

Redistribution, risk-sharing and stabilization of income per capita of households by regions

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Executive summary

The effects of redistribution and stabilization of income produced by the existing complex systems of taxes and transfers are difficult to assess. However, the observable effects on per capita income of households by regions are quite similar to what would result from applying a negative linear income tax, with a constant marginal tax rate and a fixed transfer per capita, under the same aggregate resource constraint, i.e. yielding the same net (positive or negative) tax revenue as the actual system. This paper relies on this finding to describe the effects of the actual system through the properties of the linear tax. The redistribution effect of this tax reduces inequality in primary incomes (wages, operating surplus and other market incomes) in a constant proportion in each period, as if optimizing locally a social welfare function depending negatively on income inequality measured by the coefficient of variation. The effect that dampens the dispersion of disposable income growth across regions in any single year caused by the dispersion in primary income growth (regional idiosyncratic shocks) is the risk-sharing effect. The effect that smooths out fluctuations in disposable income with respect to shocks in primary income along time (common shocks) is the stabilizing effect. By estimating the parameters of an equivalent linear income tax for each year, these effects can be calculated and compared with the actual changes in inequality, as measured through the coefficients of variation, and with the observed fluctuations across regions and through time of primary and disposable incomes. By separating fiscal impulses (those associated to changes in the parameters of the linear tax for a given income level) from automatic changes (those associated to changes in the income level through the fiscal drag produced by constant tax parameters) we can assess the impact of observed changes in taxes and transfers. This work presents the analysis of these changes for the United States, The United Kingdom, Germany, France, Italy and Spain, based on the official estimates of the income accounts of households by regions. The final section offers the main conclusions.

The existing systems of taxes and transfers effectively redistribute and stabilize per capita disposable incomes of households by regions, without apparently affecting the sources of inequality and fluctuation of primary incomes. For the period 2000-2012 on average, the following table summarises the estimates found in this paper.

AVERAGE REDISTRIBUTIVE, RISK-SHARING AND STABILISING EFFECTS (%) 2000-2012							
	REDISTRIBUTIVE		RISK-SHARING		STABILISING		
	Observed	Estimated	Drag	Estimated	Drag	Impulse	Estimated
United States	24	24	24	23	23	32	54
United Kingdom	25	25	24	22	25	39	64
Germany	41	42	46	17	40	3	43
France	44	48	48	29	47	-34	13
Italy	17	18	20	4	16	-5	11
Spain	17	19	24	2	17	6	23

The estimated redistributive effects, which are very close to the redistributive effects measured through the coefficients of variation, are stronger in France and Germany than in the US and the UK, and in Italy and Spain. The risk-sharing and stabilizing effects result from a combination of fiscal impulses, which can be procyclical or countercyclical, and automatic changes produced by the fiscal drag, which are always countercyclical. Risk-sharing effects are very volatile and the estimates are quite poor in the continental European countries. While the impact of the fiscal drag on risk-sharing and stabilizing effects is in line with the estimates of the redistributive effects, fiscal impulses do not contribute much to risk-sharing on average. In contrast, fiscal impulses are very influential in determining stabilizing effects. Fiscal impulses have been stabilising in the US and the UK (substantially) and also in Spain (slightly), while they have been neutral in Germany and destabilising in France (substantially) and Italy (slightly).



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1 Introduction

The academic literature, diversified and complex, dealing with the effects of fiscal policies is very rich, both in theoretical and empirical approaches. A subset of the empirical literature uses macroeconometric models, estimated and/or calibrated, and frequently based on microdata, to simulate scenarios of alternative policies and perform counterfactual experiments¹. The use of models is indeed essential to evaluate ex ante the potential effects of policies, but not to identify and describe ex post the outcome of past policies. This paper is related to another subset of the literature, which uses econometric techniques to estimate these effects from the available data on the income per capita of average or “representative” individuals by countries or regions². The available studies and estimates in this branch, which is rather theoretically agnostic and data driven, differ widely in the definitions of variables, in the databases used as sources, in the periods and regions considered and in the measures of inequality and methods used in the estimations³.

The usual approach in this empirical literature since the papers by Mélitz and Zumer (1998, 2002) is to estimate these effects with panel data, exploiting the cross section dimension of the panel to identify both the redistributive effect, with the variables in levels, and the risk-sharing effect, with the variables in deviations of the rates of change with respect to the national values; and the time series dimension, with the variables

¹ On redistribution effects, see for example Olivier Bargain, Tim Callan, Karina Doorley and Claire Keane: “Changes in Income Distribution and the Role of Tax-benefit Policy During the Great Recession: An International Perspective”. EUROMOD Working Paper No. EM 21/13, December 2013 https://www.iser.essex.ac.uk/euromod/publications?a=Olivier+Bargain&action=euromod_search&controller=publications. Concerning stabilisation effects, see for example Dolls, Mathias, Clemens Fuest, Jan Kock, Andreas Peichl, Nils Wehrhöfer and Christian Wittneben (2014), *Automatic Stabilizers in the Eurozone: Analysis of their Effectiveness at the Member State and Euro Area Level and in International Comparison*, Mannheim. [Download](#)

² As we will deal always with these individuals, we will often drop for brevity reasons the adjectives “regional” and “per capita” when referring to incomes, taxes, etc. and their redistribution and stabilisation.

³ A recent contribution in this area with estimates for Australia, Canada and the US, including a useful review of the literature can be found in Poghosyan, Senhadji and Cottarelli (2015). Two good pieces of work for Spain, where the reader can also find the references to the most relevant literature, are Lago-Peñas, Prada and Vaquero (2013), Capó (2008) and Capó and Oliver (2002).

expressed in rates of change, to identify the stabilising effects. The existing literature, beyond justifying intuitively the definition of the effects estimated econometrically with sophisticated methods, does not offer a formal framework of analysis and interpretation. The results found in international studies are very diverse⁴, and the interpretation of the estimates, of their differences and of their determinants, is not straightforward. Even for the same country, the estimates of these effects differ both in size, with the estimates of the risk-sharing and stabilising effects being generally different and much more uncertain than those of the redistributive one, and in the relative contributions of the various redistributive operations that link primary and disposable incomes. Discrepancies across countries are also puzzling, with the same redistributive operation having contrary signs in different countries.

The objective of this paper is to facilitate a simple approach to estimate and interpret these effects. Concerning the approach, the value which the present analysis intends to add is, rather than providing new estimates, facilitating their understanding by representing the complex system of the existing taxes and transfers as a negative linear income tax. Such an approach allows simplifying both the methods of estimation and the interpretation of the results. The comparison of the effects observed in reality or estimated with simple linear regressions with those that would produce an equivalent linear tax (ELT in what follows, which has the same aggregate values of primary income and the various redistributive operations, resulting therefore in the same aggregate value of disposable income) contributes to understand the relationship between those effects and the relative influence of their determining factors.

We will not consider the effects of fiscal changes on the generation of primary income. In the tradition of this branch of the literature, our analysis is also theoretically agnostic and not model-based. We do not consider the effects of changes in the parameters defining the structure of the system on the decisions of individuals and on key economic variables (the “multipliers” of fiscal policy, over which there is much

⁴ See, for example, the review of the literature contained in Arachi, Ferrario and Zanardi (2006). <http://ecomod.net/sites/default/files/document-conference/ecomod2007-rum/162.pdf> and the more recent of Poghosyan, T., Senhadji, A., and Cottarelli, C. (2015).

uncertainty⁵). While the debate on the stabilising role of fiscal policy is focused on the effectiveness of automatic stabilisation and the impact of discretionary measures on output⁶, the approach taken here puts the emphasis on the identification and measurement of the redistribution, risk-sharing and stabilising effects of taxes and transfers on per capita disposable income of households by regions, taking as given primary income per capita. These operations represent only a subset of fiscal policy decisions affecting redistribution and stabilisation. We leave out of the analysis, in particular, indirect taxes and benefits in kind, which have important effects on the redistribution and stabilisation effects of fiscal policy⁷ on individuals' consumption and welfare.

The empirical basis of the analysis is the set of income accounts of households by regions in the European Union, as well as the personal income by states for the US⁸. These accounts provide solid statistical information, with homogeneous definitions in national accounts terms in Europe, estimated with common procedures and, therefore, sufficiently comparable. We analyse the redistribution, risk-sharing and stabilization of per capita primary income of households by regions in the period 2000-2012 relying on the information of the regional income accounts of households provided by the national institutes of statistics of the US (Bureau of Economic Analysis), the UK (Office for National Statistics), Germany (DESTATIS), France (INSEE), Italy (ISTAT) and Spain (INE) for these years. In the US, disposable income is equal to market income plus personal current transfers minus personal income taxes. In the European System of

⁵ See, for example, Thomas Warnedinger, Cristina Checherita-Westphal and Pablo Hernández de Cos (2015).

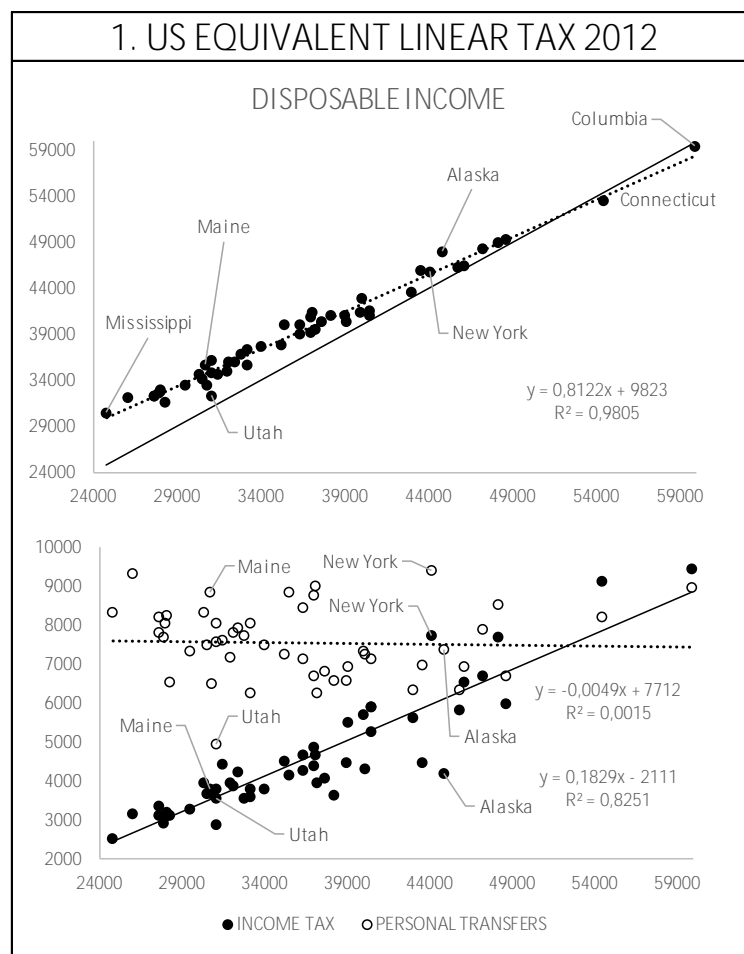
⁶ See, for example, the discussion in Veld, Jan in 't, Larch, M., and Vandeweyer M. (2010).

⁷ In Spain, the only country of the six studied here that provides regional data on in-kind transfers, the redistributive impact of these transfers (health, education and social services provided free by the government to all individuals) is as important as the effect of all other redistribution operations taken together, although transfers in kind do not contribute much to the stabilisation of the adjusted income resulting from adding transfers in kind to disposable income.

⁸ A short description for the European countries can be obtained in <http://ec.europa.eu/eurostat/web/products-manuals-and-guidelines/-/KS-GQ-13-001>. For the US, the methodology of the conceptual framework, the data sources, and the statistical methods used by the Regional Income Division of the Bureau of Economic Analysis (BEA) to estimate personal income and employment for states can be found in <http://www.bea.gov/regional/pdf/spi2014.pdf>.

Accounts, disposable income of households equals primary income plus social benefits other than in kind, less income taxes, less social security contributions and less other (net) transfers paid.

The estimate of the ELT for the US in 2012 is presented in chart 1. Per capita disposable income, taxes and transfers in 2012 are presented in the vertical axis as a function of market income per capita of the 50 states, measured in the horizontal axis. All figures are expressed in current US dollars. Mississippi had the lowest primary income (24784\$) and Columbia (59982\$) the highest one. In terms of disposable income per capita, the first state had 30584\$ and the second 59529\$, so that the range of the distribution of disposable incomes was almost one fifth smaller than the range of the distribution of market incomes. All the states, except the two richest ones (Columbia and Connecticut) get a higher disposable income than their primary income, as shown in the chart by the position of the points with respect to the continuous line of 45°.



The adjusted regression lines show the key parameters estimated for the ELT in 2012. The intersection with the vertical axis of the regression line estimated for disposable income in the upper part of chart 1, was 9823\$. The regression line of disposable incomes over primary incomes is a very good fit ($R^2=0.98$), although the fit of the components of the ELT are poorer. As shown in the lower of chart 1, the ELT is the combination of a progressive income tax, characterised by a negative lump sum tax credit per capita of 2111\$ and a marginal tax rate of 18.29%, with a basic transfer of 7712\$. Transfers are not dependent on market income (slope equal to -0.005 and $R^2=0$). The intercept in the regression line of disposable income is the sum of the tax credit and the basic transfer, and the slope of the regression equals one plus the slope of the regression line for the income tax and minus the slope of the regression for personal transfers. Although the parameters of the ELT have not remained constant through time, the structure of the ELT and the relative positions of all the states (i.e., the residuals of the fitted regressions) show great stability, indicating that there are structural features that determine the highly persistent dispersion of the income taxes paid and the personal transfers received per capita by each state.

The content of this paper is as follows. The definition and measurement of the effects of a linear income tax and the relationship between both are presented in section 2. This section also presents a way to define the automatic changes and fiscal impulses underlying the observed changes of primary and disposable incomes, which will be used in the empirical analysis contained in section 3. In that section, we estimate first for each year and country the parameters of an ELT, which determine the redistributive effects, and check whether they correspond to the observed effects. Then, the changes in the estimated parameters in any one year allow to check the risk-sharing effects in that year, which depend on the automatic changes induced by the differential growth in primary income through the fiscal drag, without any systematic role for the fiscal impulses. Finally, the stabilising (or destabilising) fiscal impulses introduced in that structure every year interact with the always stabilising influence of the fiscal drag embedded in the structure of the ELT to determine the procyclical or countercyclical effect of observed changes in disposable income with respect to primary income. The main conclusions are summarised in the last section.

2 Redistributive, risk-sharing and stabilising effects of a linear tax

A negative linear income tax is the simplest theoretical mechanism to formalise redistributive, risk-sharing and stabilising effects. A negative linear income tax is a combination of a proportional tax on the primary or market income of each individual and a fixed transfer (“a minimum guaranteed income” or MGI) to each individual. Below a certain threshold of primary income the amount transferred is bigger than the proportional tax and the net result is a negative tax or positive transfer for the individuals whose primary income is below that threshold. The redistributive effect of this tax consists in reducing by a constant the distance to the mean of each individual’s share in disposable income with respect to what is his share in primary income. In this way, the shares of all individuals in disposable income are closer to equality than their shares in primary income by the same constant. The stabilising and risk-sharing effects are the same as the redistributive effect when considering the impact on disposable income growth either of idiosyncratic shocks to the growth of primary income in any region in a single year (risk-sharing effect), or the impact of growth fluctuations in primary income along time (stabilising effect).

The linear income tax is formally defined by:

$$T(y_i) = \tau \cdot y_i - I \quad [1]$$

In this expression, y_i is the primary income of individual i , and T is the tax function, where $\tau \in (0,1)$ is the constant marginal tax rate and $I > 0$ is a constant transfer per capita (the MGI). Hence, from [1], we define disposable income of individual i , d_i as:

$d_i = y_i - T(y_i) = (1 - \tau) \cdot y_i + I$, and we derive:

$$\frac{d_i - d_m}{d_m} = (1 - \tau) \cdot \frac{y_i - y_m}{y_m} \cdot \frac{y_m}{d_m} = \frac{1 - \tau}{1 - t_m} \cdot \frac{y_i - y_m}{y_m} = \eta \cdot \frac{y_i - y_m}{y_m} \quad [2]$$

Where the sub-index m refers to the average of the distributions and t_m is the average tax rate: $t_m = \frac{T(y_m)}{y_m} = \left[\tau - \left(\frac{I}{y_m} \right) \right]$. Equation [2] shows that the distance of any individuals’ disposable income to the mean income, as a proportion of the mean of disposable income, is a constant η of the distance of the individual primary income to the

mean of primary income. This constant $\eta = \frac{1 - \tau}{1 - t_m} = \frac{\Delta d / \Delta y}{d / y}$ is the residual tax progressivity,

defined as the elasticity of disposable income with respect to primary income and measured at the mean of the distribution of primary income⁹.

The residual tax progressivity η is the constant of contraction of inequality in primary income distribution and of the width of its fluctuations. The dispersion of disposable incomes around their mean is a linear contraction of the dispersion of gross incomes around their mean. This type of redistribution is specific of a linear tax, which is the only redistributive mechanism that produces a net tax revenue and redistributive, risk-sharing and stabilising effects not dependent on the distribution of primary income, but only on the parameters of the tax function and on the mean of the primary income distribution¹⁰. For given parameters of the linear tax, the width of variations in disposable income (cross-section, due to regional shocks, and time-series, due to common shocks) is equal to this same constant times the width of the respective variations in primary incomes. Hence, these three effects are the same, and if the observed data can be satisfactorily approximated by an ELT, the magnitude of the estimated effects should be similar.

The redistributive effect of a linear tax is measured by $1 - \eta = \frac{I}{d_m}$, and the associated index of inequality is the coefficient of variation. From [2] it can be seen that the redistributive effect of the linear tax has a particularly simple presentation as the ratio of the minimum guaranteed income to the average disposable income. In addition, it can be shown that there is a one-to-one association between the linear tax as a redistribution mechanism and the CV as a measure of inequality¹¹. The type of redistribution operated by a linear tax minimizes locally inequality measured by the CV, and the minimisation of inequality measured by the CV requires the type of redistribution

⁹ See Marín, J. (1985): Algunos índices de progresividad de la imposición estatal sobre la renta en España y otros países de la OCDE. Documento de trabajo 8529. Banco de España. Servicio de Estudios.

¹⁰ A formal proof of this proposition can be found in Marín, José (1989): Dos propiedades del impuesto lineal, *Investigaciones Económicas* vol. XIII, nº 1, 1989, pp. 3-14. <http://193.146.141.99/investigacion/revistas/paperArchive/Ene1989/v13i1a1.pdf>

¹¹ A formal proof of this proposition can be found in en Blackorby, Ch. and Donaldson, D. (1978): "Measures of relative equality and their meaning in terms of social welfare", *Journal of Economic Theory*, núm. 18, págs. 59-80. [http://darp.lse.ac.uk/papersdb/Blackorby-Donaldson_\(JET78\).pdf](http://darp.lse.ac.uk/papersdb/Blackorby-Donaldson_(JET78).pdf).

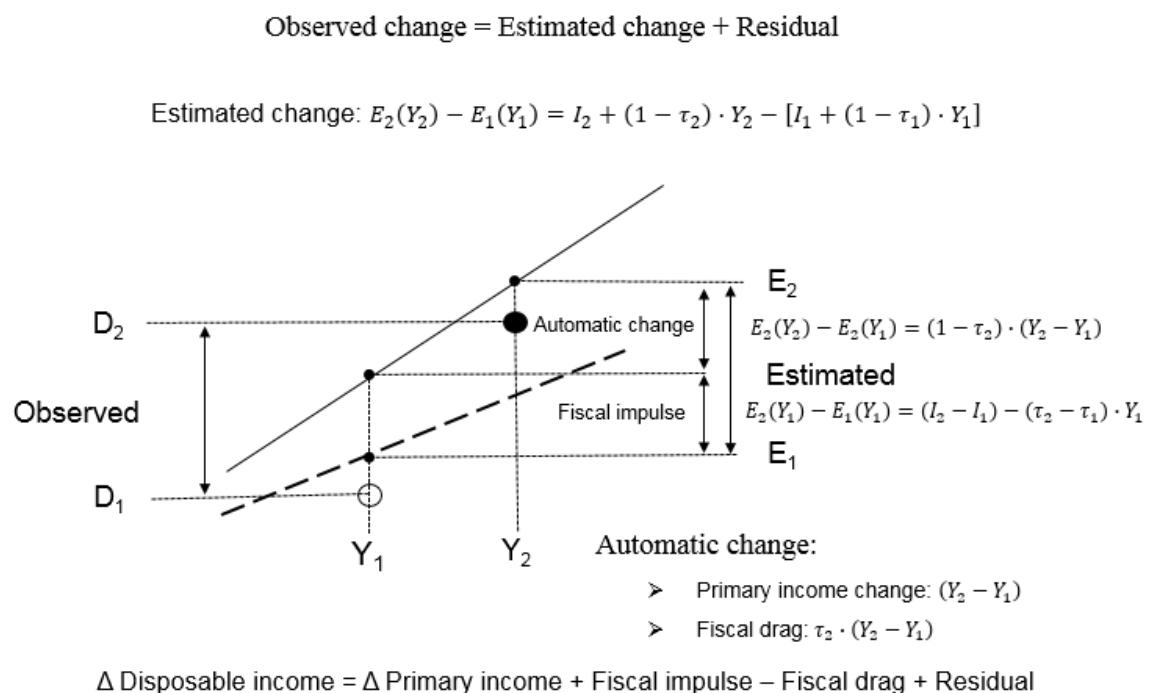
generated by the linear tax. The coefficient of variation (CV in what follows) is defined as the ratio of the standard deviation to the mean of the income distribution. For a variable x_i the coefficient of variation $CV(x_i)$ is defined by $CV(x_i) = \frac{1}{x_m} \left[\frac{1}{N} \sum_{i=1}^N (x_i - x_m)^2 \right]^{1/2}$. From equation [2] it also follows that the residual tax progressivity should be equal to the ratio of the coefficient of variation of disposable income over the coefficient of variation of primary income: $CV(d_i) = \eta \cdot CV(y_i)$. Hence, in the redistribution of income operated through a linear tax, the CV of disposable income is a fraction of the CV of primary income, and the observed redistributive effect can be measured independently from the ELT estimate by one minus this fraction: $1 - \left[\frac{CV(d_i)}{CV(y_i)} \right]$. The comparison of this observed effect with the ELT estimated effect ($1/d_m$) allows to assess how good the ELT approximation is.

The risk-sharing and stabilising effects of the linear income tax are equal to the redistributive effect. When we estimate the residual tax progressivity $\eta = \frac{1-\tau}{1-t_m}$ for each year through cross section regressions of data of deviations in the rates of change of disposable income of the regions from the national rate on their deviations in the rates of change of primary income from the national rate, we get the risk-sharing effect. When we estimate this elasticity with time series regressions of the changes in disposable income on the changes in primary income, we get the stabilising effect. These effects capture the ability of the tax and transfer system to smooth disposable income fluctuations when there are idiosyncratic regional (risk-sharing) or common (stabilization) shocks. However, the results of these estimates using rates of change and their deviations from the national value as basic data are very far from what is found from annual cross-section estimates of the ELT with the variables in levels. The links between cross-section estimates in levels (redistributive effect), cross-section estimates in deviations of rates of change with respect to the national value (risk-sharing effect), and time-series estimates in rates of change (stabilising effect) are not easy to find in empirical estimations, due to changes in regulations of taxes and transfers and discretionary decisions taken every year.

The estimation of the parameters of an ELT for each year facilitates the analysis of risk-sharing and stabilising effects by differentiating between the impact on disposable income of changing the parameters of the ELT, for a given income level (fiscal

impulse), and the impact of changes in primary income levels, for a given structure of the ELT (automatic change). Risk sharing and stabilising effects are a combination of fiscal impulses and automatic changes. Figure 1 reproduces schematically two observations of primary and disposable incomes, one for an initial year (Y_1, D_1) as an empty point and another one (Y_2, D_2) as a full point for the following year, as well as the two regression lines corresponding to the estimates of the ELT in year 1 (the discontinuous line) and year 2 (the continuous one). The estimated points on the regression lines would then be (Y_1, E_1) and (Y_2, E_2). It is possible to decompose the observed change in disposable income ($D_2 - D_1$) into two estimated changes and a residual. The “fiscal impulse” change in disposable income is calculated for the primary income of year 1, with the changes in the estimated parameters of the ELT from year 1 to year 2. A positive impulse is represented in figure 1, which shifts the regression line upwards. The automatic change is calculated with the parameters of the ELT in year 2 as the change in disposable income induced by the observed change in primary income from year 1 to year 2 minus the fiscal drag effect.

Figure 1. Fiscal impulse and drag effects



The contributions of the fiscal impulse and the automatic change to the observed change in disposable income can be easily calculated:

$$\frac{D_2 - D_1}{D_1} = \frac{E_2(Y_2) - E_1(Y_1)}{D_1} + \varepsilon = \frac{I_2 - I_1}{D_1} - (\tau_2 - \tau_1) \cdot \frac{Y_1}{D_1} + \frac{1}{D_1} \cdot [(1 - \tau_2) \cdot (Y_2 - Y_1)] + \varepsilon \quad [3]$$

The observed rate of change in disposable income is then decomposed into the contributions of the fiscal impulse and the automatic change plus a residual. Although we will focus on the fiscal impulse and drag effects on disposable income, these effects are a composition of the respective effects in the different redistributive operations. The same formula [3] can be applied to decompose the observed rates of change of the different redistributive operations into the same effects. The definitions of the stabilising effect and the decomposition in [3] preserve the additivity of the different redistributive operations that mediate between primary and disposable income.

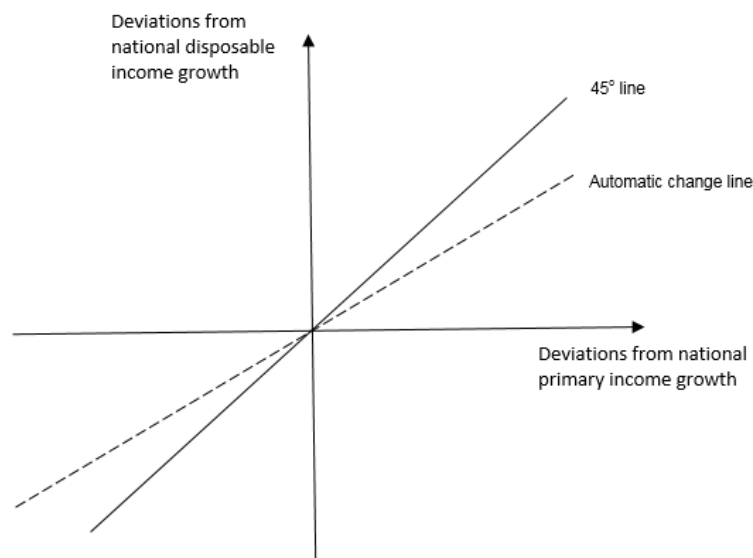
Fiscal impulses and automatic changes could be interpreted as proxies of discretionary policies and automatic stabilisers, respectively¹². Existing taxes and benefits have structures defined by parameters, some of which should be adjusted every year, like tax allowances and credits, values defining the limits of brackets in the bases to which specific tax and contributions rates are applicable, benefits revaluation, minimum and maximum pensions, unemployment benefits, etc. Hence, while the automatic changes depend on the structure of the system fixed for each year, such structure is fine-tuned every year. The rates of change of the variables are much more volatile than the changes in their relative levels, and accordingly it is not surprising that the estimates of the redistributive effects are much more robust than the estimates of the risk-sharing and stabilising effects.

To estimate risk-sharing effects we analyse deviations of regional rates of change of disposable and primary incomes from the respective national values. If a region

¹² However, as pointed out by Dolls et alii (2014, p.19), the computation of these effects from macro data “include behavioral and general equilibrium effects. Therefore, a measure of automatic stabilization based on macro data changes captures all these effects. Thus, it is not possible to disentangle the automatic stabilization from stabilization through discretionary policies or changes in behavior because of endogeneity and identification problems”. According to Fatás and Mihov (2011), “the literature has struggled with the issue of endogeneity and there is no consensus on how to completely avoid the problem”.

suffers from an idiosyncratic shock that makes its primary income change deviate from the national value, the redistribution mechanisms implicit in the national tax and transfer system will dampen the impact of the shock on disposable income growth in the region. As shown in figure 2, a risk sharing effect would be observed if the points representing each year the pairs of values of deviations of regional primary income growth from the national value (in the horizontal axis) and deviations of regional disposable income growth from the national value (in the vertical axis) are below the 45° line whenever they are to the right of the vertical axis, and above if they are to the left of the same axis. This is shown by the dashed line representing the automatic change line in figure 2, which is the regression line of deviations of automatic changes (as defined in [3]) of regional disposable income from the national value on regional deviations of primary income rates from the national value.

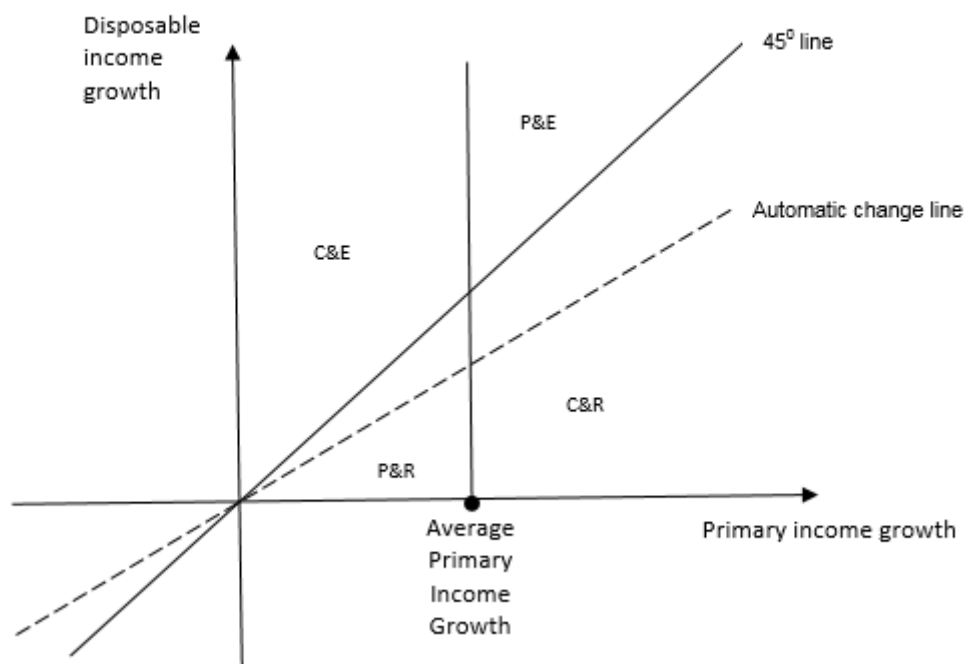
Figure 2. Risk-sharing effects



The analysis of stabilising effects is based on the relationship between the time series of rates of change in primary and disposable incomes. The overall effects will be expansionary if fiscal policy (here understood in a limited way, as the set of redistributive operations of the tax and transfer system intervening between primary income and disposable income) contributes to a higher growth (or a lower decline) in disposable income than in primary income, and restrictive otherwise. The cyclical characterization of the changes depends on whether they are expansionary or restrictive

when the rate of growth of primary income is higher or lower than the average rate of growth of the period analysed. If the change is restrictive when primary income rises faster than the average of the period, or expansionary when the rate of growth of primary income falls below the average of the period, this change will be characterised as countercyclical. Symmetrically, when primary income growth falls below the average and the change is restrictive, or if primary incomes grow more than the average of the period and the change is expansive, we will call these changes procyclical. A diagram (Figure 3) representing changes in primary incomes in the horizontal axis, and changes in disposable incomes in the vertical axis, can help fixing unequivocal conventions for the analysis of the overall stabilising effects and their decomposition into automatic changes and fiscal impulses.

Figure 3. Stabilising effects



The continuous line of unitary elasticity sets the boundary to characterize fiscal policies as expansionary or restrictive. Expansionary policies correspond to points that are above it, because disposable incomes grow more or decline less than primary incomes, while restrictive policies correspond to points below that line. Thus, the crossing of this line of unitary elasticity with a vertical line over the average rate of growth of

primary income during the period considered define four regions in the plane which allow a classification of fiscal effects. Following the direction of clock hands, the effects are considered procyclical and expansionary (P&E) for points in the upper right region, countercyclical and restrictive (C&R) for points in the lower right region, procyclical and restrictive (P&R) for points in the lower left region, and last, countercyclical and expansionary (C&E) in the upper left region. The dashed line in figure 3, with slope lower than one represents the automatic changes that are induced by the change in primary incomes through the fiscal drag. This line is fitted to the points of the automatic changes calculated for each year from the slope of the estimated ELT for each year t : $(1 - \tau_t) \cdot (Y_t - Y_{t-1})$. The vertical distance between the automatic change line and the 45° line is the drag effect on disposable income. Plotting in this diagram the points corresponding to the observed annual rates of change of primary and disposable income and fitting a linear regression to them, we can assess the effects of fiscal changes. The vertical distance from each observed point to the automatic change line measures the impact of fiscal impulses in that year. For example, a point located between the unitary elasticity and the dashed lines represented in figure 3 indicates an impulse countervailing only partially the drag. A slope of the fitted regression line lower (higher) than the slope of the automatic changes line indicates a higher (lower) overall stabilisation effect than the automatic effect and, therefore, a stabilising (destabilising) influence of fiscal impulses on disposable income.

3 Empirical evidence

3.1 Data

The existing systems of taxes and transfers intervene year after year a sizeable part of output. Tax and transfers systems redistribute close to 15% of output in the US, more than 20% in Spain, and close to 30% in the other European countries we analyse. It is useful to stress upfront some limitations of the data basis of the analysis, in order to qualify the interpretation of the conclusions. Although the variables analysed are broadly comparable across countries, there are some differences in their statistical definitions. For example, market income in the US does not include payroll taxes, while social security contributions are included in primary income in the European countries. In the same vein, disposable income includes in the US interest and transfers to be paid by persons, which are netted out in the European definition, and some in kind benefits received, which are not computed as disposable income according to the European System of Accounts, but recorded in the concept of “adjusted disposable income”. INSEE does not provide the estimates of regional primary income, but only of its main components, excluding the social contributions in charge of the employer (which do not affect the estimates of disposable incomes), so that we have had to impute them by regions in order to homogenise the figures of primary incomes with the information provided by the other countries. There may be also differences in the institutional arrangements affecting other operations, notably indirect taxes and transfers in kind, which are excluded of the analysis but have an important potential to redistribute and stabilise adjusted income (which is obtained adding these transfers to disposable income) and the real consumption possibilities of individuals. For example, a country can collect more revenue as indirect taxes, reducing primary incomes, and use the proceeds to finance lump sum cash benefits for children, boosting disposable income, or free health care benefits, thus increasing adjusted disposable income and also the prices of the taxed goods and services. In addition, the results may be sensitive to differences in the level of aggregation of the data, particularly in years with strong changes in income. For example, in Spain, at the level of disaggregation of 52 provinces and autonomous cities (instead of 19 areas), and in Germany, at the level of some 430 municipalities (instead of 16 länder), the highest discrepancies in redistributive and stabilising effects

are observed in the crisis year of 2009¹³. In the case of the UK, the differences in the regional distribution of primary incomes per capita are quite important when using the aggregation at the level of NUTS1 (nine regions) or NUTS2 (40 regions). The CVs at the more aggregate level are between 8 and 12 percentage points lower than at the more disaggregate level, although the estimated and observed redistributive effects are very close at each level separately, showing a difference of less than 2 percentage points and 0.9 on average. In the case of the UK, we have chosen the most disaggregated data as a basis. In the other countries, the choice is relatively easier, given their administrative structure: the states in the US, the länder in Germany and the autonomous regions in France, Italy and Spain. Comparisons involving the levels of the variables in different countries have to be assessed carefully. The size of the redistribution operated between primary and disposable incomes of the individuals which are on average representative of the regions in the different countries should not support conclusions on relative inequality of individuals between regions or countries.

3.2 Redistributive effects

The redistributive effects of the tax and transfers system are very different, both in size and composition, in different countries. Although they have not remained constant, their changes during the period studied here have been gradual and smooth, with a steady increase in the UK and Italy, while remaining almost flat in the US and France (except for the structural break in 2006), and declining somewhat in Germany and more markedly in Spain. Concerning the size, Table 1 reports the redistribution effects between primary and disposable income per capita of households by regions, estimated as the ratio of the MGI to the average disposable income, together with the observed redistribution effects, measured by 1 minus the ratio of the CV of disposable income over the CV of primary income. It is to be noted that the differences are below one percentage point in the US, the UK, Germany and Italy in all years, but they are more important in Spain (2.1 on average) and France (3.9 on average).

¹³ In that exercise, the redistributive and stabilising effects estimated in Spain with more disaggregated data are 3.6 and 2.6 percentage points lower, respectively, than those estimated with aggregated data. In Germany the effects are also 4.6 and 5.2 percentage points lower, respectively, when estimated at the level of the municipalities than when estimated for the länder.

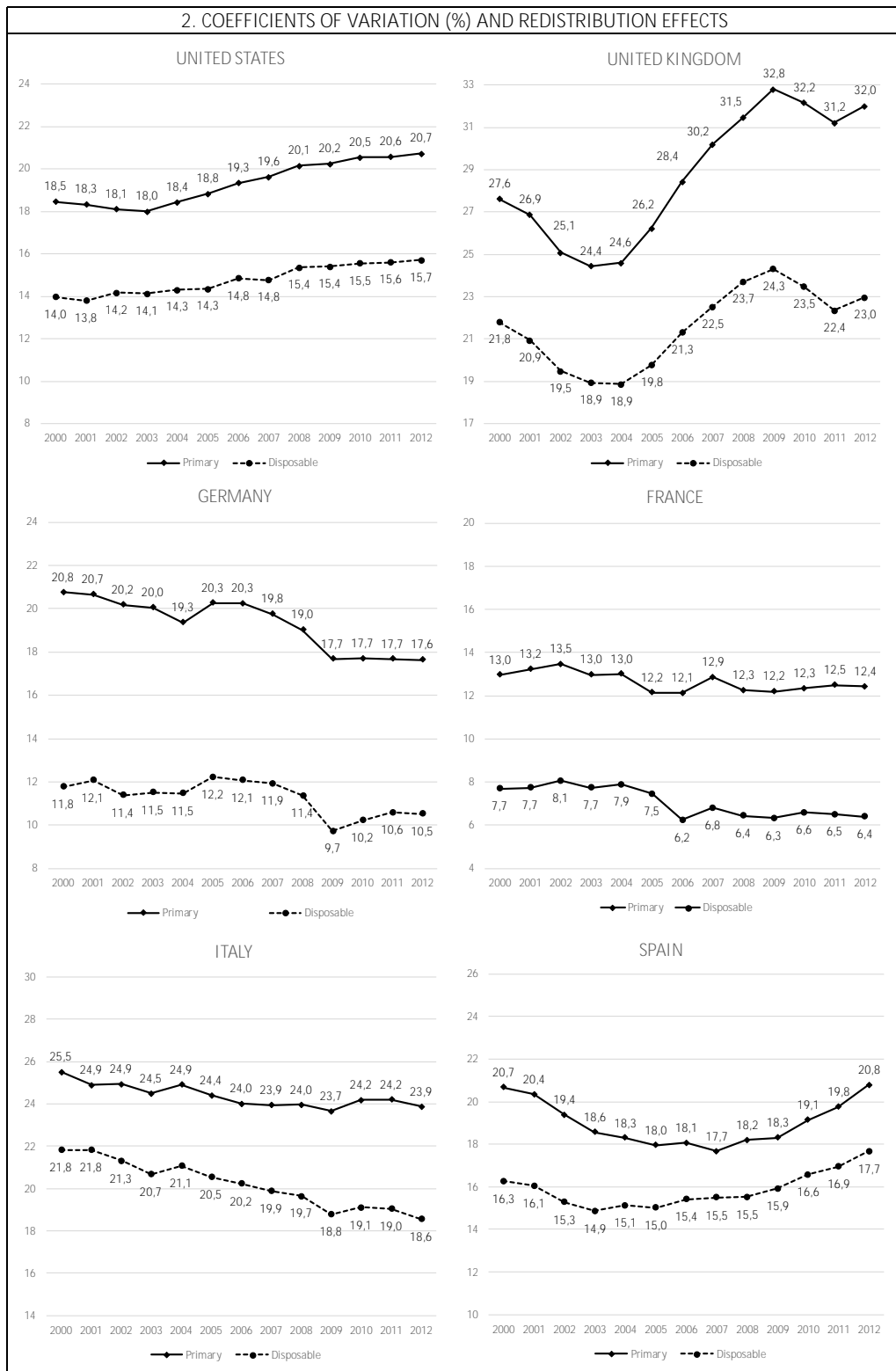
ESTIMATED	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	AVERAGE	S.D.
United States	25,3	25,4	22,5	22,3	23,1	24,6	23,9	25,4	24,6	24,7	25,1	25,0	24,9	24,4	1,1
United Kingdom	21,6	22,6	23,2	23,1	23,9	25,1	25,6	25,9	25,1	26,3	27,5	29,0	28,8	25,2	2,3
Germany	44,0	42,4	44,3	43,3	41,6	40,4	41,1	40,3	41,0	45,5	42,7	40,5	40,9	42,2	1,7
France	44,0	44,2	42,6	43,1	42,1	42,5	53,6	50,9	52,7	52,1	50,7	53,7	53,8	48,1	5,0
Italy	15,1	13,0	15,2	16,4	16,1	16,5	16,5	17,6	18,6	21,1	21,6	21,9	22,9	17,9	3,1
Spain	22,4	22,3	22,6	21,7	19,4	18,9	17,8	16,0	17,3	15,2	15,3	15,9	17,1	18,6	2,8
OBSERVED	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	AVERAGE	S.D.
United States	24,3	24,7	21,7	21,5	22,4	23,8	23,2	24,7	23,7	23,9	24,3	24,2	24,2	23,6	1,1
United Kingdom	21,1	22,0	22,4	22,5	23,3	24,6	25,1	25,4	24,6	25,9	27,0	28,4	28,2	24,7	2,3
Germany	43,3	41,6	43,6	42,6	40,8	39,6	40,4	39,6	40,3	44,9	42,2	40,1	40,4	41,5	1,7
France	40,7	41,5	40,1	40,3	39,3	38,6	48,5	47,1	47,5	48,1	46,6	47,9	48,5	44,2	4,0
Italy	14,4	12,3	14,5	15,6	15,4	15,8	15,8	16,9	18,0	20,6	21,0	21,3	22,3	17,2	3,1
Spain	21,4	21,1	21,2	19,9	17,3	16,4	14,7	12,3	14,7	13,1	13,4	14,2	15,0	16,5	3,3

The distribution of primary income per capita of households by regions has not remained constant. The time pattern of inequality in disposable income is dominated in all countries by inequality in primary incomes, while the redistributive impact of the tax and transfer systems develops much more sluggishly. The panel of charts 2 presents for each country the evolution of the CVs of primary income (top line) and disposable income (bottom line). The gap between the two lines in each chart shows the evolution of the redistributive capacity of each system. The experience of each country is different. In the US and the UK, inequality has tended to increase, while redistribution effects have remained stable in the US and increased substantially in the UK. In Germany and Italy inequality of primary incomes has diminished, while the impact of redistributive operations has also diminished in the former but increased in the latter. In France, inequality of primary incomes has been practically flat, but redistribution has risen mainly due to the jump in 2006, which seems to be associated to a statistical break¹⁴. In Spain, inequality has first declined, in the years before the crisis of 2007, and then returned to the previous level, with rising inequality.

The tax and transfer system does not seem to affect the sources of inequality in primary income. As shown in chart 2, the time pattern of inequality in the distribution of disposable income is determined by inequality in primary income, so that redistribution through the tax and transfer system, while effectively reducing every year the inequality

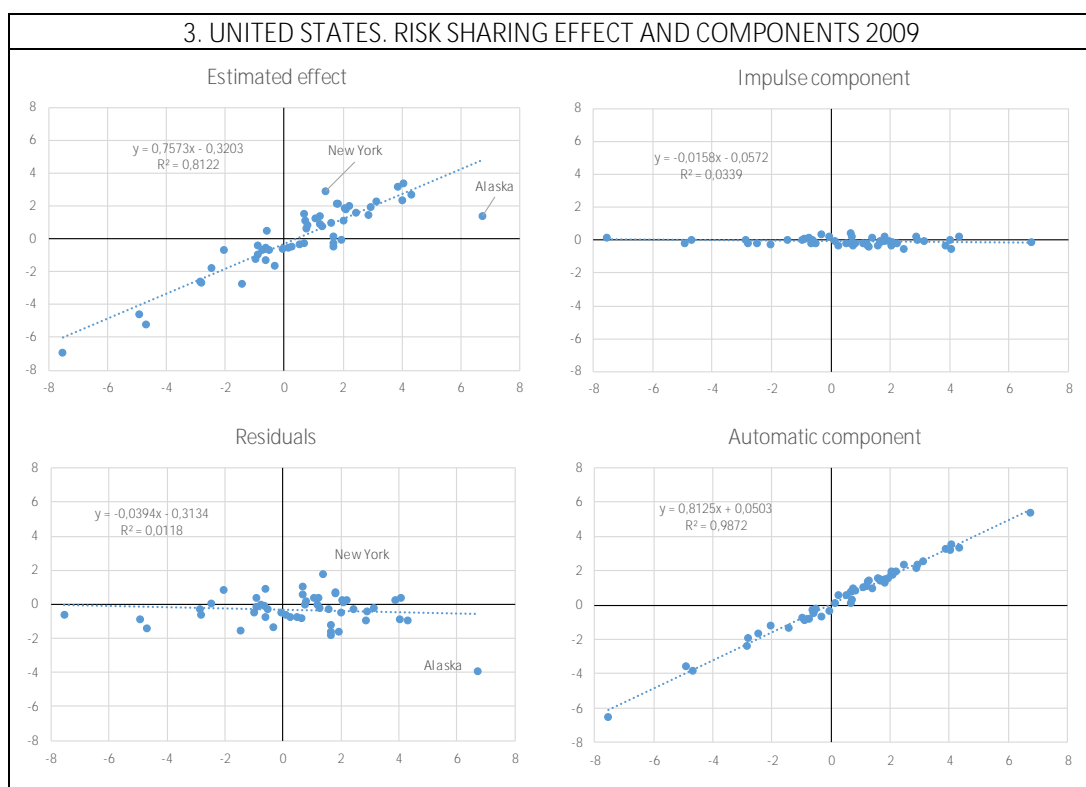
¹⁴ This point has not been clarified by INSEE.

in the distribution of disposable income with respect to primary income, does not seem to affect the determinants of inequality in primary income.



3.3 Risk-sharing effects

Risk-sharing effects are estimated for each year through regressions of regional differences in the rates of change of disposable income on the regional differences in the rates of change of primary income, defining both differences with reference to the respective national values. An example of the estimates of the risk-sharing effect and its decomposition into the impulse and automatic changes and the residual is shown in panel 3 for the United States in 2009. The impulse component is almost always insignificant, as can be seen in the upper right chart of the panel, so that it is possible to infer that this is a common noisy factor for all regions which, once we normalise taking as the reference the national values, there is no systematic effect of this component. Therefore, the risk-sharing effect is produced entirely by the drag effect implicit in the automatic change, presented in the bottom right chart of the panel, which almost always shows a very high correlation coefficient. Hence, as the fiscal drag depends almost exclusively on the progressivity of income taxes (see chart 1) while the impulses come mainly from changes in personal transfers, it can be concluded that risk sharing operates mainly through taxes and not through transfers.



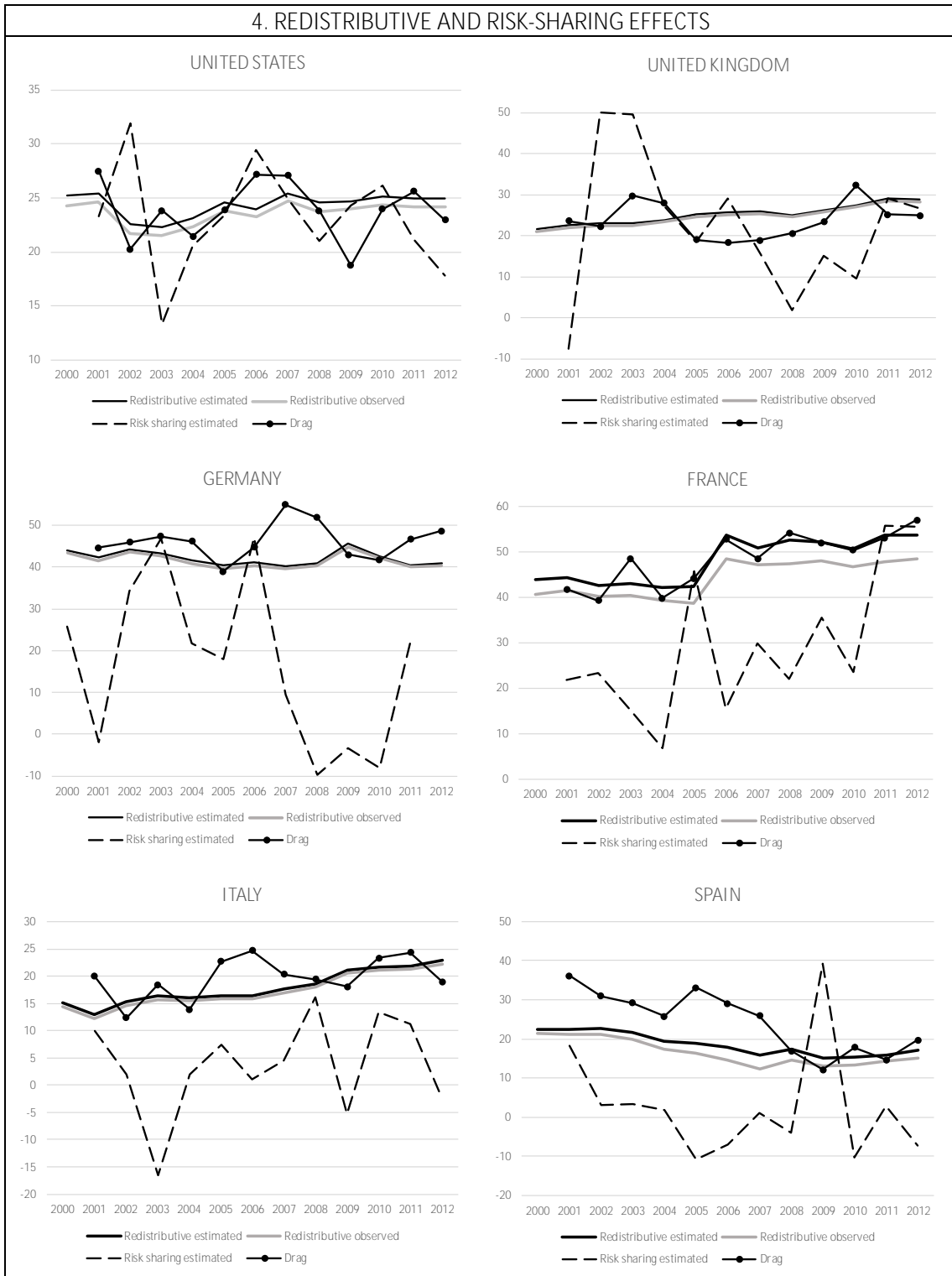
Nevertheless, in addition to the deviation of regional primary income growth from the national value, there are other variables (ignored in this analysis) that contribute to explain the observed differential growth of disposable income in specific regions, as can be seen in the bottom left chart of the panel, showing the residual component. In the years considered in our analysis, the states with the highest standard deviation of the residuals are Alaska (1.7 percentage points) and New York (1.2 percentage points), but also Louisiana, Mississippi, and South Dakota have standard deviations of one percentage point. As a consequence, the fit of the regression to the observed data of growth differentials shown in the upper left part chart of panel 3 is somewhat worse and the estimation of the risk-sharing effect much more volatile than the automatic effect induced by the fiscal drag.

There is a high variability of the risk-sharing effect and the automatic changes in comparison with the redistributive effect. Table 2 summarises the averages and standard deviations of the risk-sharing effects and the drag effects. In terms of averages for the period, the estimates for the US and the UK are close to the respective redistribution effects reported in Table 1, while in the other countries the estimated risk-sharing effects are much lower than the redistributive ones, and hardly different from zero in the continental European countries because of their high volatility. However, the drag effect is less volatile and the redistributive effects of table 1 are within one standard deviation of the estimates shown in table 2.

TABLE 2. RISK-SHARING EFFECTS (%)				
	Estimated		Drag	
	Average	Stand. Dev.	Average	Stand. Dev.
United States	23,1	5,0	23,8	2,8
United Kingdom	22,0	17,2	23,8	4,5
Germany	16,8	20,0	46,2	4,3
France	29,2	15,9	48,4	5,9
Italy	3,6	9,1	19,7	3,8
Spain	2,5	14,0	24,3	7,8

In panel 4, it is shown the estimated and observed redistributive effects in the six countries considered here, as reported in table 1, together with the estimated risk sharing effect and the drag effects.

4. REDISTRIBUTIVE AND RISK-SHARING EFFECTS



3.4 Stabilising effects

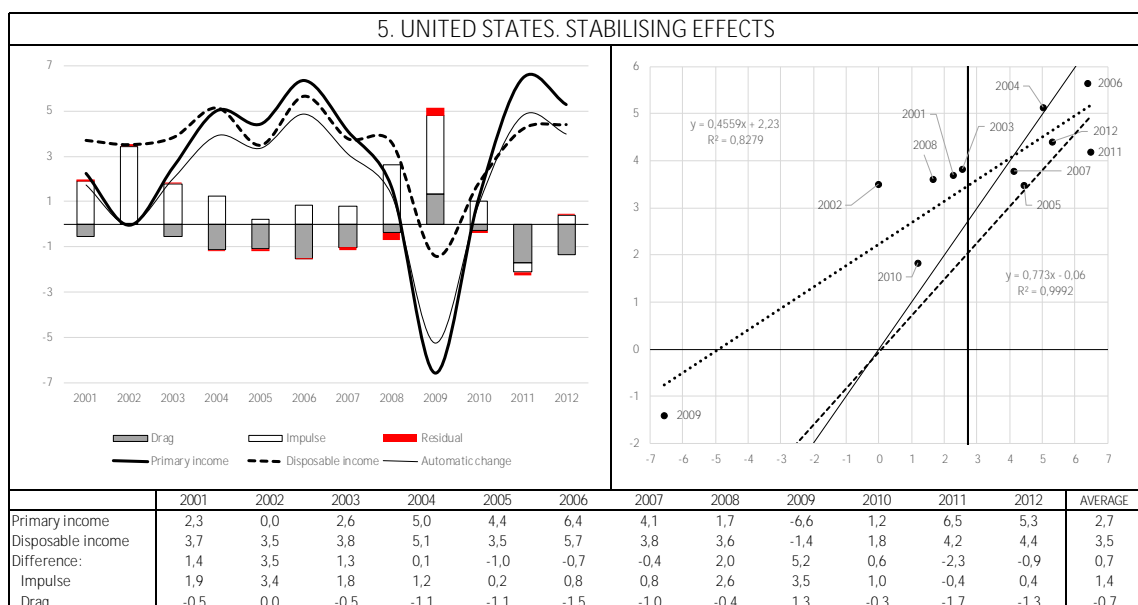
Stabilising effects are estimated through the elasticity of disposable income with respect to primary income. In the empirical literature these estimates exploit the time series dimension of panel data and find a wide range of results, which differ from one another not only in the size and the composition of the effects, but also in the puzzling differences between redistributive and stabilising effects. Despite the variety of approaches taken and the efforts invested in refining the econometric techniques used in successive studies, discrepancies persist. The estimation of annual ELT is a simpler method, whose transparency may contribute to clarify some issues. The parameters estimated in the ELT are relatively stable. However, when considering the fluctuations of disposable incomes over time, the stabilising effects embedded in the system are complemented by fiscal impulses which often override them. The estimated stabilising effects in each year are a mix of the annual fiscal impulses changing this structure, which may be stabilising or destabilising in that particular year, and the drag effect of changes in primary income through the existing structure of the system on changes in disposable income, which is always stabilising.

Automatic stabilisation effects produced by the fiscal drag are equal to the redistributive effects. Table 3 summarises the decomposition of estimated stabilising effects, estimated by applying [4], into the impulse and drag effects estimated by applying in [3] the estimated parameters of the ELT. It is worth stressing that the estimates of the fiscal drag in all countries are very close (well within one standard deviation) to the average redistributive effects observed in the period, as reported in Table 1.

TABLE 3. STABILISATION EFFECTS (%)			
	Estimated	Impulse	Drag
United States	54,4	31,7	22,7
United Kingdom	63,9	38,7	25,2
Germany	43,2	2,8	40,3
France	12,6	-34,0	46,7
Italy	11,1	-5,4	16,5
Spain	23,1	6,5	16,6

3.4.1 United States

Fiscal policy in the US has been highly stabilising and systematic. Panel 5 shows the estimated decomposition of the gap into automatic changes, fiscal impulses and a residual from the errors in the regression on which the decomposition is based. The size of these errors indicate how good the decomposition of the observed changes based on the estimates of the ELT parameters each year is. In the left chart, the gap defined by the thin continuous line (automatic change) minus the thick continuous line (market income growth) is the fiscal drag. The gap defined by the dashed line (disposable income growth) minus the line of automatic change (continuous thin line) is the fiscal impulse. The size of the bars is the sum of both effects plus the error, all in absolute value, which is also the gap defined by the difference between the rate of change of disposable income minus the rate of change of primary income. The net value of these three elements corresponds in the right chart of the panel to the vertical distance measured by the difference of each point minus the 45° line. In the same chart, the vertical distance measured by the gap defined by the dashed line minus the 45° line is the effect of the fiscal drag on disposable income, and the vertical distance measured by the difference between each point minus the dashed line is the fiscal impulse plus the error. The figures corresponding to fiscal impulse and drag effects are reported at the bottom of the panel. Fiscal impulses have prevailed over the automatic effects in half of the years. In 2001-2003 and 2008-2010, the size of the fiscal impulse is bigger than the drag effect.



Fiscal impulses have been stabilising in the period as a whole, as shown in the right chart of panel 5 by the regression line of estimated effects (line of points) being flatter than the regression line of automatic effects (dashed line). At 0.46 the estimated slope implies that fiscal effects have attenuated on average by more than a half the impact on disposable incomes of the fluctuations in primary incomes, doubling by fiscal impulses the effect of automatic changes (the vertical distance between the dashed line of automatic stabilisation and the 45° line). Fiscal impulses have always been countercyclical. All observed points fall in the two regions of countercyclical effects (NW and SE) defined in figure 3. Only 2004, when primary and disposable incomes grew at 5%, is at the edge of being procyclical.

Fiscal changes have had a clear expansionary bias in the period, as shown in the same chart by the intersection of the regression line of observed points with the vertical line of average growth of disposable income at a point above the intersection of this vertical line with the line of 45°. Fiscal impulses were almost always expansionary. The only exception is 2011, when primary income grew at its maximum rate (6.5%) and disposable income 2.3 percentage points less, so that this is the only point below the regression line of automatic changes. Fiscal impulses did not fully compensate the restrictive automatic effects when primary incomes grew above the average of the period. This partial compensation left the overall stance of fiscal changes with a restrictive orientation in the years of above average expansion, as shown by the fact that all points to the right of the vertical line are below the 45° line (2004 is on the boundary). Fiscal impulses overcompensated the restrictive influence of automatic changes in all years when primary income grew less than the average of the period. All points to the left of the vertical line are above the 45° line. Fiscal impulses had almost always the opposite sign of drag effects. The exceptions were 2009, when both were expansionary, and 2011, when both were restrictive, as shown in the left chart of the panel by the bars being fully above (in 2009) or below (in 2011) the zero line.

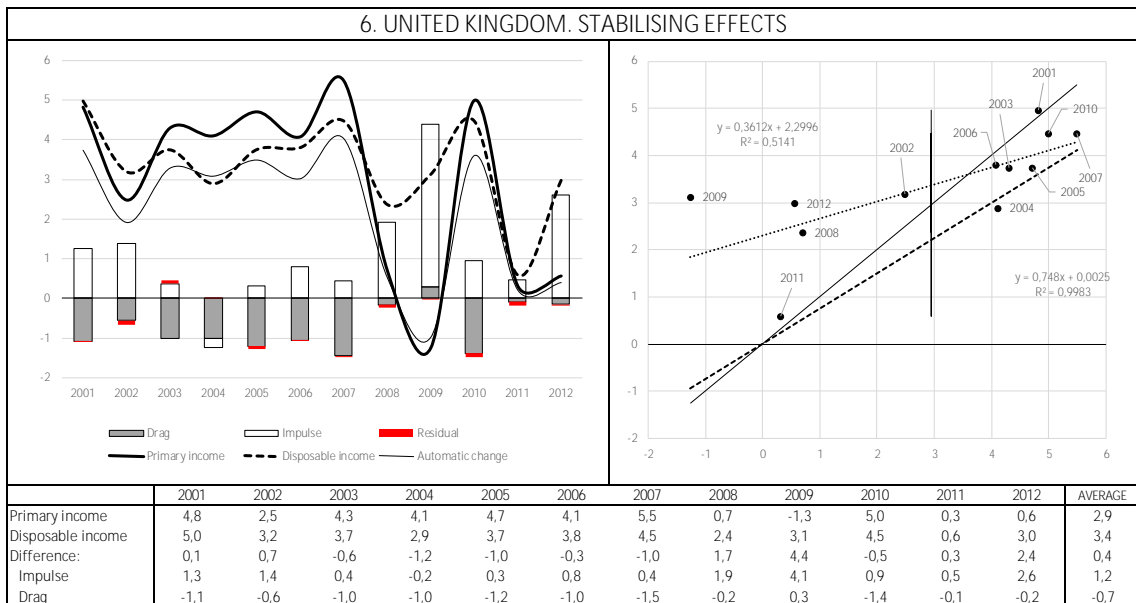
3.4.2 United Kingdom

Fiscal policy in the UK has been even more stabilising than in the US, but also notably more volatile. Fiscal impulses have strengthened automatic changes in the period as a whole. At 0.36 the estimated slope of the regression line on observed rates of change implies that fiscal impulses have attenuated by almost two thirds the impact

on disposable incomes of the fluctuations in primary incomes, while automatic changes would only have reduced by one quarter the width of these fluctuations (See panel 6, where the slope of the dashed line is 0.75). However, the lower correlation coefficient in the UK (0.51 against 0.83 in the US) indicates that fiscal policy has been more erratic. All observed points of disposable income, but one, fall in the two regions of countercyclical effects. Only 2001, when primary income grew at 4.8% and disposable income at 5%, is barely procyclical.

Fiscal changes have had an expansionary bias of half a percentage point per year in the period on average. This expansion took place in the years of below average growth of primary incomes (2002, 2008-2009 and 2011-2012), when disposable income rose at rates above primary income. Fiscal impulses were almost always expansionary. All the points save one (2004) are above the dashed line of automatic changes in the right hand chart of panel 6. Expansionary impulses were moderate in the years of high growth and they did not fully compensate the fiscal drag when primary incomes grew above the average of the period. This partial compensation, shown in the fact that the points are between the dashed line and the 45° line, kept the overall fiscal changes with a stabilising restrictive orientation in this years of above average expansion (As noted before, 2001 is a borderline case). On the contrary, fiscal impulses overcompensated the restrictive influence of the fiscal drag in all years when primary income grew less than the average of the period (all points to the left of the vertical line are also above the 45° line) and had almost always the opposite sign of automatic changes, the exceptions being 2009, when both were expansionary, and 2004, when both were restrictive.

Fiscal impulses in the UK had a substantial stabilising effect. In this period, it is possible to distinguish three different phases. In the years 2000-2003, there was a mild cycle in primary income with its bottom in 2002. After 2003 and up to the onset of the crisis in 2007, primary income expanded at high speed, with rates of growth above 4% every year, reaching a peak at 5.5% in 2007. Then, the five last years are of low growth, on average, with the Great Recession in 2009, and a very short-lived though strong rebound of the economy in 2010, largely induced by the expansionary policy of 2008-2009, which was unsustainable. The turnaround in policy orientation in 2011 would bring again the economy close to recession and trigger a new turn of policy towards expansion in 2012, a roller-coaster experience similar to the stop and go policies of the 1960s.

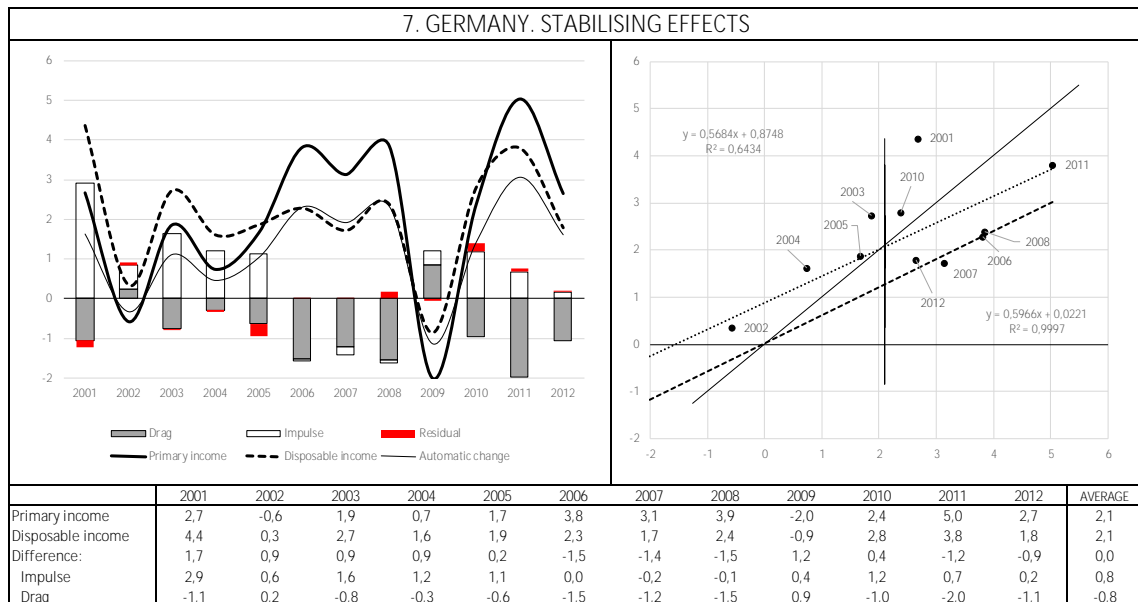


3.4.3 Germany

Fiscal changes have been neutral in Germany on average over the period. The growth rates of disposable and primary incomes have been the same (2.1%) on average, while at 0.57 the estimated slope of the regression line on observed rates of change is practically identical to the slope of the automatic changes line (0.60), as shown in the right chart of panel 7. Overall, it has moderated the fluctuations of disposable income with respect to primary income by 43%, against almost two thirds in the UK and more than half in the US. The low correlation coefficient (0.64) indicates more volatile policy effects than in the US (0.83), but less than in the UK (0.51).

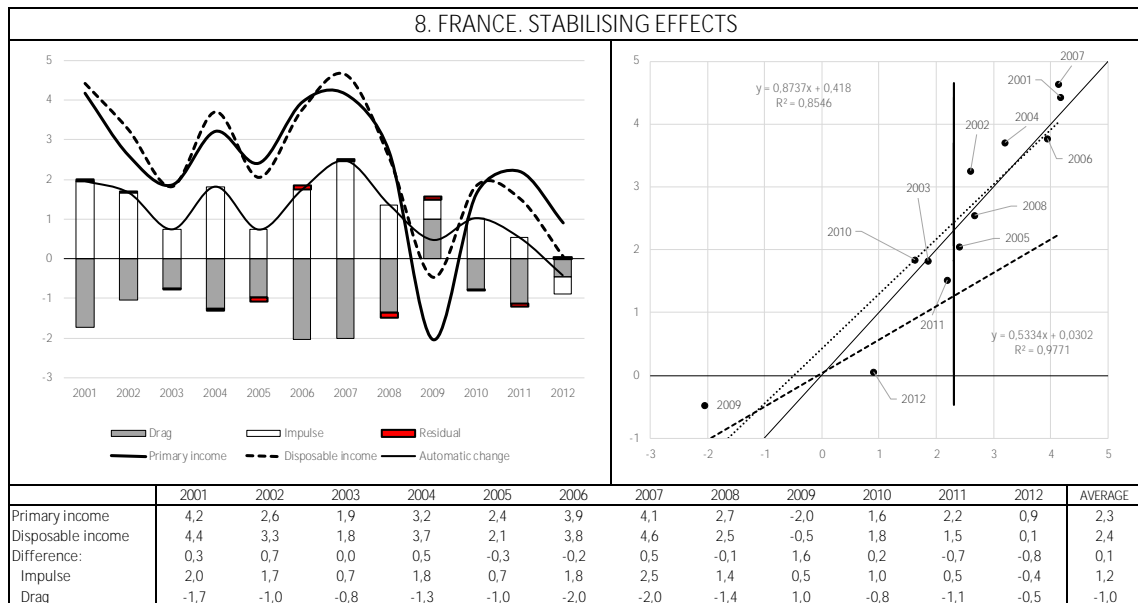
Fiscal changes in Germany have been characterised by fiscal impulses neutralising on average the drag effects. In the period under consideration, it is possible to differentiate four phases. Before 2005, there were three years of low growth, including one year (2002) with a drop in primary income, and a slow recovery in the following two years. After a transition exercise in 2005, the following three years were of solid expansion at rates of growth of primary income between 3% and 4%. The third phase was the blip of the short (one year) and comparatively shallow (-2%) recession of primary income in 2009, with a quick and sharp fall from a peak of 3.9% growth still in 2008, and with an equally fast rebound to a rate of growth of 2.4% in 2010. The last phase is the years 2010-2012, when the German economy consolidated its recovery,

against the background of a fragile international economy and the unfolding sovereign financial crisis in Europe.



3.4.4 France

France had the strongest drag effects of the six countries considered, but the overall stabilisation achieved was small. Fiscal changes have almost always been procyclical, marginally expansionary on average, and very systematic. While automatic changes would increase disposable income only 0.53% for each percentage point of increase in primary income, the average observed fluctuation was on average 0.87% per percentage point of primary income fluctuation, as shown in the slopes of the dashed and dotted lines in the right chart of panel 8. The average rate of growth of disposable income was just one tenth of a percentage point above the average increase in primary income. The correlation coefficient of the regression on the observed points is high (0.85). Almost all the points in the chart fall in, or very close to, the two procyclical regions. Only the expansionary policy implemented in 2009, which strengthened the automatic change, brought the corresponding point well inside the countercyclical region. In the left chart of panel 8, it is apparent the wider fluctuation of disposable income growth than primary income increases in the period before the crisis.



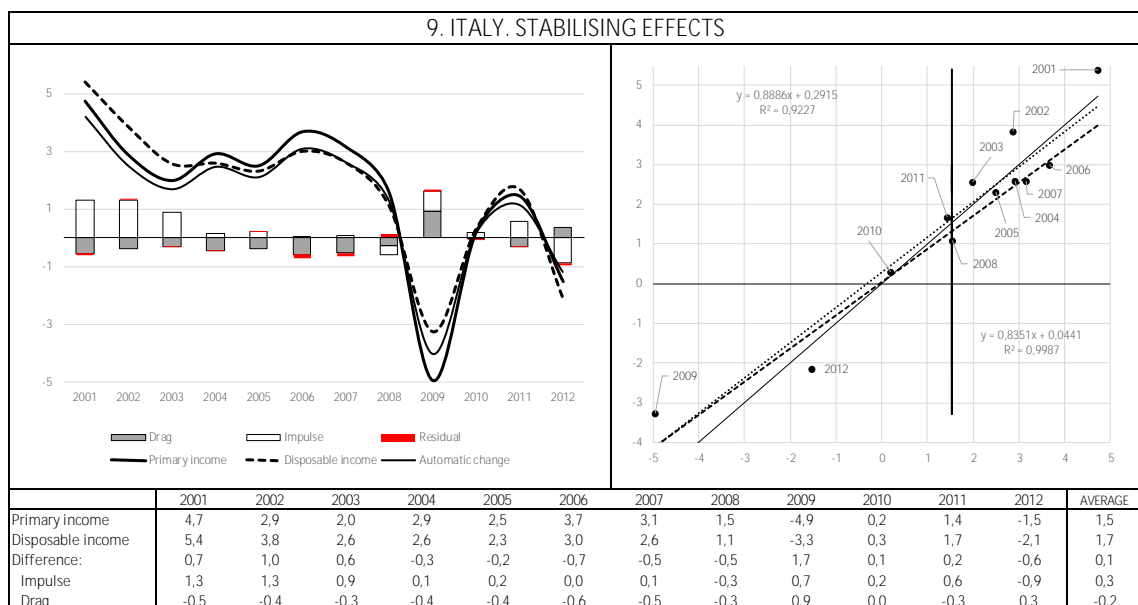
Fiscal impulses were not stabilising in France during this period. It is useful to split just in two phases the twelve years contemplated here. In the first one, covering the years 2001-2008, primary income grew above the average of the period in all years, except in 2003, while expansionary impulses were fuelling disposable income growth to reach rates even above primary income increases in 2001-2002, 2004 and 2006-2008. Furthermore, restrictive procyclical impulses were observed in 2003, bringing the rate of growth in disposable income below the increase in primary income in the only year before the crisis when the latter was slowing down below the average of the period. In the second phase, starting with the year of the Great Recession, fiscal changes were first countercyclical and then procyclical. In the final year of the period, although benefits turned again to be countercyclical, the fiscal impulses of a restrictive nature in income taxes and social contributions kept procyclically biased the overall impact of the redistributive operations on disposable income.

3.4.5 Italy

Italy (and Spain) had the lowest drag effects of the countries studied, and the overall stabilisation provided by fiscal changes was also the weakest. The estimated automatic change implied, on average, that disposable income changed 0.84% for each percentage point of change in primary income, as shown in the right chart of panel 9. The fluctuation actually observed in data has been somewhat higher (0.89%),

so that fiscal impulses have weakened automatic changes exercising a slightly destabilising influence over the period, although less pronounced than in France.

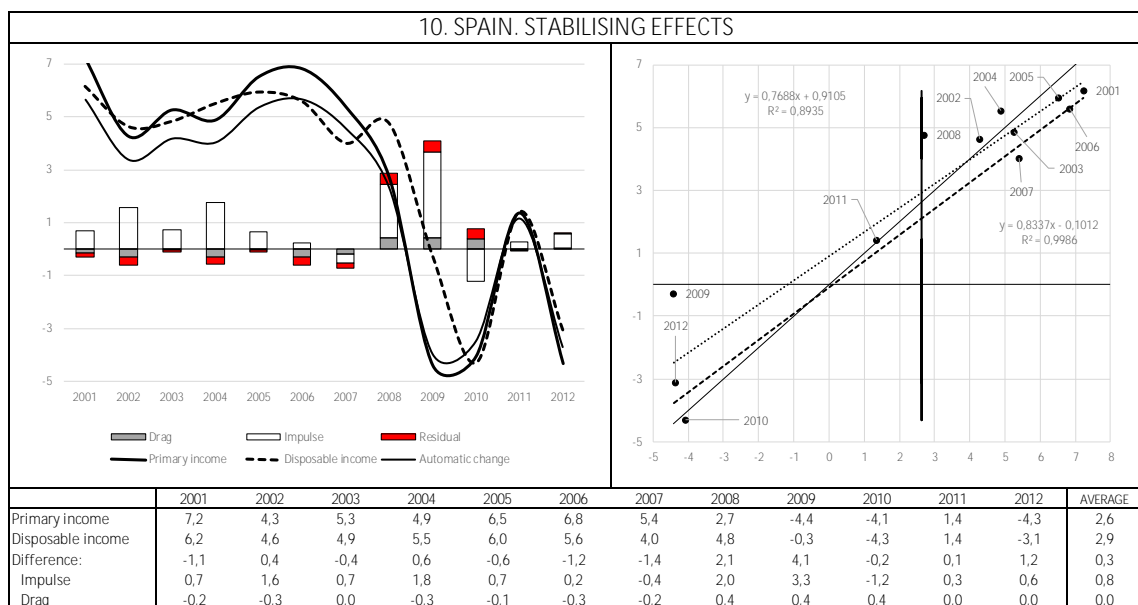
Fiscal changes have been almost neutral in Italy. The differences in the average rates of growth of disposable income (1.7%) and primary income (1.5%), and in the slopes of the automatic (0.82) and observed (0.89) regression lines, are small. Thus, the orientation in one or the other direction of fiscal impulses has had very weak effects on the overall effects. Only in 2001-2003, 2009 and 2011-2012, fiscal impulses had a significant role in affecting the gap between the growth rates of primary and disposable incomes, as shown in the left chart of panel 9. In contrast, the observed points were close to the automatic change line in 2004-2008 and 2010.



In Italy, we can differentiate three phases in the period 2001-2012. In the first three years, there were expansionary fiscal changes, like in other countries, to try to arrest the recessionary trends of declining growth. The following years, up to 2008, when the economy was hit by the international financial crisis, there was a change in orientation towards restriction and a stable expansion of disposable income. In the third phase, after the year 2008, the economy was in a recessionary environment and public finances in a permanently fragile position, which prevented any bold expansionary impulse and even led to a procyclical adjustment of fiscal consolidation in the critical financial circumstances of the last years.

3.4.6 Spain

Fiscal changes have had small stabilising effects in Spain and has been slightly expansionary on average. While the fiscal drag is comparatively weak, fiscal impulses have reinforced a little its stabilisation role in this period. As we can see in the right chart of panel 10, the fiscal drag effect on disposable income reduces by 0.17% the fluctuation of disposable income for each percentage point of fluctuation of primary income, like in Italy. Fiscal impulses have increased slightly the overall stabilisation effect as reflected in the lower slope of the regression line on observed rates of change (0.77) than the slope of the automatic changes line (0.83).



Fiscal impulses had a restrictive orientation in just two years, marginally in 2007, and more intensely in 2010, when it was necessary to limit the rapid deterioration of public finances after the strong fiscal impulses of the preceding two years. In all years, save 2007 and the recessions of 2009 and 2012, fiscal impulses were offsetting the automatic effects of the fiscal drag. The overall effects have not deviated much from automatic changes in this period and redistributive operations have had a relatively systematic impact on disposable income, as shown by the correlation coefficient (0.89). By comparing the relative size of the empty and the full parts of the bars in the left chart of panel 10, it is seen that fiscal impulses have prevailed over drag effects in 2002, 2004, 2008, and 2009. In all these years, save the last, the fiscal stance was expansionary and procyclical.

The period contemplated can be split into two differentiated phases, one of strong expansion (2001-2007) and another one of recession (2009-2012), with a transition year in 2008. In the first phase, fiscal impulses were positive until 2006, compensating partially the small restraining influence of the fiscal drag, and even overpowering it in 2002 and 2004. After the onset of the financial crisis in the summer of 2007, fiscal impulses were more belligerent. In 2008, there was a sharp slowdown in primary income to a rate of growth of 2.7% and fiscal policy, trying to break the recessionary trend, became procyclical. As in other countries, fiscal impulses were no longer supportive in Spain after 2010. With a looming sudden stop of financial flows, after the sovereign debt crisis erupted in Greece, and the economy still in the middle of a deep recession, there was no room for fiscal stimulus. Economic activity broadly stabilised in 2011 before plunging again into recession in 2012. Fiscal impulses were neutral in 2011. The second dip of the Spanish economy was shallower than the first one in terms of output losses, but the fall of primary income by 4.3% in 2012 was as severe as those of 2009 and 2010.

4 Conclusions

The main finding of this paper is that the observed data of primary and disposable incomes per capita of households by regions can be closely approximated by a (negative) linear income tax. A simple regression line of disposable income over primary income gives directly the two parameters (the slope of the line, or marginal rate, and the intersection with the vertical axis, or minimum guaranteed income MGI) defining the structure of an equivalent linear tax (ELT). This tax is equivalent from an aggregate point of view to the existing system, in the sense that it takes the same total values for each variable (primary income, income taxes, social contributions and benefits, etc.) and thus it redistributes the same resources. By exploiting this finding, it is possible to rely on the properties of this type of tax to identify and describe more precisely the redistributive and stabilising effects of the complex systems of taxes and transfers existing in reality.

As a redistribution mechanism, the key property is that a linear income tax is univocally associated with the coefficient of variation, as a measurement of inequality. The type of redistribution produced by a linear tax is a contraction of the dispersion around the mean of primary income shares, so that all shares in disposable income are closer to the average by a constant than the initial shares in primary income. The redistributive effect of the linear tax is given by the ratio of the MGI to the average disposable income. It is thus possible to check whether this effect is a good estimate of the reduction in the inequality directly observable in the data through the coefficients of variation of disposable and primary incomes. It is also possible to do the same for each of the redistributive operations (taxes and transfers) that link primary and disposable incomes.

As a stabilising mechanism, the key property of the linear tax is that it allows to have a clear distinction between fiscal impulses and automatic changes. By calculating separately the effect on disposable income produced by changes in the structure of the system (the two parameters of the ELT) for a given level of primary income (fiscal impulse), and the effect produced by changes in primary income for a given structure of the system (automatic change), it is possible to decompose the observed changes in disposable income into three elements: a fiscal impulse, an automatic effect defined as the change in primary income minus a fiscal drag effect, and

a residual whose size indicates how good is the approximation of the ELT to the data. Automatic effects are “blindly symmetrical” and proportional to the change in primary income. When primary income grows, the drag restrains disposable income expansion, while in recessions the drag limits its decline. Hence, if the average rate of change of primary income is positive, a fiscal impulse is neutral if just compensate this drag without affecting the automatic changes built into the system of taxes and transfers.

The existing systems of taxes and transfers provide effective redistribution, risk sharing and stabilisation of per capita disposable incomes of households by regions. However, there is no indication that they affect the sources of inequality and fluctuation of the respective market economies. Seen through the filter of the ELT, the structure of the systems, represented by the parameters of the ELT, and the redistributive and stabilising effects calculated from these parameters change slowly, while the residual of the regressions identifying the parameters of the ELT are very persistent in size and structure. Year after year, the inequality in the distribution as well as the fluctuations of primary incomes do not seem to be corrected by the effects of these systems, which are just able to attenuate their impact on disposable income.

The distribution of per capita primary incomes of households by regions has not remained constant. During the years 2000-2012, inequality has tended to rise in the UK and the US, has declined in Germany and Italy, and remained stable in France, while in Spain declined first and rose later in the period to reach in 2012 the same level of 2000. The Great Recession does not seem to have affected at all previous trends in the inequality indices by regions in any country.

The size of the redistribution effects is very different in the different countries. The most redistributive system is the French one, where inequality in the distribution of primary incomes is reduced by half in the distribution of disposable incomes. Redistribution in Germany is somewhat smaller and reduces inequality by 40%. In the UK, the tax and transfer system shrinks inequality in the distribution by almost 30%. The redistributive effects are just a little below one quarter in the US, and a little above one fifth in Italy and one sixth in Spain. These orders of magnitude of the effects are the same in both, the values calculated as the ratio of the MGI estimated in the ELT to the average of disposable income, and those observed directly in the data through the CVs of the distributions.

The redistributive power of the taxes and transfer systems has also evolved in divergent directions. It has increased substantially in the UK and in Italy, limiting the effects on disposable incomes of the rising inequality in primary incomes in the British case and adding up to the decline of inequality in the Italian case. In the US, Germany and France (discounting the jump of the structural break of 2006) it has remained more stable, while in Spain has declined markedly up to the Great Recession, recovering later only one third of the loss in the redistributive capacity of the system.

Risk-sharing effects have been very volatile in the six countries analysed. The only systematic component of these effects is the fiscal drag, which is relatively close to the redistributive effect. In contrast, fiscal impulses have played a minor role, being very asystematic across regions in all countries. The estimates are rather poor and the residuals in the regressions are sizeable, indicating that, in addition to the deviations of regional primary income growth from the national value, there have been other (omitted) variables that contributed to determine the observed differential growth of disposable income in specific regions.

Fiscal impulses have had a stabilising effect in some countries and a destabilising impact in others. Fiscal impulses have strengthened the automatic stabilising changes produced by the fiscal drag in three countries (very notably in the US and the UK, and a little in Spain), have been neutral in Germany, and have weakened them in Italy (a little) and in France (remarkably). Fiscal impulses have been often more influential than automatic changes in determining the gap between primary and disposable income growth. On average over the period considered, the size of fiscal impulses in the US (1.7) doubles the size of the drag effect (-0.7), and also on a much smaller scale in Italy (0.4 versus -0.2). In the UK and Spain there have also been activist policies, with fiscal impulses boosting disposable income growth by 1.2 percentage point on average over the period in the UK (0.8 in Spain), and the fiscal drag restraining it by 0.7 percentage point in the UK (0.5 in Spain). In contrast, in Germany and France they have been more balanced, with fiscal impulses and drag compensated at 1 percentage point.

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