctuations for consumption suggests that OECD countries behave as a macro-area and respond in the same way to the shock.

To corroborate the hypothesis that the 15 OECD countries in the sample share almost fully tradable risks among each other, consider that perfect risk sharing would imply that the growth rate of tradable consumption in the OECD sub-sample equals the growth rate of tradable consumption in the rest of the world. This prediction can be tested by investigating the determinants of the aggregate growth rate in the 15 OECD country sample:

$$\Delta c_t^A = \delta_0 \Delta c_t^{world} + \delta_1 OILP_t + \varepsilon_{jt} \tag{5}$$

where Δc_t^{world} is the growth rate of world consumption.[5] The hypothesis of (world-wide) perfect risk sharing would imply that the joint hypothesis $\delta_0 = 1$ and $\delta_1 = 0$ is true.

The results in Table 9 (column 2) indicate that the mean consumption growth rate in the OECD sample is only slightly correlated with world consumption growth while the effect of oil price changes is highly significant. Hence, there is no evidence of perfect international consumption risk sharing in the data.

6. Conclusions

This paper documents that labour market institutions are relevant to the character of deviations from perfect risk sharing, and that country-specific indicators of credit market accessibility also shape the responsiveness of country-level aggregate consumption to income fluctuations.

From a positive point of view, economies that rely more on financial markets and on private insurance schemes, such as Anglo-Saxon countries and Japan, show a higher responsiveness of country-level consumption to country-specific shocks. Scandinavian countries, with the notable exception of Denmark, have the most effective risk-reducing labour and credit markets' configurations. The evidence on Continental Europe is mixed and mainly mirrors differences in labour market policies.

From a normative point of view, the preliminary results presented in this paper are suggestive. The inability of financial and credit markets to shield labour incomes during the 2008-09 financial crisis has increased the appeal of policy interventions in national markets. But, if it is true that national labour and credit market reforms need to be carefully assessed as affecting risk sharing opportunities available to agents who have limited access to international financial markets (Bertola and Lo Prete, 2011), economic integration trends call for alternatives to isolated and national-level policies. Shedding light on the relevance of within-country risk sharing, the findings presented in this paper suggest that a stronger coordination of rules and policies in financial, credit and labour markets may help increase income stability.

As directions for future research, more detailed analyses would be warranted on policy complementarities, as well as on the role of cross-country differences in the degree of access to financial markets. Given that OECD countries have a strong bias towards trading assets among themselves, it would be interesting to assess the role of national institutions and undiversifiable consumption risks in the world economy, enlarging the

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[5] The 'world' comprehends the 30 OECD countries plus the 14 countries which best perform in terms of financial markets development in The Business Week "The Global 1000" ranking of 2004, namely: Argentina, Brazil, Chile, China, Hong Kong (China), India, Indonesia, Israel, Malaysia, Philippines, Russian Federation, Singapore, South Africa, Thailand.

sample to include countries which possess (at least) developing financial markets. Significant interactions between international asset trade and within-country risk sharing could be analyzed also in terms of portfolio allocation and hedging strategies, with the aim of contributing to the literature on the observed "home bias in equities" (see Bottazzi et al., 1996).

Data appendix

Time series for labour and credit market institutional indicators are constructed according to the following compilation strategy. When yearly observations are missing, data are interpolated. When data referred to a 5 (or more) sub-period average, the average value is assigned to the mid year in the sub-period, and then interpolated. For years before (after) the first (last) observation available no change is assumed, assigning the value recorded in the first (last) year of observation back (up) to all years since the starting (ending) point in the dataset.

Employment protection legislation (EPL). EPL time series are based on data by Lazear (1990), who collected variables on severance payments and notice periods expressed in means over the period 1956-1984, and by the OECD, which compiled two indicators describing EPL along several (14 up to 18) dimensions (OECD Employment Outlook, 2004). The present dataset compiles two series. The first is based on the OECD's EPL version 2 index - recorded at two points in time, 1998 ("late 1990s") and 2003. The second is based on OECD's EPL version 1 - available for 1985 ("late 1980s"), 1998 ("late 1990s") and 2003 - and Lazear's data. Values on both the series range from 0 to 6, with lower scores indexing looser regulations.

Benefit replacement rates (NRRs and GRRs). OECD Benefits and Wages (2004) compiles two indicators of the level of unemployment benefits. The net replacement rates (NRRs) is the average of net unemployment benefit replacement rates over 60 months of unemployment, calculated for four family types and two earning levels (in percentage values). The gross replacement rates (GRRs) is the average of gross unemployment benefit replacement rates for two earnings levels, three family situations, and three durations of unemployment - available since 1961 and recorded on a 2-year basis up to 2003.

Duration of unemployment benefits. The length of unemployment benefit entitlement is indexed by the (monthly) "maximum benefit duration" of entitlement to unemployment insurance. The corresponding time series is based on values available for 1989 (OECD Employment Outlook, 1991), 1996 (OECD Employment Outlook, 1996), and 2002 (OECD Benefits and Wages: OECD Indicators, 2004) - with "unlimited" duration normalized to 84 months (i.e. 7 years).

Active Labour Market Programmes (ALMPs). The ALMPs index is defined as originally in Nickell (1997), as the amount of expenditures on ALMPs per unemployed person as a percentage of GDP per member of the labour force.

Collective bargaining coverage. The collective bargaining coverage index refers to the measure compiled and recorded by the OECD – available for three years, 1980, 1990, and 2000 (OECD Employment Outlook, 2004).

Trade union density. The OECD Labour Market Statistics Database (online) provides data on trade union density rates by collecting both surveys and administrative information. Administrative information for the EU -countries refers to the so-called Visser's version, available for 1970-2001 (sometimes 2002). Time series for non-EU countries are based on administrative and survey data, using the latter where available (in line with the OECD approach).

Coordination in wage bargaining. The OECD index of coordination in wage bargaining ranges between 1 and 5, with higher values indicating economy-wide levels of coordination. It is recorded on a 5-year basis over the period 1970-2000 (OECD Employment Outlook, 2004).

Labour taxation. Measures of labour taxation are provided by "Taxing Wages: 2003/2004" (OECD, 2005) and by the OECD online database. The marginal tax wedge refers to the un-weighted average of the homonymous indicator over four family types, available for the period 1997-2003. The average tax wedge is the tax wedge of a one-earner family with two children (i.e., "married" average production worker); data are collected on a two-year basis for the period 1979-1997, and every year since 1999.

Loan-to-Value ratios (LTV). The OECD Economic Study by Catte et al. (2004) collects data for typical and maximum LTV ratios without reporting on the years of observation; here the choice has been to ascribe the records to the "early 2000s" (i.e. to the 2000-2003 period). While it has not been possible to compile a time series for the typical LTV, the maximum LTV series is based on data by Jappelli and Pagano (1994) - available as average values for 1961-1970, 1971-1980, 1981-1987 - combined with those reported by the OECD, and various sources adding information on countries not accounted for by the OECD, namely: Canada (Canada Mortgage and Housing Corporation), Japan (Standard & Poor's Reports), and the USA (Millennial Housing Commission).

RE. The real (effective) exchange rate shock variable is the change in the ratio of the PPP conversion factor to the official exchange rate. Source: World Bank, World Development Indicators online database.

OILP. The real oil price is the annual average crude oil price, in dollars, adjusted for inflation using the current US CPI. Sources: www.inflationdata.com, on data from US Department of Energy, and Bureau of Labour Statistics.

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Table 1. National institutional features, early 2000s (first part)

	Employment Protection Index		Benefit Replacement Rates (%)		Benefit Duration (monthly)	ALMPs Index
	Version 1	Version 2	Net	Gross		
Austria	2.2	1.9	73	32	9	11.0
Belgium	2.5	2.2	65	38	unlimited	18.8
Canada	1.1	0.8	51	15	9	5.9
Denmark	1.8	1.4	79	51	48	35.0
Finland	2.1	2	77	35	23	10.3
France	2.9	3	73	44	30	14.6
Germany	2.5	2.2	76	30	12	14.8
Italy	2.4	1.9	6	34	6	4.9
Japan	1.8	1.8	65	9	10	5.7
Netherlands	2.3	2.1	77	53	18	60.6
Portugal	3.5	3.5	69	41	24	14.6
Spain	3.1	3.1	53	36	24	7.6
Sweden	2.6	2.2	77	24	14	34.1
United Kingdom	1.1	0.7	65	17	6	6.9
United States	0.7	0.2	31	14	6	3.1
Rank correlation	0.97		0.49			

Notes: Data refer to 2001, or first value available after 2000: EPL (2003), NRRs (2001), GRRs (2001), Benefit duration (2002), ALMPs (2001). "Rank correlation" is the Spearman's rank correlation coefficient.

Table 2. National institutional features, early 2000s (second part)

	Union Density (%)	CB Coverage (%)	Coordination Index	Labour Taxation Tax wedge (%)		Loan-to-Value Ratios	
				Marginal	Average	Typical	Maximum
Austria	35.7	95	4.0	56.6	29.0	60	80
Belgium	55.8	90	4.5	66.6	40.3	83	100
Canada	28.2	32	1.0	43.9	20.4	75	95
Denmark	73.8	80	4.0	50.8	30.7	80	80
Finland	77.8	90	5.0	56.9	38.8	75	80
France	9.6	90	2.0	54.1	39.4	67	100
Germany	23.5	68	4.0	58.1	32.7	67	80
Italy	34.8	80	4.0	53.7	35.4	55	80
Japan	20.9	15	4.0	28.1	20.4	80	100
Netherlands	22.6	80	4.0	51.3	33.0	90	115
Portugal	23.4	80	4.0	38.0	24.1	83	90
Spain	13.8	80	3.0	43.6	31.1	70	100
Sweden	78.3	90	3.0	52.5	41.1	77	80
United Kingdom	30.7	30	1.0	46.5	18.1	69	110
United States	12.6	14	1.0	40.2	18.3	78	100
Rank correlation				0.70		0.38	

Notes: Data refer to 2001, or first value available after 2000: Union density (2001), CB Coverage (2000), Coordination (average over 1995-2000), Tax wedges (2001), LTV ratios (2002). "Rank correlation" is the Spearman's rank correlation coefficient.

Table 3. National institutional features, time variation (1971-2003)

	First and last year of recorded observations	Average values (levels)[a]			Spearman's Rank Correlation with 2003 measure [a]		
		1971	2003	Change	1971	1980	1990
EPL version 1	1971-2003	2.4	1.9	-0.21	0.81	0.88 [b]	0.91
EPL version 2	1998-2003	2.3	2.2	-0.04	-	-	0.94
NRRs	2001-2003	62.5	62.4	0.00	-	-	0.97
GRRs	1971-2003	18.6	31.2	0.67	0.37	0.61	0.87
Benefit Duration	1989-2002	1.8	1.8	0.01	-	0.83	0.85
Union Density	1971-2002	42.1	35.9	-0.16	0.85	0.90	0.99
CB Coverage	1980-2000	67.4	67.6	-0.01	-	0.91	0.97
Coordination	1970-2000	3.5	3.2	-0.08	0.60	0.70	0.90
Tax Wedge, Marginal	1997-2003	49,3	49.4	0.00	-	-	0.90
Tax Wedge, Average	1979-2003	28.3	29.6	0.05	0.76	0.74	0.75
LTV maximum	1971-2003	70.4	91.3	0.30	0.30	0.21	0.62

Notes. (a) Values based on time series of labour and credit market institutional indicators. (b) Due to data availability, the rank correlation coefficient refers to 1985 (see the Data Appendix).

Table 4. Shocks and time-invariant institutions

Dependent variable: Country-specific Consumption growth rate

	1		2	
Idiosyncratic income shock	0.826	(0.000)	0.816	(0.000)
Employment Protection	- 0.300	(0.042)	- 0.311	(0.058)
Benefit replacement rate	- 0.001	(0.808)	- 0.000	(0.873)
Duration of entitlement	0.115	(0.007)	0.117	(0.013)
ALMPs	0.010	(0.016)	0.009	(0.041)
Trade union density	- 0.008	(0.001)	- 0.008	(0.001)
Coll. Barg. Coverage	0.009	(0.146)	0.009	(0.174)
Coordination	0.050	(0.143)	0.046	(0.182)
Labour tax wedge	- 0.028	(0.021)	- 0.029	(0.043)
Loan-to-value ratio	- 0.023	(0.009)	- 0.022	(0.020)
Period Dummies	yes		yes	
Country Dummies	no		yes	
Adj. R2	0.863		0.863	

Notes. P-values, in parentheses, are computed on the basis of robust standard errors. Test on the joint significance of the country effects: the null hypothesis of the Wald test is rejected in both columns. Test on the joint significance of the shock-institution interaction terms: the null hypothesis of the Wald test is rejected in both columns.

Table 5. Within-country risk sharing, sense of magnitude (by institution)

Dependent variable: Country-specific Consumption growth rate

	Estimation results		Range of independent variable [a]		Implied range of effect of the shock (mean=1)	
Idiosyncratic income shock	0.816	(0.000)				
Employment Protection	- 0.311	(0.058)	-1.47	1.33	1.46	0.59
Benefit replacement rate	- 0.000	(0.873)	-56.47	16.53	1.02	0.99
Duration of entitlement	0.117	(0.013)	-1.29	5.21	0.85	1.61
ALMPs	0.009	(0.041)	-13.41	44.12	0.88	1.40
Trade union density	- 0.008	(0.001)	-26.5	42.20	1.21	0.67
Coll. Barg. Coverage	0.009	(0.174)	-53.6	27.40	0.52	1.24
Coordination	0.046	(0.182)	-2.23	1.77	0.90	1.08
Labour tax wedge	- 0.029	(0.043)	-21.3	17.19	1.62	0.50
Loan-to-value ratio	- 0.022	(0.020)	-18.93	16.07	1.42	0.64
Period Dummies	yes					
Country Dummies	yes					
Adj. R2	0.863					

Notes. Estimates refer to the regression reported in Table 4, column (2). P-values in parentheses.
(a)Institutional variables are expressed as deviations from the mean value in the country aggregate.

Table 6. Shocks and time-varying institutions

Dependent variable: Country-specific Consumption growth rate

	1		2	
Idiosyncratic income shock	0.831	(0.000)	0.828	(0.000)
Employment Protection	-0.120	(0.077)	-0.112	(0.130)
Benefit replacement rate	-0.006	(0.109)	-0.005	(0.177)
Duration of entitlement	0.055	(0.140)	0.062	(0.122)
ALMPs	0.010	(0.009)	0.009	(0.032)
Trade union density	-0.005	(0.037)	-0.005	(0.030)
Coll. Barg. Coverage	0.008	(0.082)	0.009	(0.097)
Coordination	0.011	(0.829)	0.008	(0.889)
Labour tax wedge	-0.016	(0.081)	-0.019	(0.079)
Loan-to-value ratio	-0.009	(0.031)	-0.008	(0.096)
Period Dummies	yes		yes	
Country Dummies	no		yes	
Adj. R2	0.861		0.861	

Notes. P-values, in parentheses, are computed on the basis of robust standard errors. Test on the joint significance of the shock-institution interaction terms: the null hypothesis of the Wald test is rejected both in column 1 and 2.

Table 7. Robustness checks

Dependent variable: Country-specific Consumption growth rate

	1		2	
15 OECD (mean) Consumption growth rate	1.012[a]	(0.000)	-	
Country-specific shock to exchange rates	-		0.000	(0.644)
Idiosyncratic income shock	0.807	(0.000)	0.840	(0.000)
Employment Protection	-0.291	(0.065)	-0.289	(0.110)
Benefit replacement rate	-0.000	(0.896)	0.002	(0.389)
Duration of entitlement	0.100	(0.022)	0.095	(0.053)
ALMPs	0.008	(0.054)	0.009	(0.058)
Trade union density	-0.007	(0.002)	-0.006	(0.047)
Coll. Barg. Coverage	0.009	(0.156)	0.010	(0.120)
Coordination	0.033	(0.324)	0.004	(0.921)
Labour tax wedge	-0.027	(0.046)	-0.033	(0.023)
Loan-to-value ratio	-0.018	(0.027)	-0.018	(0.108)
Period Dummies	no		yes	
Adj. R2	0.872		0.742	

Notes. P-values, in parentheses, are computed on the basis of robust standard errors. All the models include country effects. The model in column (2) is estimated using data for the sub-period 1976-2003. (a) The hypothesis that the coefficient is equal to 1 cannot be rejected.

Table 8. Within-country risk sharing, sense of magnitude (by country)

Implied range of effect of the shock (mean=1)

Austria	0.93	Japan	1.41
Belgium	0.68	Netherlands	1.03
Canada	1.21	Portugal	0.83
Denmark	1.19	Spain	1.07
Finland	0.45	Sweden	0.49
France	1.04	United Kingdom	1.34
Germany	0.79	United States	1.56
Italy	0.99		

Notes. Calculations based on estimation outcomes from the regression reported in Table 4, column (2).

Table 9. Cross-country risk sharing

Dependent variable: Country-specific Consumption growth rate			Dependent variable: OECD (mean) Consumption growth rate		
OECD (mean) Consumption growth rate	1.011	(0.000)	World Consumption growth Rate	0.2427	(0.000)
Worldwide shock to oil price	0.001	(0.757)	Worldwide shock to oil price	0.011	(0.007)
Employment Protection	-0.290	(0.067)			
Benefit replacement rate	-0.000	(0.902)			
Duration of entitlement	0.102	(0.022)			
ALMPs	0.008	(0.055)			
Trade union density	-0.007	(0.002)			
Coll. Barg. Coverage	0.009	(0.161)			
Coordination	0.033	(0.328)			
Labour tax wedge	-0.028	(0.044)			
Loan-to-value ratio	-0.019	(0.029)			
Adj. R2	0.871		Adj. R2	0.288	

Notes. P-values, in parentheses, are computed on the basis of robust standard errors. The joint hypothesis that the coefficient in front of the mean consumption growth rate variable equals 1 (model in the left panel) and the coefficient in front of the worldwide shock to oil price variable equals 0 (model in the right panel) cannot be rejected.