Session 1

BUDGETARY POLICIES AND INEQUALITY

FISCAL CONSOLIDATION AND INEQUALITY IN ADVANCED ECONOMIES: HOW ROBUST IS THE LINK?

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This paper examines the robustness of the link distributional effects of fiscal consolidation. Using a sample of 17 OECD countries over the period 1978-2009, we show that fiscal consolidations increase income inequality and lower wage income shares in the short and medium term. Our results are robust to the use of "traditional" methods of identifying fiscal episodes based on changes in the cyclically-adjusted primary balance (CAPB) as well as the policy-action narrative approach. They are also robust to the use of alternate sources for the data on income inequality.

"[we need a] fiscal policy that focuses not only on efficiency, but also on equity, particularly on fairness in sharing the burden of adjustment, and on protecting the weak and vulnerable."

Christine Lagarde (2012)

1 Introduction

Fiscal policy played a key role in the response to the global financial crisis. At the onset of the crisis, many G20 countries implement comprehensive support packages, mainly based on expenditure hikes, to try to stave off the crisis. Combined with the decline in tax revenues (as incomes fell), the increase in social spending (particularly unemployment benefits) and the costs of financial bailouts of banks and companies, the net result has been a sharp rise in government debt. Public debt rose on average from 70 per cent of GDP in 2007 to slightly over 100 per cent of GDP in 2014 – its highest level in 50 years (IMF, *Fiscal Monitor*, 2014a).

Concerned about the long-term sustainability of public finances, many governments across the world have turned to implementing budgetary consolidation measures. The effects of such fiscal consolidations on output remain a matter of some debate which revolves in part around the measurement of fiscal consolidation. Using the cyclically-adjusted primary balance (CAPB), some work suggests that fiscal consolidation could be expansionary (see, e.g., Alesina and Perotti, 1995; Alesina and Ardagna, 2010, 2012).[1] In contrast, using a narrative approach to measuring consolidation, Guajardo *et al.*, (2014) argue that consolidations are contractionary.

In addition to the aggregate effects of fiscal consolidations, the distributional impacts are also starting to receive attention. Many recent studies suggest that fiscal consolidation episodes are usually associated with increases in income inequality (Roe and Siegel, 2011; Ball, Leigh, Loungani, 2012; Furceri *et al.* 2013; Bova *et al.*, 2013; Agnello and Sousa, forthcoming; Agnello *et al.*, 2014).

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[1] In neoclassical models, fiscal policy affects economic activity by means of wealth effects, intertemporal substitution and distortions. If consolidation measures remove uncertainty with respect to fiscal sustainability (signaling tax cuts in the future and raising discounted disposable income), hence boosting confidence, then the negative impact on output may be limited or even give rise to an "expansionary fiscal contraction".

In this paper we examine the robustness of the link between fiscal consolidation and inequality. This is important for a couple of reasons. First, as noted above, the aggregate effects of fiscal consolidation appear to depend on how consolidation is measured. Are the distributional effects also sensitive to the measurement of consolidation?

Second, the measurement of inequality is also the subject of some controversy. Many of the studies use the Standardized World Income Inequality Database (SWIID). But there are concerns abut this data set because of the extensive use of interpolation and other assumptions to fill in missing data (Jenkins 2014). In light of this, we examine how robust the consolidation-inequality link is to the use alternate measures of inequality.

A third contribution of the paper is to revisit the issues of whether spending-based and tax-based consolidations have different effects on inequality and whether the consolidation-inequality link is symmetric (*i.e*., do fiscal *expansions* lower inequality?). Lastly, we carry out a number of technical robustness checks.

The remainder of the paper is organized as follows. Section 2 details the definitions and sources the data while Section 3 presents the econometric methodology. Section 4 analyses the main empirical findings and the last section concludes and discusses some policy considerations.

2 Data

2.1 Inequality and income shares

Many studies use the Standardized World Income Inequality Database (SWIID) because it provides long time-series of Gini coefficients for a large group of countries. But problems with comparability of data across years and countries, and with the imputation methodology used, have long been noted (see Atkinson and Brandolini, 2001) and have recently been reconfirmed in a comprehensive assessment by Jenkins (2014).

In light of such concerns, we test the robustness of the consolidation-inequality link using several measures of distributional outcomes. They comprise: (1) the Gini coefficient for disposable income (both gross and net concepts), taken from SWIID; (2) the shares of wage and profit in GDP, obtained from the OECD Analytical Database; (3) the Gini coefficient for disposable income retrieved from the OECD Stats; and (4) the combined "*all the Ginis*" index compiled by Branko Milanovic (2014) from merging several sources.[2]

2.2 Fiscal consolidation episodes

The literature addressing the identification of fiscal episodes is vast and has, for a long time, relied on changes in the cyclically adjusted primary balance (CAPB). Some caveats surrounding this approach have been highlighted recently. In particular, the CAPB approach could bias empirical estimates towards finding evidence of non-Keynesian effects (see Afonso and Jalles, 2014 for a recent study). Many non-policy factors, such as price fluctuations, influence the CAPB and can lead to erroneous conclusions regarding the presence of fiscal policy changes.[3] In addition, even when the CAPB accurately measures fiscal actions these include discretionary responses to economic developments, such as fiscal tightening to restrain rapid domestic demand growth.

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[2] Publicly available at: http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:22301380~menuPK:64 214916~pagePK:64214825~piPK:64214943~theSitePK:469382,00.html

[3] For example, a stock price boom raises the CAPB by increasing capital gains tax revenue, and also tends to coincide with an expansion in private domestic demand (Morris and Schuknecht, 2007).

With these considerations in mind, an alternative "narrative approach" is considered, which relies on the identification of fiscal episodes on the basis of concrete policy decisions. The episodes are identified by looking at IMF and OECD historical reports and by checking what countries intended to do at the time of publication.[4] This policy-action based approach makes use of descriptive historical facts that usually describe what happened to the deficit in a particular period but they do not go into the details of policy makers' intentions, discussions and congressional records. Proponents of this approach argue that the estimated size of the fiscal measures during the episodes identified have the advantage of not being affected by the cycle (since their construction is "bottom-up"), can minimize identification problems,[5] and are unlikely to imply risks of reverse causation (Guajardo *et al.*, 2014). That said, the narrative approach could also have some drawbacks: it largely relies on judgment calls, and it may not eliminate entirely endogeneity problems (*i.e.*, fiscal policy reacting to the output performance and not the other way around).

The analysis that follows thus relies on both the narrative and CAPB-based approaches. On the former, the analysis uses the publicly available dataset compiled by Devries *et al.* (2011) based on the policy-action based method for 17 advanced economies between 1978 and 2009.[6] On the latter, the analysis relies on:

i) Alesina and Ardagna (1998), who adopted a fiscal episode definition that allows that some stabilization periods may have only one year. More specifically, they consider the change in the primary cyclically adjusted budget balance that is at least 2 percentage points of GDP in one year or at least 1.5 percentage points on average in the last two years.

ii) Giavazzi and Pagano (1996), who decrease the probability of fiscal adjustment periods with only one year by using a limit of 3 percentage points of GDP for a single year consolidation. They proposed using the cumulative changes in the primary cyclically adjusted budget balance that are at least 5, 4, 3 percentage points of GDP in respectively 4, 3 or 2 years, or 3 percentage points in one year.

iii) Afonso (2010), who defines the occurrence of a fiscal episode when either the change in the primary cyclically adjusted balance is at least one and a half times the standard deviation (from the panel sample of 17 countries) in one year, or when the change in the primary cyclically adjusted balance is at least one standard deviation on average in the last two years.

Table 1 reports the fiscal episodes identified according to the above-mentioned four alternative methods. The number of fiscal contractions ranges from 29, in the approach proposed by Afonso (2010), to 43, using the approach from Alesina and Ardagna (1998). In the Devries *et al.*'s (2011) narrative approach the magnitude of the fiscal consolidation episode ranges between 0.1 per cent and about 5 per cent of GDP, with an average of about 1 per cent of GDP. Moreover, it reports a much higher number of years where fiscal contractions take place (171 years against an average of 70 for the CAPB approaches). For fiscal consolidations, the average duration of the reported fiscal episodes is, on average, 1.7 years for the CAPB approaches and around 3.8 years for the narrative approach. Moreover, the three CAPB-based methods essentially coincide in about 50 per cent of total number of years with those of the narrative approach.

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[4] Note, however, that this approach differs from the one used in Romer and Romer (2010), who identify exogenous tax policy changes by carefully analyzing US congressional documents.

[5] However, as Jorda and Taylor (2013) argue, fiscal shocks may not be exogenous and can be predicted.

[6] The countries are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, Portugal, Spain, Sweden, the United Kingdom and the United States.

Table 1

Fiscal Episodes Based on the Change in the Primary Cyclically-adjusted Budget Balance and on the Narrative Approach

Country	Devries *et al.* (2011)	Giavazzi and Pagano (1996)		Alesina and Ardagna (1998)		Afonso (2010)	
	Contractions	Expansions	Contractions	Expansions	Contractions	Expansions	Contractions
Australia	1985-88, 1994-99	2009	1987-88	1975, 2009	1987-88	2009	1987-88
Austria	1980-81, 1984, 1996-97, 2001-02,	1976, 2004	1997	1976, 2004	1984, 1997, 2001, 2005	2004	1984, 1997, 2001, 2005
Belgium	1982-87, 1990-97	1981, 2005, 2009	1982-87	1981, 2005, 2009	1982-85, 1993, 2006	1981, 2005, 2009	1982-85
Canada	1984-97	1975, 1977-78, 2002, 2009	1987, 1996-98	1977, 2001-02, 2009	1981, 1986-87, 1996-97	1975, 2009	1987, 1996-97
Denmark	1983-86, 1995	1975-76, 1982, 1991, 2010	1983-87	1975-76, 1982, 1990-91, 1994, 2009-10	1983-86	1975-76, 1982, 1991, 2010	1983-86
Finland	1992-97	1979-80, 1991-93, 2010	1976-77, 1997-98, 2000-1	1978-79, 1987, 1991-92, 2009-10	1976-77, 1981, 1984, 1988, 1996-97, 2000-01	1978-79, 1987, 1991-92, 2010	1976-77, 1996-97, 2000-01
France	1987-92, 1995-2000	2009-10		2009-10		2009-10	
Germany	1982-84, 1991-2000, 2003-07	1975, 1991, 2001-03		1975, 1990-91, 2001-02		1975, 1990-91, 2001-02	
Ireland	1982-88, 2009	1975, 1979, 2001-03, 2007-10	1976-77, 1983-86, 1988-9, 2010	1974-75, 1978-79, 1995, 2001-02, 2007-09	1976-77, 1983-84, 1988, 2010	1974-75, 1978-79, 2001-02, 2007-09	1976-77, 1983-84, 1988, 2010

Table 1 (continued)

Fiscal Episodes Based on the Change in the Primary Cyclically-adjusted Budget Balance and on the Narrative Approach

Italy	1991-98, 2004-07	2001	1977, 1982-83, 1992-94	1981, 2001	1977, 1982-83, 1992-93	1981, 2001	1977, 1982-83, 1992-93
Japan	1980-83, 1997-98, 2003-07	1993-95, 1998 2009-10	1998-2000, 2005-07	1975, 1994-95, 1998, 2009-10	1998-99, 2005-06	1993-94, 1998, 2009-10	1999-00, 2006-07
Netherlands	1981-88, 1991-93, 2004-05	2002, 2010	1991, 1993	2001-02, 2009-10	1991, 1993	2002, 2009-10	1991
Portugal	1983, 2000-07	1978-80, 2005, 2009-10	1977, 1983-84, 1986	1978-79, 1985, 1990, 1993, 2005, 2009-10	1977, 1983-84, 1986, 1988, 1992, 1995, 2006	1978-79, 1993, 2005, 2009-10	1977, 1983-84, 1986, 1988, 1992
Spain	1983-84, 1989-97	2008-10	1987	2008-09	1986, 1987, 2010	2008-09	1987
Sweden	1984, 1993-98	1974, 1979-80, 1991-94, 2002-03	1984, 1987, 1996-99	1974, 1979, 1991-93, 2002-03, 2010	1976, 1983-84, 1987, 1996-97	1974, 1979, 1991-93, 2002	1984, 1987, 1996-97
United Kingdom	1980-82, 1994-99	1972-75, 1992-94, 2001-04, 2009-10	1981-82, 1997-2000	1972-73, 1990, 1992-93, 2001-02, 2009-2010	1981, 1997-98, 2000	1972-73, 1992-93, 2001-03, 2009-10	1981, 1997-98
United States	1980-81, 1985-8	2001-02, 2007-10		2001-02, 2007-08		1974, 2001-02, 2007-08	
Years with episodes	171	95	73	95	79	78	59
Average duration (years)	3.8	2.0	2.1	1.6	1.5	1.6	1.6

Notes: all measures computed by the authors, except the Devries *et al.* (2011) one. See main text for definitions.

3 Methodology

To estimate the distributional impact of fiscal consolidation episodes over the short and medium run, we follow the method proposed by Jorda (2005) which consists of estimating impulse response functions directly from local projections. For each period *k* the following equation is estimated on annual data:

$$G_{i,t+k} - G_{i,t} = \alpha_i^k + Time_t^k + \sum_{j=1}^{l} \gamma_j^k \Delta G_{i,t-j} + \beta_k D_{i,t} + \varepsilon_{i,t}^k \quad (1)$$

with *k=1,…,8* and where *G* represents one of our measures of distributional outcomes; $D_{i,t.}$ is a dummy variable that takes the value equal to 1 for the starting date of a consolidation episode incountry *i* at time *t* and is 0 otherwise; α_i^k are country-fixed effects; $Time_t^k$ is a time trend; and β_k measures the distributional impact of fiscal consolidation episodes for each future period *k*. Since fixed effects are included in the regression the dynamic impact of consolidation episodes should be interpreted as compared to a baseline country-specific trend. In the main results, the lag length (*l*) is set at 2, even if the results are extremely robust to different numbers of lags included in the specification (see robustness checks and sensitivity presented in the next section). Equation (1) is estimated using the panel-corrected standard error (PCSE) estimator (Beck and Katz, 1995).

Impulse response functions are obtained by plotting the estimated β_k for *k*= 1,…,8, with confidence bands computed using the standard deviations of the estimated coefficients β_k. While the presence of a lagged dependent variable and country fixed effects may in principle bias the estimation of γ_j^k and β_k in small samples (Nickell, 1981), the length of the time dimension mitigates this concern.[7] Reverse causality is addressed by estimating the distributional effect in the years that follow a fiscal consolidation episode. In addition, robustness checks for endogeneity confirm the validity of the results.

An alternative way of estimating the dynamic impact of fiscal consolidation episodes is to estimate an ARDL equation of changes in inequality and consolidation episodes and to compute the IRFs from the estimated coefficients (Romer and Romer, 1989; and Cerra and Saxena, 2008). However, the IRFs derived using this approach tend to be sensitive to the choice of the number of lags this making the IRFs potentially unstable. In addition, the significance of long-lasting effects with ARDL models can be simply driven by the use of one-type-of-shock models (Cai and Den Haan, 2009). This is particularly true when the dependent variable is highly persistent, as in our analysis. In contrast, the approach used here does not suffer from these problems because the coefficients associated with the lags of the change in the dependent variable enter only as control variables and are not used to derive the IRFs, and since the structure of the equation does not impose permanent effects. Finally, confidence bands associated with the estimated IRFs are easily computed using the standard deviations of the estimated coefficients and Monte Carlo simulations are not required.

4 Empirical results

4.1 Gini coefficient for disposable income

The impacts of fiscal consolidation (using Devries *et al.* (2011) narrative approach to identifying episodes) on the four alternative definitions of the Gini index are shown in Figure 1. Each figure shows the estimated impulse response function and the associated one standard error bands (dotted lines). The horizontal axis measures years after the start of the episode of fiscal consolidation.

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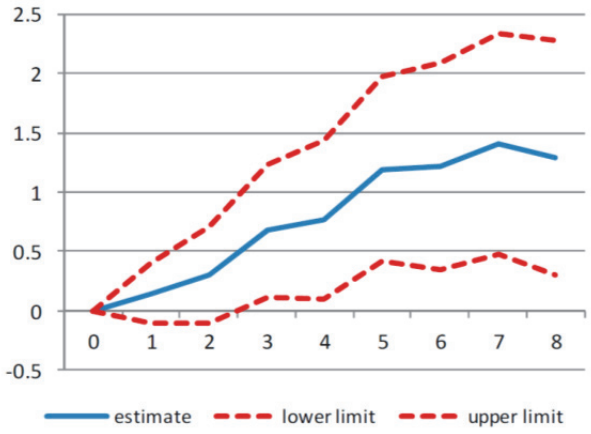
[7] The finite sample bias is in order of 1/*T*, where *T* in our sample is 32.

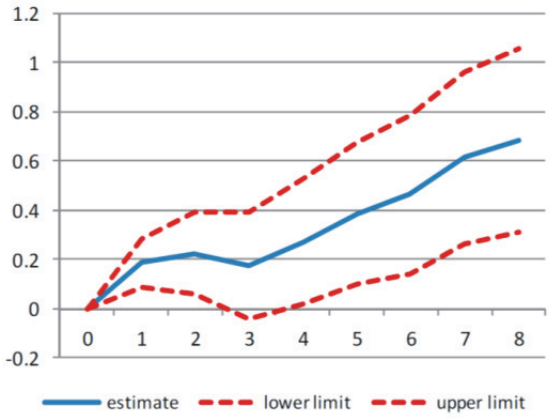
Figure 1

Impact of Fiscal Consolidation on Inequality-comparing Different Gini Indices

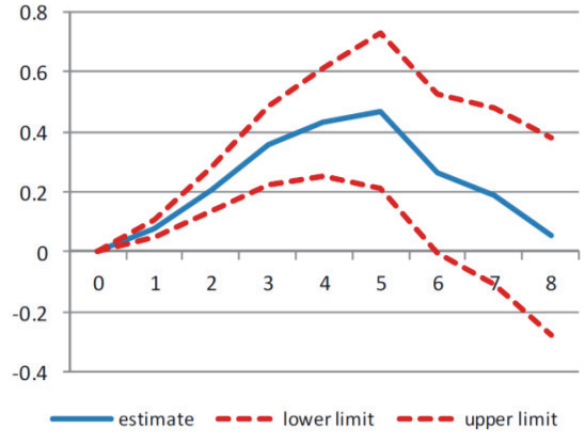
a).SWIID Gross Gini Index (Interpolated)



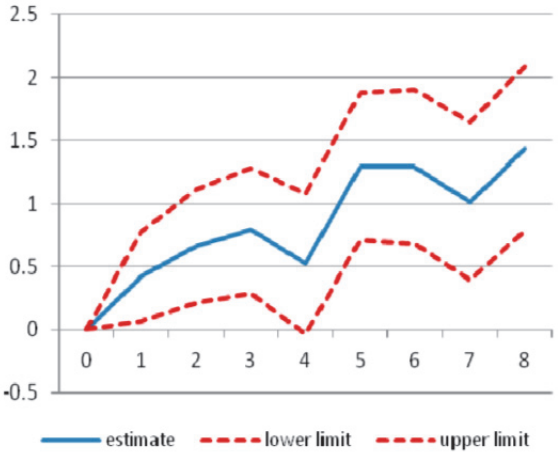
b).SWIID Net Gini Index (Interpolated)



c) OECD Gini Index (Interpolated)



d).Milanovic's *All Ginis* Index (Interpolated)



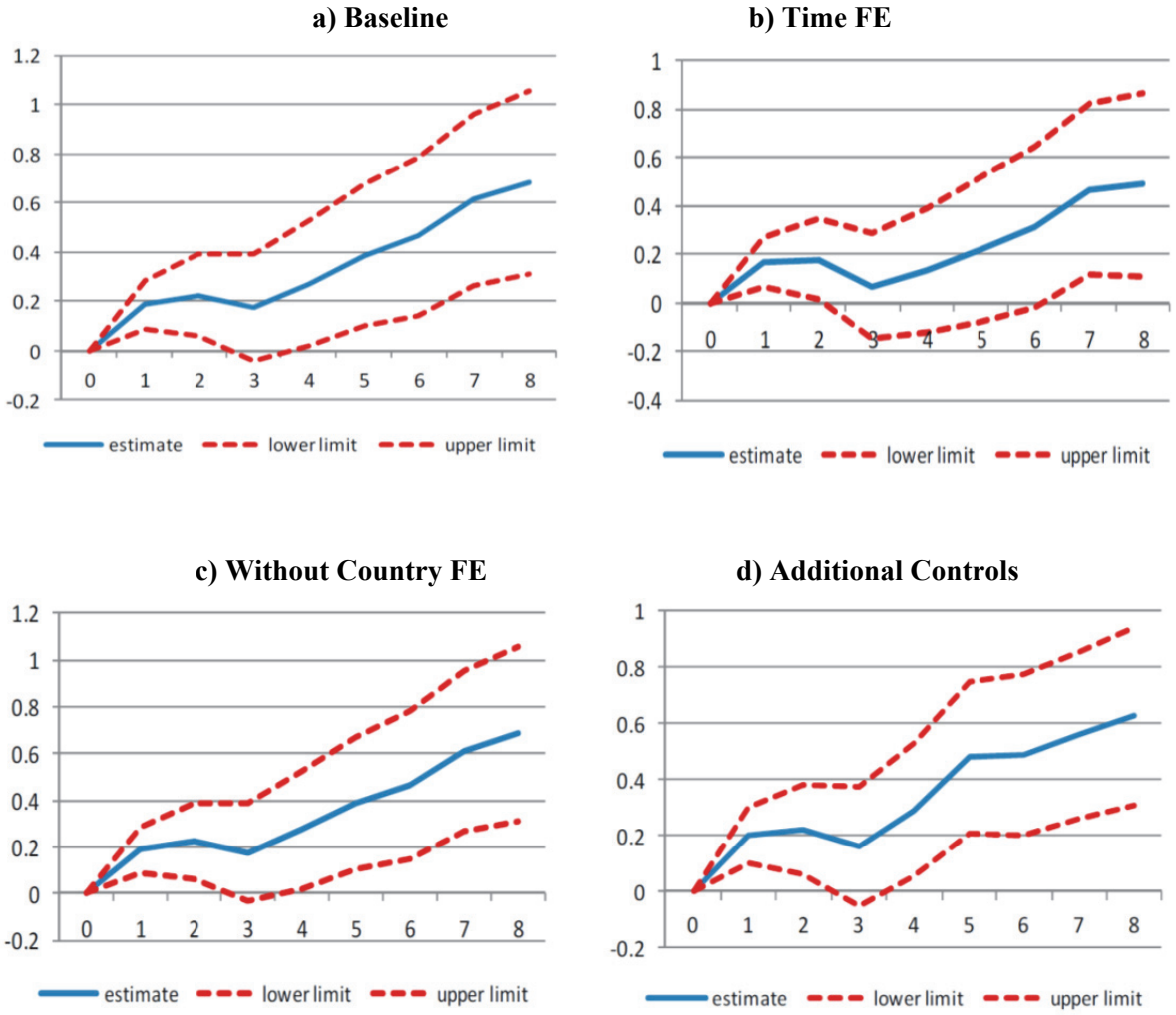
Note: Dotted lines equal one standard error confidence bands. See main text for more details.

In general, fiscal consolidation is followed by a persistent rise in income inequality. The Gini index increases by an average (across different proxies) of about 0.2 per cent in the short term (one year after the occurrence of the consolidation episode) and by nearly 0.9 per cent in the medium term (eight years after the occurrence of the consolidation episode). This is consistent with Agnello and Sousa (forthcoming) who find that fiscal consolidations lead to a short-term increase in the Gini of about 0.3 per cent.

The results of several additional robustness checks are shown in Figure 2. These results are shown for one particular measure of inequality, the SWIID net Gini index but similar findings hold for the other measures as well. First, equation (1) is re-estimated by including time fixed effects to control for specific time shocks, such as those affecting world interest rates. The results for this specification remain statistically significant and broadly unchanged (Figure 2 panel (b)).

Figure 2

Sensitivity and Robustness: Different Set of Regressors Using SWIID Net Gini Index (Interpolated)



Note: Dotted lines equal one standard error confidence bands. See main text for more details.

As shown by Tuelings and Zubanov (2010), a possible bias from estimating Equation (1) using country-fixed effects is that the error term of the equation may have a non-zero expected value, due to the interaction of fixed effects and country-specific arrival rates of consolidation episodes. This would lead to a bias in the estimates that is a function of *k*. To address this issue and check the robustness of our findings, Equation (1) was re-estimated by excluding country fixed effects from the analysis. The results reported in Figure 2 panel (c) suggest that this bias is negligible (the difference in the point estimate is small and not statistically significant).

Estimates of the impact of consolidation on inequality could be biased because of endogeneity, as unobserved factors influencing the dynamics of the Gini coefficient may also affect the probability of the occurrence of a consolidation episode. In particular, a significant deterioriation in economic activity, which would affect unemployment and inequality, may determine an increase in the public debt ratio via automatic stabilizers, and therefore increase the

Table 2

Panel Estimations of different Gini indices

Specification	SWIID Gini Index, Gross	SWIID Gini Index, Net	OECD Gini Index	Milanovic's *All Ginis* Index
Baseline	1.332** (0.646)	0.585** (0.297)	0.595*** (0.185)	1.491*** (0.418)
Robustness				
Time FE	0.672	0.241	0.598***	1.822***
	(0.631)	*(0.293)*	*(0.195)*	*(0.544)*
Without country FE	1.392**	0.564*	0.453*	1.478***
	(0.640)	*(0.301)*	*(0.263)*	*(0.459)*
Additional controls	0.915	0.487	0.685***	1.729***
	(0.699)	*(0.313)*	*(0.219)*	*(0.476)*

Note: The dependent variable is the 5th year forward difference of the corresponding inequality proxy as identified in the first row. The coefficients presented in the table denote the estimates of the consolidation episode (narrative approach). Each entry corresponds to an independent regression where non-relevant regressors (including a constant term) are omitted for reasons of parsimony. Robust standard errors are in parenthesis. *, **, *** denote statistical significance at the 10, 5 and 1% levels, respectively.

probability of consolidation. To address this issue, Equation (1) was augmented to control for: i) contemporaneous and past crises episodes (banking, debt and currency crises); ii) change in economic activity (proxied by real GDP growth); iii) change in total unemployment rate. The results of this exercise are reported in Figure 2 panel (d) and confirm the robustness of the previous findings.

As an additional sensitivity check, Equation (1) was re-estimated for different lags (l) of changes in the Gini coefficient. The results confirm that previous findings are not sensitive to the choice of the number of lags (results are not shown for reasons of parsimony but are available upon request).

Finally, as noted earlier, another concern is that the different Gini alternatives use interpolations where there are gaps in the inequality data. While this adds to the number of observations, it also adds some concerns about data quality. We have therefore used raw data and estimated panel regressions with the fifth forward difference of the relevant Gini index as the dependent variable. We find that the results are very robust (Table 2). Moreover, these results are also robust to a number of more technical checks as shown in the table, including: the inclusion of time fixed effects; the exclusion of country fixed effects; and inclusion of a different set of control variables in the estimated regressions.

4.2 The role of the composition of consolidation packages: spending vs. tax-based

Does the composition of fiscal consolidation (spending versus taxes-based) matter for inequality? There is a broad consensus in the literature that taxes-based consolidations are typically more contractionary than spending-based ones, particularly over the medium term (Alesina and Ardagna, 2010; IMF, 2010a). In normal times, spending cuts tend to be more successful in enhancing economic growth than tax increases (Alesina and Perotti, 1995; Alesina and Ardagna, 2012) because the former are generally perceived as more credible by economic agents (Hernández

de Cos and Moral-Benito, 2012).[8] At the same time, however, most of the direct redistributive impact of fiscal policy in advanced economies has been achieved through the expenditure side of the budget – especially non-means-tested transfers (Bastagli *et al.*, 2012). Therefore, whether taxes-based or spending-based consolidations are more harmful for income inequality is not a priori clear.

In order to test this hypothesis, Equation (1) is separately estimated for taxes and spending-based adjustments, by constructing starting dummies of taxes and spending consolidation episodes (in the Devries *et al.* (2011) dataset the average magnitude of both spending and taxes-based consolidation is about 1 per cent of GDP). The results presented in Figure 2, panel A for a selected measure of income inequality, namely the SWIID net Gini index (though results are consistent across alternative proxies), show that spending and tax-based programs have similar effect over the short and medium term. This result however has to be treated with caution given that most of past fiscal adjustments have involved both spending cuts and tax increases. In order to address this issue, following Guajardo *et al.* (2014), Equation (1) is separately estimated for: i) episodes where taxes-based adjustments have been larger than spending adjustments; ii) episodes where spending adjustments have been larger than tax based adjustments. These correspond to the "alternative definition" of tax and spending-based consolidations. The results obtained with this exercise suggest that spending-based consolidations tend to have larger effects – Figure 3, panel B. In particular, the short (medium)-term effect of fiscal consolidations on income inequality is about 0.24 (1.05) per cent after one (eight) year(s) for spending-based consolidations and 0.09 (0.13) per cent respectively for tax-based ones.[9]

4.3 Wage versus profit and rent income

Another way to assess the distribution effects of fiscal consolidation measures is to look at the effect of fiscal consolidations on different types of income. A traditional way of splitting total income is into wages, profits and rents. This harks back to times when the roles of workers, capitalists and landlords were fairly distinct. While these distinctions have eroded somewhat over time, the split between wages and other forms of income represents a starting point for describing how income is divided between the *Main Street* and *Wall Street*. To assess the effects of fiscal consolidations on the distribution of income between wage earners and others, Equation (1) is estimated for the share of wage income in GDP and the share of profits in GDP.

The results of this empirical exercise are reported in Figure 4.a and 4.b respectively for wage and profits. They suggest that fiscal consolidation measures typically reduce the slice of the pie going to wage earners and increase the slice of the pie going to profit recipients. These findings are consistent with the results resulted in panels B of these two figures which suggest that fiscal consolidations have a larger negative effect on the level of (inflation-adjusted) wage income than on the level of (inflation-adjusted) profit and rent incomes. Moreover, as before, spending-based adjustments seem to be the most detrimental, at least as far as wage incomes are concerned. In the case of profits such distinction does not matter much as evidenced by confidence bands above and below the horizontal axis.

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[8] The majority of the empirical literature also supports the view that expenditure-driven consolidations increase the likelihood of success of the episode of adjustment (see, e.g., Giavazzi and Pagano, 1996; McDermott and Wescot, 1996; Alesina and Ardagna, 1998; and Giavazzi *et al.*, 2000). There is also evidence that consolidations and particularly reductions in public expenditure can contribute to reducing sovereign debt spreads, and therefore the cost of servicing sovereign debt (Akitoby and Stratmann, 2006).

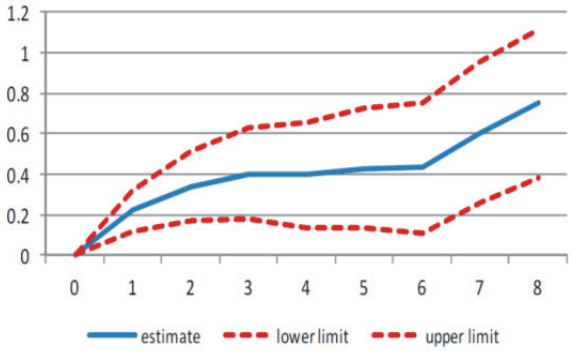
[9] It must be recognized that also this approach is imperfect. Indeed, to properly differentiate between spending versus tax-based consolidations one should consider episodes characterized by only spending or taxes-based adjustments. This however would dramatically reduce the number of "pure" spending and taxes-based consolidations in our sample.

Figure 3

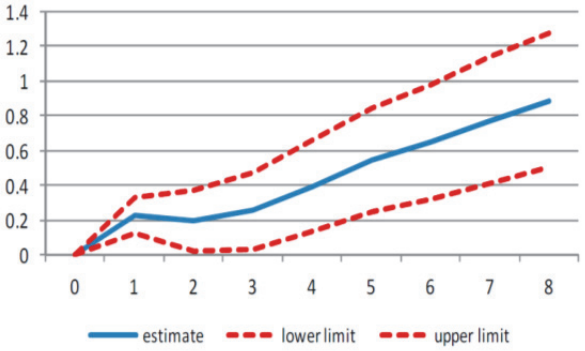
Composition of Fiscal Adjustments Using SWIID Net Gini Index (Interpolated): Tax vs. Spending Based

Panel A

Standard Definition, Spending Based

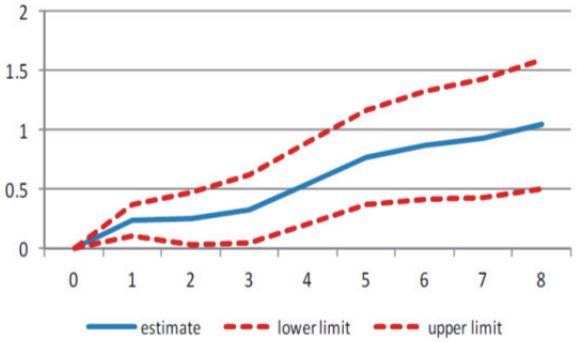


Standard Definition, Tax Based

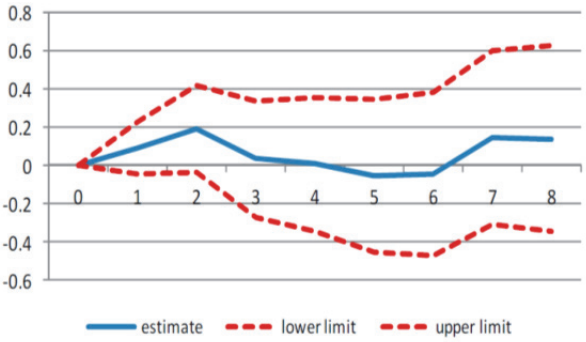


Panel B

Alternative Definition, Spending Based



Alternative Definition, Tax Based



Note: Dotted lines equal one standard error confidence bands. See main text for more details.
The standard definition denotes starting date dummies of taxes and spending consolidation episodes. Because most of past fiscal adjustments have involved both spending and taxes-based measures, we follow Guajardo *et al.* (2011) and redefine the dummies as follows: i) episodes where taxes-based adjustments have been larger than spending adjustments; ii) episodes where spending adjustments have been larger than taxes-based adjustments. This corresponds to the alternative definition.

4.4 Narrative approach vs. CAPB-based methods to identifying fiscal episodes

So far we have based our results on the use of the Devries *et al.* (2011) narrative approach dataset. What if we use the "traditional" method of identifying fiscal episodes using changes in the CAPB. Taking the three alternative approaches detailed in Section 2 and estimating Equation (1) for the SWIID net Gini index (though results are consistent across alternative proxies) gives the IRFs displayed in Figure 5. In general, we still find that fiscal consolidations lead to an increase in income inequality irrespectively of the approach under scrutiny.

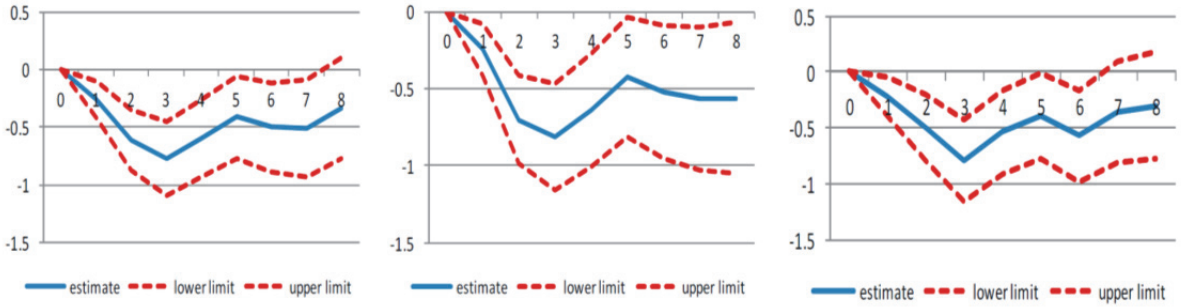
Picking one approach, say Afonso's (2010), one can observe in Figure 6 that our previous results are invariant to the choice of the dependent variable, *i.e.*, the source of the Gini index employed.[10]

[10] Using either Giavazzi and Pagano (1996) or Alesina and Ardagna (1998) instead does not qualitatively change our results.

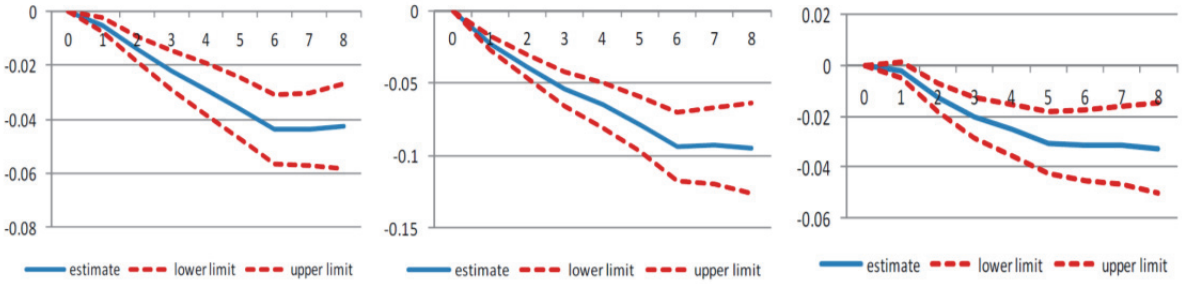
Figure 4.a

The Impact of Fiscal Consolidations on Wage Income

Panel A, Income
(percent of GDP)



Panel B, Income
(percent change)



Note: Dotted lines equal one standard error confidence bands. See main text for more details.

4.5 What about fiscal expansions?

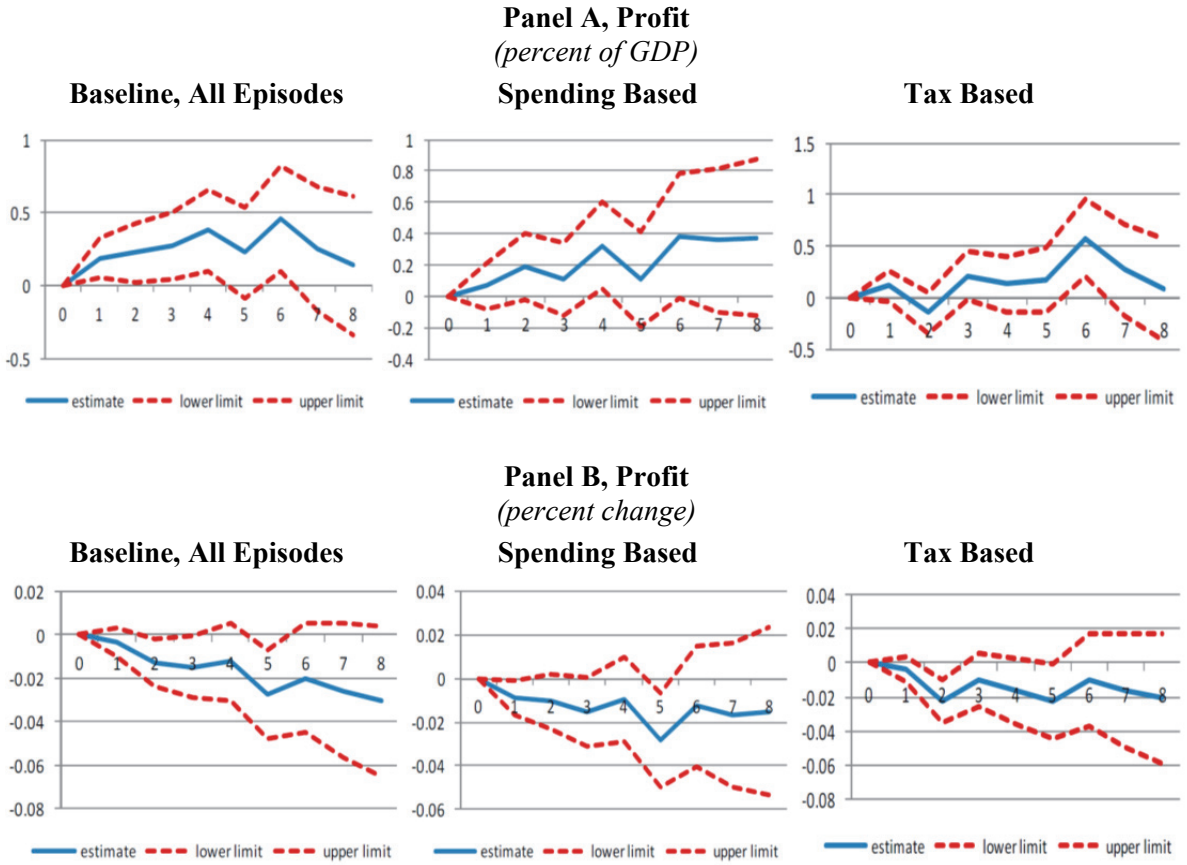
A final aspect is the following: to what extent is there symmetry in our results when one considers a fiscal expansion instead of a fiscal consolidation? In this case, only the CAPB-based methods can provide us with a tentative answer. Re-estimating Equation (1) and constructing a figure analogous to Figure 5 where now our $D_{i,t.}$ denotes the starting year of a fiscal expansion episode, yields the IRFs displayed in Figure 7. Results seem to suggest that the fiscal expansions lower inequality, but the impact is generally short-lived, dissipating after 2-3 years. This finding holds when using the SWIID net Gini index as well as the Milanovic's *all Ginis* index, but not in the case of the SWIID gross Gini index or the OECD Gini index – see Figure 8.

5 Concluding remarks and policy considerations

We find, for a sample of 17 OECD countries over the period 1978-2009, that fiscal consolidations tend to lead to an increase in income inequality in the short and medium term.

Figure 4.b

The Impact of Fiscal Consolidations on Profit Income



Note: Dotted lines equal one standard error confidence bands. See main text for more details.

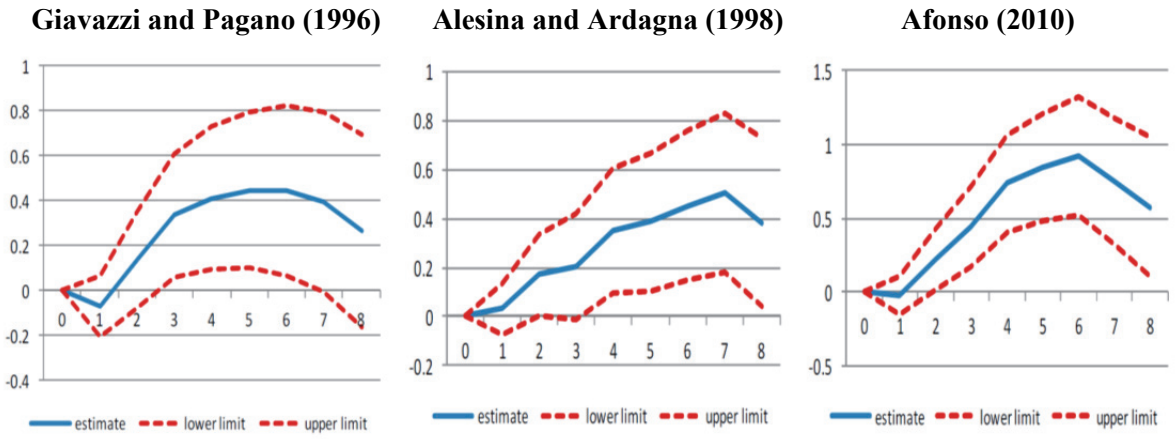
Typical fiscal consolidations lead to an increase in income inequality in the order of 0.2-1 per cent over the short and medium term. This main finding of our paper is robust to the use of alternate measures of consolidation (in particular the 'traditional' methods of identifying fiscal episodes based on changes in the cyclically-adjusted primary balance, CAPB) and to the use of alternate measures and sources of inequality data. The main finding is also robust to a vast array of technical checks such as inclusion of time fixed effects, the exclusion of country fixed effects, and inclusion of different sets of control variables. We also find that more work is needed to sort out the differences between tax-based and spending-based fiscal adjustments and on whether the consolidation-inequality link is symmetric.

Our findings do not imply that countries should not undertake fiscal consolidation. The results do suggest however that the benefits of fiscal adjustments should be weighed against their likely distributional impact. Many governments assign some weight to distributional outcomes and, as discussed in other chapters of the book, may have the flexibility to design the consolidation in a way that mitigates at least some of the distributional impacts. History shows that fiscal plans succeed when they permit "some flexibility while credibly preserving the medium term consolidation objectives" (IMF, 2010b; Mauro, 2011).[11] In general, the distributional effects of

[11] For instance, plans could specify that unemployment benefits would be shielded from cuts in the event of slower growth than assumed in the plan.

Figure 5

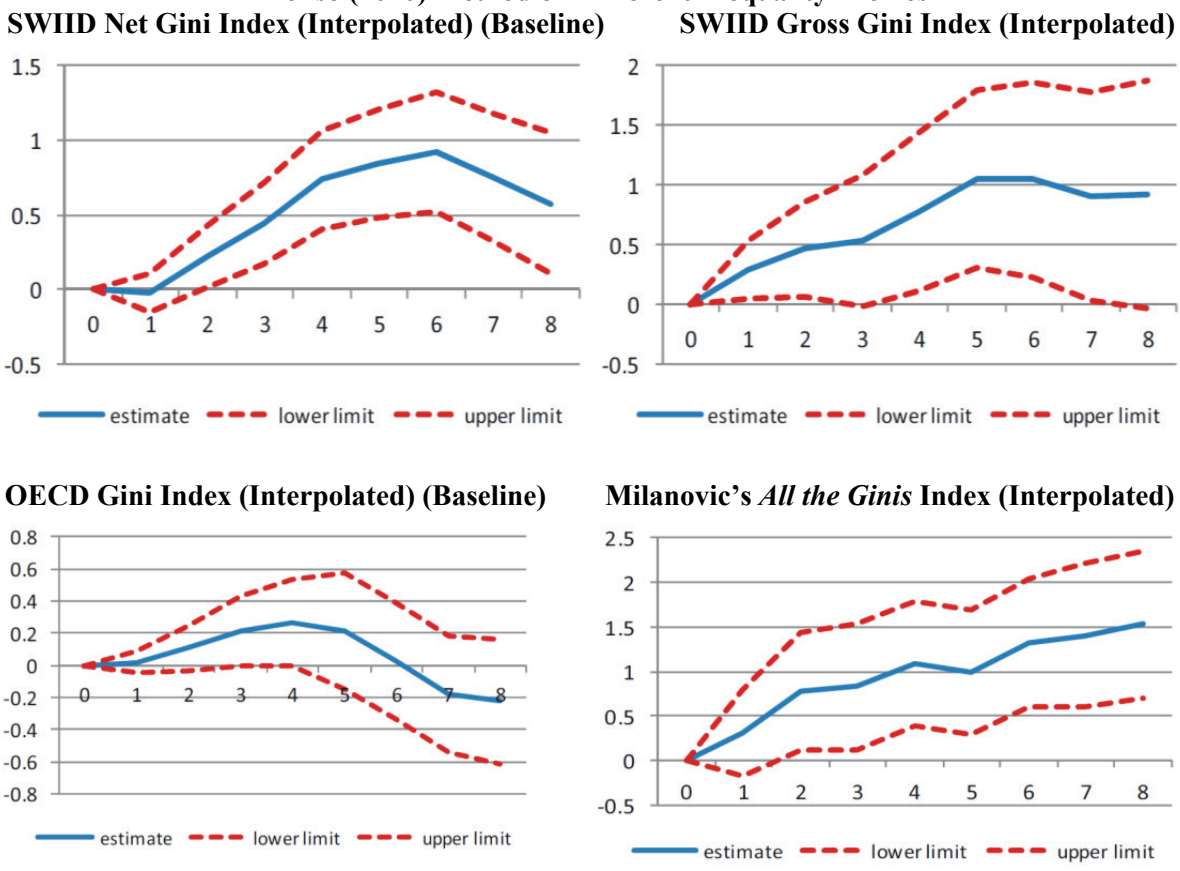
CAPB-based Identification of Fiscal Adjustments
Comparing 3 methods, SWIID Net Gini Index (Interpolated) (Baseline)



Note: Dotted lines equal one standard error confidence bands. See main text for more details.

Figure 6

Afonso (2010) Method on Different Inequality Proxies

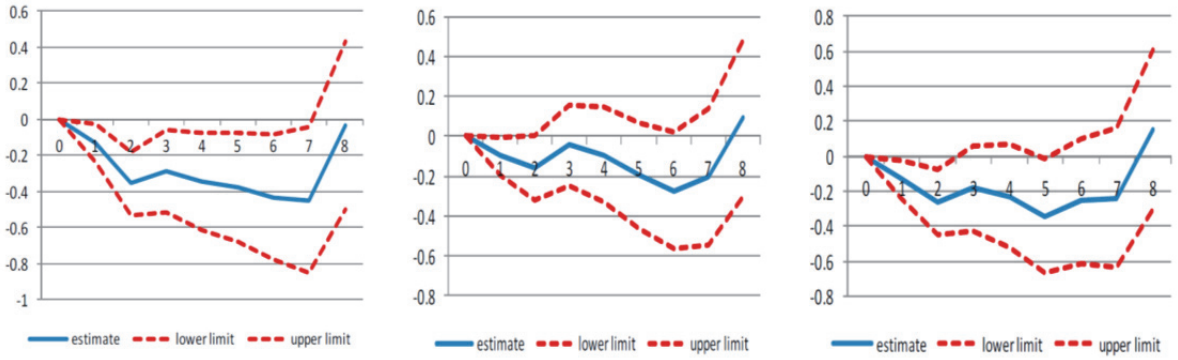


Note: Dotted lines equal one standard error confidence bands. See main text for more details.

Figure 7

CAPB-based Identification of Fiscal Expansions
Comparing 3 Methods, SWIID Net Gini Index (Interpolated) (Baseline)

Giavazzi and Pagano (1996) **Alesina and Ardagna (1998)** **Afonso (2010)**

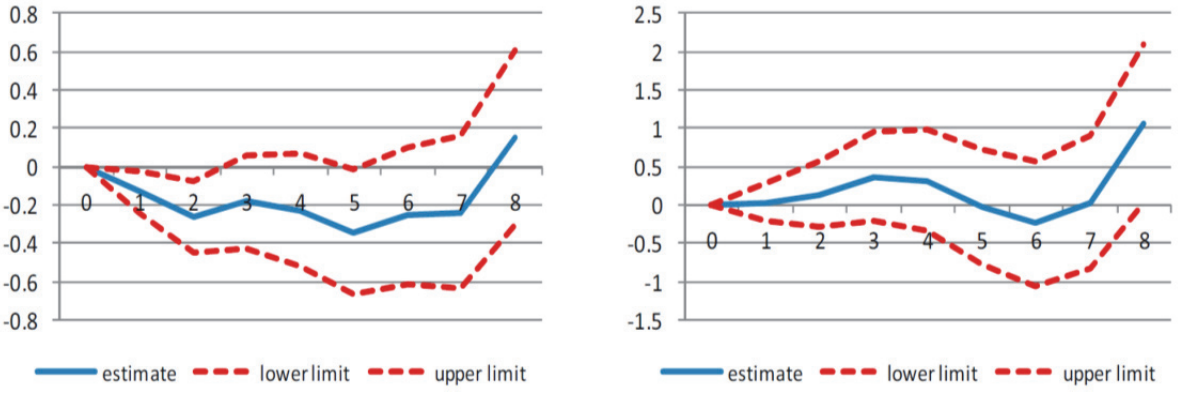


Note: Dotted lines equal one standard error confidence bands. See main text for more details.

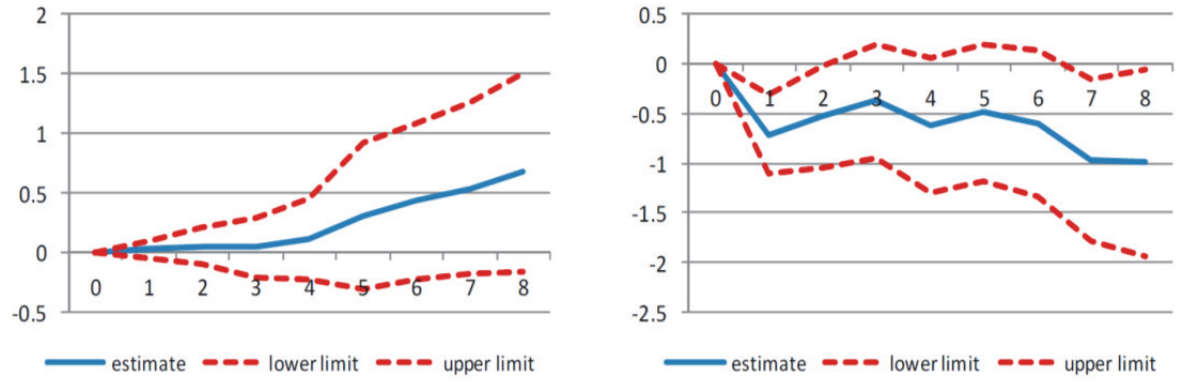
Figure 8

Fiscal Expansions: Afonso (2010) Method on Different Inequality Proxies

SWIID Net Gini Index (Interpolated) (Baseline) **SWIID Gross Gini Index (Interpolated)**



OECD Gini Index (Interpolated) (Baseline) **Milanovic's *All the Ginis* Index (Interpolated)**



Note: Dotted lines equal one standard error confidence bands. See main text for more details.

consolidation must be balanced against the potential longer term benefits that consolidation can confer benefits as interest rates decline and the lighter burden of interest payments permits cuts in distortionary taxes.

As noted in IMF (2013), the results on the impact of consolidation on equity "strengthens the case for better targeting of both spending and revenue measures." Specifically, the paper notes that "equity considerations suggest that a larger share of the adjustment burden could be borne by the rich, which could be achieved through revenue measures targeted at the higher income segments of the population. Revenue increases can therefore be an important component of consolidation packages, even in countries where the adjustment should focus on the expenditure side, as in a number of European countries. However, better targeted spending can also help achieve equity objectives, though there may be a trade-off between growth and equity concerns when choosing consolidation measures."

Overall, our results bolster the IMF's general fiscal policy advice to advanced economies. At the onset of the Great Recession, the IMF played a key role in making the case for – and helping coordinate through the auspices of the G20 – a coordinated global fiscal stimulus (Spilimbergo *et al.*, 2008). Since many governments entered the crisis with high debt-to-GDP ratios, attention turned to consolidation once financial conditions started to stabilize. But cognizant of the adverse impact of fiscal consolidation on growth (IMF, 2010b), the policy stance has been to support "a case-by- case assessment of what is an appropriate pace of consolidation" and to emphasize the need "to make fiscal policy more growth-friendly" (Lipton, 2013). The results here bolster that policy stance by suggesting that not only does consolidation lower aggregate incomes in the economy, but it adds to the pain of those who are likely to be already suffering the most – the people in lower income deciles.

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COMMENT TO "FISCAL CONSOLIDATION AND INEQUALITY IN ADVANCED ECONOMIES: HOW ROBUST IS THE LINK?" BY DAVIDE FURCERI, JOÃO TOVAR JALLES AND PRAKASH LOUNGANI

Jan Babecký[*]

The paper deals with a topical issue of distributional effects of fiscal consolidation. The objective of the paper is to test a nexus between fiscal consolidation and inequality in a group of 17 OECD economies during the period 1978-2009 employing two alternative measures of consolidation such as the Cyclically Adjusted Primary Balance (CAPB) and the narrative approach, several alternative measures of inequality, and distinguishing between expenditure-based and tax-based consolidations.

The main contributions of the paper are the following:

A robust result emerges: fiscal consolidations increase income inequality in the short and medium term. This link holds with respect to the alternative measures of fiscal consolidations – CAPB and the narrative approach by Devries *et al.* (2011) – as well as for the alternative inequality indicators such as the Gini coefficient for disposable income (taken from the alternative sources: the Standardized World Income Inequality Database, SWIID, and from the OECD database), the share of wage and profit in GDP (OECD) and the combined "all the Ginis" indicator (Milanovic, 2014).

Concerning tax- versus expenditure-based consolidations, some evidence is found for stronger effects of expenditure -based consolidations.

Regarding the link between fiscal expansion and consolidation (CAPB), fiscal expansion is found to lower inequality in the short run, although this is valid for two measures only (the Gini coefficient from the SWIID and "all Ginis" by Milanovic, 2014).

Overall, fiscal consolidations are found to be associated with raising income inequality (by about 0.2-1.0 per cent in the short- and medium-term).

My comments and suggestions are mainly aimed at making the paper more accessible to a general reader, who is not an expert on the topic studied.

A first suggestion would be to comment on a link between inequality and wealth (or on the underlying assumption) and elaborate on motivation, which is mainly explained in the concluding section.

A second suggestion would be to add a literature review section. In particular, it would be useful to discuss the existing methodological approaches on assessing a link between fiscal consolidation and inequality and explain why the method by Jorda (2005) is chosen in this paper. What are its pros and cons? What are other popular methodological approaches (e.g., those used in the cited studies)? Why the approach by Jorda (2005) is particularly useful?

Third, the authors might wish to discuss their choice of countries and mention the specific features of the OECD-17 group. It would be useful to provide some stylized facts, for example, correlation between wealth (income per capita) and inequality (the Gini coefficient) in the sample countries. Is there any link? To facilitate the interpretation of the results for a general reader, the authors could also comment on how big is a "0.2-1.0 per cent increase in Gini"? Is it perceivable in practical terms? It would be useful to provide some benchmark.

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[*] Czech National Bank.

Fourth, more details on the data and estimations could be provided. In particular, what are the time series properties of the data used in equation (1)? The assumption of a linear time trend is used. How is it valid during the crisis period? What is the degree of persistence of the dependent variable? ("the dependent variable is highly persistent"). It would be useful to provide numbers.

Relatedly, the authors could perform poolability tests, to assess whether 17 countries represent a homogenous group, and provide diagnostic tests for regressions. To ensure that the results of the study are not driven by country-specific outliers, it would be helpful to plot the estimation residuals.

Fifth, on the conceptual side, it could be discussed how to separate the effects of shocks and fiscal consolidations, in particular in small open economies. Some of these shocks (e.g. shocks to expenditures/taxes) are not are not always exogenous, but might represent a result of another factors (external shocks), eventually also a changing legislation. One practical way to address this issue would be to perform robustness check sto the sample composition (e.g. group countries by income and by the degree of openness) and time period (e.g., check how sensitive the results are to the inclusion of the recent crisis – the sample ends in 2009).

Finally, a reader might wonder if there is an answer to the call stated in the epigraph: "[we need] a fiscal policy that focuses not only on efficiency but also on equity, particular on fairness".

Are there examples of such fiscal policy, e.g. in some of the countries covered by the study?

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FUNCTIONAL INCOME DISTRIBUTION AND ITS ROLE IN EXPLAINING INEQUALITY

Maura Francese[*] *and Carlos Mulas-Granados*[*]

This paper is motivated by two parallel trends at the center of the policy debate – the declining labor share of income and increasing income inequality. We use samples drawn from both household surveys and macroeconomic data, covering up to 93 advanced, emerging and developing countries between 1970 and 2013, and assess whether the declining labor share of income has been a key factor driving growing inequality. The major conclusion is that the most important determinant of income inequality is not the share of the labor income, but inequality in wages, which has increased notably in the recent past. Behind the increase in the dispersion of wages, we find that financial globalization has played an important role. Industry unionization, higher educational attainment and larger welfare states help reduce wage dispersion.

1 Introduction

In the years preceding the crisis, analysts and policy makers have wondered about diverging trends between aggregate measures of economic performance (such as economic growth) and stagnating wages and household incomes. This also revived public interest in the issue of whether capital was receiving too high a share of the economic pie.[1] In 2006 Ben Bernanke, the Chairman of the Federal Reserve, expressed the hope that "corporations would use some of those profit margins to meet demands from workers for higher wages" and in 2007, Germany's finance minister asked European companies to "give a fairer share of their soaring profits."[2] Interest in these contrasting trends has deepened since the onset of the financial crisis. It has been driven in part by the rescue of financial institutions by many governments juxtaposed with rising unemployment and inequality.[3]

A brief examination of the time series of income inequality (measured by the Gini index) and the labor share of income[4] in Group of Seven countries shows that the wage share has indeed been declining since the 1970s while inequality has been on the rise (Figure 1). On average, the wage share declined by 12 percent while income inequality increased by 25 percent in some advanced economies in barely three decades.

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[*] International Monetary Fund.

The authors wish to thank Andrea Brandolini, Benedict Clements, and Sanjeev Gupta for their helpful comments and suggestions. They are also grateful to participants at the Fiscal Affairs Department seminar and at the 17th Banca d'Italia Workshop on Public Finance (Perugia, April 9-11, 2015) for their valuable feedback and to IMF colleagues for their comments. Ryan Espiritu and Louis Sears provided excellent research assistance. The views expressed in this paper are those of the author(s) and do not necessarily represent the views of the IMF, its Executive Board, or IMF management.

A version of this paper will be published as Chapter 6 in *Inequality and Fiscal Policy*, edited by Benedict Clements, Ruud de Mooij, Sanjeev Gupta, and Michael Keen (International Monetary Fund, 2015).

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[1] In this paper, capital incomes include both profits and rents, that is, all value added that does not accrue to labor (including self-employment).

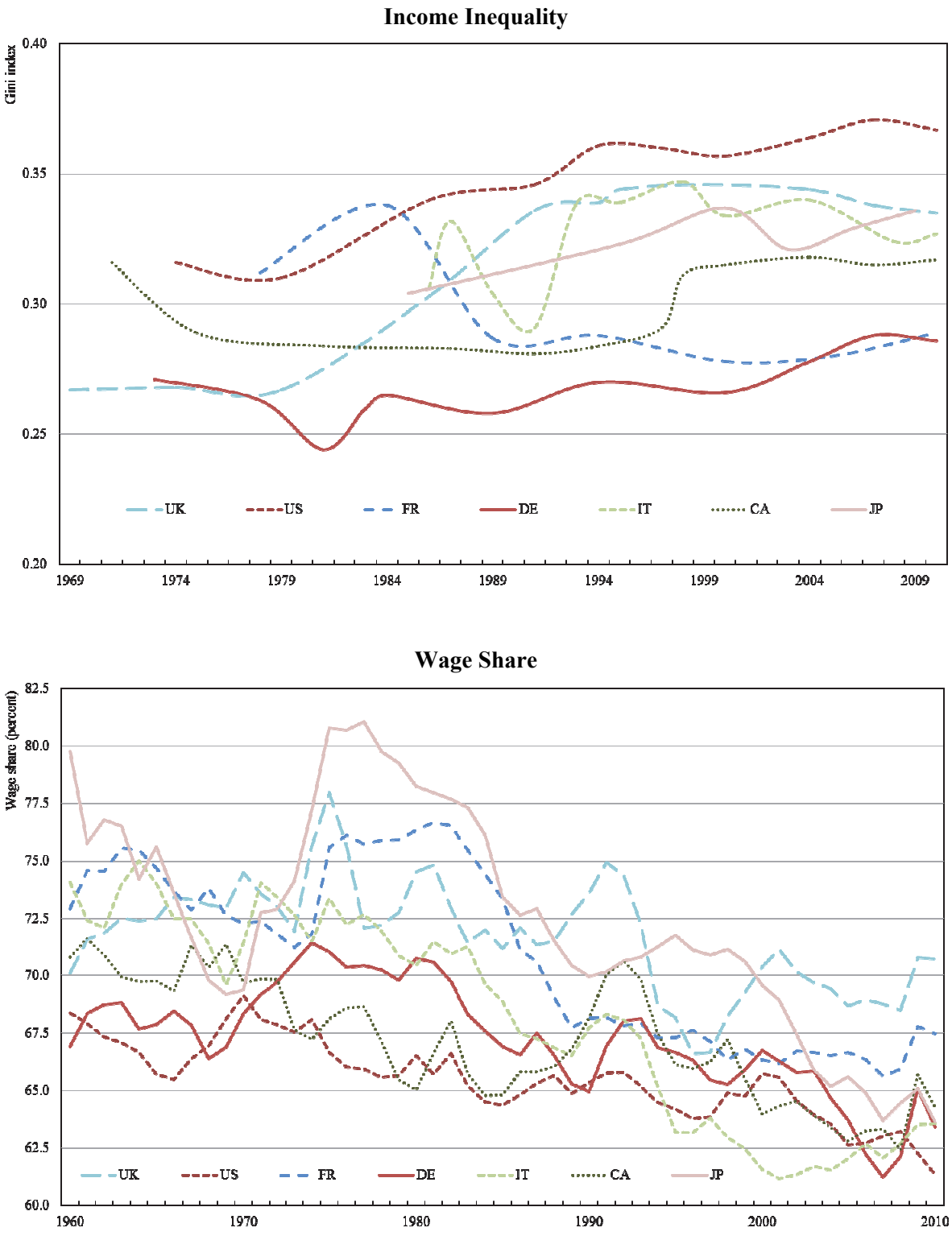
[2] See Glyn (2009) citing Bernanke's statement reported by the New York Times (July 20, 2006), and Germany's finance minister declaration reported by the Financial Times (February 28, 2007).

[3] The flurry of ensuing policy work and analysis has even caught Wall Street companies like Standard's and Poor and Morgan Stanley, who released their first reports on inequality in the fall of 2014 (Rotondare 2014).

[4] For the rest of the paper, "labor share" of income and "wage share" of income are used as synonymous.

Figure 1

Income Inequality and Wage Share in Group of Seven Countries



Sources: Luxembourg Income Study for Canada, France, Germany, Italy, United Kingdom, and United States and Organisation for Economic Co-operation and Development for Japan (panel 1). For the years in which the Gini coefficient is available both from the OECD and LIS, data are in line and show similar patterns; European Commission AMECO database (panel 2).

While apparently correlated, these two phenomena may not be directly linked in a causal relationship. Income inequality refers to the personal distribution of income, and the labor share refers to the remuneration of employees in total factor income (value added) in a given year. The classical economists of the 19th century took for granted that capitalists were rich and their income was solely based on the returns on capital, while laborers where poor and only relied on wages. But the world has evolved during the 20th century, and scholars working in this field acknowledged that the study of factor shares and inequality became more difficult as evidence started to show mixed realities where "many employees earn more than capitalists, many property owners work and many workers own property" (Lydall, 1968: 2).

In this paper, we test if the declining labor share of income has been a key driving factor for growing inequality. We conclude that it is not – the most important determinant of rising income inequality has been the growing dispersion of wages, especially at the top of the wage distribution. This echoes the results of Piketty (2014), who concludes that inequality of total income is closer to inequality of income from labor.

While these results confirm previous findings in the literature, the paper makes an important contribution by providing evidence from a wide sample of countries and simultaneously analyzing microeconomic data from household surveys and macroeconomic data from national accounts. As it is well known, micro and macro data do not always perfectly match. However, we find that they reveal broadly similar trends.

The remainder of the paper is organized as follows. Section 2 briefly reviews the relevant literature. Section 3 explains how the Gini index can be decomposed and linked to factor shares and pseudo-Gini indexes of the income sources, and applies this decomposition to available micro data. For this exercise we use the vast sample of income surveys made available to researchers by the Luxembourg Income Study (LIS) data center. Working on 231 household surveys covering 43 countries over the period 1978-2010, we compute the marginal effects of changes in factor shares and in the dispersion of labor and capital on the Gini index for market income. Section 4 broadens the scope of our analysis and uses macroeconomic data for a large set of 93 countries over the period 1970 to 2013, to explore the aggregate effect of the labor share on income inequality. Finally, Section 5 presents final remarks and our main conclusions.

2 Review of the literature

The analysis of factor shares of income was considered the principal problem of political economy by classic economists like David Ricardo. Up until the 1960s, this topic was given great preeminence in economic textbooks and academic research. When Kaldor famously summarized the long term properties of economic growth (Kaldor, 1961), he stated that the shares of national income received by labor and capital were roughly constant over long periods of time. The analysis of factor income shares was the subject of ninety percent of the papers presented at the conference of the International Economic Association in 1965 (Marchal and Ducros, 1968; Glyn, 2009). The dominant theme was that factor shares were important for the macroeconomic performance of economies, as they are linked to the potential problem of profits squeeze or real wages growing above productivity (Glyn and Sutcliffe, 1972; Bruno and Sachs, 1985; Eichengreen, 2007).

Since the 1970s, however, the analysis of factors shares has no longer been at the center of economic debates, given their lack of volatility and reflecting the fact that "the division of income could be easily explained by a Cobb-Douglas production function" (Makiw, 2007: 55). Those concerned with personal income distribution emphasized that there was no direct (or mechanical) link with factors shares, and that difference in personal income were related to differences in educational attainment (Stigler, 1965; Goldfard and Leonard, 2005). In addition, a broader share of

the population was starting to enjoy some kind of capital income. As home ownership, financial assets holdings and capital-funded pensions expanded in advanced economies, the division into (pure) workers receiving only wages and (pure) capitalists/landlords receiving only profits/rents became blurred, thus contributing to the decline in attention paid to this theme.

Interest in the analysis of factors shares returned in the early 2000s. Atkinson (2009) cites three reasons to explain this growing attention: first, the analysis of factors shares is useful for understanding the link between incomes at the macroeconomic level (national accounts) and incomes at the individual/household level; second, factor shares can potentially help explain inequality in the personal income (at least partly, if certain types of income are mainly received by some type of economic agents); and last "they address the concern of social justice with the fairness of different sources of income" (Atkinson 2009, 5).

Initially, researchers returning to work in this area focused on explaining the shifts in the labor share (Bentolila and Saint Paul, 2003), its gradual but constant decline (De Serres and others, 2001; Gollin, 2002) and the relationship between wages and productivity (Dew-Becker and Gordon, 2005; Feldstein, 2008). The perception that citizens were not fully enjoying the fruits of the long period of economic expansion of the late 1990s and early 2000s attracted the attention also of national policy-makers and international organizations. The IMF (2007, 2014), the European Commission (2007), the Bank for International Settlements (Ellis and Smith, 2007) and the OECD (2008) all published reports that documented the decline in the labor share of income and provided several explanations of this trend, mainly linked to the impact of globalization and technological change on labor skills, international capital mobility, and wage bargaining.

Since then, contributions in this field can be divided into two groups: a group of papers that document the recent and constant decline in the labor share and seek to explain the main drivers of this decline; and another group of studies that focuses more on its consequences for economic inequality. In the first group of papers, most researchers have used survey data and focused on single countries – mainly the US (Gomme and Rupert, 2004; Harris and Sammartino, 2011; Elsby and others, 2013); others have analyzed instead macroeconomic data and cross-country developments (ILO, 2011 and 2012). In particular, the ILO contributions have highlighted the impact of capital mobility on the evolution of factors shares over the last decades. Stockhammer's report published by ILO (Stockhammer, 2013) finds a strong negative effect of financial liberalizaiton on the wage share and documents the consequences of cutbacks in welfare payments and globalization. The available evidence on the effects of technological change on labor income shares are mixed (positive in developing economies and modestly negative in advanced ones). Recently, Karabarbounis and Neiman (2014) attribute the declining share of labor income to the decrease in the relative price of investment goods, often ascribed to advances in information technology and the computer age, which have induced firms to shift away from labor and towards capital. According to these authors "the lower price of investment goods explains roughly half of the observed decline in the labor share, even when we allow for other mechanisms influencing factor shares such as increasing profits, capital-augmenting technology growth, and the changing skill composition of the labor force" (Karabarbounis and Neiman, 2014, 16).

In the second group of studies, mostly focused on the interplay between functional income distribution and income inequality, researchers have also worked with survey household data from single countries. This is the case of Adler and Schmid (2012) who find that declining labor income shares are associated with growing inequality and an increasing concentration of market income in Germany. Similarly, Jacobson and Occhino (2012a, 2012b) follow Lerman and Yitzhaki (1985) and decompose the Gini coefficient into the weighted average of the pseudo-Gini indeces of labor and capital income, with the weights equal to the two income shares. Using household data for the US, they confirm that the decline in the labor share made total income less evenly distributed and more concentrated at the top of the distribution, thus increasing income inequality in the US.

According to their results, a 1 percent decrease in the labor share of income increases the Gini coefficient in the US by 0.15-0.33 percent. A recent ILO report addresses the relation between wages and inequality using several sources, and it comes to the conclusion that "inequality starts in the labor market" (ILO, 2015: xvii), meaning that developments in the distribution of wages have been key factors for inequality dynamics.

In this context, the major contribution of this paper is that we perform a deeper empirical analysis than previous studies, by using more micro and macro data sources and pooling them across a larger set of countries.

3 Income shares or the distribution of income? A look at household data

In this section we explore how changes in labor and capital income shares and their distribution have impacted on the dynamics of income inequality. The inequality measure that we use is the Gini index because it is the most widely income inequality measure used both in the literature and in policy analysis. The data source is the Luxembourg Income Study Database (LIS). We use a very wide set of household surveys covering a large sample of economies and spanning more than three decades. This allows us to look for regularities that are supported by a broad empirical base.

We start by writing down a decomposition of the Gini index which can then be applied to micro-data. Our decomposition analysis follows an established path in the literature (Lerman and Yitzhaki, 1985 and CBO, 2011) and breaks down changes in the Gini index into changes in the income components and variations in their pseudo-Gini (or concentration) indices. In particular, assuming that household's income (y) comes from K sources, the following relation applies (see Appendix A for details on how the decomposition is obtained):

$$G_y = \sum_{k=1}^{K} C_{y_k} s_k \tag{1}$$

where G_y is the Gini index for total income y, and C_{y_k} and s_k are respectively the pseudo-Gini (or concentration) indexes and the shares of each income component (given that $y = \sum_{k=1}^{K} y_k$). Pseudo-Gini indeces capture the level of 'unevenness' of the distribution of each income component and are proportional to the Gini index of the income category ($C_{y_k} = \rho_k^{Gini} G_{y_k}$).[5] As equation (1) indicates the Gini index can therefore be represented as a weighted average of the pseudo-Gini indeces of income components, where the weights are the income shares.

Changes in the overall Gini index occurring over a period starting at time $t=t_0$ can therefore be summarized as follows:

$$\Delta G_y = \underbrace{\sum_{k=1}^{K} \Delta s_k C_{y_k}^0}_{\substack{\text{impact of changes} \\ \text{in the income shares}}} + \underbrace{\sum_{k=1}^{K} \Delta C_{y_k} s_k^0}_{\substack{\text{impact of changes} \\ \text{in the concentration} \\ \text{of the income components}}} + \underbrace{\sum_{k=1}^{K} \Delta s_k \Delta C_{y_k}}_{\approx 0} \tag{2}$$

where the third addend can safely be assumed to be close to zero.

[5] See Appendix A also for a discussion of the relation between Gini and pseudo-Gini indexes and its interpretation.

Given equation (1) it is also possible to recover the marginal impact of changes in pseudo-Gini indices:

$$\frac{\delta G_y}{\delta C_{y_k}} = s_k \tag{3}$$

As to the impact of changes in the income shares, assuming that a variation in labor income (l) is compensated by an opposite change in capital income (c), while everything else stays the same, we have:

$$\frac{\delta G_y}{\delta s_l} = C_l - C_c \tag{4}$$

If the pseudo-Gini index of capital is higher than that of labor, an increase in the labor share reduces inequality (while a reduction raises the Gini index). This condition requires the Gini index for capital income to be 'sufficiently' higher than that of labor.

We compute empirical values for the decomposition of the Gini index using the LIS database; Appendix B presents how the breakdown is computed.

In terms of analysis, we start first by considering a small sample of advanced countries: the United States, the United Kingdom, Germany and France. These countries are the Group of Seven members with the highest and the lowest income inequality level (Figure 1); in addition, we can exploit longer series, allowing us to consider developments over an extended period, which is useful given that inequality tends to move slowly.

Table 1 reports the results of decomposing the change in the Gini index (according to the breakdown described in (2)) observed in these countries over the last three decades.[6] We start by considering disposable income y_{net} (market income plus transfers and minus taxes); the increase in inequality has been significant: more than 25 per cent and 35 per cent respectively in the US and the UK, almost 10 per cent in Germany. In France, inequality is lower than in the seventies and mid eighties, and has been substantially stable since the mid nineties with a slight pickup in recent years.[7] If we look at market income m, for all the countries the increase in inequality has also been substantial.

Given the wealth of data offered by the LIS database, the empirical decomposition of the Gini index for market income can be extended to a larger sample of countries (43 in total) that includes not only advanced economies (26) but also emerging ones (17). Selecting as a starting year the oldest available income survey in each country since the late 1970s, the analysis can be expanded to include a total of 231 income surveys covering the past three decades (Appendix Table 7).[8]

Once we have calculated the components of the Gini index, we can compute for each country the average marginal effects of changes in the income composition and the pseudo-Gini

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[6] The results presented here are robust to using alternative decomposition measures to calculate the contribution of income components to overall inequality. See the discussion in Appendix A and in footnote 30.

[7] The Gini index for disposable income for France published by the OECD, which covers the period 1996-2011, displays values close to those that can be computed using LIS data. For the most recent years it shows that inequality has been slightly increasing also in this country.

[8] Household surveys over such a long period and covering a broad set of countries are obviously heterogeneous. Of course, pooling all the data would not be advisable. The analysis therefore proceeds by considering each survey separately (taking into account whether income and income components are recorded net or gross of taxes), then assessing the impact on inequality of the different factors for each country and finally across the entire sample.

Table 1

Decomposition of Changes in Inequality (Measured by the Gini Index)

	US 1979-2013	UK 1979-2010	DE 1978-2010	FR 1978-2010
DG_{ynet}	0.08	0.10	0.03	-0.01
Impact of changes in taxation	0.01	0.00	-0.02	0.00
DGy	0.07	0.10	0.05	-0.01
Impact of changes in transfers	-0.03	-0.03	-0.03	-0.03
DGm	0.10	0.13	0.08	0.02
Impact of changes in income shares				
labour $Ds_l(C^0_l-C^0_c)$	0.00	0.00	0.01	0.00
Impact of changes in pseudo-Gini indexes				
labour $s^0_lDC_l$	0.09	0.13	0.06	0.03
capital $s^0_cDC_c=-s^0_lDC_c$	0.01	0.00	0.02	0.00
Residual	0.00	0.00	0.00	0.00
G^0_{ynet}	0.31	0.27	0.26	0.33
G_{ynet} in the final year	0.40	0.36	0.29	0.31
G^0_y	0.36	0.30	0.29	0.34
G_y in the final year	0.43	0.40	0.34	0.33
G^0_m	0.41	0.39	0.42	0.44
G_m in the final year	0.51	0.52	0.49	0.47
G^0_l	0.44	0.43	0.45	0.46
G_l in the final year	0.53	0.57	0.54	0.53
G^0_c	0.92	0.88	0.61	0.97
G_c in the final year	0.94	0.97	0.87	0.88

Source: authors calculations on LIS data. The decomposition of changes in market income inequality (lines 6 to 9 in the table) follows equation (19) in Appendix B. Appendixes A and B detail the methodology used for the Gini index decomposition.

indices for labor and capital. The results we obtain from this extended sample mirror those described for the US, UK, Germany and France. The main hypothesis is confirmed. The variable that has had the most sizeable impact on market income inequality (as measured by Gini coefficients) is the change in the pseudo-Gini index of labor income; increases in the unevenness of capital income also raise inequality, but by a much smaller degree given that wages represent the lion's share of market income for the vast majority of the surveyed households (see Table 2 and Figure 2 which report average marginal effects on inequality). Computed at sample average values, we find that a 10 per cent increase in the pseudo-Gini index of labor income would increase the Gini index for market income by more than 9 per cent.

Table 2

Average Effects on the Gini Index for Market Income

	All countries	St. Dev	T	P>|t|
Impact of a 0.01 change in the share of labor income				
dG_m/ds_l	-0.0004 **	0.0012	-2.2889	0.0272
impact of a 0.01 increase in the pseudo-Gini index				
dG_m/dC_l	0.0096 ***	0.0003	250.3138	0.0000
dG_m/dC_c	0.0004 ***	0.0003	9.8787	0.0000

Significance levels are computed using standard deviations calculated over the sample of 43 countries (26 advanced and 17 emerging) considering the avilable income surveys since the late 1970s.

Significance level: * 10%, ** 5%, *** 1%

Subsamples	Advanced economies	Emerging economies
Impact of a 0.01 change in the share of labor income		
dG_m/ds_l	-0.0001	-0.0010
impact of a 0.01 increase in the pseudo-Gini index		
dG_m/dC_l	0.0096	0.0097
dG_m/dC_c	0.0004	0.0003

Source: authors calculations on LIS data.

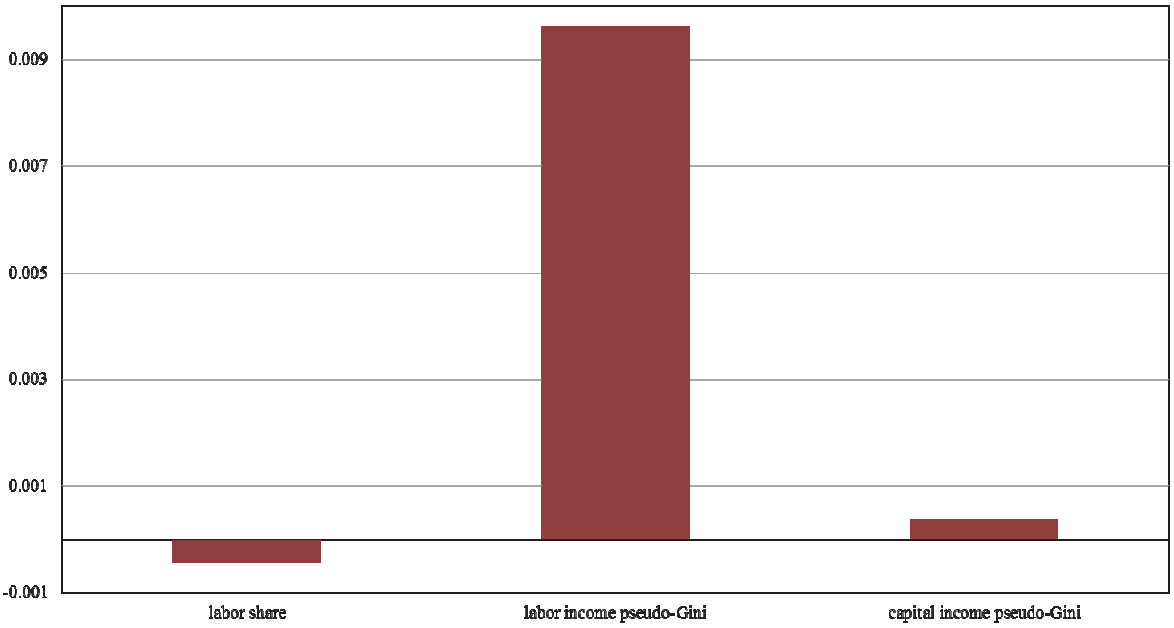
Consistent with previous studies, we find that on average increases (reductions) in the wage share reduce (raise) the Gini index. In our sample, however, this effect is small but statistically significant. For the average values observed in our sample, a 10 per cent decline in the labor share would increase the inequality index of market income by about 0.9 per cent. This result is mostly driven by emerging market economies, due to the larger difference between the pseudo-Gini index of capital and labor income relative to advanced countries.[9] The overall picture, in terms of magnitude and relevance, of the marginal effects of changes in income shares and pseudo-Gini indices, however, is not very different in the two subsamples of countries (Figure 3).

A few remarks may also help qualify our findings and underscore some important aspects. As observed, our micro data analysis suggests that shifts in functional income distribution have an effect, even though a small one, that depends on the difference between the unevenness of the distribution of labor and capital incomes. If the 'unevenness' in the distribution of labor income approaches that of capital income (which has historically been higher), then how income is functionally distributed no longer matters for inequality.

[9] The pseudo-Gini index for capital income in emerging economies is on average higher (by 0.16) than in advanced economies, the difference for labor income is less than half (0.07).

Figure 2

Marginal Impact on the Gini index for Market Income of Changes in the Labor Share and Pseudo-Gini Indexes for Labor and Capital



Source: authors' calculation on LIS data.

Note: average values across countries (43 countries; 231 observations/income surveys).

As to the estimates obtained in our empirical exercise, it is worth remembering that they are affected by the weaknesses traditionally associated with income surveys: the latter generally underreport the extent of capital income; they also do not capture very accurately the tail of the income distribution (generally, the exceptionally rich are poorly represented). Our analysis therefore likely underestimates what has been happening at the top of the income scale and the relevance of developments concerning capital earnings. Recent work (Alvaredo *et al*., 2013) on the top 1 per cent (or even smaller groups of very rich earners) would suggest that the share of income accruing to top earners has been increasing even more rapidly than that appropriated by other (less) rich percentiles. Even though our estimates may not appropriately incorporate these developments, we think, however, that our empirical results capture well the general trends.

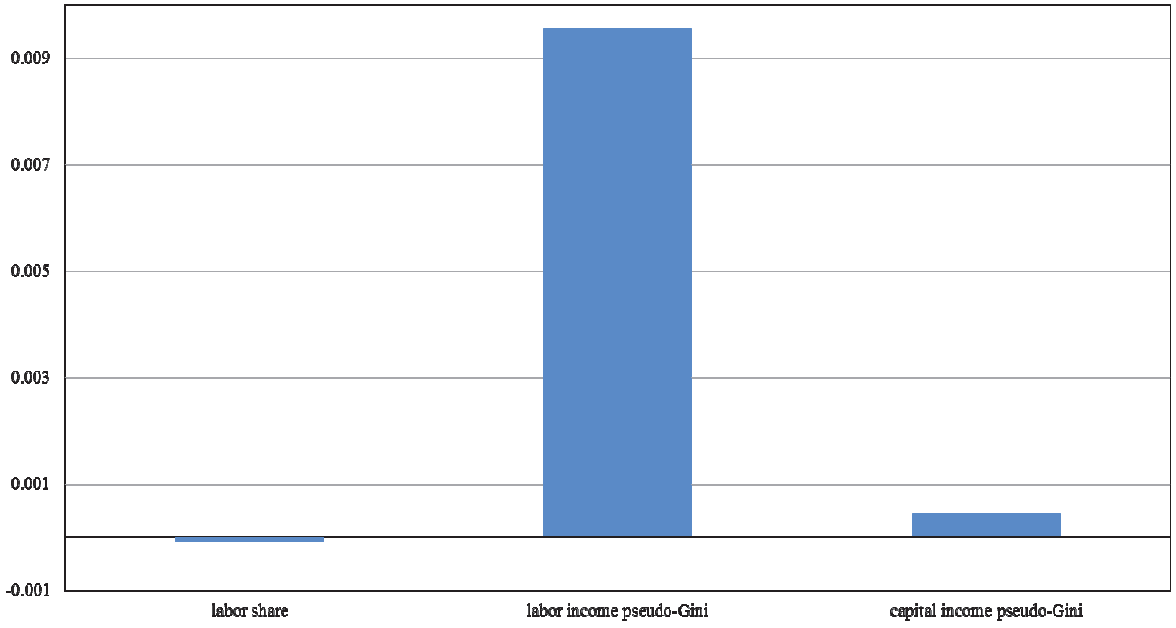
4 Labor share and inequality in a macro framework

This section addresses the same issue (the link between functional income distribution and inequality) in a different framework. We move to a macro framework to verify whether the main findings (that the increasing inequality of labor income is more important than the declining labor share to explain the observed increase in total income inequality) still hold. The estimations presented in this section have the purpose to ascertain if robust correlations exists, while a fully-fledged analysis of the determinants of income shares and inequality is beyond the scope of this paper. The framework also controls for simultaneous additional factors that affect the labor share and the Gini index.

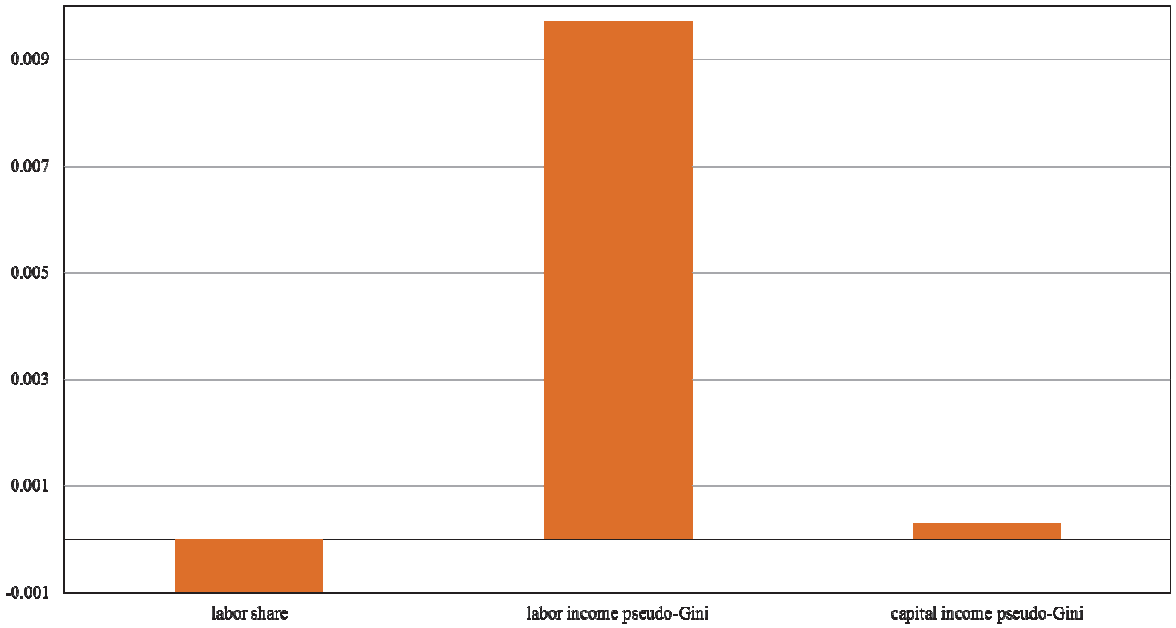
Figure 3

Marginal Impact on the Gini Index for Market Income of Changes in the Labor Share and Pseudo-Gini Indexes for Labor and Capital

a) Advanced Economies



b) Emerging Economies



Note: average values across countries (panel a: 26 countries; 174 observations/income surveys; panel 2: 17 countries; 57 observations/income surveys)
Source: authors' calculations on LIS data.

To preserve continuity with the definition we used in Section 3, we write the Gini coefficient for disposable income as:

$$G_{y^{net}} = C_c + (C_l - C_c)s_l + r \tag{5}$$

where r is the redistributive impact of the tax/welfare system (which we is proxied by public revenues to GDP, and social protection and health spending to GDP).[10] It should be noted that government action may also have an indirect impact on inequality, via an effect on market income allocation. In the analysis presented here, we do not aim at disentangling the direct and indirect effects, but at controlling for this factor when estimating the correlation between inequality and the wage share.

From (5) we derive an equation that we estimate for a sample of 93 advanced, emerging and low income countries. We recognize that the labor share reflects underlying economic developments (mainly in the labor market) and end up with the following specification:

$$\begin{cases} G_{y^{net},it} = \alpha_i + \beta s_l + \gamma r_{it} + \varepsilon_{it} \\ s_{l,it} = a_i + \sum_{j=1}^{J} \theta_j x_{j,it} + \upsilon_{it} \end{cases} \tag{6}$$

where ε_{it} and υ_{it} are error terms; i and t are indices for country and time; x_j are J factors that impact the labor share of income, such as the rate of unemployment, the share of employment in the services sector, and the type and intensity of wage-setting coordination.

The dataset we use in our empirical exercise (an unbalanced panel) covers a large sample of countries; the number of observations drops when we add control variables and when we move to a structural model that allows simultaneous estimation of the wage share and Gini equations as in (6).[11] The period covered is from the 1970s to 2013, although the coverage for each country varies (Appendix Table 8 reports the earliest and latest value for the Gini index for the countries included in our sample). The database is explained in detail in Appendix C. As to the estimation methodology we start exploring separately the wage share and Gini equations using panel techniques.[12] We then run a structural model which includes simultaneously both equations (to account for the endogeneity of the wage share in the Gini equation).[13] Our interest is in the Gini equation, to ascertain whether the small effect of the wage share is confirmed.

Table 3 presents the results we obtain when estimating separately a wage share equation. Our preferred specification (columns 4 and 5)[14] captures the effect of labor market indicators and

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[10] The analysis on micro data (also reflecting data limitations for tax and transfers for our very wide sample of countries) allowed us to recover marginal effects on market income inequality. Since here we use the Gini index for disposable income as a dependent variable, the impact of the tax/transfers system must be taken into account in order to present a framework which is as consistent as possible with that of section 3.

[11] The sample includes about 800 observations for our preferred specification of the wage share equation (Table 3, columns 4 and 5) and 350 for our preferred specification of the Gini equation (Table 4, columns 6 and 7). When the two equations are estimated together the sample size drops to 300 and 150 observations (Table 5, columns 5 and 6); the largest fall in the number of observations is caused by the addition of the variables that capture the wage bargaining set up, which are available for a reduced number of countries. Another factor that reduces the sample size is related to the Gini coefficient not being available for all the years but at a lower frequency.

[12] We run both a fixed and a random effect model. The Breusch and Pagan LM test suggests that a fixed effect model is appropriate.

[13] Our model includes two linear simultaneous equations. The labor income share is treated as an observed endogenous variable in the Gini equation. The model is estimated using a (full information) maximum likelihood estimator.

[14] The first 3 columns report results of parsimonious specifications that have been our starting point. They show that signs and significance of coefficients are robust when explanatory variables are added. We compute robust standard errors to determine statistical significance of coefficients.

institutional characteristics on the labor share;[15] results are in line with those generally found in the literature (Stockhammer, 2013). The wage share does not display large and erratic changes from one year to the other and its lagged value is significant. The lagged value is included because the objective here is to obtain a good explanatory power for the wage share which can then be exploited to solve the simultaneity problem in the Gini equation. As expected the wage share is negatively related to unemployment: a large slack on the labor market negatively affects the income share flowing to workers. With regard to structural indicators, the labor share is lower when the share of employment in the services sector is higher, since unionization is typically higher in the industry and lower among service workers. The wage bargaining framework matters: more centralized and coordinated set ups (including social dialogue with government participation) are associated with higher aggregate income from work.[16]

Results for the Gini equation, when estimated separately, are reported in Table 4. The preferred specifications, the most complete ones, are reported in columns 6 and 7.[17] As to the relationship between the labor income share and the Gini index, the analysis indicates that inequality declines when the wage share increases, however the estimated coefficient is significant only when the dispersion of labor income is not taken into account. When we add a proxy for the dispersion of wages (measured by the ratio of top 10 percent salaries to bottom 90 percent salaries), the wage share seems to no longer matter, whereas the dispersion variable turns out to be positively (and significantly) related to inequality.[18] As to the other control variables, all proxies aimed at capturing the redistributive impact of public policies have the expected negative effect on the Gini index (revenues and health spending display a significant coefficient, while social protection spending does not).[19]

The outcome of the estimation remains stable when we turn to estimating (6) with a structural model that treats the labor share as an endogenous variable (Table 5). The dispersion of labor income remains more important than the wage share to explain income inequality; the estimated coefficient of the wage share continues to be negative, and even if small in magnitude, it is now statistically significant. Government action keeps playing a role; government revenue (as a proxy for redistributive tax policies), social protection spending and health expenditure all contribute significantly to reducing income inequality.[20] Finally in line with the literature we find that economic and financial globalization lead to higher income inequality. As to the wage share equation, control variables are now not significant.[21]

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[15] Since we use a panel estimator, other country specific factors (such as for example technology) are absorbed by country effects and in our set up we are not explicitly singling out all determinants of the labor share or inequality (even though they are taken care of by country dummies).

[16] This is consistent with results obtained by Checci and García-Peñalosa (2010). On a smaller sample of OECD economies they study in detail the role of market institutions on personal income distribution and conclude that greater unionization and greater wage bargaining are important factors affecting inequality.

[17] Again the first columns report results of parsimonious specifications that have been our starting point. Also in this case signs and significance of coefficients are robust when we start adding explanatory variables.

[18] Note that the variable that measures the ratio of the top 10 percent of salaries to the bottom 10 percent reported in table 4 reflects total income dispersion. This choice guarantees a larger number of observations which is consistent with our large dataset of countries. The 10-to-90 income ratio of labor income (that would capture directly wage dispersion) is only available for OECD countries. Nonetheless, both variables are highly correlated. Estimation results are the same when the model is run using the reduced sample of OECD countries and the 10-to-90 income ratio of labor income.

[19] These results are robust to the inclusion of the unemployment rate as control variable, as in Checci and García-Peñalosa (2010). The inclusion of the unemployment rate in the Gini equation takes into account that labor income is nil for the unemployed. The structural model presented in Table 5 duly takes into account the impact of the unemployment rate; for consistency we maintain the same specification both for the fixed effect and structural model estimations.

[20] Revenue is always significant; health and social protection spending are significant when our complete set of explanatory variables is taken into account.

[21] To verify that the adopted specification is suitable, we also estimate the model using instrumental variables panel techniques for the Gini equation (instruments for the wage share are the explanatory variables used in the labor share equation, i.e. the lagged wage

(continues)

Table 3

Determinants of Labor Share, Fixed Effects

Labor Share	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
Labor Share (t-1)	0.8074 ***	0.7788 ***	0.7493 ***	0.8134 ***	0.7748 ***
	(62.33)	*(55.78)*	*(42.23)*	*(41.4)*	*(36.5)*
Unemployment (t-1)		-0.197 ***	-0.1587 ***	-0.151 ***	-0.133 ***
		(10.28)	*(6.95)*	*(8.33)*	*(6.07)*
Employment Service Sector			-0.0655 ***	-0.064 ***	-0.07 ***
			(5.90)	*(5.59)*	*(5.3)*
Type of Wage Setting Coordination				0.0887 **	
				(2.28)	
Intensity of Wage Setting Coordination					0.1976 **
					(2.11)
Constant	9.8812 ***	13.441 ***	18.568 ***	16.041 ***	18.767 ***
	(14.64)	*(16.53)*	*(13.37)*	*(9.51)*	*(10.23)*
Observations	2184	1845	1305	775	856
Number of Country	106	83	80	31	38
R-squared	0.6516	0.6824	0.6753	0.8193	0.7441

Absolute value of t statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4

Determinants of Income Inequality, Fixed Effects

Gini Disposable Income	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
Labor Share	-0.0008 ***	-0.0006	-0.0003	-0.0001	0.0000	0.0004	0.0006
	(2.70)	(1.50)	(0.69)	(0.30)	(0.02)	(1.03)	(1.21)
Dispersion of Labor		0.0242 ***	0.0203 ***	0.0174 ***	0.0173 ***	0.0173 ***	0.0161 ***
		(4.77)	(4.23)	(3.80)	(3.80)	(3.83)	(3.54)
Public Revenues			-0.0011 ***	-0.0008 **	-0.0007 **	-0.0008 **	-0.0008 **
			(3.40)	(2.28)	(2.19)	(2.39)	(2.29)
Public Social Protection Spending				-0.0011	-0.0006	-0.0009	-0.0007
				(1.24)	(0.67)	(0.98)	(0.74)
Public Health Spending					-0.0046 *	-0.0055 **	-0.0070 ***
					(1.89)	(2.25)	(2.67)
Economic Globalization						0.0007 ***	
						(2.80)	
Financial Globalization							0.0094 **
							(2.38)
Constant	0.3847 ***	0.3888 ***	0.4158 ***	0.4129 ***	0.4231 ***	0.3650 ***	0.4051 ***
	(25.89)	(22.28)	(19.26)	(19.32)	(19.28)	(12.18)	(17.58)
Observations	683	445	393	353	353	352	353
Number of Countries	93	84	83	71	71	70	71
R-squared	0.2817	0.4626	0.6363	0.6609	0.5810	0.3756	0.4252

Absolute value of t statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

share, lagged unemployment, the share of employment in the services sector, the proxy for the coordination of the wage setting set up). Results are in line with those reported in the paper (i.e. that while the labor share has small effect on inequality, the impact of the unevenness of labor income is sizeable and dominant). Results are confirmed also when we expand the set of control variables in the Gini equation to include the whole set of explanatory factors for the labor share (to control for an indirect effect on inequality).

Table 5

Determinants of Labor Share and Income Inequality, Structural Model

	(1)	(2)	(3)	(4)	(5)	(6)
	Labor Share					
Labor Share (t-1)	0.9796 ***	0.9631 ***	0.9809 ***	0.9809 ***	0.9809 ***	0.9256 ***
	(95.44)	*(87.00)*	*(80.56)*	*(80.56)*	*(80.56)*	*(33.48)*
Unemployment (t-1)		-0.0561 ***	-0.0574 ***	-0.0574 ***	-0.0574 ***	-0.1330 ***
		(2.92)	*(2.87)*	*(2.87)*	*(2.87)*	*(3.56)*
Employment Service Sector			-0.0093	-0.0093	-0.0093	-0.0035
			(0.85)	*(0.85)*	*(0.85)*	*(0.16)*
Intensity of Wage Setting Coordination						-0.0733
						(0.56)
Constant	0.7250	2.1850 ***	0.7235	0.7235	0.0723	5.6232 **
	(1.43)	*(3.53)*	*(0.91)*	*(0.91)*	*(0.91)*	*(2.80)*
	Gini Disposable Income					
Labor Share	-0.0027 ***	-0.0013 ***	-0.0012 ***	-0.0013 ***	-0.0012 ***	-0.0015 ***
	(10.41)	*(4.75)*	*(3.80)*	*(3.98)*	*(3.59)*	*(3.68)*
Dispersion of Labor income	0.1619 ***	0.1772 ***	0.1668 ***	0.1626 ***	0.1623 ***	0.6036 ***
	(14.46)	*(14.95)*	*(13.71)*	*(12.84)*	*(12.99)*	*(19.38)*
Public Revenues		-0.0038 ***	-0.0039 ***	-0.0040 ***	-0.0037 ***	-0.0014 ***
		(14.18)	*(9.75)*	*(9.82)*	*(8.90)*	*(3.16)*
Public Social Protection Spending			-0.0006	-0.0011	-0.0013	-0.0039 *
			(0.79)	*(1.17)*	*(1.42)*	*(1.76)*
Public Health Spending				-0.0028	-0.0038 *	-0.0039 *
				(1.17)	*(1.59)*	*(1.78)*
Economic Globalization					0.0007 **	0.0003 *
					(2.72)	*(1.61)*
Constant	0.4628 ***	0.5275 ***	0.5386 ***	0.5384 ***	0.5671 ***	0.0459 ***
	(34.06)	*(38.13)*	*(32.85)*	*(32.91)*	*(30.00)*	*(14.51)*
Observations	425	351	309	309	309	148
Chi2	0.08	4.93	15.66	14.58	21.38	33.39
Prob>Chi2	0.9613	0.2943	0.0157	0.0418	0.0062	0.0001

Absolute value of z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 6

Determinants of Dispersion of Labor Income

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Financial Globalization	0.0719 **	0.0701 *	0.037 *	0.1531 *	0.0788 ***
	(2.07)	*(1.69)*	*(1.79)*	*(1.74)*	*(2.62)*
Unemployment		0.0082 *	0.0066 *	0.0231 **	0.0075 **
		(1.65)	*(1.69)*	*(2.05)*	*(2.25)*
Industry Unionization			-0.0118 ***	-0.024 ***	-0.01 ***
			(2.86)	*(2.72)*	*(3.39)*
Tertiary Education				-0.018 ***	-0.009 ***
				(2.96)	*(4.47)*
Government Spending					-0.009 ***
					(5.22)
Constant	0.2295 ***	0.1601 ***	0.5643 ***	1.0694 ***	0.8488 ***
	(9.73)	*(2.89)*	*(3.72)*	*(3.31)*	*(6.86)*
Observations	1,045	810	785	405	342
Number of countries	142	91	90	74	67
R-squared	0.004	0.006	0.017	0.062	0.257

Absolute value of z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

If the major conclusion that can be extracted from the previous empirical analysis is that higher income inequality is more driven by wage dispersion rather than by the wage share of national income, then the question becomes, what explains that dispersion? This is not the major focus of the paper and could be a topic for further analysis. Without aiming at providing a comprehensive analysis, Table 6 shows the results of simply regressing the dispersion of wages on different factors.[22] We recognize that this exercise is very simple and that a fully-fledged analysis would require a more sophisticated discussion. Column 5 shows that higher financial globalization and higher unemployment levels are associated with higher dispersion of wages. In contrast, higher unionization in the industry,[23] higher share of educated workers and higher primary government spending (as a proxy for the size of the state) are factors that help reduce the distance between higher and lower wages.

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[22] Again we estimated this model using both versions of income dispersion (total and wage). Results reported in table 6 are those from total dispersion to guarantee a larger sample. As noted in a previous footnote, these results are very similar when we estimate the model on a subsample of OECD countries and using wage dispersion.

[23] Jaumotte and Osorio Buitron (2015) also find evidence that a decline in union density – the fraction of union members in the workforce – affects inequality, in particular that it is associated with the rise of top income shares.

5 Conclusion

This paper analyzes the relationship between functional and personal income distributions, which has returned to center stage in the academic and policy discussion. In the advanced world, the wage share and inequality have shown opposite trends in recent decades: the share of factor income to labor has been declining, while inequality has risen. This paper has addressed this issue from different angles, first by analyzing what is behind widely used inequality measures based on micro data (i.e. Gini indices), and second by running regression analysis on macro data.

Empirical evidence suggests that the most important determinant of income inequality is not the share of income that accrues to labor or capital, but the dispersion of labor income. This result reflects the fact that the lion's share of household income is labor earnings and its distribution has become more unequal. The increase in wage dispersion has been associated with growing financial globalization, a decrease in industry unionization and a decline in the size of the state.

From a policy perspective our results suggest that to avoid unfavorable (or undesired) distributional consequences, policymakers will have to pay attention to labor market outcomes and to the dispersion of wages, including distortions induced in the labor market by different policy interventions or by changes in labor market institutions.[24] Public policies that support inclusive growth (by for example promoting participation in the labor market and strengthening the human capital of low-income groups) may prevent the rise in economic disparities. In addition, tax and transfer policies should be properly assessed in terms of their costs and the relative effectiveness in correcting market income inequalities while minimizing distortions.

[24] These indications are also in line with findings from recent research on Latin America (the most unequal region in the world), where the recent decline in inequality appears to be mostly related to labor income developments (Lustig *et al*., 2015).

APPENDIX A
GINI COEFFICIENTS, PSEUDO-GINI (OR CONCENTRATION) INDEXES AND GINI CORRELATIONS

The Gini coefficient for income y can be written as:

$$G_y = \frac{2\text{cov}(y, F(y))}{\bar{y}} \quad \text{or:} \tag{7}$$

$$\text{cov}(y, F(y)) = \frac{\bar{y} G_y}{2} \tag{8}$$

The Gini index captures the distance of the observed income distribution from a hypothetical condition of perfect equality in which each individual would be endowed with exactly the same income (in this case the Gini index would be equal to zero).[25]

If income y comes from K sources, the Gini index can be decomposed as follows:[26]

$$G_y = \sum_{k=1}^{K} \underbrace{\underbrace{\left[\frac{\text{cov}(y_k, F(y))}{\text{cov}(y_k, F(y_k))}\right]}_{\text{Gini correlation } \rho_k^{Gini}} \underbrace{\left[\frac{2\,\text{cov}(y_k, F(y_k))}{\bar{y}_k}\right]}_{\text{Gini index for income component k}}}_{\text{pseudo-Gini (or concentration) index for income component k}} \underbrace{\left[\frac{\bar{y}_k}{\bar{y}}\right]}_{\text{component k's share of total income}} \tag{9}$$

$$G_y = \sum_{k=1}^{K} \underbrace{\underbrace{\rho_k^{Gini}}_{\text{Gini correlation}} \underbrace{G_{y_k}}_{\text{Gini index for income component k}}}_{\text{pseudo-Gini index for income component k}} \underbrace{s_k}_{\text{component k's share of total income}} = \sum_{k=1}^{K} C_{y_k} s_k \tag{10}$$

where the pseudo-Gini (or concentration) index is given by:

$$C_{y_k} = \rho_k^{Gini} G_{y_k} = \frac{2\,\text{cov}(y_k, F(y))}{\bar{y}_k} \tag{11}$$

and the Gini correlation index is:

$$\rho_k^{Gini} = \frac{\text{cov}(y_k, F(y))}{\text{cov}(y_k, F(y_k))} = \frac{2\,\text{cov}(y_k, F(y))}{\bar{y}_k G_{y_k}} \tag{12}$$

As equation (10) indicates, the Gini index is a weighted average of the pseudo-Gini indexes of income components, where the weights are the income shares. But what is the difference between a Gini and a pseudo-Gini index for an income component y_k? As can be seen by comparing (7) and (11) the difference is due to the reference ranking of individuals used in the two calculations. For the pseudo-Gini index C_{y_k} the weights attached to each individual correspond to the ranking in the distribution of total income ($F(y)$), while for the Gini index G_{y_k} the reference

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[25] A Gini index equal to 1 would be instead observed in the case of extreme inequality in which one individual would appropriate all available income leaving nothing to the others.

[26] See Lerman and Yitzhaki (1985) and CBO (2011).

ranking would be that of the distribution of the *k*th income component ($F(y_k)$). The two indexes would be the same if the ranking of individuals in the two distributions was the same, that is if no re-ranking would take place when moving from the income component distribution to the total income distribution. It should also be noted that the higher an income component share (on total income) is, the lower the possibility of re-ranking (and therefore the closer C_{y_k} and G_{y_k} would be).[27]

BOX 1
DIFFERENCE BETWEEN THE GINI CORRELATIONS AND CORRELATION COEFFICIENTS

The standard (Pearson) correlation coefficient (ρ) and the Gini correlation index have the same numerator: $\text{cov}(y_k, F(y))$. But while the correlation coefficient denominator is the product of the standard deviations, the denominator of the Gini correlation index is half the product between the Gini coefficient and the average for the income component under consideration:

$$\rho = \frac{\text{cov}(y_k, F(y))}{\sigma_{y_k}\sigma_{F(y)}} \tag{i}$$

$$\rho_k^{Gini} = \frac{\text{cov}(y_k, F(y))}{\text{cov}(y_k, F(y_k))} = \frac{\text{cov}(y_k, F(y))}{\frac{\bar{y}_k G_{y_k}}{2}} = \frac{2\,\text{cov}(y_k, F(y))}{\bar{y}_k G_{y_k}} \tag{ii}$$

The decomposition of the Gini index presented here has been used in many empirical studies. We use the Gini index because it is the most widely used inequality measure used both in the literature and in policy analysis. The literature has however shown that the classical Gini decomposition suffers some limitations. In particular Shorrocks (1982) and (1983) show that there is no unique way to decompose inequality, and proposes an alternative decomposition rule that satisfies a set of desirable properties[28] and delivers contributions for each income component to inequality, which are not anchored to the use of a specific measure. The measure proposed by Shorrocks is:

$$SH_k = \frac{\text{cov}(y_k, y)}{\text{var}(y)} \tag{13}$$

[27] See Pyatt, Chen and Fei (1980).

[28] For example symmetry (meaning that the order of the income components does not affect the decomposition results) and continuity (which requires that for each income component the results do not depend on the number of other income components).

In the framework set forth in this paper, the contributions to inequality of each income component are instead given by:

$$SH_k^G = \frac{\mathrm{cov}(y_k, F(y))}{\mathrm{cov}(y, F(y))} \tag{14}$$

There are several reasons why the standard Gini decomposition is appropriate in the analysis presented in this paper. First, since we decompose market income into only two exhaustive components (see Appendix B), the Gini decomposition is unique (Shorrocks, 1982). Second as also highlighted by Lerman ans Yitzhaki (1985) this approach provides an economic interpretation of the empirical results and allows to derive marginal effects of changes in the income sources (wage and capital shares) and their distributional characteristics (pseudo-Gini indexes). Finally, the standard Gini decomposition and the Shorrocks measure provide very close results.[29]

[29] If we consider the four countries whose results are summarizes in Table 1, the standard Gini decomposition and the Shorrocks' measure provide very similar assessments of the contribution of each income component to inequality. In particular for the observed period for the US the average contribution of labor income to inequality is 0.94 (0.6 for capital income) using the standard Gini decomposition; the corresponding Shorrocks measure is 0.92 (0.8). For the UK the corresponding average values are: SH_l^G =0.97 (SH_c^G =0.03) and SH_l =0.95 (SH_c =0.05); for France: SH_l^G =0.96 (SH_c^G =0.04) and SH_l =0.94 (SH_c =0.06); and for Germany: SH_l^G =0.94 (SH_c^G =0.06) and SH_l =0.83 (SH_c =0.17).

The results therefore confirm that the largest impact on inequality is to be expected from labor income variations.

APPENDIX B
INEQUALITY DECOMPOSITION USING THE LIS DATASET

Bringing equation (1) and (2) to the LIS data implies singling out the empirical counterparts of total income and of income components. The reference unit in calculations is the household and the income definition is the per capita equivalent income computed using LIS equivalence scale.[30] The list of countries considered in the analysis is reported in Table 7.

We define total gross income as market *m* income plus transfers *g*:

$$y = m + g \tag{15}$$

Transfer income is given by both private (such as alimony, remittances, transfers from non-profit institutions) and public transfers (such as pensions, unemployment benefits, disability benefits). Public transfers makeup the bulk of transfer income.

Gross market income *m* is the sum of labor[31] *l* and capital income *c* (from financial or non financial types of investments):

$$m = l + c \tag{16}$$

Net (or disposable) household income is obtained by subtracting taxes from total income:

$$y^{net} = y - t \tag{17}$$

Using (10), the breakdown of changes in inequality in market income over a certain period can be obtained as:

$$\Delta G_m = \underbrace{\left[\Delta s_l C_l^0 + \Delta s_c C_c^0\right]}_{\text{income shares impact}} + \underbrace{\left[s_l^0 \Delta C_l + s_c^0 \Delta C_c\right]}_{\text{concentration indexes impact}} + \underbrace{\left[\Delta s_l \Delta C_l + \Delta s_c \Delta C_c\right]}_{\approx 0} \tag{18}$$

where s_l, s_c and C_l, C_c are, respectively, the income shares and pseudo-Gini indexes for *l* and *c* and 0 is the base year (or the initial year in our analysis, which varies depending on the country).

Given that income shares add up to 1, it follows that $\Delta s_c = -\Delta s_l$ (changes in the labor share are absorbed by an opposite change in the capital share), so that (18) can be rewritten as:

$$\Delta G_m = \underbrace{\Delta s_l \left[C_l^0 - C_c^0\right]}_{\text{income shares impact}} + \underbrace{\left[s_l^0 \Delta C_l + s_c^0 \Delta C_c\right]}_{\text{concentration indexes impact}} + \Delta s_l \underbrace{\left[\Delta C_l - \Delta C_c\right]}_{\approx 0} \tag{19}$$

and the observed impact of changes in income composition on inequality will depend on the initial values of the pseudo-Gini indexes for labor and capital.

The impact of transfers and taxation on inequality can be measured respectively by:

$$\Delta G_y - \Delta G_m \tag{20}$$

$$\Delta G_{y^{net}} - \Delta G_y \tag{21}$$

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[30] The LIS equivalence scale is defined as the square root of the number of individuals in the household.

[31] The labor income definition we use includes both wages from paid employment and income from self employment.

Marginal effects on income inequality can be calculated from the following equation for the Gini index for gross market income:

$$G_m = C_l s_l + C_c s_c \tag{22}$$

Remembering that:

$$s_c = 1 - s_l \tag{23}$$

we have that at any point in time the marginal impact from a variation in market income composition is expressed by:

$$\frac{\delta G_m}{\delta s_l} = C_l - C_c \tag{24}$$

If the pseudo-Gini index for capital is higher than that for labor, then an increase (reduction) in the labor share reduces (raises) inequality. In terms of Gini indexes of the income components this requires that:

$$G_c > \frac{\rho_l^{Gini}}{\rho_c^{Gini}} G_l \tag{25}$$

which implies that the Gini index for capital has to be 'sufficiently' larger than the Gini index for labor.

Condition (25) can also be written in terms of average labor and capital incomes:

$$\bar{l} > \frac{\mathrm{cov}(l, F(m))}{\mathrm{cov}(c, F(m))} \bar{c} \tag{26}$$

which requires average labor income to be 'sufficiently' higher than average capital income.

Table 7

List of Countries Considered

(and indication if income components are recorded gross or net of taxes; definition may vary by year of survey, in this case both gross, net or mixed are listed

Australia (gross)	1981; 1985; 1989; 1995; 2001; 2003; 2008; 2010
Austria (net; gross)	1994; 1997; 2000; 2004
Belgium (net; gross)	1985; 1988; 1992; 1995; 1997; 2000
Brazil (gross)	2006; 2009; 2011
Canada (gross)	1981; 1987; 1991; 1994; 1997; 1998; 2000; 2004; 2007; 2010
China (gross)	2002
Colombia (gross)	2004; 2007; 2010
Czech Republic (gross)	1992; 1996; 2004
Denmark (gross)	1987; 1992; 1995; 2000; 2004; 2007; 2010
Egypt (net)	2012
Estonia (mixed, gross)	2000; 2004; 2007; 2010
Finland (mixed, gross)	1987; 1991; 1995; 2000; 2004; 2007; 2010
France (mixed; gross)	1978; 1984; 1989; 1994; 2000; 2005; 2010
Germany (gross)	1978; 1981; 1983; 1984; 1989; 1994; 2000; 2004; 2007; 2010
Greece (net; gross)	1995; 2000; 2004; 2007; 2010
Guatemala (gross)	2006
Hungary (net)	1991; 1994; 1999; 2005; 2007; 2009; 2012
Iceland (gross)	2004; 2007; 2010
India (net)	2004
Ireland (gross; net)	1987; 1994; 1995; 1996; 2000; 2004; 2007; 2010
Israel (gross)	1979; 1986; 1992; 1997; 2001; 2005; 2007; 2010
Italy (net; mixed)	1986; 1987; 1989; 1991; 1993; 1995; 1998; 2000; 2004; 2008; 2010
Japan (gross)	2008
Luxembourg (net; gross)	1985; 1991; 1994; 1997; 2000; 2004; 2007; 2010
Mexico (net)	1984; 1989; 1992; 1994; 1996; 1998; 2000; 2002; 2004; 2008; 2010
Netherlands (gross)	1983; 1987; 1990; 1993; 1999; 2004; 2007; 2010
Norway (gross)	1979; 1986; 1991; 1995; 2000; 2004; 2007; 2010
Peru (net)	2004
Poland (net; mixed; gross)	1992; 1995; 1999; 2004; 2007; 2010
Romania (gross)	1995; 1997
Russia (net)	2000; 2004; 2007; 2010
Serbia (net)	2006; 2010; 2013
Slovak Republic (gross; net)	1992; 1996; 2004; 2007; 2010
Slovenia (net)	1997; 1999; 2004; 2007; 2010
South Africa (gross)	2008; 2010
South Korea (Gross)	2006
Spain (net; gross)	1980; 1985; 1990; 1995; 2000; 2004; 2007; 2010
Sweden (gross)	1981; 1987; 1992; 1995; 2000; 2005
Switzerland (gross)	1982; 1992; 2000; 2002; 2004
Taiwan (gross)	1981; 1986; 1991; 1995; 1997; 2000; 2005; 2007; 2010
United Kingdom (gross)	1979; 1986; 1991; 1995; 1994; 1999; 2004; 2007; 2010
United States (gross)	1979; 1986; 1991; 1994; 1997; 2000; 2004; 2007; 2010; 2013
Uruguay (net)	2004

Source: LIS database. Cut off date for data February 24, 2015.
Note: for a detailed definition of the recording method (gross, net or mixed) of taxes see http://www.lisdatacenter.org/

APPENDIX C
DESCRIPTION OF THE DATABASE

Annex Table 8 reports the earliest and latest value for the Gini index for the countries included in the estimation sample.

The data sources for the estimation analysis are the following:

1) For the disposable Gini index (which is a discontinuous variable observed only in some years that vary depending on the country) we use data from various sources with the aim of covering the largest possible sample. The sources are the OECD, Eurostat, the World Bank's World Development Indicators, LIS, and the Socio-Economic Database for Latin America and the Caribbean.
2) For the wage share, the main data source is the ILO database. When available the adjusted wage share is used. For many countries longer time series for wage shares are also published in the European Commission's Annual Macroeconomic Database (AMECO). For these countries the two datasets display similar patterns, and AMECO data can be used to extrapolate developments over a longer time period.
3) The unemployment rate has been taken from the IMF *World Economic Outlook*.
4) The employment rate in the services sector come from ILO.
5) For the variables capturing the wage setting set up we have used the Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts dataset, 1960-2011 (ICTWSS) (produced by Jelle Visser, Amsterdam Institute for Advanced Labour Studies). The variable used (ictwss_Coord and ictwss_Type) capture the following aspects: coordination of wage-setting, and the type, or the modality or mechanism through which coordination of wage bargaining behavior is produced. The higher the value of the variable the higher is degree of coordination/centralization of the wage bargaining framework.
6) The dispersion of labor income is measured as the ratio of total income of the top 10 percent to the bottom 10 percent and data are taken from the World Bank's World Development Indicators;
7) The ratios of public revenue, social protection spending and health expenditure to GDP are taken from IMF *World Economic Outlook*, Eurostat, OECD, World Health Organization, the United Nations Educational, Scientific and Cultural Organization; CEPALSTAT; the Asian Development Bank; the World Bank; and the IMF International Financial Statistics.
8) Economic globalization is measured as a score based on actual flows and trade restrictions, and the data are drawn from KOF Index of Globalization (Dreher, Gaston, and Martens 2008).
9) Financial globalization is proxied by the log of total foreign assets and liabilities divided by GDP, which is computed from data from updated and extended versions of the dataset constructed by Lane and Milesi-Ferretti (2007).

Table 8

Countries Considered in the Estimation and Descriptive Statistics for Inequality

Country		Earliest Observation		Latest Observation	
		Gini	Year	Gini	Year
Argentina	EME	0.46	1995	0.44	2007
Armenia	EME	0.34	2003	0.31	2008
Australia	ADV	0.28	1981	0.34	2008
Austria	ADV	0.23	1987	0.27	2011
Azerbaijan	EME	0.35	1995	0.34	2008
Belarus	EME	0.29	1995	0.27	2008
Belgium	ADV	0.23	1985	0.24	2011
Bhutan	LIDC	0.47	2003	0.38	2007
Bolivia	LIDC	0.56	1997	0.44	2009
Bosnia and Herzegovina	EME	0.36	2007	0.36	2007
Brazil	EME	0.55	2004	0.52	2008
Bulgaria	EME	0.31	1995	0.26	2012
Burkina Faso	LIDC	0.40	2003	0.40	2003
Burundi	LIDC	0.33	2006	0.33	2006
Cameroon	LIDC	0.41	1996	0.40	2001
Canada	ADV	0.32	1971	0.32	2008
Chile	EME	0.54	1996	0.51	2009
China	EME	0.36	1996	0.42	2005
Colombia	EME	0.55	2000	0.53	2009
Costa Rica	EME	0.43	1995	0.49	2009
Côte d'Ivoire	LIDC	0.37	1995	0.44	1998
Croatia	EME	0.27	1998	0.37	2011
Cyprus	ADV	0.29	1997	0.31	2012
Czech Republic	ADV	0.26	1996	0.27	2004
Denmark	ADV	0.26	1987	0.27	2012
Dominican Republic	EME	0.46	1996	0.46	1996
Egypt	EME	0.30	1996	0.31	2008
Estonia	ADV	0.36	2000	0.30	2012
Finland	ADV	0.21	1987	0.26	2012

France	ADV	0.29	1979	0.31	2012
Gabon	EME	0.41	2005	0.41	2005
Georgia	EME	0.40	2003	0.41	2008
Germany	ADV	0.27	1973	0.28	2012
Greece	ADV	0.35	1995	0.35	2012
Guatemala	EME	0.56	2002	0.53	2006
Honduras	LIDC	0.52	2001	0.58	2005
Hong Kong SAR	ADV	0.43	1996	0.43	1996
Hungary	EME	0.29	1999	0.28	2012
India	EME	0.33	2005	0.33	2005
Iran	EME	0.44	1998	0.38	2005
Ireland	ADV	0.33	1987	0.30	2011
Israel	ADV	0.34	1997	0.36	2008
Italy	ADV	0.31	1986	0.34	2012
Japan	ADV	0.30	1985	0.33	2008
Jordan	EME	0.36	1997	0.34	2008
Kazakhstan	EME	0.35	1996	0.29	2009
Kenya	LIDC	0.43	1997	0.48	2005
Korea	ADV	0.31	2006	0.31	2006
Kyrgyz Republic	LIDC	0.36	1998	0.36	2009
Latvia	ADV	0.27	1993	0.35	2012
Lesotho	LIDC	0.53	2003	0.53	2003
Lithuania	EME	0.34	1993	0.36	2012
Luxembourg	ADV	0.24	1985	0.28	2012
Macedonia, FYR	EME	0.28	1998	0.43	2009
Malta	ADV	0.30	2000	0.27	2012
Mexico	EME	0.52	1996	0.45	2010
Moldova	LIDC	0.37	1997	0.33	2010
Mongolia	LIDC	0.33	2002	0.37	2008
Morocco	EME	0.39	1999	0.41	2007
Mozambique	LIDC	0.47	2003	0.46	2008
Namibia	EME	0.64	2004	0.64	2004
Nepal	LIDC	0.44	2003	0.33	2010

Netherlands	ADV	0.25	1983	0.22	2012
New Zealand	ADV	0.32	1990	0.33	2008
Niger	LIDC	0.44	2005	0.35	2008
Nigeria	LIDC	0.43	2004	0.43	2004
Norway	ADV	0.22	1979	0.23	2012
Panama	EME	0.55	1997	0.50	2008
Papua New Guinea	LIDC	0.51	1996	0.51	1996
Philippines	EME	0.46	1997	0.43	2009
Poland	EME	0.26	1992	0.32	2004
Portugal	ADV	0.35	1975	0.34	2012
Romania	EME	0.28	1995	0.28	1997
Senegal	LIDC	0.41	2001	0.39	2005
Serbia	EME	0.33	2002	0.28	2009
Sierra Leone	LIDC	0.43	2003	0.43	2003
Singapore	ADV	0.42	1998	0.42	1998
Slovak Republic	ADV	0.25	1996	0.26	2012
Slovenia	ADV	0.23	1997	0.23	2004
South Africa	EME	0.57	1995	0.63	2009
Spain	ADV	0.32	1980	0.34	2012
Sri Lanka	EME	0.41	2002	0.40	2007
Sweden	ADV	0.26	1967	0.25	2011
Switzerland	ADV	0.31	1992	0.27	2012
Tajikistan	LIDC	0.33	2003	0.33	2007
Tanzania	LIDC	0.35	2000	0.38	2007
Tunisia	EME	0.41	2000	0.41	2005
Turkey	EME	0.42	1994	0.39	2008
Ukraine	EME	0.39	1995	0.26	2009
United Kingdom	ADV	0.27	1969	0.36	2011
United States	ADV	0.32	1974	0.37	2010
Uruguay	EME	0.42	1998	0.44	2005
Venezuela	EME	0.46	1997	0.39	2007

Sources: see text of this Appendix.
Note: ADV = advanced economy; EME = emerging market economy; LIDC = low-income and developing countries.

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THE EVOLUTION OF WORLD WELFARE INEQUALITY

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*The paper proposes a measure of countries' well-being based on individuals' lifetime utility and applies it to a large sample of countries in the period 1960-2011. Together with a decreasing trend in welfare inequality across world populations, we find clear evidence of polarization with the formation of three groups: those with high welfare levels, those in transition towards the upper part of the distributions and those "trapped" at medium-low levels. Such tendencies to polarization shall strengthen in the future, jointly with an increase in the world welfare inequality. We also suggest a method to take into account within country-inequality along the two relevant dimensions of welfare we are considering, namely income and health (*i.e., *life expectancy). The analysis not only confirms the evidence in favour of polarization but also points to a level of inequality remarkably higher.*

1 Introduction

Despite the wide consensus on the multidimensionality of human well-being, most of the studies that analyse the dynamics of world inequality mainly focus on the distribution of income or consumption alone. Bourguignon and Morrisson (2002) and Becker *et al.* (2005), however, have argued how a more meaningful analysis of the evolution of welfare inequality across countries/among world citizens should jointly consider at least the dynamics of income and life expectancy, even by simply looking at some composite indicator of welfare such as lifetime income or utility.[1] In particular, Bourguignon and Morrisson (2002) observe that inequality in the per capita GDP across the world population increased from the beginning of the 19th century to World War II, and then stabilized (or slightly increased). On the contrary inequality in life expectancy decreased markedly after 1920-1930. Taking lifetime income as a proxy of welfare, they conclude that the decreasing trend observed in welfare inequality since 1950 has stopped since the main determinant of such dynamics, *i.e.*, the pronounced drop in life expectancy disparities, has lost its momentum or even reversed its path. Becker *et al.* (2005) propose a more sophisticated approach to the measurement of welfare based on the concept of lifetime utility as previously discussed in Rosen (1988), computing the countries' "full income" growth rates, *i.e.*, growth rates which include the monetary value of the gains in longevity experienced by countries' populations. They conclude in favour of an even stronger convergence in the world welfare distribution over the period 1960-2000 – with the partial exception of the populations from Sub-Saharan countries – than the one that would emerge looking at income alone.

In this paper we make both a theoretical and an empirical contribution to the current literature: we propose a methodology to measure welfare based on the lifetime utility of individuals; we then apply it to a large sample of countries to assess the evolution of world inequality of well-being using non-parametric techniques to identify the possible emergence of polarisation.

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[1] Many different approaches to the measurement of multidimensional well-being have been proposed in the literature so far, based on very diverse definitions of well-being itself. Those measures range from the identification of a single (usually utility-based) "sufficient statistics" for welfare to a dashboard of non-comparable dimensions. For a critical review of the literature, see Aaberge and Brandolini (2015).

Starting from the concept of lifetime utility of Becker *et al.* (2005), we directly consider the indirect utility function as a cardinal index of welfare. Our approach brings some advantages, among which the potential inclusion of the expected income growth rates on the determinants of welfare, and, mainly, the possibility to directly compare welfare across populations.[2]

Using such an index, we find evidence of a decreasing trend in welfare inequality (as Becker *et al.* (2005)), but also of a strong pattern of polarization. Polarization in welfare is more pronounced than the one characterising income distribution, and is expected to persist in the future. In particular, we first consider as a proxy of the world distribution of welfare, the population-weighted cross-country distribution (in the following, "cross-population distribution" or "PWCC") in the period 1960-2011. We find a clear pattern of polarization with the emergence of three clusters in 2011, together with of a fall in welfare inequality. The populations of Sub-Saharan countries represent the poorest part of the low-welfare cluster, but the most of the mass is constituted by the populations of South Asia. The second cluster is in a relatively higher position and, with the notable exception of China, is constituted by Latin American populations. The upper cluster is instead mainly formed by populations from Western Europe and Western Offshoots and some Asian Tigers (Hong Kong, Korea and Singapore).

The clusters differ by some typical features discussed in literature as determinant of poverty traps, as the level of life expectancy, the degree of social conflict, the quality of institutions and the quality of labour force (human capital).[3]

The estimate of the long-run tendencies suggests that polarization should be a persistent phenomenon, while welfare inequality is expected to increase in the future. This expected pattern results from a stop in income and life expectancy convergence across the medium and high-income populations, and from a divergent dynamics of the lower income group.

We show how the polarization in welfare appears the result of the polarization in the cross-population distribution of income,[4] jointly with the positive relationship between income and life expectancy also at high levels of per capita GDP.[5] The complementarity between life expectancy and income in our welfare index implies that under a general upward trend of per capita income, a constant absolute difference in life expectancy, as the one observed between medium and high-income countries, leads to an increasing gap between welfare levels. In our sample this divergent dynamics is indeed only partially counterbalanced by the (recent) higher income growth rates of medium-income countries.

The estimate of the cross-population distribution disregards within-country disparities. However, there is increasing evidence that such inequalities both in income and life expectancy can be sizeable and changing over time. A more comprehensive approach should aim at directly considering the entire world population, ranking the individuals from the poorest to the richest irrespective of their nationality.[6] We then make a further step ahead with respect to Becker *et al.*

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[2] The methodology proposed by Becker *et al.* (2005) allows to compute only variations in "full income"; absolute welfare levels can be computed only if income and "full income" are assumed to coincide in a chosen base year (Becker *et al.* (2005) consider 1960 as base year, p. 283). Fleurbaey (2005) discusses how the income equivalent variations may depend on the choice of the base year, and, in turn, how it may lead to intransitive comparisons. An alternative method directly compute money-metric indices, which however need arbitrary references for both the income and non-income dimensions to be fixed. Fleurbaey and Gaulier (2009) applied such a method to 24 OECD countries in 2004, obtaining a ranking which strongly differs from the one based only on per capita GDP. Similarly the work by Jones and Klenow (2010) considers 134 countries and takes into account consumption, life expectancy as well as leisure and inequality.

[3] See Durlauf *et al.* (2005).

[4] See Quah (1997) and, for a more recent evidence, Vollmer *et al.* (2010)).

[5] This evidence partially contrasts with the so called "Preston curve" (see Preston (2007)), which points to convergence in life expectancy for medium/high-income countries.

[6] In terms of Milanovic's taxonomy the cross-population distribution corresponds to *Concept 2 inequality*, while this second approach is labelled as *Concept 3 inequality*.

(2005), estimating the world population distribution (in the following, "WP") of welfare by taking into account also within-country inequalities in the period 1993-2005.[7] With respect to the estimates based on the cross-population distribution, the world welfare inequality as measured by the Gini index appears to be remarkably higher (by 8 percentage points on average), but the qualitative pattern of its dynamics is confirmed: decreasing inequality over time and evidence of polarization.

Bourguignon and Morrisson (2002) and Becker *et al.* (2005) are the main sources of inspiration of the paper. Our theoretical model follows the approach in Rosen (1988), while the empirical analysis is inspired by the work of Danny Quah on income distribution and club-convergence dynamics (see, for example, Quah (1997)).

Our methodology is strongly related to the recent literature which proposes a more theoretically grounded approach towards the analysis of non-market dimensions of inequality and the evaluation of gains in quality and quantity of life.[8]

In the estimate of individual welfare by lifetime utility we are close to Murphy and Topel (2006); their goal, however, is different, since they aim at valuing improvements in overall longevity and health care. From a theoretical point of view Anderson (2005) presents a similar framework: however, no randomness in the length of life is considered; moreover, the empirical analysis is limited to African countries. Finally, Nordhaus (2003) and Hall and Jones (2007) provide stimulating discussions on the evaluation of welfare associated to extensions in life expectancy.

The non-parametric methodology used in the empirical analysis is based on Fiaschi and Lavezzi (2003). The estimate of the long-run distribution follows Johnson (2005), thus avoiding the discretization of the state space. In addition, we propose a novel bootstrap procedure to identify confidence intervals for the estimation of the long-run distributions.

The paper is organized as follows: Section 2 presents the theoretical measure; Section 3 reports and discusses the empirical results; Section 4 concludes. The appendices contain proofs, some extensions of the analysis, and other technicalities.

2 A measure of individual welfare

The measure of individual welfare we propose is based on the model in Rosen (1988) with state dependent utility. In particular, we apply it in a framework with long-run growth and CIES instantaneous utility function, in order to calculate an explicit formulation of the lifetime utility of agents. Consider an agent born at time 0 with a maximum length of life equal to T and a positive probability of dying before $T > 0$. Given her initial wealth, $\bar{p}_0$, and a flow of potential labour incomes ($yl_0, yl_1, ..., yl_T$), the intertemporal budget constraint of the agent is:

$$\int_0^T c_t \exp(-rt)\, S_t dt \leq w, \tag{1}$$

where r is the interest rate, S_t the probability to survive at age t, and w is the lifetime wealth of the agent, given by:

$$w = \bar{p}_0 + \int_0^T yl_t \exp(-rt)\, S_t dt. \tag{2}$$

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[7] Limitation in data availability constraints the time span we can consider.

[8] For a review on these issues, cf. Decancq *et al.* (2015) and Weil (2014).

We assume that r is constant over time and non-negative.

Budget constraint (1) assumes full annuity insurance, or the existence of a complete contingent claims market (see Becker *et al.* (2005)): the agent can borrow in perfect capital markets all her potential future labour incomes at the current interest rate r, and the survival function S is common knowledge across all the agents in the economy.

When the agent is alive, her preferences are described by the following *CIES* instantaneous utility function:[9]

$$u(c) = \begin{cases} \frac{c^{1-\sigma}}{1-\sigma} - M & \text{for} \quad \sigma > 0 \text{ and } \sigma \neq 1; \\ \log(c) - M & \text{for} \quad \sigma = 1, \end{cases} \tag{3}$$

Preferences (3) depend on two additive components: a constant term, M, which represents the utility of the state "dead",[10] and the term $c1-\sigma$ / $(1 - \sigma)$ describing the utility of the state "alive".[11] Subtracting M from utility in each state (both "dead" and "alive") normalizes the utility of non-survival to zero.

If $\sigma \in (0, 1)$ and $M < 0$ being alive has a positive utility *per se*; the agent would prefer a longer life independently of her consumption level. On the contrary, if $\sigma > 1$, then M should be negative, otherwise $u(c) < 0$ for all c and therefore "dead" would be always the preferred state of the agent. We therefore assume that:[12]

$$\begin{array}{ll} 1. & \text{if } \sigma \in (0,1) \text{ then } M > 0; \\ 2. & \text{if } \sigma = 1 \text{ then } M \in (-\infty, +\infty); \text{ and} \\ 3. & \text{if } \sigma > 1 \text{ then } M < 0. \end{array} \tag{4}$$

Under Assumption (4) there exists a *zero utility consumption*, c^{ZUC} , such that $u(c^{ZUC}) = 0$, *i.e.*:

$$c^{ZUC} = [(1-\sigma) M]^{\frac{1}{1-\sigma}}. \tag{5}$$

The expected utility of the agent is given by:[13]

$$E[U] = \int_0^T \left(\frac{c^{1-\sigma}}{1-\sigma} - M \right) \exp(-\rho t) S dt, \tag{6}$$

where ρ is the discount rate.

Assume that:[14]

$$\dot{S}/S = -\pi^D, \tag{7}$$

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[9] The form of the utility function for $\sigma \to 1$ in Eq. (3) is obtained by adding the constant term $-1/(1-\sigma)$ to the term $c^{1-\sigma}/(1-\sigma)$.

[10] The presence of the constant term M allows the utility elasticity to decline with consumption. Under reasonable assumptions on the parameters' values, this implies that an agent would eventually prefer to substitute consumption with additional years of life.

[11] The latter term is commonly used in the literature on economic growth, because it ensures constant growth rates in steady state.

[12] Rosen (1988), p. 287, argues that the economically interesting cases are those for which the elasticity of the instantaneous utility function $\varepsilon \in (0, 1]$. This corresponds to the cases: i) if $\sigma \in (0, 1)$ then $M > 0$ or ii) if $\sigma > 1$ then $M < 0$.

[13] In the following, we omit the time index whenever it does not cause confusion.

[14] See Nordhaus (2003) for a similar framework

where $\pi^D > 0$ is the mortality rate. Under Assumption 7 life expectancy at birth (*i.e.*, at time $t = 0$) is given by:

$$LE = \frac{1 - \exp\left(-\pi^D T\right)}{\pi^D}. \tag{8}$$

If $T \to \infty$ then $LE = 1/\pi^D$, while if $\pi^D = 0$ then $LE = T$.

We also assume that the agent's expected labour income grows at a rate equal to the steady-state growth rate g, *i.e.*:[15]

$$yl_t = yl_0 \exp(gt) \text{ for } t \in [0, T]. \tag{9}$$

When the agent has no initial wealth, *i.e.*, $\bar{p}_0 = 0$, her indirect lifetime utility is given by:[16]

$$V(T, yl_0, g) = \left(\frac{1}{1-\sigma}\right)\left\{yl_0^{1-\sigma}\left[\frac{\exp\left((g-\hat{r})T\right)-1}{g-\hat{r}}\right] + \frac{(1-\sigma)M\left[\exp\left(-\hat{\rho}T\right)-1\right]}{\hat{\rho}}\right\}, \tag{10}$$

where $\hat{r} = r + \pi^D$ and $\hat{\rho} = \rho + \pi^D$ are respectively the interest rate and the discount rate adjusted for the instantaneous probability of dying before T.[17]

In our analysis, V is considered as a direct index of human well-being. We depart from Becker *et al.* (2005), whose index of well-being is the sum of per capita GDP in 1960 plus the gains in both material income and longevity expressed in "full income" variations, assuming that in 1960 "full income" and income coincide. In the empirical analysis, under the hypothesis of equal preferences across world population, the two approaches lead to the same results.

A key feature of lifetime utility in Eq. (10) is that income and life expectancy are complements, which means that the same gain life expectancy is valued more by rich individuals than by poor ones (both in absolute and relative terms). This element has been partially embodied also in the new formulation of the *Human Development Index* (HDI), which before the revision showed the opposite (and mostly criticized) feature, *i.e.*, income and life expectancy were pure substitutes. The HDI retains however the drawback of the lack of a clear microfoundation (cf. Weil (2014), p. 668). The same objection applies to the more recent *OECD Better Life Index*. In this regard our index based on lifetime utility overcomes this limit.[18] As we will discuss below, this has relevant implication for the analysis: under a general upward trend of per capita income, a constant absolute difference in life expectancy, as the one we will observe between medium and high-income countries, leads to an increasing gap between welfare levels.

3 Empirical evidence

This section studies the evolution of world inequality in welfare, per capita GDP and life expectancy and their distribution dynamics. Ideally, in order to derive the proper distribution we

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[15] For the sake of simplicity, in Eq. (9) we are considering that the agent works over her whole life; however, the analysis could be easily extended to the case in which the agent retires at age T^R, with $T^R \in (0, T]$.

[16] See Appendix A for the details.

[17] Lifetime utility V can be a non-monotonic function of life expectancy. The parameters' setting adopted in the paper excludes such possibility. We refer to Fiaschi and Romanelli (2010) for a more detailed analysis of this issue.

[18] On the other side, we do not incorporate dimensions other than health and income (consumption) in measuring welfare while both of those indices include other aspects, more or less correlated with income, such as education, environmental quality, civic engagement, etc.

should estimate the welfare of each individuals in the world. This would require a tremendous amount of microdata which is so far not available. Our *first* approximation is then deriving an estimate of the population-weighted welfare distribution among countries.

3.1 Methodology of the empirical investigation

As in Becker *et al.* (2005), the welfare of a population in a given country is assumed to be equal to the (indirect) lifetime utility of a representative agent with no initial wealth, *i.e.*, $\bar{p}_0 = 0$, whose first yearly income, yl_0, is proxied by the per capita GDP of that country and whose life expectancy, *LE*, is equal to the average life expectancy at birth of its citizens; it is therefore equal to the utility of a representative newborn.

Given our welfare indicator for each country in each year of the considered time-span (1960-2011), we can estimate the population-weighted distributions over time. Such analysis provides a picture of the dynamics of inequality across individuals and possibly allows to identify the emergence of clusters of populations. Such estimates contain a bias since they neglect the *within-country* distribution of welfare.[19] However, in Section 3.4 we will show for the period 1993-2005 how the inclusion in the analysis of the *within-country* distribution of welfare substantially confirm our findings.

Concerning the empirical analysis, we depart from Becker *et al.* (2005) in a key methodological aspect: the use of non-parametric techniques, which crucially affects the results because of the presence of non-linearities in the distribution dynamics. As discussed by Durlauf and Johnson (1995) the presence of σ (or, in our case, Gini) and β (absolute) convergence does not exclude the existence of multiple equilibria, *i.e.*, polarization.

Finally, Eq. (10) shows that a proper estimate of the welfare distribution should take into account all the non-linearities between growth rates, income and life expectancy, especially in presence of high cross-country heterogeneity in income growth rates. However, estimating g for a given country in a given year is not a simple task, because it should represent the *expected* income growth rate for a newborn in that country in that year. This suggests to limit the analysis to the baseline case of $g = 0$.[20] We checked the sensitivity of our results to the assumption $g = 0$ by considering non-null country-specific growth rates. The picture is qualitatively confirmed, that is the presence of polarization, even tough with higher welfare inequality. Therefore, cross-country heterogeneity in income growth rates does seem only to exert a second-order effect on the dynamics of welfare inequality.[21]

3.2 Calibration of individual welfare

The sample in the empirical analysis includes 103 countries, for which we have complete information on per capita GDP, life expectancy and population size for the period 1960-2011. Countries' GDP is measured by the expenditure-based real GDP at chained PPPs in 2005

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[19] Bourguignon and Morrisson (2002) show that in modern economic history the within-country component was the main source of inequality in per capita GDP until World War II, accounting for almost 3/4 of total inequality on average. However, since the 1950s, its contribution to world inequality has been halved, given that the dynamics of between-country inequality is the leading factor in determining inequality across world citizens.

[20] In fact, the decomposition of changes in welfare into additive separable components, namely changes in income and changes in life expectancy or in other non-income dimensions, as for example in Becker *et al.* (2005) or in Jones and Klenow (2010), relies on such assumption.

[21] For the sake of brevity, we omit to report such robustness check here. For more details, we refer the interested reader to Section 4 in Fiaschi and Romanelli (2009).

international prices (I$) drawn from Penn World Table 8.1 (PWT 8.1); the population is taken from the same dataset, while life expectancy at birth comes from the 31st January 2015 release of the World Development Indicators (WDI 2014).[22]

For the model parameters, we use almost the same set as in Becker *et al.* (2005); in particular $\rho = 0.005$, $\pi^D = 0$, so that $LE = T$,[23] and $\sigma = 1/1.250$. For what concerns the estimation of M , we derive it from Eq. (5), setting c^{ZUC} equal to the minimum level of per capita GPD observed in our sample (*i.e.*, I$225.2 for Nigeria in 1995; which implies that $M = 14.8$). This setting represents a lower bound: indeed, no country (not even Nigeria) displays a per capita GDP permanently lower than that (remind that no agent in any case would be willing to consume permanently less than c^{ZUC} and still survive). An alternative specification is proposed by Becker *et al.* (2005), who calibrate M using parameters values estimated from the U.S. economy: specifically, $\varepsilon = u'(c)\, c/u(c) = 0.346$ and $c = 31,439$I$ in 1990, from which $M = 16.7$.[24] The implied zero utility consumption, c^{ZUC} , would be equal to I$419 (see Eq. (5)): an individual whose consumption in every period is equal to I$419 would be indifferent between living or dying independently of her life expectancy. In our sample there are 3 countries for which per capita GDP would be lower than I$421 for at least 20 per cent of the time span (Mozambique, Democratic Republic of the Congo, Nigeria). This leads us to focus on the first and more conservative calibration for M. However, the findings discussed below appear robust to alternative specification of the model's parameters.[25] What could make a difference is a (implausible) value of c^{ZUC} close to zero, which would determine a collapse in the Gini index.

As discussed above, a country's welfare is computed by Eq. (10) assuming $g = 0$.[26]

In order to gain an intuition of the relationships between per capita GDP, life expectancy and welfare, Figure 1 displays a series of level curves for welfare in the space *(per capita GDP*, *life expectancy)*. It also reports the positions of some representative countries in 1980 (diamond) and in 2011 (grey circle).

Between 1980 and 2011, for example, Cote d'Ivoire and Democratic Republic of the Congo show a decrease in their welfare, while China and India a large increase. Some developed countries present a relatively high increase in their life expectancy (Italy and Japan), while others a relatively marked increase in their per capita GDP (*i.e.*, the United States). The numbers reported in the three triangles along the dashed line (which represents an estimation of the "Preston Curve" in 2011) are the marginal rates of substitution (MRS) between life expectancy and per capita GDP (expressed in ten 2005 international dollars). As expected, at very low levels of life expectancy and per capita GDP (respectively around 35 years and I$440), individuals value income relatively more than life expectancy (*i.e.*, individuals value I$10 more in each year of their life equal to 1.4 years of life expectancy at birth). Instead, at very high level of life expectancy and per capita GDP (respectively 82 years and I$39100), the opposite occurs (*i.e.*, individuals value I$10 per year equal

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[22] Appendix B reports the country list; expenditure-side real GDP at chained PPPs in 2005 international prices: variable *rgdpe* in Penn World Table 8.1, see http://www.ggdc.net/pwt; population: variable *pop* in Penn World Table 8.1; life expectancy at birth: variable *SP.DYN.LE00.IN* in World Development Indicators, see http://databank.worldbank.org/data/home.aspx/

[23] An alternative specification could consider $T \to \infty$, from which $LE = 1/\pi^D$, thus setting π^D equal to the inverse of the observed life expectancy, in the estimates of the agent's utility. All the empirical results reported below are robust to this alternative specification.

[24] Indeed, from Eq. (3) $M = c^{(1-\sigma)}\,[1/(1-\sigma) - 1/\varepsilon]$.

[25] See Fiaschi and Romanelli (2009) for a broader discussion.

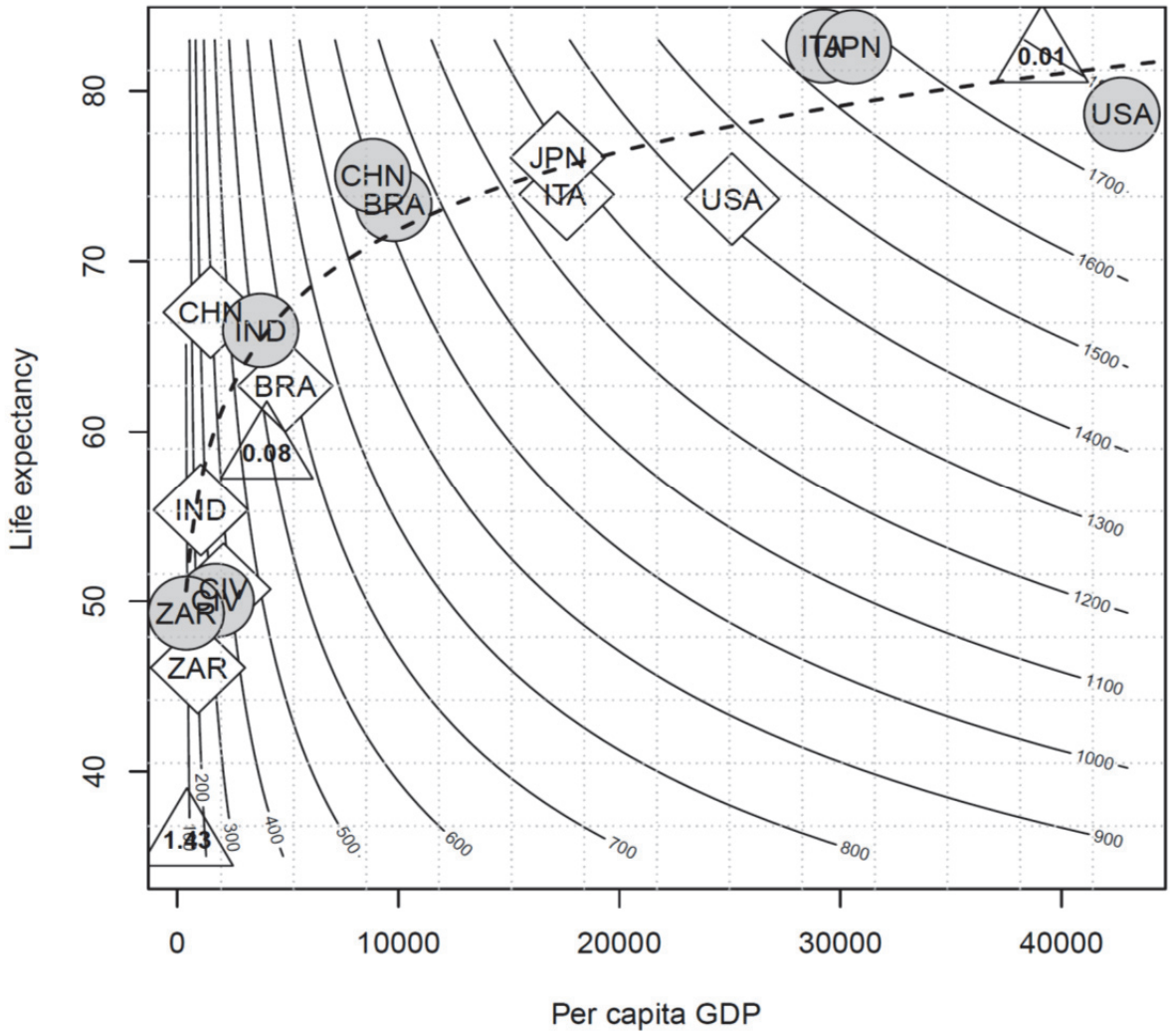
[26] For example, the expected welfare of a representative American newborn in 2011 is:

$$V_{US} = \left(\frac{1}{1-\sigma}\right)\left\{\frac{\exp(-\rho LE_{US}) - 1}{\rho}\left[(1-\sigma)\,M - yl_{US}^{1-\sigma}\right]\right\} = 1782.1,$$

where yl_{US} = I$42734 and $LE_{US} = 78.64$.

Figure 1

Welfare Calculated with $g = 0$ for a Sample of Countries in 1980 (Diamond) and in 2011 (Grey Circle)
(ten international dollars)



Country codes: Brazil (BRA), China (CHN), Cote d'Ivoire (CIV), India (IND), Italy (ITA), Japan (JPN), Democratic Republic of the Congo (ZAR), United States (USA).
Numbers in Triangles are the Marginal Rate of Substitution Between Life Expectancy and per capita GDP.

to 0.01 years of life expectancy at birth).[27] The marginal rate of substitution in the bottom part of the distribution clearly depends on c^{ZUC}: for example, if c^{ZUC} is around I$100 at the same low level of life expectancy and per capita GDP (35 years and I$440)individuals value I$10 per year equal to 0.7 years of life expectancy at birth, while at high level of per capita GDP and life expectancy (82 years and I$39100) the MRS remains unchanged (at 0.01). The latter finding is not surprising, given that for rich people the level of c^{ZUC} is almost irrelevant.

[27] This feature stems from the fact that while marginal utility of consumption decreases, that of life expectancy does not. Hall and Jones (2007) discuss such element as an explanation for the increasing size in health care expenditure the richer the country.

Table 1

Descriptive Statistics for the Sample's Variables

Year		**1960**	**1980**	**2000**	**2007**	**2011**
Per capita GDP						
	Mean	3536	5779	8612	10493	10962
	Gini	0.56	0.60	0.60	0.54	0.51
	Top 5%	0.323	0.272	0.254	0.232	0.222
	Bottom 5%	0.005	0.005	0.003	0.004	0.004
Life expectancy						
	Mean	51	63	68	70	71
	Gin	0.12	0.07	0.07	0.06	0.06
Welfare ($g = 0$)						
	Mean	425	588	753	872	917
	Gini	0.40	0.35	0.32	0.28	0.26
	Top 5%	0.203	0.152	0.128	0.119	0.117
	Bottom 5%	0.009	0.012	0.006	0.01	0.011
Pop						
	Total (*millions*)	2548	3789	5272	5752	6024

Table 1 reports some descriptive statistics of the sample, including a set of inequality indices for selected years (1960, 1980, 2000, 2007 and 2011). Following the standard in the literature on income distribution, inequality is measured in relative terms, even though we are aware of the possible important consequences of such choice in our analysis with variables generally growing over time. For example, if the average welfare is increasing over time a constant relative inequality would mean an increasing absolute inequality.[28]

Inequality in both per capita GDP and life expectancy across populations decreased markedly from 1960 to 2011, with the inequality of per capita GDP always higher than the one of life expectancy. Accordingly, we can also observe a strong reduction in the inequality of welfare and a level that is systematically lower than that of income inequality. However, looking at two sub-periods, namely 1960-1980 and 1980-2011, per capita GDP and life expectancy seem to follow two different patterns: inequality in income first rose and then started declining, while disparities in life expectancy shrank dramatically in the first sub-period and then remained substantially constant. This is consistent with Ram (2006) who finds in fact a reversal in the convergence dynamics of life expectancy at the country level after 1980 (see also Bloom and Canning (2007) and Becker *et al.* (2005) for similar findings). This is also the reason why we will focus on such two sub-periods to elicit long-run tendencies.

[28] See Anand and Segal (2008) for a discussion on this issue.

3.3 Distribution dynamics of welfare

To further investigate the evolution of welfare inequality over time, we use the non-parametric methodology proposed in Fiaschi and Lavezzi (2003). In particular, Section 3.3.1 reports the estimated growth path of welfare so to detect possible non-linearities, a necessary condition for the presence of polarization; Section 3.3.2 then analyses how the distribution of welfare has changed, estimating also the evolution of the joint dynamics of per capita GDP and life expectancy over time and the related stochastic kernels; and, finally, Section 3.3.4 discusses the long-run tendencies by comparing the actual distributions and the estimated ergodic distributions.

3.1.1 Con(Di)vergence in welfare

Figures 2-3 report the population-weighted estimate of the growth paths of welfare. In particular, they show the estimate of Model (11) over different time-spans, where x is the log of welfare level.

$$\overline{GR}_i^x = m\left(x_i^{INI}\right) + \epsilon_i; \tag{11}$$

$\overline{GR}_i^x$ is the average growth rate of x in country i in a given period, x_i^{INI} is the initial value of x and ε_i is an independently distributed random variable with zero mean.[29]

The estimate of m (.) is made using the Nadaraya-Watson estimator with the optimal normal bandwidth.[30]

A note of caution is needed. It is well-known that in presence of measurement errors related to the initial value of x, the linear estimate of Model (11) can be biased in favour of convergence (*i.e.*, at low level of x is associate a higher growth rate). Heuristically, non-parametric regressions, given their nature of "local" regressions, should be more robust to the presence of non-classical measurement errors, in particular larger errors in the lower tail of the distribution, because they would not affect the whole range of the variable; however, the problem still remains.[31]

The growth path welfare is estimated for the whole period 1960-2011 and for the subperiod 1980-2011.[32] The figures report the cross-population estimates, where the weights used are the population sizes at the initial year. Dotted lines represent the pointwise confidence intervals at 95 per cent (see Ha¨rdle *et al.* (2004)) and the red line signals the overall annual average growth rate. We also report countries' observations by circles, whose area is proportional to their population at the initial year (the country-codes reported in the figures refer to the top ten countries by population size). Finally, Sub-Saharan countries are represented by grey circles.

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[29] Usually, the relationship between the income growth rates of a cross-section of countries and their levels of income is called "growth path" because, under the assumption of an equal stochastic process governing income growth in all countries, this relationship should represent the path followed by each country in its development. With a slight abuse we use the same denomination for the case of our welfare measure.

[30] All the calculations and estimates in the paper are made using R. The estimates of nonparametric regressions are made using the package *sm* (see Bowman and Azzalini (2005)).

[31] For example, one of the two main components of the welfare measure, that is life expectancy, can suffer from an upward bias particularly relevant at lower levels of the variable and which could decline over time, affecting the estimates for poor countries, see Becker *et al.* (2005), p. 278.

[32] We also performed the same estimation for per capita GDP and life expectancy separately. In the case of life expectancy, the growth rate is replaced by the average difference. The estimates for the subperiod 1960-1980 and all the estimates for per capita GDP and life expectancy are available upon request.

Figure 2

Growth Path for Welfare in 1960-2011

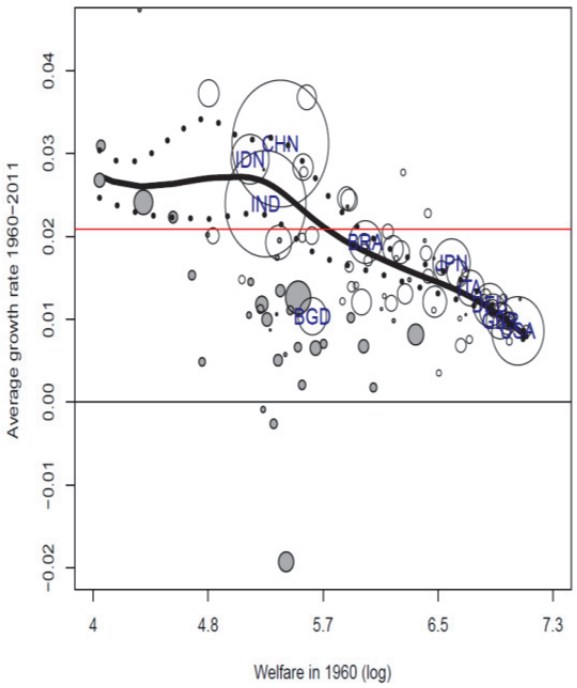
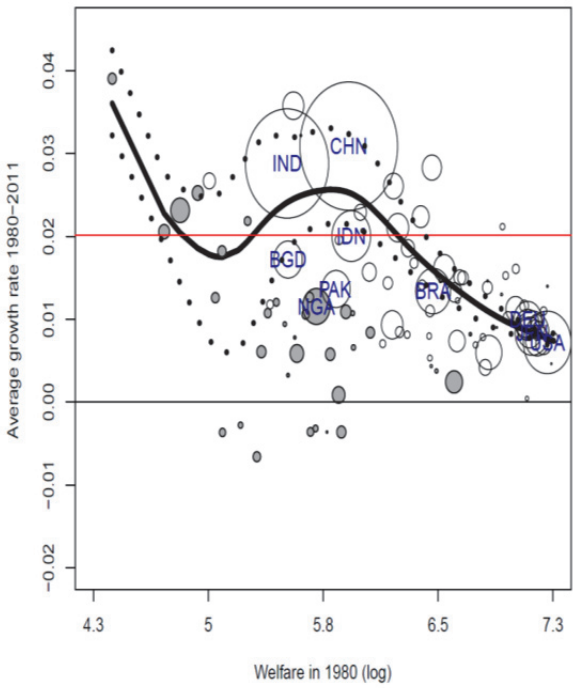


Figure 3

Growth Path for Welfare in 1980-2011



For the entire timespan 1960-2011, the growth path of welfare points to convergence, at least at medium-low levels of welfare (see Figure 2). The main driver of such dynamics is the evolution characterising the populations of some of the largest (and still poor in 1960) countries in the world, such as China, India and Indonesia,[33] and in particular their spectacular performance both in terms of income growth rates and life expectancy gains.

However, at lower levels of welfare the caching up process seems less robust and some populations appear instead to be getting trapped into middle-welfare levels. Focusing on the period 1980-2011 (Figure 3), such club-convergence dynamics appears clearer. As some of the Asian largest countries continue along their convergence path, other large populations with similar welfare levels (for example, those from Bangladesh or Pakistan) get relatively stuck. Indeed they have not over-performed compared to the people from high-income countries, so that the gap between those populations and the rich people has been growing in absolute terms.

A specific case can then be made for the populations of Sub-Saharan countries, whose wellbeing is rather diverging, with general stagnant or even negative growth rates. This is owed both to their gloomy performance in terms of GDP growth rates compared with that of China and India and to their very small increases in life expectancy mainly due to AIDS epidemics which had, and, unfortunately, continue to have, a devastating impact on mortality rates in the area (see, e.g., Bloom and Canning (2007)). Such evidence is not substantially reverted even when we take a look at the years of the "African growth miracle", which has characterised African countries' income growth rates in the first decade of the XXI century (Rodrik (2014)): even though a light convergence toward the medium-welfare club could be detected (Figure 4), it seems to have lost its momentum after the beginning of the Great Recession (Figure 5).

[33] They represent almost 50 per cent of the total population in the sample in 2011.

Figure 4

Growth Path for Welfare in 2000-2011

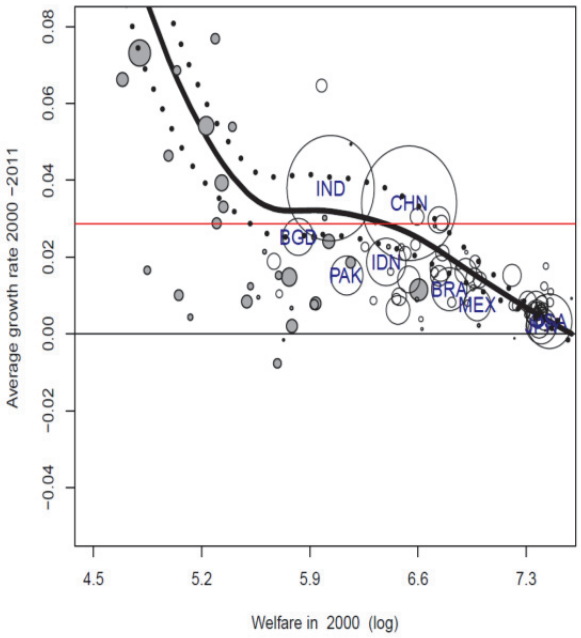
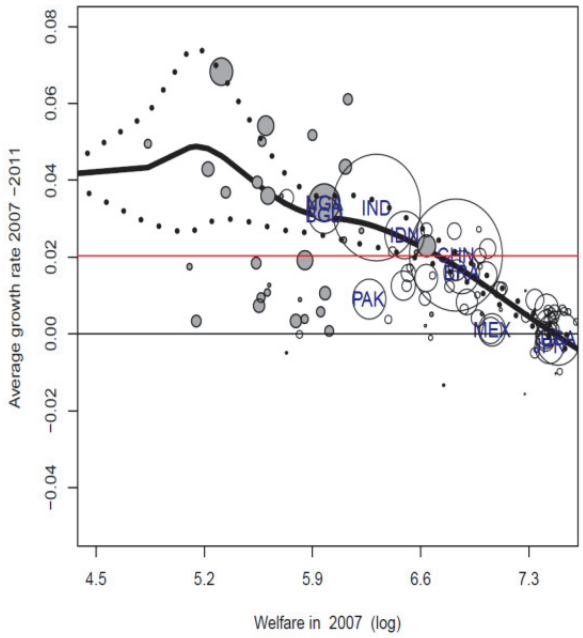


Figure 5

Growth Path for Welfare in 2007-2011



Looking separately at the two welfare components, namely income and life expectancy, a clear convergence path across the world population over the entire period considered (1960-2011) is observable only at very high levels of per capita GDP. However, focusing on the period 1980 onwards, the picture is rather different, with convergence regarding populations only at low-medium level of income. This pattern is mainly due to the high growth rates of four big Asian countries, Bangladesh, China, India and Indonesia, as already mentioned. Instead, very poor people, *i.e.*, people from Sub-Saharan countries, tends to diverge.

On the contrary, life expectancy across population shows a clear path of convergence between 1960 and 2011, driven by large gains in life expectancy of highly populated Asian countries. Again, since 1980 things seem to change and convergence stops. The population of the Sub-Saharan countries are left behind, and no convergence of the people with medium life expectancy to those with high expectations occur. Also high life expectancy countries stop converging. Various explanations have been proposed, among which the increasing difficulties in transferring medical technology among countries with respect to the past (e.g., immunization and antibiotics), and the different role of the governments in the health system.[34]

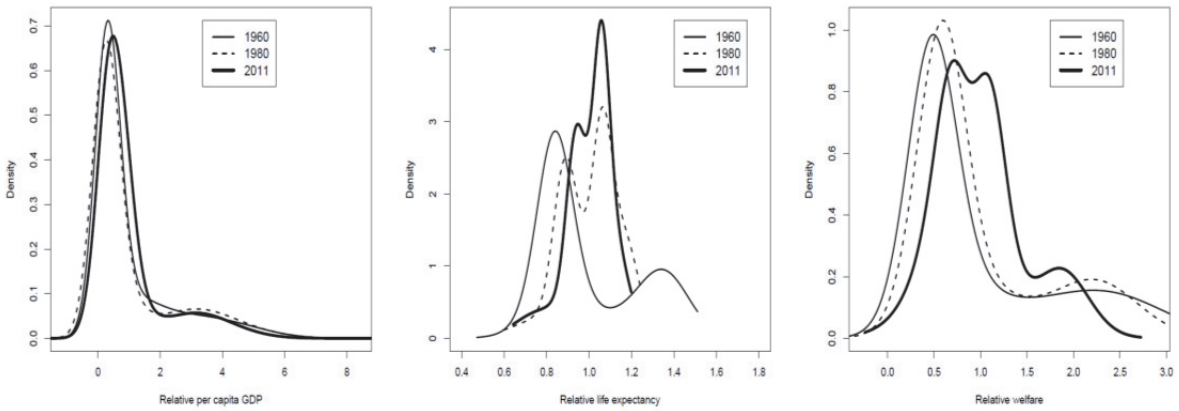
Overall the evidence suggests the presence of polarization across world population. In particular, the ’80ies seem to mark a change in the dynamics of convergence. The evolution of welfare appear highly non-linear and affected by a strong cross-country heterogeneity. The next section discusses the implications for the distribution dynamics.

[34] We refer to Easterlin (2004), Cap.7, and Becker *et al.* (2005) for a more detailed discussion of the possible causes.

Figure 6

Estimated Distributions

(a) Relative GDP **(b) Relative Life Expectancy** **(c) Relative Welfare**



3.3.2 The evolution of the distribution of per capita GDP, life expectancy and welfare from 1960 to 2011

In the following we first report estimates of the distribution of welfare in three significant moments – at the beginning, in the middle and at the end of the period considered (Figure 6) – and then we analyse the dynamics of such distribution focusing on the period 1980 onwards. In particular, for this second step we estimate the evolution of the joint distribution of per capita GDP and life expectancy and then the stochastic kernel for welfare, so to take into account non-linearities.[35]

In estimating densities, we use the *adaptive kernel estimation* with the Gaussian kernel as suggested by Silverman (1986).[36]

Turning to the results, we already noted that inequality of per capita GDP among the world population decreased between 1960 and 2011 (actually the declining trend started in 1980). The Gini index indeed falls slightly but significantly from 0.56 in 1960 to 0.51 in 2011 (see Table 2). Looking at the distributions of relative GDP (Figure 6a), apparently they seem to be always single-peaked (around 0.5) with a thick right tail in all three years, even though as time goes by a second peak around 3.5 becomes more and more evident: indeed tests for the presence of multimodality in the per capita GDP distributions suggest that while unimodality cannot be rejected for the distribution in 1960, bimodality is instead a likely feature already in 1980 (see Table 3).[37] This in turn points to a stronger identification of at least two clusters of populations.

The picture for life expectancy is slightly different (Figure 6b). Inequality decreases from 1960 to 1980, and then remains steady. The Gini index almost halves in the first twenty years considered (from 0.12 in 1960 to 0.07 in 1980; see Table 2) and then stops. Polarization is clearly present since 1960, as suggested by the multimodality tests which support the presence of multiple modes in the distribution from the very beginning (see Table 3). However, the two groups (*i.e.*, the two modes), although neatly separated, tend to be closer over time.

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35 The stochastic kernels of per capita GDP and life expectancy are not reported for the sake of brevity. They are all available upon request.

36 See Appendix C.

37 For the 1980 distribution, the null hypothesis of unimodality is rejected with a p-value of 0.024, while the null hypothesis of bimodality would be rejected only with a p-value equal to 0.346. Details on the tests of multimodality are presented in Appendix D.

Table 2

The Gini Index of the Distributions of Per Capita GDP, Life Expectancy and Welfare ($g = 0$)

Year	GDP	Life exp.	Welfare ($g = 0$)
1960	0.56 ** (0.015)	0.12 *** (0.006)	0.40 *** (0.011)
1980	0.60 *** (0.013)	0.07 ** (0.005)	0.35 *** (0.012)
2011	0.51 (0.022)	0.06 (0.005)	0.26 (0.017)

Note: Standard errors are in parentheses. The results of the test on the equality between Gini indices (base-year 2011) are reported as follows: "#"15 per cent significance level, "*" 10 per cent significance level, "**" 5 per cent and "***" 1 per cent.

Table 3

P-value of the Null-hypothesis of Unimodality and Bimodality of the Cross-population Distribution of Per Capita GDP, Life Expectancy and Welfare

	Unimodality Test			Bimodality Test		
Year	**GDP**	**Life Expectancy**	**Welfare**	**GDP**	**Life Expectancy**	**Welfare**
1960	0.722	0.000	0.022	0.374	0.194	0.528
1980	0.024	0.026	0.016	0.346	0.036	0.272
2011	0.020	0.028	0.016	0.342	0.130	0.000

As a result of the dynamics of per capita GDP and life expectancy, the inequality of the cross-population distribution of welfare decreases remarkably, while clusterization strengthens over time. Not only all the distributions are two-peaked, but the 2011 distribution seems to be characterised by the emergence of a third peak (supported also by the tests for multimodality), made of some of the populations in the lower welfare group who turn out to be less able to catch up (Figure 6c).

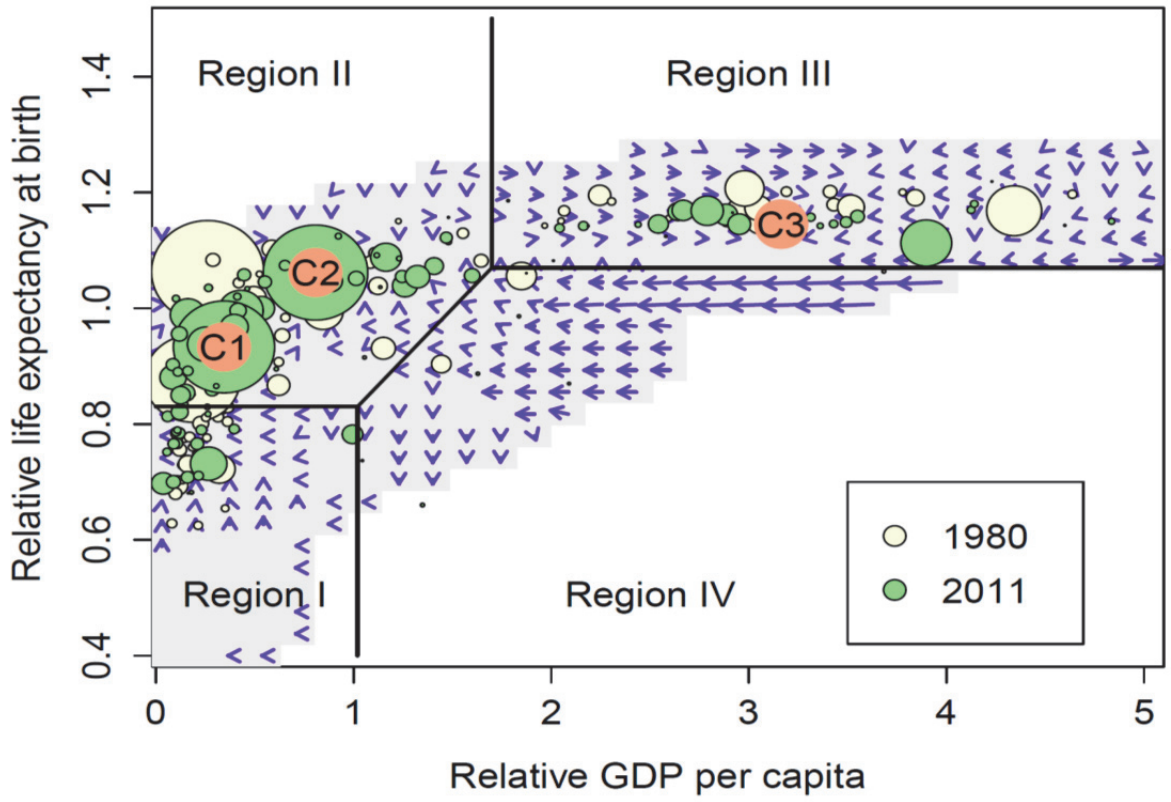
Both the growth paths and the distribution estimates support the idea of a polarization or club convergence dynamics of welfare across populations, besides an overall reduction in inequality. In particular, such dynamics starts realizing in the '80ies. Per capita GDP tends to polarize and life expectancy stops converging. The evidence is towards the formation of at least two clusters over the last 3 decades, with the possibility of a third cluster in the lower part of the distribution of welfare. Analysing the evolution of the joint dynamics of (relative) per capita GDP and life expectancy between 1980 and 2011 across populations can shed some lights on what forces are at play.

3.3.3 Club-convergence in welfare

Figure 7 depicts a vector field, where the arrows indicate the direction and magnitude of

Figure 7

The Joint Dynamics of Relative Per Capita GDP and Relative Life Expectancy, 1980-2011
(circles represent countries in 1980 (light yellow) and in 2011 (light green) and their size is proportional to countries' populations)



the joint dynamics of per capita GDP and life expectancy at different points in the space *(per capita GDP*, *life expectancy)*.[38]

Circles, representing countries observations in 1980 (light yellow) and in 2011 (light green), are proportional to the size of the countries population.

Four regions are defined on the basis of the pattern of the arrows: in particular, the frontiers of the regions are drawn where the vector field displays divergent dynamics. The Sub-Saharan countries lay in Region I, the highly populated countries (*i.e.*, China and India) are located in Region II and the OECD countries in Region III. Basically, no country is located in Region IV, suggesting that a high per capita GDP is always associated with a long life expectancy.

From 1980 to 2011 the distribution of populations across the four regions changes in favour of Region II: the probability mass varies from (0.1, 0.72, 0.16, 0.02), respectively, in Region I, II, III and IV in 1980 to (0.09, 0.75, 0.16, 0.0) in 2011. The change mainly reflects the transition into Region II of some large Sub-Saharan populations, such as Ethiopian and Tanzanian. Mobility across regions however is very low (with the obvious exception of Region IV, which is basically empty): the probabilities that an individual in Region I, II, III and IV were in the same region in 1980 and in 2011 are respectively equal to (0.64, 0.97, 1, 0).

[38] For the methodology used, refer to Appendix E.

In terms of per capita GDP at least two clusters of populations seem to exist in 2011, one in Region II (*i.e.*, populations with relative per capita GDP of around 0.5) and the other one in Region III (*i.e.*, populations with relative per capita GDP of around 3).[39] Similarly, the distribution of life expectancy shows at least two clusters in 2011, one in Region II (around 1.0) and one in Region III (around 1.15). The joint distribution of life expectancy and per capita GDP, therefore, suggests the existence of (at least) two clusters of populations also in terms of welfare. However, looking at both lower levels of per capita GDP (around 0.10.2) and life expectancy (around 0.8) a non-negligible mass of countries can be detected, pointing to the possible presence of a third cluster (in line with the observation drawn from the analysis of the welfare distribution in 2011, cf. Figure 6c).

For descriptive purposes only, we applied the *k-medians algorithm* to the observations in 2011 assuming the existence of such three clusters;[40] the centroids of these three possible clusters are located in C1 = (0.34, 0.93), C2 = (0.81, 1.06) and C3 = (3.16, 1.15): we refer to Appendix B for the list of countries (and their share of the world population) in the different clusters.

Cluster 1 is centred at low levels of per capita GDP (about 34 per cent of the average) and life expectancy (about 93 per cent of the average); it is mainly composed by populations from Sub-Saharan countries, some very large countries in South Asia, like India, Indonesia and Bangladesh, and few North African countries, like Egypt and Morocco. All low-income populations present on average also a low life expectancy, as suggested by the Preston curve. Cluster 2 is centred at relatively low levels of per capita GDP (about 80 per cent of the average) and medium-high levels of life expectancy (around 106 per cent of the average); apart from China, the cluster is mainly composed of Latin American populations and people from Central Asia. Finally, Cluster 3 is centred at high levels of per capita GDP and life expectancy (both variables are well above the average, *i.e.*, 316 and 115 per cent); the cluster is formed by OECD countries located in Western Europe, Western Offshoots and by some Asian Tigers, like Hong Kong, Korea and Singapore. The three clusters therefore appear to have a strong regional characterization.

Table 4 reports some descriptive statistics of the three clusters.[41] Cluster 1 only partially fits the description made by Collier (2007) of the poverty trap: even tough it is characterised by very low income and life expectancy levels, a relatively high level of social conflict, lowquality institutions and governance and the lowest level of human capital, income growth rates are not dissimilar to that of Cluster 3 and output does not seem to rely only on natural resources (as suggested by the even share of manufactures exports of the total of merchandise exports). Moreover, saving rates are substantial.

Also Cluster 2 seems to be partially plagued by high political instability and social conflict, as well as by low-quality institutions. However, it presents a very high level of savings, a higher stock of human capital, a higher share of output deriving from manufactures and a lower population growth rate. Moreover, the growth rate on average is by far the largest. Overall this results in substantially higher levels of both per capita income and life expectancy with respect to Cluster 1. Finally, Cluster 3 is, by far, the cluster with the highest living standards under several points of view (e.g., not only for the high level of per capita income and life expectancy, but also for less growth volatility, low intensity of social conflicts, etc). Moreover, remarkably larger than

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[39] Quah (1997) finds a similar feature.

[40] See Leisch (2006) for details. We choose the *k-medians algorithm* since its objective is to minimize the total intra-cluster absolute distance; it thus appears more robust to outliers than *k-means algorithm.*

[41] In particular, we report some average characteristics of the countries belonging to the three different clusters in 2011, weighted by populations' size. Apart from average income, average life expectancy and population growth, we consider the average volatility of the income growth within the clusters, indicators of capital accumulation (gross fixed capital formation) and human capital accumulation (the share of the labour force with at least a secondary or a tertiary degree) and measures of the quality of governance and political instability.

Table 4

Descriptive Statistics for the Three Clusters of Countries in 2011 Selected Variables

	Cluster 1	Cluster 2	Cluster 3
Average per Capita GDP (PPP $2005)	3,240	9,944	35,792
Average Growth Rate of per Capita GDP 1980-2011 *(annual percent)*	2.73	4.5	2.15
Stand. Dev. of the Growth Rate of per Capita GDP 1980-2011	1.76	1.92	1.04
Average Life Expectancy	64	74	81
Gross capital formation *(percent of GDP)*	27.60	36.61	20.43
GG public expenditure *(percent of GDP)*	23.32	28.26	41.78
Total health expenditure *(percent of GDP)*	4.22	5.71	12.28
Labor force with secondary education *(percent of total)*	28.68	36.79	44.55
Labor force with tertiary education *(percent of total)*	14.50	20.27	29.55
Manufactures exports *(percent of merchandise exports)*	50.41	74.36	70.29
Political Stability and Absence of Violence *(percentile rank)*	13.78	29.04	69.03
Regulatory Quality *(percentile rank)*	35.62	47.04	88.24
Rule of Law *(percentile rank)*	37.88	44.42	88.41
Population growth *(annual percent)*	1.71	0.69	0.56
Population *(percent of total)*	47.28	36.52	16.20

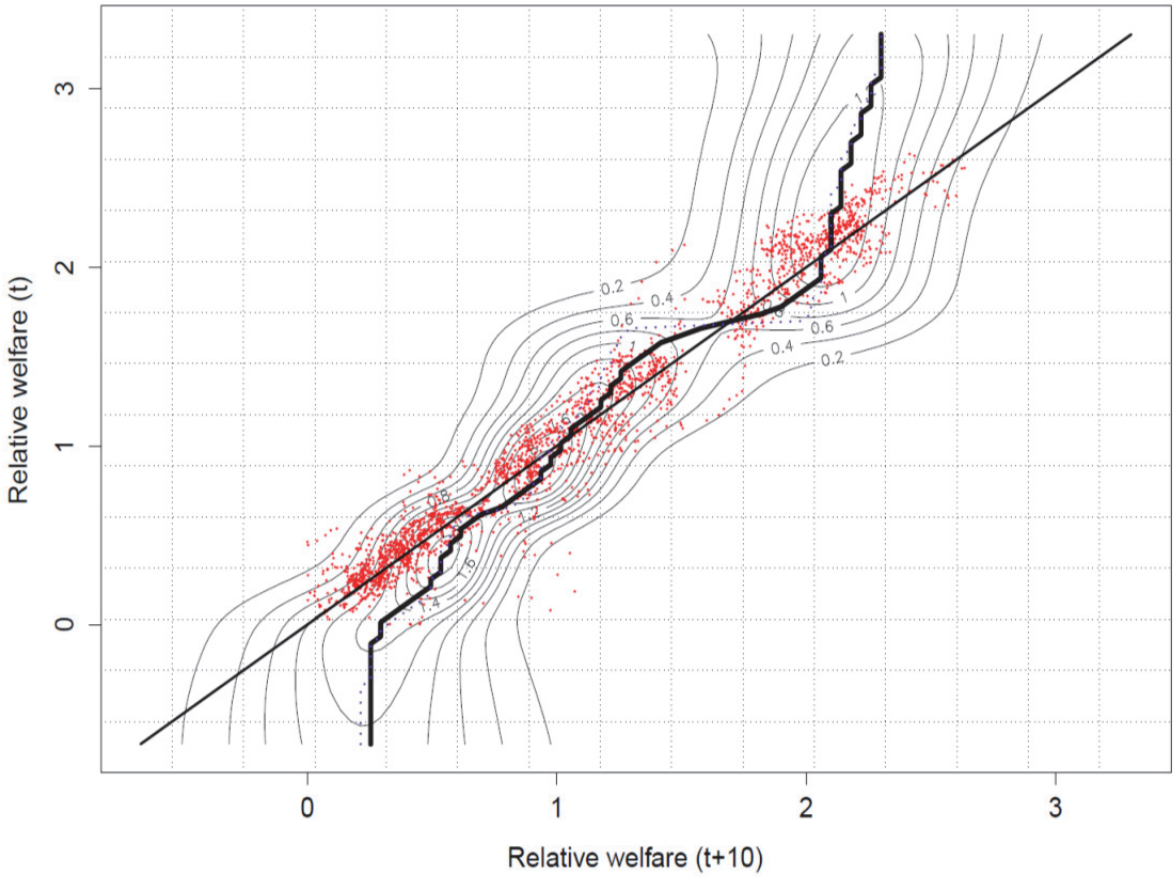
Source: PWT 8.1, World Development Indicators 2014 (January 2015 release), World Economic Outlook (April 2015) and Worldwide Governance Indicators (www.govindicators.org).

in the other two clusters are also the size of the public sector and the resources (both public and private) devoted to health care.

Given the evolution of the joint distribution of income and life expectancy, a clearer picture on how welfare (that is on how the non-linear combination of per capita GDP and life expectancy) evolves can be given by the estimation of its stochastic kernel over the period 1980-2011, which overcomes the bias in the estimates of the growth paths caused by the presence of cross-country heterogeneity.

Figure 8

Stochastic Kernel Estimation of the Relative Welfare ($g = 0$)



The stochastic kernel indicates for each level of x at time t the probability distribution of x at time $t + \tau$.[42] In the estimate, τ is set at ten years to reduce the influence of short-run fluctuations. The total number of observations is 2163).

Figure 8 reports also a solid line representing the estimated median value at $t + \tau$ conditional on the value at time t, a dotted light-blue line indicating the "ridge" of the stochastic

kernel (which is the mode at t + τ conditional on the value at time t), and the 45° line. The red dots represents observations.

Two clusters of populations are located around 1 and slightly above 2 can be clearly detected (see Figure 8) even though a third substantial mass can be noticed at lower level of welfare. Accordingly, in terms of relative welfare in 2011, Centroid C1, C2 and C3 of Figure 7 correspond to around 0.5, 1 and 2.1 respectively.

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[42] More formally, let $q(x_t, x_{t-\tau})$ be the joint distribution of $(x_t, x_{t-\tau})$ and $f(x_{t-\tau})$ be the marginal distribution of $x_{t-\tau}$, then the stochastic kernel is defined as $g_\tau(x_t|x_{t-\tau}) = q(x_t, x_{t-\tau}) / f(x_{t-\tau})$. The ergodic distribution $f_\infty(x)$ is implicitly defined as $f_\infty(x) = \int_0 g_\tau(x|z) f_\infty(z) dz$

Table 5

The Gini Index of the Estimated Ergodic Distributions of Per Capita GDP, Life Expectancy and Welfare ($g = 0$)

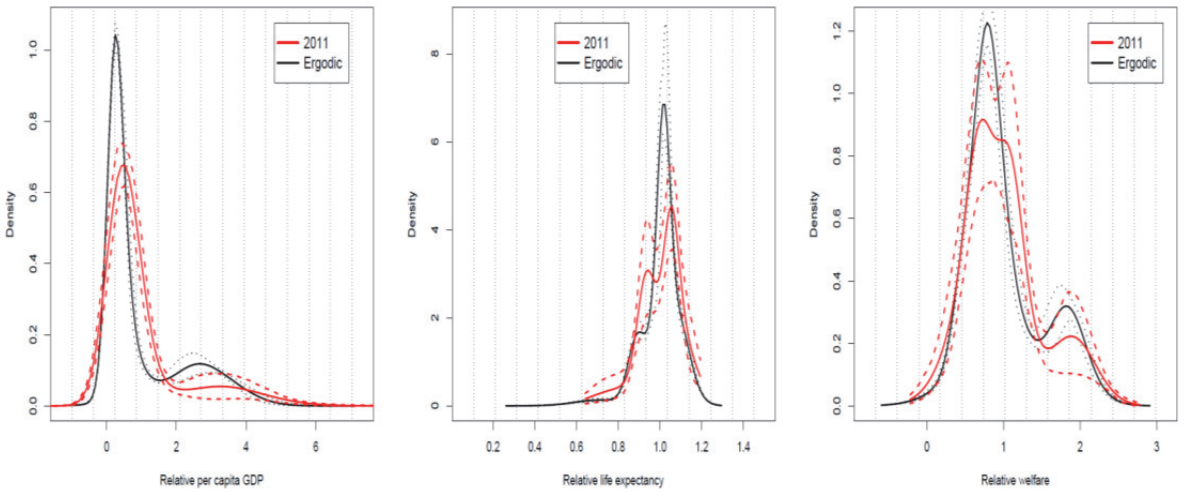
Year	GDP	Life Expectancy	Welfare (g = 0)
2011	0.51	0.06	0.26
	(0.022)	(0.005)	(0.017)
Ergodic	0.61	0.05	0.27
	(0.006)	(0.001)	(0.005)

Note: Standard errors in parentheses; those relative to the ergodic distribution are calculated by the bootstrap procedure described in Appendix G.

Figure 9

Estimated Ergodic Distributions

(a) Relative GDP **(b) Relative Life Expectancy** **(c) Relative Welfare ($g = 0$)**



3.3.4 The ergodic distribution of per capita GDP, life expectancy and welfare

The estimate of the ergodic distribution of per capita GDP, life expectancy and welfare by stochastic kernel aims at assessing the long-run tendencies resulting from the distribution dynamics just discussed. In other words, the ergodic distribution shows if the estimated distribution dynamics in the period 1980-2011 have completely exhausted their effects on the distribution in 2011 or, instead, whether significant distributional changes are embedded in the ongoing process. Clearly, such estimate of the long-run tendencies does not take into account structural shocks which could lead to non-stationarity.

The ergodic distributions are estimated following the procedure in Johnson (2005), adjusted for the use of normalised variables (with respect to the average) in the estimate.[43] Both the ergodic distribution and the distribution in 2011 are depicted with their confidence intervals at 95 per cent significance level, computed via a bootstrap procedure suggested in Bowman and Azzalini (1997) (Figure 9).[44]

Both inequality and polarization of the cross-population distribution of per capita GDP would increase. The Gini index of the ergodic distribution is indeed equal to 0.61 versus 0.51 in 2011 (see Table 5). The presence of two clearly identified group of populations becomes neater and neater.

By contrast, inequality in life expectancy would continue to stay stable (the Gini index of the ergodic distribution is substantially unchanged with respect to 2011: 0.05 vs. 0.06; see Table 5), while polarization would probably slightly decrease.

As a result, inequality of the cross-population distribution of welfare will stop decreasing (or even increase; see Table 5). The high-welfare peak already present in 2011 is more and more evident and identified, while the two lower peaks tend to merge and locate at a relative welfare level lower than 1 (see Figure 9c).

3.4 The world distribution of welfare

So far we have neglected within-country inequality in welfare; however, several contributions related to the world distributions of life expectancy and, mainly, income suggest that such source of inequality can be sizeable and changing over time (see Anand and Segal (2008) for a survey of the literature on the world distribution of income and Pradhan *et al.* (2003) and Ryan (2010) for the world distribution of life expectancy).

In order to have a proper estimate of within-country welfare inequality we need information on the joint distribution of income *and* life expectancy, which could be calculated starting from the two single distributions by a random-matching procedure if the variables were independently distributed. Unfortunately, there is strong evidence which points to the existence of a within-country negative correlation between mortality and socio-economic conditions (see, e.g., Cutler *et al.* (2006) for developed countries, and Grimm *et al.* (2010) for the poor ones). The variability of life expectancy among different income groups can therefore be quite large.[45]

Several works estimate the joint distribution of life expectancy and socio-economic indicators,[46] but very few (three to our knowledge) directly put into relation income and life expectancy. In particular, Gerdtham and Johannesson (2000) estimate life expectancy by income deciles in Sweden, McIntosh *et al.* (2009) make the same for a sample of Canadian population, and, finally, Khang *et al.* (2010) quantify the differences in life expectancy by income quartiles for 4 million public servants in South Korea. Visual inspections of the data supplied by these three

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[43] See Appendix F for more details.

[44] See Appendix G for more details.

[45] For example, Marmot (2004) calculates a difference of almost 15 per cent in the life expectancy at 45 years of age between the lowest and the highest employment grades among the British civil servants.

[46] For example Grimm *et al.* (2010) apply a principal component analysis on data collected in the Demographic and Health Surveys to proxy income at household level for 32 countries and use life tables and the survival status information on all children born in the 5 years preceding the surveys to estimate life expectancy; a very similar analysis is made by Harttgen and Klasen (2010) on a smaller sample of developing countries; Singh and Siahpush (2006) study changes in the extent of inequalities in life expectancy at birth in US between 1980-2000 by socio-economic deprivation status computed at counties' level (it is worth to notice that their deprivation index relies, among other things, on the *m*edian incomes of the counties); other studies proxy socio-economic status by education attainment (see, among others, Brønnum *et al.* (2008) for Denmark, Leinsalu *et al.* (2003) for Estonia and Hoi *et al.* (2009) for Vietnam).

studies suggests to model the within-country relationship between relative life expectancy and income in the following way:

$$\frac{LE_i}{\overline{LE}} = \beta_0 + \beta_1 \log\left(\frac{y_i}{\bar{y}}\right), \tag{12}$$

where LE_i and y_i are respectively the life expectancy and the average income of the *i*-th income quantile, and $\overline{LE}$ and $\bar{y}$ the sample averages of life expectancy and income respectively.[47] Indeed, the estimation of Model (12) on the data of Canada, Sweden and South Korea results in an adjusted R-squared which ranges from 0.95 up to 0.98, which provides a strong support in favour of the proposed specification (see Appendix H).

In light of the parameters' estimates reported in Appendix H, we set $\beta_0 = 1.009$ and $\beta_1 = 0.054$ in building the joint distribution of life expectancy and income for all the countries in the sample.[48] In general, such assumption could appear to be very strong, since it implies that the relationship between relative life expectancy and relative income is invariant across countries (notwithstanding, e.g., possible heterogeneity in their health systems) and over time. However, and surprisingly, the differences in the parameters' estimates across countries, also with very different levels of per capita income and life expectancy, are quite modest (see Appendix H), and the analysis will concern a quite short time-span for data unavailability.

The second piece of information we need to estimate the joint distribution of life expectancy and income is the world distribution of income. In this respect we exploit the WYD (World Income Distribution) dataset built and used by Milanovic (2012), which contains income distribution by quantiles drawn from nationally representative household surveys for a large set of countries (covering up to around 95 per cent of the world population).[49] Unfortunately, so far data are available only for a relatively small time period. In particular, we will use the data labelled "1993" for the estimate of the world income distribution in 1993 and those labelled "2005" for the 2005 estimate.[50] The data on within-country inequality are then combined (scaled) with countries' per capita GDP (for consistency with respect to the previous analysis),[51] for deriving the world income distribution; finally, by Model (12) we calculate the joint world distribution of income and life expectancy.

As expected the estimate of the world inequality by the population-weighted crosscountry distribution (Milanovic's Concept 2 inequality) that we have previously discussed,

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47 In the estimate of Model 12 we expect $\beta_0 = 1$ by definition, and β_1 positive, but strongly less than 1. It is indeed reasonable to expect that an increase in the variance of income positively affects the variance of life expectancy but to some limited extent.

48 Such values corresponds to those for Canada, but the use of alternative parameters do not appear to alter the results. In Appendix H we also report the estimates of Model 12 using data for the US, taken from Singh and Siahpush (2006), and for other 15 developing countries, taken from Harttgen and Klasen (2010). Model (12) seems to fit very well all the datasets (expect for Armenia's), according to the adjusted R-squared (the lowest value being equal to 0.74).

49 Other approaches have been followed in the literature. For example, Bourguignon and Morrisson (2002) and Sala-i-Martín (2006) overcome the lack of data on the within-country distribution of income by assuming that similar countries have similar income distributions. Other scholars (e.g. Chotikapanich *et al.* (1997), Schultz (1998) and, for recent estimations, Holzmann *et al.* (2007) and Vollmer *et al.* (2010)) estimate the countries' income distributions assuming a lognormal density function whose first two moments are inferred by the countries' mean income (or per capita GDP) and by a summary of inequality statistics as Gini index. Milanovic (2012) dataset is available at http://go.worldbank.org/IVEJIU0FJ0 to which we refer for more details.

50 In fact, the surveys composing the dataset are not available at annual intervals for most countries. Milanovic (2012) aggregates them around benchmark years, spaced approximately at 5-year intervals so that all countries that have had surveys within that interval are included.

51 This implies that the discrepancy between national accounts GDP and household surveys aggregate income is evenly spread across the distribution. Other approach could be followed: for example allocating the entire gap to the top tail of the distribution or making correction according to a Pareto tail estimate of right tail. Our assumption however is more conservative and reduces the risk of artificially inflating inequality. See Anand and Segal (2008) for a discussion of the issues related to this choice of rescaling.

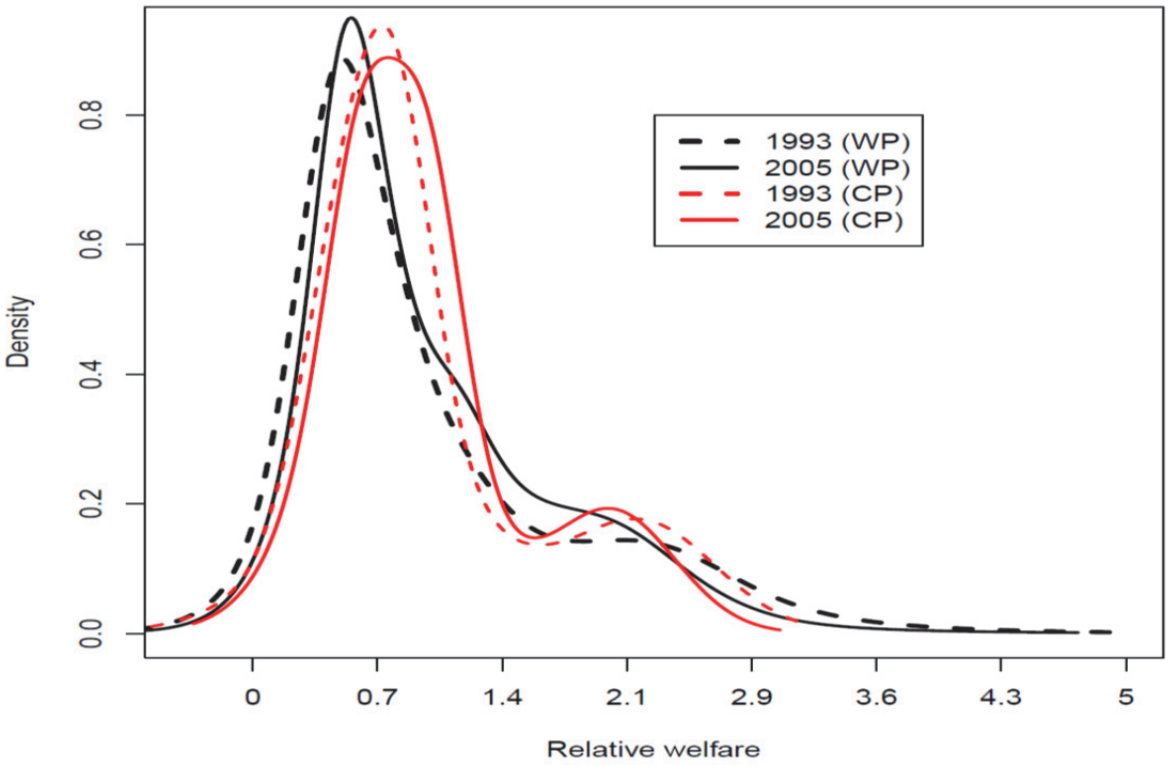
Table 6

A Comparison of Different Levels of Inequality for the World Distribution of Welfare ($g = 0$)

Year	1993	2005
Cross Population	0.34	0.30
World Population	0.42	0.38

Figure 10

The World Distributions and the Cross-population Distribution of Relative Welfare ($g = 0$; with Respect to the Average of the Period) in 1993 and 2005



leads to a substantial undervaluation (by about 8 percentage points in terms of Gini index, see Table 6). However, the downwards trend in welfare inequality is confirmed also for the world distribution of welfare, with a fall of around 4 percentage points from 1993 to 2005, which contrasts with the substantial stability of the Gini index of the world income distribution that several studies observed for the same period (see Anand and Segal (2008) and Milanovic (2012)).

Figure 10 displays the estimates of the world distribution of welfare in 1993 and 2005 and the analogue cross-population distributions.

In 2005 the world distribution presents a two-peaked distributions, with the peaks approximately around the same position (around 0.7 and 2) as in the cross-population distribution,

but with a larger mass at the center of distribution. The within-country inequality, therefore, seems to mainly affect the middle-welfare individual.

The comparison of the estimates in 1993 and 2005 gives less clear-cut conclusions for the evolution of world distribution. The two modes are better identified in 2005, but also closer to each other; moreover a non-negligible probability mass is shifting away from the upper tail toward the center of distribution.

4 Concluding Remarks

This paper presents two main contributions to the existing literature on growth empirics: i) it provides a methodology to measure the welfare of a country/individual and ii) it finds evidence of polarization across world population; moreover, such pattern is expected to be persistent in the future.

This evidence is not in contrast with the recent observed impetuous income growth of some large Asian countries nor with the so called ”African growth miracle”; indeed, those countries appear to be converging in terms of populations to a cluster of medium-welfare countries; but these, in turn, are not converging to the high-welfare cluster, because their higher growth of per capita GDP is counterbalanced in terms of welfare growth by the relative large increase in life expectancy experienced by the countries in the high-welfare cluster (equal *absolute variations* in life expectancy have a higher impact in terms of welfare at higher levels of income).

This suggests the existence of middle-welfare traps with relevant policy implications. For countries in the medium-welfare cluster welfare-enhancing policies should complement income growth with health-improving measures. Moreover, assuming the “Preston curve” as a causal relationship at low levels of income (higher levels of income lead to higher levels of life expectancy) implies that the best welfare-improving policy for the very poor countries should be mainly income-growth oriented (as suggested by Sachs (2005) and Collier (2007)). On the contrary, if the causality run from life expectancy to income, as suggested by Lorentzen *et al.* (2008), the limited diffusion of recent medical technology (see Easterlin (2004) and Becker *et al.* (2005)) should increase the concern to provide an appropriate support to health-enhancing policies in poor countries.

Finally, our findings on the distribution dynamics of welfare can integrate the analysis of the effect of globalization on income distribution provided by Milanovic (2012). For example, we can account for many phenomena, such as the migration of the relatively poor people, where the difference in living standards is one of the crucial explanatory factors (see Anand and Segal (2008)).

Four aspects need to be further investigated. First, the methodology used to measure welfare might be extended to account for factors which appear very different across countries, such as the labour market structure, the provision of public goods and the level of taxation, and the market incompleteness. Second, in our approach we do not distinguish between changes in life expectancy at birth due to changes in infant mortality or changes in adult mortality. Given an increase in life expectancy at birth, welfare could differently change if such increase is the result of a fall in infant or in adult mortality. So far the lack of data for a sufficiently large set of countries and years makes this extension problematic; however the observation of the dynamics of infant mortality and adult mortality, that have recently shown opposite trends (being the first one characterized by a strong convergence pattern across countries, while for the second one divergence prevails, see Edwards (2010)), suggests that such extension could provide further support to the conclusion of polarization in welfare. Third, the methodology related to the inclusion of the within-country distribution should be refined. Indeed, taking into account the within-country inequality seems to

have a non-negligible impact on the magnitude and the dynamics of the world welfare distribution; however, the non-availability of comparable microdata on the relationship between income and life expectancy for a large sample of countries represents a serious obstacle.

Finally, for a more thorough picture of the world welfare inequality, it could be interesting to consider cases where inequality is measured in absolute terms, and/or where inequality by itself produces a welfare loss (see Gruen and Klasen (2008) and Atkinson and Brandolini (2010), who respectively discuss the same issues but related to the world income inequality).

APPENDIX A
SOLUTION OF THE AGENT'S PROBLEM

The agent solves the following problem:

$$V = \max_{\{c_t\}_{t=0}^{T}} \int_0^T \left(\frac{c^{1-\sigma}}{1-\sigma} - M \right) \exp\left(-\rho t\right) S dt \tag{13}$$

$$s.t. \begin{cases} \dot{p} = p\hat{r} + yl - c; \\ p_0 = \bar{p}_0; \\ \lim_{t \to T} p \exp\left(-\hat{r}t\right) \geq 0; \end{cases}$$

where $r\hat{} = r + \pi^D$ is the interest rate adjusted for the instantaneous probability of dying before T. Dynamic constraint $\dot{p} = pr\hat{} + yl - c$ in Problem 13 is derived directly from the intertemporal budget constraint given in Eq. (1).

The Hamiltonian of Problem (13) is given by:

$$\mathcal{H} = \left(\frac{c^{1-\sigma}}{1-\sigma} - M \right) \exp\left(-\rho t\right) S + \lambda \left(p\hat{r} + yl - c \right) \tag{14}$$

and the necessary and sufficient conditions of Problem (13) are the following:

$$\lambda = c^{-\sigma} \exp\left(-\rho t\right) S; \tag{15}$$

$$\dot{\lambda} = -\lambda r\hat{}; \tag{16}$$

$$\lim_{t \to T} \lambda p = 0, \tag{17}$$

from which:

$$\frac{\dot{c}}{c} = \frac{r - \rho}{\sigma} = g. \tag{18}$$

Given λ (0) > 0 and the constraints in Problem 13, Eq. (17) is always satisfied. Since r is assumed constant over time, we have:

$$c_t = c_0 \exp\left(gt\right). \tag{19}$$

The growth rate of consumption g is independent of T and S and it represents the steadystate growth rate.

Because of the strict monotonicity of $u(c)$, budget constraint (1) holds with strict equality. Hence, the initial consumption level c_0 is given by:

$$c_0\left(T, w\right) = w \left[\frac{g - \hat{r}}{\exp\left(\left(g - \hat{r}\right) T\right) - 1} \right]. \tag{20}$$

Substituting Eq. (19) into Eq. (13) yields the agent's (indirect) utility:

$$V\left(T, w\right) = \frac{1}{\left(1 - \sigma\right)} \left\{ c_0\left(T, w\right)^{1-\sigma} \left[\frac{\exp\left[\left(\left(1 - \sigma\right) g - \hat{\rho}\right) T\right] - 1}{\left(1 - \sigma\right) g - \hat{\rho}} \right] + \frac{\left(1 - \sigma\right) M \left[\exp\left(-\hat{\rho} T\right) - 1\right]}{\hat{\rho}} \right\} \tag{21}$$

where $\hat{\rho} = \rho + \pi^D$. V in Problem (13) is an improper integral for $T \to +\infty$ if $(g - \hat{r}) \geq 0$ Therefore if $T \to +\infty$ we must assume that $(g - \hat{r}) < 0$ in order to have a well-defined maximisation problem.

The agent's lifetime wealth w is therefore given by:

$$w = \frac{yl_0 \left[\exp\left((g - \hat{r})\, T\right) - 1\right]}{g - \hat{r}} + \bar{p}_0, \tag{22}$$

which substituted in Eq. (21) yields:

$$V\left(T, yl_0, g\right) = \frac{1}{1-\sigma}\left\{\left(\frac{yl_0\left[\exp\left((g-\hat{r})\,T\right)-1\right]}{g-\hat{r}} + \bar{p}_0\right)^{1-\sigma}\left(\frac{\exp\left((g-\hat{r})\,T\right)-1}{g-\hat{r}}\right)^{\sigma} + \frac{(1-\sigma)\,M\left[\exp\left(-\hat{\rho}T\right)-1\right]}{\hat{\rho}}\right\}. \tag{23}$$

APPENDIX B
COUNTRY LIST WITH THE INDICATION OF CLUSTERS

Table 7

Country List with the Indication of Clusters

Country Name	Population 2011 *(million)*	Cluster in 2011	Country Name	Population 2011 *(million)*	Cluster in 2011
Bangladesh	150.49	1	Chile	17.27	2
Benin	9.10	1	China	1324.35	2
Bolivia	10.09	1	Colombia	46.93	2
Burkina Faso	16.97	1	Costa Rica	4.73	2
Burundi	8.58	1	Dominican Republic	10.06	2
Cabo Verde	0.5	1	Ecuador	14.67	2
Cameroon	20.03	1	Equatorial Guinea	0.72	2
Central African Republic	4.49	1	Gabon	1.53	2
Chad	11.53	1	Iran, Islamic Rep.	74.8	2
Comoros	0.75	1	Jordan	6.33	2
Congo, Dem. Rep.	67.76	1	Malaysia	28.86	2
Congo, Rep.	4.14	1	Mauritius	1.31	2
Cote d'Ivoire	20.15	1	Mexico	114.79	2
Egypt, Arab Rep.	82.54	1	Panama	3.57	2
El Salvador	6.23	1	Peru	29.4	2
Ethiopia	84.73	1	Romania	21.44	2
Fiji	0.87	1	South Africa	50.46	2
Gambia, The	1.78	1	Sri Lanka	21.05	2
Ghana	24.97	1	Thailand	69.52	2
Guatemala	14.76	1	Trinidad and Tobago	1.35	2
Guinea	10.22	1	Tunisia	10.59	2
Guinea-Bissau	1.55	1	Turkey	73.64	2
Honduras	7.75	1	Uruguay	3.38	2
India	1241.49	1	Venezuela, RB	29.44	2
Indonesia	242.33	1	Australia	22.61	3
Jamaica	2.75	1	Austria	8.41	3
Kenya	41.61	1	Belgium	10.75	3
Lesotho	2.19	1	Canada	34.35	3
Madagascar	21.32	1	Cyprus	0.82	3
Malawi	15.38	1	Denmark	5.57	3
Mali	15.84	1	Finland	5.38	3
Mauritania	3.54	1	France	65.09	3
Morocco	32.27	1	Germany	82.16	3
Mozambique	23.93	1	Greece	11.39	3
Namibia	2.32	1	Hong Kong SAR, China	7.12	3
Nepal	30.49	1	Iceland	0.32	3
Niger	16.07	1	Ireland	4.53	3
Nigeria	162.47	1	Italy	60.79	3
Pakistan	176.75	1	Japan	126.5	3
Paraguay	6.57	1	Korea, Rep.	48.39	3
Philippines	94.85	1	Luxembourg	0.52	3
Rwanda	10.94	1	Malta	0.42	3
Senegal	12.77	1	Netherlands	16.66	3
Syrian Arab Republic	20.77	1	New Zealand	4.41	3
Tanzania	44.92	1	Norway	4.92	3
Togo	6.15	1	Portugal	10.69	3
Uganda	34.51	1	Singapore	5.19	3
Zambia	13.47	1	Spain	46.45	3
Zimbabwe	12.75	1	Sweden	9.44	3
Argentina	40.76	2	Switzerland	7.7	3
Barbados	0.27	2	United Kingdom	62.42	3
Botswana	2.03	2	United States	313.09	3
Brazil	196.66	2			

APPENDIX C
ADAPTIVE KERNEL ESTIMATION

When observations vary in sparseness over the support of the distribution, the adaptive kernel estimation is a two-stage procedure which mitigates the drawbacks of a fixed bandwidth in density estimation (see Silverman (1986), p. 101). In general, given a multivariate data set $X = \{X_1, ..., X_n\}$ and a vector of sample weights $W = \{\omega_1, ..., \omega_n\}$, where X_i is a vector of dimension d and $\sum_{i=1}^{n} \omega_i = 1$, we first run the pilot estimate:

$$\tilde{f}(\boldsymbol{x}) = \frac{1}{n \det(\boldsymbol{H})} \sum_{i=1}^{n} \omega_i k\left\{\boldsymbol{H}^{-1}(\boldsymbol{x} - \boldsymbol{X}_i)\right\}, \tag{24}$$

where $k(u) = (2\pi)^{-1} \exp(-1/2u)$ is a Gaussian kernel and *bandwidth matrix H* is a diagonal matrix ($d \times d$) with diagonal elements ($h_1, ..., h_d$) given by the optimal normal bandwidths, *i.e.*,

$$h_i = [4/(d+2)]^{1/(d+4)} \hat{\sigma}_i n^{-1/(d+4)}$$

$\hat{\sigma}_i$ is the estimated standard error of the distribution of X_i. The use of a diagonal bandwidth matrix instead of a full covariance matrix follows the suggestions in Wand and Jones (1993). In the case of $d = 1$ we have:

$$H = \det(H) = (4/3)^{1/5} n^{-1/5} \hat{\sigma}$$

In the cross-population estimate we consider $W = \{p_i, ..., p_n\}$, where p_i is the population of country i. We then define local bandwidth factors λ_i by:

$$\lambda_i = \left[\tilde{f}(\boldsymbol{X}_i)/g\right]^{-\alpha}, \tag{25}$$

where $\log(g) = \sum_{i=1}^{n} \omega_i \log\left(\tilde{f}(\boldsymbol{X}_i)\right)$ and $\alpha \in [0, 1]$ is a sensitivity parameter. We set $\alpha = 1/2$ as suggested by Silverman (1986), p. 103. Finally the adaptive kernel estimate $\hat{f}(x)$ is defined as:

$$\hat{f}(\boldsymbol{x}) = \frac{1}{n \det(\boldsymbol{H})} \sum_{i=1}^{n} \lambda_i^{-d} \omega_i k\left\{\lambda_i^{-1} \boldsymbol{H}^{-1}(\boldsymbol{x} - \boldsymbol{X}_i)\right\}. \tag{26}$$

The Gaussian kernel guarantees that the number of modes is a decreasing function of the bandwidth; this property is at the basis of the test for unimodality (see Silverman (1986), p. 139). In all the estimates we use package *sm* (see Bowman and Azzalini (2005)).

APPENDIX D
MULTIMODALITY TEST

The multimodality test follows the bootstrap procedure described in Silverman (1986), p. 146. Given a data set $X = \{x_1, \ldots, x_n\}$ and a vector of sample weights $W = \{\omega_1, \ldots, \omega_n\}$, we calculate the smallest value of bandwidth, $\hat{h}_0$, for which the estimated distribution is unimodal and the corresponding local bandwidth factors $\Lambda = \lambda_1, \ldots, \lambda_n$. We then perform a *smoothed bootstrap* from the estimated density of observed data set. Since we use the Gaussian kernel, it amounts to: i) draw (with replacement) a vector $I = \{i_1, \ldots, i_n\}$ of size n from $\{1, \ldots, n\}$, given the sample weights W; ii) define $Y = \{x_{i_1}, \ldots, x_{i_n}\}$ and $W^* = \{\omega_{i_1}, \ldots, \omega_i\}$, calculate:

$$x_j^* = \bar{\mathbf{Y}} + \left(1 + \left(\hat{h}_0 \lambda_{i_j}\right)^2 / \hat{\sigma}_{\mathbf{Y}}^2\right)^{-\frac{1}{2}} \left(y_j - \bar{\mathbf{Y}} + \hat{h}_0 \lambda_{i_j} \epsilon_j\right), \quad j = 1, \ldots, n; \tag{27}$$

where $\bar{Y}$ and $\hat{\sigma}_{\mathbf{Y}}^2$ are respectively the mean and the estimate variance of sample Y and ε_j are standard normal random variables; iii) find the minimum value of bandwidth, $\hat{h}^*$, for which the estimated density of X^* is unimodal; iv) repeat point i)-iii) B times in order to obtain a vector of critical values of bandwidth $\left\{\hat{h}_1^*, \ldots, \hat{h}_B^*\right\}$. Finally, p-value of null-hypothesis of unimodality is given by:

$$\#\left\{\hat{h}_b^* \geq \hat{h}_0\right\} / B.$$

For testing the bimodality, point iii) has to be modified accordingly. We set $B = 1000$.

APPENDIX E
VECTOR FIELD ESTIMATION

Assume that the dynamics of economy j at period t only depends on (GDP_{jt}, LE_{jt}), *i.e.*, (GDP_{jt}, LE_{jt}) follows a *time invariant* and *Markovian* stochastic process.

The dynamics of the sample in the space (*GDP*, *LE*) can be therefore represented by a random vector field (RVF). In particular, given a subset L of the possible realization of (*GDP*, *LE*) (*i.e.*, a lattice, see small black points in Figure 7), a RVF is represented by a random variable $\Delta_\tau z_i$, where $\Delta_\tau z_i \equiv (\Delta_\tau GDP_i, \Delta_\tau LE_i) \equiv (GDP_{it+\tau} - GDP_{it}, LE_{it+\tau} - LE_{it})$, indicating the dynamics (*i.e.*, the dynamics from period t to period $t + \tau$ represented by a movement vector) at $z_i \equiv (GDP_i, LE_i) \in L$. For each point in the lattice z, with $i = 1, ..., L$, we therefore estimate the distribution of probability $Pr(\Delta_\tau z|z_i)$ on the $N(T - \tau)$ observed movement vectors $\Delta_\tau^{OBS} z$. In $\Pr(\Delta_\tau^{OBS} z_{jt}|z_i)$ measures the probability that the dynamics at z_i follow $\Delta_\tau^{OBS} z_{jt}$; this suggests $\Pr(\Delta_\tau^{OBS} z_{jt}|z_i)$ should decrease as function of the distance between z_{jt}^{OBS} d .

A convenient way to calculate these probabilities is to use a kernel function to measure the distance between z_i and z_{jt}^{OBS}. In particular:

$$\omega\left(z_i, z_{jt}^{OBS}\right) = \frac{K\left(\frac{(z_i - z_{jt}^{OBS})^T S^{-1} (z_i - z_{jt}^{OBS})}{h^2}\right) \frac{\det(S)^{-\frac{1}{2}}}{2h^2}}{\sum_{t=1}^{T-\tau} \sum_{j=1}^{N} K\left(\frac{(z_i - z_{jt}^{OBS})^T S^{-1} (z_i - z_{jt}^{OBS})}{h^2}\right) \frac{\det(S)^{-\frac{1}{2}}}{2h^2}} \tag{28}$$

is assumed to be an estimate of the probability that at *zi* dynamics follows observed movement vectors $\Delta_\tau^{OBS} z_{jt}$ where $K(\cdot)$ is the kernel function, h is the smoothing parameter and S is the sample covariance matrix of z^{OBS}. The kernel function $K(\cdot)$ is generally a smooth positive function which peaks at 0 and decreases monotonically as the distance between the observation z_{jt} and the point of interest z_i increases (see Silverman (1986) for technical details). The smoothing parameter h controls the width of the kernel function.[52] In the estimation we use a multivariate Epanechnikov kernel (see Silverman (1986) pp. 76-78), *i.e.*:

$$K(u^T S^{-1} u) = \begin{cases} \frac{2}{\pi}(1 - u^T S^{-1} u) & \text{if } u^T S^{-1} u < 1 \\ 0 & \text{if } u^T S^{-1} u \geq 1, \end{cases} \tag{29}$$

where $u \equiv \left(z_i - z_{jt}^{OBS}\right)/h$ Multivariate Epanechnikov kernel is particularly adapted to our scope because it assigns zero probability to observed movement vectors very far from z_i. Other possible kernels, as the Gaussian, does not allow such possibility. The exact quantification of "very far" is provided by bandwidth h, *i.e.*, higher bandwidth means higher number of observed movement vectors entering in the calculation of the movement at z_i.

Given Eq. (28) for each point in the lattice z_i we estimate the τ-period ahead *expected movement* $\mu_{\Delta\tau} z_i \equiv E[\Delta_\tau z_i \mid z_i]$ using a *local mean estimator*, first proposed by Nadaraya (1964) and Watson (1964), where the observations are weighted by the probabilities derived from the kernel function, *i.e.*, (see Bowman and Azzalini (1997) for details):

$$\widehat{\mu}_{\Delta_\tau z_i} = \sum_{t=1}^{T-\tau} \sum_{j=1}^{N} \omega\left(z_i, z_{jt}^{OBS}\right) \Delta_\tau z_{jt}^{OBS} = \widehat{\Pr(\Delta_\tau z|z_i)} \Delta_\tau z^{OBS}. \tag{30}$$

[52] In all the estimation we use the optimal normal bandwidth; for a discuss on the choice of bandwidth see Silverman (1986).

The estimation of Eq. (30) strongly depends on the choice of τ . This choice is the result of a trade-off: from one hand, a too short τ can increase the noise in the estimation due to the possible presence of short-run fluctuations; on the other hand, a too long τ could contrast with the local characteristics of the estimate, increasing the probability that observed movement vectors very far from z_i affects the estimate of $\mu_{\Delta\tau} z_i$. In the estimate we set $\tau = 10$.

Below we discuss in details how we have conducted the inference on the estimated expected movements by a bootstrap procedure, whose results is reported in Figure 7.

Given the observed sample of observations z_{jt}^{OBS} with $j = 1, ..., N$ and $t = 1, ..., T$, the bootstrap procedure consists of four steps.

1) Estimate the expected value of the τ-period ahead movement $\mu_{\Delta\tau} z_i$ by Eq. (30) for each point of the lattice ($i = 1, ..., L$).
2) Draw B samples $z^b = \left(z_1^b, ..., z_{N(T-\tau)}^b\right)$ and the associated $\Delta_\tau^b z = \left(\Delta z_1^b, ..., \Delta z_{N(T-\tau)}^b\right)$. with $b = 1, ..., B$, by sampling with replacement from the observed z^{OBS} and the associated movement vectors $\Delta^{OBS} z$.
3) For every bootstrapped sample b and for each point of the lattice i estimate by Eq. (30) the expected value of the τ-period ahead movement $\mu_{\Delta_\tau z_i}^b$.
4) Calculate the two-side p-value of the estimated movement vector at point i in the lattice under the null hypothesis of no dynamics (note that null hypothesis of no dynamics is separately tested in the two directions y and Wy) as:

$$\widehat{ASL}_i = 2 \times \min\left(\sum_{b=1}^{B} \hat{\mu}_{\Delta_\tau z_i}^b \leq 0, \sum_{b=1}^{B} \hat{\mu}_{\Delta_\tau z_i}^b > 0\right) / B. \tag{31}$$

In the analysis we have set $B = 300$, and used the usual significance level of 5 per cent to decide which expected movements to report.

APPENDIX F
THE ESTIMATE OF ERGODIC DISTRIBUTION

The ergodic distribution solves:

$$f_{\infty}(x) = \int_0^{\infty} g_{\tau}(x|z)\, f_{\infty}(z)\, dz, \tag{32}$$

where x and z are two levels of the variable, $g_{\tau}(x|z)$ is the density of x, given z, τ periods ahead, under the constraint:

$$\int_0^{\infty} f_{\infty}(x)\, dx = 1. \tag{33}$$

Since in our estimates all variables are normalized with respect to their average, the ergodic distribution, moreover, must respect the additional constraint:

$$\int_0^{\infty} f_{\infty}(x)\, x dx = 1. \tag{34}$$

Following the methodology proposed by Johnson (2005) we first estimate the distribution $\tilde{f}_{\infty}(x)$, which satisfies Constraints 32 and 33, but not Constraint 34. We then calculate

$$f_{\infty}(x) = \tilde{\mu}_x \tilde{f}_{\infty}(x)$$

where:

$$\tilde{\mu}_x = \int_0^{\infty} \tilde{f}_{\infty}(x)\, x dx$$

which will satisfy all Constraints 32, 33 and 34. In particular, Theorems 11 and 13 in Mood *et al.* (1974), pp. 200 and 205 prove that if $\tilde{f}_{\infty}(x)$ satisfies Constraints 32 and 33 then $f_{\infty}(x)$ satisfies Constraints 32, 33 and 34. In fact, $g_{\tau}(z|x) = f_{z,x}(z, x) / f_x(x)$ and $f_{y,q}(y, q) = \mu_z\, \mu_x\, f_{z,x}(z, x)$, where $y = z/\mu_z$ and $q = x/\mu_x$. In all computations we set $\tau = 10$.

APPENDIX G
BOOTSTRAP PROCEDURE TO CALCULATE CONFIDENCE INTERVALS FOR DENSITY ESTIMATION

The following is a description of the bootstrap procedure used to calculate the confidence intervals for the estimates of densities and ergodic distributions; this is based on the procedure reported in Bowman and Azzalini (1997), p. 41. Given a sample $X = \{X_1, ..., X_n\}$ of observations and a vector of sample weights $W = \{\omega_1, ..., \omega_n\}$, where $\sum_{i=1}^{n} \omega_i = 1$ and X_i is a vector of d dimensions, the bootstrap procedure is as follows.

1) Construct a density estimate $\hat{\phi}$ from sample X, given the sample weights W.
2) Resample X with replacement, taking into account the sample weights W, to produce a bootstrap sample X^*.
3) Construct a density estimate $\hat{\phi}^*$ from X^*.
4) Repeat steps 2. and 3. B times in order to create a collection of bootstrap density estimates $\left\{\hat{\phi}_1^*, ..., \hat{\phi}_n^*\right\}$.

The distribution of $\hat{\phi}_i^*$ about $\hat{\phi}$ can therefore be used to mimic the distribution of $\hat{\phi}$ about ϕ, as discussed by Bowman and Azzalini (1997), p. 41, *i.e.*, to calculate confidence intervals for the estimates. In particular, the confidence interval for the distribution in 2000 corresponds to the case $\hat{\phi} = \hat{f}$, while for the ergodic distribution to the case $\hat{\phi} = \hat{f}_\infty$. In the bootstrap procedure $\hat{\phi}^*$ are calculated taking the bandwidth(s) equal to the bandwidth(s) calculated for the observed sample X, as suggested in Bowman and Azzalini (1997), p. 41. We set $B = 300$.

APPENDIX H
ESTIMATION RESULTS FOR THE RELATIONSHIP BETWEEN INCOME AND LIFE EXPECTANCY

Table 8

Estimation Results for Model (12) Various Countries

Country	β_0	β_1	Adjusted R^2	Source
Canada (2001)	1.009	0.054	0.95	McIntosh *et al.* (2009)
Sweden (1996)	1.004	0.039	0.98	Gerdtham and Johannesson (2000)
South Korea (2002)	1.006	0.033	0.97	Khang *et al.* (2010)
US (1981)	1.001	0.057	0.88	Singh and Siahpush (2006)
US (1990)	1.001	0.053	0.95	Singh and Siahpush (2006)
US (1999)	1.002	0.076	0.97	Singh and Siahpush (2006)
Armenia (2005)	1.000	0.003	–0.09	Harttgen and Klasen (2010)
Burkina Faso (2003)	1.001	0.086	0.86	Harttgen and Klasen (2010)
Bolivia (2003)	1.000	0.069	0.92	Harttgen and Klasen (2010)
Egypt (2007)	1.000	0.066	0.97	Harttgen and Klasen (2010)
Ethiopia (2005)	1.006	0.123	0.74	Harttgen and Klasen (2010)
India (2005)	1.000	0.024	0.81	Harttgen and Klasen (2010)
Indonesia (2003)	1.000	0.063	0.95	Harttgen and Klasen (2010)
Kyrgyz Republic (1997)	1.001	0.065	0.84	Harttgen and Klasen (2010)
Nicaragua (2000)	1.000	0.052	0.82	Harttgen and Klasen (2010)
Nigeria (2003)	1.000	0.107	0.97	Harttgen and Klasen (2010)
Pakistan (2007)	1.000	0.085	0.85	Harttgen and Klasen (2010)
Peru (2005)	1.000	0.059	0.89	Harttgen and Klasen (2010)
Senegal (2005)	1.000	0.116	0.91	Harttgen and Klasen (2010)
Vietnam (2002)	1.000	0.039	0.81	Harttgen and Klasen (2010)
Zambia (2002)	0.996	0.091	0.76	Harttgen and Klasen (2010)

Note: All the coefficients are significantly different from zero at 1 per cent level, with the exception of the β_1 for Armenia.

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COMMENT TO "THE EVOLUTION OF WORLD WELFARE INEQUALITY" BY DAVIDE FIASCHI AND MARZIA ROMANELLI

Nikola Altiparmakov[*]

1 Introduction

In their well written and very elaborate analysis Davide Fiaschi and Marzia Romanelli take on several issues in the area of welfare measurement and welfare dynamics, going beyond the standard *GDP per capita* measure of material well-being. In particular, the authors look to expand existing results in the relevant literature (Becker *et al.*, 2005; Bourguignon and Morrisson, 2002) in several directions. On the theoretical front, the authors assume relevant utility functions to be cardinally measurable in order to gain further insights. On the empirical front, the authors introduce more sophisticated non-parametric techniques in order to infer future trends in world welfare and identify potential polarization among countries.

In this comment I will briefly describe reasons for measuring welfare beyond traditional GDP per capita statistics and show major trends in GDP per capita and life expectancy over the last two centuries. Then I will highlight major results presented by Davide and Marzia, elaborate how these results fit into existing literature and make a couple of suggestions how to strengthen existing results and possibly expand them.

2 Background

It is well known that GDP (per capita) is not a perfect measure of well-being or welfare. Standard GDP statistics are an imperfect measure of material well-being since they fail to capture some relevant aspects, such as the household production of goods and services, or to incorporate undesirable effects of the production process, such as the deterioration of natural environment or climate change. Furthermore, the welfare of people is a multi-dimensional concept that goes beyond material well-being. The existing literature on welfare dynamics tries to incorporate other aspects of well-being, most notably the life expectancy. The idea is basically not only to capture the quality of life (as measured by GDP per capita) but also the quantity of life (measured by life expectancy). This has been done in the existing literature either by relying on the *lifetime income* concept (Bourguignon and Morrisson, 2002) or on the *lifetime utility* approach (Becker *et al.*, 2005; Rosen, 1988). In their paper, Davide Fiaschi and Marzia Romanelli follow the latter lifetime utility approach. They augment this approach by assuming lifetime (indirect) utility function to be cardinally measurable, which allows them to directly compare welfare level across countries and also to analyze the effects of (expected) income growth on the welfare (inequality) across the world.

Since the dynamics of GDP per capita and life expectancy are driving the empirical results in this strand of literature, it is instructive for readers to be familiar with basic dynamics of these two (related) variables in a longer time perspective. Namely, it is interesting to note that both GDP per capita and life expectancy were basically stagnant for centuries, until the start of industrial revolution in early 19th century, which resulted in parallel increase in both GDPpc and life expectancy inequality across (industrial and non-industrial) countries. This parallel increase lasted until the first half of 20th century, when trends in GDPpc and life expectancy (inequality) diverged.

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Most of the results from the empirical literature seem to suggest that income inequality (measured by GDPpc) increased until 1950's and has stagnated since (or decreased slightly). On the other hand, the divergence of life expectance inequality turned into strong converge after 1930's, as a result of less developed countries catching up with the developed ones (mostly by implementing non-expensive measures to reduce mortality at early stages in life).

Table 1

Graph from Bourguignon and Morrisson, 2002

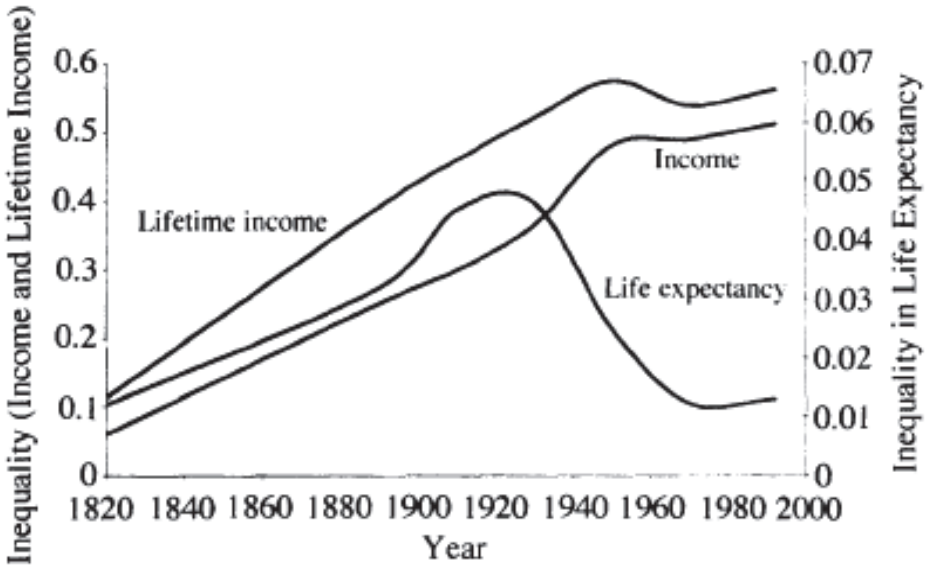

FIGURE 3. EVOLUTION OF INTERNATIONAL INEQUALITY IN INCOME, LIFETIME INCOME, AND LIFE EXPECTANCY (THEIL INDEX)

Davide Fiaschi and Marzia Romanelli focus on the 1960 to 2011 period by analyzing GDP per capita, life expectancy and consequently welfare dynamics on a panel consisting of 103 countries. Most of their paper is based on the between-country analysis of inequality, although in one (very preliminary) section the authors try to incorporate within-country inequality in order to measure the overall inequality among all individuals in the world. This preliminary section tries to expand the approach used by Bourguignon and Morrisson (2002) that included the analysis of within-country inequality of income but not the within-country inequality of lifetime (which was assumed to be zero). Davide and Marzia instead build a (log-linear) model of joint distribution of income and life expectancy within countries. As the authors themselves note, assuming invariant relationship between relative life expectancy and relative income across countries might be a restrictive research approach. Nonetheless, it represents a welcome improvement over the zero life expectancy inequality assumption made by Bourguignon and Morrisson (2002).

3 Results

As mentioned earlier, Davide and Marzia use non-parametric estimation techniques to analyze welfare dynamics on the panel of 103 countries over the 1960-2011 period. In doing so, the authors confirm the results and dynamics in the existing literature. Namely, that life expectancy inequality has been on the downward trend throughout the referenced time period, while the reduction in income (GDPpc) inequality was less clear-cut and less pronounced. Overall, these two trends combined into unambiguous decline in welfare inequality over the entire period (Table 1). The use of more sophisticated non-linear empirical analysis allows the authors to test for the existence of polarization among countries, and also to extrapolate the likely trend of welfare inequality in the future.

The results presented do indicate polarization among countries, into two or likely three clusters. Besides the cluster of countries with high standard of living and high life expectancy, countries with low-to-medium standard of living seem to be forming two different clusters depending on their ability to catch-up with more developed countries or being trapped at low levels of development and low life expectancy. Analysis also indicates that the trend of reduced welfare inequality observed over the 1960-2011 period would be stopped and even reversed in the future, due to the stagnation of life expectancy convergence and increase in income (GDPpc) inequality. The results from preliminary section that includes within-country inequality seem to confirm these conclusions.

4 Comments

The authors conclude that the (expected) growth rate g has rather negligible influence on the final results and have thus been assuming growth rate $g = 0$ throughout the paper. Although the authors state that simulations and scenario analysis of different growth rate assumptions confirm their conclusions, it could be beneficial to include some more (intuitive) evidence on this result, which might contradict *a priori* expectations that vastly heterogeneous growth rates across the would should/could more tangibly influence welfare dynamics.

The authors conclude that ignoring within-country inequality "seems to have a non-negligible impact on the magnitude and the dynamics of the world welfare distribution". While the impact on magnitude is obvious and documented not only by the authors but also in the existing literature, the impact of ignoring within-country inequality on the welfare dynamics seems to be less clear-cut (to me at least). In fact, my reading of Table 6 that the authors present in the (preliminary) section that includes within-country inequality is that within-country inequality tangibly impacts the magnitude but not the trend or dynamics of welfare inequality.[1]

When making policy recommendations in the concluding section, the authors explore whether (very) poor countries should focus on improving health outcomes or increasing GDP per capita. Implicit in these considerations seems to be the assumption of exclusive influence on one of these two outcomes. However, these considerations could be broadened to common factors that seem to improve both health and income, such as the quality of institutions and government capacity (Deaton, 2015).

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[1] A small note on the terminology – the authors could consider using the term "between-country" inequality instead of "cross-population" inequality, in order to make the wording more comparable to the terminology used in other papers in the literature.

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THE IMPACT OF INCOME INEQUALITY AND FISCAL STIMULI ON POLITICAL (IN)STABILITY

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We use data for a panel of developed and developing countries to assess the impact of income inequality and fiscal stimuli episodes on political instability. We find that government crises are likely to rise when inequality increases and this effect is especially important in the case of OECD countries. However, expansionary and increasingly expansionary fiscal stimuli episodes can help dampening the detrimental impact of an uneven distribution of income on political stability. From a macroeconomic point of view, economic growth and low inflation seem to be crucial to avoid the occurrence of government crises.

1 Introduction

By fuelling political disaffection, income inequality is typically seen as being at the roots of political instability. Yet, the severity of the most recent financial turmoil that emerged in 2008 forced fiscal authorities in many G20 countries to implement comprehensive support packages based on expenditure hikes. These ended up leading to sharp increases in budget deficits.

As concerns about long-term (un)sustainability of public finances started mounting, governments across the world faced the need to implement budgetary consolidation measures and decided to shift wealth towards banks and debtors and away from taxpayers, fuelling public anger about the unfairness of such decisions.

While the recent literature has started to provide some guidelines about the linkages between fiscal policy and income inequality (Agnello and Sousa, 2012a, b), there is still an important gap regarding our understanding about the effects of an uneven distribution of income and the implementation of fiscal adjustments on the occurrence of government crises.

Is an increase in income inequality likely to shorten a government's mandate? Can fiscal stimuli reduce the probability of a government crisis? Is the impact of inequality on political instability abated in the context of fiscal stimuli episodes?

From a theoretical point of view, the tentative answer to the above mentioned questions should be *"*yes*"*. Fiscally constrained governments loose popularity and this is particularly true when restrictive fiscal measures and fiscal consolidation programs are implemented in countries experiencing a high degree of income inequality. Contrarily, the effects of inequality (on political stability) might be muted when fiscal adjustments are perceived as equalizing and stimuli programs are put into place. In this context, investigating the impact of inequality and fiscal stimuli on political instability emerges as the main goal of our paper.

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We show that inequality raises the prospects of political instability. More specifically, when the income gap rises, the likelihood of a government crisis increases. This effect of inequality on political instability is particularly important for OECD countries, as economies characterized by high inequality in income distribution are more susceptible to face an unstable political environment.

With regard to fiscal stimulus programs, the empirical findings reveal that both expansionary and increasingly expansionary fiscal stimuli help preserving political stability. Moreover, when conditioning the effect of inequality on the occurrence of fiscal stimuli episodes, our results suggest that such episodes abate the impact of inequality on political instability. This finding is corroborated, in particular, when fiscal stimuli are expansionary (and, thus, promote economic growth) or when they lead to an increasingly expansionary environment (and, therefore, contribute to a sustainable growth path).

Additionally, we show that some factors characterizing the legislature, such as whether the government has a majority of seats in the parliament and whether the government consists of a coalition or not, help explaining a reduction in political instability. Similarly, while the level of government fractionalization increases the number of government crises, the regime durability and the level of political competition provide the ground for a more stable legislature. Moreover, the political regime (as measured by the level of democracy) has a positive effect on the occurrence of government crises, signalling a potentially nonlinear relationship between political instability and the level of democracy. We also find that the larger the number of years in office of the chief executive is, the more likely the number of government crises will fall.

Finally, economic growth seems to be the key for a stable legislature, but inflation tends to deteriorate political stability. Consequently, economic growth and low inflation appear to be crucial ingredients for avoiding the occurrence of government crises.

The rest of the paper is organized as follows. Section 2 briefly looks at the related literature. Section 3 presents the econometric methodology. Section 4 describes the data and discusses the empirical results. Section 5 provides the sensitivity analysis. Finally, Section 6 concludes.

2 Literature review

Several studies looked at the relationship between political instability and the economic performance of a country, as weak growth is likely to shorten policymakers' horizons leading to the implementation of sub-optimal macroeconomic policies in both democracies and dictatorships (Kramer, 1971; Fair, 1978). These studies find that, in general, high income growth rates during pre-election years are likely to increase the probability of the re-election of the incumbent government in democratic countries. A finding that is supported by the idea of the political business cycle developed by Nordhaus (1975) and the partisan effects emphasized by Hibbs (1977). As for dictatorships and military regimes, the likelihood of experiencing coups increases with the decline of GDP per capita. Londregan and Poole (1990) consider the number of coups experienced by 121 countries over the period 1950-1982 and uncover a pronounced inverse relationship between coups and income. In addition, coups are more likely to occur among the poorest countries than among the wealthiest ones. Alesina *et al.* (1996) use data on 113 countries from 1950 to 1982 and show that a high propensity of government collapse is characterized by low GDP growth. Klomp and de Haan (2009) note that economic volatility and political instability and policy uncertainty tend to be positively linked. More recently, Aisen and Veiga (2013) show that higher degrees of political instability are associated with lower growth rates of GDP per capita, as a reflex of the lower rates of productivity growth and physical and human capital accumulation.

Other studies assessed the relationship between political instability and the dynamics of inflation. Paldam (1987) compares the path of consumer price with the incidence of political change for eight Latin American countries over the period 1946-1984. The author uncovers a significant connection between the frequency of military regimes and the level of inflation. Interestingly, while military regimes are relatively strong in fighting inflation, civilian regimes are less stringent about the level of inflation. In addition, just a few regimes survive to the spell of hyperinflation. Aisen and Veiga (2008a) use a dataset covering around 100 countries for the period 1960-1999 and show that greater political instability is associated with high inflation, especially, in developing, less democratic and socially-polarized countries, with low access to domestic and external debt financing and high turnover of central bank presidents. One important policy implication of their study is the need to develop strong institutions conducive to greater political stability. Similar conclusions are found by Aisen and Veiga (2008b) concerning the linkages between political instability and inflation volatility.

Another strand of the literature investigated how the institutional framework affects political instability. Taylor and Herman (1971) find a fairly strong relation between government stability and the fractionalization of the parliamentary party system: the more fragmented the party system is, the more unstable the cabinet is. Gates *et al.* (2006) show that regimes exhibiting a mix of democracy and autocracy characteristics tend to be short-lived. The least stable political system is the dictatorship with a large degree of political participation. Similarly, when the executive is highly constrained and the electorate is very small, the political configuration will be unstable.

With regard to the relationship between political instability and income inequality, Alesina and Perotti (1996) show that the two variables are positively related because of the social discontent associated with income inequality. Perotti (1996) and Odedokun and Round (2001) show that countries with high income inequality are more likely to be politically unstable. Acemoglu and Robinson (2006) develop a theoretical model of democracy and income inequality where they argue that high income inequality in Latin America can be one of the main causes of weak democracy in the region. Blanco and Grier (2009) investigate the underlying causes of political instability in a panel of 18 Latin American countries from 1971 to 2000 and find that income inequality, in particular, have an important nonlinear effect on political instability: increases in income inequality raise instability up to a point, after which any further increases lower instability.

Despite the recent mounting interest of the effects of fiscal consolidation on growth prospects (Cimadomo *et al.*, 2010; Cimadomo, 2012), a thorough analysis of the impact of fiscal retrenchment on political stability has been neglected. To the best of our knowledge, only a few works assess how budget cuts affect the lack of political stability. Paldam (1987) points that fiscal austerity measures are typically associated with higher levels of social unrest. Haggard *et al.* (1995) show that the IMF interventions in developing countries were accompanied with greater instability. Rogoff and Sibert (1988) and Persson and Tabellini (2000) focus on the role played by political budget cycles, that is, the idea that incumbent governments tend to raise spending or cut taxes before elections in order to maximize the probability of re-election. Using data for OECD countries up to the nineties, Alesina *et al.* (1998) do not uncover a statistically significant relationship between fiscal adjustments and the probability of re-election. More recently, Alesina *et al.* (2012) use data for a group of 19 OECD countries from 1975 to 2008 and find no evidence that governments that quickly reduce budget deficits are systematically voted out of office. In fact, many governments are able to decisively reduce deficit and avoiding an electoral defeat.

Other works tackle a somewhat related question from a different angle. Agnello and Sousa (2013) stress that fiscal prudence – *i.e.*, a low and stable public deficit – is essential for the achievement of economic prosperity, while Agnello and Sousa (2014) suggest that more political instability (as expressed by an incoming signal of a government crisis) increases the likelihood of

fiscal policy discretion. Agnello *et al.* (2013a) emphasize that fiscal variables (such as the budget deficit and the level of public debt) and economic factors (such as the degree of openness, the inflation rate, the interest rate and per capita GDP) are crucial for the fiscal consolidation process. Agnello *et al.* (2013b) find evidence pointing that fiscal fatigue may compromise the implementation and successfulness of fiscal consolidation programs. The authors conclude that chronic fiscal imbalances might lead to a vicious austerity cycle, while discipline in the behaviour of fiscal authorities is a means of achieving credible and shorter adjustments.

Our paper contributes to the existing literature in three major directions. First, it specifically looks at the relationship between fiscal stimuli and political instability (as proxied by episodes of government crises). Second, given the strong linkage between income inequality and fiscal adjustment programs (Agnello and Sousa, 2012b), we assess the interaction between fiscal stimuli and the gap in income distribution in determining the likelihood of government crises. Therefore, we evaluate the impact of inequality on political instability, in particular, when countries undertake fiscal stimulus programs. Finally, because of the crucial role played by the composition of the fiscal adjustments (Alesina and Ardagna, 1998), we identify several measures of fiscal stimuli with the aim of assessing their effect on political stability. These are avenues of research that the previous theoretical and empirical works have not fully addressed, but denote important dimensions to be considered for a better understanding of the relationship between income inequality, fiscal stimuli and political (in)stability. With the current paper, we aim at fill such gaps.

3 Econometric methodology

Our modelling strategy consists of three steps. First, we explore the empirical relationship between income inequality and political stability by estimating the following equation:

$$C_{i,t} = \boldsymbol{Y}_{i,t}^{'}\Gamma + \boldsymbol{X}_{i,t}^{'}\beta + \lambda Gini_{i,t} + \alpha_i + \varepsilon_{i,t} \quad (1)$$

where $C_{i,t}$ denotes, for each country i included in the sample, our proxy of government instability; $\boldsymbol{Y}_{i,t}$ and $\boldsymbol{X}_{i,t}$ are a set of institutional and macroeconomic controls, respectively, that we assume to be correlated with the degree of government fragility; and $Gini_{i,t}$ is the income inequality index.

Then, we broaden our analysis and extend the model specification (1) by considering the relationship between fiscal stimuli episodes ($F_{i,t}$) and government stability. Specifically, we evaluate the impact of specific fiscal episodes on political instability. Similarly to Alesina and Ardagna (1998), we use a statistical approach to identify episodes of: (i) fiscal stimuli; (ii) expansionary fiscal stimuli; (iii) increasingly expansionary fiscal stimuli; (iv) contractionary fiscal stimuli; (v) increasingly contractionary fiscal stimuli; (vi) successful fiscal stimuli; and (vii) unsuccessful fiscal stimuli. A detailed description of these events is presented in the data section. Formally, we run the following regression model:

$$C_{i,t} = \boldsymbol{Y}_{i,t}^{'}\Gamma + \boldsymbol{X}_{i,t}^{'}\beta + \lambda Gini_{i,t} + \phi F_{i,t} + \alpha_i + \varepsilon_{i,t} \quad (2)$$

where $F_{i,t}$ is a binary variable taking the value of one when a specific fiscal stimuli episode ((i)-(vii)) occurs, and zero otherwise.

Finally, we assess the importance of the interplay between income inequality and fiscal stimuli by running the following regression:

$$C_{i,t} = \boldsymbol{Y}_{i,t}^{'}\Gamma + \boldsymbol{X}_{i,t}^{'}\beta + \lambda_1 Gini_{i,t} + \lambda_2 Gini_{i,t} \cdot 1_F\left(F_{i,t}\right) + \alpha_i + \varepsilon_{i,t} \quad (3)$$

where $1_F(F_{i,t})$ is a fiscal indicator function taking value of one during periods of fiscal stimuli, and zero otherwise. Its inclusion aims at checking whether the effects of income inequality on government stability change during periods of fiscal stimuli. Under the assumption that fiscal

consolidation plans are detrimental for income distribution (Agnello and Sousa, 2012b), we would expect, for instance, that the impact of inequality on government stability is reduced during the years of the implementation of programs of fiscal stimulus.

Due to the endogenous nature of the regressors, models (1)-(3) are estimated using an instrumental variables (IV) approach. As is standard in the literature, we instrument the endogenous variables with their own lags.

4 Data and empirical results

4.1 Data

We start by using a panel dataset consisting of 128 countries. However, the presence of missing values for several variables and the limited time span of fiscal variables (mainly, for developing countries) reduce the number of countries in the estimation to at most 58.

The dependent variable, $C_{i,t}$, used in our specification is Government Crisis, which is provided by the Cross-National Time-Series Data Archive (CNTS). It counts the number of any rapidly developing situation that might lead to the fall of the current regime and remove a particular government from power with the exclusion of situations of revolt.

The set of institutional variables (Y) is retrieved from the Database of Political Institutions (DPI) of the World Bank, the Polity IV Database (Polity IV) and the CNTS and includes:

- *military* (DPI): It is a dummy variable that takes the value one if the Chief Executive is military officer and zero otherwise.
- *stabs* (DPI): It counts the percentage of veto players who drop from the government in a specific year and, as such, it provides information about the veto points in the decision making process and the constraints that governments face in the course of policy implementation.
- *system* (DPI). This variable characterizes the political system. A value of 0 is given in the case of a presidential system, a value of 1 is allocated in the case of an Assembly-elected presidential system, and a value of 2 is associated to a parliamentary system.
- *govfrac* (Polity IV). It refers to the degree of government fragmentation as measured by the probability that two deputies picked at random from among the government parties will be of different parties.
- *polity2* (Polity IV). This describes how democratic a country is. It subtracts the country's score in an *"*Autocracy*"* index from its score in a *"*Democracy*"* index and produces a polity scale ranging from -10 (strongly autocratic) to +10 (strongly democratic).
- *durable* (DPI). This variable counts the number of years that a cabinet has been in power, up to the current year. A cabinet that falls during its first year in power is counted as 1. Every time there is a government termination, the variable is reset to 1 the year after the termination.
- *polcomp* (Polity IV). It measures the level of political competition in the next election that is expected by the incumbent when making policy decisions over the administration cycle.
- *yrsoffc* (DPI). It counts the number of years the chief executive has been in office.
- *maj* (DPI). It is a dummy variable equal to 1 if the cabinet has majority support in parliament.
- *party_coal* (DPI). It is a dummy variable equal to 1 if a coalition cabinet (including ministers from two or more parties) is in power.

The set of macroeconomic variables (X) is provided by the World Economic Outlook (WEO) of the International Monetary Fund (IMF) and includes: the GDP growth rate, the inflation rate and the real interest rate.

The net income Gini inequality index data comes from the Standardized World Income Inequality Database (SWIID).

Finally, fiscal data are retrieved from the WEO of the IMF. The cyclically adjusted budget balance is computed as in Alesina and Perotti (1995) and Alesina and Ardagna (1998, 2010), and is based on the method proposed by Blanchard (1990). Data on public debt are retrieved from the Historical Public Debt Database assembled by the Fiscal Affairs Department of the IMF (Ali Abbas *et al.*, 2011). In addition, the fiscal stimuli episodes considered in our study can be defined as follows:

- *Fiscal stimulus*. A period of fiscal stimulus is a year in which the cyclically adjusted primary balance deteriorates by at least 1.5 per cent of GDP.
- *Expansionary (contractionary) fiscal stimulus*. It corresponds to a period of fiscal stimulus followed by a positive (negative) GDP growth for two consecutive years.
- *Increasingly (decreasingly) expansionary fiscal stimulus*. It is a period of fiscal stimulus followed by an increasing (declining) GDP for two consecutive years. As we are not able to identify increasingly contractionary fiscal stimuli episodes, we do not consider these in the analysis.
- *Successful (unsuccessful) fiscal stimulus*. It is a period of fiscal stimulus followed by the cumulative reduction of the debt to GDP ratio greater (smaller) than 4.5 percentage points over two consecutive years after the beginning of a fiscal stimulus.

4.2 Political instability

We start by investigating the institutional and economic determinants of political instability and the impact of income inequality on the occurrence of government crises. Therefore, we estimate the baseline model and provide a summary of the findings in Table 1. In Column 1, we focus on the set of institutional variables; in Column 2, we add a set of economic determinants; in Column 3, we also consider the level of inequality; and, in Column 4, we condition the results on the strength of the income gap.

Looking at the set of institutional variables, we find that some factors providing details on the legislature, such as whether the government has a majority of seats in the parliament (*maj*) and whether the government consists of a coalition or not (*party_coal*), are important determinants of political instability. Both variables have a negative effect on the number of episodes of government crisis, in line with the conventional wisdom, being particularly relevant in the case of *party_coal* as shown by the large magnitude of the estimated coefficient. Similarly, the level of government fractionalization (*govfrac*) – which represents a Party variable in the legislature – helps explaining the occurrence of government crises and it has a positive and statistically significant impact on the dependent variable, in line with the findings of Taylor and Herman (1971). As expected, the regime durability (*durable*) reduces the probability of government crisis and the level of political competition (*polcomp*) seems to provide the ground for a more stable legislature. In what concerns to the political regime (*polity2*), the evidence suggests that it has a positive effect on the number of government crises, which indicates that the relationship between political instability and the level of democracy might be nonlinear. Indeed, Gates *et al.* (2006) show that regimes that are strongly autocratic and strongly democratic display a high degree of stability, as the maintenance of the institutional framework is in the interest of the political elites. In contrast, inconsistent regimes (as those with a mix of characteristics of autocracy and democracy) lack self- enforcing equilibrium and tend to be shorter. As for the chief executive variables (*yrsoffc*, *system* and *military*) and the stability and checks and balances determinants, our results show that only the number of years in office of the chief executive contributes significantly for a more stable political environment.

Table 1

Political Instability

Government Crisis	**[1]**	**[2]**	**[3]**	**[4]**
military	0.0131	0.0027	0.1035*	0.0909
	[0.020]	*[0.027]*	*[0.062]*	*[0.062]*
stabs	0.0091	-0.0088	-0.0816	-0.0852
	[0.035]	*[0.041]*	*[0.057]*	*[0.056]*
system	0.0105	-0.0071	0.0214	-0.001
	[0.012]	*[0.015]*	*[0.025]*	*[0.025]*
govfrac	0.0751**	0.0822*	0.0688	0.0945
	[0.037]	*[0.044]*	*[0.063]*	*[0.064]*
polity2	0.0183***	0.0156***	0.0335***	0.0347***
	[0.004]	*[0.005]*	*[0.010]*	*[0.010]*
durable	-0.0010***	-0.0006*	-0.0009**	-0.0011***
	[0.000]	*[0.000]*	*[0.000]*	*[0.000]*
polcomp	-0.0217***	-0.0219**	-0.0557***	-0.0563***
	[0.008]	*[0.009]*	*[0.019]*	*[0.019]*
yrsoffc	-0.0014	-0.0026**	-0.0031	-0.0031
	[0.001]	*[0.001]*	*[0.002]*	*[0.002]*
maj	-0.2345***	-0.1939***	-0.1815*	-0.2317**
	[0.054]	*[0.062]*	*[0.108]*	*[0.111]*
party_coal	-0.0308***	-0.0124	-0.0430*	-0.0572**
	[0.008]	*[0.012]*	*[0.024]*	*[0.025]*
GDP growth rate		-1.3798***	-2.7839***	-2.7863***
		[0.359]	*[0.767]*	*[0.769]*
inflation		0.0144***	0.0290***	0.0291***
		[0.004]	*[0.008]*	*[0.008]*
real interest rate		0.0001	0.0000	0.0000
		[0.000]	*[0.000]*	*[0.000]*
inequality			0.0047**	
			[0.002]	
(inequality < average)				0.0155***
				[0.004]
(inequality > average)				0.0098***
				[0.003]
constant	0.4721***	0.4492***	0.5410***	0.3482*
	[0.071]	*[0.087]*	*[0.189]*	*[0.195]*
Observations	2690	1752	991	991
R-squared	0.053	0.068	0.093	0.102
Hansen Statistic	-	3.242	4.991	5.221
p-value	-	0.518	0.288	0.265

Note: Robust standard errors in brackets. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Turning to the group of economic variables, the empirical findings interestingly reveal that while economic growth contributes to stable legislature, an increase in inflation tends to deteriorate it, corroborating the findings of Aisen and Veiga (2008a, 2008b). In light of the magnitude of the coefficient associated to real GDP growth, the baseline model suggests that the underlying performance of the economy is, perhaps, the most important determinant of political stability. In addition, the positive coefficient of inflation shows that government crises are likely to rise as a result of an increase in inflation. As for the interest rate, it does not seem to play a significant role in explaining the number of government crises.

Moving to the analysis of the impact of inequality on political instability, our results clearly suggest that when the income gap rises, the likelihood of a government crisis increases (Column 3). This, in turn, highlights that countries which fail to address the problem of inequality in income distribution are more susceptible to face social polarization and, hence, an unstable political environment. Alesina and Perotti (1996), Perotti (1996) and Odedokun and Round (2001) show that income inequality affects growth, but the problem is more complex since in this process worse income distribution generates social dissatisfaction which in turn leads to social and political instability, as we show in our analysis. Moreover, we also find that this effect does not seem to depend on how large the income gap is, as shown in Column 4. Hence, income inequality arises as an important trigger for political instability as soon as it is spotted by society.

4.3 Political instability and fiscal stimuli

We now move a step forward and assess the effects of fiscal stimuli on political (in)stability, as proxied by the number of episodes of government crises. We consider different typologies of fiscal episodes, namely: (i) fiscal stimuli, (ii) increasingly expansionary fiscal stimuli, (iii) expansionary fiscal stimuli, (iv) increasingly contractionary fiscal stimuli, (v) contractionary fiscal stimuli, (vi) successful fiscal stimuli, and (vii) unsuccessful fiscal stimuli. The results are summarized in Table 2.

It can be seen that episodes of fiscal stimuli are not associated with more unstable political environments *per se*. In fact, the results suggest that fiscal stimuli episodes do not significantly reduce the occurrence of government crises. However, the typology of fiscal stimuli matters. Indeed, expansionary and increasingly expansionary fiscal stimuli programs help reducing the likelihood of political instability. Thus, the fall in unemployment and the effectiveness of such programs in boosting the economy are likely to contribute to less political instability. Contractionary fiscal stimuli reforms have not proven to contribute to more political stability. These results suggest that it might be easier for political forces to reach an agreement when an expansionary package is being discussed than when a contractionary one is *on the table*. Hence, additional political stability is more likely to be obtained in the first kind of stimuli. In sum, our empirical findings show that the design of fiscal packages exerts an effect on the occurrence of government crises that cannot be neglected. Due to their redistributive nature, expansionary programs are more easily accepted by society, therefore, generating a higher social cohesion and stability than contractionary packages. In fact, social stability is also an important driver for a higher degree of political stability (Annett, 2000).

Additionally, the results are still indicating that when the income inequality increases social discontent is fuelled and, therefore, it contributes to more politically unstable governments, no matter the kind of fiscal stimuli that is considered. Regarding the institutional and economic conditionings the main results and conclusions remain unchanged.

4.4 Political instability and interaction between inequality and fiscal consolidation

We concluded above that income inequality contributes to political instability regardless the type of fiscal stimuli program put in place by the fiscal authority. However, in the previous analysis, we did not disentangle the interaction between these two effects on political (in)stability. Hence, next, we condition the effect of inequality on political instability by accounting for the occurrence of fiscal stimuli episodes, that is, we interact the net income Gini inequality index with the various fiscal stimuli episodes and assess whether the impact on the likelihood of a government crisis is dampened.

The results are summarized in Table 3 and show that when expansionary and increasingly expansionary fiscal stimuli programs are implemented, the detrimental impact that inequality has on political instability is abated. The results also point out to the fact that the more expansionary the program is, the larger the reduction in the degree of political instability will be.

All in all, these findings interestingly suggest that in countries where income distribution is uneven, governments implementing fiscal stimuli programs are more likely to avoid political instability. In particular, these expansionary stimuli generate a redistribution of income in favour of a sizeable group of the population, which helps to reduce the overall level of inequality. Fiscal policy can favourably influence long-term trends in both inequality and growth by promoting education and training among low- and middle-income workers. This is more relevant when the initial level of inequality is high. Agnello and Sousa (2012a) show that expansionary fiscal adjustments are more effective in shortening the income gap, which means that growth-promoting consolidation programs lead to a more stable social and political environment. Hence, fiscal authorities, in countries where income inequality is more striking, should carefully design their fiscal stimuli programs: ultimately, they need to be expansionary (*i.e.*, generate economic growth) or increasingly expansionary (in the sense of generating positive sustainable growth) in order to be able to significantly reduce the likelihood of government crises. In sum, the redistributive role of these programs helps mitigating some of the inequalities in society and, therefore, reduce social and political instability.

5 Sensitivity analysis

In this section, we provide the sensitivity analysis. We assess the robustness of the previous findings along different dimensions, namely: (i) by analysing the evidence for OECD and non-OECD countries; and (ii) by estimating an ordered probit model.

5.1 Evidence for OECD and non-OECD countries

We start by investigating the effects of income inequality on political instability in two sets of countries: (i) OECD countries and (ii) non-OECD countries. In Tables 4-6, we present the main findings using data for OECD countries. As we are not able to identify contractionary fiscal stimuli episodes for OECD countries, we do not consider these in the analysis. In Tables 7-9, we provide the evidence for non-OECD countries.

Tables 4-6 show that the results for OECD countries are similar to the ones found when using the full sample. More specifically, among the list of institutional variables, the fact that the government in power is made of a coalition (*party_coal*) and the regime durability (*durable*) are positively associated with political stability. An increase in the level of political competition (*polcomp*) also seems to go along in tandem with a more stable legislature. Moreover, while the

Table 2

Political Instability and Fiscal Stimuli

Government Crisis	[1]	[2]	[3]	[4]	[5]	[6]
military	0.0833	0.0896	0.0863	0.0853	0.0854	0.0857
	[0.067]	*[0.068]*	*[0.067]*	*[0.068]*	*[0.069]*	*[0.068]*
stabs	–0.0889	–0.0935	–0.0908	–0.0854	–0.088	–0.0873
	[0.062]	*[0.064]*	*[0.063]*	*[0.063]*	*[0.063]*	*[0.063]*
system	0.0263	0.0257	0.0257	0.0249	0.0245	0.0256
	[0.027]	*[0.027]*	*[0.027]*	*[0.027]*	*[0.028]*	*[0.028]*
govfrac	0.0299	0.0299	0.0287	0.0305	0.0328	0.0307
	[0.065]	*[0.065]*	*[0.065]*	*[0.065]*	*[0.065]*	*[0.065]*
polity2	0.0349***	0.0347***	0.0348***	0.0343***	0.0341***	0.0351***
	[0.011]	*[0.011]*	*[0.011]*	*[0.011]*	*[0.011]*	*[0.011]*
durable	–0.0010**	–0.0009**	–0.0010**	–0.0010**	–0.0010**	–0.0010**
	[0.000]	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*
polcomp	–0.0571***	–0.0562**	–0.0564**	–0.0556**	–0.0557**	–0.0572**
	[0.022]	*[0.022]*	*[0.022]*	*[0.022]*	*[0.023]*	*[0.022]*
yrsoffc	–0.0031	–0.0032	–0.0032	–0.0033	–0.0035	–0.0031
	[0.003]	*[0.003]*	*[0.003]*	*[0.003]*	*[0.003]*	*[0.003]*
maj	–0.1989*	–0.1942	–0.2009*	–0.1814	–0.1955	–0.1969*
	[0.119]	*[0.119]*	*[0.119]*	*[0.118]*	*[0.119]*	*[0.119]*
party_coal	–0.0457**	–0.0447*	–0.0454**	–0.0428*	–0.0435*	–0.0458*
	[0.023]	*[0.023]*	*[0.023]*	*[0.023]*	*[0.024]*	*[0.023]*

GDP growth rate	–3.0762*** *[0.802]*	–3.0260*** *[0.807]*	–3.0409*** *[0.800]*	–2.8864*** *[0.796]*	–3.0040*** *[0.804]*	–3.0661*** *[0.819]*
inflation	0.0321*** *[0.008]*	0.0315*** *[0.008]*	0.0318*** *[0.008]*	0.0300*** *[0.008]*	0.0312*** *[0.008]*	0.0318*** *[0.008]*
real interest rate	0.0000 *[0.000]*	0.0000 *[0.000]*	0.0000 *[0.000]*	0.0000 *[0.000]*	0.0000 *[0.000]*	0.0000 *[0.000]*
inequality	0.0057** *[0.002]*	0.0058** *[0.002]*	0.0057** *[0.002]*	0.0053** *[0.002]*	0.0055** *[0.002]*	0.0055** *[0.002]*
fiscal stimuli	–0.0616 *[0.040]*					
increasingly expansionary fiscal stimuli		–0.1099* *[0.066]*				
expansionary fiscal stimuli			–0.0743* *[0.042]*			
contractionary fiscal stimuli				0.5332 *[0.647]*		
successful fiscal stimuli					–0.0305 *[0.081]*	
unsuccesful fiscal stimuli						–0.0596 *[0.047]*
Constant	0.5610*** *[0.196]*	0.5371*** *[0.196]*	0.5590*** *[0.196]*	0.5316*** *[0.196]*	0.5419*** *[0.196]*	0.5634*** *[0.195]*
Observations	914	914	914	914	907	909
R–squared	0.102	0.102	0.103	0.102	0.10	0.101
Hansen Statistic	5.371	5.345	5.387	5.313	5.529	5.15
p–value	0.251	0.254	0.25	0.257	0.237	0.272

Note: Robust standard errors in brackets. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 3

Political Instability and Interaction Between Inequality and Fiscal Stimuli

Government Crisis	[1]	[2]	[3]	[4]	[5]	[6]
military	0.0832	0.09	0.0858	0.0853	0.0862	0.0857
	[0.067]	*[0.068]*	*[0.067]*	*[0.068]*	*[0.069]*	*[0.068]*
stabs	–0.0885	–0.0945	–0.0902	–0.0857	–0.0873	–0.0864
	[0.062]	*[0.064]*	*[0.063]*	*[0.063]*	*[0.063]*	*[0.063]*
system	0.0263	0.0262	0.0262	0.0248	0.0243	0.0259
	[0.027]	*[0.027]*	*[0.027]*	*[0.027]*	*[0.028]*	*[0.028]*
govfrac	0.0306	0.0299	0.029	0.0311	0.033	0.0312
	[0.065]	*[0.065]*	*[0.065]*	*[0.065]*	*[0.065]*	*[0.065]*
polity2	0.0348***	0.0345***	0.0347***	0.0344***	0.0343***	0.0351***
	[0.011]	*[0.011]*	*[0.011]*	*[0.011]*	*[0.011]*	*[0.011]*
durable	–0.0010**	–0.0009**	–0.0010**	–0.0010**	–0.0010**	–0.0010**
	[0.000]	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*	*[0.000]*
polcomp	–0.0567**	–0.0556**	–0.0560**	–0.0557**	–0.0558**	–0.0571**
	[0.022]	*[0.022]*	*[0.022]*	*[0.022]*	*[0.023]*	*[0.022]*
yrsoffc	–0.0031	–0.0032	–0.0031	–0.0033	–0.0034	–0.003
	[0.003]	*[0.003]*	*[0.003]*	*[0.003]*	*[0.003]*	*[0.003]*
maj	–0.1985*	–0.1941	–0.2015*	–0.1826	–0.1945	–0.1979*
	[0.118]	*[0.118]*	*[0.119]*	*[0.118]*	*[0.119]*	*[0.119]*
party_coal	–0.0460**	–0.0458**	–0.0462**	–0.0428*	–0.0436*	–0.0462**
	[0.023]	*[0.023]*	*[0.023]*	*[0.023]*	*[0.024]*	*[0.023]*

GDP growth rate	–3.0479*** *[0.797]*	–3.0292*** *[0.802]*	–3.0244*** *[0.797]*	–2.8953*** *[0.795]*	–2.9889*** *[0.803]*	–3.0562*** *[0.815]*
inflation	0.0318*** *[0.008]*	0.0315*** *[0.008]*	0.0317*** *[0.008]*	0.0301*** *[0.008]*	0.0310*** *[0.008]*	0.0317*** *[0.008]*
real interest rate	0.0000 *[0.000]*	0.0000 *[0.000]*	0.0000 *[0.000]*	0.0000 *[0.000]*	0.0000 *[0.000]*	0.0000 *[0.000]*
inequality	0.0060** *[0.002]*	0.0061** *[0.002]*	0.0061** *[0.002]*	0.0053** *[0.002]*	0.0055** *[0.002]*	0.0058** *[0.002]*
inequality x fiscal stimuli	–0.0013 *[0.001]*					
inequality x increasingly expansionary fiscal stimuli		–0.0033** *[0.001]*				
inequality x expansionary fiscal stimuli			–0.0019* *[0.001]*			
inequality x contractionary fiscal stimuli				0.0097 *[0.014]*		
inequality x successful fiscal stimuli					–0.0002 *[0.002]*	
inequality x unsuccessful fiscal stimuli						–0.0015 *[0.001]*
constant	0.5441*** *[0.196]*	0.5266*** *[0.196]*	0.5407*** *[0.197]*	0.5327*** *[0.196]*	0.5424*** *[0.196]*	0.5513*** *[0.196]*
Observations	914	914	914	914	907	909
R–squared	0.101	0.104	0.103	0.102	0.099	0.101
Hansen Statistic	5.396	5.348	5.413	5.331	5.454	5.133
p–value	0.249	0.253	0.247	0.255	0.244	0.274

Note: Robust standard errors in brackets. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

number of years in office of the chief executive reduces the occurrence of government crises, the political regime (in the form of increased democracy) seems to lead to more political tensions. In general, these results show that within the group of OECD countries, those with better and more solid political institutions tend to show lower levels of political instability, but very liberal democratic systems can, nevertheless, be counterproductive in achieving political stability. Hence, our results suggest the need for these countries to find a balance between their usually higher degree of democracy and the building up of a solid set of political institutions.

Among the group of economic variables, we find that economic growth and inflation have, once again, opposite effects on political instability: while economic growth strongly reduces the occurrence of government crises in OECD countries, an increase in inflation tends to erode the stability of the political environment. It is easy to understand that a more favourable economic environment provides better opportunities for all economic agents and the population in general, creating favourable conditions for a more equal distribution of income. As mentioned before, this is a key factor for social and, consequently, political stability. On one hand, a higher economic growth is *per se* a fundamental catalyst for this stability; on the other hand, higher inflation levels generate an erosion of wealth and an unfair redistribution of the income among the economic agents, promoting social and political tensions.

In what concerns inequality, we clearly uncover a positive effect on the number of episodes of government crisis. However, this impact does not appear to depend on the magnitude of the income gap, as the coefficients associated with inequality above the average and inequality below the average are very similar in magnitude. This result confirms the important role that income distribution has at the social and political level. Without an adequate and fair distribution of income, social tensions will become more frequent with consequential repercussions at the political level.

With regard to the effects of fiscal episodes, we find that fiscal stimuli programs are particularly important at reducing the likelihood of government crises (as shown in Table 5). Moreover, for OECD countries, what matters is the implementation of such programs, independently of their kind. As developed democracies, these programs are usually perceived as needed when supported by the society, so it is easier to reach a consensus for its implementation, which will ultimately contribute to strengthen the political environment. This piece of evidence is corroborated in Table 6, when we interact the level of inequality with the implementation of fiscal stimuli. Indeed, the table shows that conditioning the impact of inequality during periods of fiscal stimulus significantly reduces the number of government crisis episodes. As this group of countries tend to present higher levels of political stability, a simple fiscal stimuli might be enough to reinforce that stability, even when the degree of inequality is higher. Reforms since the 1980s in this group of countries have been a factor behind rising income inequality by lessening the generosity of social benefits and the progressiveness of income tax systems. So, a well designed fiscal package can mitigate inequalities in the society, reinforcing the social and political stability that usually characterizes the group of OECD countries.

As for the evidence for non-OECD countries (reported in Tables 7-9), our results show that the level of political competition (*polcomp*) and, to some extent, the fact that the government in power has a majority of seats in the parliament (*maj*) or is made of a coalition (*party_coal*) reduces the occurrence of government crises, while more democracy (*polity2*) may exacerbate political instability. However, only political competition and the degree of democracy remain relevant when the economic environment and the level of inequality are controlled for. In fact, non-OECD countries need political competition to promote a more stable political system. However, like the OECD countries, stronger democratic systems tend to generate more instability, maybe because the complex nature of the political system under these regimes – perhaps not very well apprehended by the political authorities in such developing countries – might complicate the quest for political

Table 4

Political Instability – Evidence for OECD Countries

Government Crisis	**[1]**	**[2]**	**[3]**	**[4]**
military	0.5912** *[0.244]*	–0.1103 *[0.176]*	–0.0019 *[0.146]*	–0.1583 *[0.127]*
stabs	–0.0835 *[0.080]*	–0.074 *[0.086]*	–0.1339 *[0.090]*	–0.1279 *[0.089]*
system	0.0123 *[0.033]*	–0.0339 *[0.048]*	0.1567*** *[0.056]*	0.0955* *[0.052]*
govfrac	–0.0507 *[0.102]*	–0.0334 *[0.109]*	–0.0092 *[0.119]*	0.1047 *[0.132]*
polity2	0.1334*** *[0.044]*	0.1416*** *[0.036]*	0.1514*** *[0.039]*	0.1279*** *[0.035]*
durable	–0.0016*** *[0.000]*	–0.0006 *[0.001]*	–0.0016*** *[0.001]*	–0.0017*** *[0.001]*
polcomp	–0.1407** *[0.068]*	–0.1323** *[0.060]*	–0.1582* *[0.081]*	–0.1786** *[0.078]*
yrsoffc	–0.0154* *[0.008]*	–0.0135* *[0.008]*	–0.0118 *[0.008]*	–0.0118 *[0.008]*
maj	0.1355 *[0.193]*	0.0319 *[0.186]*	–0.0207 *[0.194]*	–0.0968 *[0.201]*
party_coal	–0.0986* *[0.054]*	–0.1017* *[0.058]*	–0.1084* *[0.061]*	–0.0836 *[0.061]*
GDP growth rate		–2.6183*** *[0.815]*	–3.4111*** *[0.906]*	–3.1144*** *[0.878]*
inflation rate		0.0397** *[0.009]*	0.0394*** *[0.010]*	0.0374*** *[0.010]*
real interest rate		–0.0042** *[0.002]*	–0.0027 *[0.005]*	–0.0005 *[0.005]*
inequality			0.0181*** *[0.005]*	
(inequality < average)				0.0286*** *[0.007]*
(inequality > average)				0.0173*** *[0.005]*
constant	0.606 *[0.391]*	0.5154 *[0.387]*	–0.0619 *[0.563]*	0.1326 *[0.532]*
Observations	671	520	461	461
R–squared	0.054	0.081	0.11	0.125
Hansen Statistic	–	0.993	3.008	2.488
p–value	–	0.803	0.39	0.477

Note: Robust standard errors in brackets. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 5

Political Instability and Fiscal Stimuli – Evidence for OECD Countries

Government Crisis	[1]	[2]	[3]	[4]	[5]
military	–0.1435	–0.1467	–0.1417	–0.1049	–0.1934
	[0.116]	*[0.120]*	*[0.116]*	*[0.125]*	*[0.121]*
stabs	–0.1391	–0.1289	–0.1401	–0.1319	–0.1387
	[0.092]	*[0.092]*	*[0.092]*	*[0.092]*	*[0.092]*
system	0.1487**	0.1492**	0.1496**	0.1520**	0.1466**
	[0.062]	*[0.063]*	*[0.062]*	*[0.063]*	*[0.062]*
govfrac	0.0227	0.0261	0.0247	0.0275	0.0196
	[0.123]	*[0.123]*	*[0.124]*	*[0.124]*	*[0.123]*
polity2	0.1510***	0.1604***	0.1528***	0.1555***	0.1551***
	[0.040]	*[0.039]*	*[0.040]*	*[0.039]*	*[0.040]*
durable	–0.0015**	–0.0016**	–0.0016**	–0.0016**	–0.0016**
	[0.001]	*[0.001]*	*[0.001]*	*[0.001]*	*[0.001]*
polcomp	–0.1146	–0.1302	–0.1176	–0.1276	–0.1157
	[0.091]	*[0.090]*	*[0.091]*	*[0.090]*	*[0.092]*
yrsoffc	–0.0112	–0.012	–0.0111	–0.0116	–0.0117
	[0.008]	*[0.008]*	*[0.008]*	*[0.008]*	*[0.008]*
maj	–0.079	–0.0429	–0.0664	–0.0477	–0.074
	[0.205]	*[0.204]*	*[0.204]*	*[0.203]*	*[0.204]*
party_coal	–0.0977	–0.0954	–0.0958	–0.0935	–0.0991
	[0.061]	*[0.062]*	*[0.061]*	*[0.062]*	*[0.061]*

GDP growth rate	–3.8643*** *[1.024]*	–3.3767*** *[0.981]*	–3.6856*** *[0.993]*	–3.4776*** *[0.949]*	–3.7889*** *[1.014]*
inflation	0.0458*** *[0.012]*	0.0403*** *[0.011]*	0.0441*** *[0.012]*	0.0417*** *[0.011]*	0.0442*** *[0.012]*
real interest rate	–0.0012 *[0.006]*	–0.0025 *[0.006]*	–0.0017 *[0.006]*	–0.0026 *[0.006]*	–0.0009 *[0.006]*
inequality	0.0192*** *[0.005]*	0.0195*** *[0.006]*	0.0193*** *[0.005]*	0.0197*** *[0.006]*	0.0191*** *[0.005]*
fiscal stimuli	–0.1087** *[0.053]*				
increasingly expansionary fiscal stimuli		0.0503 *[0.131]*			
expansionary fiscal stimuli			–0.0825 *[0.055]*		
successful fiscal stimuli				–0.091 *[0.077]*	
unsuccessful fiscal stimuli					–0.0982* *[0.057]*
Constant	–0.5024 *[0.834]*	–0.4929 *[0.823]*	–0.5151 *[0.832]*	–0.4831 *[0.834]*	–0.5244 *[0.835]*
Observations	453	453	453	453	453
R–squared	0.118	0.113	0.115	0.113	0.116
Hansen Statistic	2.091	2.306	1.965	2.093	2.153
p–value	0.554	0.511	0.58	0.553	0.541

Note: Robust standard errors in brackets. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 6

Political Instability and Interaction Between Inequality and Fiscal Stimuli
Evidence for OECD Countries

Government Crisis	[1]	[2]	[3]	[4]	[5]
military	–0.1195	–0.146	–0.1246	–0.0944	–0.1963
	[0.119]	*[0.120]*	*[0.119]*	*[0.135]*	*[0.125]*
stabs	–0.1398	–0.1303	–0.14	–0.1328	–0.138
	[0.092]	*[0.092]*	*[0.093]*	*[0.092]*	*[0.092]*
system	0.1524**	0.1490**	0.1520**	0.1522**	0.1491**
	[0.063]	*[0.063]*	*[0.063]*	*[0.063]*	*[0.062]*
govfrac	0.025	0.0263	0.0266	0.0285	0.0197
	[0.124]	*[0.123]*	*[0.125]*	*[0.125]*	*[0.123]*
polity2	0.1478***	0.1607***	0.1503***	0.1549***	0.1540***
	[0.040]	*[0.039]*	*[0.040]*	*[0.039]*	*[0.041]*
durable	–0.0015**	–0.0016**	–0.0016**	–0.0016**	–0.0016**
	[0.001]	*[0.001]*	*[0.001]*	*[0.001]*	*[0.001]*
polcomp	–0.1123	–0.1304	–0.1158	–0.1269	–0.115
	[0.092]	*[0.089]*	*[0.092]*	*[0.090]*	*[0.094]*
yrsoffc	–0.0111	–0.0121	–0.0111	–0.0118	–0.0115
	[0.008]	*[0.008]*	*[0.008]*	*[0.008]*	*[0.008]*
maj	–0.0717	–0.0451	–0.0628	–0.0465	–0.0677
	[0.205]	*[0.203]*	*[0.204]*	*[0.203]*	*[0.203]*
party_coal	–0.0969	–0.0949	–0.0954	–0.0932	–0.0991
	[0.061]	*[0.061]*	*[0.062]*	*[0.062]*	*[0.061]*

GDP growth rate	–3.7924***	–3.4079***	–3.6468***	–3.4745***	–3.7094***
	[1.015]	*[0.967]*	*[0.989]*	*[0.949]*	*[1.004]*
inflation	0.0450***	0.0406***	0.0436***	0.0416***	0.0433***
	[0.012]	*[0.011]*	*[0.012]*	*[0.011]*	*[0.012]*
real interest rate	–0.0009	–0.0025	–0.0014	–0.0025	–0.0006
	[0.006]	*[0.006]*	*[0.006]*	*[0.006]*	*[0.006]*
inequality	0.0198***	0.0195***	0.0197***	0.0197***	0.0195***
	[0.006]	*[0.006]*	*[0.006]*	*[0.006]*	*[0.006]*
inequality x fiscal stimuli	–0.0033*				
	[0.002]				
inequality x increasingly expansionary fiscal stimuli		0.0012			
		[0.004]			
inequality x expansionary fiscal stimuli			–0.0025		
			[0.002]		
inequality x successful fiscal stimuli				–0.0022	
				[0.002]	
inequality x unsuccessful fiscal stimuli					–0.0028
					[0.002]
constant	–0.5337	–0.4915	–0.5346	–0.4882	–0.5495
	[0.844]	*[0.819]*	*[0.840]*	*[0.834]*	*[0.847]*
Observations	453	453	453	453	453
R–squared	0.117	0.112	0.115	0.113	0.115
Hansen Statistic	2.033	2.219	1.962	2.094	2.101
p–value	0.566	0.528	0.58	0.553	0.552

Note: Robust standard errors in brackets. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 7

Political Instability – Evidence for Non-OECD Countries

Government Crisis	[1]	[2]	[3]	[4]
military	–0.0034 *[0.020]*	0.0024 *[0.027]*	0.0831 *[0.065]*	0.0726 *[0.066]*
stabs	0.0176 *[0.038]*	–0.0129 *[0.047]*	–0.1121 *[0.077]*	–0.1158 *[0.077]*
system	0.0055 *[0.014]*	–0.0147 *[0.016]*	–0.0436 *[0.031]*	–0.0482 *[0.031]*
govfrac	0.0659 *[0.043]*	0.0773 *[0.052]*	0.1347 *[0.086]*	0.1307 *[0.086]*
polity2	0.0161*** *[0.004]*	0.0137*** *[0.005]*	0.0307*** *[0.010]*	0.0303*** *[0.011]*
durable	0.0001 *[0.001]*	–0.0003 *[0.001]*	–0.0014 *[0.001]*	–0.0012 *[0.001]*
polcomp	–0.0198** *[0.008]*	–0.0175* *[0.009]*	–0.0528** *[0.021]*	–0.0480** *[0.022]*
yrsoffc	–0.0015 *[0.001]*	–0.0024* *[0.001]*	–0.0033 *[0.003]*	–0.0031 *[0.003]*
maj	–0.2584*** *[0.058]*	–0.1987*** *[0.067]*	–0.1872 *[0.125]*	–0.2139 *[0.130]*
party_coal	–0.0237*** *[0.009]*	–0.0069 *[0.012]*	–0.0216 *[0.026]*	–0.0353 *[0.030]*
GDP growth rate		–1.3826*** *[0.380]*	–2.6312*** *[0.966]*	–2.6612*** *[0.968]*
inflation rate		0.0143*** *[0.004]*	0.0271*** *[0.010]*	0.0275*** *[0.010]*
real interest rate		0.0001* *[0.000]*	0.0000 *[0.000]*	0.0000 *[0.000]*
inequality			–0.0006 *[0.003]*	
(inequality < average)				0.0069 *[0.006]*
(inequality > average)				0.0033 *[0.004]*
constant	0.4577*** *[0.074]*	0.4207*** *[0.088]*	0.7517*** *[0.247]*	0.5759** *[0.246]*
Observations	2019	1297	568	568
R–squared	0.058	0.093	0.121	0.125
Hansen Statistic	–	2.625	5.312	5.364
p–value	–	0.453	0.15	0.147

Note: Robust standard errors in brackets. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

parties to reach a consensus. This in turn, generates political instability and delays in the implementation of important programs necessary to stabilize the economy when affected by adverse shocks. Indeed, the state of the economic environment is a crucial determinant of the number of government crises. We observe that economic growth is undoubtedly the most important factor contributing to the stability of the government, as can be seen by the large magnitude of the coefficient associated to this variable. In contrast, inflation and increasing funding costs (as expressed in a higher interest rate) boost the possibility of political tensions (albeit weakly in the later variable). This is because many developing countries are characterized by less democratic and socially-polarized environments with low access to either domestic or external sources of debt financing (Aisen and Veiga, 2008a).

Finally, we show that inequality does not have a significant impact on the number of government crises, a result that is in sharp contrast with the evidence found for OECD countries. Moreover, this impact does not seem to rely on the size of the income gap, as the coefficients associated with inequality above and below the average are also statistically insignificant. In non-OECD countries the average lower literacy rates and education levels act as obstacles for the median voter to exert active civic and political pressure and demand public accountability from their political leaders and governments. Moreover, the traditionally higher average starting level of income inequality means that any marginal increase in the Gini coefficient is not felt as much as in OECD countries. Moreover, contrary to the group of OECD countries, non-OECD countries are usually characterized by a higher level of political instability and even periods of dictatorship and repression. This might mean that institutional and economic conditions can be overcastting the impact of income inequality on political instability that is observed in more stable political systems. In fact, we observe that the degree of democracy (*polity2*), GDP growth and inflation are the most relevant factors for this group of non-OECD countries.

Turning to the effects of fiscal episodes, our results suggest that it is the kind of program that ultimately matters: both expansionary and increasingly expansionary fiscal stimuli are particularly important in reducing the likelihood of government crises (as shown in Table 8). This, to some extent, can be interpreted as the mirror image of the finding of Haggard *et al.* (1995) that contractionary measures implemented in developing countries towards fiscal adjustments, as a result of external interventions, were accompanied by greater instability. Thus, the simple implementation of a program is not enough, like it has proven to be the case for the group of OECD countries; in non-OECD economies, only expansionary fiscal stimuli seem to be able to promote political stability.

Our previous piece of evidence is corroborated in Table 9, when we interact the level of inequality with the implementation of fiscal stimuli. Indeed, the table shows that conditioning the impact of inequality during periods of fiscal stimulus significantly reduces the number of government crisis episodes, since the magnitude of the resulting interacting coefficients gets significantly smaller. Blanco and Grier (2009) show that Latin American countries with low levels of inequality tend to suffer, on average, less political instability. In fact, in low-income countries and some emerging market economies, reforms of fuel and food subsidies are crucial to improving the equity impact of fiscal policy (Coady *et al.*, 2010). For non-OECD countries, we also observe that trend but only when redistributive expansionary measures are put in place. They seem to provide some positive re-adjustments in the income distribution, which in turn contributes to a more peaceful social and political environment.

Table 8

Political Instability and Fiscal Stimuli – Evidence for Non-OECD Countries

Government Crisis	[1]	[2]	[3]	[4]	[5]	[6]
military	0.0674	0.076	0.0717	0.0697	0.0733	0.074
	[0.070]	*[0.071]*	*[0.071]*	*[0.072]*	*[0.073]*	*[0.072]*
stabs	–0.1204	–0.1326	–0.1215	–0.1143	–0.1174	–0.1184
	[0.094]	*[0.098]*	*[0.094]*	*[0.093]*	*[0.094]*	*[0.095]*
system	–0.0326	–0.0303	–0.0339	–0.0362	–0.0378	–0.0357
	[0.033]	*[0.033]*	*[0.033]*	*[0.033]*	*[0.032]*	*[0.033]*
govfrac	0.053	0.0555	0.0461	0.0563	0.063	0.0579
	[0.093]	*[0.092]*	*[0.092]*	*[0.091]*	*[0.092]*	*[0.093]*
polity2	0.0263**	0.0270**	0.0258**	0.0265**	0.0256**	0.0261**
	[0.012]	*[0.012]*	*[0.012]*	*[0.012]*	*[0.012]*	*[0.012]*
durable	–0.0015	–0.0013	–0.0015	–0.0015	–0.0015	–0.0014
	[0.001]	*[0.001]*	*[0.001]*	*[0.001]*	*[0.001]*	*[0.001]*
polcomp	–0.0416*	–0.0422*	–0.0404*	–0.0422*	–0.0407	–0.0411*
	[0.024]	*[0.024]*	*[0.024]*	*[0.024]*	*[0.025]*	*[0.025]*
yrsoffc	–0.0046	–0.0046	–0.0047	–0.0046	–0.005	–0.0045
	[0.003]	*[0.003]*	*[0.003]*	*[0.003]*	*[0.003]*	*[0.003]*
maj	–0.2101	–0.2046	–0.2152	–0.1904	–0.2116	–0.2094
	[0.135]	*[0.136]*	*[0.135]*	*[0.135]*	*[0.136]*	*[0.136]*
party_coal	–0.0372	–0.0373	–0.0386	–0.0322	–0.0353	–0.0389
	[0.026]	*[0.026]*	*[0.026]*	*[0.026]*	*[0.027]*	*[0.027]*

GDP growth rate	–2.9778*** *[1.015]*	–2.9986*** *[1.026]*	–2.9605*** *[1.016]*	–2.8007*** *[1.018]*	–2.9399*** *[1.028]*	–3.0044*** *[1.042]*
inflation	0.0307*** *[0.010]*	0.0309*** *[0.010]*	0.0307*** *[0.010]*	0.0288*** *[0.010]*	0.0301*** *[0.010]*	0.0308*** *[0.010]*
real interest rate	0.000 *[0.000]*	0.000 *[0.000]*	0.000 *[0.000]*	0.000 *[0.000]*	0.000 *[0.000]*	0.000 *[0.000]*
inequality	–0.0012 *[0.004]*	–0.0007 *[0.004]*	–0.0013 *[0.004]*	–0.0014 *[0.004]*	–0.0014 *[0.004]*	–0.0013 *[0.004]*
fiscal stimuli	–0.0598 *[0.052]*					
increasingly expansionary fiscal stimuli		–0.1761** *[0.069]*				
expansionary fiscal stimuli			–0.1042* *[0.054]*			
contractionary fiscal stimuli				0.5274 *[0.629]*		
successful fiscal stimuli					0.0001 *[0.095]*	
unsuccessful fiscal stimuli						–0.0734 *[0.063]*
constant	0.8334*** *[0.253]*	0.8031*** *[0.255]*	0.8440*** *[0.253]*	0.7990*** *[0.251]*	0.8194*** *[0.253]*	0.8331*** *[0.252]*
Observations	493	493	493	493	485	487
R–squared	0.137	0.143	0.141	0.139	0.134	0.137
Hansen Statistic	5.78	5.656	5.777	5.707	5.793	5.528
p–value	0.123	0.13	0.123	0.127	0.122	0.137

Note: Robust standard errors in brackets. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 9

Political Instability and Interaction Between Inequality and Fiscal Stimuli
Evidence for Non-OECD Countries

Government Crisis	[1]	[2]	[3]	[4]	[5]	[6]
military	0.0675	0.0767	0.0712	0.0697	0.075	0.0746
	[0.070]	*[0.071]*	*[0.071]*	*[0.072]*	*[0.073]*	*[0.072]*
stabs	–0.1204	–0.1339	–0.1216	–0.1149	–0.1155	–0.1173
	[0.094]	*[0.098]*	*[0.094]*	*[0.093]*	*[0.095]*	*[0.095]*
system	–0.0329	–0.0307	–0.0341	–0.0363	–0.0387	–0.0354
	[0.033]	*[0.033]*	*[0.033]*	*[0.033]*	*[0.032]*	*[0.033]*
govfrac	0.054	0.0578	0.0471	0.0574	0.0647	0.0586
	[0.093]	*[0.092]*	*[0.092]*	*[0.092]*	*[0.092]*	*[0.093]*
polity2	0.0263**	0.0268**	0.0259**	0.0266**	0.0258**	0.0260**
	[0.012]	*[0.012]*	*[0.012]*	*[0.012]*	*[0.012]*	*[0.012]*
durable	–0.0015	–0.0013	–0.0015	–0.0015	–0.0015	–0.0014
	[0.001]	*[0.001]*	*[0.001]*	*[0.001]*	*[0.001]*	*[0.001]*
polcomp	–0.0417*	–0.0420*	–0.0406*	–0.0422*	–0.041	–0.0408
	[0.024]	*[0.024]*	*[0.024]*	*[0.024]*	*[0.025]*	*[0.025]*
yrsoffc	–0.0045	–0.0046	–0.0045	–0.0046	–0.0049	–0.0044
	[0.003]	*[0.003]*	*[0.003]*	*[0.003]*	*[0.003]*	*[0.003]*
maj	–0.2106	–0.2037	–0.2147	–0.192	–0.2106	–0.212
	[0.135]	*[0.135]*	*[0.135]*	*[0.135]*	*[0.136]*	*[0.135]*
party_coal	–0.0372	–0.038	–0.0388	–0.0323	–0.0353	–0.0402
	[0.026]	*[0.026]*	*[0.026]*	*[0.026]*	*[0.027]*	*[0.027]*

GDP growth rate	–2.9705*** *[1.013]*	–3.0033*** *[1.023]*	–2.9479*** *[1.016]*	–2.8123*** *[1.018]*	–2.9253*** *[1.027]*	–3.0201*** *[1.041]*
Inflation	0.0306*** *[0.010]*	0.0309*** *[0.010]*	0.0306*** *[0.010]*	0.0289*** *[0.010]*	0.0299*** *[0.010]*	0.0310*** *[0.010]*
real interest rate	0.0000 *[0.000]*	0.0000 *[0.000]*	0.0000 *[0.000]*	0.0000 *[0.000]*	0.0000 *[0.000]*	0.0000 *[0.000]*
inequality	–0.0008 *[0.004]*	–0.0003 *[0.004]*	–0.0006 *[0.004]*	–0.0014 *[0.004]*	–0.0015 *[0.004]*	–0.0009 *[0.004]*
inequality x fiscal stimuli	–0.0013 *[0.001]*					
inequality x increasingly expansionary fiscal stimuli		–0.0042*** *[0.001]*				
inequality x expansionary fiscal stimuli			–0.0024* *[0.001]*			
inequality x contractionary fiscal stimuli				0.0096		
inequality x successful fiscal stimuli					0.0006 *[0.002]*	
Inequality x unsuccessful fiscal stimuli						–0.002 *[0.001]*
constant	0.8169*** *[0.253]*	0.7867*** *[0.256]*	0.8145*** *[0.253]*	0.8015*** *[0.251]*	0.8207*** *[0.253]*	0.8210*** *[0.253]*
Observations	493	493	493	493	485	487
R–squared	0.137	0.144	0.141	0.138	0.134	0.138
Hansen Statistic	5.808	5.707	5.826	5.73	5.715	5.476
p–value	0.121	0.127	0.12	0.126	0.126	0.14

Note: Robust standard errors in brackets. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

5.2 Evidence from an Ordered Probit Model

As a final robustness exercise, we estimate an ordered probit model, which assesses the institutional and economic determinants of the probability of political instability and evaluates the impact of inequality and fiscal stimuli on the likelihood of government crises.

Table 10 provides evidence of the relationship between political instability and inequality. The results are in line with our baseline model estimated using an IV approach. Indeed, they suggest that variables providing detailed information about the legislature, such as the existence of a majority of seats in the parliament by the incumbent government (*maj*) as well as whether it consists of a coalition or not (*party_coal*), strongly reduce the probability of occurrence of government crises. Similarly, the regime durability (*durable*) and the level of political competition (*polcomp*) both have a negative effect on the likelihood of political instability. In contrast, the level of government fractionalization (*govfrac*) and the political regime (*polity2*) increase the probability of occurrence of government crises, while the number of years in office of the chief executive (*yrsoffc*) warrants a more stable government (albeit only weakly from a statistical point of view).

In what concerns the group of economic determinants, our results show that economic growth increases the likelihood of a stable legislature. The importance of the economic environment is, therefore, clear and robust. In fact, Alesina *et al.* (1996) have also found, for a large heterogeneous sample, a higher propensity for government collapses in countries characterized by lower growth. Moreover, this different specification confirms that high inflation erodes the likelihood of a stable legislature and contributes to an increase in the probability of government crises. Inflation always creates an environment of instability at the economic, social and political levels.

With regard to inequality, the empirical findings do not corroborate the existence of a significant impact on the likelihood of government crises, despite the fact that the coefficient estimate has the expected positive sign. However, we uncover a nonlinear effect of inequality on the probability of the occurrence of government crises in that the magnitude of the income gap matters for political instability. When inequality is above average, the likelihood of political instability almost doubles relatively to the case in which it is below average. Therefore, political parties must pay attention to the distribution of income, otherwise they might end up trapped in an unstable social and political setup.

In Table 11, we include the different fiscal stimuli episodes in the group of regressors. Such type of programs and, in particular, expansionary fiscal stimuli strongly reduce the prospects of government crises. A similar conclusion is reached when we interact inequality with fiscal stimuli programs, as can be seen in Table 12. Thus, the impact of the income gap on the occurrence of government crises is dampened during periods of fiscal stimuli. This may reflect the fact that incumbent governments tend to raise spending or cut taxes before elections in order to maximize the probability of re-election (Rogoff and Sibert, 1988; Persson and Tabellini, 2000). In this way, they can erode any underlying social tensions arising from worse income distribution and, consequently, lower the prospects of political instability.

6 Conclusion

In this paper, we use data for a panel of developed and developing countries to assess the impact of income inequality and fiscal stimuli on political instability.

Table 10

Political Instability – Ordered Probit Model

Government Crisis	**[1]**	**[2]**	**[3]**	**[4]**
military	0.0961 *[0.117]*	0.039 *[0.154]*	0.2489 *[0.196]*	0.2372 *[0.197]*
stabs	–0.0279 *[0.117]*	–0.1138 *[0.138]*	–0.3570* *[0.183]*	–0.3940** *[0.184]*
system	0.0461 *[0.039]*	0.0039 *[0.048]*	0.0588 *[0.072]*	–0.0058 *[0.074]*
govfrac	0.2652** *[0.121]*	0.3312** *[0.148]*	0.1942 *[0.192]*	0.315 *[0.197]*
polity2	0.0857*** *[0.021]*	0.0729*** *[0.024]*	0.1026*** *[0.035]*	0.1114*** *[0.036]*
durable	–0.0048*** *[0.001]*	–0.0037*** *[0.001]*	–0.0047*** *[0.002]*	–0.0055*** *[0.002]*
polcomp	–0.0907** *[0.036]*	–0.0800* *[0.041]*	–0.1237* *[0.064]*	–0.1400** *[0.066]*
yrsoffc	–0.014 *[0.009]*	–0.0229** *[0.010]*	–0.0195 *[0.013]*	–0.0201 *[0.013]*
maj	–0.7961*** *[0.199]*	–0.6213*** *[0.231]*	–0.2869 *[0.319]*	–0.4234 *[0.334]*
party_coal	–0.1055** *[0.047]*	–0.0336 *[0.062]*	–0.1858** *[0.081]*	–0.2082** *[0.082]*
GDP growth rate		–4.7104*** *[0.926]*	–7.0495*** *[1.411]*	–7.2997*** *[1.440]*
inflation rate		0.0491*** *[0.009]*	0.0725*** *[0.014]*	0.0753*** *[0.014]*
real interest rate		0.0000 *[0.000]*	0.0000 *[0.000]*	0.0000 *[0.000]*
inequality			0.011 *[0.007]*	
(inequality > average)				0.0491*** *[0.014]*
(inequality < average)				0.0290*** *[0.009]*
threshold 1	0.0782 *[0.260]*	0.2456 *[0.306]*	0.2116 *[0.594]*	0.921 *[0.625]*
threshold 2	0.9558*** *[0.261]*	1.1501*** *[0.309]*	1.0962* *[0.601]*	1.8182*** *[0.632]*
threshold 3	1.6334*** *[0.277]*	1.9940*** *[0.337]*	2.0061*** *[0.608]*	2.7302*** *[0.646]*
threshold 4	1.9386*** *[0.304]*	2.3781*** *[0.369]*	2.3653*** *[0.620]*	3.0881*** *[0.642]*
Observations	2690	1922	1079	3.3254***

Note: Robust standard errors in brackets. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 11

Political Instability and Fiscal Stimuli – Ordered Probit Model

Government Crisis	[1]	[2]	[3]	[4]	[5]	[6]
military	0.1218	0.1396	0.1306	0.1388	0.1223	0.1308
	[0.226]	*[0.226]*	*[0.226]*	*[0.228]*	*[0.226]*	*[0.227]*
stabs	–0.3864**	–0.3850*	–0.3868**	–0.3670*	–0.3785*	–0.3700*
	[0.196]	*[0.199]*	*[0.196]*	*[0.197]*	*[0.197]*	*[0.197]*
system	0.0853	0.078	0.0835	0.0755	0.0792	0.0823
	[0.080]	*[0.079]*	*[0.079]*	*[0.078]*	*[0.078]*	*[0.079]*
govfrac	0.033	0.0352	0.0247	0.0377	0.0456	0.0367
	[0.205]	*[0.204]*	*[0.204]*	*[0.205]*	*[0.205]*	*[0.204]*
polity2	0.0921**	0.0903**	0.0929**	0.0896**	0.0910**	0.0944**
	[0.038]	*[0.038]*	*[0.038]*	*[0.038]*	*[0.038]*	*[0.038]*
durable	–0.0044**	–0.0041**	–0.0044**	–0.0042**	–0.0043**	–0.0043**
	[0.002]	*[0.002]*	*[0.002]*	*[0.002]*	*[0.002]*	*[0.002]*
polcomp	–0.1038	–0.0993	–0.1032	–0.0987	–0.1033	–0.108
	[0.072]	*[0.071]*	*[0.072]*	*[0.071]*	*[0.072]*	*[0.073]*
yrsoffc	–0.0221	–0.0225	–0.0218	–0.0228	–0.0225	–0.0212
	[0.015]	*[0.015]*	*[0.015]*	*[0.015]*	*[0.015]*	*[0.015]*
maj	–0.2325	–0.2037	–0.2269	–0.1843	–0.1992	–0.2077
	[0.341]	*[0.337]*	*[0.341]*	*[0.338]*	*[0.338]*	*[0.340]*
party_coal	–0.2119**	–0.2054**	–0.2111**	–0.2023**	–0.1974**	–0.2058**
	[0.087]	*[0.088]*	*[0.087]*	*[0.088]*	*[0.089]*	*[0.088]*

GDP growth rate	–7.4400*** *[1.558]*	–7.1514*** *[1.513]*	–7.2552*** *[1.524]*	–6.9170*** *[1.508]*	–7.0966*** *[1.525]*	–7.2202*** *[1.533]*
inflation	0.0771*** *[0.015]*	0.0737*** *[0.015]*	0.0754*** *[0.015]*	0.0712*** *[0.015]*	0.0732*** *[0.015]*	0.0744*** *[0.015]*
real interest rate	0.0000 *[0.000]*	0.0000 *[0.000]*	0.0000 *[0.000]*	0.0000 *[0.000]*	0.0000 *[0.000]*	0.0000 *[0.000]*
inequality	0.0169** *[0.008]*	0.0164** *[0.008]*	0.0167** *[0.008]*	0.0155** *[0.008]*	0.0164** *[0.008]*	0.0158** *[0.008]*
fiscal stimuli	–0.2217* *[0.127]*					
increasingly expansionary fiscal stimuli		–0.2222 *[0.204]*				
expansionary fiscal stimuli			–0.2338* *[0.133]*			
contractionary fiscal stimuli				0.5772 *[0.728]*		
successful fiscal stimuli					–0.1791 *[0.188]*	
unsuccessful fiscal stimuli						–0.1724 *[0.137]*
threshold 1	0.4178 *[0.657]*	0.4936 *[0.654]*	0.432 *[0.657]*	0.4979 *[0.655]*	0.4876 *[0.653]*	0.4128 *[0.654]*
threshold 2	1.2980* *[0.664]*	1.3711** *[0.661]*	1.3130** *[0.664]*	1.3757** *[0.662]*	1.3649** *[0.660]*	1.2913* *[0.661]*
threshold 3	2.1816*** *[0.674]*	2.2606*** *[0.671]*	2.2008*** *[0.675]*	2.2634*** *[0.674]*	2.2501*** *[0.670]*	2.1744*** *[0.671]*
threshold 4	2.5407*** *[0.678]*	2.6269*** *[0.677]*	2.5601*** *[0.679]*	2.6251*** *[0.678]*	2.6088*** *[0.676]*	2.5384*** *[0.678]*
threshold 5	2.7732*** *[0.727]*	2.8598*** *[0.728]*	2.7911*** *[0.726]*	2.8562*** *[0.726]*	2.8380*** *[0.721]*	2.7730*** *[0.728]*
Observations	959	959	959	959	951	953

Note: Robust standard errors in brackets. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 12

Political Instability and Interaction Between Inequality and Fiscal Stimuli
Ordered Probit Model

Government Crisis	[1]	[2]	[3]	[4]	[5]	[6]
military	0.1176	0.1405	0.1257	0.1386	0.1254	0.1281
	[0.225]	*[0.225]*	*[0.225]*	*[0.228]*	*[0.226]*	*[0.226]*
stabs	–0.3826*	–0.3894*	–0.3826*	–0.3676*	–0.3758*	–0.3639*
	[0.197]	*[0.199]*	*[0.197]*	*[0.197]*	*[0.197]*	*[0.198]*
system	0.0867	0.0804	0.086	0.0753	0.0783	0.0843
	[0.080]	*[0.079]*	*[0.079]*	*[0.078]*	*[0.078]*	*[0.080]*
govfrac	0.0401	0.0353	0.0298	0.0392	0.0461	0.0409
	[0.205]	*[0.204]*	*[0.204]*	*[0.205]*	*[0.205]*	*[0.204]*
polity2	0.0918**	0.0901**	0.0931**	0.0896**	0.0911**	0.0949**
	[0.038]	*[0.038]*	*[0.038]*	*[0.038]*	*[0.038]*	*[0.038]*
durable	–0.0043**	–0.0041**	–0.0043**	–0.0042**	–0.0043**	–0.0043**
	[0.002]	*[0.002]*	*[0.002]*	*[0.002]*	*[0.002]*	*[0.002]*
polcomp	–0.1032	–0.0987	–0.1034	–0.0986	–0.1032	–0.1088
	[0.072]	*[0.071]*	*[0.072]*	*[0.071]*	*[0.072]*	*[0.073]*
yrsoffc	–0.0218	–0.0223	–0.0214	–0.0228	–0.0223	–0.0208
	[0.015]	*[0.015]*	*[0.014]*	*[0.015]*	*[0.015]*	*[0.015]*
maj	–0.2398	–0.2071	–0.2369	–0.1865	–0.1962	–0.2155
	[0.340]	*[0.337]*	*[0.340]*	*[0.338]*	*[0.338]*	*[0.340]*
party_coal	–0.2130**	–0.2080**	–0.2133**	–0.2024**	–0.1980**	–0.2066**
	[0.087]	*[0.088]*	*[0.087]*	*[0.088]*	*[0.089]*	*[0.088]*

GDP growth rate	–7.4083*** *[1.553]*	–7.1908*** *[1.509]*	–7.2275*** *[1.522]*	–6.9318*** *[1.507]*	–7.0538*** *[1.520]*	–7.2242*** *[1.529]*
inflation	0.0769*** *[0.015]*	0.0743*** *[0.015]*	0.0753*** *[0.015]*	0.0713*** *[0.015]*	0.0727*** *[0.015]*	0.0745*** *[0.015]*
real interest rate	0.000 *[0.000]*	0.000 *[0.000]*	0.000 *[0.000]*	0.000 *[0.000]*	0.000 *[0.000]*	0.000 *[0.000]*
inequality	0.0182** *[0.008]*	0.0171** *[0.008]*	0.0181** *[0.008]*	0.0156** *[0.008]*	0.0162** *[0.008]*	0.0167** *[0.008]*
inequality x fiscal stimuli	–0.0054* *[0.003]*					
inequality x increasingly expansionary fiscal stimuli		–0.0082* *[0.005]*				
inequality x expansionary fiscal stimuli			–0.0063* *[0.003]*			
inequality x contractionary fiscal stimuli				0.0106 *[0.016]*		
inequality x successful fiscal stimuli					–0.0026 *[0.004]*	
inequality x unsuccessful fiscal stimuli						–0.0048 *[0.003]*
threshold 1	0.4723 *[0.654]*	0.515 *[0.654]*	0.483 *[0.655]*	0.4965 *[0.655]*	0.4886 *[0.653]*	0.4437 *[0.652]*
threshold 2	1.3524** *[0.662]*	1.3939** *[0.662]*	1.3647** *[0.662]*	1.3740** *[0.662]*	1.3653** *[0.659]*	1.3226** *[0.659]*
threshold 3	2.2345*** *[0.672]*	2.2862*** *[0.672]*	2.2520*** *[0.674]*	2.2611*** *[0.674]*	2.2501*** *[0.670]*	2.2046*** *[0.670]*
threshold 4	2.5919*** *[0.676]*	2.6536*** *[0.678]*	2.6091*** *[0.678]*	2.6231*** *[0.678]*	2.6101*** *[0.676]*	2.5680*** *[0.675]*
threshold 5	2.8237*** *[0.723]*	2.8867*** *[0.729]*	2.8389*** *[0.723]*	2.8544*** *[0.726]*	2.8400*** *[0.721]*	2.8028*** *[0.726]*
Observations		959	959	959	951	953

Note: Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

We find that government crises are more frequent when inequality increases. This result is particularly important for OECD countries, where a widening of the income gap leads to less stable legislatures. Considering that economic agents are sensitive to changes in the income gap, they will react more actively when they feel penalized, which in turn fuels social and political instability. This is an aspect to which political authorities should pay attention to and address by implementing measures aimed at promoting a fair distribution of income and wealth. In fact, our results show that expansionary and increasingly expansionary fiscal stimuli can help improving the stability of the political system. As they tend to promote a more equitative distribution of income and it is easier to reach a consensus for their implementation, they contribute to a more stable environment. Moreover, the implementation of fiscal stimuli is likely to abate the impact of inequality on political instability, especially, when fiscal stimuli are effective at inducing growth.

Finally, we find that the existence of a majority of seats or a coalition government, the regime durability, the level of political competition and the number of years in office of the chief executive reduce political instability, while the level of government fractionalization and the political regime has a positive effect on the occurrence of government crises. These results confirm that the political setup (the composition of the political spectrum, the level of competition among parties, their structure, …) play an important role in promoting political stability. Therefore, the more solid the underlying political institutions is, the more stable the political environment will be.

In addition, and from a macroeconomic point of view, economic growth and low inflation seem to be key determinants for political stability. This is another important result that arises from our study and consolidates the idea that fiscal and monetary authorities must act to promote a stable economic framework: fiscal authorities should take special care in designing growth promoting packages, such like expansionary fiscal stimuli programs; while monetary authorities must play their role in stabilizing inflation. If these roles are successfully accomplished, the necessary conditions for a stable economic, social and political environment are observed and the economy can thrive therein.

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COMMENT TO "THE IMPACT OF INCOME INEQUALITY AND FISCAL STIMULI ON POLITICAL (IN)STABILITY" BY LUCA AGNELLO, VÍTOR CASTRO, JOÃO TOVAR JALLES AND RICARDO SOUSA

Martin Larch[*]

In the past several years the distribution of income and income inequality have experienced a remarkable comeback in macroeconomics. Largely ignored before, the post-2007 financial and economic crisis has made the economic profession more sensitive to a trend that actually had been going on for years, if not decades. More and more questions are being raised about the macroeconomic and political impact of inequality as in some advanced economies indicators of income distribution returned to levels observed at the beginning of the 20th century.

The paper by Agnello, Castro, Tovar Jalles and Sousa is part of this new wave of interest. It sets out to explore the empirical nexus between income inequality and political (in)stability. The underlying, and a priori perfectly sound assumption is that unequal societies are more prone to political instability and that fiscal expansions can quell political discontent. The results of the empirical analysis carried out by authors – a panel regressions covering 128 OECD and non-OECD countries – broadly confirm these priors. In fact, all of their findings look very sensible from a macro perspective and seem to confirm popular priors as well as existing findings in the literature. I do not review them in detail here. The presentation in the paper is very clear and comprehensive.

There is only one specific finding, which in my view stands out (at least in the version of the paper that I had the pleasure to review for the 2015 edition of the Banca d'Italia workshop on public finances) and which I personally find rather delicate. Notably, too much democracy is reported to be bad for political stability, especially in non-OECD countries. While I am not a political scientist and hence may not be familiar with the relevant literature, I find such statements too sweeping especially when based on results from reduced form regressions. The sign and statistical significance of a coefficient in a panel regression do probably not represent ultimate and compelling pieces of evidence to conclude on the role of democracy for political stability. Are we sure of the causality? Are the proxies for democracy really robust? Do we really understand how the alleged transmission between democracy and political (in)stability works? These are only some of the question that came to my mind when I stumbled across this particular finding and which, after all, is not crucial to the main focus of the paper and could possibly be toned down.

At the same time, by taking issue with the paper's conclusion on democracy I implicitly open up to a more general difficulty of empirical papers that address very weighty macro questions via reduced-form relationships. The number of possible interactions is large, the direction of causality very complex and the existing empirical literature correspondingly rich. Figure 1 tries to illustrate in a very simplistic manner the space of macro factors at play.

The parts in colour highlight the specific angle taken by the authors whereby political instability is expected to be influenced by income inequality and fiscal policy making while at the same time controlling for the possible role played by the macroeconomic situation and a number of institutional features. Of course, as becomes clear from the illustration, there are many other possible angles from which one can look at the space of macro relations. In fact, the literature

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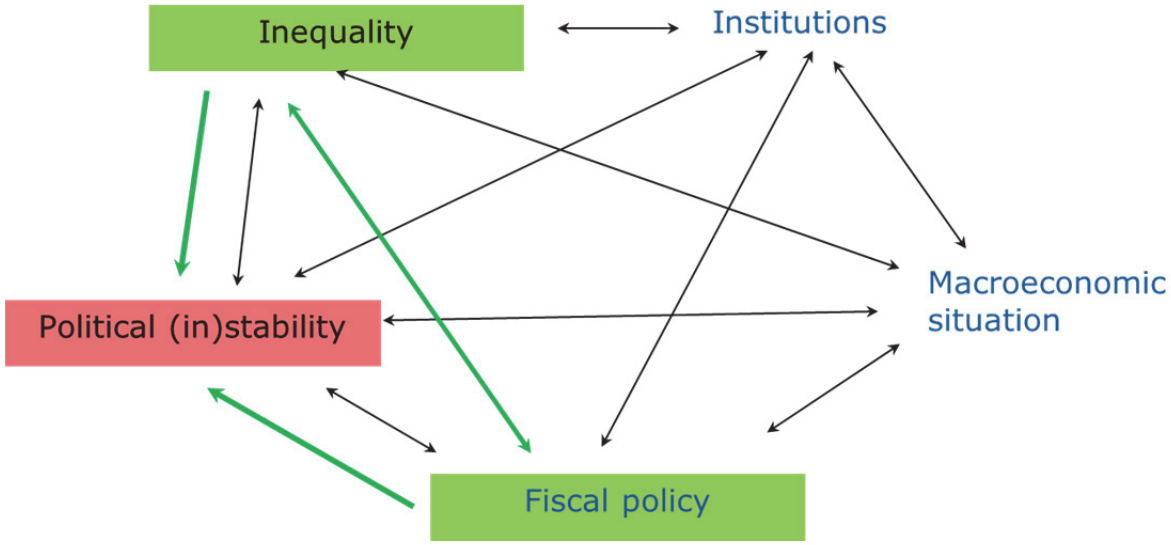
Figure 1

Macro Factors at Play in the Inequality Arena



review included in the paper is very extensive covering almost all possible combinations such as the impact of institutions on macroeconomic performance or political stability, the impact of fiscal policy on economic performance, the link between institutions and fiscal performance to mention a few.

I am not making this point to put into question the paper by Angello *et al.* In particular, I am not trying to argue that the empirical strategy chosen by Angello et al. is inappropriate, inadequate or not granular enough. There are far too many papers in the empirical literature following the same or a similar path, including one of my own papers.[1] In fact, the econometrics used in the paper is fairly solid.

What is lacking for my taste is a more detailed description or a theory of how the postulated nexus is expected to operate. As indicated earlier, the presumption that income inequality may nurture political instability is intuitive. However, the microeconomics of the link is not spelled out and not that obvious. Since the space of possible linkages is so complex and allows for many different narratives it would be very useful to refer to relevant political economy models. Without such a theoretical reference or compass that would help navigate the data many questions concerning the results spring to mind and remain unanswered.

Firstly, and going beyond the apparent intuition behind the presumption of the paper, the political science literature known to me does not establish unconditional links between income distribution and political (in)stability. To be more concrete, political instability is rarely driven by the 'bottom 5 or 10%' of society. Most of the times political discontent, which eventually translates into instability, originates in fears of the politically more involved middle or upper middle class. Keeping this in mind, how would changes at the upper or lower end of the income distribution

[1] Larch, M. (2012), Fiscal Performance and Income Inequality: Are Unequal Societies More Deficit-Prone?, *Kyklos*, No. 65, pp. 53-80. doi: 10.1111/j.1467-6435.2011.00527. The paper looks at whether income inequality has a direct and indirect effect (via political instability) effect on fiscal policy. The findings are consistent with those of Angelo *et al.* in the sense that I find a significant link between inequality and fiscal performance. The crucial difference is that I postulate a different causality.

effectively translate into political (in)stability? Can we assume a linear relationship, or are we more likely to deal with non-linear relationships where thresholds may play an important role?

Also, since the early 1980s income distribution has become increasingly more unequal in OECD countries, in some cases reaching all-time highs. Has political instability increased? On the face of it, no. What are then the other factors at play? Better political institutions? While I am quite sure there is no single theoretical framework capable of providing an answer to all these questions, finding and describing relevant models would further improve an already interesting paper.

Another key aspect of the paper that deserves a moment of reflection is the assumed link between income inequality and fiscal expansion. Again, the intuition underlying the paper is straightforward: To the extent that fiscal policy can influence the distribution of income, specific fiscal episodes should help mitigate political instability. In practical terms, and assuming that fiscal consolidation is detrimental for income distribution, Agnello *et al.* proxy the relevant fiscal policy episodes with indicators of fiscal stimuli where the indicator looks at a given change in the cyclically-adjusted primary budget balance.

As before, this approach looks perfectly reasonable from a certain distance but triggers a number of important questions. For instance, is a fiscal stimulus necessarily beneficial for the distribution of income? Is fiscal consolidation always detrimental? One can easily think of tax cuts that favour individuals with above median income. While I am not an expert of recent or less recent tax reforms that lead to a reduction in the tax burden, I am sure there are quite a few reforms that increased the inequality of income rather than reducing it. By the same token, it is not at all obvious that fiscal consolidation will always increase the gap between the rich and the less well off. A recent and quite prominent example is the EU-IMF financial assistance programme for Ireland which encompassed a very significant fiscal retrenchment. However, the expenditure cuts and tax increases were implemented in such a way as to minimise their social impact. A quick look at relevant data shows that the consolidation episode was successful in two ways. It brought public finances back to a sustainable path while keeping indicators of the distribution of disposable income, that is, after taxes and transfers, essentially unchanged throughout the adjustment period.

To use fiscal stimuli as proxy was most likely dictated by the availability of relevant indicators. As far as I am aware, there are no datasets providing cross-country comparable indicators measuring the distributional impact of fiscal policy measures. However, even leaving aside the issue of data availability the question of how fiscal policy actually affects income distribution remains. Does the effect work directly and predominantly through taxes and transfers or rather indirectly through the effect on aggregate demand and unemployment? The paper could provide some more insights in this regard. Unemployment is one of the most incisive events that lead to a loss of personal income. Hence, the rate of unemployment would be a natural candidate to be added to the list or variables controlling for economic conditions in the panel regressions. Apart from affecting the distribution of income, unemployment is arguably also a factor that should directly impact on people's sentiment *vis-à-vis* government even if social protection is effective. I may be wrong, but my prior is that once the rate of unemployment is included, inequality may lose some of its statistical significance. This would not invalidate or undermine the findings of the paper. It may clarify the actual channel through which fiscal policy and inequality affect the political stability of a country.

WEALTH DISTRIBUTION AND TAXATION IN EU MEMBERS

Anna Iara[*]

After a short overview of the distribution of private wealth and asset-based taxation in EU Members, this paper provides a range of economic arguments to make the case for asset-based taxation. Thereafter, aspects of design and implementation of specific asset-based taxes, notably housing, net wealth, and gifts and inheritances, are discussed from a distributional perspective. Finally, the possible role of the EU level of policy making in the adoption of such tax instruments is addressed.

1 Introduction

Calls for the taxation of wealth have become more vocal recently, underpinned by different objectives. The possibility to raise Treasury revenue from wealth has received increased interest in light of the struggle of EMU Members with high public debt. The IMF (2013) established for 15 euro area countries that that a net wealth levy of about 10 per cent could reduce public debt to the levels of 2007, but highlighted the experience of limited success due to implementation delays. In the same vein, the Bundesbank (2014) contemplated a wealth levy as a pre-condition to foreign public debt relief to affected countries. Wealth taxes are also increasingly seen as an instrument to foster equity. This view has received prominent support by Piketty's (2014) historical analysis of wealth distributions in industrialized countries. The argument goes that wealth tends to concentrate due to higher returns to capital than growth, which is particularly acute in ageing societies. A tax on wealth is expected to counteract both widening wealth inequality within populations and its transmission to next generations. Finally, more tax revenue from specific assets, residential property, is seen to improve the growth-friendliness of taxation systems. Recurrent taxes on land and residential buildings have received support by the OECD (2010)'s analysis on taxation and growth, based on the assertion that such taxes affect labour supply, investment, human capital investment, and innovation decisions to a lesser degree than other taxes, and are more difficult to evade.

The renewed interest in wealth taxation has also been echoed by analysis and public debate within EU Members, typically driven by concerns about equity. In Austria, in late 2013, a broad platform of economists and social scientist launched a call to re-introduce a tax on gifts and inheritances that was abolished in 2008.[1] In Germany, the taxation of wealth has been put on hold since 1997 but its reactivation has been picked up by public debate lately (Bräuninger, 2012); besides, an investigation by the Constitutional Court is ongoing on the privileges to private assets offered by the gift and inheritance taxation rules applied to business assets. In Spain, a net wealth tax had been effectively abolished in 2008 but re-introduced in 2011. In the UK, the debate has been ongoing, with analytical contributions made e.g., by IPPR, one of the country's leading think-tanks, extending micro-simulation over household assets. In France, a "solidarity tax on wealth" has been levied since 1982. After a reduction in the overall burden in 2012, most recently again higher rates of up 1.5 per cent on assets over EUR 10 mn are being applied. In Belgium, public

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[*] European Commission, Secretariat-General. Email: anna.iara@ec.europa.eu. Disclaimer: Most of this paper was written while the author was staff member of the European Commission's Directorate-General for Taxation and Customs Union. The views expressed in the paper are the author's alone and do not necessarily correspond to those of the European Commission and its Services. Comments by Cécile Denis, Kees Heineken, Thomas Hemmelgarn, Gaëtan Nicodème, Alvaro Pina, and participants of the 17th Banca d'Italia Workshop on Public Finance in Perugia, 9-11 April 2015, are gratefully acknowledged. Errors and omissions remain those of the author.

[1] See the website www.erbschaften-besteuern.at

debate on the possibility to tax wealth to the benefit of decreasing the high tax burdens on labour has also become more vocal recently. On the other hand, in Italy, hostility against wealth taxes – in particular against those on residential property, that had been introduced in 2011 but abolished for non-luxury dwellings later – is wide-spread and appears consistent with high and broadly spread levels of net household wealth against the highly indebted state.

This paper contributes to the dissemination of information for policy choices considering taxes on wealth in EU Members. In the EU policy framework so far, the recurrent taxation of immovably property in particular has been in the focus of the tax policy recommendations for the EU Members, backed by the growth-friendliness of this instrument. However, a comprehensive assessment of different approaches to the taxation of assets with regard to different objectives has not yet been undertaken. This paper intends to fill this gap by discussing the rationale, design choices, and scope of action at the EU level with regard to asset based taxation. We first describe household wealth distributions in euro area Member States derived from the Eurosystem Household Finance and Consumption Survey, and provide a sketch of wealth taxation in EU Members applied at present (Section 3). Next we review basic arguments for and against the taxation of wealth (Section 3). Thereafter we discuss specific design aspects, relating to the choice of the base, and the timing resp. frequency of levies, as well as some implementation challenges (Section 4). Finally we explain what role could possibly be assumed by policy making at the EU level (Section 5).

2 The distribution and taxation of wealth in EU Members

2.1 The distribution of wealth in euro area Members

The Eurosystem Household Finance and Consumption Survey (HFCS) provides comparative information on the distribution and composition of household wealth in more than half of the EU Members as of 2010. The HFCS survey was conducted in 2010 and the data were released in spring 2013. For all members of the euro area as of 2010 but Ireland and Estonia, it contains ex ante harmonized information on real and financial assets, liabilities, and expenses of private households. The country samples are established on the grounds of complex survey design, aiming at allowing for statistical inference that is representative of the population. Among others, item non-response is dealt with by multiple imputation.[2] In spite of the ambitious survey design and the explicit oversampling of the wealthy by some but not all participating countries (Eurosystem Household Finance and Consumption Network, 2013), the caveat holds that the top tail of the wealth distribution is heavily under-estimated, as suggested by comparison with rich lists compiled by journalists (Vermeulen, 2014). Therefore, conclusions on the wealthiest fractions of the households should be understood as based on lower bound estimates of their wealth.

Descriptive analysis derived from the Eurosystem HFCS[3] shows the following (see also the tables in the Annex).

- **Net household wealth is relatively highly concentrated across households in EU Members, but considerable country differences exist (Fig. 1; Table A2 in the Annex).** By the share of the net wealth holdings of the top decile of households in the net wealth distribution, net wealth

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[2] This technique helps preserve observations on which responses on some items are missing. The missing values are predicted by a regression including a residual to reflect uncertainty. With multiple imputation, several imputed values are created from different random draws for each missing variable. This procedure allows preserve the characteristics of the distribution of the variables and consider uncertainty. For a detailed description, see Eurosystem Household Finance and Consumption Network (2013), pp. 46ff.

[3] The reported results have been obtained using the multiple imputation structure of the data and the estimation weights provided by the data providers.

Table 1

Correlation Between Gross Income, Gross Wealth and Net Wealth of Households in 15 Euro Area Countries

Country	Gross Income		Gross Wealth
	Gross Wealth	Net Wealth	Net Wealth
Austria	0.28	0.27	1.00
Belgium	0.19	0.18	0.99
Cyprus	0.44	0.42	1.00
Germany	0.39	0.36	0.99
Greece	0.44	0.42	0.99
Spain	0.26	0.25	1.00
Finland	0.65	0.59	0.98
France	0.46	0.44	1.00
Italy	0.49	0.48	1.00
Luxembourg	0.48	0.47	1.00
Malta	0.19	0.19	1.00
Netherlands	0.33	0.25	0.88
Portugal	0.49	0.48	1.00
Slovenia	0.39	0.38	1.00
Slovakia	0.29	0.28	0.99

Source: HFCS, own calculations.

is most concentrated in Austria, Germany, and Cyprus, where the wealthiest households hold about 57-61 per cent of total net household wealth. Countries with comparatively little concentration of net household wealth are the Slovak Republic, Slovenia, Greece, and the Netherlands, where the top decile of households holds about 33-40 per cent of net household wealth. For Belgium, Italy, Finland, Malta, France, Luxembourg, and Portugal, the top decile's share is between 44 and 53 per cent of total net wealth.

- **Across households, gross and net wealth is highly correlated, but wealth and income is less so (Table 1).** Lower correlations among gross and net wealth are characteristic of the Netherlands, reflecting the effect of mortgage debt. Highest correlations among gross income of wealth (net or gross) can be seen in Finland (with correlation coefficients around 0.6); these correlations are more moderate in Italy, Luxembourg, Portugal, France, Cyprus, and Greece (correlation coefficients around 0.45), and relatively low in Austria, Slovakia, Belgium, and Malta (correlation coefficients below 0.3). By decile of net wealth, in most of the countries considered, households' gross income is below or around average up to the 7th decile; gross incomes are somewhat higher in the first decile where low net wealth might reflect high stocks of debt than in the second. Average incomes moderately increase in the eighth and ninth decile

up to 115 to 160 per cent of the average (in the Netherlands and Slovenia respectively), and are about 130 to 225 per cent of the average in the tenth decile (in the Netherlands and Portugal and France, respectively). Information on post-tax household income is unavailable from the HFCS dataset but tax-benefit systems can be expected to attenuate differences of household income across net wealth deciles. As a second caveat, as suggested by a growing literature, top incomes are likely to be underestimated.

- **Net wealth constituted by the household main residence (HMR) net of outstanding HMR mortgages is less concentrated across households than overall net wealth.** The top net wealth decile of households possesses 22 to 42 per cent of overall household wealth constituted by the household residence net of mortgages. Particularly high shares of the top decile are found in Austria and Germany, two countries with broad rental housing markets, but also in the Netherlands, which has high levels of households' mortgage debt with downward adjusting home values. Countries with a relatively low concentration of overall net wealth, where the top 10 per cent of households hold about a quarter of total net HMR wealth, are Belgium, Spain, Greece, Malta, and Slovenia (see Table 7 in the Appendix).
- **In nearly all countries considered, households in the fifth to ninth decile of net wealth hold relatively more HMR net wealth than net assets overall.** The comparison of the distribution of overall net wealth and net HMR wealth across households show that HMR wealth plays a considerably lesser role in the portfolio of households in the tenth decile in all countries but the Netherlands. Households in the first four net wealth deciles tend to hold relatively more overall net wealth then HMR net wealth, but the difference in the shares of these deciles' net HMR wealth and overall wealth in total household net wealth is relatively small, in most cases less than one percentage point (see Table 4).

2.2 Taxation of capital and wealth: main characteristics of EU Countries

Ernst and Young carried out for the European Commission a cross-country overview of taxes on wealth and transfers of wealth (ibid., 2014). The study provides information on taxes in place and on revenue raised from these taxes. Taxes on assets and their transfers are classified in three categories: inheritance and gift, real estate and land, and net wealth. On the prevalence of such taxes the following is found (see Figure 1).

- Inheritance is taxed in all EU Members except Sweden, Latvia, Estonia, the Czech Republic, Austria, Romania, Bulgaria, Cyprus, and Malta. Two further Members – the Czech Republic and Portugal – have a provision on inheritance taxation in other tax schedules. Although bases are normally broad and rates can be high, spouses and children are largely exempt. Typically, the tax is charged upon the beneficiaries (not donors) and is based on the fair market value of the assets. Inheritance taxes favor close relatives up to total exemption; they are progressive in 14 Members. Inheritance tax rates vary from complete exemption in the most favored group (e.g., in Greece, Luxembourg, Slovenia, Finland, and the UK) to up to 80 per cent for the most heavily taxed group (e.g., in Brussels and the Walloon region in Belgium). Family businesses enjoy exemptions up to 100 per cent (the Netherlands up to a ceiling, and Germany) in 12 EU Members applying a tax on inheritances; Bulgaria, Denmark, Croatia, Lithuania, Luxembourg, and Slovenia have no such exemption.
- In most countries the approach to inheritance and gift taxation is similar, except for Belgium (that applies a moderate registration duty on gifts, in comparison with the taxation of inheritances that is among the highest in the EU), and Latvia and Lithuania respectively (that have a provision for gifts in the personal income tax schedule). Exemptions of close relatives and differential rates depending on the relation between donor and done apply for gift taxes as well as.

Table 2

Average Gross Household Income Across Deciles of Net Household Wealt, 2010
(percent of the overall average in 15 euro area countries)

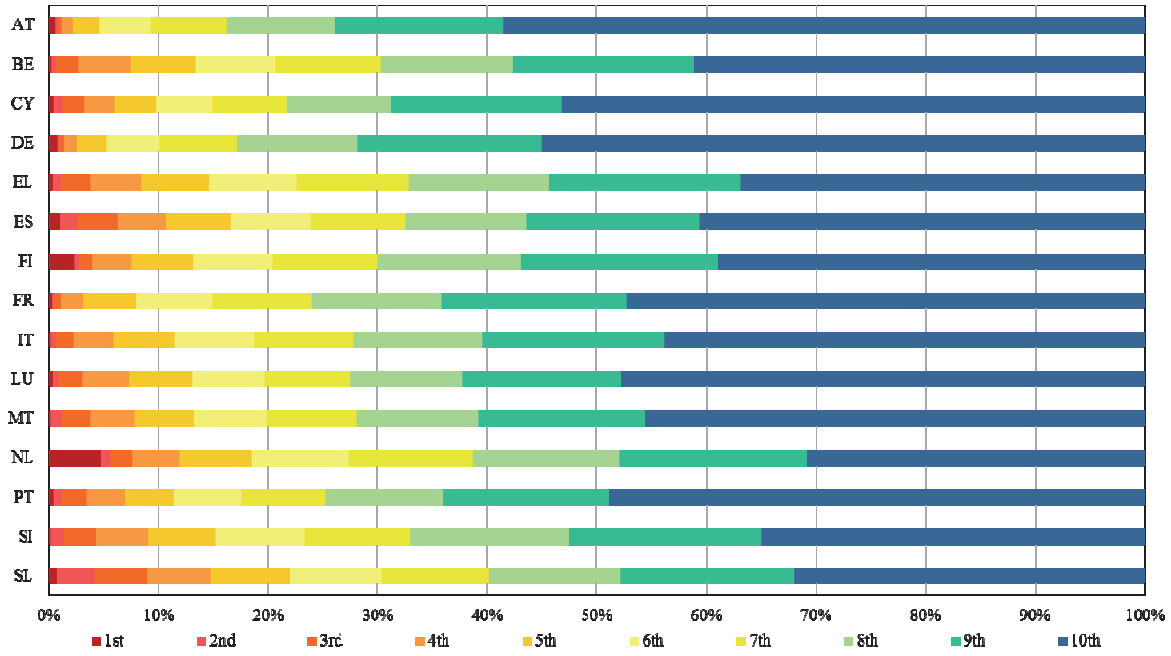
Country/decile	1	2	3	4	5	6	7	8	9	10
AT	0.55	0.54	0.64	0.83	0.87	0.90	1.06	1.14	1.43	2.04
BE	0.58	0.52	0.68	0.99	0.94	0.94	1.10	1.23	1.30	1.71
CY	0.49	0.60	0.59	0.72	0.87	1.05	1.01	1.18	1.33	2.16
DE	0.52	0.42	0.59	0.76	0.92	1.02	1.05	1.20	1.36	2.17
EL	0.56	0.80	0.78	0.72	0.80	0.91	1.05	1.18	1.37	1.83
ES	0.65	0.72	0.68	0.71	0.77	0.89	1.02	1.09	1.33	2.15
FI	0.86	0.48	0.64	0.87	0.85	0.88	1.00	1.17	1.26	1.99
FR	0.59	0.53	0.68	0.81	0.85	0.89	0.98	1.08	1.32	2.26
IT	0.45	0.62	0.81	0.75	0.82	0.86	1.00	1.14	1.42	2.13
LU	0.40	0.55	0.70	0.85	0.89	0.87	1.04	1.26	1.46	1.97
MT	0.58	0.78	0.77	0.82	0.93	0.99	1.05	1.30	1.13	1.63
NL	1.01	0.74	0.87	0.89	0.97	0.97	0.97	1.08	1.15	1.35
PT	0.53	0.70	0.72	0.70	0.77	0.88	0.96	1.08	1.41	2.25
SI	0.41	0.80	0.73	0.91	0.85	0.87	0.99	0.91	1.57	1.97
SK	0.65	0.84	0.83	0.86	1.11	0.98	0.92	1.06	1.17	1.57

Source: HFCS, own calculations.

- Taxes on real estate and land are in place in nearly all EU Members. All Member States except Slovenia and Malta tax the possession of real estate, while all but Slovenia, France, and Romania levy taxes on real estate transfers.
- Recurring taxes on net wealth are in use in about one third of the Member States: in seven cases, this involves vehicles and is mainly motivated by environmental policy concerns. In one case, Italy, there is a tax on bank accounts and financial assets with a genuine aim to tax wealth. General net-wealth taxes are in place in Spain and France, while the Netherlands has a provision practically providing for wealth taxation in its income tax regime.

Figure 1

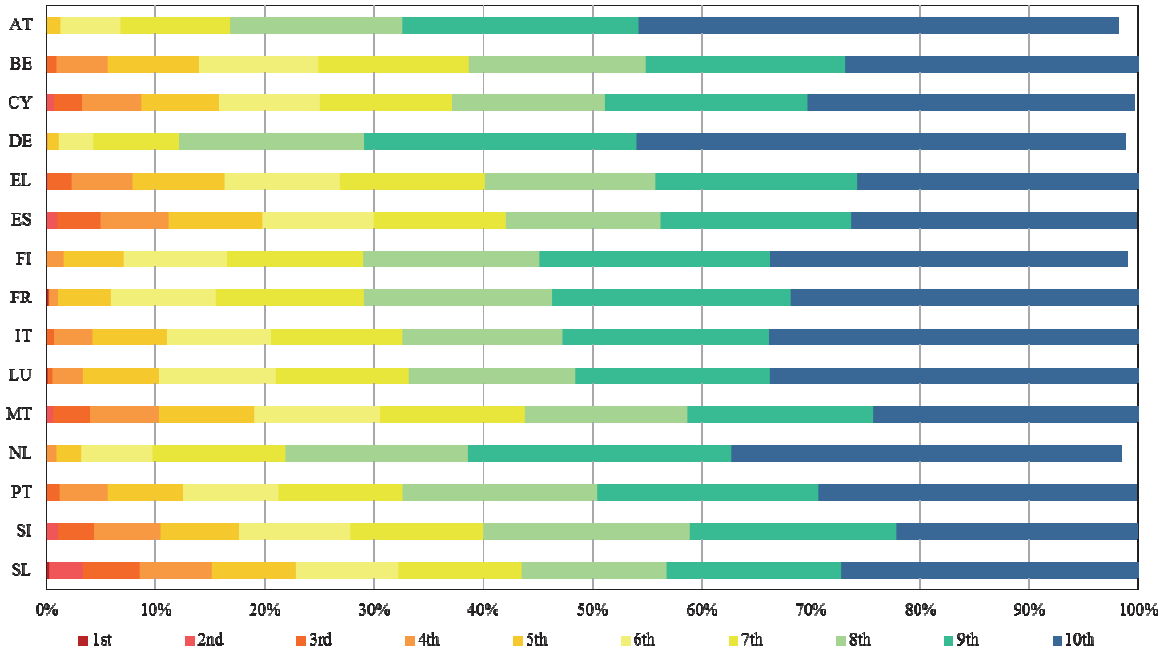
Distribution of Net Wealth of Households in 15 Euro Area Countries Across Deciles, 2010



Source: HFCS, own calculations.

Figure 2

Distribution of HMR Wealth Net of Outstanding HMR Mortgage of Households in 15 Euro Area Countries Across Deciles, 2010



Source: HFCS, own calculations.

Table 3

Overview of Taxes on Wealth and Transfers on Wealth in EU Members

Member State	Inheritance tax	Inheritance provision	Gift tax	Gift provision	Real estate possession tax	Real estate poss. provision	Real estate transfer tax	Real estate trans. provision	General net-wealth tax	General net-wealth provision	Specific net-wealth tax
BE	✓	×	×	✓	×	✓	×	✓	×	×	×
BG	✓	×	✓	×	✓	×	✓	×	×	×	✓
CZ	×	✓	×	✓	✓	×	✓	×	×	×	×
DK	✓	×	✓	✓	✓	×	×	✓	×	×	✓
DE	✓	×	✓	×	✓	×	✓	×	×	×	×
EE	×	×	×	×	✓	×	×	✓	×	×	✓
IE	✓	×	✓	×	✓	×	×	✓	×	×	×
EL	✓	×	✓	×	✓	×	✓	×	×	×	×
ES	✓	×	✓	×	✓	×	✓	×	✓	×	×
FR	✓	×	✓	×	✓	×	✓	×	✓	×	×
HR	✓	×	✓	×	✓	×	✓	×	×	×	✓
IT	✓	×	✓	×	✓	×	×	✓	×	×	✓
CY	×	×	×	×	✓	×	✓	×	×	×	×
LV	×	×	×	✓	✓	×	✓	×	×	×	×
LT	✓	×	×	✓	✓	×	×	×	×	×	×
LU	✓	×	✓	×	✓	×	✓	×	×	×	×
HU	✓	×	✓	×	✓	×	✓	×	×	×	×
MT	×	×	×	×	×	×	✓	×	×	×	✓
NL	✓	×	✓	×	✓	×	✓	×	×	✓	×
AT	×	×	×	×	✓	×	✓	×	×	×	×
PL	✓	×	✓	×	✓	×	✓	×	×	×	✓
PT	×	✓	×	✓	✓	×	✓	×	×	×	×
RO	×	×	×	×	✓	×	×	✓	×	×	×
SI	✓	×	✓	×	✓	×	×	×	×	×	✓
SK	×	×	×	×	✓	×	×	✓	×	×	×
FI	✓	×	✓	×	✓	×	✓	×	×	×	×
SE	×	×	×	×	✓	×	✓	×	×	×	×
UK	✓	×	✓	×	✓	×	✓	×	×	×	×

Source: Ernst and Young (2014), p. 5.

Table 4

Difference Between the Share of Overall and HMR Net Wealth of Households in 15 Euro Area Countries Across Deciles, 2010

Country/decile	1	2	3	4	5	6	7	8	9	10
AT	-1.55	-1.12	-0.47	-0.93	-1.13	1.02	3.34	6.43	6.82	-13.33
BE	-0.21	-0.33	-1.29	-0.12	2.51	3.52	4.32	4.17	1.66	-14.25
CY	-0.79	-0.19	0.69	2.61	3.46	4.08	5.45	4.62	3.05	-22.99
DE	-1.41	-0.71	-0.52	-1.04	-1.66	-1.59	0.79	6.36	8.58	-9.40
EL	-0.38	-0.66	-0.50	0.94	2.25	2.62	3.09	2.86	0.90	-11.11
ES	-1.11	-0.71	0.37	1.77	2.83	2.83	3.50	3.09	1.82	-14.38
FI	-3.42	-0.41	-1.10	-2.13	0.09	2.31	3.24	3.36	3.65	-5.58
FR	-0.15	-0.17	-0.55	-1.29	-0.04	2.72	4.51	5.42	4.98	-15.43
IT	-0.19	-0.42	-0.99	-0.14	1.20	2.38	2.92	2.89	2.30	-9.95
LU	-0.31	-0.47	-1.76	-1.43	1.17	4.09	4.37	5.08	3.24	-13.97
MT	-0.17	-0.44	0.71	2.32	3.43	4.74	5.04	3.85	1.84	-21.32
NL	-6.31	-0.97	-1.88	-3.48	-4.16	-2.12	1.19	3.87	7.76	6.08
PT	-0.62	-0.72	-1.11	0.97	2.37	2.62	3.76	7.16	5.18	-19.61
SI	-0.20	-0.30	0.38	1.42	1.05	2.12	2.47	4.49	1.34	-12.77
SL	-0.53	-0.34	0.32	0.78	0.56	1.10	1.45	1.25	0.19	-4.79

Source: HFCS, own calculations.

The contribution of wealth taxes to government revenue is limited in EU Members. Among the taxes on wealth, those levied on real estate and land have been the most important for generating revenue: in the countries applying such taxes, real estate transfers and possession taxes have been found to raise about 3 per cent of total revenue, i.e. about 0.85 per cent of GDP on average in 2012. Inheritance and gift taxes have brought about 0.27 per cent of GDP – 0.6 per cent of total revenue. Their limited revenue reflects the relatively low taxes when assets pass over to close relatives. Finally, taxes on the possession of net wealth have contributed about 0.5 per cent to total revenue (0.17 per cent of GDP) on average. This relatively low figure reflects the relatively narrow base: in the two countries applying such a tax, along with large tax free thresholds, business assets are fully exempt from the base.

3 New arguments in favour of asset based taxation

During the past two decades, the assessment of wealth related taxation was predominantly negative. A tax on wealth is ultimately a tax on capital income, potentially at a high rate relative to a flow-type base. Therefore the arguments for a lighter tax treatment of capital income also translate to capital stocks. In the optimal taxation framework, the distortionary effect of capital taxation was well entrenched since Atkinson and Stiglitz (1979), Chamley (1986), and Judd (1985).[4] From a policy perspective, the favorable tax treatment of capital income is seen to encourage investment, notably by enabling more projects with positive expected after-tax return. Furthermore, due to its higher mobility, taxes on capital income other than real estate are considered more distortive than on labour, hence justifying lighter burdens.

The negative assessment of wealth related taxation warrants reconsideration given new theoretical insight and economic and policy developments to date. A light approach to capital taxation is being questioned on the grounds of fuzzy distinctions between capital and labour income, a positive correlation between earnings opportunities and saving propensities, positive incentive effects on labour supply and human capital investment, the efficiency enhancing scope of lighter burdens on borrowing constrained households, and its aptitude as an instrument of redistribution above what could be achieved with labour income taxes alone (Diamond and Saez, 2011; ibid., 2012; Jacobs, 2013).[5] Recent theoretical work (Straub and Werning, 2014) goes even further, to refute the optimality of capital non-taxation in the long run within the logic of the modelling framework of Chamley (1986) and Judd (1995).

The terms of a consequentialist evaluation of wealth taxes – concerning avoidance and administrative costs – are also changing. From a practical point of view, evasion and difficulties of valuation have been considered key arguments against the taxation of wealth. Opportunities of avoidance and evasion reduce the capacity of wealth taxes to generate revenue, and they contribute to the perception that wealth taxes produce little net benefit. Because the better off are rather able to exploit avoidance opportunities, wealth taxes have also been seen to fail to deliver on equity. Opponents of wealth taxation quote that the recurrent re-valuation of infrequently traded assets, such as antiquities but also housing stock in areas with few market transactions, is impeded by the lack of information on market values of comparable items. This makes such revaluation costly in principle and risks creating inequitable treatment of taxpayers. With new international standards of third-party reporting and information exchange on asset holdings and capital income, avoidance of capital taxation is about to become less profitable. Likewise, these new standards and the declining cost of processing large databases can be expected to lower the administrative costs of wealth taxation, valuation included. In countries with net taxes on wealth, information on assets is seen as an important complement to enhance the validity of capital income reporting.

Its ability to provide utility to the owner also suggests consider wealth as a tax base. In the welfarist framework, the normative yardstick of tax design is individual utility. Empirical evidence supports that wealth is a source of utility in its own right (Carroll, 1998; Yang and De Nardi, 2014; Peichl and Pestel, 2013). Such utility might include power by the command over resources providing advantage in bargaining situations (Bowles, 2012), and result in over-

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4 Since Atkinson and Stiglitz (1976), optimal taxation theory has maintained that capital income should not be taxed on condition that non-linear income taxes can be levied: taxing capital income would imply burdens on future consumption and distort the inter-temporal consumption decision. The zero capital income tax result has been famously corroborated by Chamley (1986) and Judd (1985), on account of a growing tax wedge between current and future consumption over time. Policy recommendations from the highly stylized analytical framework of optimal taxation theory and the proposition not to tax capital were not followed by policy in full but were influential in policy debates nevertheless.

5 Some theoretical work (Straub and Werning, 2014) goes even further to refute the optimality of capital non-taxation in the long run within the logic of the modelling framework of Chamley (1986) and Judd (1995).

proportional political influence and rent-seeking.[6] Income and wealth are positively correlated overall, but deviations might occur for reasons other than life-cycle consumption smoothing, so that income cannot be taken as a proxy for wealth with regard to taxation. Also some people argue that taxing wealth is expropriation, but it is not clear why the right to private property should protect stocks of assets more than pre-tax income flows. The consideration of wealth taxation, but not of income taxation, as non-respect of the right to private property might relate to features of tax salience. Concerning the protection of private property, political philosophy approaches other than radical individualism have been calling for a balance between the right to property and the common good.[7]

Political considerations further add to the case for the taxation of wealth. The "one dollar one vote" hypothesis expresses the idea that political voice is mediated by the command over material resources, which is at odds with the normative underpinnings of democratic regimes. Evidence from OECD countries in the late 20th century provides support of principle to this argument (Karabarbounis, 2011);[8] The over-proportional political influence of the wealthy bears risks to efficiency via securing means of rent-seeking; [9] indicative cross-country evidence suggests that wealth inequality is damaging for growth notably when coupled with political influence (Bagchi and Svejnar, 2014).

The specific fiscal situation in the aftermath of the financial crisis provides a particular rationale for asset based taxation. The paramount importance of financial stability for growth and job creation notwithstanding, financial stabilization policies have importantly served the stabilization of asset values, while crisis-driven fiscal adjustment tends to burden those with incomes from labour and social transfers more heavily.[10] Taxes on wealth could extend the notion of the ability to pay for the costs of crisis.

The restoration of comprehensive income taxation systems could contribute to a fairer distribution of tax burdens, but reasons to complement such systems with asset-based systems will still remain. Lately, there have been three trends providing for challenges to distributional equity: first, the effective taxation of capital income has been declining over the past decades (European Commission, 2015) – against the background of international tax competition and the proliferation of dual income taxation systems –, putting recipients of labour income at a disadvantage. Second, the link between aggregate capital accumulation and household welfare

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6 The over-proportional influence of the affluent to tilt political deliberations in their interest has received attention in the context of financial regulation in the United States in particular. Indeed the large wage premia in the pre-crisis financial industry in the UK and the US appear to relate to the ability of the sector to enjoy and share rents (Philippon and Reshef, 2012). On the role of political lobbyism in the incomplete implementation of the Dodd-Frank act more recently see Rivlin (2013), quoted from Oxfam (2014).

7 For advocates of a lean state, wealth should be an ideal tax base candidate: the protection of private property is considered the core responsibility of the state even by those who do not grant much *raison d'être* to redistribution. Among the rules that govern polities to date, the principle that 'property has its duties as well as its rights' coined by B. Disraeli (1804-81) is, e.g., found in the German Basic Law, Art. 14 (1) of which stipulates: "property entails obligations. Its use shall also serve the public good". Other countries' practice to tax wealth shows a similar approach.

8 Karabarbounis (ibid.) argues that the decline in redistribution in the US reflects declining relative incomes of both the lower and the middle class, while an increase in redistribution in Europe can be explained with declining relative incomes of the upper class. These developments are explained by two hypotheses, indeed deviating from the median voter proposition: first, that political influence increases with income ("one dollar, one vote"), and second, that the political participation of poorer populations increases with income, resulting in redistribution increasing with the relative wealth of populations at the bottom of the income distribution. The empirical relevance of these assertions has to be assessed against the background of country-specific income and wealth distributions.

9 The over-proportional influence of the affluent to tilt political deliberations in their interest has received attention in the context of financial regulation in the United States in particular. Indeed the large wage premia in the financial industry developed over the past decade in the UK and the US appear to relate to the ability of the sector to enjoy and share rents (Philippon and Reshef, 2012). On the role of political lobbyism in the incomplete implementation of the Dodd-Frank act more recently see Rivlin (2013), quoted from Oxfam (2014).

10 A full account of the distributional effects of crisis policies falls outside the scope of the present note. A comprehensive approach would need to consider the effects of monetary policy as well; on this see e.g., Bank of England (2012).

irrespective of type of income has weakened: globally, in the past decades, the labour share of income has been falling (Karabarbounis and Neiman, 2014; ibid., 2012), and increasing corporate profitability has been coinciding with subdued job creation (International Labour Organisation, 2014); going further, technological progress might accelerate the substitution of capital for labour (Brynjolfsson et al., 2014): thus, fostering the accumulation of capital might not do enough to increase the welfare of households mainly living from labour income. Third, market income inequality appears to be on the rise not only as a matter of unequal distribution of capital endowments, as highlighted by the broad debate about the top 1 per cent of income earners; going forward, innovation might render income processes less predictable and distributions more skewed (Brynjolfsson et al., ibid.). Income tax systems' fairness to treat households with different types but similar levels of income equally could be reinforced by restoring synthetic income taxation instead of dual taxation schemes, and eliminating regressive deduction and avoidance possibilities, while ensuring that all incomes and wealth increases are taxed, including capital gains and imputed income of homeowners. Also reinforcing the progressivity of income taxation could attenuate the differences in households' ability to save. However, it might be politically unfeasible to institute income tax progressivity and top marginal rates specifically to a degree that mitigates socio-economic inequality to a socially desired extent. Also, the equal application of high top marginal income tax rates at all ranks of wealth might act as a disincentive to valorising talent and to social mobility. Instead of very high top marginal income tax rates, income tax systems could be complemented by asset-based taxation. Another argument for the taxation of assets relates to the trend of shifting the tax base to consumption. Such taxation leaves the utility of accumulated wealth unaddressed, and it benefits those households whose members can afford unconsumed lifetime wealth.[11] Such advantage could be counter-balanced by taxing high stocks of wealth.

Going beyond possibilities of income taxation, wealth taxation would allow for progressivity based on assets, with benefits of its own. Reinforced capital income taxation and notably the return to universal income taxation, more rigor in defining the base, and higher progressivity would do a lot to meet concerns of distributional equity seen to date. Still there are economic challenges innate to the distribution of wealth that could be addressed by tax instruments that differentiate by the stock of capital. First, incentivising a more balanced distribution of savings might help macroeconomic stability. Households are not homogeneous by saving behaviour: saving rates increase steeply with wealth (Carroll, 1998; Saez and Zucman, 2014). However, the highly unequal distribution of net assets can be a source of macroeconomic instability. In the US household debt has been an instrument to mitigate consumption inequality against widening disparities in household income, resulting in a highly vulnerable pre-crisis growth model (Cynamon and Fazzari, 2008; ibid., 2014). In Europe, difficulties to adjust household portfolios to income and wealth shocks had an important role in depressing consumption and growth in crisis countries (Pontuch, 2014). The impact of the distribution of household saving rates might also have implications on external imbalances, via the substantial effect of the saving behaviour of the wealthiest on the aggregate, and the responsiveness of consumption to changes in stocks of wealth, with country-specific mechanics and magnitudes. Second, broader asset ownership might spur entrepreneurial activity and growth. By the commitment value of pledgeability, asset ownership is an important prerequisite to the access of credit: by easing funding constraints for less wealthy sub-populations, a more equitable distribution of assets might release entrepreneurship and innovation, and improve performance (Piketty, 1997; Bowles, 2012).[12] And finally, differentiating tax burdens

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[11] Indeed lifetime savings of the wealthy importantly contribute to wealth inequality (Yang and De Nardi, 2014); meanwhile, indirect taxes are proportional or progressive with respect to total expenditure, but regressive with respect to disposable income (Decoster *et al.*, 2010).

[12] On a detailed discussion of the effects of wealth inequality on macroeconomic efficiency, see Bowles (2012, ch. 4): the key argument goes that asset concentration prevents residual claims of individuals providing non-contractible work for owners of productive assets on the results of their action, which dis-incentivises performance. The positive impact of wealth and notably home

(continues)

by levels of wealth might also enhance the efficiency of taxation. At lower levels, to the extent that wealth is built up for later consumption, wealth taxation appears inefficient, incentive incompatible with the need for households to save for retirement, and indeed add a third layer of taxation on a base that has been taxed as income and will be taxed as consumption. Stock based progressivity aimed at wealth holdings beyond levels used for life cycle consumption smoothing, however, would allow to correct for the advantage of households holding such wealth, in particular in tax systems with reinforced indirect taxation, and complement the role of the income tax system to mitigate socio-economic inequality.[13]

4 Stock based capital taxation: aspects of design and implementation

4.1 The taxation of housing

The efficiency implications of increased housing taxation are straightforward. To date, in many EU Members the consumption of housing services by owner-occupiers receives a privileged treatment relative to other investment, mostly due to outdated valuations of the base. Neutrality would require align housing taxation with the approach to other investment on the one hand,[14] and to savings on the other. Increasing the role of housing taxation in overall revenue, not least to make up for the tax shift away from labour, is recommended by international policy advice, spearheaded by the OECD (2010). Its beneficial efficiency effects are straightforward: reducing incentives for housing investment could free up resources for more productive investment, asset price increases allow for the taxation of economic rents; and housing taxation is evasion proof.

When it comes to equity, the effects of housing taxation require differentiated consideration. The case for taxing imputed net income from housing in line with income from other investment is straightforward, in order to put home owners and renters with otherwise similar characteristics who invest in other assets on an equal footing. However, an increase of the tax burden on housing beyond that level, in the sense of genuine asset taxation, requires more careful consideration. True, among the households in the bottom deciles of the income distribution, the share of owner-occupiers is considerably lower than in higher ranks, and their housing consumption is more modest (ECB, 2013). Therefore, the increased taxation of household main residences appears to contribute to more equity. However, a closer examination shows that household main residence assets constitute equalising wealth. In several euro area countries, over half of the households even in the bottom income quintile are homeowners. Typically, home equity is the characteristic asset of the middle class, while home equity possessions of households on the top of both the income and the wealth distribution are under-proportional relative to their share in overall household wealth. According to statistical decomposition analysis, precisely because its share in total net wealth of low wealth households tends to be disproportionately larger, owner-occupied housing has an equalising effect in euro area countries. At the same time, wealth inequality is found to be lower in countries with higher rates of owner-occupant housing (Bezrukovs, 2013; Sierminska and Medgyesi, 2013).[15] Indeed home ownership appears effective to

ownership on entrepreneurial activity in the presence of credit constraints is backed by empirical evidence (e.g., Evans and Jovanovic, 1989; Schmalz *et al.*, 2013). However, implications of capital concentration on growth have not yet been fully explored. Possible benefits of asset concentration might include the availability of venture capital at a lower cost, given that risk aversion is decreasing in wealth (Carroll, 2000).

[13] To the extent that such taxation of higher stocks of wealth reduces incentives for further wealth accumulation, such taxation might also facilitate social mobility by chaning the distribution of investment risk along the wealth distribution.

[14] Such neutrality warrants the taxation of imputed income net of costs, including interest for debt-financed homeownership, maintenance costs, as well as an equity allowance where this is granted for business investment.

[15] Based on decomposition analysis of wealth inequality, Sierminska and Medgyesi (2013) argue in favour of encouraging home ownership throughout the wealth distribution to promote a more equitable distribution of wealth. For a similar point on the role of home equity for most citizens but those on the very top at the wealth distribution in the US, see Yellen (2014).

build up savings: controlling for anterior savings and other relevant covariates, home owners are found to accumulate significantly higher wealth than renters (Di et al., 2007, Turner and Luea, 2009).[16] Increasing the tax burden on owner-occupied housing relative to other assets, even if beneficial for neutrality, might make modestly and moderately wealthy households more worse off relative to the most affluent, and deter households from investing in an own home, thereby aggravating rather than mitigating wealth inequality. For taxation policy, therefore, it might be useful to consider appropriate thresholds in order not to discourage home ownership at the extensive margin and block access to this vehicle of wealth accumulation. Furthermore, a more balanced distribution of wealth can only be supported if the taxation of owner-occupied housing beyond the level of imputed income is aligned with that of other assets, notably those held by the wealthiest. This is especially important in light of evidence that socio-economic inequality is driven by the concentration of income and wealth at the top of the distributions.

When considering taxing housing beyond the point of neutrality, the impacts of a shift of households' portfolio composition away from housing should be weighed with care. Taxing imputed income of owner-occupiers is without question with regard to achieving neutrality with other investment. Efficiency arguments can be invoked to support the taxation of owner-occupied housing beyond this point; however a perspective focused on equity suggests the pursuit of this approach with diligence, notably with regard to the incentives of home-ownership at the extensive margin.

- **After plenty of inconclusive research and detailed scrutiny, home ownership is still found to have positive social impacts. At the same time, some of its alleged economic costs only indirectly relate to homeownership as such.** It has been long posited that high levels of owner occupancy foster local social externalities such as higher local political participation. Empirical research has failed to produce conclusive evidence on most asserted advantages, mostly due to the difficulties to isolate exogenous variation in home ownership from other variables. One area where benefits of home ownership are robustly established, however, is on socially desirable traits of children (Dietz and Haurin, 2003). This is particularly noteworthy in light of the growing recognition of the long-run impacts of interventions early in life. On the cost side, home ownership came into discredit in the wake of the economic and financial crisis. However, house price bubbles in some countries and excessive leverage being at the center of the crisis are a result of inappropriate prudential and lending regulation. Another, frequently raised argument is that home ownership acts as an impediment to labour market adjustment by migration. This, however, can again be addressed by keeping the costs of household relocation low, notably by eliminating excessive fees and taxes on real estate transactions, and by possibilities to exchange pledged assets and early repayment of mortgages without large penalties.[17]
- **When reviewing incentives for different types of assets in household portfolios, it is important to consider the risks associated with different choices.** Most households have only limited capacity to absorb large financial losses. Provided that prudent mortgage lending, policy measures to curb large boom-bust cycles in housing markets, and consumer friendly credit regulations are in place, the financial risks associated with leveraged home-ownership might be better understood and managed by households with average financial literacy than those implied in many other products available for long-term investment.

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[16] Leveraged home ownership offers a commitment technology to stick to a saving plan: the high (psychical) cost and some delay in liquidation might promote short-term discipline among dynamically inconsistent savers as described by the "golden egg" model of Laibson (1997).

[17] Furthermore, recent work has highlighted that a high level of labour mobility is not uniquely associated with economic benefits: studying the impact of mobility on macroeconomic adjustment in currency unions, Farhi and Werning (2014) highlight that labour outflows produce internal demand shortfalls in the non-tradable sector, so that out-migration provides no relief to the stayers.

- **Home ownership has specific qualities to maintain households' well-being upon retirement.** Retiree owner-occupiers have an important determinant of household wellbeing kept constant and providing a shield against price level developments and house price inflation transmitted into rents over the longer run. In addition, they don't face the risk of consuming up their assets before death, be it by unplanned longevity or time inconsistent consumption behaviour. At times where the generosity of income replacement by public pensions is expected to decline and with private pension funds being subject to political risk, owner-occupied housing might gain in importance in households' aspirations to maintain their standard of living upon retirement. These aspects might be part of the explanation why reform plans to introduce taxes on owner-occupied housing without appropriate qualifications tend to be unpopular. For this reason, the fiscal approach to housing should be integrated into the policy framework on retirement wealth, possibly putting housing investment on par with other forms of retirement saving.
- **In turn, extending the taxation of housing over rental property raises the issue consideration of incidence.** To the extent that the supply of housing is fixed (and foremost determined by building regulation), part of a tax on income from renting will fall on the renters, weakening the case for housing taxation for the sake of equity, and likely to necessitate measures to mitigate the burden for low-income households.

When introducing housing taxation reforms, issues of intergenerational equity should be borne in mind. Typically, elderly homeowners are mortgage-free; in many countries today's pensioners were shielded from the effects of fiscal adjustment policies relative to younger households (Darvas and Tschekassin, 2015). Mortgaged younger households, in turn, might have seen their net worth severely decline in countries undergoing a decline in home prices, perhaps into negative territory, and might have experienced negative income shocks that increase their repayment rates. In times of income instability and more cautious lending in some countries, youngest households have a more difficult time to acquire housing assets altogether. In order not to reinforce inequities among generations, it would be pertinent to consider net wealth positions in the approach to housing taxation.[18]

4.2 The taxation of net wealth

For the pursuit of a distributional perspective in asset taxation and the full advantage of the stock based approach, a comprehensive net base appears appropriate. A partial approach to wealth taxation, in particular including broadly held assets but excluding those held by the wealthiest households, might worsen wealth inequality instead of mitigating it. Putting higher burdens on housing but not addressing and financial wealth risks such outcomes: in terms of overall wealth, it affects households in the middle of national wealth distributions relatively highly but provides an advantage to the households at the top of the distribution, who tend to held most of a country's financial and business wealth.

Net wealth taxes avoid the challenges of capital import and export neutrality but might produce other challenges instead. Capital export neutrality requires that income from capital invested at home or abroad receive similar tax treatment. This cornerstone of allocation efficiency has become increasingly important in countries' approaches to capital income taxation over the past decades. In contrast, capital import neutrality requires that capital income from both domestic and foreign investors receive the same tax treatment; non-compliance leads to differences in inter-

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[18] In the wake of the financial crisis, broad-spread home ownership tended to be associated with the build-up of real estate bubbles and impediments to macroeconomic adjustment. It should not be forgotten that many such economic difficulties do not follow from home ownership as such, but from policy mistakes in other areas such as credit regulation.

temporal marginal rates of substitution across countries and distortions in the international allocation of savings. Both principles are impossible to achieve across countries with non-uniform capital taxation; policy choices have rather favored the first principle. Within the EU, however, the European Court of Justice has increasingly pushed toward the respect of the second, making the taxation of capital flows by Member States increasingly difficult, contributing to lowering standards of taxing capital income. A tax on net wealth based on residents' wealth world-wide would allow for the correction of the resulting bias in favor of capital income while avoiding immediate conflict with the principles of capital import and export neutrality. The group of taxpayers would have to be carefully circumscribed; the domicile concept in the UK shows the scope for policy choices in this regard. Distortions in the international allocation of high net worth individuals might arise but should not be overrated at moderate rates of a net wealth tax. However, if more countries choose to tax net wealth, challenges of double taxation might require the adoption of common international principles.

The economic effects of a net wealth tax should be overstated: but such a tax could enhance the fairness of taxation. Other than a tax on capital income, a tax on worldwide net wealth of resident taxpayers would not necessarily have to increase the cost of capital, because it would apply to households, not enterprises. Furthermore, it would not affect foreigners' investment. At the macroeconomic level, the broader distribution of wealth can be expected to have positive effects, such as the loosening of credit constraints at the lower part of the wealth distribution to support entrepreneurship, and improved self-reliance in life cycle savings to alleviate pressure on public budgets. Such objectives will not be achieved by a moderate wealth tax alone, but such a tax might contribute to a broader stream of policies to distribute net benefits of economic development more evenly and enhance economic and social stability.

To serve the purpose of equity, the taxation of wealth has to build on a strong international reporting and anti-avoidance framework. Levying taxes on broadly distributed assets but excluding those held by the wealthiest households is deficient in fairness terms and might contribute to socio-economic inequality instead of mitigating it. Restricting the taxation of wealth on assets held domestically might invite to capital flight. Hence a net wealth tax on worldwide assets of taxable residents appears appropriate. This, however, is associated with difficulties similar to capital income taxation. Complementing taxation systems with asset based components will require the development international standards to avoid double taxation, as well as mechanisms of third party reporting and international information exchange on residents' assets held abroad. Recent advancement with the international reporting of capital income suggests that this perspective should not be dismissed as unrealistic.

From an efficiency point of view, a progressive wealth tax should not affect lifetime consumption smoothing of average citizens. A part of wealth inequality across households is driven by the age structure of the population, notably by savings for retirement and insurance against longevity and health risks. In particular in countries where private savings for such purposes are part of the welfare system, a tax on the build-up of wealth at average levels would provide disparate incentives. This suggests appropriate zero-tax allowance thresholds, also supported by lighter administration; however no-duty thresholds must not be so high to jeopardize the production of revenue. Finally, mechanisms for the adjustment of the bands have to be considered to avoid the erosion of equity by long-run asset price increases. In addition to a broad base, the setting of the rate structure of a wealth tax is also a prerequisite of broader political acceptance.

Possibly high wealth tax duties relative to realized or earned income require appropriate administrative solutions. Wealth taxation might be considered confiscatory if it consumes a large share of income flows or if it hits the substance of the asset. This can happen if returns are reinvested, in particular in combination with low labour or public pension income, or if

assets yield low or negative returns. To yield to such arguments, practice has been to draw an upper bound to wealth taxes as a share of overall income, e.g., in the Netherlands: however this obviously invites to evasion. In any case the normative argument of confiscation is questionable if wealth is considered a different dimension of utility than income. In addition, under assumptions that public funds provide social benefits and that bounded wealth inequality is valued by society, there is no obvious reason to encourage the reinvestment of business profits while keeping realized income flows and tax payments low. Finally, difficulties of tax compliance of wealth-rich but income-poor households could be handled with provisions for deferral.

The effectiveness and fairness of wealth taxation also rests upon limitations to tax shelters available to the wealthiest and to outright exclusions of certain assets from the base. Such shelters include legal vehicles to conceal the beneficial ownership of assets, limitations of wealth taxes as a share of realised income combined with generous write-off possibilities, and exemptions of business wealth from taxation, which is most acute in the context of inheritance taxation (see Section 4.3).

Switzerland provides an example that a net wealth tax is feasible. Switzerland's sub-federal entities have been traditionally operating taxes on individuals' net wealth. Typically also today, they cover real estate and other real and financial capital, including businesses and life insurance and pension wealth, as well as collections of art, assessed as close as possible to fair market value. Liabilities are deducted; retirement savings are exempted before access. Taxpayers must declare world-wide assets, but enterprises, permanent establishments and real estate abroad are not included in the base; non-residents face limited net wealth tax liability. Rates are progressive usually between 0.3 to 0.7 per cent of net wealth, up to 1 per cent. Some but not all cantons operate shields to prevent the depletion of assets by tax burdens above income; indeed flexibility in the valuation of assets together with this shield allows diminish the effective tax burden and the performance of the tax in terms of fairness. The net wealth tax can provide up to 10 per cent of sub-national revenue. Among its benefits, it is considered helpful to provide information to assess the reliability of income reporting.

4.3 Event-based wealth taxation: gifts and bequest

Instead of taxing assets in a recurrent fashion, taxes on assets can also be levied upon transfer of ownership. Apart from the real estate transfer tax, the economic effects of which are unambiguously assessed negative, the most important of these are gift and inheritance taxes. The design of these two is similar in some countries and dissimilar in others, reflecting different approaches to the encouragement of planned bequests. Inheritance taxation is of particular interest to date, given that the oldest cohorts in many European countries could participate in the accumulation of some wealth relatively broadly, that will change ownership in the forthcoming years.

Economic theory provides arguments in support of taxation of inheritances, but the precise policy prescriptions are not clear. To start with, from the perspective of heirs, bequests are unearned income: it appears straightforward to apply the prevailing rate of (capital) income tax on them. Besides, from an efficiency point of view, unintended bequests offer an ideal situation to tax, since a behavioural response has not been made in a forward-looking fashion and cannot be given ex post. Complications arise if the utility of the bequeather is considered. Here, policy prescriptions depend on the normative approach taken (Boadway et al., 2010). In the welfarist public policy framework that builds on the strict consideration of sources of individual well-being, accidental bequests should receive lighter taxation because they offer no utility to the bequeather: this, however, contrasts with the efficiency argument. In turn, bequests that provide utility to the bequeather, in particular strategic bequests offered in return for services such as caring, might be

taxed similar to other consumption on the side of the bequeather. In two other cases, 'warm glow' and altruistic bequests – where the utility of the bequeather is increased by good deeds, or by the utility of the recipient – their consideration for taxation is ambiguous. Furthermore, social norms about family raise some questions on the intuition to subject bequests to income tax in the heir's schedule. Notably the recognition of parenting as socially beneficial activity that involves some altruism also beyond the accumulation of assets suggests some leeway for the possibility to pass on resources to one's offspring with lighter taxation than a separate income stream.

At the current juncture, inheritance taxation is expected to address two important policy challenges: the mitigation of dynastic wealth inequality and the redistribution of resources across generations. As taxation overall, inheritance and gift taxation first and foremost serves the objective of generating revenue. At the current economic and social conditions in EU Members, two other policy objectives are increasingly gaining recognition: first, contributing to a more equitable distribution of resources in the sake of equality of opportunity, and second, contributing to a more balanced distribution of resources and opportunities across generations where older generations tend to have higher lifetime incomes and savings than younger generations can expect to have, while the capacity of the latter to save and invest is squeezed by high dependency ratios.

Inherited wealth has become increasingly relevant in advanced economies, while the role of taxation to mitigate the intergenerational transmission of wealth inequality is less clear. Empirical evaluations disagree on the volume of inherited wealth. For the US, influential estimates on the share of inherited wealth in overall household wealth in the late 1980s suggest a range of about one to two fifths (Modigliani, 1988, Barthold and Ito 1992). Looking at another metric, for France, Piketty (2011) finds that the annual flow of inheritance made up for about 15 per cent of national income in France most recently, up from about 5 per cent in the post-war period. How inheritance translates the distribution of wealth to the next generation is not well understood: in this regard a complex interplay of factors such as the intergenerational transmission of earnings inequality, family size, (dis-) similar socioeconomic status of parents, preferences on the splitting of bequests, etc. are at play, as well as opportunities to amass 'new' wealth from income and income mobility over the life cycle. Indeed inherited wealth might be scattered by the heirs' generation,[19] putting a brake on the build-up of longer-term dynastic wealth accumulation.

Irrespective of impact, taxing inheritances appears to be a command of justice: implementation can be adjusted to country-specific norms of solidarity within the family. No matter what the impact of taxation on the long-term distribution of wealth, inheritance constitutes unearned advantage. This makes a very strong case for the taxation of inheritances, in particular in view of creating a level playing field and fostering justice in terms of opportunity in the generation of heirs. At the same time, norms of justice leave scope for variation in the approach to inheritance taxation. Survey-based cross-country comparisons reveal significant differences in households' bequest motives that correspond to prevailing social norms, most importantly those regulating inheritance irrespective of legal provisions (Horioka, 2014). Variants of welfarism suggest taxing bequests involving some altruism more lightly than strategic bequeathing;[20] this corresponds to inheritance tax provisions in many countries that typically levy lower rates on bequests to close relatives and exempt bequests to charities. In fact today's plurality of family types and sequential family formation notwithstanding, families continue to be economic units with risk sharing, the

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[19] In their theoretical analysis supported by calibration with German data, Grossmann and Strulik (2010) argue that the continuation of family firms by unable managers has important negative welfare effects on the third generation of heirs.

[20] See the discussion of Boadway *et al.* (2010). They argue that under the "restricted welfarism" approach, with some arguments the case can be made even for the non-taxation of wealth transfers.

pooling of resources, and joint investment decisions;[21] welfare systems of EU Members acknowledge these roles to different extents,[22] e.g., by means-testing social benefits against spouses' resources, or explicitly positing a duty of children to provide for the care of aged parents before drawing on social budgets. These considerations support the taxation of bequests but suggest some leeway to yield to social norms prevailing in the country by preferential treatment of some bequeathing within the family. This can be done with reduced rates and thresholds to allow populations with modest wealth to pass it down to offspring. The acknowledgment of intergenerational solidarity in the policy discussion about inheritance taxation might promote its political acceptability, to the extent that it meets norms shared by the affected citizens; this approach does not preclude the promotion of distributional justice by the taxation of higher inheritances that arguably contribute more to wealth inequality. Acknowledging a positive role of resource sharing across generations and some dynastic asset-based welfare could also be done by tax exempt amounts of bequests granted per heir: overall donee based elements of inheritance taxation are more conducive to distributional equity because they provide privilege to split bequests.

The positive role of intergenerational provision notwithstanding, the case for the unlimited continuation of family assets' unity is weak. A central challenge to distributional equity in inheritance taxation in practice relates to the reduction of effective taxation at high levels of wealth among others by exempting business assets. This is often posited to be crucial for the vitality of family businesses and the national economies more broadly, including the preservation of jobs. At the same time, the opportunity to shelter private wealth from inheritance taxation under business tax exemption schemes appears a key driver of inequity in approaches to tax bequests. Dynastic family businesses might be a framework to pass on not only productive assets but firm specific know-how and entrepreneurial behaviour: still it is difficult to comprehend that recipients of such privilege to foster their productivity should be unable to foot a bill of inheritance taxation over an extended redemption period. Also empirical findings support the hypothesis that dynastic family management might slow down productivity increases within the firm and the Schumpeterian process of creative destruction in the overall economy (Bloom, 2006; Grossmann and Strulik, 2010). As for business assets, the case is often made to exclude the family home from the taxation of bequests, referring to the cost of adjustment for surviving family members. On economic grounds however there is no reason to favour this specific type of assets over others in the overall framework of inheritance taxation: the diminution of hardship to the survivors can be mitigated with appropriate schemes for deferral; besides, with appropriate thresholds, the fraction of affected populations can be expected to be small.

The design of inheritance taxation could usefully consider different generations' needs within an overall approach of equity. With increased longevity, the age to become heir is also increasing on average. From the perspective of potential heirs, expecting a bequest is a risky strategy to provide for retirement wealth; the timing of relative certainty about bequests leaves little possibilities to step up own savings if necessary (Pfeiffer and Braun, 2011). At the same time, some economists posit that speeding up the flow of assets to younger generations in higher need to invest could be more productive economically (Arrondel and Masson, 2013). To this end it might be useful to incentivise the skipping of generations in bequeathing, e.g., by equal rates for children and grandchildren, or the possibility of tax-exempt lifetime gifts of heirs to their children within a certain period. A further way to foster the transfer of resources to younger generations is to provide

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[21] From a sociological point of view it has been argued the aging societies of the advanced economies tend to be age-segregated with age-homogeneous institutions, where resource transfers across generations are crucial to maintain age integration (Uhlenberg and Riley 2000, quoted after Kohli, 2004).

[22] The heterogeneity of European and other OECD economies with regard to the role of the family as a welfare provider along with the market and the state has been extensively analysed by G. Esping-Andersen (1999), the founding father of the research on the typology of welfare states.

preferential tax treatment for lifetime gifts relative to bequests. This is problematic however as lower levels of wealth must be held by the donor for precaution: certainty about the size of the bequest will only come with death. Schemes that provide relief for the transfer of assets with the reservation of usufruct to the donor give preference to the most wealthy whose asset income is sufficient to meet precautionary needs, and are thus inimical to the objective of equity.

With regard to equity, unlimited tax exemptions to gifts made to charities are doubtful. The tax exemption of donations to charities appears to kill two birds with one stone: it fosters the pro-social behaviour of the wealthy and might alleviate the burden of the state to deliver social services. The delivery of services of public interest by charities might be efficient and show social organisation in line with norms of subsidiary. However by the financing of such charities the most affluent are better able than average citizens to shape societies according to their preferences; but charitable donations should not discharge the wealthy from the duty to pay inheritance taxes in line with the approach valid for any citizen. In this context it should not be overlooked that among the wealthy insight for the need to support the state – and not just of private social welfare providers – notably in times of economic duress for broader populations does exist.[23]

Norms of equity are central to approaches to inheritance taxation; in this regard some clarifications are due. First, distinctions of sources of wealth do not provide the only points of departure to support inheritance taxation. Proponents of taxing bequests tend to assert that this could correct for the advantageous treatment of capital income during bequeathers' lifetime, building on the idea that high levels of wealth stem from unearned income, which is more straightforward to tax post mortem than the fruits of a laborious life. However in some cases large estates can be accumulated from labour income as well. Second, capital gains constitute a challenge to equal treatment and offer a route for dynastic wealth accumulation: rebasing assets upon inheritance without taxation gives advantage to those that are able to delay realising those gains into the next generation. Such advantage is hard to justify; at the same time considering inheritance taxation a substitute to a capital gains tax on bequeathed assets provides unfair treatment to bequeathers of non-appreciated assets. Therefore, capital gains taxation should be consistently implemented at the moment of separation from assets by either sale or bequest, and kept conceptually separate from inheritance taxation. With appropriate periods of deferral, liquidity concerns do not appear valid against such an approach. Finally, proponents advocate inheritance taxation as a key instrument of the state to foster a specific perspective on equity, namely the equality of opportunity. Substantial bequests obviously violate equality of opportunity: but taxation alone only goes half-way to foster this objective. Therefore a more comprehensive policy commitment to the promotion of equal opportunity might also raise support to the taxation of bequests.

The small amounts of revenue collected and the cost of administration are not arguments against inheritance taxes as such. To date, the contribution of inheritance taxes to overall public revenue in EU Members is relatively small (see Section 2.2). However this might be due to an easy approach toward larger estates. Opponents of inheritance taxation also invoke the difficulties and costs to establish the value of certain assets. This question pertains to any approach to link tax burdens to wealth: the related difficulties should not be overstated (see Section 3.2). In any case, proportionality suggests some tax-free threshold to provide relief to administrations from the burden of valuation.

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[23] In the US, in 2012 the "Responsible estate tax proposal" calling for lowering the estate tax threshold and rising applicable rates was supported by 33 highly wealthy individuals such as Warren Buffet and George Soros (http://faireconomy.org/sites/default/files/2012%20Estate%20Tax%20Sign%20On%20Statement%202_0.pdf, accessed on 20/02/2014). Already in 2011, similar statements were made by highly wealthy French citizens, summarised by http://www.ft.com/intl/cms/s/2/9e6cd460-cf40-11e0-b6d4-00144feabdc0.html#axzz1WY8h9o5H

Antagonism of broad populations against the taxation of inheritances might be due to weaknesses of policy design and credibility, as well as insufficient information. The taxation of inheritances importantly builds on core social concepts and norms like property rights, family, opportunity, and merit prevailing in a society; norms of justice and equity have a key role in the justification of such a tax. However where practiced, inheritance taxation often tends to shelter portfolios of the most wealthy from the tax:[24] this considerably weakens the case for the taxation of bequests as an instrument to foster a more equitable distribution of wealth, in particular as household wealth tends to be concentrated at the top of the distribution. If operated as a redistributive instrument with revenue mainly generated by the middle class, such a tax might clash with middle class quests of upward social mobility and of self-insurance against downward mobility in a dynastic perspective. Such reservations might be particularly strong where perspectives of increased well-being are no longer seen ascertained to younger generations, and where the ability of the state to provide status-preserving insurance is questioned. These arguments are not to exculpate policy-makers from promoting the equality of opportunity, but need to be taken into consideration in view of the necessary support of appropriate tax instruments in the electorate. Finally, insufficient information about the distribution of bequests and suspicions of time-inconsistent policies and fiscal drag will make even those citizens reject the idea of inheritance taxation who would normally benefit from it.[25] In order to avoid timing decisions around expectations of change, the adoption of an approach to tax inheritances has to build on constancy and broad policy consensus (Boadway et al., 2010). Its acceptance can be expected to increase if the right balance is found between redistribution and self-providence in line with the prevailing social norms and on the one hand, and the promotion of equal opportunity by policies more broadly on the other.

In comparison with a net wealth tax, the taxation of inheritances and gifts has specific pros and cons. The former levies a small tax on capital at a relatively high frequency, the latter do the same at a higher rate and lower frequency. Over 30 years, an annual asset tax of 1 per cent diminishes the capital stock by about the same amount than a one-off levy of 26 per cent every 30 years. Inheritance taxation has the advantage of efficiency as it allows for fluctuations of wealth during the course of life, and also does more for the comparable treatment of individuals with pension income and asset-based post-retirement wellbeing respectively.[26] On the downside, the burden put on individuals' and families' wealth put by inheritance taxation has some individual variation, reflecting differences in life spans. Also, broad reservations against inheritance taxes across populations as suggested by anecdotal evidence raise the question of salience: in this regard there might be a trade-off between the frequency and the rate of taxation. In countries where neither tax is present, with appropriate thresholds, a continuous capital tax for high net worth individuals might be easier to accept than a cumulative burden associated with the emotionally charged event of death. As concerns the challenge of administration costs and notably valuation, both approaches to capital taxation tend to be heavily criticised. Against this background a less frequent valuation of taxpayers' assets might have some appeal. However, this approach ignores potential informational benefits to tax administrations from obtaining higher frequency stock and flow data about individuals' ability to pay taxes. Finally, net wealth taxes appear less complex in international environments because the dimension of the donee is missing and does thus not create additional variation and complication. Likewise, net wealth taxes imply a lesser need for normative

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[24] This perception is found e.g., in the United Kingdom (Boadway *et al.*, 2010).

[25] It is questionable if better information improves the possibility to promote better policies, though (Bartels, 2004; Krupnikov *et al.*, 2006).

[26] Depending on the organisation of retirement income for different populations, the consideration of pension entitlements might change household wealth inequality considerably. E.g., for Germany 2007, Frick and Grabka (2010) show that the Gini coefficient of net wealth inequality among individuals aged 17 and more drops from 0.79 to 0.64 once the net present value of pension rights is taken into consideration.

choices: the main question at stake is the rationale of taxing assets, while the ambiguity of bequest motives and judgment about altruistic preferences does not come into play.

4.4 Implementation challenges to wealth taxation

Arguments often brought up against more comprehensive taxes on wealth refer to difficulties with implementation. Policy approaches to taxing assets tend to be piecemeal, either excluding certain assets, or incomplete to address particular challenges of introduction: this might add to the difficulty of the subject in the policy debate. Addressing the main challenges to implementation – some of which are technical, while others relate to social contract more broadly – might enhance the public acceptance of wealth taxation.

The availability of information is crucial for a fair and effective net wealth tax: in this regard a shift of paradigm is underway. Owner-occupied housing is fiscally attractive because it is near-impossible to avoid, while the main argument against comprehensive wealth tax that would be more equitable in principle is avoidance: thus there is an inherent challenge to fairness in wealth taxation. But as the damage to tax bases by the lack of an international taxation framework is increasingly recognized, encouraging developments are underway, that might help implement broader based taxes on wealth as well. Notably since 2010, the US Foreign Account Tax Compliance Act (FATCA) has set new standards of worldwide information sharing on taxpayers' income.[27] Among EU Members, advances toward better tax policy enforcement have been made in particular by the adoption of Directive 2011/16/EU on administrative cooperation in the field of taxation; the OECD Global Forum creates yet another international framework for strengthening tax policy cooperation. As an example at the national level, recognizing that quality regulation cannot be based on double standards, in 2013, the UK government committed to create a publicly accessible central registry of company beneficial ownership in the framework of the international "Open Government Partnership" platform and the then-G8 respectively (Cabinet Office, 2013). These encouraging developments notwithstanding, there is still a long way to go to restrict possibilities of tax avoidance at high levels of income and wealth (Zucman, 2014; Johannessen and Zucman, 2014). This will also require action against tax havens and domestic tax shelters that allow for tax planning strategies only affordable to the wealthy. Eliminating such loopholes would improve the acceptance of taxes on asset holdings at lower levels of wealth.

Difficulties of valuation and administration costs are associated with challenges to wealth taxes, but they do not constitute arguments against them. Illiquid assets' valuation gains changes are notoriously difficult to establish, which might jeopardize the perception of fairness in the taxation of net wealth. Also, high administration costs have been long-stated arguments against the taxation of net wealth. However, as the immediate cost of processing information has been rapidly declining thanks to IT advances, the administrative costs of wealth taxation might rather depend on establishing the standards to compile information. Stock and flow data, third party reporting and international cooperation, asset registries, socially appropriate "nil bands", and punishment of under-reporting could develop the necessary technical underpinnings of equitable wealth taxation in the longer term. Such information could also be used to establish appropriate methods of asset valuation. Where this fails, retroactive taxation upon change of ownership via market transaction could be applied.

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[27] The FATCA framework establishes a worldwide system of reporting information on income derived from US assets or sales, including interest, dividends, annuities, royalties, rents, and realized valuation gains. Financial institutions including the shadow banking sector are incentivized to comply by a withholding tax of 30 per cent on payments to such institutions related to the covered income flows unless reporting agreements are entered with the US Inland Revenue Service.

Cash constraints are a weak argument against recurrent wealth taxes. Cash constraints affect (notional) asset returns that do not translate into liquidity, in particular utility from owner-occupied housing, gains from asset appreciation, and reinvested earnings. A progressive design of wealth taxation – with low rates for the least wealthy – mitigates the problem of cash constraints, as wealthier individuals will be more likely to receive higher liquid income. Hardship to the "wealthy hand-to-mouth" can be avoided by the deferral of the tax liability to the moment of liquidation. For businesses, equity finance of investment is a strong case for keeping liquidity outflows low: but tax-free thresholds might help small businesses, while owners or heirs of substantial business wealth can be expected to service tax obligations from capital gains, possibly stretched out over several years.

Citizens' reservations against wealth taxation need to be taken seriously. Objections against taxes on wealth will differ across types of households. To the extent that considerable parts of populations possess some wealth in most EU Members, the proposition of a wealth tax without qualifications or progressivity or a tax on housing in isolation will be perceived unfair unless attempts are made to raise contributions at the top of the wealth distribution. The tracking of ownership of mobile assets, on the other hand, might be seen with suspicion for fears of coercive and time inconsistent wealth levies. Against such reservations, the taxation of wealth will not gain political support as long as the public fails to perceive the benefits of public goods provision and the potential of the specific instrument proposed to mitigate socio-economic inequality. Therefore, public administrations and tax-benefit systems that deliver both on efficiency and fairness are cornerstones of wealth taxation. Special fiscal mechanisms, such as earmarking wealth tax receipts to fund forward-looking social objectives such as access to opportunity instead of plain redistributive spending might also enhance the acceptance of wealth taxes, notably among entrepreneurs who are less appreciative of social safety nets. Finally, safeguards and principles to preclude perceptions of unjust confiscation and expropriation might also be helpful.

5 Asset based taxation: the role of policy at the EU level

5.1 Wealth taxation in the framework of EU economic policy guidance

Taxes on wealth could be studied in the framework of policy guidance to EU Members. As a potential source of revenue, wealth taxation could be assessed just as other possible sources in terms of efficiency and equity. In the follow-up of the publication of Piketty's (2014) "Capital in the 21st century", citizens EU-wide have become more sensitive to inequalities in the distribution of wealth. The containment of wealth inequality might be a policy objective in itself but also in the sake of economic and social stability. Choices whether or not to adopt taxes on net wealth and how to design these are fully in the remit of EU Members; the role of the EU institutional level is only ancillary. Therefore it might be appropriate to consider wealth-based taxation in the policy advice process in particular in countries where broad debates have developed on the issue. In considering such a tax, its design has to be carefully evaluated with regard to distributional implications; a partial approach might enhance wealth inequality instead of mitigating it.

- To enable a thorough assessment of the potential of asset-based taxation in EU Members, better statistical information is necessary. To date, reliable information on the distribution of wealth is unavailable for a number of countries, mostly outside the euro area; also the Eurosystem HFCS is found to underestimate the upper tail of the wealth distribution, and does not consider public pension entitlements. The need to improve Member States' tax systems in terms of efficiency and equity under the challenge of population ageing, as well as the increasing relevance of wealth as compared to income as projected by Piketty (2014) will continue to provide valid arguments for the improvement of data availability and analysis to this end.

- To date, aggregate characteristics of tax systems might guide judgment on the suitability of taxing wealth. In the absence of robust micro data on asset distribution, as a first approximation, summary information on tax systems might help decide if the taxation of wealth might contribute to the improvement of national tax systems in terms of efficiency and equity. With regard to equity, taxes on wealth could appear useful in particular in countries with a high share of indirect taxation (as the former is regressive with regard to disposable income, see Decoster et al., 2010), large differences between the implicit tax rates of capital and labour, or flat and dual tax systems or little progressivity of income taxation respectively: these tax systems will in general be weak to mitigate income and consumption inequality, or disproportionately favor capital income, making the build-up of assets difficult for those receiving relatively low income, or living from labour income alone. Likewise, high post-tax income inequality might also hint at the fact that socio-economic inequality is only moderately attenuated by income taxation: here, asset based taxation at high levels of wealth might have an ancillary role to play.
- The potential of wealth taxes has to be evaluated under consideration of the total capital stock, private and public, as well as the welfare policy framework. Asset inequality might coincide with less social exclusion where efficient public administrations are able to offer quality social housing, and public pension systems are the main mechanism for income redistribution between life cycles: in such systems, life cycle driven variations in asset holdings are less relevant, and assessments of wealth inequality would warrant the consideration of pension entitlements. Another question concerns the taxation of net asset holdings in catching up economies. The impact of a tax on the concentration of wealth might have implications on the structure of production. The efficiency gain from concentrated business assets might be necessary for catching up economies to robustly integrate into global production chains. In addition, even in one generation's time after the demise of socialism, wealth inequality appears less pronounced in the new as compared to the pre-2004 EU Members. Therefore, wealth based tax instruments appear to have a weaker case in those countries.

5.2 Tax cooperation to allow the efficient and equitable taxation of wealth

Further to the European Semester, the need for administrative and policy co-operation constitutes another avenue for European perspectives in approaches towards taxing assets.

- With cross-country wealth holdings, issues of double taxation might arise; affected citizens as well a Member States would benefit from a common set of principles. As the taxation of net wealth is the exception rather than the rule among EU Members, cross-border issues with asset based taxation are mostly confined to inheritances and gifts, with multiple combinations of citizenship and residency of the bequeather and the heir and the location of the asset allowing for substantial complexity. In addition, to date, EU Members tend to levy higher inheritance taxes on border-crossing bequests (Hirst, 2015). The European Court of Justice requires EU Members not to discriminate among resident or own-citizen and other EU citizens as bequeathers or recipients of bequests. It has, however, no power to prevent the taxation of assets by two Member States, which is left to bilateral agreement between jurisdictions. In order not to create a complex set of bilateral agreements with mismatches and the possible effect of base erosion, a common framework for the taxation of asset, including inheritance and gift taxation, would be helpful. With the Commission Recommendation 2011/856/EU regarding relief for double taxation of inheritances, first steps have been taken in this regard.
- The effective taxation of financial wealth necessitates administrative cooperation and bank reporting also from beyond the border of the EU. As argued above, a comprehensive approach to asset based taxation needs to include financial wealth; this is likely to be a prerequisite of the broader acceptance of wealth taxation, including inheritances and gifts, among citizens.

However as shown by a number of recent scandals, tax avoidance makes it difficult for national tax administrations to verify information on wealth holdings, let alone to tax wealth. Recently substantial progress has been made to move toward administrative cooperation among tax authorities and bank reporting on foreign accounts. However as tax evasion is becoming increasingly difficult in some internationally cooperative jurisdictions, incentives for the remainder and new jurisdictions world-wide are high to provide frameworks conducive to tax evasion (Elsayyad and Konrad, 2012). EU Members can best address this problem at the international level when acting together.

5.3 A wealth levy to restore macro-financial stability: difficulties of implementation

As a conditionality item of macro-financial support for ailing sovereigns, the scope of wealth-based tax contributions appears limited. The perspective of a wealth levy to mitigate funding constraints of illiquid states has been brought up by the Bundesbank (2014). It is difficult to conceive the implementation of such an instrument in an effective and equitable way, however. To meaningfully add to debt reduction, such a levy will have to be imposed with a nontrivial rate up to 10 per cent (IMF, 2013) Fairness and the application of the residence principle would require equal consideration of residents' wealth kept domestically and abroad. Historical experience shows that the time needed for implementation of a wealth levy meeting such criteria is used to substantially erode the tax base by avoidance measures (Eichengreen, 1988). Besides, a levy on financial assets would probably necessitate capital controls, which require very strong conditions to be admissible in the EU. Ultimately, wealth taxation is less likely to be successful to remedy large-scale fiscal imbalances and should better be seen as a preventive instrument to maintain fiscal and social stability.

6 Conclusion

Asset ownership, in addition to income, has received increased interest with regard to shouldering the burdens of public finance lately. With the Eurosystem Household Finance and Consumption Survey, comparable data on households' asset holdings in euro area Member States have become available recently, showing country-specific characteristics of household wealth distribution in terms of composition, relation to income, and correlates.[28] Also, with the Ernst and Young (2014) cross-country review of wealth-related taxes commissioned by the European Commission, a comparative stock-taking of such taxes in place in EU Members to date exists, providing a detailed picture of these instruments.

Wealth is an indicator of the ability to contribute to the public purse in its own right, and the distribution of assets is a matter of economic policy relevance. A more equitable distribution of wealth has some positive impacts at the micro- and macroeconomic level that have not yet received sufficient attention. Furthermore, in the advent of improved means to process information, counter-arguments to wealth-based taxation on grounds of their ineffectiveness might lose their strength. While the restoration of universal income taxation with appropriate progressivity could do much to support a fairer distribution of tax burdens, wealth taxation has the additional advantage of allowing for progressivity based on assets, not income, thereby attenuating asset inequality arguably without inciting strong negative behavioural effects on capital accumulation for most taxpayers.

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[28] This paper disregards multivariate analyses of these household wealth distributions. A growing body of empirical evaluations of the Eurosystem HFCS dataset can be found at the ECB's homepage: https://www.ecb.europa.eu/pub/economic-research/research-networks/html/researcher_hfcn.en.html

There are several approaches to taxing wealth, with pros and cons of their own. Increasing the tax burden on owner-occupied housing has become a constant strain of policy advice on tax reform in EU Members lately: on this point, a careful approach is needed in order not throw out the baby with the bath water. A net wealth tax, in turn, is the fairest approach from an equity point of view: but certain conditions have to be met to implement it successfully. Taxes on inheritances, finally, are most used to tax assets, but conceptually they involve most complexity, due to the presence of two parties with possibly different jurisdictional affiliations, and due to the normative choices inherent to the taxation of bequeathing. To garner voters' support for inheritance taxation – that could, if appropriately designed, benefit a majority of voters as well as society as a whole – a circumspect approach is necessary, rendering account to country-specific social norms. To be in line with norms of justice and contribute to attenuating dynastic wealth inequality, inheritance taxation must not provide preferential treatment to assets held by the wealthiest.

Concerning wealth taxation, there is scope for approaches at the European level of policy making. Competence for direct taxation is allocated at the Member States' level; notwithstanding this, in the European Semester framework of economic policy advice asset based taxation might be considered – and indeed a sub-set of the base, housing, is considered – in the context of a budget neutral tax shift away from labour. For such policy advice to be appropriate to country-specific conditions, broader statistical information on household asset holdings is necessary, also including countries not yet covered by the Eurosystem HFCS. Beyond such policy advice, a more widespread application of wealth related taxes might increasingly result in issues of double taxation and non-taxation, leading to the need for a common framework of principles at the EU level. Finally, a fair approach to asset based taxation not sparing out assets held by the wealthiest is impossible without administrative cooperation and information exchange. Such cooperation has to go beyond the borders of the EU, calling EU Members to speak with one voice in the relevant international fora.

ANNEX
STATISTICAL TABLES

Table 5

Distribution of total assets across deciles of total household gross income in some euro area Members, 2010, Euro and per cent respectively

Decile		1	2	3	4	5	6	7	8	9	10
Austria	no. obs.	1101	1224	1208	1197	1223	1341	1173	1171	1109	1153
	mean	62838	85208	137843	156925	200882	233834	250171	366511	401310	925087
	s.e.	21082	15100	71556	50977	55303	61054	51859	126709	81437	249360
	mean/GDP	1.84	2.50	4.04	4.60	5.89	6.86	7.34	10.75	11.77	27.13
	decile sha	2.31	3.05	4.93	5.56	7.15	8.29	8.94	12.82	14.43	32.53
Belgium	no. obs.	867	1097	1122	1055	1110	1196	1204	1155	1292	1537
	mean	150811	168236	279225	245557	368106	321232	403572	449226	500980	804864
	s.e.	28810	17264	44854	29938	60801	31003	34751	44672	37715	59691
	mean/GDP	4.42	4.93	8.19	7.20	10.79	9.42	11.83	13.17	14.69	23.60
	decile sha	4.11	4.55	7.58	6.69	10.03	8.61	10.93	12.22	13.59	21.69
Cyprus	no. obs.	412	471	513	538	520	581	750	714	732	954
	mean	249349	342777	372584	380075	418342	552521	625011	981427	1373982	2141730
	s.e.	69686	130884	130277	59135	145181	119674	95315	205748	192370	404335
	mean/GDP	11.87	16.32	17.74	18.10	19.92	26.31	29.76	46.73	65.43	101.99
	decile sha	3.41	4.58	5.12	5.06	5.66	7.38	8.43	13.21	18.54	28.59
Germany	no. obs.	1228	1127	1204	1262	1464	1643	1689	2075	2615	3518
	mean	41159	53231	70272	97224	134176	150365	179936	274419	442485	783719
	s.e.	12240	13716	16426	19253	15878	16364	12337	51375	73663	94859
	mean/GDP	1.35	1.75	2.30	3.19	4.40	4.93	5.90	9.00	14.51	25.70
	decile sha	1.92	2.37	3.10	4.39	6.01	6.82	8.04	12.40	19.82	35.13
Spain	no. obs.	2482	3150	2717	2763	2637	2541	2756	2825	3120	5994
	mean	133447	160260	172219	223873	238645	300106	303371	353589	449885	911153
	s.e.	7889	9000	8927	13715	21126	32913	20725	23172	29065	60023
	mean/GDP	5.88	7.06	7.59	9.86	10.51	13.22	13.36	15.58	19.82	40.14
	decile sha	4.13	4.96	5.30	6.95	7.47	9.20	9.38	11.06	13.49	28.06
Finland	no. obs.	3665	3250	4065	4660	4680	5515	6110	6215	7185	9600
	mean	57267	66635	95618	123239	140213	170715	210365	242927	286079	585926
	s.e.	3970	4403	4461	4837	5081	5737	6208	6594	6800	15244
	mean/GDP	1.72	2.00	2.87	3.70	4.21	5.13	6.32	7.30	8.59	17.60
	decile sha	2.89	3.37	4.83	6.23	7.08	8.63	10.64	12.27	14.46	29.61
France	no. obs.	6860	6115	6195	6225	6230	6605	6585	7110	7930	15175
	mean	82069	84987	103995	149564	154193	192076	239680	278044	366258	932269
	s.e.	10316	6014	6729	12148	7699	9005	10163	14401	9867	54991
	mean/GDP	2.74	2.84	3.48	5.00	5.16	6.42	8.02	9.30	12.25	31.18
	decile sha	3.21	3.26	4.02	5.81	5.95	7.44	9.28	10.76	14.18	36.09
Greece	no. obs.	1436	1451	1498	1601	1530	1487	1547	1424	1422	1459
	mean	66085	85012	93032	120821	137101	162965	165658	187711	227395	353503
	s.e.	8150	6702	6180	10287	9502	15451	16885	19023	14039	23649
	mean/GDP	3.32	4.27	4.67	6.07	6.89	8.19	8.32	9.43	11.43	17.76
	decile sha	4.16	5.36	5.78	7.95	8.30	10.07	10.30	11.75	14.26	22.07
Italy	no. obs.	3975	4015	3905	4030	3635	4105	4045	3980	4120	3945
	mean	108758	112185	145638	173529	199735	225736	288400	316128	386400	914981
	s.e.	19329	9406	9266	14328	10271	11860	18626	15987	16082	46946
	mean/GDP	4.23	4.37	5.67	6.75	7.77	8.78	11.22	12.30	15.04	35.60
	decile sha	3.80	3.90	5.07	6.05	6.95	7.86	10.09	10.98	13.48	31.81
Luxembourg	no. obs.	413	331	329	355	369	393	551	523	646	840
	mean	255428	286496	479022	363635	510705	590730	663460	994111	1248895	2547354
	s.e.	52162	72994	127005	50473	70911	76489	51219	203665	296445	446076
	mean/GDP	3.30	3.70	6.19	4.70	6.60	7.63	8.57	12.84	16.14	32.91
	decile sha	3.28	3.62	6.05	4.58	6.65	7.17	8.39	12.47	15.83	31.96
Malta	no. obs.	463	486	469	439	398	386	425	371	394	384
	mean	164142	198366	224412	276607	249900	266936	324982	422015	474172	1197901
	s.e.	25501	31192	27304	37496	34070	50565	49986	53064	57821	514910
	mean/GDP	10.52	12.72	14.39	17.73	16.02	17.11	20.83	27.05	30.40	76.79
	decile sha	4.37	5.24	5.94	7.29	6.62	7.06	8.66	11.04	12.77	31.01
Netherlands	no. obs.	527	458	501	571	528	660	671	779	875	935
	mean	209423	153435	174193	193547	189349	229478	265284	327899	340775	438820
	s.e.	29812	30568	32121	29753	31519	27520	28849	42959	30899	37759
	mean/GDP	5.93	4.35	4.93	5.48	5.36	6.50	7.52	9.29	9.65	12.43
	decile sha	8.38	6.06	6.95	7.71	7.47	9.05	10.53	13.01	13.52	17.32
Portugal	no. obs.	2531	2087	2165	2205	2034	2029	2157	2167	2152	2493
	mean	75956	67679	81798	103073	112799	141854	147628	162344	229282	582353
	s.e.	7357	10013	11184	11940	9525	14126	10988	11156	19414	68064
	mean/GDP	4.66	4.15	5.02	6.32	6.92	8.70	9.06	9.96	14.07	35.73
	decile sha	4.59	3.86	4.85	6.00	6.63	8.34	8.66	9.57	13.40	34.11
Slovenia	no. obs.	110	121	121	195	209	218	144	192	225	180
	mean	131029	44842	129073	100119	137651	140398	124661	146604	253508	335286
	s.e.	28780	13274	17398	13544	23948	22315	42521	21271	33193	55061
	mean/GDP	7.57	2.59	7.46	5.79	7.96	8.12	7.21	8.47	14.65	19.38
	decile sha	8.79	2.87	8.45	6.41	8.95	9.09	8.18	9.39	16.83	21.03
Slovak Republic	no. obs.	988	984	1072	1137	1206	1182	1034	933	908	841
	mean	52491	51780	54092	82963	76579	78528	83345	94882	114552	142233
	s.e.	5685	4518	4238	7416	5582	4461	7555	7746	7728	12558
	mean/GDP	4.34	4.28	4.47	6.86	6.33	6.49	6.89	7.84	9.47	11.75
	decile sha	6.46	6.65	6.12	9.75	9.35	9.41	9.99	11.43	13.80	17.05

Table 6

Distribution of total assets across deciles of net wealth in some euro area Members, 2010, Euro and per cent respectively

Decile		1	2	3	4	5	6	7	8	9	10
Austria	no. obs.	1073	1150	1249	1173	1148	1192	1228	1261	1228	1198
	mean	17720	5219	13007	27675	65611	129122	193664	271026	429072	1668932
	s.e.	11885	876	1329	2618	4973	5074	7124	5377	11747	472624
	mean/GDP	0.52	0.15	0.38	0.81	1.92	3.79	5.68	7.95	12.58	48.94
	decile shai	0.62	0.19	0.47	1.00	2.36	4.67	6.97	9.78	15.40	58.54
Belgium	no. obs.	937	929	944	900	1012	1139	1278	1377	1418	1701
	mean	9006	12904	80119	175699	217861	269905	351975	443196	610682	1523092
	s.e.	3199	2940	6591	6498	5364	8544	8699	8494	9612	75571
	mean/GDP	0.26	0.38	2.35	5.15	6.39	7.92	10.32	13.00	17.91	44.67
	decile shai	0.25	0.35	2.16	4.75	5.90	7.33	9.53	12.02	16.53	41.18
Cyprus	no. obs.	546	474	454	480	586	592	691	709	701	952
	mean	32262	65111	144104	207727	277935	382553	501996	708649	1148692	3975569
	s.e.	12977	9260	11162	10154	9674	15908	18674	18966	38303	454122
	mean/GDP	1.54	3.10	6.86	9.89	13.24	18.22	23.90	33.75	54.70	189.31
	decile shai	0.44	0.88	1.92	2.81	3.76	5.14	6.76	9.54	15.53	53.22
Germany	no. obs.	1250	1175	1223	1379	1294	1395	1508	2027	2713	3861
	mean	17988	2576	11487	26156	60014	106579	158208	242182	373586	1226479
	s.e.	4255	324	1891	2459	5429	5392	5870	4655	6695	103196
	mean/GDP	0.59	0.08	0.38	0.86	1.97	3.49	5.19	7.94	12.25	40.21
	decile shai	0.81	0.12	0.52	1.18	2.69	4.79	7.11	10.93	16.77	55.08
Spain	no. obs.	2061	1927	2007	2180	2250	2349	2785	2811	3595	9020
	mean	32612	55079	116675	144439	187610	238676	279252	357728	510121	1320130
	s.e.	7871	4062	4958	3838	3442	6756	4378	4377	6787	61577
	mean/GDP	1.44	2.43	5.14	6.36	8.26	10.51	12.30	15.76	22.47	58.16
	decile shai	1.01	1.70	3.59	4.46	5.80	7.36	8.62	11.05	15.75	40.66
Finland	no. obs.	4510	3450	3960	4465	4525	5010	5705	6810	7285	9225
	mean	47269	8067	22503	72194	109903	145259	188166	258946	353892	773511
	s.e.	2336	1042	1481	2223	1985	1918	1902	2239	2185	14963
	mean/GDP	1.42	0.24	0.68	2.17	3.30	4.36	5.65	7.78	10.63	23.23
	decile shai	2.39	0.41	1.14	3.65	5.55	7.35	9.51	13.07	17.91	39.03
France	no. obs.	5327	5069	4981	5512	6582	6590	6889	7658	9166	17256
	mean	8104	4602	15919	53714	124854	179372	233947	304212	436406	1222366
	s.e.	3715	466	1467	2678	2729	2744	2404	2279	3141	55008
	mean/GDP	0.27	0.15	0.53	1.80	4.18	6.00	7.82	10.17	14.60	40.88
	decile shai	0.31	0.18	0.62	2.08	4.83	6.94	9.07	11.77	16.89	47.32
Greece	no. obs.	1884	1673	1513	1328	1351	1389	1459	1378	1418	1462
	mean	5805	12945	43049	74426	99283	126469	162445	204302	280371	590801
	s.e.	1224	1523	2115	2291	2775	2433	2407	3119	3771	20673
	mean/GDP	0.29	0.65	2.16	3.74	4.99	6.36	8.16	10.27	14.09	29.69
	decile shai	0.39	0.77	2.66	4.65	6.23	7.91	10.17	12.76	17.54	36.91
Italy	no. obs.	3800	3640	3535	3705	4385	4090	4010	4250	4205	4135
	mean	5464	13344	47626	105168	159688	206821	259843	337190	476965	1261566
	s.e.	1656	1502	2525	2492	1842	1548	1374	2650	3868	44963
	mean/GDP	0.21	0.52	1.85	4.09	6.21	8.05	10.11	13.12	18.56	49.09
	decile shai	0.20	0.45	1.64	3.66	5.56	7.21	9.10	11.75	16.57	43.86
Luxembourg	no. obs.	370	400	439	451	389	425	419	496	632	729
	mean	32681	38195	173280	336935	455703	519844	620949	811570	1152668	3799252
	s.e.	11830	12587	19559	16657	20221	14251	15074	18786	21132	483666
	mean/GDP	0.42	0.49	2.24	4.35	5.89	6.72	8.02	10.49	14.89	49.09
	decile shai	0.42	0.48	2.18	4.26	5.74	6.59	7.84	10.21	14.54	47.75
Malta	no. obs.	436	461	426	411	397	429	453	391	414	397
	mean	6276	40388	98740	151459	203269	252402	309548	421220	572983	1736915
	s.e.	860	3043	5460	4812	8489	4522	5249	9233	16454	503717
	mean/GDP	0.40	2.59	6.33	9.71	13.03	16.18	19.84	27.00	36.73	111.34
	decile shai	0.17	1.07	2.62	4.01	5.35	6.68	8.23	11.05	15.16	45.66
Netherlands	no. obs.	388	364	419	483	481	649	698	820	990	1213
	mean	119281	23307	48979	109468	163967	223678	286206	338295	430587	779153
	s.e.	22333	10236	12715	12899	15750	18035	10872	11047	23581	35118
	mean/GDP	3.38	0.66	1.39	3.10	4.64	6.34	8.11	9.58	12.20	22.07
	decile shai	4.79	0.92	1.95	4.33	6.51	8.87	11.29	13.43	17.05	30.87
Portugal	no. obs.	2481	2160	2189	1873	2038	2046	2136	2283	2261	2553
	mean	7798	13461	37859	59073	76722	104753	130959	181717	257666	834756
	s.e.	1672	2232	3295	2594	1816	2370	2135	3114	4327	65583
	mean/GDP	0.48	0.83	2.32	3.62	4.71	6.43	8.03	11.15	15.81	51.21
	decile shai	0.46	0.79	2.21	3.47	4.52	6.13	7.68	10.67	15.14	48.93
Slovenia	no. obs.	145	144	171	163	199	175	166	182	166	204
	mean	2658	19558	45701	72145	93198	125008	153762	215752	275891	550724
	s.e.	916	3434	4059	3703	4218	4089	7052	11803	11969	61998
	mean/GDP	0.15	1.13	2.64	4.17	5.39	7.23	8.89	12.47	15.95	31.83
	decile shai	0.18	1.32	2.92	4.67	6.12	8.11	9.70	14.40	17.60	34.97
Slovak Republic	no. obs.	2089	1126	883	933	917	848	830	869	882	908
	mean	6471	28301	39980	48464	59512	69113	81340	99729	130724	267218
	s.e.	820	1073	821	1054	923	778	704	979	2089	11602
	mean/GDP	0.53	2.34	3.30	4.01	4.92	5.71	6.72	8.24	10.80	22.08
	decile shai	0.78	3.42	4.85	5.79	7.17	8.33	9.81	12.02	15.75	32.08

Table 7

Distribution of HMR assets across deciles of total household net wealth in some euro area Members, 2010, Euro and per cent respectively

Decile		1	2	3	4	5	6	7	8	9	10
Austria	no. obs.	1073	1150	1249	1173	1148	1192	1228	1261	1228	1198
	mean	9477	9477	1624	3627	23302	81623	130171	191669	264807	526242
	s.e.	9793	9793	1314	2708	4826	5080	8747	5433	11211	47873
	mean/GDP	0.28	0.28	0.05	0.11	0.68	2.39	3.82	5.62	7.77	15.43
	decile sha	0.77	0.77	0.13	0.30	1.89	6.65	10.54	15.61	21.46	42.65
Belgium	no. obs.	937	929	944	900	1012	1139	1278	1377	1418	1701
	mean	4484	2913	40814	132234	175209	207152	262448	288495	323567	466588
	s.e.	2496	1744	6385	7685	6358	10416	10956	11206	10775	27770
	mean/GDP	0.13	0.09	1.20	3.88	5.14	6.07	7.70	8.46	9.49	13.68
	decile sha	0.24	0.15	2.13	6.93	9.21	10.91	13.79	15.18	16.99	24.47
Cyprus	no. obs.	546	474	454	480	586	592	691	709	701	952
	mean	14634	32424	90949	149779	186373	236507	292260	336317	426729	673381
	s.e.	7741	7724	11428	11877	12730	19767	23751	24814	38272	66401
	mean/GDP	0.70	1.54	4.33	7.13	8.87	11.26	13.92	16.02	20.32	32.07
	decile sha	0.61	1.34	3.69	6.16	7.67	9.68	11.99	13.79	17.58	27.48
Germany	no. obs.	1250	1175	1223	1379	1294	1395	1508	2027	2713	3861
	mean	7972	7972	2230	4824	22584	48949	82069	153664	216846	371480
	s.e.	2222	2222	1459	1447	4095	4926	6298	6341	6685	20017
	mean/GDP	0.26	0.26	0.07	0.16	0.74	1.60	2.69	5.04	7.11	12.18
	decile sha	0.88	0.88	0.25	0.53	2.48	5.37	9.01	16.94	23.78	40.76
Spain	no. obs.	2061	1927	2007	2180	2250	2349	2785	2811	3595	9020
	mean	17548	38816	91552	116717	150978	181739	201639	233929	286778	427021
	s.e.	3930	3883	4015	3982	4095	5037	6896	8562	9698	17762
	mean/GDP	0.77	1.71	4.03	5.14	6.65	8.01	8.88	10.31	12.63	18.81
	decile sha	1.01	2.23	5.23	6.69	8.66	10.39	11.55	13.41	16.43	24.41
Finland	no. obs.	4510	3450	3960	4465	4525	5010	5705	6810	7285	9225
	mean	36245	5468	12437	48827	81483	107937	129357	161704	198953	299114
	s.e.	2037	940	1320	2196	1986	1989	2248	2550	3186	5627
	mean/GDP	1.09	0.16	0.37	1.47	2.45	3.24	3.88	4.86	5.97	8.98
	decile sha	3.36	0.51	1.15	4.51	7.53	9.99	11.96	14.94	18.43	27.62
France	no. obs.	5327	5069	4981	5512	6582	6590	6889	7658	9166	17256
	mean	3777	322	3527	24383	80464	129917	165585	202562	251895	366227
	s.e.	3316	292	1238	2716	3432	4503	4007	3845	5023	7977
	mean/GDP	0.13	0.01	0.12	0.82	2.69	4.35	5.54	6.77	8.42	12.25
	decile sha	0.31	0.03	0.29	1.98	6.55	10.57	13.49	16.48	20.49	29.81
Greece	no. obs.	1884	1673	1513	1328	1351	1389	1459	1378	1418	1462
	mean	2101	4873	27830	56240	77829	95705	116978	135495	158946	218731
	s.e.	865	1448	2254	2784	2997	2914	3626	5333	7327	13609
	mean/GDP	0.11	0.24	1.40	2.83	3.91	4.81	5.88	6.81	7.99	10.99
	decile sha	0.25	0.52	3.08	6.29	8.73	10.70	13.09	15.12	17.78	24.43
Italy	no. obs.	3800	3640	3535	3705	4385	4090	4010	4250	4205	4135
	mean	897	2447	20006	73343	122206	165969	203962	252297	325382	580342
	s.e.	559	1508	2639	3262	2624	2974	3154	3703	6395	33142
	mean/GDP	0.03	0.10	0.78	2.85	4.76	6.46	7.94	9.82	12.66	22.58
	decile sha	0.05	0.13	1.14	4.20	7.00	9.51	11.75	14.45	18.59	33.18
Luxembour	no. obs.	370	400	439	451	389	425	419	496	632	729
	mean	10708	7343	102109	218314	344924	435669	480280	591847	671484	1252332
	s.e.	6946	6817	18921	22418	20781	17026	21246	25616	33162	272802
	mean/GDP	0.14	0.09	1.32	2.82	4.46	5.63	6.21	7.65	8.68	16.18
	decile sha	0.26	0.18	2.48	5.33	8.37	10.65	11.69	14.35	16.33	30.35
Malta	no. obs.	436	461	426	411	397	429	453	391	414	397
	mean	0	11117	62527	110088	146126	187717	215442	257110	282192	401354
	s.e.	0	2774	6648	5686	9022	8600	9621	14467	19795	35760
	mean/GDP	0.00	0.71	4.01	7.06	9.37	12.03	13.81	16.48	18.09	25.73
	decile sha	0.00	0.66	3.76	6.59	8.71	11.25	12.96	15.27	16.91	23.89
Netherlanc	no. obs.	388	364	419	483	481	649	698	820	990	1213
	mean	94724	14764	28849	63557	91940	144723	199411	225240	278639	403750
	s.e.	18827	9469	10125	14861	15873	18757	20143	12951	15709	16248
	mean/GDP	2.68	0.42	0.82	1.80	2.60	4.10	5.65	6.38	7.89	11.44
	decile sha	6.21	0.95	1.88	4.10	5.96	9.37	12.83	14.60	18.00	26.10
Portugal	no. obs.	2481	2160	2189	1873	2038	2046	2136	2283	2261	2553
	mean	5190	8806	24794	45157	58172	74545	89074	136602	155151	216568
	s.e.	1483	2135	3285	2502	2573	3570	2748	3884	4553	8598
	mean/GDP	0.32	0.54	1.52	2.77	3.57	4.57	5.46	8.38	9.52	13.29
	decile sha	0.64	1.08	3.03	5.56	7.18	9.13	10.93	16.79	19.09	26.58
Slovenia	no. obs.	145	144	171	163	199	175	166	182	166	204
	mean	667	11986	35538	64638	77203	106135	127317	187254	196437	233753
	s.e.	673	3792	4675	4204	6275	6986	13015	13359	10668	25640
	mean/GDP	0.04	0.69	2.05	3.74	4.46	6.13	7.36	10.82	11.35	13.51
	decile sha	0.07	1.20	3.38	6.21	7.55	10.24	11.95	18.61	18.69	22.11
Slovak Rep	no. obs.	2089	1126	883	933	917	848	830	869	882	908
	mean	3782	22964	33330	41250	48746	57834	67617	80181	96470	165682
	s.e.	804	1270	1321	1175	1296	1186	1744	2012	2706	8818
	mean/GDP	0.31	1.90	2.75	3.41	4.03	4.78	5.59	6.63	7.97	13.69
	decile sha	0.61	3.73	5.44	6.63	7.90	9.37	10.97	12.99	15.62	26.75

Note: No ownership of the household main residence is considered 0.

Table 8

Distribution of HMR assets net of HMR mortgage across deciles of total household net wealth in some euro area Members, 2010, Euro and per cent respectively

Decile		1	2	3	4	5	6	7	8	9	10
Austria	no. obs.	1073		1249	1173	1148	1192	1228	1261	1228	1198
	mean	-10728		-60	59	4563	24233	39725	54414	70065	176466
	s.e.	15336		156	393	1547	3859	7837	8404	13077	39586
	mean/GDP	-0.31		0.00	0.00	0.13	0.71	1.16	1.60	2.05	5.17
	decile sha	-3.27	-0.01	-0.02	0.01	1.26	6.79	11.03	15.24	19.54	49.42
Belgium	no. obs.	937	929	944	900	1012	1139	1278	1377	1418	1701
	mean	228	201	9152	44273	68675	62948	81696	92240	87270	76165
	s.e.	358	195	2163	4548	7286	11774	12168	12242	12086	15895
	mean/GDP	0.01	0.01	0.27	1.30	2.01	1.85	2.40	2.70	2.56	2.23
	decile sha	0.04	0.04	1.74	8.45	13.14	12.08	15.62	17.66	16.68	14.54
Cyprus	no. obs.	546	474	454	480	586	592	691	709	701	952
	mean	-7194	5830	21816	48956	57254	85071	99090	139272	172049	231191
	s.e.	7636	2157	4940	8441	10145	12790	21604	24716	37339	53261
	mean/GDP	-0.34	0.28	1.04	2.33	2.73	4.05	4.72	6.63	8.19	11.01
	decile sha	-0.85	0.69	2.53	5.75	6.74	9.95	11.61	16.34	20.27	26.96
Germany	no. obs.	1250	1175	1223	1379	1294	1395	1508	2027	2713	3861
	mean	-4475	-4475	-75	23	3793	12568	21531	38992	63730	86316
	s.e.	2004	2004	340	507	965	2224	3413	4450	6147	12745
	mean/GDP	-0.15	-0.15	0.00	0.00	0.12	0.41	0.71	1.28	2.09	2.83
	decile sha	-2.02	-2.02	-0.03	0.01	1.70	5.65	9.69	17.60	28.63	38.79
Spain	no. obs.	2061	1927	2007	2180	2250	2349	2785	2811	3595	9020
	mean	-1895	6463	26668	37136	39508	50745	54146	52557	58547	69882
	s.e.	1481	1085	2821	3974	4446	5151	6343	8490	11735	11733
	mean/GDP	-0.08	0.28	1.17	1.64	1.74	2.24	2.39	2.32	2.58	3.08
	decile sha	-0.48	1.65	6.76	9.44	10.05	12.87	13.76	13.37	14.87	17.72
Finland	no. obs.	4510	3450	3960	4465	4525	5010	5705	6810	7285	9225
	mean	-8063	-67	231	8681	23023	33401	40297	48100	59337	85192
	s.e.	1008	81	313	687	1143	1750	2077	2405	3315	4828
	mean/GDP	-0.24	0.00	0.01	0.26	0.69	1.00	1.21	1.44	1.78	2.56
	decile sha	-2.79	-0.02	0.08	2.99	7.93	11.53	13.89	16.57	20.49	29.33
France	no. obs.	5327	5069	4981	5512	6582	6590	6889	7658	9166	17256
	mean	-184	19	396	4589	22047	35494	43053	46725	48708	59935
	s.e.	289	33	211	616	1602	2960	3553	4177	4711	5095
	mean/GDP	-0.01	0.00	0.01	0.15	0.74	1.19	1.44	1.56	1.63	2.00
	decile sha	-0.07	0.01	0.15	1.76	8.45	13.61	16.53	17.91	18.67	22.98
Greece	no. obs.	1884	1673	1513	1328	1351	1389	1459	1378	1418	1462
	mean	31	416	4475	10387	9991	16225	20655	23390	16349	28076
	s.e.	119	182	872	1796	2055	3145	3792	4364	3320	7399
	mean/GDP	0.00	0.02	0.22	0.52	0.50	0.82	1.04	1.18	0.82	1.41
	decile sha	0.03	0.30	3.40	7.99	7.71	12.49	15.91	17.98	12.59	21.59
Italy	no. obs.	3800	3640	3535	3705	4385	4090	4010	4250	4205	4135
	mean	-306	53	2311	10353	15312	15394	15439	28287	37225	54883
	s.e.	219	31	536	1468	2182	2604	2504	4966	6316	9627
	mean/GDP	-0.01	0.00	0.09	0.40	0.60	0.60	0.60	1.10	1.45	2.14
	decile sha	-0.18	0.03	1.28	5.79	8.57	8.61	8.68	15.82	20.76	30.64
Luxembour	no. obs.	370	400	439	451	389	425	419	496	632	729
	mean	2108	263	10853	85688	150114	175575	123805	242455	225125	159690
	s.e.	2034	2500	4014	12736	17491	29361	26143	33704	39555	40227
	mean/GDP	0.03	0.00	0.14	1.11	1.94	2.27	1.60	3.13	2.91	2.06
	decile sha	0.18	0.02	0.92	7.31	12.74	15.02	10.55	20.57	19.15	13.54
Malta	no. obs.	436	461	426	411	397	429	453	391	414	397
	mean	0	1825	10543	23498	14868	25939	29189	40046	32778	25259
	s.e.	0	1247	3076	6146	5394	8329	10282	11419	12042	15922
	mean/GDP	0.00	0.12	0.68	1.51	0.95	1.66	1.87	2.57	2.10	1.62
	decile sha	0.00	0.90	5.20	11.55	7.27	12.75	14.39	19.52	16.11	12.33
Netherlanc	no. obs.	388	364	419	483	481	649	698	820	990	1213
	mean	-13742	-451	715	7478	19206	52267	93888	112305	111082	158263
	s.e.	7830	1023	1500	2753	6177	12160	11242	11094	14329	17856
	mean/GDP	-0.39	-0.01	0.02	0.21	0.54	1.48	2.66	3.18	3.15	4.48
	decile sha	-2.58	-0.08	0.13	1.38	3.56	9.66	17.29	20.82	20.56	29.26
Portugal	no. obs.	2481	2160	2189	1873	2038	2046	2136	2283	2261	2553
	mean	-1194	223	2746	10076	14869	20600	20210	38758	37323	53874
	s.e.	508	253	499	1333	1796	2194	2496	4178	4703	6594
	mean/GDP	-0.07	0.01	0.17	0.62	0.91	1.26	1.24	2.38	2.29	3.31
	decile sha	-0.61	0.11	1.38	5.11	7.56	10.40	10.22	19.63	18.93	27.25
Slovenia	no. obs.	145	144	171	163	199	175	166	182	166	204
	mean	-212	-212	3553	16318	13890	15745	4654	13979	18147	50128
	s.e.	213	213	4848	10110	7379	7448	4118	9383	11780	18700
	mean/GDP	-0.01	-0.01	0.21	0.94	0.80	0.91	0.27	0.81	1.05	2.90
	decile sha	-0.16	-0.16	2.68	11.81	10.44	11.61	3.28	10.85	12.92	35.67
Slovak Rep	no. obs.	2089	1126	883	933	917	848	830	869	882	908
	mean	632	2913	3415	2497	4578	3451	2563	5306	5899	20927
	s.e.	265	537	759	845	1030	1059	1010	1605	1569	4258
	mean/GDP	0.05	0.24	0.28	0.21	0.38	0.29	0.21	0.44	0.49	1.73
	decile sha	1.22	5.60	6.60	4.75	8.78	6.63	4.92	10.18	11.32	40.01

Note: No ownership of the household main residence is considered 0.

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COMMENT TO "WEALTH DISTRIBUTION AND TAXATION IN EU MEMBERS" BY ANNA IARA

Álvaro Pina[*]

This very interesting study by Anna Iara contains three main contributions. First, it presents an overview of wealth distribution and wealth taxation in European Union (EU) countries, drawing on the Eurosystem Household Finance and Consumption Survey (HFCS) and on Ernst and Young (2014). Second, the paper offers a summary of arguments in favour of asset-based taxation, taking account of efficiency, equity, political economy and tax administration considerations. Third, Iara's study discusses design and implementation issues, at both national and supranational levels, for taxation of three forms of wealth: housing, net wealth, and bequests and gifts.

My discussion will be structured along similar lines. I will start by reporting some evidence on wealth taxation, resorting to an alternative statistical source. I will then briefly discuss the case for taxation of wealth transfers and net wealth on both efficiency and equity grounds. In my view, arguments for taxation are stronger as regards wealth transfers, but there are considerable design and implementation challenges. While efforts to overcome these challenges are called for, priority should nonetheless be given to improving the taxation of capital income: progress in this area, highly desirable in itself, may also make the taxation of wealth transfers more feasible in the future.

Revenues from wealth taxation are small

In the OECD classification of taxes (OECD, 2014), wealth taxation can be approximated by taxes on property. Average revenue across the OECD from this category of taxes is summarised in Table 1.

Unsurprisingly, these taxes often yield limited revenue, and are heavily tilted towards recurrent taxes on real estate and, to a smaller extent, transaction taxes (falling on either real estate or on other assets). Recurrent taxes on net wealth and estate, inheritance and gift taxes have on average a residual dimension, and in some countries simply do not exist (Figure 1). There is broad consensus that recurrent taxes on immovable property tend to be among the most growth-friendly forms of taxation (for instance, by avoiding that capital allocation is distorted into housing and by penalising vacant property), and that transaction taxes are often highly distortive (Johansson *et al.*, 2008). In contrast, there is less agreement among economists on whether wealth transfers and net wealth should be taxed. Some discussion on the pros and cons of these latter taxes therefore ensues.

The case for taxing wealth transfers tends to be stronger than for taxing net wealth

If my interpretation is correct, the general balance of arguments in Anna Iara's paper tends to favour taxing net wealth over taxing wealth transfers (see, e.g., the last paragraph of Section 4.3). One of the arguments invoked is the ambiguity of bequest motives.

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Table 1

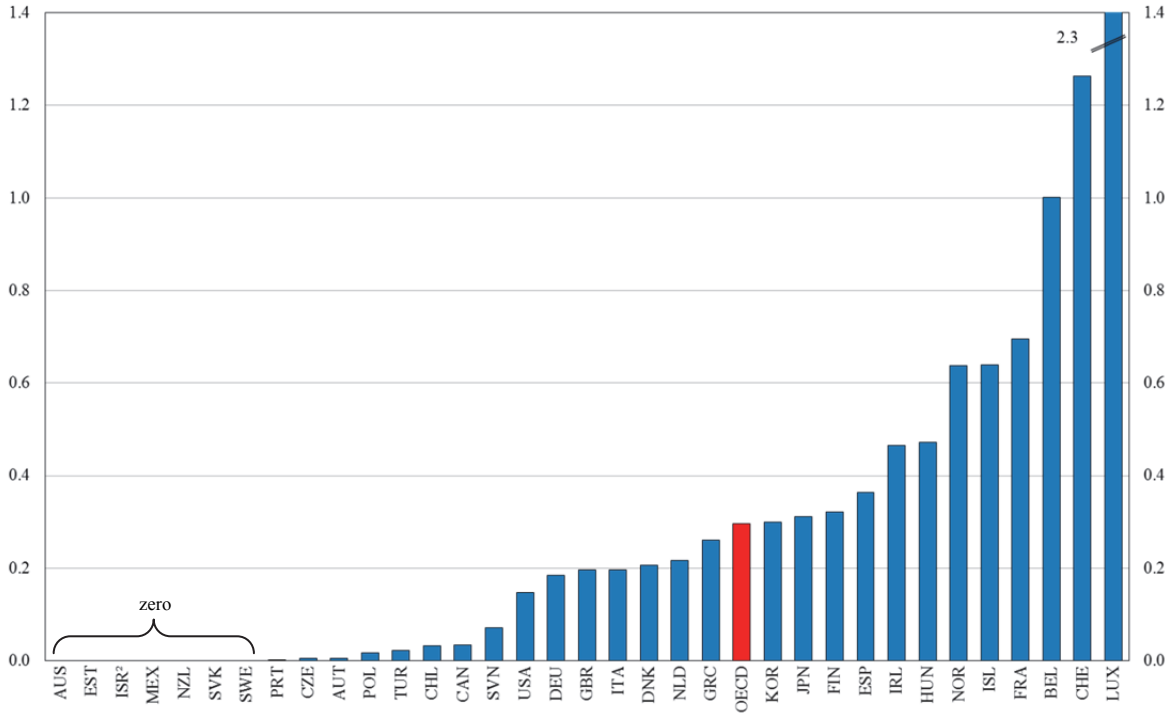
Wealth Taxation in the OECD, 2013
(tax revenue as a percentage of GDP)[1]

	OECD Average
Taxes on property	**1.82**
Recurrent taxes on immovable property	1.09
Recurrent taxes on net wealth	0.18
Estate, inheritance and gift taxes	0.13
Taxes on financial and capital transactions	0.40
Non-recurrent taxes	0.03
Other recurrent taxes on property	0.01

1. Estimate calculated using 2012 data for Australia, Greece, Mexico, Netherlands and Poland.
Source: OECD (2015), "Revenue Statistics: Comparative tables", OECD Tax Statistics (database).

Figure 1

Wealth Taxation in OECD Countries, 2103
(recurrent taxes on net wealth plus estate, inheritance and gift taxes as a percentage of GDP)[1]



2012 for Australia, Greece, Mexico, Netherlands, Poland and the OECD average.
The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.
Source: OECD (2015), "Revenue Statistics: Comparative tables", OECD Tax Statistics (database).

This ambiguity – or rather, variety – of motivations can in my view help justify wealth transfer taxation on efficiency grounds. To the extent that bequests are unplanned or accidental – which would correspond to wealth accumulation driven only by consumption smoothing or precautionary motivations – taxation, even at a high rate, entails no disincentive to save (Cremer, 2010). Bequests guided by strategic considerations (e.g., in exchange for care or attention) should also arguably be taxed. It is only when bequests are driven by pure altruism that, under certain additional conditions, zero taxation would be optimal from an efficiency viewpoint. While some altruism will likely be behind many bequests, making taxation distortive to some extent, a counterargument is that inheritances also reduce the incentives to save and work of recipients (Mirrlees et al., 2011).

The efficiency case for a periodic tax on the stock of wealth, especially on top of capital income taxation, appears weaker. Adverse effects on capital accumulation and growth are a common concern, especially with high capital mobility. Further, while a tax on wealth is roughly equal to a tax on capital income from that wealth, the wealth tax is more exposed to the objection of taxing normal returns to savings but not taxing excess returns (for instance, in the corporate context, capital income taxation can be designed to avoid taxing normal returns on capital through an ACE – allowance for corporate equity – system). Wealth taxation could be advocated as a backstop to taxing capital income, but it is far from clear whether taxing wealth stocks is any easier than capital income.

On equity grounds, both taxes on net wealth and on wealth transfers are generally desirable. As Anna Iara's paper shows, wealth tends to be highly concentrated across households in European countries. In most of these countries, the recent crisis has made distributional concerns more pressing, with increases in income inequality, poverty incidence and poverty intensity. An important goal in itself, greater equity is also likely to bring benefits on a number of other fronts, such as efficiency gains associated to less scope for rent-seeking by politically-influent wealthy citizens, a better functioning of democracy and possibly less macroeconomic instability (by avoiding that low-income households take excessive debt to keep up with consumption norms). The paper has the merit of highlighting these different potential benefits.

Given major challenges to taxing wealth transfers, improving capital income taxation is key

Taxing wealth transfers would often be desirable, but would also face considerable challenges. There are ample avoidance opportunities, especially for transfers *inter vivos* concerning non-real estate assets. This tends to have regressive implications: the wealthy are in a better position to avoid taxation than the middle classes, for whom wealth often largely consists of owner-occupied housing and other (modest) assets hard to dispose of (Mirrlees *et al.*, 2011). Other hurdles include valuation difficulties and cash constraints on some asset owners (e.g. family businesses), though these constraints could at least in some cases be alleviated by tax deferrals. Failure to successfully implement taxation of wealth transfers – ideally falling on the recipient and taking account of all gifts and bequests received over a lifetime, possibly with an exemption level for small amounts – decreases potential efficiency and equity gains, and likely leads to (even) greater political resistance to such taxes.

These difficulties, and the drawbacks of net wealth taxation briefly discussed above, are arguments to give priority to improving the taxation of capital income, for which international cooperation is key. A major breakthrough in this domain was the recent (2014) adoption of a single, global standard (the Common Reporting Standard, CRS) for Automatic Exchange of Information (AEOI) in tax matters. Developed by the OECD at the request of G20 countries, the CRS asks jurisdictions to obtain information from their financial institutions and automatically

share that information, on an annual basis, with foreign countries. Over 90 jurisdictions have now committed to implementing the CSR by 2017 or 2018, thus giving tax authorities automatic access to data on account balances and multiple types of investment income. Progress in AEOI might also enable countries to tax capital income of individuals resident for tax purposes in the country at (modestly) progressive rates through dual progressive income taxation, which would be equity-enhancing. In the future, better information on capital income, and associated cross-checking between wealth stocks and income flows, will also likely make it more feasible to successfully implement taxation of wealth transfers.

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PROPERTY TAX REFORM AND THE USER COST OF OWNER-OCCUPIED HOUSING IN THE EU

Salvador Barrios,[*] *Serena Fatica*[**] *and Jonathan Pycroft*[**]

In this paper we compute the user cost of housing capital investment in four EU countries (France, Italy, Spain and the UK) following Poterba (1984, 1992) and Poterba and Sinai (2008) to investigate the role played by tax policy during the recent period. Our results suggest that current tax provisions – including both recurrent property taxes and mortgage interest tax deductions – bring about significant differences in the user cost of capital across income deciles. Taking a normative perspective, we also simulate the effects of taxing imputed rental income. In a sensitivity analysis, we show that house price evolutions have dominated other considerations about the user cost over the recent period, leading to large variations in the cost of housing investment. This even occurs when prospective homeowners incorporate a long-term view of the housing market.

1 Introduction

The housing bubble boom and bust represent a key element of the recent global financial crisis. In certain instances tax incentives have played a non-trivial role toward incentivising home acquisition in the wake of buoying asset prices and credit access. While home ownership is often considered as positive from a social perspective (e.g., higher civic behaviour of home owners), sharp fluctuations in house prices might also have disrupting effect on the economy as a whole, including for public finances, consumption and the labour market, (see Bover and Jimeno, 2007 and Bover, 2006). For instance countries such as Ireland and Spain have experienced substantial tax revenues windfalls and shortfalls in close connection with the house price evolutions, (see Barrios and Rizza, 2010). From a household perspective, housing investment often represent the most important lifetime investment and house price fluctuations and mortgages can have very large effects on net wealth and consumption, see Bover (2012).

In this paper we investigate this issue taking a user cost of capital approach to owner-occupied housing (Poterba, 1984 and 1992; Poterba and Sinai, 2008). Based on this approach, home ownership is considered as an investment decision and an indicator for the marginal cost of investing in housing against investment alternatives is considered taking explicitly the role of tax incentives (through property taxes and mortgage deductibility) into account. We compute country-specific average user costs of capital to analyse the role of tax policy and housing price expectations on the cost of housing investment per income decile based on micro-data across a set of EU countries.

The paper utilises the EUROMOD microsimulation model, which makes use of the EU-SILC data set, to provide detailed household-level information, including incomes, tax rates and demographic characteristics. Individual variations in the determination of the user cost of housing investment is introduced across a number of key variables, namely marginal income tax rates, mortgage interest relief and property taxes (including a hypothetical imputed rent tax). Indicators on the effective tax burden are calculated at household level considering explicitly the interaction of the tax system, including specific housing tax provisions, with the benefit system.

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These tax indicators are combined with long-run time series on house prices in order to consider alternative hypotheses regarding the housing price expectations.

The analysis is carried out for selected EU countries, namely France, Italy, Spain and the UK, focusing on the distributional impacts by income decile, which allows for a focus on which household groups are (dis)favoured by the current tax system, and how this has possibly changed under the various tax reforms implemented in the countries considered. Our results show that house price expectations are key to determine the evolutions of the cost of housing investment and that the tax systems, which often provide generous tax rebate on mortgage interest payments, can lead to significant differences in the cost of owner-occupied households across income deciles.

The following section outlines the theoretical background to our approach. Section 3 explains how the baseline estimates were obtained and shows the baseline values by income decile. Section 4 explains the simulations carried out and analyses the results, and Section 5 concludes drawing out some policy implications of the research.

2 Theoretical framework

2.1 The user cost of housing

Incentives to homeownership can be captured by a synthetic measure, the user cost of capital (Himmelberg et al., 2005). Under this approach, homeownership is considered an investment decision, and treated as such according to the neoclassical investment theory (Poterba, 1984). In such framework, an equilibrium relationship is derived between the imputed rental income accruing to homeowners and the cost associated with homeownership, which in turn identifies the marginal cost of purchasing additional housing services. The user cost has been extensively used to measure tax expenditures favouring owner-occupied housing, such as the tax exemption of imputed rents and the deductibility of mortgage interest payments, in the US (Poterba, 1992; Poterba and Sinai, 2008a; Poterba and Sinai, 2008b).

Our analysis follows this well-established literature closely. As a starting point, it is useful to consider the hypothetical case where homeownership is treated as a business, and thus the associated economic profits are subject to taxation. With income tax deductions on the interest paid on mortgage the net-of-tax income could be expressed as:

$$(1-t)[R-\{i+t_p+\beta+m+\delta-\pi\}P_H]$$

where R is the imputed rental income from housing capital, P_H is the price of a unit of housing capital, t is the income tax rate, i is the owner's interest, or foregone equity cost, t_p is the recurrent property tax rate.[1] In addition, β is a risk premium associated with the housing investment, δ is the economic depreciation rate, m denotes maintenance costs (assumed not tax-deductible), and π is the nominal asset revaluation term (capital gain).

In equilibrium, the net income from homeownership must be zero. This allows the derivation of the user cost of capital (denoted with c) as the ratio R/P_H or:

$$R/P_H \equiv c = \{i+t_p+\beta+m+\delta-\pi\}$$

Keeping in mind that the equilibrium relationship is valid with unchanged tax rules, the expression for the cost of capital can be modified to account for the different tax provisions

[1] Throughout the analysis, we rule out the possibility recurrent property taxes are benefit taxes. In other words, we do not consider the case where, by financing local public services, property taxes can indirectly provide a positive utility to taxpayers.

potentially applicable to homeownership. In particular, some taxes fall on ownership in a recurrent fashion. They can be designed as taxes on the flow of services from ownership (taxation of imputed rents), or on (a proxy of the value of) the stock, such as the recurrent property tax. Furthermore, a tax relief might be offered to the cost of financing housing by debt. In addition, taxes might be levied upon acquisition or disposal of immovable property, when they normally take the form of transfer (or registration) taxes and capital gains taxes, respectively.

Accounting for these taxes, while assuming – consistent with common practice – that imputed rents are not taxed, leads to the following general formulation for the cost of capital for an additional unit of housing investment:

$$c = \{i(1 - t_M\varphi)\lambda + t_p + \beta(1 - t_y) + m + \delta - \pi(1 - t_{capgain}) + (1 - \lambda)i(1 - t_y)\}(1 + t_{trans}) \quad (1)$$

The new elements in (1) are explained in turn. First, (1) assumes that, in the presence of a transfer tax, the actual disbursement for a housing unit of price P_H is $(1 + t_{trans})P_H$, where t_{trans} is the statutory transfer tax rate.[2] Moreover, when a capital gains tax is applied, the after-tax asset revaluation term becomes $\pi(1 - t_{capgain})$, with $t_{capgain}$ being the tax rate on the capital gains.

An important component of the generalised cost of capital relates to the financing of the house purchase. The formulation in (1) takes the traditional view that the financial cost is equal to a weighted average of the cost of equity and the cost debt, with weights given by the corresponding shares of finance (Poterba, 1992). However, we do not differentiate between the cost of equity and that of debt, and hence use a single interest rate to capture the cost of finance. As noted by Himmelberg *et al.* (2005), mortgage interest rates reflect the risk-adjusted required return on a housing loan, as well as a premium for the borrower's refinancing and default options. The cost of funds for a housing investment should not include these additional factors. Thus, in the empirical application, we use the 10-year government bond rate as a measure for the cost of funds. In the presence of a tax relief for mortgage interest payments, the after-tax nominal cost of debt becomes $i(1 - t_M\varphi)$, where $t_M$is the rate at which the relief is granted, and the φ is the fraction of interest benefitting for the tax subsidy. In the case of a deduction granted via the PIT system, t_M represents the marginal tax rate for the taxpayer. In the case of a tax credit reducing the individual tax liability proportionally to the interest paid, t_M would be the same across all taxpayers. The possibility of a cap to the amount of subsidised interest payments is introduced through the parameter φ, which ranges between 0 (no tax relief) to 1 (full tax relief). In practice, the parameter φ allows for additional heterogeneity to be included in the empirical model, since tax systems in Europe often link the amount of deductible interest to individual and household characteristics. The requirement of a down payment is incorporated via λ, the loan-to-value ratio. Hence, the fraction of the house that is equity-financed, $(1 - \lambda)$, foregoes earned interest at the unit yield of i, which is taxed, not necessarily under the PIT schedule, at the rate t_y, for which we employ the effective marginal tax rate (EMTR). The fact that housing and alternative assets are not in the same risk class is reflected in the pre-tax risk premium term β, for which the relevant tax rate is again t_y. Admittedly, the calibration of the risk premium is somewhat arbitrary, and is not explicitly derived from optimised portfolio choices based on the risk-return trade-off. In that, we again follow the available literature (Poterba and Sinai, 2008a).

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[2] In order to isolate the impact of transaction taxes, this formulation explicitly assumes no capitalisation of taxes into property prices.

2.2 A closer look at housing-related taxes

There is consensus in the literature that the tax exemption of imputed rental income represents the main tax expenditure for owner-occupied housing, in terms both of foregone revenue and induced economic distortions. Imputed rent refers to the amount that an owner would pay to rent a property of equivalent quality. The argument for taxing imputed rent can be derived from the Haig-Simons approach set forth in Haig (1921) and Simons (1938). The theoretical argument is that a comprehensive income tax base should reflect all the potential consumption opportunities – both monetary and non-monetary – while leaving the stock of wealth unaffected. Imputed rent clearly constitutes part of the homeowner's non-monetary consumption set (and hence, expands their monetary consumption set). Therefore excluding imputed rent from the tax base is argued to be undesirable on the grounds of horizontal equity (compared with otherwise similar renters), and also on efficiency grounds, as it would lead to distortions in the housing and rental markets.

The Haig-Simons approach would entail taxing the rental income it generates while allowing deduction of the costs incurred, including maintenance costs and interest payments in the case of debt-financed investment, depreciation and other costs of providing housing services. In this way, only the net return on investment would be subject to taxation. Capital gains from housing transactions would also be taxed to achieve neutrality *vis-à-vis* the taxation of other assets in countries where realised capital gains are subject to taxation more broadly.

In practice, however, while national tax systems vary significantly in their treatment of immovable property, they tend to be biased in favour of owner-occupied housing, in a way which is hard to justify from a purely economic point of view. For the purpose of our analysis, this warrants some qualifications of the general expression in (1). While the imputed rent tax exemption is duly reflected therein, in practice capital gains taxation of primary residences is usually either tax-exempt, or subject to specific conditions, for instance in terms of the duration of tenure. Likewise, recurrent property taxes present a high degree of heterogeneity, in terms of both design and revenue yield, thus entailing a very different effective tax burden across countries.

2.3 Calculating effective marginal tax rates with the EUROMOD microsimulation model

In order to calculate the individual rate of income tax, t_y, we calculate the effective marginal tax rate using EUROMOD, which is a microsimulation model of EU countries personal income taxes and benefits (including benefits such as unemployment, family benefits, etc.) applied to all household revenues sources, including wages, self-employment income, pensions and unemployment benefits. The model generates gross and net household income applying countries' tax codes and calculates theoretical benefit entitlements and tax liabilities. EUROMOD is a static model, *i.e.*, simulations abstract from potential behavioural reactions of a representative sample of individuals and of changes in the socio-demographic characteristics of the population. EUROMOD is managed, maintained, developed and updated by the Microsimulation Unit of the Institute for Social and Economic Research, based at the University of Essex, which is specialised in socio-economic research and surveys, in particular as regards the production and analysis of longitudinal data. The model is developed in collaboration with national experts who update the tax and benefit coding and provide updated reports on the tax and benefit system of each country. The European Commission has recently adopted the model for its tax modelling activities. The model is run and physically located at the Joint Research Centre premises in Seville (Institute for Prospective Technological Studies).The aggregate estimates for expenditure and number of recipients of each benefit (and revenue and number of tax payers of each tax) are regularly compared with the same information from external sources (e.g., administrative statistics and national microsimulation models, whenever available) including detailed tax and benefit simulation as well as income

distribution indicators. The results of the validation exercises are included in the country reports (available on the EUROMOD website at https://www.iser.essex.ac.uk/euromod) which contain background information on the tax-benefit system for each country, a detailed description of all tax-benefit components simulated in EUROMOD, a general overview of the input data (including information on sample quality, weights, data adjustment, imputations and assumptions) and an extended summary of the validation process. EUROMOD baseline results do not comprehensively take into account non take-up of benefits or tax evasion.

In order to calculate the EMTRs we follow the approach of Jara and Tumino (2013). Thus, the EMTRs for each individual are evaluated taking account of taxes paid by, and benefits paid to all members of a household and affecting household current cash disposable income. Individual level EMTRs are calculated according to the following formula:

$$EMTR = 1 - \frac{Y_{HH}^{1} - Y_{HH}^{0}}{G_{k}^{1} - G_{k}^{0}}$$

where *YHH* represents the household disposable income to which the individual *k* belongs and *G* represents the earnings of the individual. The household disposable income is calculated first and then individual earnings are increased sequentially by a given margin for each earner in the household accounting for all new tax liabilities and benefits entitlements for all individuals *k* in the same household *HH*. The same procedure is then applied to the successive income earners in the household. In computing the EMTR we have chosen to increase only the largest component of an individuals' aggregate income which, in our sample, is gross labour income. As in Jara and Tumino (2013), the margin applied is equal to 3 per cent which corresponds approximately to a one hour increase for a worker working 40 hours per week.

In most countries the EMTR is high for low income earners (mostly because they begin to lose means-tested benefits). These high EMTR values are thus reflective of the disincentive effect of existing tax and benefit systems in the EU on the extensive margin of labour supply. The EMTR tends to be relatively stable in the middle of the distribution, before it becomes more progressive for the higher income deciles.

3 Empirical implementation

Calculating the user cost requires calibrating and simulating a number of parameters that enter equation (1).

In what follows, we focus on taxes and relief that are levied in a recurrent fashion, as they can immediately be related to ownership. Operationally, they can also be simulated using the microsimulation model. By contrast, the rates of transaction taxes used are the statutory ones (for France and Italy) or the average statutory rates (for Spain and the UK, where a progressive scale applies).

For the interest rate we use the 10-year government bond rate, which represents a non-risky alternative return on investment.[3] The risk premium estimate, and the maintenance and depreciation estimates are taken from Poterba and Sinai (2008a). The loan-to-value ratio is taken from Calza *et al.* (2013), who report country-specific averages for some European countries. Although this

[3] Ideally one would have used bond rates of longer maturity, e.g., 20-year. However such bonds are more rarely issued than 10-year bonds or bonds with shorter maturity. The 20 and 10- year bond yield are usually highly correlated such that we opted for the 10-year bond maturity rate as better and more representative data was available.

clearly does not account for differences in access to finance within countries, it allows us to focus on tax variables as the only source of heterogeneity across households.

To account for house price dynamics, as reflected in individual expectations, for the majority of our simulations we use the average growth in house prices for 1989 to 2013 (OECD House Price Index). Using this time frame gives a reasonable estimate of the underlying growth in house prices and its foreseeable evolutions for potential buyers. In a sensitivity analysis, we also look at the impact that house price variation has on the user cost of housing, by varying the assumptions on how households' expectations on future house prices are formed (the methodology is described in Section 4.5).

For the individual/household-level analysis, we use the EUROMOD microsimulation model, which is based on the EU Statistics on Income and Living Conditions (EU-SILC) data (for France, Italy and Spain) and the FRS data (for the UK). The sample size of the survey is as follows:

Table 1

Sample Size of EU-SILC and FRS Data Used for EUROMOD
(2010 wave)

Country	Individuals	Households
France	26,387	11,042
Italy	47,420	19,147
Spain	36,922	13,597
UK	57,380	25,200

The survey data is for 2010, which is the most recent wave for both EU-SILC and the FRS. EUROMOD then applies uprating factors to each of the relevant variables to account for the year-on-year anticipated changes. For example, variables may be uprated by the change in average earnings, average gross pension changes, the harmonised index of consumer prices or the change in aggregate tax receipts.[4]

3.1 Baseline results

To highlight the country-level differences, we first report the country-level values, shown in Table 2.

One can see large variations between the countries, with the UK having the lowest user cost of housing followed by France, Spain and lastly Italy, where the user cost is more than twice that of the UK. Building on this, we move to estimates for the user cost of housing calculated disaggregated by decile.

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[4] See *EUROMOD Country Reports* for more details.

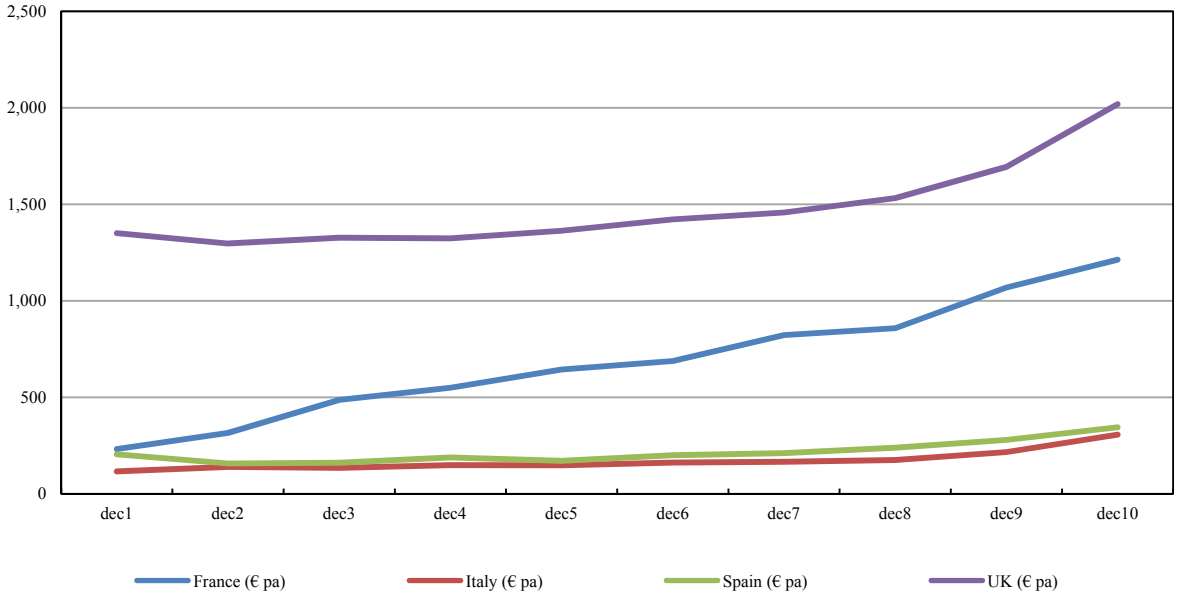
Table 2

User Cost of Housing by Country in 2013

Country	Average User Cost of Housing
France	0.0309
Italy	0.0486
Spain	0.0424
UK	0.0236

Figure 1

Existing Property Taxes per Unit of Housing by Deciles, 2013



Note: The UK figures have been converted from pounds sterling to euros at the average exchange rate for 2013: 1.178 euros = 1 pound sterling.
Source: EUROMOD and authors' calculations.

3.1.1 Existing property tax values

Information on property taxes paid by household is available in EUROMOD. The microsimulation model estimates by household, the value of the tax liability. The values themselves are shown by decile for the four countries in Figure 1. As can be seen, the value of the property tax paid is progressive across countries, although to different degrees. The progressivity in the value of the property tax paid is the most pronounced in the case of the UK and France and it is the least pronounced in the case of Italy and Spain.

Alternatively, Figure 2 provides an indication on the progressivity of actual property taxes as measured in terms of the gross disposable income. Figures are provided by income quintile so as to simplify the reading of this graph. Accordingly, property tax systems appear to be largely regressive in most countries, with the regressivity being the most pronounced in the UK and Spanish cases while being mildly regressive in the Italian case. In the French case the property tax system appears to be progressive until the third quintile and regressive afterward. In the Italian case the property tax system appears to be relatively neutral.

Additionally using EUROMOD one can simulate the tax credit that is received by household from the mortgage interest relief (in those countries where it applies, namely France, Spain and Italy). The values in euros themselves are shown by decile for the three countries in Figure 8. [5]

As for the property taxes, the mortgage tax relief appears to be regressive when considering level values. Considering relative values (in percent of net disposable income) as in Figure 4 confirm the regressive nature of mortgage interest relief. This is especially so in the Spanish case.

The property taxes and subsidies need to be entered into the user cost of housing equation in *per unit of housing* terms. In order to estimate house price value we use an indirect estimate based on the concept of the imputed rent, for which we have estimates at the household-level.

Estimates of the imputed rent have been made by Verbist *et al.* (2015), which use the rental equivalence method (sometimes referred to as the opportunity cost approach).[6] The relationship between imputed rent and the value of the house will vary, though the literature tends to take five percent as a rule of thumb (e.g. Mirrlees *et al.*, 2011:384). The accuracy of this estimate will also vary across individuals, though we argue that for the distribution as a whole and for the deciles, it will be a reasonable approximation. Taking this estimate of the house price, we calculate the property taxes and subsidies per unit of housing, as required for the user cost equation.

These individual-level values are entered into the user cost of housing equation, resulting in the baseline user cost of housing estimates shown in Table 3. The baseline figures are represented graphically in Figure 3.

As already noted, the differences across countries are substantial. Table 3 and Figure 3 show the within country differences. In France, the user cost is fairly stable across deciles, whereas in Italy, Spain and the UK, it is regressive. In the UK the user cost is nearly 59 per cent higher for the poorest decile compared to the richest. To a lesser extent, this is the case in Italy and Spain (39 and 27 per cent respectively).

4 Simulations of tax reforms

In the following we consider the influence of the various components of the cost of capital, namely the mortgage tax deduction, property taxes, the impact of substituting current property taxes with an imputed-rent based tax. We also pay specific attention to the role played by housing price expectations. The latter is particularly relevant to consider the evolution of the user cost of capital during the period given the large fluctuations in house prices.

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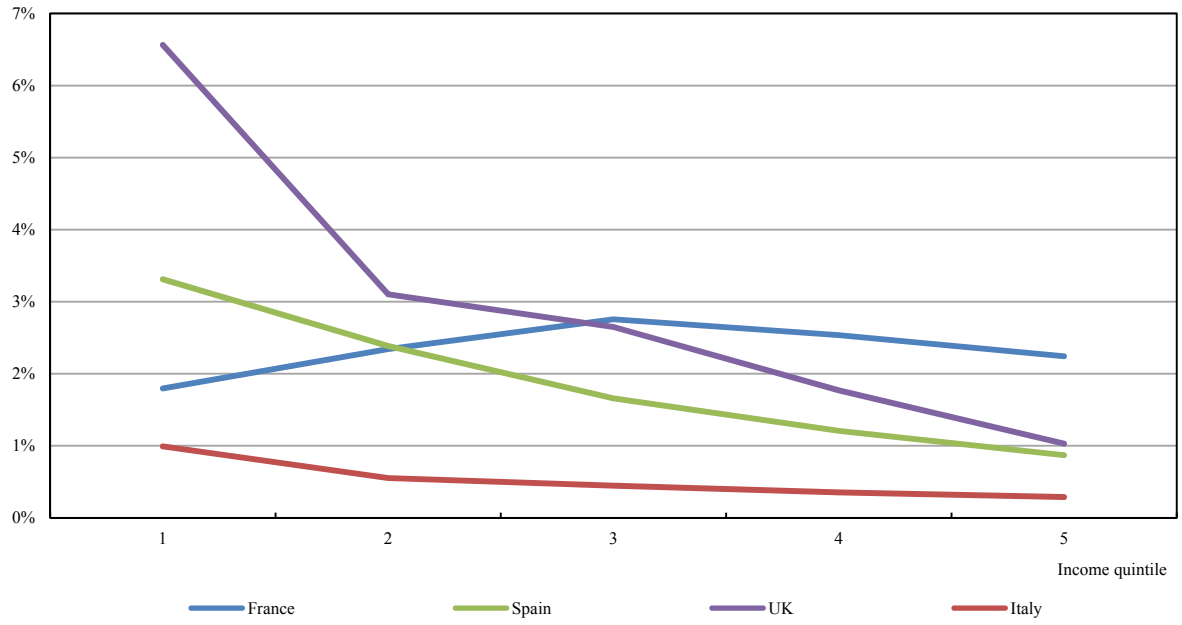
[5] In the UK, mortgage interest tax relief was fully abolished in 2000 (having been phased out over many years).

[6] These estimates are calculated using hedonic price estimations of the rental value of owned housing based on the EU-SILC micro-data from EUROSTAT. Note that the EU-SILC database already provides estimates of imputed rent, but as Juntto and Reijo (2010) indicate, these suffer from lack of comparability between countries given the variety of approaches used to collect this data. The Verbist et al. (2015) estimations on the contrary use the same empirical model applied to EU-SILC micro- data (with the only exception of United Kingdom, where analysis will be based on a national household budget survey, the Family Resources Survey). Verbist *et al.* (2015) estimate the imputed rent equivalent in two steps. The first step being a regression on private market tenants with rent as the dependent variable. The second step takes the coefficients of the explanatory variables and applies them to owner occupiers, correcting for the selection bias using a Heckman procedure and adding an error component in order to account cross-households' heterogeneity observed in the rent data.

Figure 2

Existing Property Taxes per Unit of Housing by Quintile, 2013



Source: EUROMOD and authors' calculations.

Figure 3

Mortgage Interest Tax Relief per Unit of Housing by Deciles, 2013

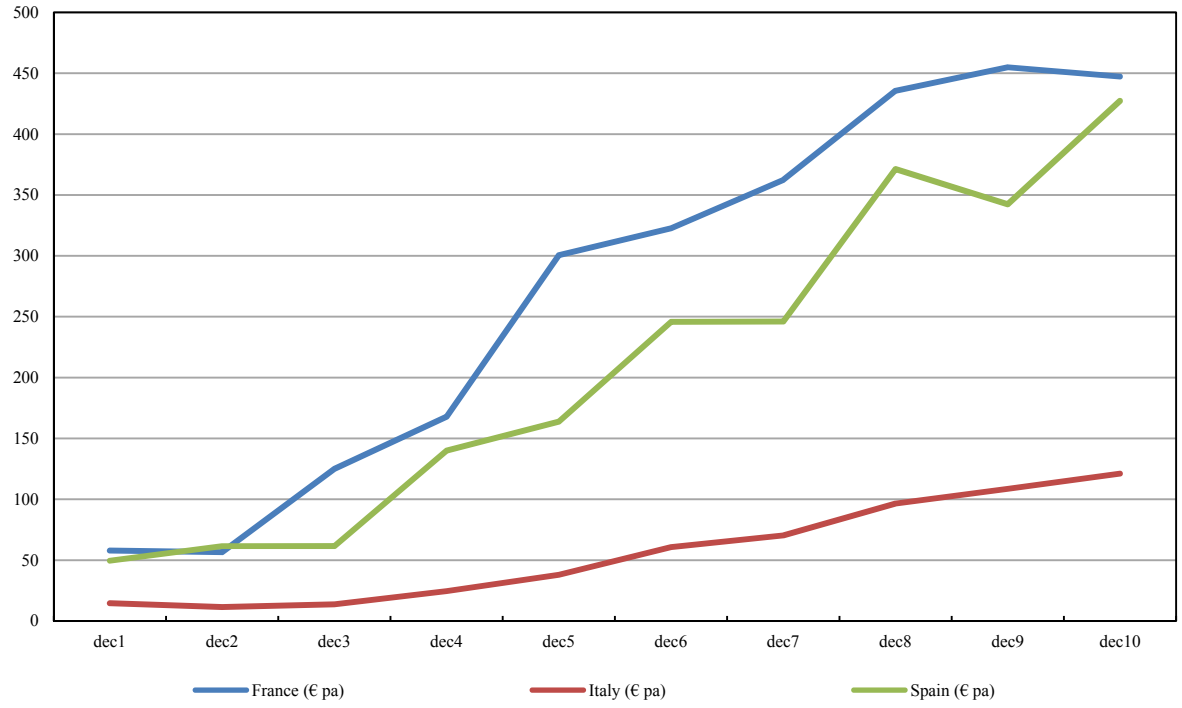


Figure 4

Mortgage Interest Tax Relief, 2013
(percentage of net disposable income)

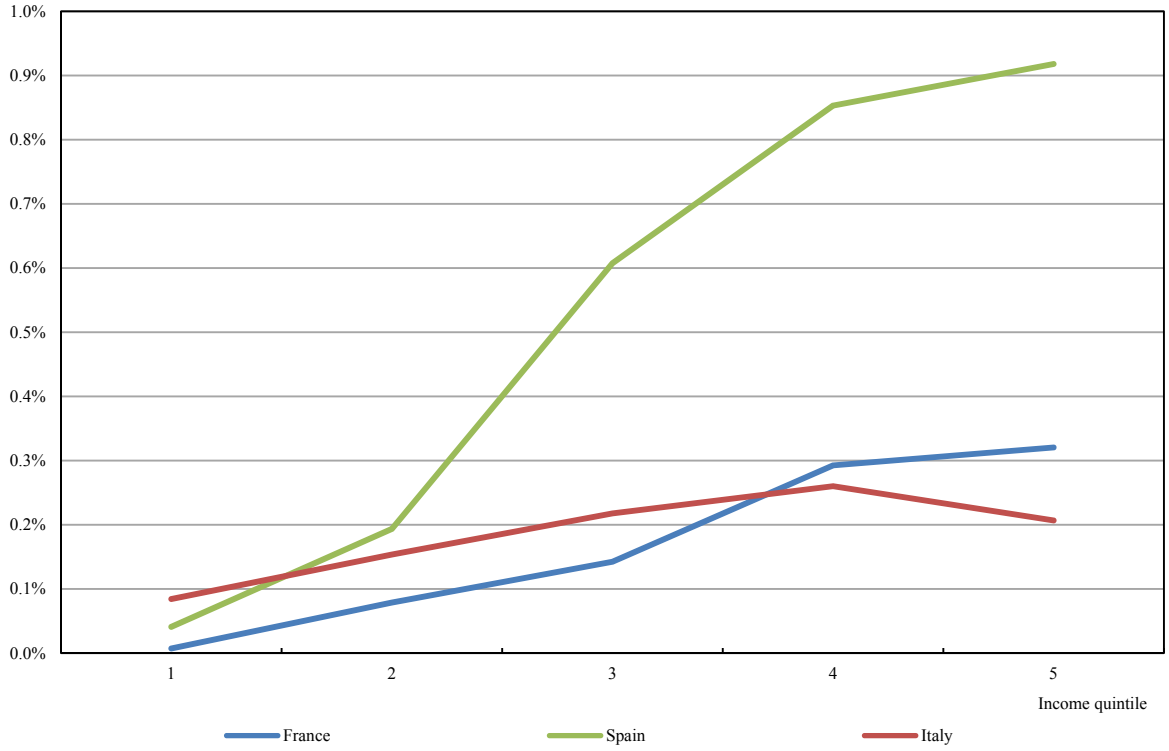


Table 3

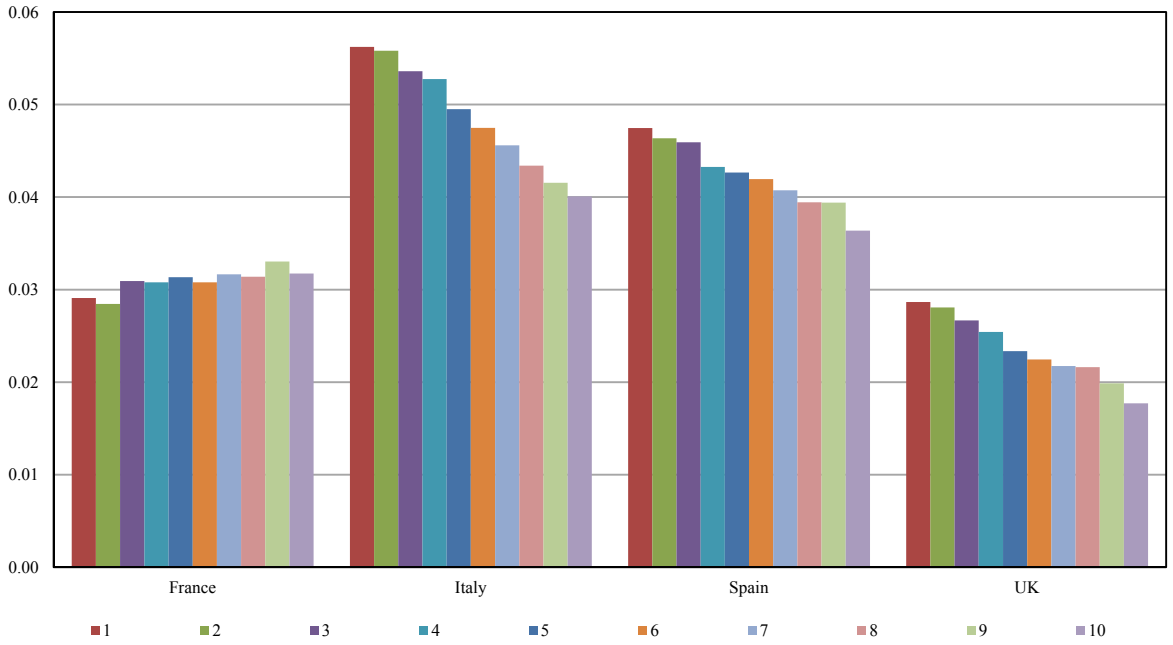
Baseline User Cost of Housing:
Individual-level EMTR and Property Tax and Subsidy Estimates, 2013

Country	User Cost of Housing		by Income Decile									
	Average	CoV*	1	2	3	4	5	6	7	8	9	10
France	0.0309	4.25%	0.0291	0.0285	0.0309	0.0308	0.0313	0.0308	0.0317	0.0314	0.0330	0.0317
Italy	0.0486	12.14%	0.0562	0.0558	0.0536	0.0527	0.0495	0.0475	0.0456	0.0434	0.0415	0.0401
Spain	0.0424	8.31%	0.0475	0.0464	0.0459	0.0433	0.0427	0.0420	0.0407	0.0394	0.0394	0.0364
UK	0.0236	15.21%	0.0287	0.0281	0.0267	0.0254	0.0234	0.0224	0.0218	0.0216	0.0199	0.0177

* Coefficient of variation.

Figure 3

Baseline User Cost of Housing by Income Decile (2013)



4.1 Impact of removing mortgage interest subsidy

The consequences of removing the mortgage interest deduction are shown in the following tables.

Table 4 shows the new user cost of housing, while Table 5 shows the percentage change relative to the baseline.

Table 4

User Cost of Capital: Baseline Calculation with Mortgage Interest Relief Removed (2013)

Country	User Cost of Housing	by Income Decile									
	Average	1	2	3	4	5	6	7	8	9	10
France	0.0344	0.0326	0.0319	0.0344	0.0343	0.0348	0.0343	0.0351	0.0349	0.0365	0.0352
Italy	0.0531	0.0607	0.0603	0.0581	0.0572	0.0540	0.0520	0.0501	0.0479	0.0460	0.0446
Spain	0.0474	0.0525	0.0514	0.0510	0.0483	0.0477	0.0470	0.0458	0.0445	0.0445	0.0415
UK	0.0236	0.0287	0.0281	0.0267	0.0254	0.0234	0.0224	0.0218	0.0216	0.0199	0.0177

Table 5

Change in User Cost of Capital:
Baseline v Baseline Calculation with Mortgage Interest Relief Removed, 2013

Country	User Cost of Housing	by Income Decile									
	Average	1	2	3	4	5	6	7	8	9	10
France	10.1%	10.7%	10.9%	10.1%	10.1%	10.0%	10.1%	9.9%	10.0%	9.5%	9.8%
Italy	8.4%	7.4%	7.4%	7.7%	7.8%	8.3%	8.6%	8.9%	9.3%	9.7%	10.0%
Spain	10.7%	9.7%	9.9%	10.0%	10.5%	10.6%	10.8%	11.1%	11.4%	11.4%	12.2%
UK	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

The change in user cost is shown graphically below.

Figure 4

Change in User Cost Due to Removal of Mortgage Interest Relief by Income Decile, 2013

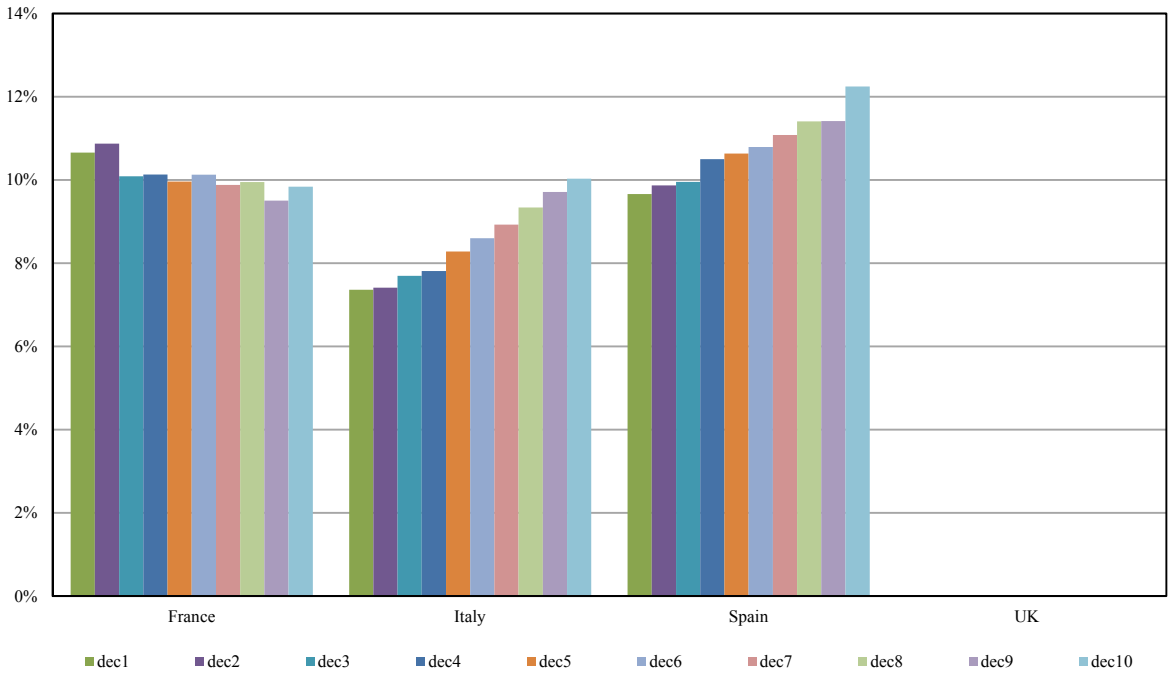


Table 6

User Cost of Capital: Baseline Calculation with Existing Property Taxes Removed, 2013

Country	User Cost of Housing	by Income Decile									
	Average	1	2	3	4	5	6	7	8	9	10
France	0.0243	0.0261	0.0247	0.0254	0.0248	0.0247	0.0241	0.0239	0.0235	0.0234	0.0221
Italy	0.0469	0.0548	0.0540	0.0520	0.0510	0.0480	0.0459	0.0440	0.0418	0.0396	0.0376
Spain	0.0401	0.0450	0.0444	0.0440	0.0411	0.0409	0.0398	0.0386	0.0372	0.0369	0.0335
UK	0.0161	0.0208	0.0198	0.0185	0.0174	0.0156	0.0149	0.0144	0.0145	0.0132	0.0119

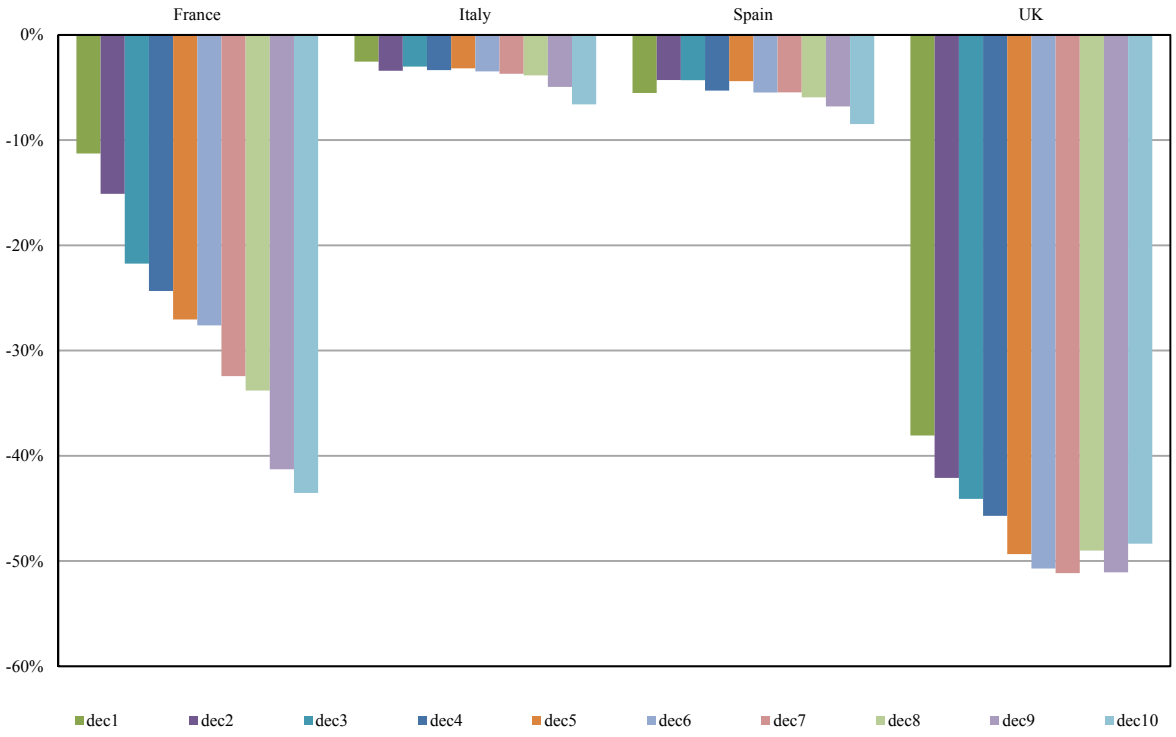
Table 7

Change in User Cost of Capital:
Baseline v Baseline Calculation with Existing Property Taxes Removed, 2013

Country	User Cost of Housing	by Income Decile									
	Average	1	2	3	4	5	6	7	8	9	10
France	-27.4%	-11.3%	-15.1%	-21.7%	-24.3%	-27.1%	-27.6%	-32.4%	-33.8%	-41.3%	-43.5%
Italy	-3.7%	-2.5%	-3.4%	-3.0%	-3.4%	-3.2%	-3.5%	-3.7%	-3.8%	-4.9%	-6.6%
Spain	-5.5%	-5.5%	-4.3%	-4.3%	-5.3%	-4.4%	-5.5%	-5.5%	-5.9%	-6.8%	-8.5%
UK	-46.3%	-38.1%	-42.1%	-44.1%	-45.7%	-49.3%	-50.7%	-51.2%	-49.0%	-51.1%	-48.4%

Figure 5

Change in User Cost Due to Removal of Existing Property Taxes by Income Decile, 2013



Clearly, the user cost of housing rises in all cases as a subsidy is being removed, except for the UK where mortgage interest relief has long been abolished (the values shown equal the baseline values). In the case of France, the change in the user cost is large, despite only being applied to a minority of homeowners, with an average increase in the user cost of 10.1 per cent. The relief is also important in Italy and Spain with average increases of 8.4 per cent and 10.7 per cent respectively. In all cases, one sees some regressivity in the existing subsidy, as removing it impacts the higher deciles more than the lower deciles.

4.2 Impact of removing existing property taxes

This simulation removes the existing recurrent property taxes compared with the baseline (both mortgage interest relief and transaction taxes are left in place). Table 6 showing the value of the user cost of housing and Table 7 the percentage change from the baseline.

The change in user cost is shown graphically in Figure 5.

One sees that the recurrent property taxes represent an important component of the user cost of housing in both France and the UK, where removing them would reduce the value by 27.4 per cent and 46.3 per cent respectively. In France, the existing tax is shown to be progressive, as higher income deciles pay a higher tax as a share of the property value. In Italy and Spain, the recurrent property taxes are less important for the user cost, though the changes observed are still significant.

4.3 Impact of introducing an imputed rent tax

This simulation adds an imputed rent tax to the baseline, and therefore *in addition* to the existing taxes and subsidies. (The tax reform scenario is shown in Section 4.4 below.) The imputed rent for each household is taxed at the standard rate for VAT in each country (between 20 and 22 per cent), which follows the notion that housing services should be taxed in the same way as other consumption services.

By design, a tax on imputed rent has a fairly uniform impact across the deciles. The variation in the percentage changes in Table 9 are due the fact that it is charged on net imputed rent (which differs from gross imputed rent by the costs of mortgage interest, and varies by individual) and from the different baseline values (the denominator in the percentage calculation).

4.4 Replacing existing property taxes with imputed rent tax

The previous section showed an imputed rent tax charged in addition to current taxes and subsidies. A more likely simulation involves having such a tax replace the existing recurrent property tax. In these simulations, the rate of the imputed rent tax has been adjusted so as to remain revenue neutral overall. The appropriate rate for a revenue-neutral imputed rent tax is shown in Appendix 1.

The change in user cost is shown graphically below.

Figure 6

Change in User Cost Due to Introduction of Imputed Rent Tax by Income Decile, 2013

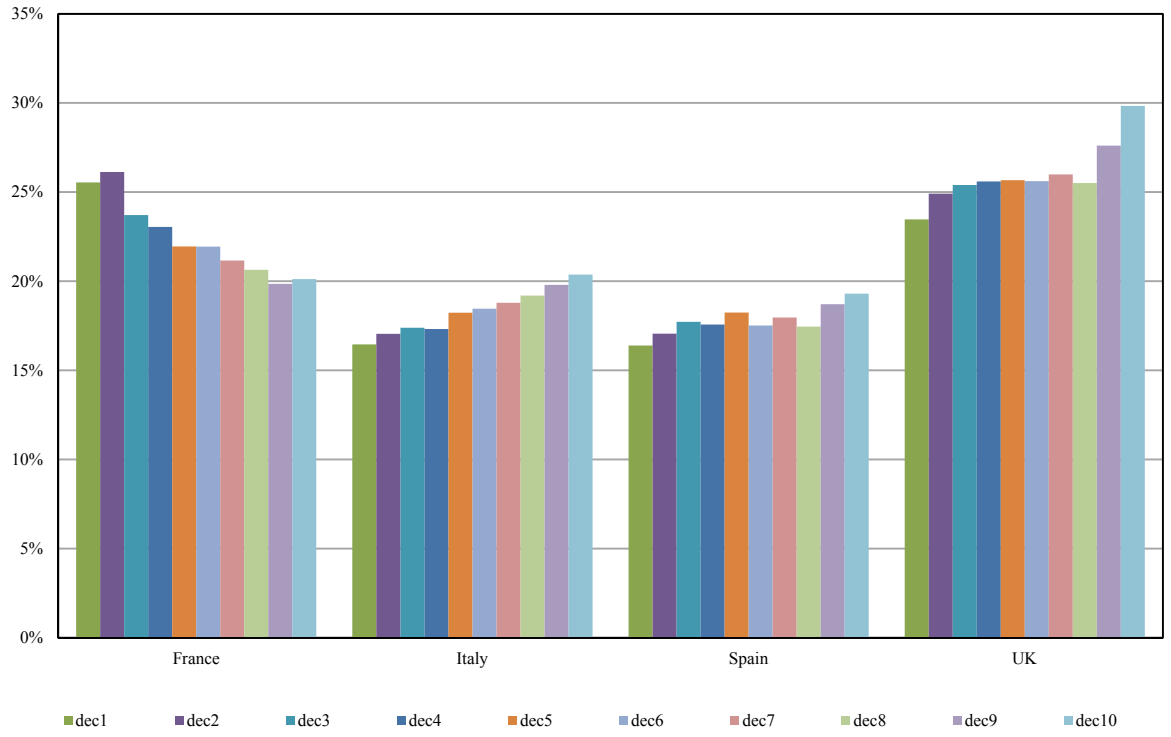


Table 8

User Cost of Capital: Baseline Calculation with Imputed Rent Tax Introduced, 2013

Country	User Cost of Housing	by Income Decile									
	Average	1	2	3	4	5	6	7	8	9	10
France	0.0398	0.0391	0.0385	0.0405	0.0400	0.0402	0.0395	0.0401	0.0396	0.0412	0.0397
Italy	0.0594	0.0673	0.0673	0.0649	0.0638	0.0605	0.0582	0.0561	0.0537	0.0518	0.0503
Spain	0.0515	0.0568	0.0559	0.0558	0.0525	0.0522	0.0509	0.0497	0.0478	0.0485	0.0451
UK	0.0317	0.0375	0.0374	0.0358	0.0342	0.0314	0.0302	0.0294	0.0290	0.0275	0.0252

Table 9

Change in User Cost of Capital: Baseline v Baseline Calculation with Imputed Rent Tax Introduced, 2013

Country	User Cost of Housing	by Income Decile									
	Average	1	2	3	4	5	6	7	8	9	10
France	22.4%	25.5%	26.1%	23.7%	23.0%	22.0%	21.9%	21.2%	20.6%	19.8%	20.1%
Italy	18.2%	16.5%	17.1%	17.4%	17.3%	18.2%	18.5%	18.8%	19.2%	19.8%	20.4%
Spain	17.7%	16.4%	17.1%	17.7%	17.6%	18.2%	17.5%	18.0%	17.5%	18.7%	19.3%
UK	25.8%	23.5%	24.9%	25.4%	25.6%	25.7%	25.6%	26.0%	25.5%	27.6%	29.8%

Table 10

User Cost of Capital: Baseline Calculation
with Imputed Rent Tax Introduced and Other Property Taxes Removed, 2013

Country	User Cost of Housing	by Income Decile									
	Average	1	2	3	4	5	6	7	8	9	10
France	0.0313	0.0340	0.0326	0.0329	0.0320	0.0316	0.0309	0.0306	0.0299	0.0298	0.0284
Italy	0.0486	0.0566	0.0559	0.0539	0.0528	0.0498	0.0477	0.0457	0.0435	0.0413	0.0393
Spain	0.0424	0.0473	0.0468	0.0465	0.0434	0.0432	0.0420	0.0408	0.0393	0.0391	0.0357
UK	0.0235	0.0287	0.0281	0.0267	0.0253	0.0229	0.0219	0.0213	0.0212	0.0200	0.0187

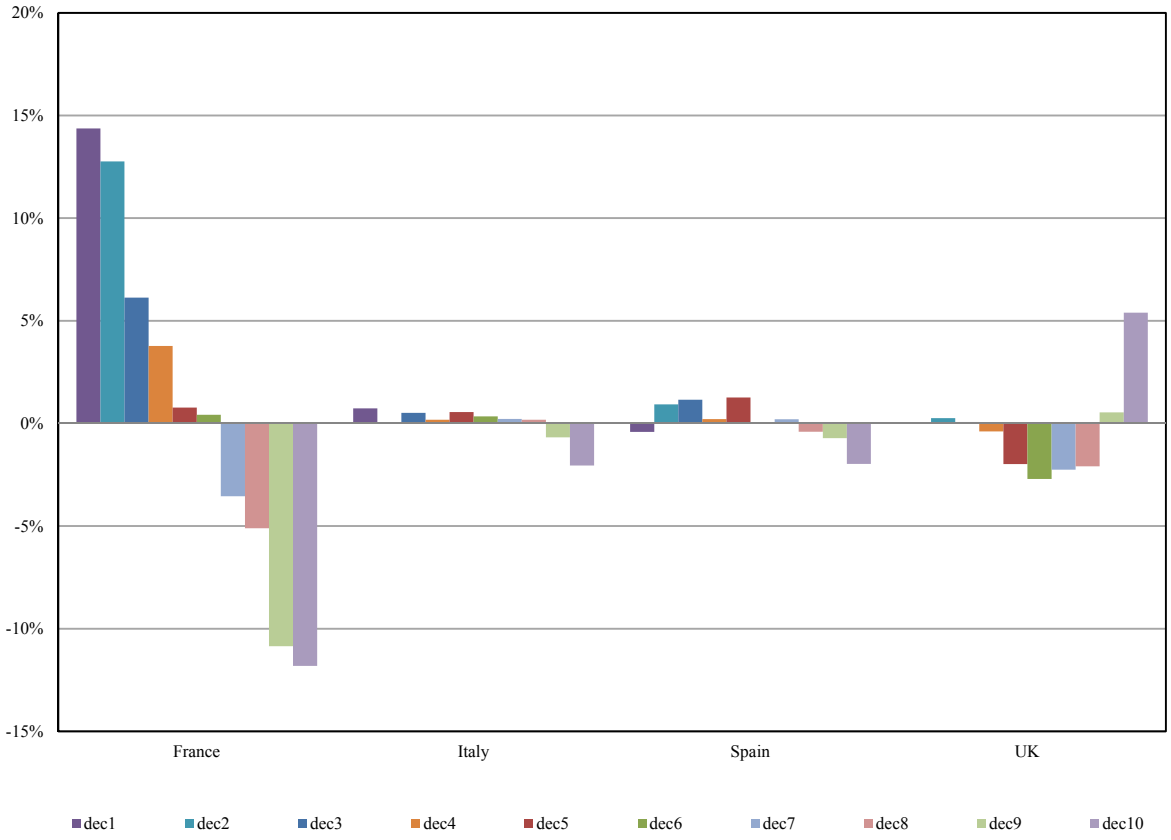
Table 11

Change in User Cost of Capital: Baseline v Baseline Calculation
with Imputed Rent Tax Introduced and Other Property Taxes rEmoved, 2013

Country	User Cost of Housing	by Income Decile									
	Average	1	2	3	4	5	6	7	8	9	10
France	1.1%	14.4%	12.8%	6.1%	3.8%	0.8%	0.4%	-3.5%	-5.1%	-10.8%	-11.8%
Italy	0.1%	0.7%	0.1%	0.5%	0.2%	0.6%	0.3%	0.2%	0.2%	-0.7%	-2.1%
Spain	0.1%	-0.4%	0.9%	1.2%	0.2%	1.3%	0.0%	0.2%	-0.4%	-0.7%	-2.0%
UK	-0.4%	0.1%	0.3%	0.1%	-0.4%	-2.0%	-2.7%	-2.3%	-2.1%	0.5%	5.4%

Figure 7

Change in User Cost Due to Introduction of Imputed Rent Tax and Removal of Other Property Taxes by Income Decile, 2013



The change in user cost is shown graphically above.

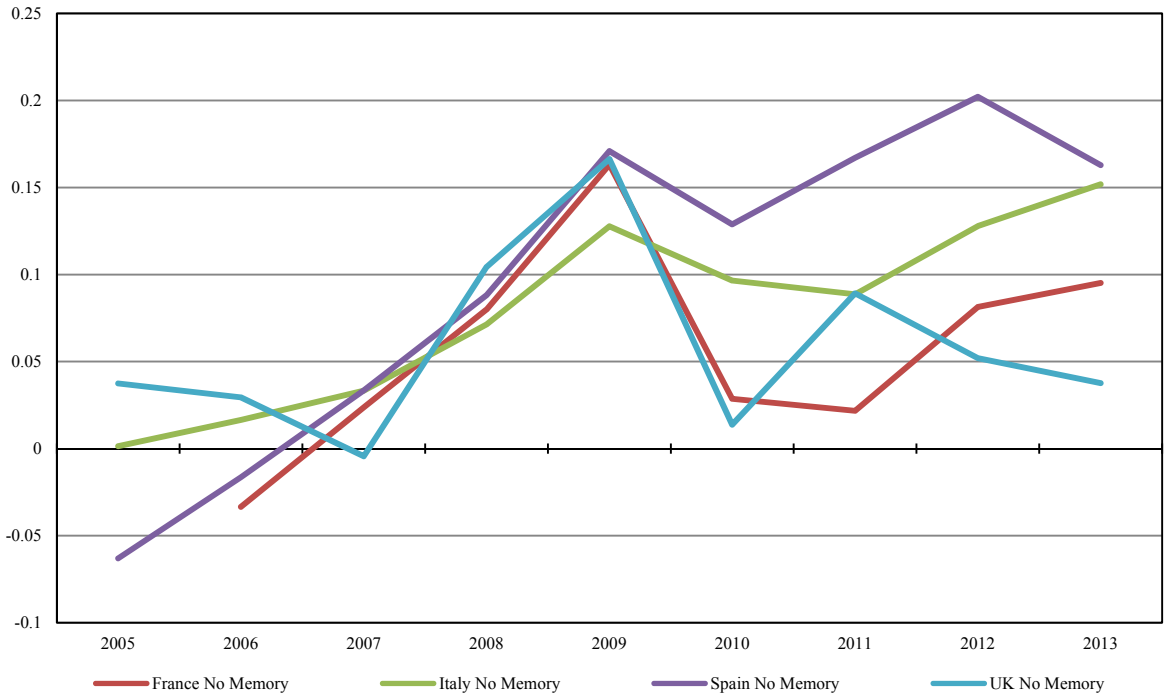
As we have argued, imputed rent represents a useful benchmark aim for economists, rather than a precise practical tax base from a policy perspective. Current deviations are an indication of how the policy has drifted from this idea over time from a "neutral" Haig-Simons-style property tax and the actual property tax. Part of this drift is due to the non-updating of house prices, often for many decades. In this sense, the imputed rent values used in this paper (from Figari *et al.*, 2014) are likely better than the legislated values.

The imputed rent was been used to guide policy in France. When the French property tax was originally designed to closely follow the imputed rent idea, see Verbist *et al.* (2015) France's results regarding the reform suggest that the existing property tax is more progressive than an imputed rent tax would be.

Spain and Italy (where the property tax is a smaller component of the user cost) show less impact overall, while the UK shows that an imputed rent would shift some of the taxes, especially from the 5th to 8th deciles to the 10th decile. This reflects the banding system in the UK property tax, where the top band can encompass moderately expensive properties up to multi-million pound properties, and charge both the same amount.

Figure 8

Evolution of the Expected User Cost of Capital with Fully-adaptive Expectations, Scenario (i), 2006-2013



4.5 Sensitivity analysis: Impact of house price expectations

The above simulations assumed that the rise in house prices, which is an important component in the user cost of housing, remains constant at the average growth rate between 1989 and 2013. The actual movements in house prices are shown in Figure 11 in the Appendix. In this simulation, we investigate the impact on the user cost of housing if households adapt, or partially adapt, their expectations based on the recent past.

We employ a simple weighted average of the long-term trend and the recent past:

$$\{E(\pi)\}_t = a \,.\, \pi_{ST} + (1 - a) \,.\, \pi_{LT}$$

where π_{ST} refers to the rise in house prices over the recent past (short-term), specifically the past year, and π_{LT} refers to the geometric mean rise in house prices over the long term, since 1989. The parameter '*a*' is the weight that the household gives to each piece of information, so an '*a*' of 1 implies that expectations are fully adaptive, and the trend over the past year is expected to continue indefinitely. An '*a*' of 0 implies that only the long-term trend is considered.

We look at how the user cost of housing evolves over time. The simulations run from 2006 to 2013 and also make incorporate variations in property taxes and subsidies and the 10-year bond rate. The three scenarios shown offer various degrees of adjustment of house price expectations: Figure 8 shows the results where '*a*' equals 0.9, near-fully adaptive expectations, Figure 9 where '*a*' equals 0.5, somewhat adaptive expectations, and Figure 10 'a' equals 0.1, nearly only long-term expectations.

Figure 9

Evolution of the Expected User Cost of Capital Somewhat Adaptive Expectations, Scenario (ii), 2006-2013

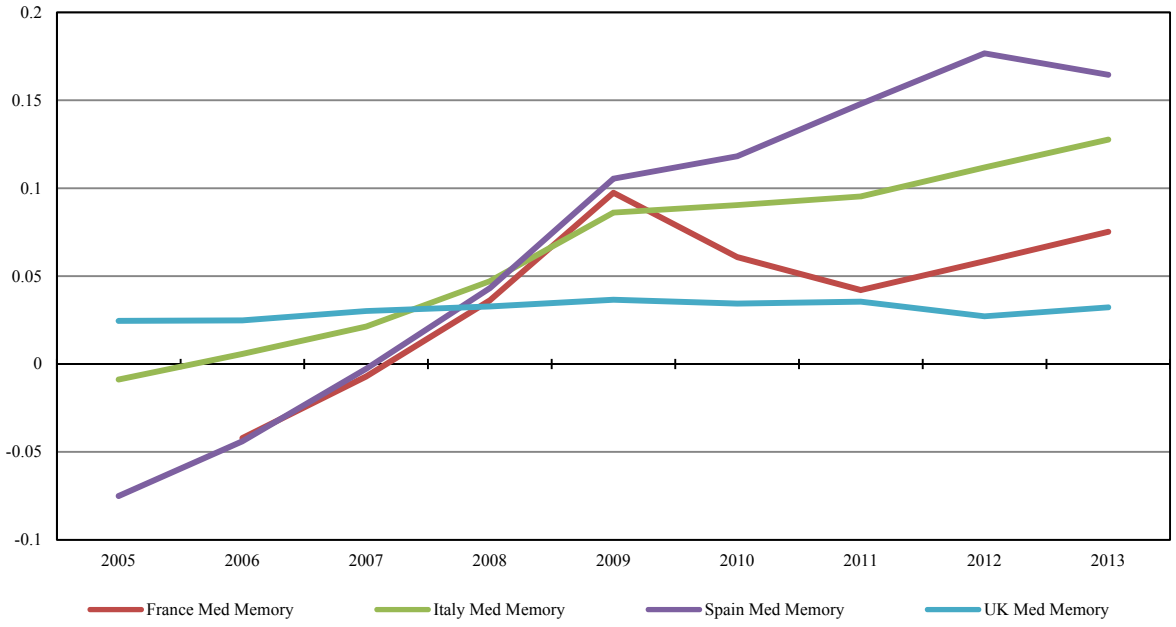
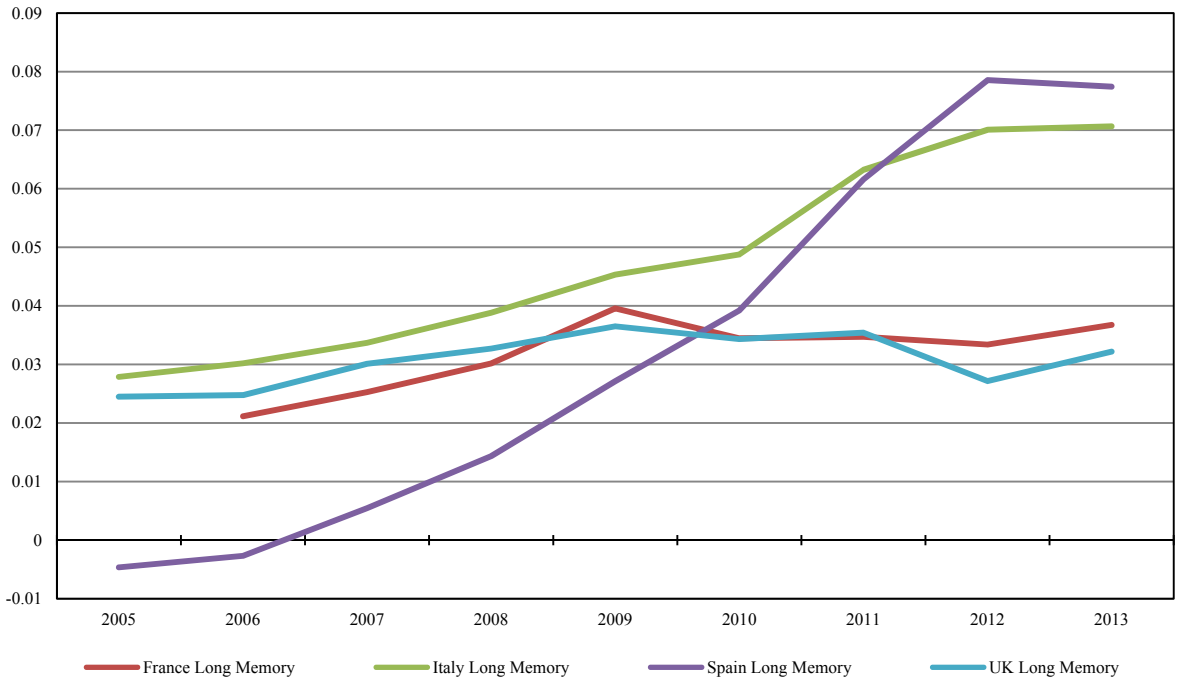


Figure 10

Evolution of the Expected User Cost of Capital Near-Only Long-term Expectations, Scenario (iii), 2006-2013



We consider Figure 8 interesting as an extreme scenario where house owners (or prospective owners) naïvely expect prices to continue to move as they have done in the past year. One sees that were house owners in Spain to adapt their expectations to this extent, their expected user cost of housing would range from minus 0.06, as the housing market was booming, to 0.21 as prices were falling most steeply. Indeed for all countries, large movements are seen under this extreme assumption. Figure 10 is considered more plausible, in that homeowners mostly rely on the long-term trend, with a small adjustment for the recent past. Therefore, if house prices are rising (or falling) steeply, there is a weak sense that this will continue. Though the changes in the user cost are much less, they still demonstrate that house price expectations can dominate the investment decision. This is seen most clearly in the case of Spain, where the user cost in 2005 and 2006 is below zero, meaning that the costs of holding capital are slightly more than compensated by the expected gain from price rises. As the housing bubble bursts in 2007, the expected user cost rises to nearly 0.08. Italy also shows a large difference over this period (approximately from 0.03 to 0.07), while France and the UK are relatively stable, reflecting the relative stability of the overall housing market during the period. Nevertheless, even in these countries fluctuations from 0.021 to 0.040 (France) and from 0.024 to 0.036 (UK) are still significant. Further disaggregation has been carried out by decile for long memory scenario, with the results show in the Appendix as Figures 12-15.

This analysis emphasises why booms and busts in the housing market can be self-sustaining. The user cost of housing fluctuates markedly based on the movement of house prices. When considering a purchase decision, the expected user cost facing the prospective buyer forms is hugely dependent on the expected house price changes. Any prospective buyer who bases their expectation on past price movements in the way suggested above would expect a lower user cost as prices rise, and so would be more inclined to buy, which sends the price even higher, fuelling the housing boom (especially as the housing market typically features an inelastic supply). Conversely, falling house prices raise the user cost, and deepen the housing bust.

5 Conclusions and policy implications

We have used the user cost of housing to investigate the impact of taxes and subsidies on the home ownership decision. The results demonstrate the mixed distributional consequences of the current tax and subsidy schemes. In particular, the mortgage interest relief (in France, Italy and Spain only) and property taxes tend to be regressive, with higher income deciles able to benefit more as measured by the impact on the user cost of housing.

The paper has argued that a tax on imputed rent is reasonable from a tax neutrality perspective. In particular, we analyse the differences emerging from a counterfactual experiment where the existing recurrent housing is replaced by an imputed rent tax. Interestingly, the existing taxes in Italy and Spain have fairly similar implications for the user cost as would an imputed rent tax. The deviations are large for the UK, especially for the richest decile, reflecting the relatively low tax rate on high value properties. In France, an imputed rent tax would be less progressive than the existing recurrent property tax.

One important element of the user cost of capital is the expected price change of the asset. When house prices move dramatically, this can dominate other considerations about the user cost. This even occurs when prospective homeowners incorporate a long-term view of the housing market.

APPENDIX 1
CALCULATING A REVENUE-NEUTRAL TAX REFORM

In order to set the rate of imputed rent tax so as to exactly match the lost revenue from removing the existing property tax, the following calculation was made. First, we calculate the total property tax revenue, ptaxrev:

$$ptaxrev = \sum_{decile=1}^{10} (propertytax\_rate_{decile} \times housevalue_{decile})$$

where "propertytax_e" is the average rate of property tax for each and "housevalue" is to the total value of housing owned by each decile (including weights to represent the whole population).

The same calculation is done for the imputed rent charged at the standard VAT rate (see Table 8 and Table 9).

$$irtaxrev = \sum_{decile=1}^{10} (irtax\_rate_{decile} \times housevalue_{decile})$$

This allows us to calculate the revenue-neutral imputed tax rate, irtaxneu_rate, by simply scaling the existing imputed rent tax rate:

$$irtaxneu\_rate = \frac{ptaxrev}{irtaxrev} \times irtax\_rate$$

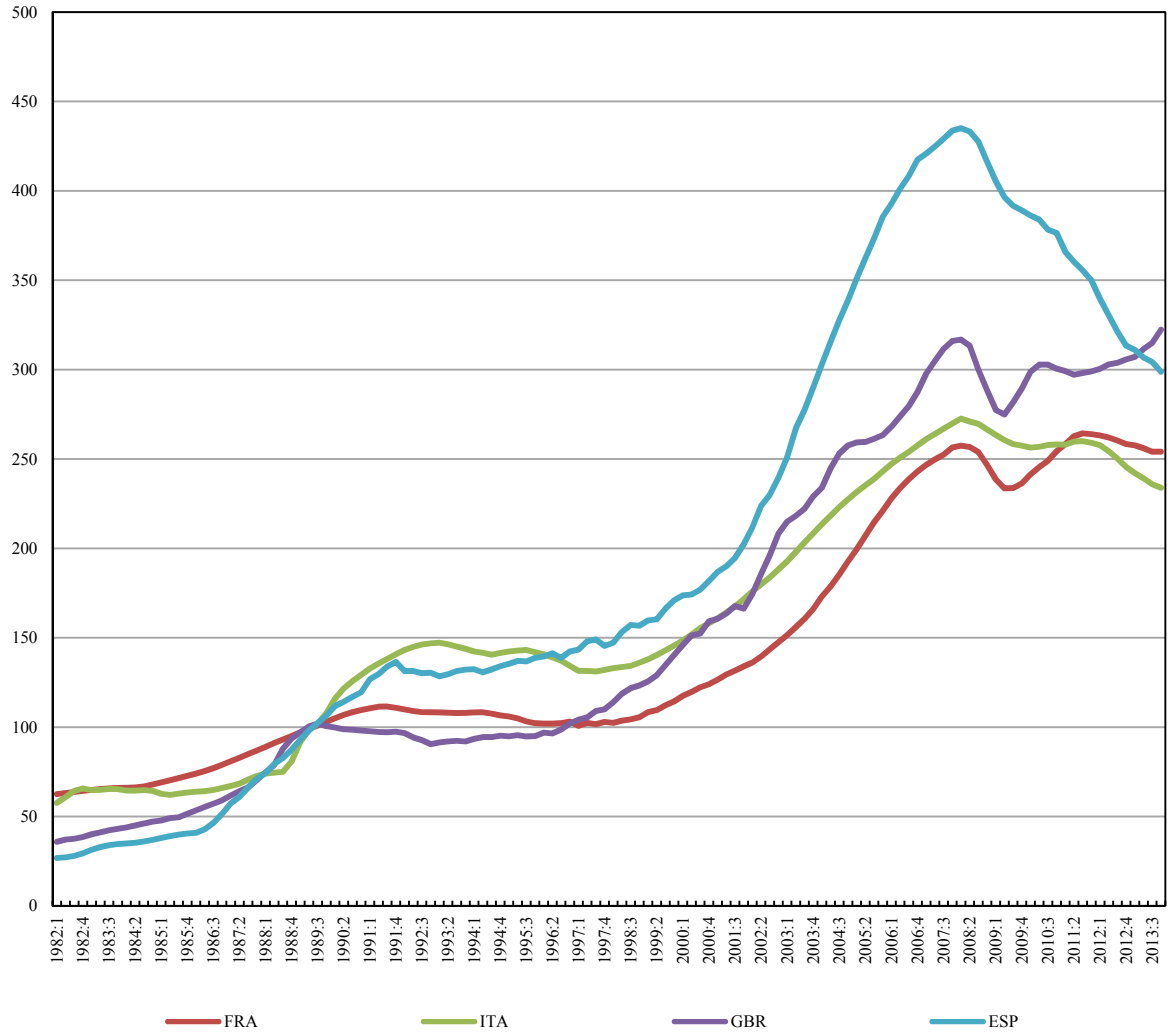
Note that irtaxneu_rate may be greater or less than the imputed rent charged at the standard VAT rate.

APPENDIX 2
ADDITIONAL FIGURES

Figure 11 shows the evolution of house prices indexed to 100 in 1989, which is an element of all calculations, and is especially relevant to the simulations in Section 4.5 where the house price expectations are allowed to vary.

Figure 11

House Price Index – OECD
(1989=100; 1982-2013)



Figures 7 to 10 show the user cost of capital over time, based on a long memory of house prices split by income decile. See Section 4.5 for further explanation.

Figure 12

France – User Cost of Capital, Long Memory of House Prices by Income Decile, 2006-2013

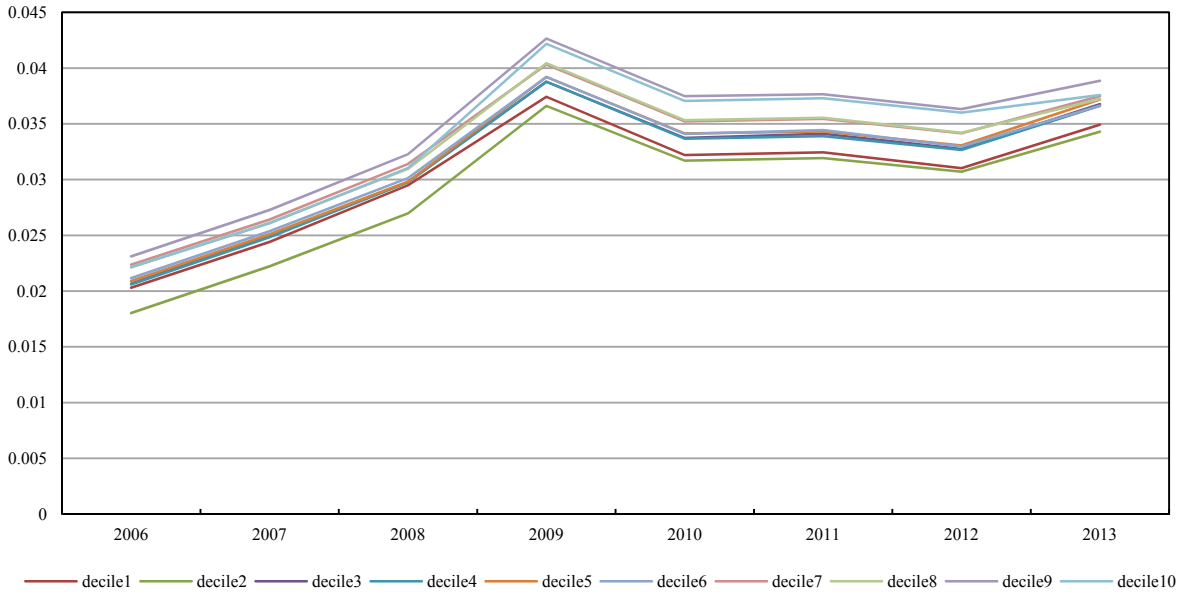


Figure 13

Italy – User Cost of Capital, Long Memory of House Prices by Income Decile, 2006-2013

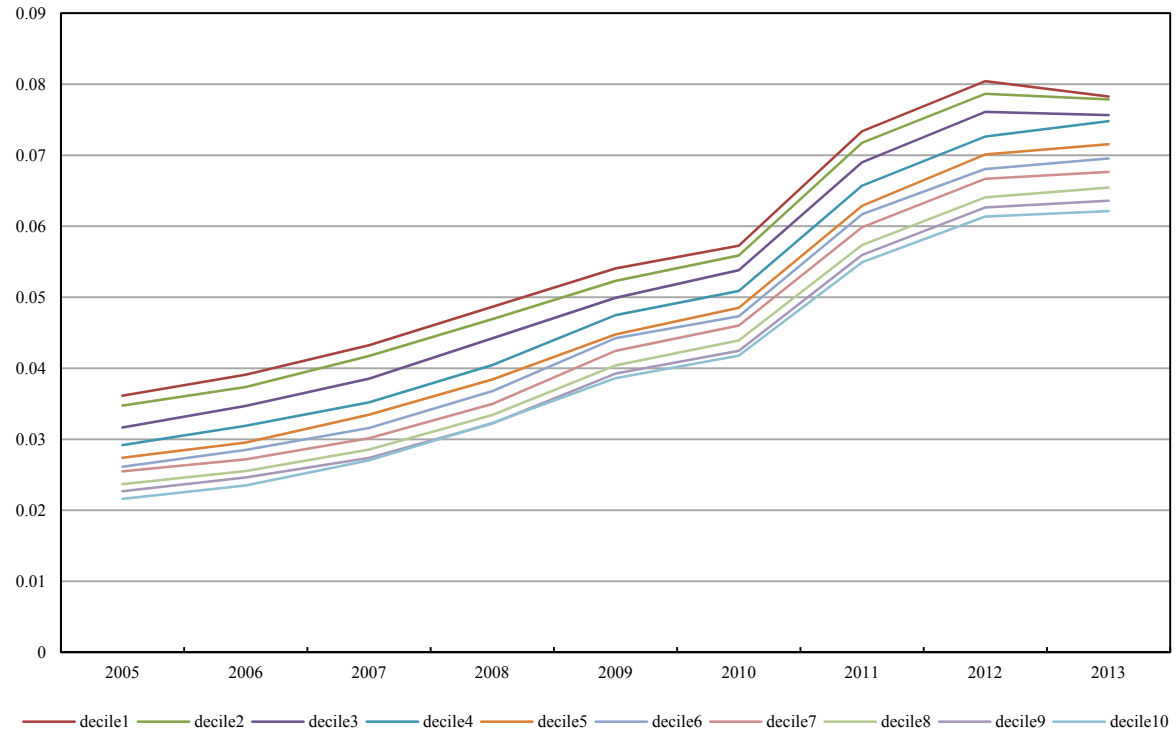


Figure 14

Spain – User Cost of Capital, Long Memory of House Prices by Income Decile, 2005-2013

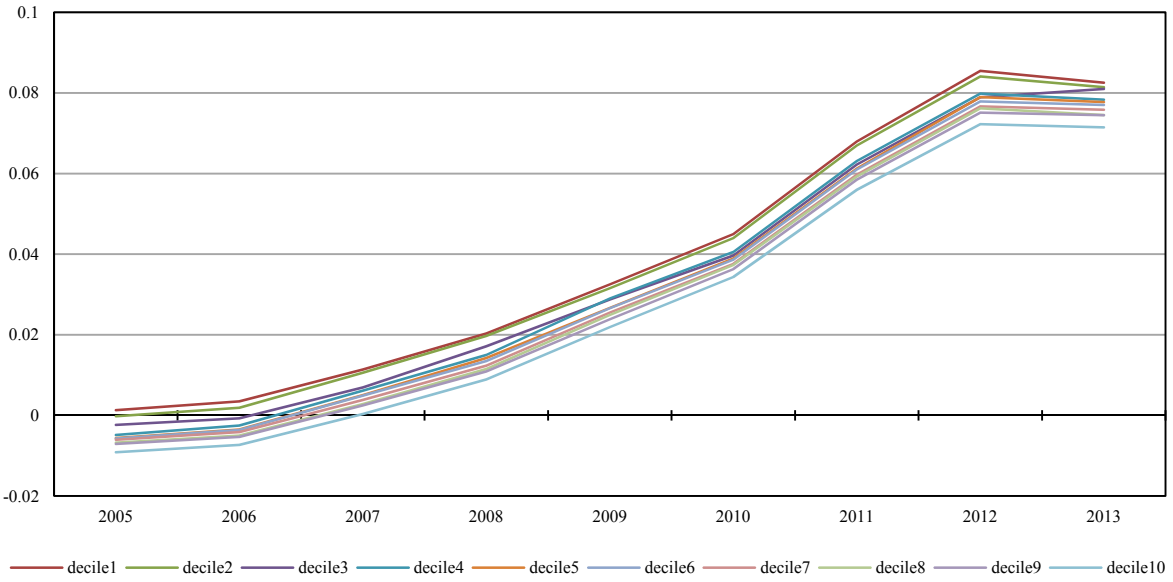
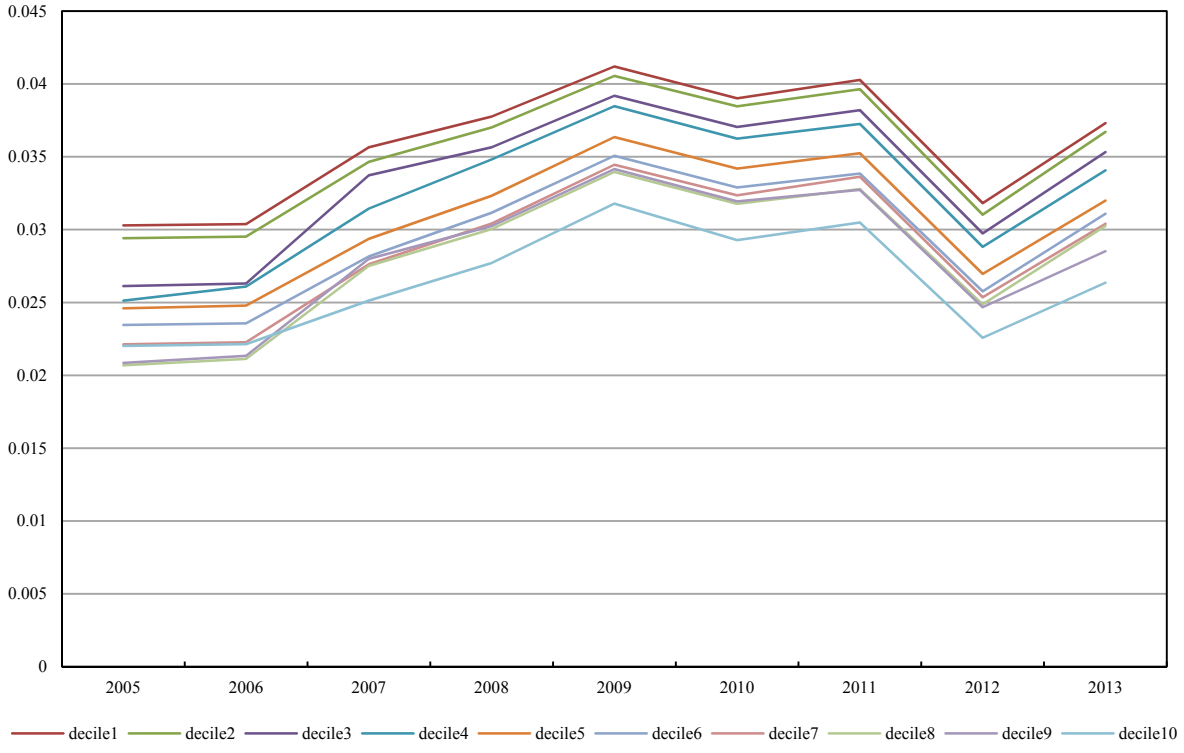


Figure 15

UK – User Cost of Capital, Long Memory of House Prices by Income Decile, 2005-2013



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COMMENT TO "PROPERTY TAX REFORM AND THE USER COST OF OWNER-OCCUPIED HOUSING IN THE EU" BY SALVADOR BARRIOS, SERENA FATICA AND JONATHAN PYCROFT

Pietro Tommasino[*]

1 Short summary of the paper

The paper computes the "marginal cost of homeownership" (MCH) for four EU Countries (France, Italy, Spain and the UK).

This measure, well-established in the empirical literature, is given by the following formula:

$$MCH = i + t_p + \beta + m + \delta - \pi_H,$$

where i is the prevailing interest rate, t_p is the recurrent property tax rate, β is a risk premium associated with housing investment, δ is the depreciation rate, m represents maintenance unit costs and π_H is the rate of increase of house prices.

Obviously, the higher the marginal cost of homeownership, the lower the incentive to invest in housing.[1]

Tax policy affects this measure in several ways, besides recurrent real estate taxes. In particular, the MCH is reduced by two elements. First, the fraction of the house which is debt-financed (call it λ) benefits from tax relief for mortgage interest payments. Second, the remaining fraction ($1-\lambda$) of the house, which is financed by own funds, is bought with funds which would have been invested in financial assets, and therefore taxed accordingly. Therefore, if we call t_{cap_inc} the tax rate applied to capital income and EMTR the effective marginal personal income tax rate, the marginal cost of homeownership becomes:[2]

$$\text{MCH} = i - \lambda EMTR - (1-\lambda)t_{cap\_inc} + t_p + \beta + m + \delta - \pi_H$$

The *EMTR* – and therefore the *MCH* – differ across different taxpayers.

The main contribution of the paper is to compute individual-specific EMTRs and MCHs for a representative sample of individuals for each of the four countries. To do this, the authors use the simulation model EUROMOD (which is in turn based on EU-SILC data for France Italy and Spain, and on FRS data for the UK).

The main results are summarized in their Table 3, which I report here for convenience. From the table emerges that Italy has the highest MCH (about 5 per cent) while UK has the lowest MCH (about 2 per cent). The other important finding is that for all countries except France the MCH decreases as a function of income (in France it is basically constant across income deciles).

2 Some comments about how the index is computed

The paper sheds light on a very interesting and hotly-debated topic, using appropriate and theory-driven tools. It is also very clear and (perhaps too) concise.

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[*] Bank of Italy.

[1] In equilibrium, it should be equal to the rent-to-price ratio.

[2] For simplicity's sake, I omit other terms included in the original contribution but not relevant for the present discussion.

Country	User Cost of Housing		By Income Decile									
	Average	CoV	1	2	3	4	5	6	7	8	9	10
France	0.0309	4.25%	0.0291	0.0285	0.0309	0.0308	0.0313	0.0308	0.0317	0.0314	0.0330	0.0317
Italy	0.0486	2.14%	0.0562	0.0558	0.0536	0.0527	0.0495	0.0475	0.0456	0.0434	0.0415	0.0401
Spain	0.0424	8.31%	0.0475	0.0464	0.0459	0.0433	0.0427	0.0420	0.0407	0.0394	0.0394	0.0364
UK	0.0236	5.21%	0.0287	0.0281	0.0267	0.0254	0.0234	0.0224	0.0218	0.0216	0.0199	0.0177

2.1 Relaxing the assumptions

I would like to discuss some assumptions made by the authors in their calculations. While I understand that they are necessary to simplify things, they might be relaxed in future versions of the paper (alternatively, they might be discussed qualitatively, and the authors could explain to what extent, and in what direction, they drive the results).

The authors assume that the borrowing and lending rates coincide, and that they are the same for all individuals. The latter hypothesis appears unrealistic for two reasons: first, given the existence of transaction costs, typically the poor have access to worse investment opportunities (for example, they don't invest in stocks); second, given their worse credit standing, they are typically charged higher borrowing rates.

The same is true for the rate of appreciation of houses. My intuition is that typically (except perhaps during housing booms) the rich own houses in city centers and in other zones in which supply is generally fixed, so these houses tend to appreciate more.

2.2 Explain results more at length

Apart from relaxing some restrictive assumptions, I think the authors could give some more information about their computations.

It seems that what drives the regressivity of the MCH is the regressivity of the property tax and of the mortgage interest relief. But what features of the four tax systems should be blamed for this?

Furthermore, in some countries (e.g. in Italy) capital income is excluded from the personal income tax base, in others it may be included, so that *EMTR* and t_{cap_inc} coincide. I don't know what are the rules in the remaining three countries, but the authors should tell us, and say whether this is relevant for their results.

3 Some comments about the index

Let me conclude with some thoughts concerning the MHC index itself.

First, one is left wondering whether the MCH is relevant from the positive point of view. Do cross-country differences in the index explain differences in households' choices and housing prices? I think the authors can check whether, everything else equal, households with lower MCHs are more likely to own a house (and/or to own larger houses). Furthermore, it would be interesting to extend the analysis to at least another point in time, to see whether reductions (resp. increases) of the MCH induce an increase in homeownership or in house prices (this would also increase the robustness of the results, as the authors' data come from a very peculiar period of subdued house price dynamics and pronounced economic downturn).

A related concern is about the use of the index for policy exercises. Indeed, the MCH is computed for given (expected) price dynamics. However, clearly the MCH and its tax components are itself drivers of house prices; doesn't this represent a classical example of the Lucas critique, and therefore limits the policy usefulness of the index?

From a normative viewpoint, I wonder what are the normative foundations of the MCH index. Said differently: should public policies target the MCH? Is it a sufficient statistics of a country's housing policy? Related to this, I would suggest the authors to look at some contributions in the fields of urban economics and local public finance[3], which argue that homeownership can be seen as a policy goal in itself as homeowners tend to behave as better citizens. In some countries, cultural preferences could drive the policy choices.

Finally, what is left unexplained is the MCH regressivity. While we all know that the degree of progressivity should be seen as an attribute of the tax-benefit system as a whole, studying the political economy reasons behind the political power of rich homeowners could be a very interesting topic for further research.

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[3] See, e.g., Fischel, W.A. (2001), *The Homevoter Hypothesis*, Harvard University Press, Cambridge (MA).