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Asset Liquidity and Fiscal Consolidation Programs

Liquidez dos Activos e Programas de Consolidação Orçamental

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ABSTRACT
We argue that the relationship between wealth inequality and fiscal multipliers depends crucially on the type of fiscal experiment used, and on the measure of wealth distribution. We calibrate an overlapping generations model with incomplete markets for different European economies and use Household Finance and Consumption Survey (HFCS) data to compare fiscal multipliers when models are calibrated to match the distribution of gross vs. net wealth. We find a negative relationship between fiscal multipliers and wealth inequality when considering fiscal consolidation programs, in contrast to fiscal expansion experiments which are standard in the literature. The underlying mechanism relies on the relationship between the distribution of wealth and the share of credit-constrained agents. We examine the role of household balance sheet compositions regarding asset liquidity and find that when calibrating the model to match liquid wealth, the relationship between wealth inequality and fiscal multipliers is much stronger.
Keywords: Fiscal consolidation; wealth inequality; fiscal multipliers.

JEL Classification: E21; E62; H31; H63.

RESUMO
Defende-se neste estudo que a relação entre desigualdade e multiplicadores fiscais depende crucialmente do tipo de instrumento fiscal usado, bem como da medida da distribuição de riqueza. Calibramos um modelo de mercados incompletos e gerações sobrepostas para diferentes economias europeias e usamos os dados do Inquérito às Finanças e Consumo das Famílias (HFCS) para comparar os multiplicadores fiscais quando os modelos são calibrados para corresponder à distribuição da riqueza líquida versus ilíquida. Existe uma relação negativa entre os multiplicadores fiscais e a desigualdade de riqueza ao considerar os programas de consolidação orçamental, em contraste com os experimentos de expansão orçamental que são mais comuns na literatura. O mecanismo subjacente depende da relação entre a distribuição da riqueza e a parcela dos agentes com restrições de crédito. Examinamos o papel das composições do balanço patrimonial das famílias em relação à liquidez dos ativos

e apurou-se que, ao calibrar o modelo para combinar a riqueza líquida, a relação entre a desigualdade e os multiplicadores fiscais é muito mais significativa.
Palavras-chave: Consolidação orçamental; desigualdade de riqueza; multiplicadores orçamentais.

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1. Introduction

The 2008 financial crisis brought a renewed interest in fiscal policy. Until 2008, the debate around monetary policy effects dominated over fiscal policy. One of the reasons, according to Ramey (2011) was the belief that fiscal policy typically has a more substantial implementation lag than monetary policy. When the effects of fiscal policy materialize, the economy can be in a different state of the economic cycle, and the consequences can be opposite to what was intended. However, historically low nominal interest rates limited the role for conventional monetary policy, and fiscal policy was brought back to the center of the policy agenda. At the same time, European economies also faced historically high sovereign debt levels which, combined with the fall in output and the rescue of the financial system in the aftermath of the Great Recession of 2008, threatened the sustainability of public finances and lead to a series of austerity packages which had impacts that were mostly unanticipated and different across countries (see Blanchard and Leigh (2013)).

Alongside the renewed interest in fiscal policy, the topic of inequality has recently raised interest among scholars and the general public. Piketty (2014) in the book *Capital in the Twenty-First Century* presented a historical perspective of income and wealth distribution and its determinants.[1] In fact, wealth inequality has been rising over the past decades. On top of that, there have been significant differences in the increase in income and wealth inequality across countries (see Atkinson and Morelli (2012)).

Recent contributions highlighted the relevance of income and wealth inequality for fiscal policy. Brinca et al. (2016) show that observable differences in income and wealth distributions across countries can lead to economically meaningful differences regarding the impact of a one-time increase in government expenditures financed by a one-time decrease in lump-sum transfers. Higher wealth inequality leads to a distribution with fatter tails and consequently more credit constrained agents, which have a larger labor supply elasticity w.r.t. a current negative income shock. Röhrs and Winter (2017) focus on the welfare implications of reducing government and also find that the optimal path of debt reductions depends on the wealth distribution and the corresponding share of credit constrained agents. Brinca et al. (2017) show that cross-country differences in income inequality can account for significant differences in the observed impacts of fiscal consolidation programs. This same mechanism is behind other theories that have been brought forth in accounting for the observed heterogeneity of output responses to fiscal shocks - Basso and Rachedi (2018) show that differences in population age structures across U.S. states explain differences in fiscal multipliers, precisely because younger agents are more likely to be credit constrained.

However, studies that took into account the nature of the asset composition are limited to the U.S. For European countries, studies have been relying on net wealth distribution,[2]

[1] Although this subject has gain importance in the last years, it is not a new topic. Plutarch, an ancient Greek historian (46-120 AD) said that "An imbalance between rich and poor is the oldest and most fatal ailment of all republics."

[2] According to the Household Finance and Consumption Survey of the ECB, net wealth is the "total household assets including pension wealth from defined contribution plans minus total outstanding household's liabilities."

instead of liquid wealth distribution.[3] The relevance of such distinction arises from the fact that only liquid wealth can be used for consumption smoothing purposes and given the focus of the literature on short-run fiscal multipliers, highly illiquid assets such as pension funds for example, cannot be used to such purposes. Hence, models that are calibrated to match the net wealth distribution will produce aggregate marginal propensities to work and consume in response to the fiscal shocks that are likely to be biased, and therefore affect the size of the output response (see Domeij and Floden (2006)). This difference can now be correctly analyzed since the ECB brought a new dataset, the *Household Finance and Consumption Survey*, that can be used to perform cross-country studies taking into account the asset composition of the wealth distribution.

Carroll et al. (2017) show that marginal propensities to consume in response to a positive income shock can be substantially larger if models are calibrated to match the moments of liquid (as opposed to net) wealth distributions. Kaplan and Violante (2014) and Kaplan, Violante, and Weidner (2014) show that the difference in asset liquidity can explain the difference between empirical results regarding the marginal propensity to consume and the ones stemming from standard macroeconomic models.

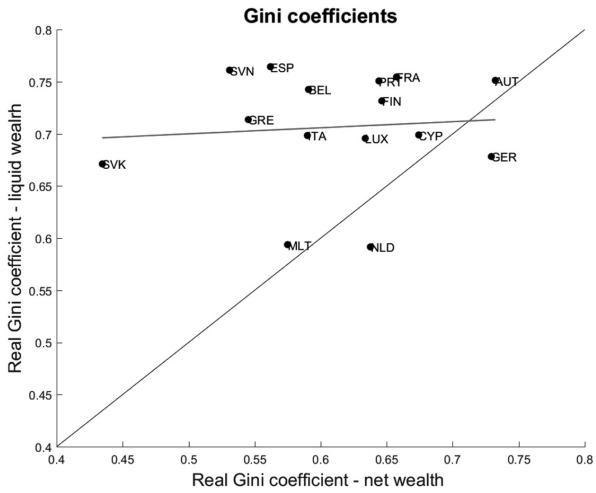
The second reason for using liquid wealth rather than net wealth is that the liquid wealth distribution tends to be, for most of the countries, more uneven distributed than the net wealth distribution (see Figure 1), which can lead to a higher share of credit-constrained individuals than what otherwise would be inferred (see Kaplan, Violante, and Weidner (2014)). The relevance of this idea is because the share of credit-constrained individuals is the data moment that is at the heart of many fiscal policy transmission mechanisms proposed in the literature. Using liquid wealth can help to bridge the gap between empirical estimates of the share of credit-constrained agents (see Grant (2007)) and that same share in standard incomplete markets models.

Third and lastly, as we show in Figure 1 for a sample of 15 European countries,[4] liquid wealth and net wealth are not closely associated: the correlation is small (albeit positive) and not statistically significant. These numbers reinforce the idea that targeting liquid wealth instead of net wealth can be very important.

[3] According to the Household Finance and Consumption Survey of the ECB, liquid wealth comprises non-self employment private businesses, sight accounts, savings accounts, mutual funds, bonds, shares, managed accounts, 'other' assets, private lending, voluntary pension plans or whole life insurance contracts plus the current account balances of any defined contribution public or occupational plans the household members own.

[4] The 15 European countries used are Austria (AUT), Belgium (BEL), Cyprus (CYP), Finland (FIN), France (FRA), Germany (GER), Greece (GRE), Italy (ITA), Luxembourg (LUX), Malta (MLT), the Netherlands (NLD), Portugal (PRT), Slovakia (SVK), Slovenia (SVN) and Spain (ESP).

Figure 1: Gini coefficients in comparison



Note: Gini coefficient of the liquid wealth distribution the x-axis and Gini coefficient of the net wealth distribution in the y-axis. Correlation coefficient 0.0820; p-value 0.7715.

In this paper, we focus on output responses to fiscal consolidation programs and the quantitative relevance of taking into account the distribution of liquid vs. net wealth for the size of fiscal multipliers. We use a novel micro-dataset, the Household Finance and Consumption Survey which has detailed household balance sheet data, and analyzes the effects of the same fiscal consolidation shock in a model calibrated to 9 different European countries, comparing fiscal multipliers when calibrating these models using moments of the liquid and net wealth distributions. We use the model 1 illustrated in the introduction chapter, which contains overlapping generations with heterogeneous agents, incomplete markets, exogenous credit constraints, uninsurable idiosyncratic risk and a bequest motive.

We find that output falls in the short-run, as a consequence of the debt reduction policy, despite converging to a higher level at the end of the consolidation program. The mechanism is similar to the one proposed in Brinca et al. (2016): differences in wealth inequality translate to differences in the share of agents that are credit constrained which, in turn, will lead to different aggregate labor supply elasticities for the fiscal shock. The difference to Brinca et al. (2016) is that, for fiscal consolidation shocks, higher wealth inequality implies *lower* multipliers: as debt-over-GDP decreases, there is a crowd-in effect of assets into productive capital, which increases the marginal product of labor and the net present value of agents' lifetime income. In the short run output falls due to inter-temporal income and substitution effects: agents substitute leisure in the future for leisure today as wages are increasing over the transition to the lower debt-to-GDP steady state; and agents can now afford a higher level of leisure due to the increase in the net present value of lifetime income, reinforced by

a lower interest rate which discounts less future income. These effects lead labor supply to fall in the short run, but by more in countries with less wealth inequality and smaller share of credit-constrained agents, as their labor supply elasticity to future shocks is much smaller. This generates the inverse relationship between wealth inequality and fiscal multipliers.

We also find that calibrating the models to match moments of the net or liquid wealth distributions has no qualitative implications for the results, but the differences are quantitatively relevant. We find multipliers to be on average 14% higher, in absolute terms, when calibrating the models to match the moments of the liquid wealth distribution. This difference is roughly the same regardless of the consolidation program being financed by a decrease in government expenditures or an increase in labor taxes. Despite the small sample size, the differences are also statistically significant.

To the extent of our knowledge, our paper is the only one that explores the policy implications of a fiscal consolidation shock either financed by austerity or by labor income taxes for Europe in the context of a general equilibrium model using liquid wealth. The rest of the article is organized as follows. Section 2 explains the calibration done for each country according to the model. Section 3 presents the results using cross-country analysis. Section 4 concludes. The appendix shows some model properties and calibration details.

2. Calibration

For this exercise, the model is calibrated following the same methodology of Brinca et al. (2016) and Brinca et al. (2017) to match moments of 9 economies: Austria, France, Germany, Greece, Italy, the Netherlands, Portugal, Slovakia, and Spain.[5] Certain parameters have direct empirical counterparts, and they were calibrated outside of the model. Other parameters are not observable, and so they are calibrated using a Simulated Method of Moments (SMM) approach. Appendix presents all the calibration values.

Wages

To estimate the life cycle profile of wages, we use data from the Luxembourg Income Study (LIS) and run for the below regression separately for each of the nine countries:

$$\ln(w_i) = \ln(w) + y_1 j + y_2 j^2 + y_3 j^3 + \epsilon_i,$$

where w is the wage rate from the firms' competitive equilibrium and j is the age of individual i. This equation was estimated in efficient units and the estimated values of y_1, y_2 and y_3 are in table 2.

The parameter for the variance of the ability, σ_a, is assumed to be unchanged across countries and set equal to the average of the European countries in Brinca et al. (2016). The parameter for the persistence of idiosyncratic shock, ρ, was also set to be unchanged

[5] Sample determined by data availability.

across countries and equal to the value used in Brinca et al. (2016), who use U.S. data from the Panel Study of Income Dynamics (PSID).[6] The variance of the idiosyncratic risk, σ_ϵ is then endogenously calibrated, as we will describe below.

Preferences and the Borrowing Limit

There is a large debate about the value of the Frisch elasticity of labor supply, η, in the literature.[7] We set it equal to 1.0, which is similar to a number of recent studies (Guner, Lopez-Daneri, and Ventura (2014) or Trabandt and Uhlig (2012)). The parameter that determines the disutility of hours worked, χ, the discount factors, $\beta_1, \beta_2, \beta_3$ and the borrowing limit, b, are calibrated so that selected model moments match the respective data moments, as we will describe below. In order to ensure that the age-profile of wealth is empirically plausible, we include a bequest motive as in Brinca et al. (2017) and Brinca et al. (2019) and choose φ accordingly.

Taxes and Social Security

We apply the labor income tax function proposed by Benabou (2002). We use U.S. labor income tax data provided by the OECD to estimate θ_0 and θ_1 for different family types. To obtain a tax function for the single individual households in our model, we take a weighted average of θ_0 and θ_1, where the weights are each family type's share of the population.[8]

The employer social security rate, $\tilde{\tau}_{ss}$, and the employee social security rate, τ_{ss} were set equal to the average tax rates between 2001 and 2007 for each country. The consumption tax rate, τ_c, and the capital tax rate, τ_k, were taken from Trabandt and Uhlig (2012), for each of the analysed countries. Table 2 summarizes the tax rates values for the entire sample.

Parameters Calibrated Endogenously

There are 7 parameters that do not have any direct empirical counterpart: φ, β_1, β_2, β_3, b, χ and σ_ϵ. To calibrate them, we use the simulated method of moments. We minimize the following loss function:

$$L(\varphi, \beta_1, \beta_2, \beta_3, b, \chi, \sigma_\epsilon) = || M_m - M_d ||$$

[6] The value of ρ was set equal to the U.S. because European countries do not have data to perform a consistent estimation.

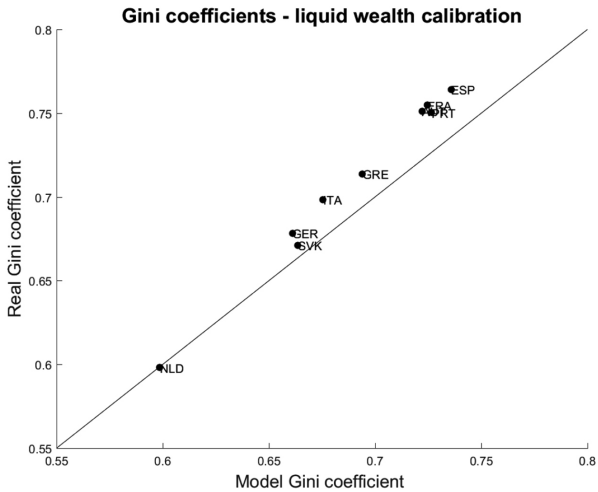
[7] For a complete literature review, see Reichling and Whalen (2012).

[8] The weights used were based in US data as some countries do not have detailed demographic data.

where M_m and M_d are model moments and data moments chosen. As there are seven parameters to calibrate, in order to have a precisely identified system we need 7 data moments. The data moments chose are the same as in Brinca et al. (2017):[9] average yearly hours, taken from the OECD Economic Outlook, the ratio of capital-to-output, $\frac{K}{Y}$, taken from the Penn World Table 8.0, the variance of log wages, taken from the Luxembourg Income Study (LIS) and the three quartiles of the cumulative liquid wealth distribution (the wealth held by those between the 1^{st} and the 25^{th} percentile, between the 1^{st} and the 50^{th} percentile, and between the 1^{st} and the 75^{th} percentile) taken from the Household Finance and Consumption Survey (HFCS), and the mean asset position held by the households with 75 to 80-years old relative to the mean wealth in the economy, from the Luxembourg Wealth Study (LWS).[10] The target moments are calibrated with an average error margin of 1.93%. Table 4 exhibits the target moments and table 5 displays the endogenous calibrated parameters and the calibration error for the nine countries.

Figure 2 compares the Gini coefficient of the liquid wealth distribution in the data with the wealth distribution in the model for the nine economies considered. It ensures that the calibration done mimics the real data since the Pearson correlation coefficient is very close to 1.

Figure 2: Comparison of Gini coefficients



Note: The Gini from the data (Real Gini coefficient) is on the y-axis and the Gini obtained from the model calibration (Model Gini coefficient) is on the the x-axis. It is also represented the 45-degrees line. The Pearson correlation coefficient is 0.9973 with a p-value < 0.01.

[9] In table 3 we summarize the calibration targets.

[10] As we do not have detailed data for the population share of each family for European countries, we use U.S. family shares, as in Holter, Krueger, and Stepanchuk (2019).

3. **Results**

Our premise is that not only the households' balance sheet composition matters for the effects of a fiscal consolidation policy but also the type of fiscal experiment carried out. This section describes the simulations undertaken, the resultant patterns from these simulations, the implied cross-country relationship regarding fiscal consequences and inequality, the importance of liquid wealth in the context of this policy and tests the robustness of the relationship for other inequality measures.

3.1. Experiment

The results from the calibration for the 9 European countries constitute the steady-state or the benchmark point. Contrary to what is standard in most of the literature, we implement a fiscal consolidation policy similar to the one in Brinca et al. (2017). We departure from the steady-state point and implement the fiscal consolidation policy for 50 years, where countries reduce the debt-to-output ratio. We implement two different kinds of experiments for each country: a fiscal consolidation via austerity, *i.e.* decreases in Government expenditure, G; or a fiscal consolidation via taxation, with increases in the labor tax rate, τ_l.

For a fiscal consolidation financed through a decrease in public expenditure, G, Government cuts G by 0.2% of the steady-state GDP. Alternatively, the Government can implement a fiscal consolidation by increasing labor taxes, τ_l. In this case, the public authority increases the tax rate by 0.1% of the steady-state GDP. Either way, the policy creates enough revenue after 50 years to decrease the debt-to-output ratio by ten percentage points.

3.2. Definition of the Fiscal Multiplier

We define the impact and cumulative multipliers as in Brinca et al. (2017):

$$\text{impact multiplier} = \frac{\Delta Y_0}{\Delta I_0}, \text{ with } I = \{G, R\}$$

where ΔY_0 is the change of output from period 0 to period 1 and ΔI_0 can be the change in Government spending from period 0 to period 1 if $I = G$ or the change in Government revenue from period 0 to period 1 if $I = R$. During a consolidation via G, τ_l and g are kept unchanged and during a consolidation via τ_l, G and g are kept unchanged.

$$\text{cumulative multiplier } I(T) = \frac{\sum_{t=0}^{t=T}\left(\prod_{s=0}^{s=T}\frac{1}{1+r_s}\right)\Delta Y_t}{\sum_{t=0}^{t=T}\left(\prod_{s=0}^{s=T}\frac{1}{1+r_s}\right)\Delta I_t}, \text{ with } I = \{G, R\}$$

where ΔY_t is the change in output from period 0 to period t and ΔI_t can be the change in Government spending from period 0 to period t, if $I = G$ or the change in Government revenue from period 0 to period t, if $I = R$.

3.3. Mechanisms

The mechanisms behind the two types of fiscal consolidation policies are distinct and it is important to characterize them separately. It is also relevant to describe how wealth inequality affects the chain of events. The model has four sources of heterogeneity: the households' age, j, their permanent ability, a, the discount factor, β and the idiosyncratic productivity shock, u. These four factors influence the households' wealth accumulation and consequently the aggregate response to the fiscal consolidation shocks.

While the Government pays its debt, the number of Government bonds in the economy decreases which makes households to change how they save. Households gradually shift savings to physical capital, which drives up the capital-to-labor ratio. An economy with more capital per worker is an economy with higher marginal productivity of labor, in other words, more capital in the economy allows workers to be more productive. Due to the market clearing conditions, the marginal productivity of labor equals the wage rate (see firm's competitive equilibrium). Hence, it also rises. Due to inter-temporal and income effects, households will prefer to have more leisure, as wages are increasing over the 50-years transition. With higher wages and lower interest rates, the net present value of lifetime income is higher, which leads labor supply to fall in the short-run and, consequently output also drops.

However, a country with more wealth inequality has more hand-to-mouth agents, which are financially constrained agents. These agents do not have the chance of smoothing consumption as much as they would like. A country with a higher share of financially constrained agents has a more rigid labor supply, meaning that the labor input does not react as much to negative policy shocks which ultimately gives lower drops in output.

In the case of a consolidation via labor income taxes, , we have that an increase in the tax rate also originates intra-temporal substitution effects on the labor supply. In fact, a higher tax rate leads to a lower after-tax income which reduces the opportunity cost of leisure. As a result, labor supply will decrease, reducing the labor input and causing the output to fall.

Following the same reasoning, economies with a higher wealth inequality display a more substantial fraction of financially constrained households. These agents will have a relatively modest reaction to the tax rate increase as they are needy agents. These agents would like to reduce the labor supply, but they cannot reduce it. Therefore, countries with higher shares of constrained agents will have less severe reactions to the fiscal consolidation policy, *i.e.* output drops will be smaller.

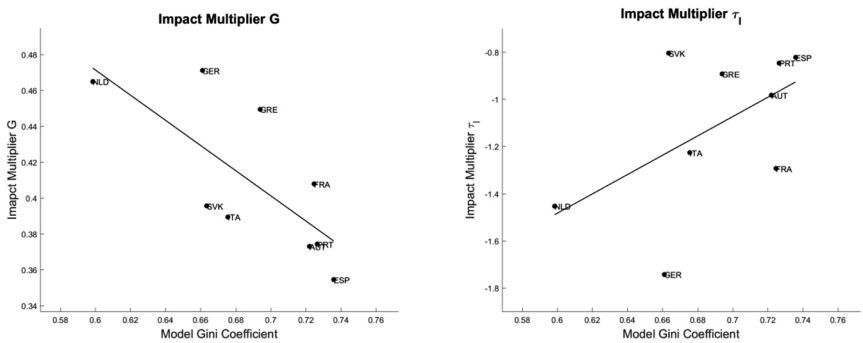
3.4. Cross-Country Analysis

In Brinca et al. (2016), the authors conclude that the wealth distribution is relevant for fiscal policy. They perform the classical fiscal expansion experiment in the literature where

current Government consumption, G, increases financed by a reduction in current Government transfers, g. They conclude that wealth inequality and fiscal multipliers are positively related with a correlation coefficient of 0.623.

As described previously, for a fiscal consolidation shock, countries with higher wealth inequality, have a larger share of financially constrained agents and a more rigid labor supply causing smaller drops in output. In other words, countries with more uneven distribution have smaller fiscal multipliers in absolute values.

Figure 3: Impact multiplier and Gini coefficient



Note: On the left panel we have the cross-country relation for a consolidation via G (correlation coefficient -0.73; p-value 0.026), while on the right panel we have the cross-country data for a consolidation via τ_l (correlation coefficient 0.55; p-value 0.124).

In Figure 3 we plot the impact multipliers for a fiscal consolidation policy either financed by austerity or by taxation and the wealth Gini coefficients across the 9 European countries considered, in the context of a model calibrated for liquid wealth. As countries have more wealth inequality, the impact multipliers are less sizable.

Furthermore, and in accordance to what is standard in the literature, the effects from a fiscal consolidation experiment financed by labor income taxes, τ_l are more severe than the effects from a fiscal consolidation experiment financed by Government expenditure, G.[11] This phenomenon is observable by looking at the absolute value of the fiscal multipliers. For our nine country sample, the fiscal multiplier of τ_l is, on average, 2.7 times larger than the fiscal multipliers of G, in absolute terms.[12]

[11] This is a result that comes from the fact that the consequences of taxation have more direct effects on the economy than austerity. Blanchard and Perotti (2002) estimated different fiscal multipliers for the period 1947-1997 and shows that the multiplier of τ_l tend to be larger than the multiplier of G.

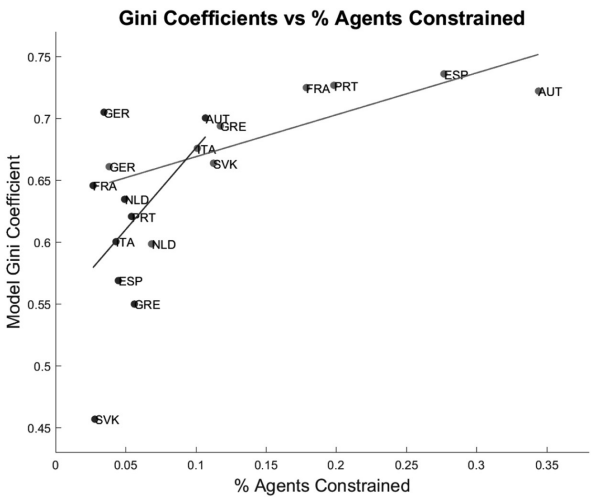
[12] Table 1 has the multipliers' values and the ratio between the τ_l multiplier and the G multiplier of each country.

3.5. Net Wealth vs. Liquid Wealth

The central economic concept behind the mechanisms is the consumption smoothing hypothesis. This hypothesis states that households prefer to consume similar amounts in each period, instead of having a considerable variance in consumption. To keep this behavior during low-income periods, households can resort to their accumulated wealth, convert it into to cash and use it to consume. Yet, not all sorts of assets are right away convertible to cash. Real estate, for instance, is not immediately sold and so households cannot use this particular asset to smooth consumption, in the short-run.

According to OECD (2015), liquid wealth only represents 25.9% of the total wealth for 18 OECD countries. Additionally, the same book shows that net wealth and liquid wealth are not linearly related and that liquid wealth has a more uneven distribution. Therefore, one should use a model calibrated for liquid wealth distribution to explain how an economy responds to a fiscal consolidation shock. To demonstrate this argument, we perform a cross--country analysis for the 9 European economies considered in this paper that illustrate the mechanism of how wealth inequality affects a fiscal consolidation shock. The results show that the mechanism is much stronger for liquid wealth than for net wealth.

Figure 4: Gini coefficient and constrained agents

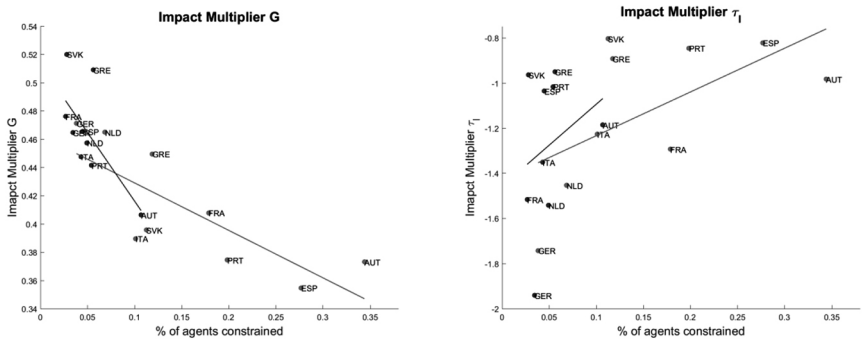


Note: Percentage of agents constrained on the x-axis and Gini coefficient on the y-axis. Red points and lines represent the liquid wealth model and the blue points and lines represent the net wealth calibration (correlation coefficient of liquid wealth 0.76, p-value 0.017; and correlation coefficient of net wealth 0.41, p-value 0.27).

Figure 4 illustrates the relationship between the Gini coefficient and the percentage of agents financially constrained, in a model calibrated for net wealth and liquid wealth.

Although the relation for net wealth is steeper than the relation for liquid wealth, due to the tremendous point-dispersion, there is no statistical significance for the correlation coefficient of net wealth (blue points). In other words, this first step of the mechanism only has statistical power in the model calibrated with liquid wealth (red points).

Figure 5: Impact multiplier and Percentage of agents constrained



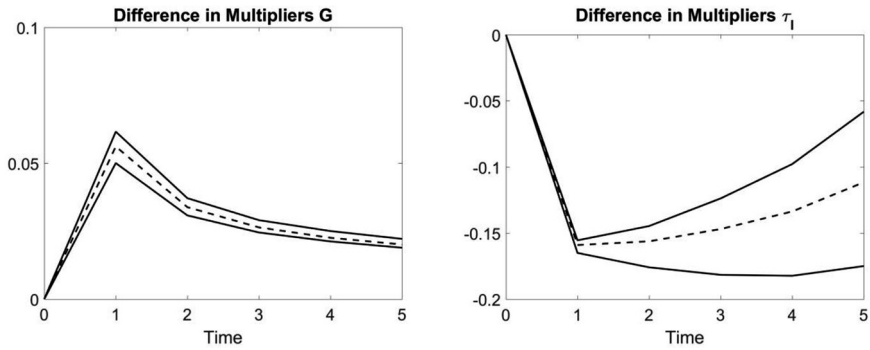
Note: Red points and lines represent the liquid wealth model and the blue points and lines represent the net wealth calibration. On the left panel we have the cross-country data for a consolidation via G (correlation coefficient of liquid wealth -0.79, p-value 0.012; and net wealth -0.68, p-value 0.044), while on the right panel we have the cross-country data for a consolidation via τ_l (correlation coefficient of liquid wealth 0.59, p-value 0.097; and correlation coefficient of net wealth 0.26, p-value 0.502).

Figure 5 shows the other step of the mechanism which states that economies with more financially constrained agents react less to fiscal consolidation policies and so the fiscal multipliers are closer to zero. Indeed, this relation happens independently of the type of wealth used. However, once again, the results have more statistical significance for the model calibrated with liquid wealth. This fact indicates that liquid wealth is, *de facto* the vital measure in what concerns consumption smoothing.

Looking at Figures 4 and 5, one can see that the liquid wealth calibration allowed for higher percentages of credit constrained or hand-to-mouth agents. This is congruent with liquid wealth distribution having a higher Gini coefficient. Several articles estimated the percentage of hand-to-mouth agents for the U.S.[13] (see Kaplan, Violante, and Weidner (2014) or Grant (2007)) and it is significantly larger than the net wealth models exhibit. Liquid wealth models allow achieving a more realistic value of hand-to-mouth agents.

[13] There is no estimation for European countries, to the extent of our knowledge.

Figure 6: Differences in Multipliers



Note: Difference of net wealth cumulative multiplier and liquid wealth cumulative multipliers for a government spending consolidation (left panel) and labor tax consolidation (right panel) in the first five periods. The area between the two solid lines is the 95% confidence interval obtained with sample bootstrapping.

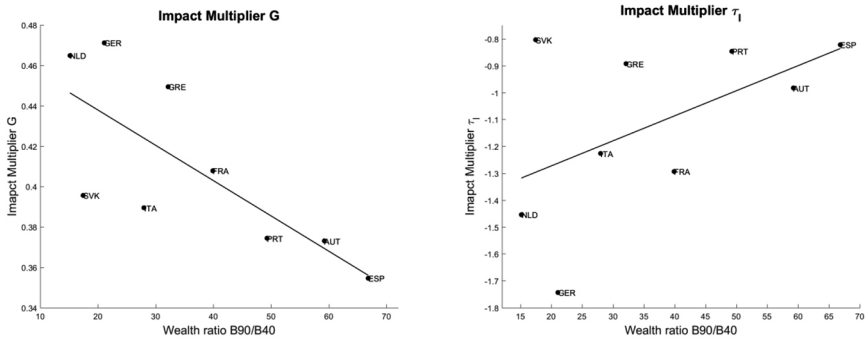
The difference in liquid wealth and net wealth influence not only impact multipliers, but also cumulative multipliers. Figure 6 shows the difference in the cumulative multipliers between net wealth and liquid wealth for the five periods immediately after the shock, computed according to the definition in section 3.1. It reinforces the idea that net wealth multipliers are larger, in absolute value than liquid wealth multipliers but overtime. This occurs precisely because of the mechanism described above where liquid wealth distribution is more unevenly distributed than net wealth which leads to a more significant share os constrained agents and consequently to lower labor supply and output responses to the shocks.

3.6. Robustness of the Mechanism

One possible issue that can arise is the type of measure used to wealth inequality. Allison (1978) presents several measures of income and wealth inequality, including the Gini coefficient. Although Leigh (2007) shows that there is a reliable and statistically significant relationship between top income shares and broader inequality measures, as the Gini coefficient, in this subsection we shall present the relationship of wealth inequality and fiscal multipliers, using the wealth ratios to measure inequality.

Independently of the ratio used, the measure on the numerator corresponds to the share of wealth held by the wealthier households. On the other hand, the denominator corresponds to the share of wealth held by the poorer households. This means that a larger ratio implies a more uneven wealth distribution. In this subsection, we use the wealth ratio B90/B40 – Bottom 90 over Bottom 40. It corresponds to the wealth held by the poorest 90% over the wealth held by the poorest 40%.

Figure 7: Impact multipliers of countries



Note: Impact multiplier and the B90-B40 ratio (B90 is the wealth held by the poorer 90% and B40 is the wealth held by the poorer 40%). On the left panel we have the cross-country data for a consolidation via G (correlation coefficient of -0.76, p-value 0.018), while on the right panel we have the cross-country data for a consolidation via τ_l (correlation coefficient of 0.52, p-value 0.149).

Figure 7 corroborates the same relation described above between fiscal multipliers and wealth inequality. For a fiscal consolidation financed by G, more inequality leads to lower multipliers, and for a consolidation financed by τ_l, more inequality leads to higher multipliers. We also have that the relationship in the case of the experiment financed with taxation is not statistically significant. In the appendix, we include other figures that test the same relation for different wealth ratios.

4. Conclusion

This paper analyzes the impacts of wealth inequality on a fiscal consolidation program financed either by austerity or by taxation. In particular, we assessed the impact of liquid wealth distribution, which is a measure more readily convertible to cash, in a fiscal contraction. We started by documenting that the Gini coefficient of net wealth distribution and liquid wealth distribution have a minimal relation and that the distribution of liquid wealth is more uneven than the one of net wealth.

To explain how wealth inequality affects the recessive impacts of the policy we calibrated an incomplete-markets, overlapping generations model to 9 European economies using the Household Finance and Consumption Survey (HFCS). We calibrated the model for both liquid wealth and net wealth, with the aim of testing the robustness of the mechanism.

We find that the relationship between wealth inequality and fiscal multipliers depend crucially on the fiscal instrument. In a case of fiscal expansion as in Brinca et al. (2016), the relationship is positive. In a case of fiscal consolidation the relationship is inverted, i.e. higher wealth inequality leads to smaller fiscal multipliers in absolute value. This result comes from

the share of financially constrained agents in each country. In fact, more wealth inequality is associated with more financially constrained agents and consequently with a more rigid labor supply. Therefore, the output drops will be smaller for a country with higher inequality comparing to a country with lower inequality.

The economic concept behind this mechanism is the permanent-income / consumption--smoothing hypothesis. For this reason, liquid wealth should be preferred over net wealth when analyzing the impacts of fiscal policy, as the possibility of liquidating assets for consumption smoothing is central to the mechanism being used. Furthermore, when calibrating the model to match liquid wealth, the relationship between wealth inequality and fiscal multipliers for calibrated models to different countries is stronger, both in terms of correlation and statistical significance. This means that cross-country differences in these economies along other dimensions (such as tax structures, age profiles of income, etc.) become comparably less important.

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APPENDIX

Tables and additional figures

Table 1: Impact Multipliers for the model calibrated with liquid wealth

Country	Multiplier G	Multiplier τ_l	$\lvert$Mult $\tau_l\rvert / \lvert$Mult $G\rvert$
Austria	0.3731	-0.9829	2.634
France	0.4078	-1.2936	3.172
Germany	0.4711	-1.7431	3.700
Greece	0.4495	-0.8931	1.987
Italy	0.3895	-1.2267	3.149
Netherlands	0.4649	-1.4536	3.127
Portugal	0.3743	-0.8460	2.260
Slovakia	0.3956	-0.8042	2.033
Spain	0.3546	-0.8223	2.319

Table 2: Parameters calibrated exogenously

Country	Age profile parameters			Taxes					
	y_1	y_2	y_3	θ_0	θ_1	τ_{ss}	τ_{ss}	τ_c	τ_k
Austria	0.155	-0.004	3.0e-05	0.939	0.187	0.217	0.181	0.196	0.240
France	0.384	-0.008	6.0e-05	0.915	0.142	0.434	0.135	0.183	0.355
Germany	0.176	-0.003	2.3e-05	0.881	0.221	0.206	0.210	0.155	0.233
Greece	0.120	-0.002	1.3e-05	1.062	0.201	0.280	0.160	0.154	0.160
Italy	0.114	-0.002	1.4e-05	0.897	0.180	0.329	0.092	0.145	0.340
Netherlands	0.307	-0.007	4.9e-05	0.938	0.254	0.102	0.200	0.194	0.293
Portugal	0.172	-0.004	2.6e-05	0.937	0.136	0.238	0.110	0.194	0.293
Slovakia	0.096	-0.002	1.7e-05	0.974	0.105	0.326	0.131	0.181	0.151
Spain	0.114	-0.002	1.4e-05	0.904	0.148	0.305	0.064	0.144	0.296

Note: y_1, y_2, y_3 are estimated according to the wage equation, using the most recent LIS survey available before 2008. Data for Portugal comes from Quadros de Pessoal 2009 database; θ_0, θ_1 are estimated according to the income tax equation; $\bar{\tau}_{ss}$, τ_{ss} are the average social security taxes paid by the employer and by the employee, respectively, using OECD data of 2001-2007; τ_c and τ_k come from Trabandt and Uhlig (2012) or calculated using their approach. They represent the average effective tax rate from 1995-2007.

Table 3: Parameters held constant across countries

Parameter	Value	Description	Source
α	0.33	Capital share of output	Literature
δ	0.06	Depreciation rate of capital	Literature
ρ	0.335	Persistence of the idiosyncratic shock	PSID-Estimation 1968-1997
σ_a	0.423	Variance of the ability	Brinca et al. (2016)
σ	1.2	Risk-aversion factor	Literature
η	1	Inverse Frisch Elasticity	Trabandt and Uhlig (2012)

Table 4: Calibration Targets - M_d

Country	Q1	Q2	Q3	K/Y	$\bar{n}$	Var $\ln(w)$
Austria	0.0056	0.0395	0.1480	3.359	0.226	0.199
France	0.0045	0.0328	0.1418	3.392	0.184	0.478
Germany	0.0063	0.0544	0.2234	3.013	0.189	0.354
Greece	0.0069	0.0462	0.1831	3.262	0.230	0.220
Italy	0.0087	0.0595	0.2012	3.943	0.200	0.225
Netherlands	0.0106	0.0812	0.3119	2.830	0.200	0.282
Portugal	0.0039	0.0283	0.1399	3.229	0.249	0.298
Slovakia	0.0131	0.0631	0.1399	3.799	0.204	0.250
Spain	0.0041	0.0275	0.1314	3.378	0.183	0.225

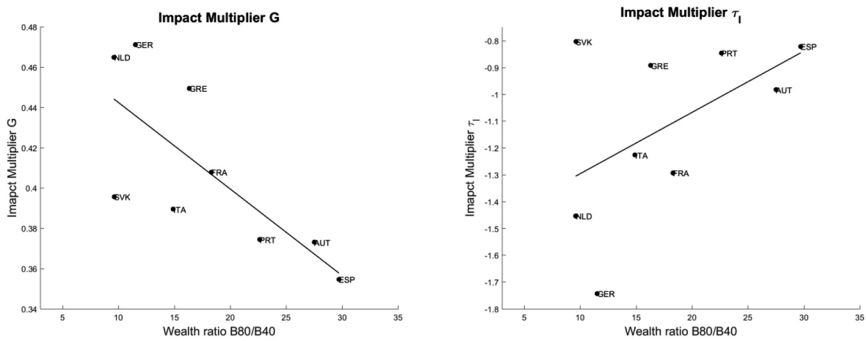
Note: The average share of wealth held by the households in the cohort of 75-80 years old relative to the total population mean is the 7^{th} target. It was used the U.S. measure which is equal to 1.5134; Q1, Q2 and Q3 are the three quartiles of the cumulative distribution of liquid wealth derived from LWS; K/Y is derived from PWT 8.0, average from 1990-2011; $\bar{n}$ is average hours worked per capita derived from OECD data 1990-2011; Var $\ln(w)$ is the variance of log wages from the most recent LIS survey available before 2008. Data for Portugal comes from Quadros de Pessoal 2009 database.

Table 5: Parameter Values calibrated endogenously and respective error Estimated by SMM

Country	β_1	β_2	β_3	b	χ	φ	σ_ϵ	Error (%)
Austria	0.9165	1.0008	0.8837	-0.040	14.47	5.99	0.1757	2.55
France	0.9030	1.0145	0.9170	-0.060	18.43	4.19	0.5060	0.59
Germany	0.9560	0.9953	0.9560	0.003	14.42	3.81	0.5386	0.01
Greece	0.9650	1.0045	0.9665	-0.070	16.77	3.35	0.1206	1.58
Italy	0.9750	1.0200	0.9755	-0.078	20.75	5.90	0.2144	5.20
Netherlands	0.9680	0.9856	0.9579	-0.022	14.72	2.99	0.2625	0.23
Portugal	0.8965	0.9921	0.8900	-0.030	11.62	6.70	0.3810	0.73
Slovakia	0.9410	1.0016	0.9410	-0.091	21.15	7.92	0.3269	3.28
Spain	0.8950	1.0005	0.8920	-0.027	25.15	7.05	0.2372	1.92

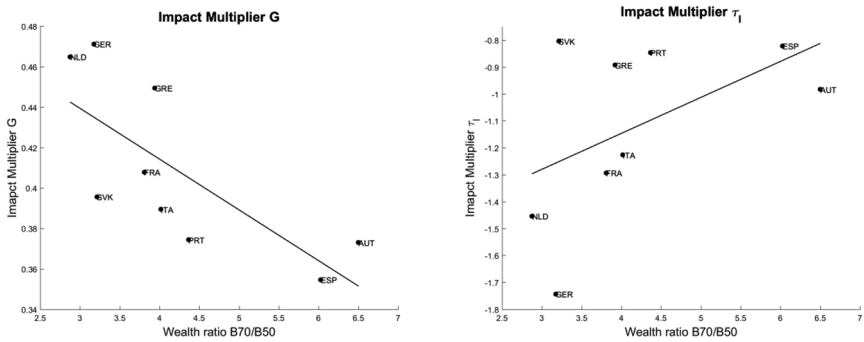
Note: The error corresponds to the value of the Loss function in the calibration section.

Figure 8: Impact Multiplier and Wealth Ratios



Note: Impact multiplier and the B80-B40 ratio (B80 is the wealth held by the poorer 80% and B40 is the wealth held by the poorer 40%). On the left panel we have the cross-country data for a consolidation via G (correlation coefficient of -0.748, p-value 0.021), while on the right panel we have the cross-country data for a consolidation via τ_l (correlation coefficient of 0.515, p-value 0.156).

Figure 9: Impact Multiplier and Wealth Ratio



Note: Impact multiplier and the B70-B50 ratio (B70 is the wealth held by the poorer 70% and B50 is the wealth held by the poorer 50%). On the left panel we have the cross-country data for a consolidation via G (correlation coefficient of -0.739, p-value 0.023), while on the right panel we have the cross-country data for a consolidation via τ_l (correlation coefficient of 0.509, p-value 0.162).