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Household income dynamics in Europe before and after the Great Recession: A four-country analysis

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Abstract

In this paper, we provide evidence of reduced short-term income mobility in the aftermath of the 2008 recession using EU-SILC data for four European countries (France, Italy, Spain and UK). By combining descriptive evidence with econometric analysis, we find that the reduction in income mobility is the result of three related developments. First, a slower income convergence process compared to pre-recession years; second, higher probability of income immobility; and third, stronger state dependence together with an increased difficulty for households at the bottom of the income distribution to move upwards. Finally, our empirical strategy also allows us to gain some insight on the microeconomic drivers of income mobility. We find that high educational attainment and the presence of employed family members facilitate households' upward movements along the income ladder.

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1. Introduction

The Great Recession of 2008 severely affected people's economic standing in Europe and nourished the perception that the crisis exposed households to fewer opportunities to improve their livelihoods. On average in the European Union (EU), per-capita GDP grew until the recession, dropped in the trough and then flattened out. However, trends were very heterogeneous among countries, with some of them, especially those at the periphery, experiencing further domestic product contraction due to the sovereign debt crisis. The European labour market also faced a contraction, with increasing unemployment rates, which in some countries never regained their pre-recession levels.

When looking into the microeconomic impact of the recession, whether it modified household income dynamics and whether households experienced a change in their ability to move along the income distribution are worthy of investigation. In other words, whether the recession had an impact on income mobility and in which direction. However, work analysing changes in mobility after the 2008 crisis is scarce, with few exceptions such as Cantó and Ruiz (2015) and Kennedy *et al*. (2015), who detect increased downward mobility in Spain and Ireland, respectively.

Our paper contributes to the strand of literature on short-term income mobility with the double aim of assessing the dynamics of household income and investigating whether mobility has changed. We employ the 4-year longitudinal component of the European Union Statistics on Income and Living Conditions (EU-SILC) for 2005-2008 (pre-recession period) and 2012-2015 (post-recession period) and we focus on four European countries, France, Italy, Spain and the UK.[1] These countries experienced heavy losses of real per-capita GDP in 2008 and 2009 that ranged from 7.5% in Italy and 6% in the UK to 5.3% in Spain and 3.7% in France, while the drop in the EU-27 was 4.3%. Italy and Spain were also hit by the 2011-2012 sovereign debt crisis, which led to an overall per capita GDP loss of 12% and 9.1% between 2008 and 2014, respectively.

To perform our investigation, we refer to Jäntti and Jenkins (2015) who define mobility as a four-dimension concept: income growth, positional change (general and rank), reduction of longer-term inequality and income risk. We focus on two of these dimensions, income growth and general positional change, which are both "directional" concepts of mobility. With the former, we explore directional mobility regardless of the relative position of households on the income distribution, while with the latter we look at movements along the distribution and overcome some of the limitations connected with the general character of the income growth concept.

The empirical investigation is carried out by employing both descriptive and quantitative instruments. Mobility indices and transition matrices are at the basis of our descriptive analysis, while we characterise mobility according to three criteria to implement the econometric analysis: (i) income growth, (ii) transitions between income quintiles and (iii) income dynamics. The first matches the income growth concept of mobility, while the second and the third represent its general positional concept. In particular, definition (i) mirrors the directional component of the Fields and Ok (1999) mobility index, while definition (ii) and, partially, definition (iii) mirror transition matrices. Each of the three characterisations is estimated by means of a different econometric model capturing the specific nature of the outcome variable, i.e. instrumental variable (IV) regression, and multinomial logit and dynamic probit model with random effects, respectively.

The descriptive statistics signal a reduction in overall mobility in the post-recession period in all countries, while income growth is diversified among countries. We find a reduction of both upward and downward income mobility in favour of increased immobility in the post-recession

[1] Data for Germany are not available.

period. Moreover, throughout the income range, the likelihood of upward mobility has dropped more than that of downward mobility. Similarly, those at the bottom of the income distribution experience more difficulty in improving their economic standing than those at the top in worsening theirs. The econometric analysis supports the evidence of changed income mobility patterns between the two periods. The post-recession years are characterised by a slower income convergence process, higher probability of income immobility and stronger state dependence combined with an increased difficulty for households lying at the bottom of the income distribution to move upwards. As for the drivers, education and employment status have a positive effect on the likelihood of households moving up the income distribution.

The structure of the paper is the following. Section 2 introduces the dataset and provides descriptive evidence of mobility patterns across countries and through time. Section 3 outlines the econometric models, while the corresponding results are discussed in Section 4. Section 5 concludes with a summary of the main findings.

2. Data and descriptive statistics

From the EU-SILC sample, we select heads of household aged 16-64 years who are observed for all four consecutive years in the two periods, 2005-2008 and 2012-2015.[2] The analysis is performed at household level on equivalised household income, where the income reference period is the previous calendar year, i.e. 2004-2007 and 2011-2014.[3] Table I reports selected descriptive statistics for the variables employed in the analysis.

Table I Descriptive statistics

	pre-recession period (2005-2008)			**post-recession period (2012-2015)**		
	mean	s.d.	s.e.	mean	s.d.	s.e.
Household head characteristics						
Age: 16-34	0.210	0.407	0.001	0.204	0.403	0.002
Age: 35-44	0.305	0.460	0.002	0.283	0.450	0.002
Age: 45-54	0.265	0.441	0.001	0.276	0.447	0.002
Age: 55-64	0.221	0.415	0.001	0.238	0.426	0.002
Education: None or primary	0.108	0.310	0.001	0.065	0.247	0.001
Education: Lower secondary	0.213	0.409	0.001	0.215	0.411	0.002
Education: Upper secondary	0.387	0.487	0.002	0.375	0.484	0.003
Education: Tertiary	0.292	0.455	0.002	0.345	0.475	0.003
Female	0.316	0.465	0.002	0.354	0.478	0.003
Married	0.672	0.469	0.004	0.639	0.480	0.003
Household characteristics						
Share of employed	0.465	0.351	0.002	0.475	0.356	0.002
Share of unemployed	0.022	0.120	0.000	0.043	0.166	0.001
Share of pensioners	0.050	0.197	0.000	0.037	0.170	0.001
Asset ownership	0.515	0.500	0.003	0.518	0.500	0.003
No. of observations	34988			34576		

Source: own calculations on EU-SILC data. Weighted statistics.

[2] Income is expressed in 2014 constant prices. Head of household is the highest earning individual within the household in the first year of appearance.

[3] Equivalised income is household disposable income divided by the OECD-modified scale, which assigns the value 1 to the first adult, 0.5 to each other adult and 0.3 to each child under the age of 14.

Initially, we describe income mobility by means of the Fields and Ok (1999) index (FO), as in Ayala and Sastre (2008), Burkhauser and Couch (2009) and Van Kerm and Pi Alperin (2013), among others. The index is as follows:

$$FO_n(x,y) = \frac{1}{n}\sum_{i=1}^{n}|\ln x_i - \ln y_i| = \frac{1}{n}\sum_{i=1}^{n} d(x_i, y_i) \quad (1)$$

where n is the number of individuals and x and y are the vectors of the initial and final distributions of income, respectively.[4] Since we are interested in the direction of mobility, we decompose it into its growth $G(x,y)$ and transfer $T(x,y)$ components:

$$FO_n(x,y) = G(x,y) + T(x,y) = \frac{1}{n}\sum_{i=1}^{n}(lny_i - lnx_i) + \frac{2}{n}\sum_{i\in L}(lnx_i - lny_i) \quad (2)$$

where L is the set $\{i: x_i > y_i\}$. We focus on the former, the so-called FO directional index $G(x,y)$.

Table II displays the FO index by country and period. In 2005-2008, Spain experiences the highest level of overall income mobility followed by the UK, Italy and France. Its growth component is negative for the UK, indicating that on average incomes in the country declined. As for 2012-2015, overall mobility decreases for all countries, especially for Spain. Nevertheless, country rankings are maintained. The growth component turns positive for the UK, while it becomes negative for Italy and Spain, both of which were hit by the sovereign debt crisis.

Table II Fields and Ok (FO) mobility index

	France	Italy	Spain	UK
	2005-2008			
FO (t, t+3)	0.271	0.287	0.350	0.330
transfer component	0.144	0.248	0.264	0.225
growth component	0.127	0.039	0.086	-0.104
	2012-2015			
FO (t, t+3)	0.230	0.279	0.304	0.297
transfer component	0.195	0.271	0.229	0.209
growth component	0.035	-0.008	-0.075	0.088

Source: own calculations on EU-SILC data. Weighted statistics.

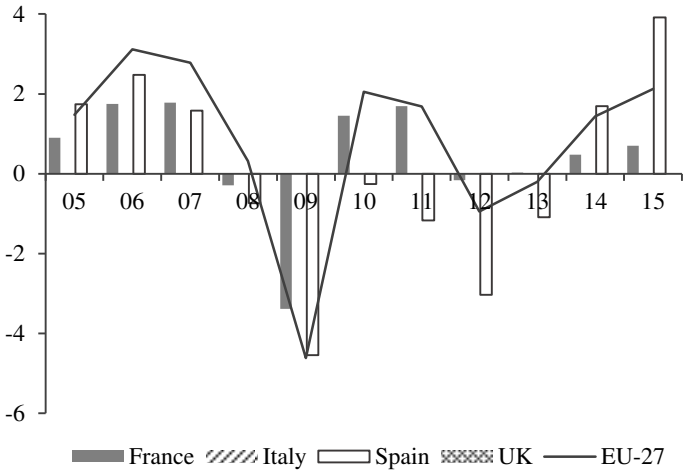
These figures can be framed within the macroeconomic context of the countries analysed. Before the recession, the overall 2004-2007 per capita GDP growth rate was positive for all four countries in real terms (Figure 1). With the exception of the UK, this is coherent with the directional FO index. In the post-recession period, the 2011-2014 per capita GDP growth rates were negative in Italy and Spain, in line with the directional index. Overall, our microeconomic data seem to mirror the macroeconomic adverse effects that hit countries with different timing and intensity.

Then, we move to transition matrices to investigate the probability of an individual to move along the income distribution between years, i.e. the general positional changes (Chen 2009 and Alves and Martins 2012). We assess annual movements among quintiles of equivalised household

[4] The *FO* index is lower-bounded at 0 in the extreme case of perfect immobility.

income in Table A.I of the Appendix, where each cell represents the number of times (as a percentage) that individuals move upwards (upper triangle of the matrix), downwards (lower triangle) or stay in the same quintile (main diagonal). The matrices show evidence of higher persistence at the tails of the distribution, especially in the post-recession period. They also indicate that upward or downward movements to the neighbouring quintile are more likely.

Figure 1 Per-capita GDP annual growth rates
(*percentages in real terms*)



Source: Eurostat.

In line with Jarvis and Jenkins (1998), in Figure 2 we summarise data from the transition matrices of Table A.I and compare two types of upward and downward transitions between periods. On the one hand, we look at the transitions towards the tails of the distribution, i.e. from the bottom 60% of the distribution to the top 20% (upward movements) and at those from the top 60% to the bottom 20% (downward movements). On the other hand, we look at the transitions from the tails of the distribution, i.e. from the richest 20% to the poorest 60% (downward movements) and from the poorest 20% to the richest 60% (upward movements). In Figure 2, panel (a) shows how much more likely it is in the post-recession period compared to the pre-recession one to move to the lower (upper) quintile starting from the top (bottom) 60% of the income distribution, while panel (b) reports differences in the probability of moving downwards (upwards) for those starting from the highest (lowest) group.

For example, by looking at the case of Italy, we see that, prior to the recession, 35.2% of the new entrants to the first quintile come from the richest group. This figure drops to 27.9% in the post-recession period.[5] This means that the likelihood of moving downwards over 2012-2015 is 7.3 percentage points lower than over 2005-2008 (Figure 2a). By contrast, at the top of the distribution, 39.1% of the new entrants to the richest group come from the poorest 60%, which drops to 30.5% in the post-recession period. In other words, over 2012-2015 the chance of moving upwards falls by 8.6 percentage points (Figure 2a).

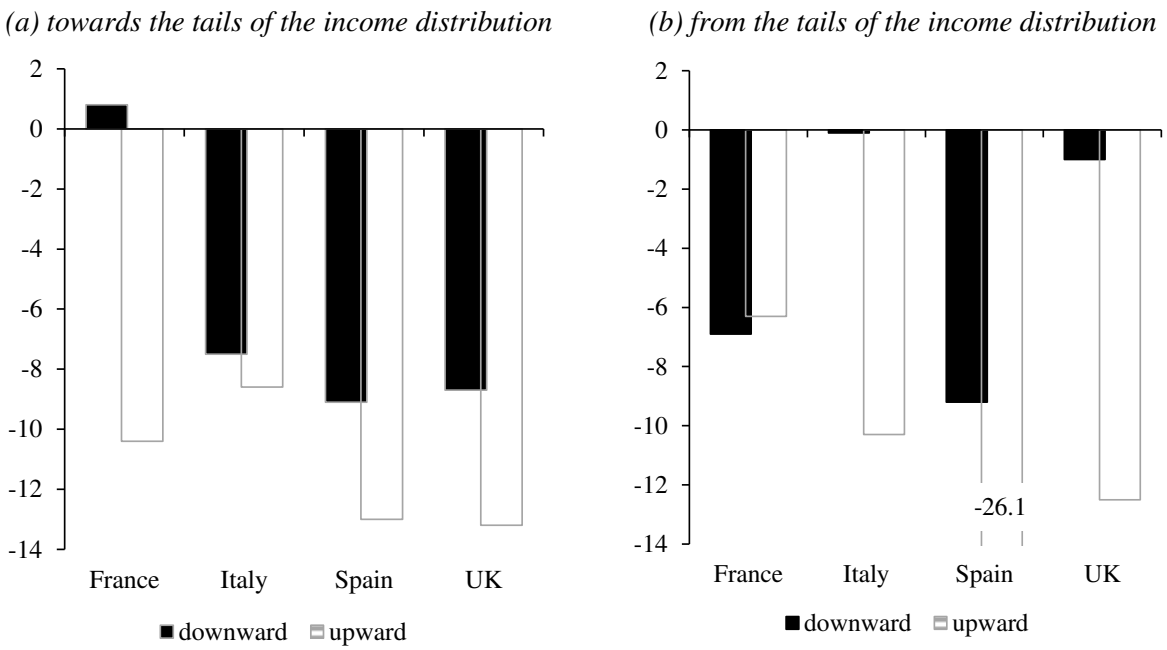
Panel (b) shifts the focus to the tails of the distribution. Continuing with the case of Italy, of those leaving the richest fifth, 37.6% drop to the poorest 60% in the pre-recession period, and

[5] See Appendix A for details on how the figures are computed.

37.5% in the post-recession one. Thus, downward movements are 0.1 percentage points less likely over 2012-2015. Conversely, of those leaving the poorest fifth, 32.9% make it to the top three quintiles in the pre-recession period, and only 22.5% in the post-recession one.[6] Therefore, upward movements are 10.4 percentage points less likely in the aftermath of the recession (Figure 2b).

These analyses indicate that, overall, in the post-recession period both upward and downward mobility have decreased for all countries, which translates into increased income immobility. Nevertheless, there is evidence of a more significant reduction in upward mobility along the entire income range. On top of this, incomes at the bottom of the income distribution experience more difficulty in climbing the income ladder than incomes at the upper end experience in moving down (with the exception of France).

Figure 2 Difference in the likelihood of upward and downward mobility between post- and pre-recession (*percentage points*)



Source: own calculations on EU-SILC data. Weighted statistics.

3. Methods

Based on the four-year longitudinal component of EU-SILC, we implement a three-tier econometric analysis. We start with the estimation of an instrumental variable (IV) regression where we model mobility as household income growth over a four-year horizon to match the income growth concept of mobility. The model provides interesting insights on the income convergence process, i.e. whether current incomes converge towards or diverge from those of previous years, but it does not distinguish between upward or downward movements along the income distribution or changes in the relative position of households. To disentangle some of these effects, we rely on two models that capture the positional concept of mobility. We proceed with the implementation of a multinomial logit model to mirror the transition matrices and a dynamic

[6] See Appendix A for details on how the figures are computed.

ordered probit model to test for state dependence and establish how likely upward movements are for households starting at different points on the income distribution.

The outcome variable of each model is a function of model-specific variables and two common sets of regressors. In the IV model it is regressed against lagged income, while in the multinomial logit and in the dynamic ordered probit it is a function of the original income quintile and of the income quintile of the previous period, respectively (Table III).[7] The analysis is run on the pooling of the two periods according to two model specifications as detailed below.

Three groups of exogenous controls are employed. One set includes socio-economic characteristics of the household head: age classes (16-34, 35-44, 45-54 and 55-64, where 35-44 is the reference category), education levels (none or primary, lower secondary, upper secondary and tertiary, where lower secondary is the reference category), gender (male and female, with male as the reference category) and marital status (married or with partner and single, where single is the reference category). Another set comprises household-level variables, namely: the shares on total household components of working members, unemployed and pensioners. The third set varies according to the specification. Specification A includes a post-recession dummy, country dummies and their interaction, while Specification B also accounts for post-recession effects of the model-specific variables to test whether the recession has modified their role in shaping mobility. Depending on the model, the explanatory variables are used with a different timing (Table III).

Table III Variables and estimation samples

	(i) IV regression	(ii) Multinomial logit	(iii) Dynamic ordered probit
Outcome variable	Income growth	Transition	Current quintile
Model-specific regressors	First-year income	First-year quintile	Previous year quintile
Exogenous variables (timing)			
Household-head characteristics (x)	First-year	Previous year	Previous year
Household-level characteristics (w)	Percentage change	Previous year	Previous year
Estimation samples	T_1 = 8,747	T_1 = 26,241	T_1 = 26,241
	T_2 = 8,644	T_2 = 25,932	T_2 = 25,932
	T = 17,391	T = 52,173	T = 52,173

3.1 Instrumental variable regression

In the first model set-up, income mobility is defined as the four-year growth rate of each household's equivalised income, i.e. the difference between log equivalised income of the final year ($lny_{i,4}$) and log equivalised income of the initial year ($lny_{i,1}$) in each period. This definition implies that the two longitudinal datasets collapse into two cross-sections capturing the changes in income over the periods 2005-2008 and 2012-2015. Mobility $\Delta \ln y_i$ is modelled following Aristei and Perugini (2015) and then estimated on the pooling of the two cross-sections:

[7] We are aware that restricting the analysis to the balanced panel dataset may introduce an attrition issue, although the design of longitudinal weights in EU-SILC partially accounts for this. Our choice is motivated by the fact that in the IV model we wish to estimate mobility on the full length of the two periods and by the fact that the dynamic ordered probit model requires the maximum length available since current values and time averages tend to coincide the shorter the time period becomes.

$$\Delta \ln y_i = lny_{i,4} - lny_{i,1} = \gamma' \ln y_{i,1} + \beta' x_{i,1} + \delta' \Delta w_i + \tau' t_i + \vartheta' c_i + \varphi' c_i t_i + \varepsilon_i \qquad (3)$$

where $x_{i,1}$ is a set of initial year exogenous regressors, Δw_i represents a set of household-level variables in percentage change, t_i is the post-recession dummy, c_i are the country dummies and $c_i t_i$ is their interaction (Specification A). Specification B also includes first year income interacted with the post-recession dummy. A t-test on the coefficient of the interacted term signals a statistically significant different degree of convergence between the two periods.

To account for the potential endogeneity bias deriving from the inclusion of initial-year income among the covariates and to solve the measurement error issue, we estimate Eq. (3) within an IV framework. We employ a dummy variable identifying financial asset ownership to instrument $lny_{i,1}$ (Fields *et al*. 2003 and Aristei and Perugini 2015), as it is reasonable to assume that in the initial period richer households are more likely to make investments. Moreover, to avoid correlation between asset ownership and the outcome variable, we exclude capital gains from household income. To instrument first year income in the post-recession period we interact financial asset ownership with the post-recession dummy.

3.2 Multinomial logit model

Second, we estimate the probability of moving down, not moving ('immobility') or moving up from one year to the next along the income distribution by means of a multinomial logit model, which also accounts for the quintile of origin (Cantò and Ruiz 2015 and Bachmann *et al*. 2016). In particular, the probability of observing each status $j = -1, 0, 1$ is as follows (Greene 2008):

$$\Pr(y = j) = \frac{\exp(\gamma_j' q_{i,1} + \beta_j' x_{i,t-1} + \delta' w_{i,t-1} + \tau' t_i + \vartheta' c_i + \varphi' c_i t_i + \varepsilon_i)}{\sum_{j=-1}^{1} \exp(\gamma_j' q_{i,1} + \beta_j' x_{i,t-1} + \delta' w_{i,t-1} + \tau' t_i + \vartheta' c_i + \varphi' c_i t_i + \varepsilon_i)} \qquad (4)$$

where $q_{i,1}$ is the quintile of origin, $x_{i,t-1}$ is the set of previous-year household-head characteristics, $w_{i,t-1}$ is the set of previous-year household-level variables, while the other variables are as in Specification A of Eq. (3). Specification B also includes the quintiles of origin interacted with t_i.

3.3 Dynamic ordered probit model with random effects

Finally, we implement a dynamic ordered probit with random effects where the outcome variable identifies the five income quintiles to test for the likelihood of households to move upwards in the income distribution and for state dependence. Inclusion of income quintiles of the previous year in the regressors' set allows us to quantify the degree of state dependence. We apply Wooldridge's (2005) and Rabe-Hesketh and Skrondal's (2013) estimation method to solve the endogeneity issue and to account for unobserved heterogeneity.

The outcome variable $q_{i,t}$ is given a value from 1 to 5, according to the quintile to which each household's equivalised income belongs. The latent formulation of the model is:

$$q_{i,t}^* = \gamma' q_{i,t-1} + \beta' x_{i,t-1} + \delta' w_{i,t-1} + \tau' t_i + \vartheta' c_i + \varphi' c_i t_i + \varepsilon_{i,t} \qquad (5)$$

where $x_{i,t-1}$ are one-period lagged household-head characteristics, $w_{i,t-1}$ is the set of household-level variables at $t-1$, $q_{i,t-1}$ is lagged income quintile and $\varepsilon_{i,t} = \alpha_i + u_{i,t}$ is the error term. Unobserved heterogeneity is $\alpha_i = \alpha_0 + \alpha_1' q_{i,1} + \alpha_2' \overline{x}_i + \zeta_i$, where $q_{i,1}$ is the first-year income quintile and $\overline{x}_i$ is the average over time of the time-varying exogenous variables excluding their initial-period value. The other variables are as in Specification A of Eq. (3). Specification B also includes the interaction term $q_{i,t-1} t_i$. The individual effects α_i are modified accordingly.

4. The estimation results

Our analysis provides some interesting takeaways. Specification A of the IV model (Table IV) shows that there is a significant income convergence process as suggested by the negative sign of the coefficient of first-year income (-0.169).[8] The post-recession dummy is negative confirming the reduction in mobility provided by the FO index. The coefficients associated with the country dummies are positive for France and negative for the UK, as signalled by the directional mobility indices.

Estimation of Specification B reveals that in the pre-recession period the coefficient of first year income is negative and equal to -0.196, while that of the post-recession period is positive (0.050), signalling a reduction of the income convergence process.[9] However, it is not significant. Therefore, we re-estimate Specification B and exclude the interaction of the country dummies and the post-recession one ('Partially interacted model', Table IV).[10] In this version, the interacted first-year income coefficient turns significant (0.203): the catching-up process slows down in the post-recession period, as the coefficient of lagged income drops in absolute value (from |-0.328| in the pre-recession period to |-0.125|=|-0.328+0.203| in the post-recession one).

Among the household head characteristics, educational attainment positively affects income mobility, an effect that increases over time for higher education levels in all specifications. This may be interpreted as a sign of greater opportunities for more highly educated workers to climb the income ladder – in case of positive income changes – which also allows them to smooth income changes in case of negative income growth. Generally, a larger share of unemployed components within the household has a negative impact on income mobility. At the opposite end, a larger share of workers within the family unit boosts income growth and prevents equivalised income from experiencing negative swings.[11]

In the multinomial logit model, the probability of immobility is higher than moving upwards or downwards, regardless of the original income quintile, as suggested by the sign of the corresponding average partial effects (APEs) in Table V. This evidence supports the findings from the transition matrices and points to a high degree of immobility in the countries analysed. However, in France, Spain and the UK, it is more likely to move downwards than in Italy. Moreover, the APE of the post-recession dummy reveals that in the period 2012-2015 the likelihood of not moving is higher than that in the period 2005-2008, which is also consistent with our descriptive analysis. Accordingly, the risk of downward movement and the possibility of upward movement is lower after the recession. Finally, education is highly significant in

[8] The validity of the IV specification is confirmed by the tests reported at the bottom of the table.

[9] The joint impact of the country dummies and their interaction with the post-recession dummy in Specification B tell us that in the post-recession mobility, relative to that in Italy, is higher in France (0.092-0.040=0.052) and the UK (-0.082+0.187=0.105) but lower in Spain (0.006-0.095=-0.089). This is consistent with per-capita GDP growth patterns with France and the UK experiencing lower losses than those experienced by Italy and Spain, especially after being hit by the sovereign debt crisis.

[10] Both Specifications B are estimated as a two-stage least squares (2SLS) model 'by hand' instead of using the in-built Stata routine, which does not allow us to instrument each of the two endogenous variables with only one instrument. We adjust the standard errors of the second stage regression by means of the wild bootstrap routine implemented by Roodman *et al*. (2019), which accounts for heteroscedasticity-robust variance. Tests of endogeneity and of excluded instruments are also performed 'by hand'.

[11] To check that our model is able to capture household compositional changes, in Specification A of Eq. (3) we replace the log of equivalised income with the log of disposable income and add to the set of covariates the number of household members and their percentage change. Results are very similar and are available upon request.

supporting an upward transition, with higher educational attainments increasingly supporting the probability of upward movements along the income distribution.[12]

In the dynamic ordered probit model, statistical significance of the APEs associated with the lagged income quintiles suggests the existence of income state dependence in both specifications (Table VI).[13] Moreover, their sign and magnitude indicate that the lower a household is in the income distribution, the more difficult it is to reach the top of the distribution (Specification A). There is no indication of aggregate post-recession effects as the corresponding dummy variable of the pooled model is not significant. The estimation delivers significant country effects, although limited to France and the UK. For French and UK households the probability of belonging to income quintile 5 is lower by 1.8pp and 2.8pp, respectively, than that of a household living in Italy (the reference category).

However, the estimation of Specification B suggests that households at the lower end of the income distribution have a greater difficulty in moving upwards in the post-recession period. On the contrary, those in the upper part do not seem to face this increased difficulty, rather the likelihood of improving their economic standing versus those in the middle and lower income brackets increases. This insight stems from comparing pre-recession and post-recession coefficients of Specification B, where the post-recession APEs are retrieved by adding up the pre-recession APEs and the corresponding interacted one. For households in quintile 1 and 2, the APE associated with moving to quintile 5 (4.7pp and 2.5pp, respectively), compared to that of households in quintile 3, is smaller in the post-recession period in absolute value (4.7pp + 3.2pp = 7.9pp and 2.5pp + 2.1pp = 4.6pp, respectively), while for households in quintile 5 the APE increases from 7pp to 9pp (7pp + 2pp).

As for the household head characteristics, education significantly increases the likelihood of households to be in the top income quintile. The labour market position of household members does not play a role in shaping income dynamics, with the exception of the share of employed components, which is positive and statistically significant in both specifications.

Finally, as an aside, our results – e.g. the slowing down of the income convergence process, the reduced ability to move to higher quintiles and the increased difficulty of households at the bottom of the distribution to move upwards – may signal risks of higher inequality in the future.[14]

[12] Estimation of Specification B delivers non-significant coefficients of the quintile of origin interacted with the post-recession dummy. However, the statistical significance of the post-recession dummy is maintained, confirming the conclusions reached with Specification A. Results are available upon request.

[13] The table only shows the APEs for outcome 5. The APEs on the probability of being in quintile 1 would be the same as those of being in quintile 5 but opposite in sign. Those for the outcomes 1, 2, 3 and 4 are available upon request. In all models, we do not accept the null of the initial conditions and within time average variables coefficients being jointly equal to zero, thus suggesting the appropriateness of a dynamic random effects specification.

[14] See, for instance, Garnero *et al*. (2019) for an analysis of the links between (earnings) inequality and mobility.

Table IV Instrumental variable regression: Estimated coefficients

	Specification A		Specification B		Specification B - Partially interacted	
	coeff.	robust s.e.	coeff.	wild bootstrapped p-value	coeff.	wild bootstrapped p-value
Initial year income						
log of equivalised income	-0.169	0.042 ***	-0.196	0.000 ***	-0.328	0.000 ***
log of equivalised income * post-recession dummy			0.050	0.129	0.203	0.000 ***
Post-recession dummy	-0.032	0.019 **	-0.517	0.084 *	-2.003	0.000 ***
Household-head characteristics (initial year)						
age: 16-34	0.031	0.012 ***	0.031	0.021 **	0.032	0.014 **
age: 45-54	0.019	0.010 **	0.020	0.053 *	0.023	0.028 **
age: 55-64	0.018	0.012	0.018	0.164	0.021	0.114
education: none or primary	0.008	0.015	0.007	0.650	0.003	0.853
education: upper secondary	0.044	0.012 ***	0.044	0.001 ***	0.047	0.001 ***
education: tertiary	0.092	0.018 ***	0.092	0.000 ***	0.101	0.000 ***
female	0.002	0.009	0.002	0.823	-0.005	0.634
married	-0.009	0.010	-0.009	0.408	-0.002	0.886
Household characteristics (initial year)						
share of employed	0.067	0.025 ***	0.069	0.014 **	0.101	0.001 ***
share of unemployed	-0.213	0.041 ***	-0.207	0.000 ***	-0.209	0.000 ***
share of pensioners	0.031	0.028	0.032	0.294	0.057	0.070 *
Country dummies						
France	0.091	0.011 ***	0.092	0.000 ***	0.071	0.000 ***
Spain	0.013	0.020	0.006	0.806	-0.057	0.000 ***
UK	-0.093	0.019 ***	-0.082	0.000 ***	0.032	0.028 **
France * post-recession dummy	-0.035	0.017 **	-0.040	0.027 **		
Spain * post-recession dummy	-0.106	0.024 ***	-0.095	0.001 ***		
UK * post-recession dummy	0.202	0.023 ***	0.187	0.000 ***		
constant	-1.606	0.391 ***	1.870	0.000 ***	3.124	0.000 ***
	Wu-Hausman Chi-sq(1)		F-test		F-test	
Endogeneity test		44.899 [0.000]	F(2, 17390)	926.72 [0.000]	F(2, 17390)	22.74 [0.000]
Test of excluded instruments						
First stage: Log equivalised income	F(1, 17367)	389.51 [0.000]	F(1, 17390)	389.51 [0.000]	F(1, 17390)	452.17 [0.000]
First stage: Log equivalised income * post-recession			F(1, 8643)	197.22 [0.000]	F(1, 8643)	197.22 [0.000]
No. of observations		17391		17391		17391

*Note: estimates are weighted. Significance levels: *** p<0.01, ** p<0.05, * p<0.1. All specifications include household characteristics in differences and a constant. In Specification A, standard errors are computed by employing the Huber-White estimator (Huber 1967 and White 1980). In Specifications B, wild bootstrapped p-values are simulated by means of Roodman et al.'s (2019) routine.*

Table V Multinomial logit: Average partial effects

Specification A	Downward transition		Immobility		Upward transition	
	coeff.	robust s.e.	coeff.	robust s.e.	coeff.	robust s.e.
Original quintile						
1st	-0.169	0.006 ***	0.150	0.011 ***	0.019	0.007 *
2nd	-0.055	0.007 ***	0.028	0.010 ***	0.027	0.007 ***
4th	0.016	0.008 *	0.028	0.011 ***	-0.044	0.006 ***
5th	-0.035	0.008 ***	0.200	0.011 ***	-0.165	0.006 ***
Post-recession dummy	-0.032	0.008 ***	0.063	0.012 ***	-0.032	0.007 ***
Household head characteristics (lag)						
age: 16-34	0.008	0.007	-0.022	0.010	0.014	0.006 *
age: 45-54	-0.009	0.006	-0.012	0.009	0.021	0.005 ***
age: 55-64	-0.012	0.006	-0.024	0.010 *	0.036	0.006 ***
education: none or primary	0.001	0.009	0.018	0.013	-0.020	0.008 ***
education: upper secondary	-0.014	0.006 *	-0.011	0.009	0.025	0.006 ***
education: tertiary	-0.059	0.007 ***	0.014	0.010	0.045	0.006 ***
female	0.003	0.005	-0.002	0.007	-0.001	0.004
married	-0.002	0.005	0.005	0.008	-0.004	0.005
Household characteristics (lag)						
share of employed	-0.064	0.008 ***	0.050	0.012 ***	0.014	0.008
share of unemployed	0.050	0.015 ***	0.022	0.023	-0.072	0.019 ***
share of pensioners	-0.048	0.013 ***	0.060	0.019 ***	-0.013	0.013
Country dummies						
France	0.024	0.007 ***	-0.007	0.011	-0.017	0.007 *
Spain	0.056	0.008 ***	-0.089	0.013 ***	0.033	0.008
UK	0.031	0.008 ***	-0.012	0.013	-0.018	0.008 *
France * post-recession dummy	0.004	0.010	-0.005	0.016	0.002	0.010
Spain * post-recession dummy	-0.065	0.012 ***	0.115	0.019 ***	-0.050	0.012 ***
UK * post-recession dummy	0.027	0.012 *	-0.061	0.019 ***	0.034	0.012 ***
No. of observations		52173		52173		52173

*Note: estimates are weighted. Significance levels: *** p<0.01, ** p<0.05, * p<0.1. Standard errors are clustered at the household level. All specifications include a constant.*

Table VI Dynamic ordered probit model with random effects: Average partial effects (outcome 5)

	Specification A		Specification B	
	coeff.	**robust s.e.**	**coeff.**	**robust s.e.**
Quintile (lag)				
1st	-0.055	0.005 ***	-0.047	0.008 ***
2nd	-0.032	0.004 ***	-0.025	0.005 ***
4th	0.029	0.004 ***	0.025	0.005 ***
5th	0.092	0.008 ***	0.070	0.008 ***
1st * post-recession dummy			-0.032	0.010 ***
2nd * post-recession dummy			-0.021	0.007 ***
4th * post-recession dummy			0.006	0.007
5th * post-recession dummy			0.020	0.010 **
Post-recession dummy	-0.004	0.005	-0.002	0.011
Household head characteristics (lag)				
age: 16-34	0.000	0.004	0.000	0.004
age: 45-54	0.011	0.003 ***	0.011	0.003 ***
age: 55-64	0.025	0.004 ***	0.025	0.004 ***
education: none or primary	-0.015	0.004 ***	-0.015	0.004 ***
education: upper secondary	0.023	0.003 ***	0.023	0.003 ***
education: tertiary	0.073	0.004 ***	0.072	0.004 ***
female	-0.001	0.003	-0.001	0.003
married	-0.010	0.008	-0.011	0.008
Household characteristics (lag)				
share of employed	0.043	0.008 ***	0.042	0.008 ***
share of unemployed	-0.018	0.015	-0.019	0.015
share of pensioners	-0.008	0.013	-0.008	0.013
Country dummies				
France	-0.018	0.004 ***	-0.020	0.004 ***
Spain	-0.005	0.006	-0.004	0.006
UK	-0.028	0.006 ***	-0.030	0.006 ***
France * post-recession dummy	-0.004	0.006	-0.001	0.006
Spain * post-recession dummy	0.018	0.008 **	0.017	0.008 **
UK * post-recession dummy	0.004	0.008	0.007	0.008
Number of observations	52173		52173	
Number of households	17391		17391	
Log likelihood value	-4.090E+08		-4.087E+08	
Test of joint significance	chi2(df)	pvalue	chi2(df)	pvalue
time averages	137.00(4)	0.000	141.90(8)	0.000
initial values and time averages	1255.56(8)	0.000	1255.38(16)	0.000
quintile (lag), initial values and time averages	5549.46(12)	0.000	5757.31(24)	0.000

*Note: estimates are weighted. Significance levels: *** p<0.01, ** p<0.05, * p<0.1. Standard errors are clustered at the household level. All specifications include first-year income quintile, time averages of the time-varying exogenous variables and a constant.*

5. Concluding remarks

In this paper, we fill in the gap of the literature on short-term income mobility caused by a shortage of analysis on whether and by how much income mobility has changed in the aftermath of the Great Recession. We give our contribution by exploiting the longitudinal samples of EU-SILC data on the periods 2005-2008 and 2012-2015 for France, Italy, Spain and the UK.

Our analysis provides evidence of reduced income mobility in the aftermath of the 2008 recession, at least in the short-term. We find that the reduction in income mobility is the result of three related developments. First, a slower income convergence process compared to pre-recession years; second, higher probability of income immobility; and third, stronger state dependence combined with an increased difficulty for household lying at the bottom of the income distribution to move upwards. Overall, education and employment status positively affect the likelihood of households to move up the income distribution. Future research should assess whether our results can be seen as transitory or permanent.

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