Universidade de São Paulo
Faculdade de Economia, Administração, Contabilidade e Atuária
Departamento de Economia

Marina da Silva Sanches

Three essays on the relationship between income inequality and aggregate demand

Três ensaios sobre a relação entre desigualdade de renda e demanda agregada

São Paulo
2024

.

Prof. Dr. Carlos Gilberto Carlotti Júnior

Reitor da Universidade de São Paulo

Profa. Dra. Maria Dolores Montoya Diaz

Diretora da Faculdade de Economia, Administração e Contabilidade

Prof. Dr. Claudio Ribeiro de Lucinda

Chefe do Departamento de Economia

Prof. Dr. Mauro Rodrigues Junior

Coordenador do Programa de Pós-Graduação em Economia

Marina da Silva Sanches

Three essays on the relationship between income inequality and aggregate demand

Três ensaios sobre a relação entre desigualdade de renda e demanda agregada

Tese apresentada ao Departamento de Economia da Faculdade de Economia, Administração, Contabilidade e Atuária da Universidade de São Paulo como requisito parcial para a obtenção do título de Doutora em Ciências.

Área de Concentração: Economia do Desenvolvimento
Orientadora: Prof.ª Dr.ª Laura Barbosa de Carvalho

Versão Corrigida (Versão original disponível na biblioteca da Faculdade de Economia, Administração, Contabilidade e Atuária)

São Paulo

2024

Catalogação na Publicação (CIP)
Ficha Catalográfica com dados inseridos pelo autor

Sanches, Marina da Silva.
Three essays on the relationship between income inequality and aggregate demand / Marina da Silva Sanches. - São Paulo, 2024.
330 p.

Tese (Doutorado) - Universidade de São Paulo, 2024.
Orientador: Laura Barbosa de Carvalho.

1. austeridade fiscal. 2. política fiscal. 3. desigualdade de renda. 4. modelo Kaleckiano. 5. projeções locais. I. Universidade de São Paulo. Faculdade de Economia, Administração, Contabilidade e Atuária. II. Título.

Acknowledgements

Agradeço primeiramente a Deus, pela minha saúde, família, e por todas as oportunidades.

Gostaria de expressar minha profunda gratidão aos meus pais, Roseli e Baltazar, pelo amor incondicional, apoio e sacrifícios que fizeram ao longo dos anos para me proporcionar as oportunidades educacionais que me levaram a este momento. Seu encorajamento constante e orientação sábia foram fundamentais para minha jornada acadêmica. Agradeço também aos meus queridos irmãos Gustavo e Thiago, e à minha cunhada e irmã Amanda.

A Nicholas Jackson, agradeço por sempre acreditar tanto em mim, muito mais do que eu mesma acredito. Suas sábias palavras foram fundamentais para que eu não só concluísse o doutorado com êxito, mas também para me ajudar a desenvolver confiança em mim mesma a fim de realizar o estágio sanduíche no exterior. Obrigada por acompanhar de perto cada resultado desse trabalho, por menor que fosse.

À minha orientadora, professora Laura Carvalho, cuja agenda de pesquisa sempre me inspirou, obrigada pelo auxílio na condução dessa pesquisa. Obrigada por apontar o melhor caminho nas lacunas da literatura e por ser uma inspiração de pesquisadora. Agradeço por sua valiosa contribuição para a minha formação desde quando entrei no Mestrado da FEA USP, também sob sua orientação.

Agradeço ao professor Gilberto Tadeu Lima, o Giba, por acompanhar de perto não só o desenvolvimento desta pesquisa desde o seu início, mas também minha formação como pesquisadora desde a época do mestrado. Obrigada por todos os seus ensinamentos em sala de aula e por todo o estímulo. Obrigada por suas leituras sempre atentas e por suas contribuições nas bancas de avaliação de progresso e de defesa de Tese. Agradeço à professora Fabiana Fontes Rocha, pelos seus pertinentes comentários e discussões em duas bancas anteriores de avaliação desse trabalho, que em muito me ajudaram a melhorá-lo. Agradeço ao professor Fernando Rugitsky por seus apontamentos ainda na fase do projeto dessa pesquisa. Agradeço à professora Carolina Troncoso Baltar, da Unicamp, pelos comentários e sugestões na defesa de Tese.

Ao meu orientador nos Estados Unidos, professor Robert Blecker, obrigada por me receber na American University, por suas leituras minuciosas e por suas valiosas contribuições ao desenvolvimento desta pesquisa, também durante a defesa de Tese. Agradeço também aos professores Juan Montecino e Ignacio Garcia, também da AU, pelas discussões que tivemos.

Agradeço a todos os professores que ministraram os cursos do doutorado que, com suas reflexões e leituras interessantes, tornaram os primeiros meses do doutorado extremamente estimulantes, apesar do auge da pandemia. Em especial, agradeço aos professores Guilherme Grandi, de Economia Brasileira; Bruno Höfig, do curso de História das Ideias Econômicas; Renata Narita, de Economia do Trabalho; além dos meus orientadores Laura Carvalho e Gilberto Tadeu Lima, que ministraram o curso de Macroeconomia do desenvolvimento. Agradeço aos colegas de estudo das disciplinas do doutorado pelas agradáveis tardes de discussão em aula on-line. Obrigada também aos veteranos que nos ajudaram com anotações e materiais de estudo.

Às minhas amigas, Flávia Camargo e Juliana de Deus, pelo estímulo de ir sempre em frente e por sua amizade. Ju, obrigada pelas leves conversas quase diárias de áudio no WhatsApp. Muito obrigada a todos os colegas do Centro de Pesquisa em Macroeconomia das Desigualdades (Made/USP) pelo trabalho em equipe instigante e pelo estímulo à pesquisa. Agradeço especialmente a Gustavo Serra, Pedro Marques, Matias Cardomingo, Tainari Taioka, Clara Brenck, Dante Cardoso, Lucca Rodrigues, Amanda Resende, Nikolas Schiozer e José Bergamin pelos comentários recebidos em versões anteriores desse trabalho, que em muito me ajudaram a melhorá-lo.

Finalmente, agradeço ao governo brasileiro e à Capes pelas bolsas de pesquisa, brasileira (Programa de Excelência Acadêmica - ProEx, processo número 88887.511804/2020-00) e de estágio sanduíche no exterior (Programa PrInt, processo número 88887.716692/2022-00). O presente trabalho foi realizado com o apoio da Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) - Código de Financimento 001/ This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior

- Brasil (CAPES) - Finance Code 001.

Esta tese foi escrita em Latex com a classe IAGTESE, para teses e dissertações do IAG.

Resumo

Esta Tese de Doutorado compreende três ensaios. O Capítulo 1 desenvolve um modelo neo-Kaleckiano para estudar a relação entre a desigualdade de ganhos e as flutuações na demanda agregada. O modelo inclui três classes em uma abordagem Kaleckiana-Goodwiniana - capitalistas e dois tipos de trabalhadores (produção e profissionais). Construímos uma relação entre a desigualdade de ganhos e a demanda agregada mediada pela taxa de emprego no médio prazo. Concluímos que a estabilidade dessa relação depende da presença de um mecanismo de "conciliação" entre as duas categorias de trabalhadores em um contexto de conflito distributivo. Também simulamos alguns impactos de políticas. Em particular, o artigo destaca a importância de políticas que aumentam a participação dos trabalhadores de produção na renda, pois têm efeitos positivos tanto na distribuição quanto na demanda agregada, independentemente do regime de demanda.

O Capítulo 2 e o Capítulo 3 contribuem para a literatura empírica sobre os impactos da austeridade fiscal na desigualdade, analisando os efeitos dinâmicos dos episódios de consolidação fiscal sobre as desigualdades de renda disponível, de renda de mercado, salarial e funcional. Usando uma abordagem de decomposição de Gini, os capítulos são os primeiros estudos empíricos na literatura macroeconométrica sobre a relação entre consolidação fiscal e desigualdade que identificam a importância dos diferentes canais de transmissão para esse efeito. Enquanto o Capítulo 2 utiliza o conjunto de dados narrativos de Alesina et al. (2019) para um grupo de países da OCDE de 1978 a 2014, o Capítulo 3 emprega um conjunto de dados narrativos abrangendo 1989-2016, de David e Leigh (2018) para um grupo de países da América Latina e do Caribe. Usando a metodologia proposta por Jordà (2005), derivamos funções de resposta ao impulso a partir de projeções locais.

No Capítulo 2, encontramos: i) a medida redistributiva responde positivamente aos choques de austeridade fiscal no curto prazo, indicando que a desigualdade de renda de mercado aumenta mais do que a desigualdade de renda disponível. Isso mostra a importância dos estabilizadores automáticos e da rede de proteção social; ii) ambos os canais salarial e funcional exibem respostas estatisticamente significativas semelhantes no curto prazo; iii) no médio prazo, o efeito redistributivo não é estatisticamente significativo, e o canal de desigualdade funcional perde significância; iv) no médio prazo, a desigualdade salarial emerge como o principal canal que afeta a desigualdade de renda; v) no curto e médio prazos, o impacto na desigualdade de renda não relacionada ao trabalho pode ser equalizador; vi) o canal de emprego sugere que medidas de austeridade aumentam a desigualdade de ganhos, especialmente se considerarmos o segmento inferior da distribuição de ganhos; vii) os choques baseados em gastos têm impactos mais relevantes na desigualdade.

Nossos principais resultados do Capítulo 3 são: i) a medida redistributiva responde positivamente aos choques fiscais no curto prazo, indicando que a desigualdade de renda de mercado aumenta mais do que a desigualdade de renda disponível; ii) o canal de desigualdade funcional exibe o impacto mais relevante no curto prazo; iii) no médio prazo, o efeito redistributivo diminui após episódios fiscais baseados em impostos, sugerindo que a desigualdade de renda disponível responde mais; iv) o canal de desigualdade salarial é o canal mais relevante no médio prazo; v) no curto e médio prazos, o impacto na desigualdade de renda não relacionada ao trabalho pode ser equalizador; vi) o impacto da austeridade na desigualdade é mais pronunciado durante períodos de baixo crescimento econômico e quando o tamanho do pacote fiscal é grande; vii) os choques baseados em gastos têm impactos mais relevantes na desigualdade.

Palavras-chave: austeridade fiscal, política fiscal, desigualdade de renda, modelo Kaleckiano, projeções locais.

Abstract

This Doctorate Dissertation comprises three essays. Chapter 1 builds a neo-Kaleckian model to study the relationship between earnings inequality and fluctuations in aggregate demand. The model includes three classes in a Kaleckian-Goodwinian approach - capitalists and two types of workers (production and professional). We build a relationship between earnings inequality and aggregate demand mediated by the employment rate in the medium run. We conclude that the stability of this relationship relies on the presence of a "conciliation" mechanism between the two categories of workers in a distributive conflict context. We also simulate some policy impacts. In particular, the paper highlights the importance of policies that increase the production workers' share in income, as they have positive effects on both distributional and aggregate demand aspects, regardless of the demand regime.

Chapter 2 and Chapter 3 contribute to the empirical literature on the impacts of fiscal austerity on inequality by analyzing the dynamic effects of fiscal consolidation episodes on disposable income, market income, wage, and functional inequalities. Using a Gini decomposition approach, the Chapters are the first empirical studies in the macroeconometric literature on the relationship between fiscal consolidation and inequality that identify the importance of the different transmission channels for this effect. While Chapter 2 uses the narrative dataset from Alesina et al. (2019) for a group of OECD countries from 1978 to 2014, Chapter 3 employs a narrative dataset covering 1989-2016, from David and Leigh (2018) for a group of countries from Latin America and the Caribbean. Using the methodology proposed by Jordà (2005), we derive impulse response functions from local projections.

In Chapter 2, we find: i) the redistributive measure responds positively to fiscal auste-

rity shocks in the short run, indicating the market income inequality increases more than the disposable income inequality. It shows the importance of automatic stabilizers and the social safety net; ii) both wage and functional channels exhibit similar statistically significant responses in the short run; iii) in the medium run, the redistributive effect is not statistically significant, and the functional inequality channel loses significance; iv) in the medium run, wage inequality emerges as the primary channel affecting income inequality; v) in short and medium runs, the impact on non-labor inequality might be equalizing; vi) the employment channel suggests that austerity measures increase earnings inequality, especially if we consider the lower end of earnings distribution; vii) spending-based shocks exhibit more relevant impacts on inequality.

Our main results in Chapter 3 are: i) the redistributive measure responds positively to fiscal shocks in the short run, indicating the market income inequality increases more than the disposable income inequality; ii) the functional inequality channel displays the most relevant impact in the short run; iii) in the medium run, the redistributive effect decreases after tax-based fiscal episodes, suggesting the disposable income inequality responds more; iv) the wage inequality channel is the most relevant channel in the medium run; v) in both short and medium runs, the impact on non-labor inequality might be equalizing; vi) the impact of austerity on inequality is more pronounced during low economic growth periods and when the size of the fiscal package is large; vii) spending-based shocks exhibit more relevant impacts on inequality.

Keywords: fiscal austerity, fiscal policy, income inequality, Kaleckian model, local projections.

List of Figures

List of Tables

Contents

Introduction

This Doctoral Dissertation comprises three chapters, each delving into the intricate relationship between aggregate demand and inequalities.

Motivated by findings in empirical literature indicating that fluctuations in economic cycles affect earnings inequality, we have developed a neo-Kaleckian theoretical model in Chapter 1 to explore the connection between inequality and aggregate demand. While the traditional focus in Kaleckian literature has been on examining the impact of wage inequality on capacity utilization rates, we have incorporated an earnings inequality measure into our model, drawing from empirical evidence suggesting that earnings inequality tends to be countercyclical. The model includes three classes in a Kaleckian-Goodwinian approach - capitalists and two types of workers (production and professional). We build a relationship between earnings inequality and aggregate demand mediated by the employment rate in the medium run. The theoretical model has important implications in regard to income distribution and macroeconomic policies.

Chapter 2 and Chapter 3 are empirical contributions. In these Chapters, we analyze the impact of fiscal austerity episodes (a more specific type of aggregate demand shock) on income inequality. They are the first empirical studies in the macroeconometric literature on the relationship between fiscal consolidation and inequality that identify the importance of the different transmission channels for this effect. While the literature focuses on the final effect of austerity on (disposable) income inequality, we investigate, using a Gini index decomposition interpretation, the following channels: a) the redistributive effect, which relates to changes in taxes and transfers and their impact on disposable income inequality; b) the impact on the distribution among workers, specifically wage inequality; c) the effect on the distribution between capital and labor. A fourth channel can also be inferred (non-labor income inequality channel). Chapter 2 intends to contribute to this literature on OECD (Organization for Economic Cooperation and Development) countries, and Chapter 3 uses a sample that includes countries from Latin America and the Caribbean. Finally, in Chapter 4 (Concluding remarks), we compare our results from Chapters 2 and 3.

Chapter 1

Distributive cycles and earnings inequality: a Kaleckian Goodwinian-inspired model

1.1 Introduction

The rise in wage inequality since the 1980s – particularly in the United States but also in several other developed countries – has been widely reported in many studies (Piketty and Saez, 2003; Carvalho and Rezai, 2015; Tavani and Vasudevan, 2014; Lavoie, 2009; EPI, 2011; Mohun, 2014; Galbraith, 2011, 2012; Piketty, 2014; Saez and Veall, 2005; Mohun, 2006; Duménil and Levy, 2010, 2004; Bakija et al., 2012).

Amongst the main reasons for this phenomenon, the literature highlights institutional and economic policy changes that have redistributed income in favor of high-income segments of the labor force (Duménil and Levy, 2004) rather than factors linked to the increasing productivity of these groups, such as technological changes (Alvaredo et al., 2013; Mishel and Bivens, 2021; Bivens and Mishel, 2013). Other authors have interpreted the increasing wage inequality as reflecting slow-moving secular trends and, in particular, the effects of technical change and globalization that have generally favored relatively high-skill workers (Reenen, 2011; Harrigan and Reshef, 2015).

While this literature has focused primarily on long-term trends of earnings inequality (Blau and Kahn, 2020) and the dynamics of income inequality at the very top (Piketty and Saez, 2003), it has overlooked cyclical patterns (Heathcote et al., 2020). There is evidence, however, that the inequality in the left tail (middle-bottom) widens sharply during recessions and tends to decrease gradually during the subsequent recoveries, while inequality between the top and the bottom of the wage distribution increases steadily (Heathcote et al., 2020; Guvenen et al., 2022).

Heathcote et al. (2020) present that there is a solid cyclical component to the dynamic of earnings inequality at the bottom. In a study for the US, the authors contend that the nature of the earnings inequality increases at the top and the bottom is different. While the earnings ratio 90/50 increased steadily until 2010, it does not exhibit any particular cyclical pattern. Moreover, it is determined by the differential growth in real wages at the top compared to the middle. On the other hand, the earnings inequality at the bottom (ratio 50/20) rises sharply in each recession, and it is determined mainly by a decrease in employment/hours worked. There is also evidence that this rise in inequality is persistent over time during the recovery. Similar results have been reported by other authors (Bonhomme and Hospido (2016) for Spain; Alessandrini et al. (2016) for the US; Bowlus et al. (2022) for Canada; Guvenen et al. (2022) for the US).

In fact, the literature has found that, while earnings inequality is strongly countercyclical and tends to widen sharply during recessions, the business cycle has a lower impact on wage inequality (Heathcote at al., 2010 for the US; Krueger et al., 2010 for 9 OECD countries; Maestri and Roventini, 2012, for 9 OECD countries; Alessandrini et al., 2016 for the US). The literature documents that the reason for this behavior is that the increase in earnings inequality during recessions is primarily driven by the rise in unemployment, since business cycle effects are much more severe at the bottom of the distribution (Geiger et al., 2020; Hoover et al., 2009; Maestri and Roventini et al., 2012; Krueger et al., 2010; Heathcote et al., 2010; Heathcote et al., 2020; Alessandrini et al., 2016; Bonhomme and Hospido, 2016).

These findings are consistent with the empirical literature that estimates the effect of the business cycle on income inequality. It typically finds that the bottom segments of the distributional pyramid suffer more from a recession, given that their income is more subject to changes in the unemployment rate - that is, inequality is countercyclical (Kuznets, 1953; Parker, 1998; Blank and Blinder, 1986; Blinder and Esaki, 1978; Dimelis and Livada, 1999; Bishop et al., 2020; Maestri and Roventini, 2012; Hoover et al., 2009; Geiger et al., 2020; Krueger et al., 2010; Atems and Jones, 2015)[1].

In particular, there is growing evidence of disproportionate impacts of recessions on

[1] An exception is the study by Camacho and Palmieri (2019) for a panel of 43 countries, which finds that inequality is procyclical in most cases - especially in emerging countries. However, many of the results lack statistical significance.

low-skilled workers, since they are more vulnerable to business cycle movements (Hoynes et al., 2012; Clark and Summers, 1981; Hoynes, 1999; Hershbein and Kahn, 2018; Forsythe, 2022; Kydland, 1984). Morin (2019), Mueller (2017), and Solon et al. (1994) report that, typically, the employed worker during recessions is more skilled (Morin, 2019). In summary, the literature documents that unemployment is not proportionally distributed along the income distribution.

Bernstein and Bentele (2019) state, in a study for the U.S, that the real earnings of workers at the bottom of the distributive pyramid are quite responsive to the unemployment rate: the increased bargaining power of these workers when the unemployment rate declines is important for the real growth of their income. This clear relationship, however, is not observed for workers at the top of the income distribution (Bernstein, 2016a; 2016b). Moreover, empirical evidence of the Goodwin cycle reported in the literature suggests the importance of workers' bargaining mechanisms when the economy grows (Barbosa Filho and Taylor, 2006; Mendieta-Muñoz et al., 2022).

The evidence of countercyclical earnings inequality has not been addressed in Kaleckian theoretical models. Although there is a growing literature about Kaleckian models that incorporate personal distribution (Lavoie 1996, 2009; Lavoie and Nah, 2020; Palley, 2016; Palley, 2017; Palley, 2014a, Palley, 2014b; Tavani and Vasudevan, 2014; Dutt, 2016), these studies have been considering the wage inequality between the top and the bottom of the wage distribution by building models with two types of workers: workers and the managerial class. They neglect, however, the effect of the cycle/aggregate demand on inequality since they consider wage inequality as the measure of personal distribution inequality. Our contribution is building a model to analyze the relationship between aggregate demand (mediated by the employment rate) and earnings inequality (which considers employment/hours worked besides wages) in the medium run.

This gap in the literature is essential since there is extensive evidence that unemployment increases are regressive (Blank and Blinder et al., 1986; Bishop et al., 2020; Parker, 1998; Maestri and Roventini, 2012), affect the bottom of the distribution (Hoover et al., 2009; Hoynes et al., 2012), which tends to increase the earnings inequality between workers (Geiger et al., 2020; Maestri and Roventini et al., 2012; Heathcote at al., 2010; Krueger et al., 2010; Heathcote et al., 2020; Alessandrini et al., 2016; Bowlus et al., 2022; Guvenen et al., 2022). Given this motivation, considering the interaction between earnings inequality and the economic cycle in a Kaleckian model is relevant. It should be taken into consideration in order to provide some policy insight analysis. For example, the model allows us to explore the effects of a fiscal policy, a redistributive policy, or a technological shock in the economy on earnings inequality and aggregate demand.

By taking into account earnings inequality, we are able to have a broader view of the relationship between the employment rate and inequality in a theoretical framework. As shown in Section 1.2, the Kaleckian literature typically studies the impact of wage inequality on the rate of capacity utilization. The other side of the causality – that is, the impact of aggregate demand on inequality – has not been often addressed in this literature. One possible explanation is that these models consider wage inequality. In this essay, we use earnings inequality as our measure since it takes into account hours worked (or employment). By doing so, we are able to study the impact of aggregate demand (mediated by the employment rate) on earnings inequality, as well as the conditions for stable dynamics of these two variables in the medium run.

The model includes three classes in a Kaleckian-Goodwinian approach - capitalists and two types of workers. We analyze the cyclical dynamics of earnings inequality, that is, the effect of aggregate demand on the earnings inequality between professional labor and production workers. The effect of earnings inequality on demand depends on whether the economy exhibits an inequality-led demand regime (as in Tavani and Vasudevan, 2014). The stability between the aggregated demand (represented by the employment rate) and earnings inequality depends on the existence of a "conciliation" mechanism between the two types of workers in a distributive conflict framework.

Also, we simulate some policy impacts in an economy characterized by distributional conflict among workers. We find that policies that increase the income share of workers who are at the bottom of the distributional pyramid reduce earnings inequality and stimulate the aggregate demand (represented by the employment rate component (k)) in both types of demand regimes (inequality or non-inequality-led). This type of redistributive policy has, therefore, the potential to provide some type of conciliation among both classes of labor, reducing their conflict and benefiting the economy as a whole. Other types of policy, however, have ambiguous effects. A fiscal stimulus, for example, has an ambiguous final impact on the variables analyzed, but in economies with a higher level of earnings inequality, it tends to have a positive distributive impact, reducing earnings inequality.

The remainder of this paper is structured as follows. Section 1.2 provides a review on the literature on Kaleckian models and personal income distribution. Section 1.3 presents the model and its extensions. Finally, Section 1.4 concludes.

1.2 Related Literature

A few years ago, personal income distribution was barely explored in this literature (Tavani and Vasudevan, 2014). More recently, this approach has been developed in Kaleckian-inspired models (Lavoie, 2009; Lavoie and Nah, 2020; Palley, 2016, 2014a, 2014b, 2017; Tavani and Vasudevan, 2014; Dutt, 2016; Carvalho and Rezai, 2015; Prante, 2018; Hein and Prante, 2018; Sasaki et al., 2013; Sonoda and Sasaki, 2019), motivated by the rise in inequality in rich countries since the 1980s.

Wage inequality in neo-Kaleckian models has been addressed in two ways[2]: i) introduction of a third class - managerial workers - in addition to workers and capitalists (Lavoie, 1996, 2009; Lavoie and Nah, 2020; Palley, 2016, 2014a, 2014b, 2017; Tavani and Vasudevan, 2014; Dutt, 2016); ii) endogenization of the worker's propensity to save (Carvalho and Rezai, 2015; Prante, 2018; Hein and Prante, 2018). Besides the Kaleckian literature, some papers deal with demand-led models using evolutionary dynamics in which income distribution (functional and among workers) and aggregate demand co-evolve over time (Silveira and Lima, 2016; Silveira and Lima, 2021).

These models commonly find that wage income concentration has contractionary impacts by redistributing income from workers at the bottom of the distributional pyramid, whose propensity to consume is higher, to richer workers, who have a higher propensity to save. Such redistribution depresses household consumption and negatively impacts the rate of capacity utilization (Lavoie and Nah, 2020; Palley, 2016, 2017, 2014a, 2014b; Carvalho and Rezai, 2015; Prante, 2018; Prante and Hein, 2018). Other models highlight that increasing wage inequality generates destabilizing fluctuations in the economy (Sasaki et al., 2013; Sonoda and Sasaki, 2019; Silveira and Lima, 2021).

A general result of these models is that wage inequality and personal income distribution affect how functional income distribution (between wages and profits) influences economic

[2] Dutt (1992a) does not make explicit a third class in the model, but was one of the first models to address the issue, assuming the existence of a lower productivity sector.

growth. In particular, a rise in wage inequality causes a hike in the average propensity to save out of labor income. It weakens the positive effect of income redistribution in favor of wages. Thus, a wage-led demand regime is more likely when wage inequality is low (Carvalho and Rezai, 2015; Oyvat et al., 2020; Palley, 2016, 2014b, Lavoie and Nah, 2020).

Table 1.1 below describes each model in terms of interactions between demand and functional/personal income distribution. The arrows indicate the direction of causality that the model addresses.

Although this literature has dealt extensively with the effect of wage inequality on aggregate demand (as shown in Table 1.1), it has looked much less at the opposite causality: the effect of aggregate demand on the interpersonal distribution of income. The empirical literature reinforces the importance of this channel in the relationship between the business cycle and inequality, as discussed earlier (Kuznets, 1953; Parker, 1998; Blank and Blinder, 1986; Blinder and Esaki, 1978; Dimelis and Livada, 1999; Bishop et al., 2020; Maestri and Roventini, 2012; Hoover et al., 2009; Geiger et al., 2020; Atems and Jones, 2015; Bernstein and Bentele, 2019).

The effect of demand on the functional distribution of income, on the other hand, is widely addressed in the literature that has developed the dynamic relationship between income distribution and the rate of capacity utilization. It suggests the possibility that income distribution behaves endogenously in a theoretical framework that deals with distributional conflicts between workers and capitalists (Flaschel and Krolzig, 2006; Tavani et al., 2011; Rezai, 2012). These models take inspiration from Goodwin (1967) (extension in Barbosa-Filho and Taylor, 2006), in which the higher profit share in income stimulates investment and increases the employment rate and the rate of capacity utilization (profit-led economy), as well as the demand for labor. This process strengthens workers' bargaining power and expands the wage share in income (Rowthorn, 1977). The profit squeeze, in turn, discourages investment and employment, reversing the expansionary wage cycle. This dynamic restores profitability and compresses the wage share in income, and the economy returns to the initial situation.

The original Goodwin model assumes that savings determine investment (there are no demand constraints) (Stockhammer, 2017; Stockhammer and Michell, 2016). The extension by Barbosa-Filho and Taylor (2006) builds a Kaleckian demand-led model inspired by Goodwin (1967) (Stockhammer, 2017). In his model, if real wages respond more to the

Model	Functional Distribution→ Demand	Demand → Functional Distribution	Personal Distribution → Demand	Demand → Personal Distribution
Lavoie (1996), Lavoie (2009). Three classes: firms, managers, and workers.	Stagnation: an increment in wage inequality has an expansionary impact on the rate of capacity utilization. Expansion: a rise in wage inequality redistributes income from workers to managers and firms (profits) via higher prices. It implies a negative impact on the rate of capacity utilization.		Stagnation: an increment in wage inequality redistributes income from firms to the managerial class, which offsets the reduced worker's income share. Expansion: an increase wage inequality implies higher price levels and lower demand by reducing the worker's income share.	
Lavoie and Nah (2020). Three classes: firms, managers, and workers.	A rise in wage inequality redistributes income from a firm's retained earnings to managers. The positive impact on the degree of capacity utilization is more likely if s_f (saved fraction of profits) is high and s_h (managerial class' propensity to save) is low. Higher wage inequality diminishes the "wage-ledness" of the economy in the long run.		A rise in wage inequality redistributes income from workers to managers. A negative impact on the capacity utilization rate is more likely if s_f is low and s_h is high. In the long run, a greater wage inequality leads to decreased economic growth.	

Table 1.1 - Wage Inequality and Kaleckian Models

Model	Functional distribution → Demand	Demand → Functional distribution	Personal distribution → Demand	Demand→ Personal distribution
Carvalho and Rezai (2015). Two classes (capitalists and workers)	Higher wage inequality diminishes the multiplier effect. Wage-led demand is less likely when there is high wage inequality.		Reduced wage inequality always leads to a positive impact on the rate of capacity utilization.	
Prante (2018)/ Hein and Prante (2018). Two classes (capitalists and workers)	A greater inequality in terms of functional income distribution leads to a negative impact on the rate of capacity utilization if the economy is wage-led and, also, if: i) there are not any conspicuous consumption effects or, if there are such effects, ii) personal redistribution to higher wages is more pronounced than redistribution to profits.		Wage inequality is a positive function of functional inequality. Increased wage inequality implies a positive effect on the rate of capacity utilization (inequality-led) if there is a conspicuous consumption impact. Otherwise, there is the Carvalho and Rezai's (2015) result (adverse effect on the rate of capacity utilization).	
Oyvat el al (2020). Three classes	Profit-led demand regime when wage inequality is elevated is more probable.			
Palley (2016). Two classes (capitalist-managers and workers).	Wage-led demand is less likely when there is an increase in wage inequality. Profit-led is less probable when there is larger inequality in terms of the capital income distribution.		Smaller inequalities (wage and capital) have positive impacts on the degree of capacity utilization/ on the economic growth.	

Table 1.1 - Wage Inequality and Kaleckian Models (continued)

Model	Functional distribution → Demand	Demand → Functional distribution	Personal distribution → Demand	Demand→ Personal distribution
Palley (2017). Two classes (capitalist-managers and workers).	Wage-led demand is less likely when there is larger wage inequality. Profit-led is less probable when there is greater inequality in terms of the capital income distribution.	Profit share is endogenous. If the rate of capacity utilization is low, the distributive curve indicates a wage squeeze. If the rate of capacity utilization is higher, there is a profit squeeze due to the strengthening of workers' bargaining power.	Lower wage and capital income inequalities positively affect the capacity utilization rate.	
Palley (2014a). Two classes (capitalist-managers and workers).	Profit or wage-led (wage inequality does not affect the demand regime).		Reduced wage inequality (due to an increase in the employment rate, for example) leads to a rise in the rate of capacity utilization.	Personal income distribution depends on the employment rate (a state variable adjusted in the long run) and on an exogenous parameter that captures the bargaining power of workers.

Table 1.1 - Wage Inequality and Kaleckian Models (continued)

Model	Functional distribution → Demand	Demand → Functional distribution	Personal distribution → Demand	Demand→ Personal distribution
Palley (2014b). Three classes (capitalists, managers, and workers).	Diminished wage inequality raises the chance that the economy will exhibit a wage-led demand regime.		More significant wage and capital inequalities have a negative impact on demand.	More pronounced wage inequality is caused by lower employment rates (a state variable adjusted in the long run) and by exogenous conditions linked to the workers' bargaining power.
Tavani and Vasudevan (2014). Three classes (capitalists, managers, and workers).	Regime 1: higher functional distribution inequality has a negative impact on the rate of capacity utilization (wage-led). Regime 2: the opposite effect (profit-led).		Regime 1: an upsurge in wage inequality causes a redistribution from profits to wages. Since the economy is wage-led, the impact on the rate of capacity utilization is positive. Regime 2: greater personal inequality negatively impacts the capacity utilization rate (profit-led case).	In the long run, wage inequality depends on demand and its persistence. There is a stable equilibrium only in regime 1 (if the wage squeeze is not so high). Larger wage inequality reduces workers' income share and stimulates economic growth (inequality-led regime).

Table 1.1 - Wage Inequality and Kaleckian Models (continued)

Model	Functional distribution → Demand	Demand → Functional distribution	Personal distribution → Demand	Demand→ Personal distribution
Dutt (2016). Two classes (capitalists, managers; and workers).	Higher manager wages imply redistribution from firms to managers. It positively impacts the rate of capacity utilization.		Greater wage inequality has an ambiguous impact (in the short and long run). It positively impacts the rate of capacity utilization (redistribution from profits to wages) but also has a negative effect (redistribution from workers to managers). Greater inequality in terms of capital income has a negative impact on the rate of capacity utilization.	
Sasaki et al (2013). Three classes: regular and non-regular workers; and capitalists.	Wage and profit-led (usual sense).		An increment in wage inequality creates instability in the long-run equilibrium (profit-led case).	
Sonoda and Sasaki (2019). Three classes: regular and non-regular workers; and capitalists.	Wage and profit-led (usual sense).		Wage conflict between the two types of workers produces instability in the long-run equilibrium (wage-led case).	

Table 1.1 - Wage Inequality and Kaleckian Models (continued)

rate of capacity utilization than productivity does, there is a profit-squeeze scenario. There is a redistribution in favor of workers: the wage share in income expands while the rate of capacity utilization increases. On the other hand, if the response of labor productivity to demand shocks is more significant, the economy experiences a forced saving process (or wage-squeeze) with income redistribution to capitalists.

Theoretical contributions to the Kaleckian literature studying the Goodwin cycle have been made by Tavani et al. (2011), building on Flaschel and Krolzig (2006), and by Rezai (2012), in addition to that by Barbosa-Filho and Taylor (2006). Such authors start from "wage-price spiral" equations, which make explicit the distributional conflict between workers and capitalists. In these models, the distributive curve presents profit-squeeze behavior if: i) the sensitivity of nominal wages variation to aggregate demand, which depends on the bargaining power of workers in the labor market, exceeds the sensitivity of price variation to demand; and ii) real wages respond more to the capacity utilization rate than productivity does.

Tavani et al. (2011), for example, make the nominal wages variation endogenous. It becomes dependent on the rate of capacity utilization. When the employment rate is higher, there is an increase in workers' bargaining power. Consequently, wage inflation is more intense than price inflation (profit-squeeze). As a result, the distributive curve depends on the business cycle. In particular, the profit squeeze occurs when aggregate demand heats up. The model theorizes, in this sense, the econometric results found by Nikiforos and Foley (2012)[3].

In the Goodwin-inspired Kaleckian empirical literature, which endogenizes the functional distribution of income, there is ample evidence about the existence of Goodwin cycles for the United States economy after the World War II - that is, the combination of profit-led and profit squeeze regimes (Taylor, 2004; Barbosa Filho and Taylor, 2006; Diallo et al., 2011; Kiefer and Rada, 2015; Proaño et al., 2006; Carvalho and Rezai, 2015; Barrales-Ruiz and Von Arnim, 2021; Basu and Gautham, 2019; Barrales-Ruiz et al., 2021; Rolim, 2019; Skott and Zipperer, 2012; Mendieta-Muñoz et al., 2022; Vechsuruck, 2017; Basu et al.,

[3] Rezai (2012) extends the Tavani et al. (2011) model and considers the endogeneity of labor productivity but does not take into account possible nonlinearities. The profit squeeze condition is that, in addition to nominal wages being more flexible than prices, such an effect via strengthening bargaining power should outweigh the Kaldor-Verdoorn effect on labor productivity.

2013). Similar results appear in studies by Chen and Flaschel (2006) and Flaschel and Krolzig (2006), who estimate that real wages are procyclical. Some authors have pointed out evidence of nonlinearities (Nikiforos and Foley, 2012; Tavani et al., 2011; Cauvel, 2023; Carvalho and Rezai, 2015). Other authors are more skeptical of Goodwin cycles (Harvie, 2000; Stockhammer and Stehrer, 2011; Stockhammer, 2017; Onaran and Galanis, 2012; Blecker et al., 2022; Setterfield, 2023; Cauvel, 2023; Mutlugün, 2022). Finally, some authors highlight the weakening of distributional cycles in the US economy during the period based on so-called neoliberal policies (Setterfield, 2023; Mendieta-Muñoz et al., 2022).

To sum up, according to the Kaleckian Goodwin-inspired literature, the profit squeeze effect (the wage share in income expands while the rate of capacity utilization increases) occurs when the economy is growing, and the strengthening of workers' bargaining power is able to offset the response of prices to demand and the pro-cyclical effect on labor productivity. In this context, inflation does not necessarily respond to higher economic activity. Greater bargaining power of workers due to growing labor demand, for example, could decrease a firm's markups and the inflation rate (Kalecki, 1971; Lavoie, 2014; Rowthorn, 1977).

At the same time, Bernstein and Bentele (2019), in a study of the US economy, have observed that the real earnings of workers at the bottom of the distributive pyramid are quite responsive to the unemployment rate. This clear relationship, however, is not observed for workers at the top. Based on this evidence, Bernstein and Bentele (2019) and Bernstein (2016a) suggest that full employment has an equalizing impact on the economy, boosting the real earnings of poorer workers.

Empirical evidence of the Goodwin cycle reported in the literature suggests the importance of worker's bargaining mechanism when the economy is growing (Taylor, 2004; Barbosa Filho and Taylor, 2006; Diallo et al., 2011; Kiefer and Rada, 2015; Proaño et al., 2006; Carvalho and Rezai, 2015; Barrales-Ruiz and Von Arnim, 2021; Basu and Gautham, 2019; Barrales-Ruiz et al., 2021; Rolim, 2019; Skott and Zipperer, 2012; Mendieta-Muñoz et al., 2022; Vechsuruck, 2017; Basu et al., 2013). Such results are also consistent with the evidence that income inequality is countercyclical and unemployment affects more the individuals' income at the bottom of the distributive pyramid (Kuznets, 1953; Blinder and Esaki, 1978; Blank and Blinder, 1986; Parker, 1998; Dimelis and Livada, 1999; Bishop et al., 2020; Maestri and Roventini, 2012; Hoover et al., 2009; Atems and Jones, 2015), and also that earnings inequality is countercyclical (Geiger et al., 2020; Hoover et al., 2009; Maestri and Roventini et al., 2012; Krueger et al., 2010; Heathcote et al., 2010; Heathcote et al., 2020; Alessandrini et al., 2016; Bonhomme and Hospido, 2016).

Lavoie (2017) criticizes the Goodwin-inspired literature that finds a profit-led regime since they may be capturing a positive correlation between the profit share and capacity utilization, which is caused by the existence of "overhead labor costs". The author states that the overall labor productivity is pro-cyclical, and the reason is given by the literature that we cited in Section 1.1, that finds that employment of production workers adjusts more in downturns than employment of professional workers (since they tend to be "overhead" labor, or "hoarded" in recessions).

Taking into account Lavoie's critique, empirical evidence by Mutlugün (2022) and Cauvel (2023) suggests that the initial Goodwin- cycle finding may be spurious. Once controlling for the short-term effect of pro-cyclical labor productivity on labor share, their results provide evidence for wage-led demand and wage-squeeze effects.

In fact, Weisskopf (1979) shows that the profit share is pro-cyclical during most of the cycle because of the existence of overhead labor. In the late expansion, it falls due to the labor strength. Sherman and Evans (1984) also highlight the importance of overhead labor: "*In most of expansion, the wage share declines mostly because productivity rises, which is mainly due to falling overhead labor proportionate to all labour*" (Sherman and Evans, 1984, p. 200). As Lavoie (2017, p. 211) argues:

"*Weisskopf (1979: 354, emphasis in original) mentions that 'certain types of labour – e.g. administrative, supervisory and maintenance employees – may be characterised as "overhead labour" in the sense that they must be employed in proportion to the capacity of an enterprise', which is exactly how Rowthorn (1981) formalized the introduction of overhead labour in his neo-Kaleckian model. As a consequence, a rise in the profit share may just as well occur as a result of an increase in the rate of utilization as it could have as a result of a drop in the strength or bargaining power of labour*" (Lavoie, 2017, p. 211).

Rolim (2019) estimates a vector autoregression model for the US from 1964 to 2010 and the wage share is split between supervisors/managers and direct workers. The results suggest the share of managers in income decreases after a positive shock to capacity utilization in the first period of response – while the response turns into positive after this period. The share of direct workers responds positively to a shock in aggregate demand. According to Rolim (2019, p. 11-12):

"*The profit-squeeze conclusion still holds in this case, as increases in capacity utilization leads to a decrease in the profit share. The decrease of the supervisors' share by the first period and its increase in the following periods might be the result of two phenomenon discussed in the literature. On the one hand, the supervisors' income, because of its overhead characteristic, is expected to be roughly stable through the cycle, so increases in capacity utilization will render a lower participation of this class in national income (Lavoie 2014, 2017). On the other hand, firms are likely to be more prone to increase supervisors' wages in the boom phase of the cycle (Lavoie 2009)*" (Rolim, 2019, p. 11-12).

In other words, the recent empirical literature that considers Lavoie's critique (Rolim, 2019; Cauvel, 2023, Mutlugün, 2022) as well as earlier work by Weisskopf (1979) and Sherman and Evans (1984) points out two effects that occur after a shock in aggregate demand: 1) an increase in profit share/ a decrease in wage share due to the overhead labor (or pro-cyclical productivity) and the fact that employment of production workers adjusts more in downturns than employment of professional workers. We call this the "overhead labor effect"; 2) a profit-squeeze effect due to the workers' bargaining power mechanism (both types of workers). These two effects are clear in Rolim (2019, p.11-12), described above.

The model in this essay aims to analyze the causality side "aggregate demand → earnings distribution", in addition to the causality typically addressed by the literature (wage inequality → aggregate demand). The Kaleckian theoretical literature, as stated earlier, usually analyzes the impact of wage inequality on aggregate demand. The Goodwin-inspired literature theorizes the opposite effect - of demand on the (functional) income distribution. Typically, this literature analyzes the functional distributional curve and investigates the conditions for a profit-squeeze (Barbosa-Filho and Taylor, 2006). However, it lacks a model incorporating wage distribution in a relationship of bidirectional causality with aggregate demand. To do so, we consider earnings inequality as our inequality measure in order to take into account employment, besides wages, motivated by the empirical literature discussed in Section 1.1. Moreover, our contribution lies in building a theoretical framework to represent the two mechanisms suggested empirically by Rolim (2019): the overhead labor effect; and the bargaining power mechanism.

1.3 Model

1.3.1 Classes and income distribution

Inspired by Tavani and Vasudevan (2014) and Palley (2014b), the model has three classes: production workers (workers from the bottom of the distributive pyramid, less educated - indexed by W); professional/ managerial workers (who are from the middle of the distributive pyramid, are more educated and earn higher wages - indexed by M); and capitalists (owners and investors in firms, who are the wealthiest class, indexed by C). The production function is inspired by Tavani and Vasudevan (2014):

$$Y = min[\kappa K, aL_W, bL_M] \tag{1.1}$$

where L_W: number of production workers employed; L_M: number of professional and managerial workers employed; a and b are their respective labor productivity; K is the capital and κ, its productivity.

Firms determine prices by applying a markup on unit labor costs (Rowthorn, 1981) in an oligopolistic market context so that:

$$P = z\frac{W}{\Lambda} \tag{1.2}$$

where P is the price level, W represents wages (for both types of labor, in nominal terms - we will separate the wage for each type in the following), Λ represents the labor productivity (for both types of labor), and z is the markup factor[4].

The total labor share ψ can be defined as:

$$\psi = \psi_W + \psi_M = \frac{W_W L_W}{Y} + \frac{W_M L_M}{Y} \tag{1.3}$$

The functional income distribution incorporates the intra-class distribution among production and professional workers. The profit share is:

$$\pi = 1 - \psi_W - \psi_M \tag{1.4}$$

The two types of workers "split" the wage bill. Wages W_W and W_M are expressed in real terms. The number of people in the workforce is given by N_W and N_M ($N = N_W + N_M$).

[4] The markup is assumed as being constant, so the profit share is constant. Hence the total wage share is constant, but the distribution among workers, our focus in this paper, can vary.

We define η >1 as the wage premium obtained by professional workers, where η can be considered a measure of wage inequality (Tavani and Vasudevan, 2014).

$$W_M = \eta W_W \tag{1.5}$$

The number of managerial and professional workers is a portion of the number of production workers ($\xi < 1$):

$$L_M = \xi L_W \tag{1.6}$$

So, in terms of wage share in income:

$$\psi_M = \xi \eta \psi_W \tag{1.7}$$

We now define $\xi\eta$ as our earnings inequality measure θ so that:

$$\xi\eta = \theta \tag{1.8}$$

So, the profit share is: $\pi = 1 - (1 + \theta)\psi_W$.

1.3.2 Structure

As seen in Section 1.1, our model aims to build a structure in which we can analyze the relationship between aggregate demand and earnings inequality between professional and production workers, given our empirical motivation. As we investigate the economic cycle, our model is divided into two steps: short and medium run. In this section, we define our variables and equations for both steps.

Aggregate demand

We define the rate of capacity utilization of the economy as u:

$$u = Y/\bar{Y} \tag{1.9}$$

where Y is the current output of the economy, while $\bar{Y}$ is its potential output. We also assume, for the sake of simplicity and as common in Kaleckian models, that $\bar{Y} = K$:

$$u = Y/K \tag{1.10}$$

The production worker's saving function - normalized by the capital stock - is:

$$S_W = s_W u \psi_W \tag{1.11}$$

The professional worker's saving function - normalized by the capital stock:

$$S_M = s_M u[\theta\psi_W] \tag{1.12}$$

The capitalists' savings function is given by:

$$S_C = s_C u(1 - \psi_W - \psi_M) \tag{1.13}$$

where s_W is the propensity to save of production workers, s_M is the propensity to save of professional workers and s_C is the propensity to save of capitalists. We make the usual Kaleckian-Kaldorian assumption that $0 < s_W < s_M < s_C < 1$.

The total savings function normalized by the capital stock is given by:

$$S = S_W + S_M + S_C \tag{1.14}$$

The investment function normalized by the capital stock is a Kalecki-Steindl type. It depends on the rate of capacity utilization u and the profit rate r (γ_1, γ_2 >0) - in addition to the autonomous investment $\gamma_0 > 0$, which reflects sales expectations by firms (Lavoie, 2014):

$$I = \gamma_0 + \gamma_1 u + \gamma_2 r \tag{1.15}$$

where r is the profit rate given by $r = \pi u$.

The following equation gives the effective demand adjustment:

$$\hat{u} = \mu(I + G - S) \tag{1.16}$$

where G is an exogenous government deficit parameter given by $G = g_0 > 0$ (normalized by the capital stock). G is given by "expenditure minus taxes". It assumes, for simplicity, a closed economy. Also, $\hat{u}$ is the rate of change of capacity utilization rate, $\hat{u} = (du/dt)(1/u)$.

Earnings inequality

In this section, we present our first state variable: earnings inequality. Although we have a three-class model, our focus is on inequality between the two types of workers, so the discussion does not emphasize capitalists' profits.

Our measure of earnings inequality θ is broader than only η (which is wage inequality). In addition to wage inequality, we also consider employment in our measure since the empirical literature surveyed earlier shows that earnings inequality increases during recessions, not only because of the differential growth in real wages but also because there is vast evidence about the impact of the business cycle on employment (mainly for workers at the bottom of the distribution) (for example, Heathcote et al., 2020; Morin, 2019; Hoynes et al., 2012; Hoover et al., 2009). Our measure of earnings inequality includes both wage inequality and relative employment (hours worked) so that:

$$\theta = \eta\xi = \frac{W_M L_M}{W_W L_W} \tag{1.17}$$

Then this can be written in terms of growth rates ($\hat{\theta} = (d\theta/dt)(1/\theta)$). as:

$$\hat{\theta} = \hat{W}_M + \hat{L}_M - \hat{W}_W - \hat{L}_W \tag{1.18}$$

To build the equations for each element on the right-hand of equation 1.18, it is useful to remember our main empirical evidence. Our motivation for this aspect of the model is given by five types of findings from the literature:

1) Earnings inequality increases during recessions mainly due to the variation in employment/hours (Heathcote et al. 2020, Heathcote et al., 2010; Krueger et al, 2010; Bonhomme and Hospido, 2016; Alessandrini et al. 2016; Bernstein and Bentele, 2019; Bowlus et al., 2022; Guvenen et al., 2022; Maestri and Roventini, 2012).

2) Workers at the bottom of the distributive pyramid are more vulnerable to changes in the unemployment rate (Blank and Blinder, 1986; Blinder and Esaki, 1978; Parker, 1998; Hoover et al. 2009; Geiger et al., 2020);

3) Recessions have a disproportionate impact on low-skilled workers, since they are more vulnerable to business cycle movements (Hoynes et al., 2012; Clark and Summers, 1981; Hoynes, 1999; Hershbein and Kahn, 2018; Forsythe, 2022; Kydland, 1984; Morin, 2019; Mueller, 2017; Solon et al., 1994).

4) Employment of production workers adjusts more in downturns and recoveries than the employment of professional labor, or what can be called the “overhead labor effect” (Lavoie, 2017; Mutlugün, 2022; Cauvel, 2023; Rolim, 2019).

5) Workers’ bargaining power appears to vary procyclically, as suggested by the Goodwin cycle literature and related models (Taylor, 2004; Barbosa Filho and Taylor, 2006; Diallo et al., 2011; Kiefer and Rada, 2015; Proaño et al., 2006; Carvalho and Rezai, 2015; Barrales-Ruiz and Von Arnim, 2021; Basu and Gautham, 2019; Barrales-Ruiz et al., 2021;

Rolim, 2019; Skott and Zipperer, 2012; Mendieta-Muñoz et al., 2022; Vechsuruck, 2017; Basu et al., 2013).

Inspired by items 1, 2, 3 and 4 above, we make the following assumption: production workers' employment responds more to the economic cycle than professional workers' employment. To represent this idea, we consider that all changes in Y are absorbed by employment in case of production workers (L_W) so that their productivity a is constant (at least in the short run that we are analyzing) and:

$$\hat{L}_W = g \tag{1.19}$$

where g is the economy's growth rate $\hat{Y}$, given by equation 1.15, since Y and K have the same growth rate in the short run equilibrium ($\hat{u} = 0$ so that $\hat{Y} = \hat{K}$, and $\dot{K} = I$):

$$g = \gamma_0 + u[\gamma_1 + \gamma_2(1 - \psi_W(1 + \theta))] \tag{1.20}$$

For professional workers, we add the "overhead effect": for each variation in aggregate demand corresponds a variation in both, employment and productivity - that is, employment does not vary as much as production workers' employment. Their productivity, therefore, is pro-cyclical (β_M >0 captures the overhead labor effect):

$$\hat{b} = \beta_M u \tag{1.21}$$

Equation 1.21 means that $\hat{L}_M = g - \hat{b}$[5].

According to Rolim (2019), a positive shock in capacity utilization leads to an increase in both the workers' and the supervisors' share (bargaining effect). However, there is an initial decrease in the latter in the first period after the shock. We incorporate these results in our model. In the case of the share of professional workers, their income is more stable due to its overhead characteristic (and then, the professional employment does not vary too much). As their share in income decreases in the short run after a positive shock to aggregate demand, we incorporate this effect by assuming that their productivity is procyclical. For production workers, on the other hand, their share responds positively to a shock in aggregate demand: we incorporate just the bargaining power effect in their theoretical framework (there is not the overhead characteristic in this case and their employment varies as much as the income does - so we consider their productivity constant).

[5] We could define that L_M depends on the potential output $\bar{Y}$ instead of Y. However, note that we would still have the same equation for $\hat{L}_M - \hat{L}_W = \hat{a} - \hat{b}$, since $\hat{\bar{Y}}$=$\hat{Y}$=$\hat{K}$ (in the equilibrium, $\hat{u} = 0$).

To build the equations for wages, we take inspiration from the literature that highlights the importance of aggregate demand to increase workers' share in income (Goodwin cycle literature). We add this worker bargaining effect to both type of workers' real wage growth, motivated by the results found by Rolim (2019).

The wage growth of professional workers is given by:

$$\hat{W}_M = \lambda_2 e + \Omega \tag{1.22}$$

where λ_2 captures the professional workers' bargaining power, e is the employment rate of the economy (for both types of workers) $e = \frac{L}{N}$, and $\Omega > 0$ captures other (exogenous) factors other than the economic cycle that impact their wage growth. To better capture the distributive conflict among workers, professional workers' wage growth depends on a term unrelated to the business cycle but only on their position in the bargaining game with production workers. This is because both classes compete to increase their share of labor income. Thus, Ω is called the exogenous distributive conflict parameter. It may reflect other variables that affect professional workers' wage growth besides the business cycle, such as institutional factors (for instance, unionization)[6].

Note that a higher employment rate increases wage growth by improving workers' bargaining power so that $\lambda_2 > 0$. The wage growth equation is inspired by Sasaki (2013), Dutt (1992b), Tavani et al. (2011), Cassetti (2003), Cassetti (2002), Skott (1989), Blecker and Setterfield (2019), Lima et al. (2021), and Setterfield (2023): the real wage growth depends on the workers' relative bargaining power, which increases with the employment rate. We decided to follow these authors since in the medium run we will analyze the relationship between aggregate demand and earnings inequality mediated by the employment rate.

Similarly, the production workers' real wage growth rate is given by:

$$\hat{W}_W = \lambda_1 e \tag{1.23}$$

where λ_1 captures the professional workers' bargaining power, and e is the employment rate of the economy (for both types of workers). As in the case of professional workers, a

[6] This is inspired by Palley (2014a), who considers an exogenous institutional parameter that affects wage inequality.

higher employment rate increases wage growth by improving workers' bargaining power so that $\lambda_1 > 0$.

We assume that $\lambda_2 > \lambda_1$ to express the idea that professional workers may have a higher bargaining power effect. This is empirically found by Rolim (2019): the professional workers' wage share responds more (positively) to a shock in aggregate demand than the production workers' wage share. It is supported by Lavoie (2009), who argues that "*firms are likely to be more prone to increase supervisors' wages in the boom phase of the cycle (Lavoie 2009).*" (Rolim, 2019, p.12).

Both real wage rates of growth depend on the overall employment rate (e): we assume that the level of labor market tightness influences the bargaining effect, as usual in the literature. Consequently, we regard the total employment rate as a key indicator of the phase within the economic cycle, as perceived by both workers and firms operating within the framework of conflicting claims. However, it is important to note that professional workers hold an advantage in this process, denoted by $\lambda_2 > \lambda_1$. In other words, the difference between the real wage growth rates for two groups, denoted as $\hat{W}_M$ and $\hat{W}_W$, is determined by labor market tightness, represented by the total employment rate e. This difference, expressed as $(\lambda_2 - \lambda_1)e + \Omega$, hinges on the sensitivity of wage growth rate disparity to labor market tightness. This sensitivity is higher when professional workers have a stronger relative bargaining position in the labor market (higher $\lambda_2 - \lambda_1$). Then, an increase in the total employment rate e positively impacts the earnings inequality rate of growth $\hat{\theta}$.

In summary, our model presents two types of mechanisms in the labor market dynamics: 1) the worker bargaining power effect, given by λ_1 and λ_2 (for production and professional workers, respectively); 2) the overhead labor effect, given by β_M. It means that the difference between employment growth rates $\hat{L}_M - \hat{L}_W$ is countercyclical: an increase (decrease) in u makes this difference smaller (greater) (in line with the empirical literature discussed in Section 1.1 and summarized above) according to the equation[7]:

$$\hat{L}_M - \hat{L}_W = -\beta_M u \tag{1.24}$$

Rolim (2019) finds that, considering the magnitude of the increase in the supervisors'

[7] Note that $Y = bL_M$ and $Y = aL_W$, so $\hat{L}_M = g - \hat{b}$ and $\hat{L}_W = g - \hat{a}$. Since $\hat{a} = 0$ and $\hat{b} = \beta_M u$, then $\hat{L}_M - \hat{L}_W = -\beta_M u$.

share after a shock in aggregate demand, the bargaining power effect for professional workers probably overcomes the overhead labor effect. In our model, it means that λ_2 is greater than β_M. As the response of supervisors' share in income to a shock in aggregate demand is higher than the response of production workers' share, the results of Rolim (2019) also support the assumption that $\lambda_2 > \lambda_1$: "*Also, the results suggest that the workers' share presents a weak response to capacity utilization, so some characteristics of the USA labour market may limit the possibility of workers benefiting from increases in capacity utilization as much as managers*" (Rolim, 2019, p. 13).

Lastly, we follow the recent empirical studies (Cauvel, 2023; Mutlugün, 2022) and model the total labor productivity of the economy as being pro-cyclical (Lavoie, 2017; Cauvel, 2023; Mutlugün, 2022):

$$\hat{\Lambda} = \beta_T u \tag{1.25}$$

where β_T has a similar meaning to β_M (overhead labor effect), but it captures the pro-cyclicality of the total productivity. It can be shown that $\beta_T = (1-\iota)\beta_M$ so that both betas are related, where $\iota = \frac{L_W}{L}$, so $\iota > 0$, and $(1-\iota) > 0$.[8]

1.3.3 Short-run equilibrium

In the short run equilibrium ($\hat{u} = 0$), real wages and productivities are given, so the distribution among workers and the earnings inequality are given or predetermined. Therefore, aggregate demand determines the output and employment levels of the two types of work.

Since adjustments in the rate of capacity utilization ensure the equality between investment and savings in the short run equilibrium, we have $S = I + G$ (see Equation 1.16), where S is the total savings function, I is the investment, and G is the government deficit. These variables are normalized by the capital stock K. The following equation gives the effective demand equilibrium with $\hat{u} = 0$, when we substitute Equations 1.14 and 1.15 into 1.16:

$$u^* = \frac{\gamma_0 + g_0}{\psi_W[s_W - \theta(s_C - s_M - \gamma_2) - s_C + \gamma_2] + s_C - \gamma_1 - \gamma_2} \tag{1.26}$$

The effect of production workers' wage share on demand, everything else held constant,

[8] $\hat{\Lambda} = \hat{Y} - \hat{L}$. Then, $\hat{L} = \iota \hat{L}_W + (1-\iota)\hat{L}_M$, with $\iota = \frac{L_W}{L}$. With some manipulation, and under the assumptions of $\hat{b} = \beta_M u$ and $\hat{a} = 0$, we can find that $\hat{\Lambda} = (1-\iota)\beta_M u$.

is given by the following partial derivative:

$$\frac{\partial u^*}{\partial \psi_W} = \frac{(\gamma_0 + g_0)[s_C - s_W + \theta(s_C - s_M - \gamma_2) - \gamma_2]}{\Delta^2} \tag{1.27}$$

where $\gamma_0 + g_0 > 0$, and $\Delta > 0$ is the denominator of equation 1.26. It is assumed to be positive by the Keynesian stability condition.

Note that $(s_C - s_W) > 0$ and $(s_C - s_M) > 0$. Also, γ_0, g_0, θ, γ_2 are > 0. Demand is wage-led if:

$$(s_C - s_W) + \theta(s_C - s_M) > (1 + \theta)\gamma_2 \tag{1.28}$$

The demand regime is wage-led if the differentials of propensities to save between capitalists and the two types of workers are relatively high. In this case, an income redistribution in favor of wages positively affects consumption and offsets the negative effect on investment (which depends positively on the profit share via γ_2). The profit-led case is the most probable if the investment function is highly sensitive to the profit rate (γ_2 relatively high). Note there is a difference in our model if we compare it to most models in the literature. Most authors in the Kaleckian literature tend to find the result that a wage-led demand regime is more likely when wage inequality is low (Carvalho and Rezai, 2015; Oyvat et al., 2020; Palley, 2016, 2014b, Lavoie and Nah, 2020). Here, the impact of earnings inequality on the demand regime depends on the differential of saving propensities between capitalists and professional workers ($s_C - s_M$) and the sensitivity of the investment function to the profit rate (γ_2). If the first is higher than the latter (inequality-led regime), higher earnings inequality generates a more wage-led regime.

The following partial derivative gives the effect of earnings inequality on demand:

$$\frac{\partial u^*}{\partial \theta} = \frac{(\gamma_0 + g_0)\psi_W(s_C - s_M - \gamma_2)}{\Delta^2} \tag{1.29}$$

Note that $(s_C - s_M) > 0$, $\gamma_0 + g_0 > 0$, $\psi_w > 0$ and $\gamma_2 > 0$. If $(s_C - s_M) > \gamma_2$, the economy exhibits an inequality-led regime in which there is redistribution from the class with a more pronounced propensity to save - capitalists - to professional workers, whose propensity to consume is higher[9]. This redistribution process positively impacts aggregate

[9] Note that this condition relates to behavior at the top of the distribution (capitalists vs. managers), not the bottom (managers vs. workers).

demand. If $(s_C - s_M) < \gamma_2$, the economy has a non-inequality-led regime. In this case, increasing earnings inequality has a contractionary effect on aggregate demand.

The short run equilibrium rate of capital accumulation g^* is obtained substituting Equation 1.26 into 1.20:

$$g^* = \gamma_o + u^*[\gamma_1 + \gamma_2(1 - \psi_W(1 + \theta))] \tag{1.30}$$

We can do the same exercises as before:

$$\frac{\partial g^*}{\partial \psi_W} = \frac{\partial u^*}{\partial \psi_W}[\gamma_1 + \gamma_2(1 - \psi_W(1 + \theta))] - u^*\gamma_2(1 + \theta) \tag{1.31}$$

$$\frac{\partial g^*}{\partial \theta} = \frac{\partial u^*}{\partial \theta}[\gamma_1 + \gamma_2(1 - \psi_W(1 + \theta))] - u^*\gamma_2\psi_W \tag{1.32}$$

If demand is wage-led ($\frac{\partial u^*}{\partial \psi_W} > 0$), the effect of ψ_W on the rate of capital accumulation is ambiguous. If demand is profit-led ($\frac{\partial u^*}{\partial \psi_W} < 0$), on the other hand, $\frac{\partial g^*}{\partial \psi_W}$ is also profit-led.

If economy is inequality-led ($\frac{\partial u^*}{\partial \theta} > 0$), the effect of earnings inequality θ on g^* is ambiguous. In the non-inequality-led situation ($\frac{\partial u^*}{\partial \theta} < 0$), $\frac{\partial g^*}{\partial \theta}$ is also negative (non-inequality-led growth regime).

1.3.4 Medium-run equilibrium

In the medium run, productivity is allowed to vary, according to the aggregate demand, capturing the overhead labor effect during the economic cycle. Earnings inequality θ, our first state variable, adjusts in the medium-run according to equation 1.18, defined in the previous section, so that $\hat{\theta} = 0$.

Also, note that we can rewrite the employment rate of the economy e as:

$$e = \frac{L}{N} = \frac{L}{Y}\frac{Y}{K}\frac{K}{N} \tag{1.33}$$

Note that $L = L_W + L_M$, and $N = N_W + N_M$. Also, $\frac{Y}{K} = u$, $\frac{L}{Y} = \frac{1}{\Lambda}$. So we rewrite the equation above as:

$$e = uk \tag{1.34}$$

where $k = \frac{K}{N\Lambda}$.

In the medium-run, the short-run equilibrium values of the variables will always be met with the economy moving over time through changes in these variables. $k = \frac{K}{N\Lambda}$, the capital per effective worker, is our second state variable that adjusts in the medium run ($\hat{k} = 0$). This variable is a component of the employment rate since $e = uk$. Then, $e = u\frac{K}{N\Lambda}$. In terms of growth rates:

$$\hat{e} = \hat{u} + \hat{K} - \hat{N} - \hat{\Lambda} \tag{1.35}$$

Note that $\hat{u} = 0$, from the short run equilibrium. Then, our second state variable k adjusts in the medium run according to:

$$\hat{k} = \hat{K} - \hat{N} - \hat{\Lambda} \tag{1.36}$$

Note $\hat{K}$ is given by Equation 1.20 and $\hat{\Lambda}$, by Equation 1.25.

Also, we consider that labor force growth $\hat{N}$ depends on the economic cycle. Since the labor force participation rate tends to be procyclical, as shown by the empirical literature on this topic for advanced economies (Epstein, 2018; Grigoli et al., 2018), we consider that $\hat{N}$ depends positively on u (see Equation 1.37, where $\alpha > 0$):

$$\hat{N} = \alpha u \tag{1.37}$$

Grigoli et al. (2018) show, for a group of countries, that participation rates depend on the state of the business cycle - more specifically, they depend positively on the output gap (which is represented by u in our model). The effect is higher for more marginally attached to the workforce groups (such as prime-age women)[10].

In the medium run equilibrium, we have the adjustment of both state variables θ and k so that $\hat{\theta} = 0$ and $\hat{k} = 0$ (Equations 1.18 and 1.36, respectively). We substitute Equations 1.22, 1.23, and 1.24 into 1.18:

$$\hat{\theta} = (\lambda_2 - \lambda_1)u^*k + \Omega - \beta_M u^* \tag{1.38}$$

Finally, we substitute Equations 1.20, 1.25, and 1.37 into 1.36:

$$\hat{k} = \gamma_o + u^*[\gamma_1 + \gamma_2(1 - \psi_W(1 + \theta))] - (\beta_T + \alpha)u^* \tag{1.39}$$

We can write the system formed by Equations 1.38 and 1.39 in its implicit form:

$$\hat{\theta} = \zeta(\theta, k) \tag{1.40}$$

[10] We could consider the labor force growth constant, as usual in Kaleckian models. However, this assumption adds even more ambiguity effects to the analysis of shocks carried out in Section 1.3.5.

$$\hat{k} = \rho(\theta, k) \tag{1.41}$$

Equations 1.38 and 1.39 form our dynamic system of differential equations in the medium run in which the rates of change of θ and k depend on the levels of these variables and the parameters of the system (see its implicit form in Equations 1.40 and 1.41). Note that u^* is given by the equilibrium in the short run (Equation 1.26), and $e^* = u^*k$.

Substituting Equation 1.26 into Equation 1.38, and also under the assumption that $\hat{\theta} = 0$ (medium run equilibrium), we have:

$$\theta = \frac{(\gamma_o + g_0)[(\lambda_2 - \lambda_1)k - \beta_M]}{\Omega\psi_W(s_C - s_M - \gamma_2)} + \frac{(s_C - \gamma_1 - \gamma_2)}{\psi_W(s_C - s_M - \gamma_2)} - \frac{(s_C - s_W - \gamma_2)}{(s_C - s_M - \gamma_2)} \tag{1.42}$$

Note Equation 1.42 yields a line in space (θ, k). As $\lambda_2 - \lambda_1$ is positive, Equation 1.42 is positively sloped if the demand is inequality-led $((s_C - s_M) > \gamma_2)$. It is negatively sloped in the non-inequality-led regime[11].

Under $\hat{k} = 0$ and substituting Equation 1.26 into 1.39, the equation for $\hat{k} = 0$ does not depend on k, so it is a horizontal line (a constant function) in which:

$$\theta^* = \frac{\gamma_0[s_C - \psi_W(s_C - s_W)] + g_0[\gamma_1 + \gamma_2(1 - \psi_W)] - (\gamma_0 + g_0)(\alpha + \beta_T)}{\psi_W[\gamma_2 g_0 + \gamma_0(s_C - s_M)]} \tag{1.43}$$

Note the denominator of Equation 1.43 is positive (since $s_C - s_M > 0$). So, we assume the numerator is also positive in order to have $\theta > 0$. We call A the numerator of Equation 1.43 and B its denominator.

Substituting Equation 1.43 into 1.42, we have k^* in the medium run equilibrium:

$$k^* = \frac{\Omega(s_C - s_M - \gamma_2)A + B_1[(\gamma_0 + g_0)\beta_M + \Omega\psi_W(s_C - s_W - \gamma_2) - \Omega(s_C - \gamma_1 - \gamma_2)]}{B_1(\gamma_0 + g_0)(\lambda_2 - \lambda_1)} \tag{1.44}$$

where A is the numerator of Equation 1.43, and $B_1 = \gamma_0(s_C - s_M) + g_0\gamma_2$. We call F the numerator of Equation 1.44, and G, its denominator. Note $G > 0$ without ambiguity so that $F > 0$, in order to have $k > 0$.

The stability of the system formed by Equations 1.38 and 1.39 can be examined through its Jacobian matrix of partial derivatives, given by:

$$\mathbf{J} = \begin{bmatrix} \frac{\partial\hat{\theta}}{\partial\theta} & \frac{\partial\hat{\theta}}{\partial k} \\ \frac{\partial\hat{k}}{\partial\theta} & \frac{\partial\hat{k}}{\partial k} \end{bmatrix} \tag{1.45}$$

[11] Note the intercept equation 1.42 is given by: $\theta_C = \frac{-(\gamma_0+g_0)\beta_M - \Omega\psi_W(s_C - s_W - \gamma_2) + \Omega(s_C - \gamma_1 - \gamma_2)}{\Omega\psi_W(s_C - s_M - \gamma_2)}$. In the inequality-led (non-inequality) regime, the denominator of θ_C is > 0 (< 0), so its numerator is also > 0 (< 0) in order to have a positive measure for earnings inequality.

Note that the trace of **J** is:

$$Tr(\mathbf{J}) = \frac{\partial \hat{\theta}}{\partial \theta} + \frac{\partial \hat{k}}{\partial k} \tag{1.46}$$

And its determinant is:

$$Det(\mathbf{J}) = \frac{\partial \hat{\theta}}{\partial \theta}\frac{\partial \hat{k}}{\partial k} - \frac{\partial \hat{\theta}}{\partial k}\frac{\partial \hat{k}}{\partial \theta} \tag{1.47}$$

We then calculate the following partial derivatives:

$$\frac{\partial \hat{\theta}}{\partial \theta} = \frac{\partial u^*}{\partial \theta}[(\lambda_2 - \lambda_1)k - \beta_M] \tag{1.48}$$

$$\frac{\partial \hat{k}}{\partial k} = 0 \tag{1.49}$$

$$\frac{\partial \hat{\theta}}{\partial k} = u^*(\lambda_2 - \lambda_1) > 0 \tag{1.50}$$

$$\frac{\partial \hat{k}}{\partial \theta} = \frac{\partial u^*}{\partial \theta}[\gamma_1 + \gamma_2(1 - \psi_W(1+\theta)) - \beta_T - \alpha] - u^*\gamma_2\psi_W \tag{1.51}$$

Note we have assumed that $\lambda_2 - \lambda_1$ is always positive (see Section 1.3.2).

The stability of the dynamical system requires $Tr(\mathbf{J}) < 0$ and $Det(\mathbf{J}) > 0$. As $\frac{\partial \hat{k}}{\partial k} = 0$, $Tr(\mathbf{J}) = \frac{\partial \hat{\theta}}{\partial \theta}$.

Equation 1.48 has an ambiguous sign. If the economy is inequality-led ($\frac{\partial u^*}{\partial \theta} > 0$), then the condition for stability ($Tr(\mathbf{J}) < 0$) is:

$$(\lambda_2 - \lambda_1)k < \beta_M \tag{1.52}$$

that is, the overhead labor effect (β_M) is higher than the professional workers' bargaining power effect ($\lambda_2 - \lambda_1$). If the latter is greater than the first, the trace is positive and the system is unstable. If the economy is non-inequality-led ($\frac{\partial u^*}{\partial \theta} < 0$), then the condition for stability is that the professional workers' bargaining power effect is greater than the overhead labor effect ($(\lambda_2 - \lambda_1)k > \beta_M$).

Equation 1.51 also has an ambiguous sign. If the economy is inequality-led ($\frac{\partial u^*}{\partial \theta} > 0$), then $\frac{\partial \hat{k}}{\partial \theta} > 0$ if:

$$\frac{\partial u^*}{\partial \theta}[\gamma_1 + \gamma_2(1 - \psi_W(1+\theta))] > u^*\gamma_2\psi_W + \frac{\partial u^*}{\partial \theta}(\beta_T + \alpha) \tag{1.53}$$

It can occur, for example, when the overhead labor effect given by β_T is small. If the economy is non-inequality-led ($\frac{\partial u^*}{\partial \theta} < 0$), then $\frac{\partial \hat{k}}{\partial \theta} < 0$ also if the overhead labor effect of the total economy productivity is low:

$$\frac{\partial u^*}{\partial \theta}[\gamma_1 + \gamma_2(1 - \psi_W(1+\theta))] + u^*\gamma_2\psi_W > \frac{\partial u^*}{\partial \theta}(\beta_T + \alpha) \tag{1.54}$$

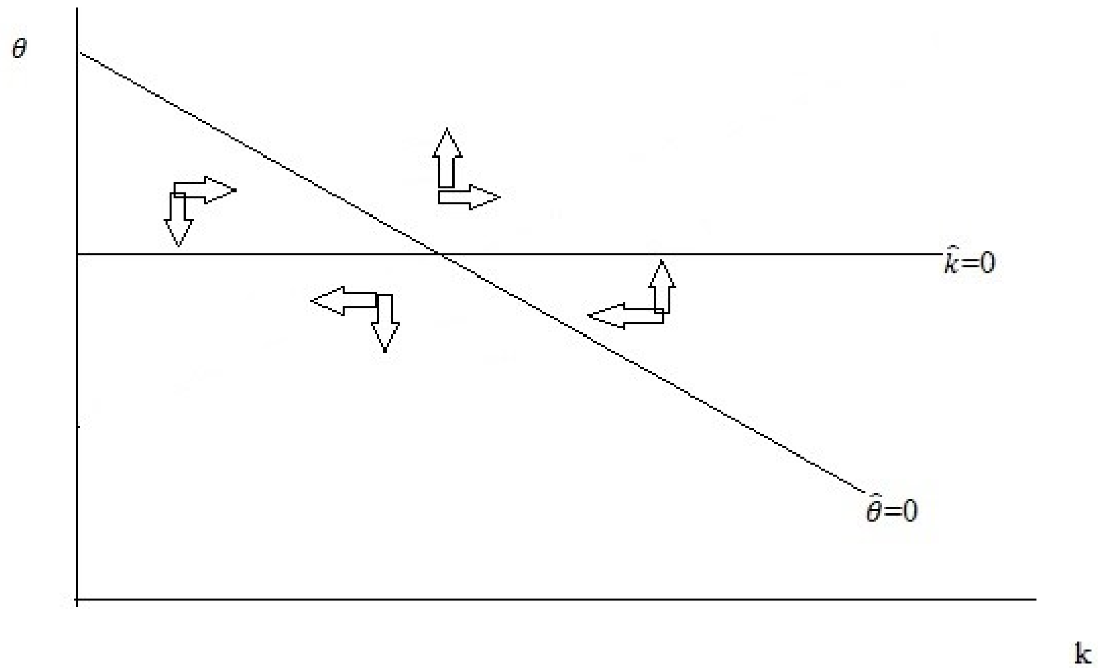

Figure 1.1: Equilibrium - possibility 1: Non-inequality-led regime + High overhead labor effect (saddle)

Source: Author's elaboration.

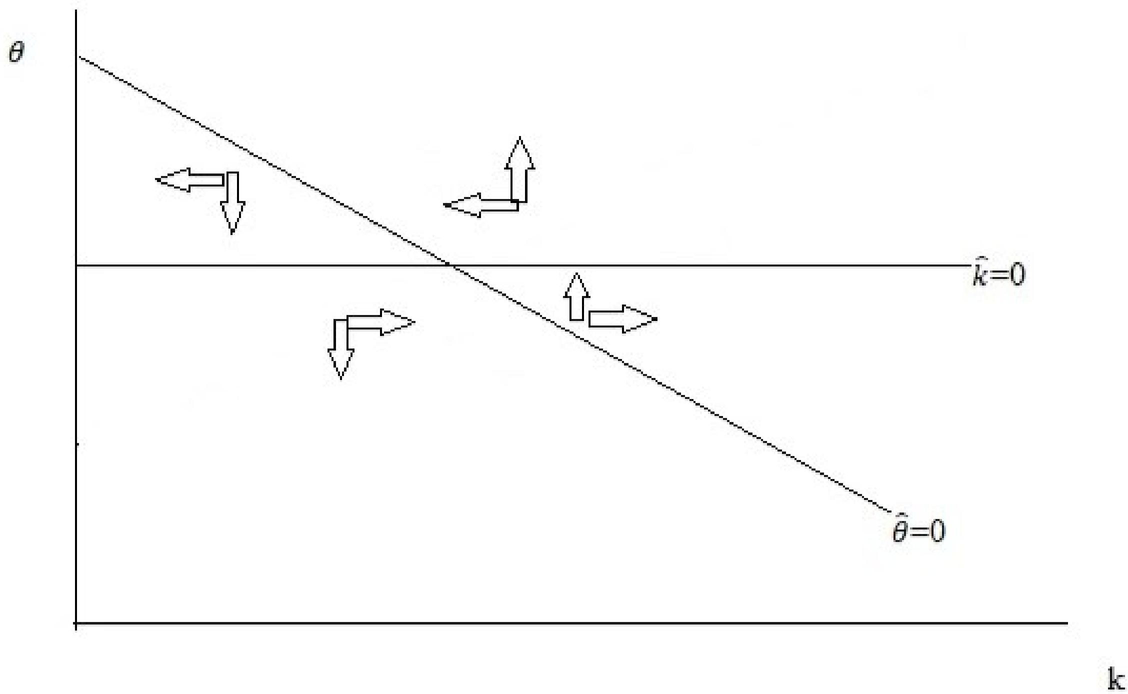

Figure 1.2: Equilibrium - possibility 2: Non-inequality-led regime + Low overhead labor effect (stable)

Source: Author's elaboration.

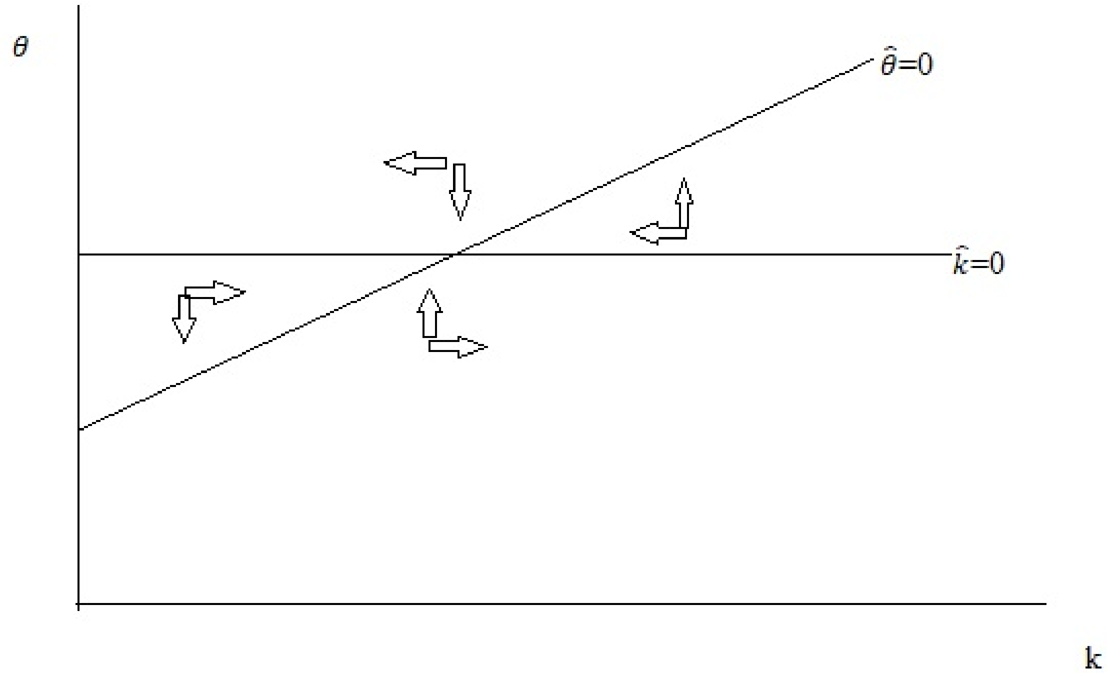

Figure 1.3: Equilibrium - possibility 3: Inequality-led regime + High overhead labor effect (stable)

Source: Author's elaboration.

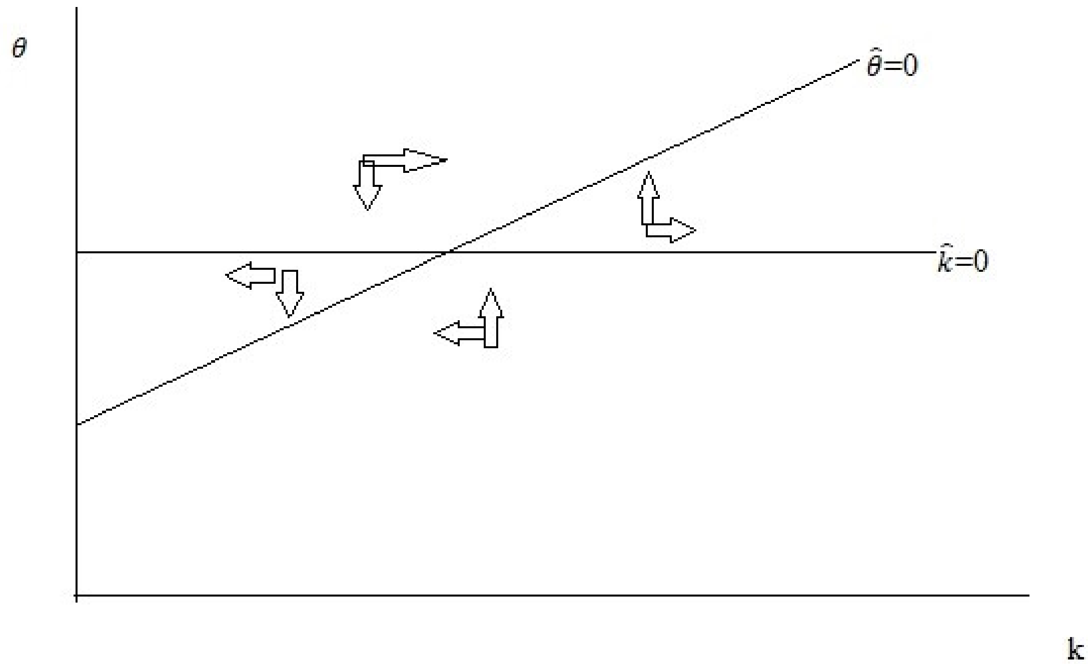

Figure 1.4: Equilibrium - possibility 4: Inequality-led regime + Low overhead labor effect (saddle)

Source: Author's elaboration.

We have then four cases represented in Figures 1.1-1.4, and in Table 1.2.

Figures 1.1 and 1.2 illustrate the non-inequality-led regime ($\frac{\partial u^*}{\partial \theta}$ is negative). Figure 1.1 shows the case in which the overhead labor effect is high so that $\frac{\partial \hat{k}}{\partial \theta}$ is positive. In this case, $Det(\mathbf{J}) < 0$, and the equilibrium is a saddle point (unstable). Also, note that if $Tr(\mathbf{J}) > 0$, there is instability if $(\lambda_2 - \lambda_1)k < \beta_M$ (professional workers' overhead labor effect is greater then their relative bargaining power). Figure 1.2 depicts the case in which the overhead labor effect is low so that $\frac{\partial \hat{k}}{\partial \theta}$ is negative. In this case, $Det(\mathbf{J}) > 0$. So if the condition for $Tr(\mathbf{J}) < 0$ is met, there is stability ($(\lambda_2 - \lambda_1)k > \beta_M$ - that is, the professional workers' bargaining effect is higher than their overhead labor effect). Table 1.2 summarizes these conditions in a more detailed manner. The empirical evidence by Rolim (2019) reports that the aggregate demand increases after a shock to the production workers' share, while it decreases after a shock in the managers' share. Based on this, the non-inequality-led demand regime (Figures 1.1 and 1.2) is more likely to occur.

Figures 1.3 and 1.4 show the inequality-led regime ($\frac{\partial u^*}{\partial \theta}$ is positive). Figure 1.3 illustrates the case in which the overhead labor effect is high ($\frac{\partial \hat{k}}{\partial \theta}$ is negative). In this case, $Det(\mathbf{J}) > 0$. As the overhead labor is high, if the condition for $Tr(\mathbf{J}) < 0$ is met $(\lambda_2 - \lambda_1)k < \beta_M$ (the professional workers' overhead labor predominates over their relative bargaining power), the equilibrium is stable. Figure 1.4, in turn, depicts the case in which the overhead labor effect is low ($\frac{\partial \hat{k}}{\partial \theta}$ is positive). So, $Det(\mathbf{J}) < 0$, and the equilibrium is a saddle point. If $(\lambda_2 - \lambda_1)k > \beta_M$, then $Tr(\mathbf{J}) > 0$ and the system is unstable (the professional workers' relative bargaining power is high and offsets their overhead labor effect). See Table 1.2 for a more detailed description.

Figures 1.1-1.4 and Table 1.2 show that the stability of the relationship between earnings inequality and aggregate demand (mediated by the employment rate) depends on which effect predominates. If the economy is inequality-led, the requirement for a negative trace (stability) is a high professional workers' overhead labor effect that is greater than their relative bargaining power effect. If the overhead labor effect is high enough ($Det(\mathbf{J}) > 0$), there is stability (Figure 1.3). In other words, in this case, as the aggregate demand growth is led by professional workers (inequality-led), it is necessary to have an opposite force that decreases earnings inequality (overhead labor effect) to stabilize the distributional conflict among workers. Note in Equation 1.38 that a higher overhead labor effect β_M decreases the variation of earnings inequality since it decreases the difference

Figure	Demand Regime	Trace	Determinant	Stability
Figure 1	Non-inequality-led $\frac{\partial u^*}{\partial \theta} < 0$	$Tr(\mathbf{J}) < 0$ if $(\lambda_2 - \lambda_1)k > \beta_M$	$Det(\mathbf{J}) < 0$ since $\frac{\partial \hat{k}}{\partial \theta} > 0$ (High overhead labor - see condition 1, Table 1.3).	Saddle point
Figure 2	Non-inequality-led $\frac{\partial u^*}{\partial \theta} < 0$	$Tr(\mathbf{J}) < 0$ if $(\lambda_2 - \lambda_1)k > \beta_M$	$Det(\mathbf{J}) > 0$ since $\frac{\partial \hat{k}}{\partial \theta} < 0$ (Low overhead labor - see condition 2, Table 1.3)	Stable
Figure 3	Inequality-led $\frac{\partial u^*}{\partial \theta} > 0$	$Tr(\mathbf{J}) < 0$ if $(\lambda_2 - \lambda_1)k < \beta_M$	$Det(\mathbf{J}) > 0$ since $\frac{\partial \hat{k}}{\partial \theta} < 0$ (High overhead labor - see condition 3, Table 1.3)	Stable
Figure 4	Inequality-led $\frac{\partial u^*}{\partial \theta} > 0$	$Tr(\mathbf{J}) < 0$ if $(\lambda_2 - \lambda_1)k < \beta_M$	$Det(\mathbf{J}) < 0$ since $\frac{\partial \hat{k}}{\partial \theta} > 0$ (Low overhead labor - see condition 4, Table 1.3)	Saddle point

Table 1.2 - Summary of the stability analysis

$\hat{L}_M - \hat{L}_W$ (which is countercyclical). An expansion (increase in u) benefits production workers more since their employment has a higher variation, which implies (as noted earlier) that $\hat{L}_M - \hat{L}_W$ is countercyclical. As we will demonstrate in Section 1.3.5.4, a higher overhead labor effect β_M (and a higher β_T consequently) decreases the level of earnings inequality.

Similarly, suppose the aggregate demand is led by production workers (non-inequality-led regime). In that case, the stability requires a higher relative professional workers' bargaining effect that offsets the overhead labor effect (negative trace). Also, if the overhead labor effect is low, then $Det(\mathbf{J}) > 0$, and the system is stable (Figure 1.2). In this case, aggregate demand is led by production workers (non-inequality-led). In order to have a stable system, it is necessary to have an opposite force in favor of professional workers (their relative bargaining power effect), and a low overhead labor effect (which decreases earnings inequality, as we will show in Section 1.3.5.4).

In summary, the stability of the relationship between earnings inequality and the business cycle (mediated by the employment rate) requires an equilibrium in terms of the distributive conflict forces among workers. In this context, a rise in inequality that is persistent over time during the economic recovery (as reported by some studies as by Hoover et al., 2009), can be interpreted as a situation in which there is instability.

Condition 1:	$\frac{\partial u^*}{\partial \theta}[\gamma_1 + \gamma_2(1 - \psi_W(1+\theta))] + u^*\gamma_2\psi_W < \frac{\partial u^*}{\partial \theta}(\beta_T + \alpha)$
Condition 2:	$\frac{\partial u^*}{\partial \theta}[\gamma_1 + \gamma_2(1 - \psi_W(1+\theta))] + u^*\gamma_2\psi_W > \frac{\partial u^*}{\partial \theta}(\beta_T + \alpha)$
Condition 3:	$\frac{\partial u^*}{\partial \theta}[\gamma_1 + \gamma_2(1 - \psi_W(1+\theta))] < u^*\gamma_2\psi_W + \frac{\partial u^*}{\partial \theta}(\beta_T + \alpha)$
Condition 4:	$\frac{\partial u^*}{\partial \theta}[\gamma_1 + \gamma_2(1 - \psi_W(1+\theta))] > u^*\gamma_2\psi_W + \frac{\partial u^*}{\partial \theta}(\beta_T + \alpha)$

Table 1.3 - Summary of the stability analysis 2

1.3.5 Comparative equilibrium analysis

In this section, we conduct four exercises considering the stable cases for non-inequality-led and inequality-led demand regimes (Figures 1.2 and 1.3). We simulate shocks to income distribution (ψ_W), autonomous government deficit (g_0), the sensitivity of productivity to aggregate demand (β_M) and the relative professional workers' bargaining power ($\lambda_2 - \lambda_1$).

1.3.5.1 Redistributive policy

In this section, we consider a positive shock in the production workers' share in income ψ_W through a redistribution policy that transfers income to these workers.

A positive shock in ψ_W diminishes the slope of Equation 1.42. Also, it shifts the curve in Equation 1.42 down, according to the partial derivative of its intercept θ_C[12]:

$$\frac{\partial \theta_C}{\partial \psi_W} = \frac{-\Omega(s_C - s_W - \gamma_2)D - C\Omega(s_C - s_M - \gamma_2)}{D^2} < 0 \tag{1.55}$$

where C and D are the intercept equation's numerator and denominator, respectively. If the economy is inequality-led, then $D > 0$, which implies $C > 0$ (in order to have $\theta > 0$). In this case, $(s_C - s_M - \gamma_2) > 0$. As $s_M > s_W$, then $(s_C - s_W - \gamma_2) > 0$. Also, note that $\Omega > 0$. So, the derivative in Equation 1.55 is negative. In the non-inequality-led regime, $(s_C - s_M - \gamma_2) < 0$, and then $D < 0$ (implying $C < 0$ in order to have a positive θ). In this case, we consider $(s_C - s_W - \gamma_2) < 0$, , which implies that Equation 1.55 is also negative. However, this is not necessarily the case. If not, the derivative in Equation 1.55 can be positive (and the intercept shifts up). Nevertheless, our results are not qualitatively affected by this.

We calculate then the partial derivative of Equation 1.43 (curve $\hat{k} = 0$):

$$\frac{\partial \theta^*}{\partial \psi_W} = \frac{[-\gamma_0(s_C - s_W) - \gamma_2 g_0]B - A[\gamma_2 g_0 + \gamma_0(s_C - s_M)]}{B^2} < 0 \tag{1.56}$$

[12] Note the intercept of equation 1.42 is given by: $\theta_C = \frac{-(\gamma_0+g_0)\beta_M - \Omega\psi_W(s_C-s_W-\gamma_2)+\Omega(s_C-\gamma_1-\gamma_2)}{\Omega\psi_W(s_C-s_M-\gamma_2)}$.

where $A > 0$ and $B > 0$ are the numerator and denominator of Equation 1.43, respectively. Note, as $s_C - s_W$ and $s_C - s_M$ are always positive, the final result is that $\frac{\partial\theta^*}{\partial\psi_W}$ is negative, without ambiguity. Note this result is valid for both inequality-led and non-inequality-led regimes.

We also calculate the effect of ψ_W on k^* (partial derivative of Equation 1.44):

$$\frac{\partial k^*}{\partial\psi_W} = \frac{\Omega\gamma_2(s_M - s_W)}{B_1(\lambda_2 - \lambda_1)} > 0 \tag{1.57}$$

Note the denominator of Equation 1.57 is positive. Note that $s_M - s_W$ is always positive. Finally, γ_2 and Ω are > 0. The impact on k^* is always positive. Again, this result is valid for both, inequality-led and non-inequality-led regimes. Figure 1.5 illustrates the shift in the equilibrium from point 1 to point 2 after a positive shock to ψ_W.

To sum up, a redistribution towards the production workers' share in income decreases the earnings inequality in both demand regimes. It benefits the workers at the bottom of the earnings distribution, whose propensity to consume is higher. This income redistribution towards people with a higher propensity to consume stimulates the aggregate demand and increases k (a component of the employment rate) in both stable regimes. Note that this positive redistribution effect on k depends on the magnitude of $s_M - s_W$ in Equation 1.57, the difference of propensity to save between professional and production workers.

A redistribution policy toward production workers' share of income decreases earnings inequality and increases aggregate demand represented by k in both types of demand regimes (inequality- and non-inequality-led). A possible interpretation is that this policy conciliates the distributive conflict among workers (both type of workers' share in income increases with ψ_W, since $\psi_M = \theta\psi_W$).

1.3.5.2 Fiscal policy

In this section, we simulate an increase in the government's autonomous deficit represented by g_0. First, a higher g_0 increases the slope of Equation 1.42. Its intercept is changed by the partial derivative:

$$\frac{\partial\theta_C}{\partial g_0} = \frac{-\beta_M}{\Omega\psi_W(s_C - s_M - \gamma_2)} \tag{1.58}$$

In the inequality-led (non-inequality-led) regime, a positive shock in g_0 shifts down (up) Equation 1.42.

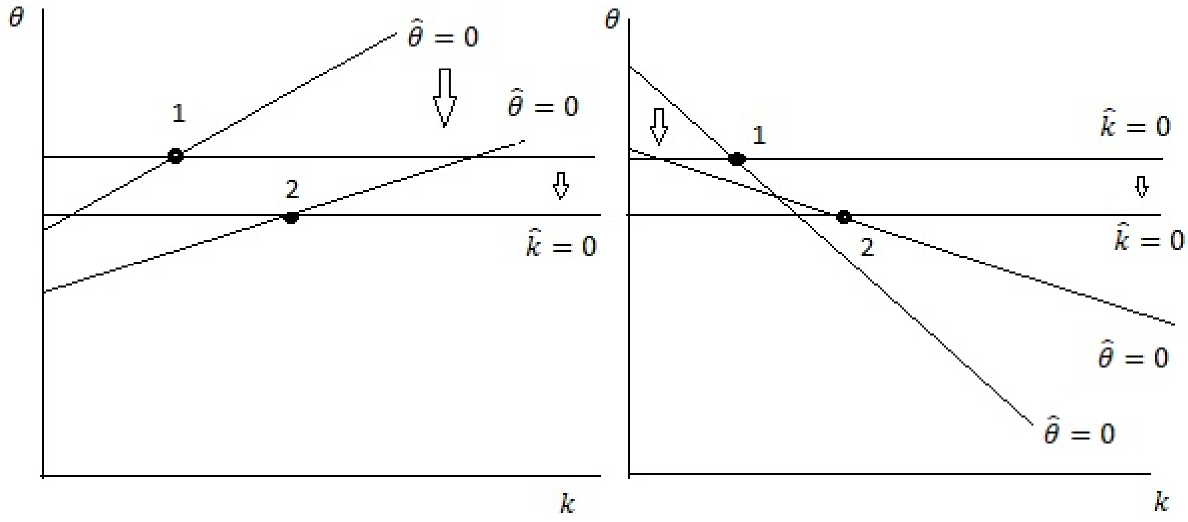

Figure 1.5: The effect of a redistributive policy (positive shock in ψ_W): inequality-led and non-inequality-led, respectively

Source: Author's elaboration.

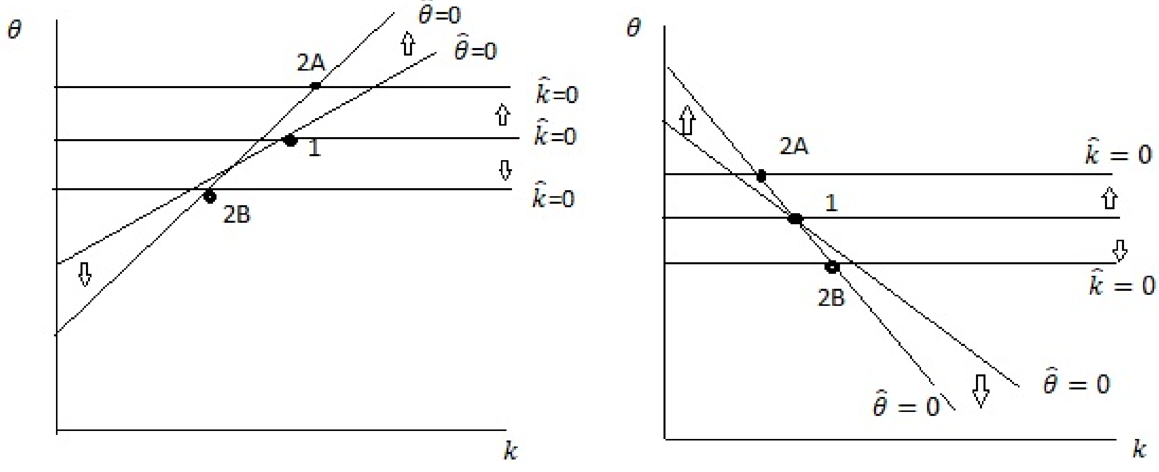

Figure 1.6: The effect of a fiscal policy (positive shock in g_0): inequality-led and non-inequality-led, respectively

Source: Author's elaboration.

The effect on earnings inequality is given by[13]:

$$\frac{\partial \theta^*}{\partial g_0} = \frac{[\gamma_1 + \gamma_2(1-\psi_W) - \alpha - \beta_T] - \theta^* \psi_W \gamma_2}{B} \tag{1.59}$$

where $B > 0$ is the denominator of Equation 1.43. Note the impact of fiscal policy is ambiguous. However, it tends to have a negative impact on earnings inequality if the second term of Equation 1.59 is high (when the earnings inequality level is high in the equilibrium (θ^*), for example). The effect of an increase in g_0 on earnings inequality tends to be negative in economies with an elevated level of inequality. If this is the case, Equation 1.43 is shifted down. Otherwise, it is shifted up. Figure 1.6 illustrates a shift in both directions (from equilibrium 1 to 2A or 2B).

The impact on k^* is also ambiguous. It tends to be positive when the economy has a low level of k in the equilibrium, which illustrates that fiscal policy tends to positively affect aggregate demand when this latter is lower (represented by the employment rate component k^* in the equilibrium). A higher professional worker's relative bargaining power $\lambda_2 - \lambda_1$, on the other hand, tends to make the derivative negative:

$$\frac{\partial k^*}{\partial g_0} = \frac{\Omega(s_C - s_M - \gamma_2)Q + B_1\beta_M + \gamma_2 H - k^*(\lambda_2 - \lambda_1)[B_1 + \gamma_2(\gamma_0 + g_0)]}{G} \tag{1.60}$$

where $Q = [\gamma_1 + \gamma_2(1-\psi_W) - \alpha - \beta_T]$, and $H = [(\gamma_0 + g_0)\beta_M + \Omega\psi_W(s_C - s_W - \gamma_2) - \Omega(s_C - \gamma_1 - \gamma_2)]$.

1.3.5.3 Relative workers' bargaining power

In this section, we consider a positive shock in $\lambda_2 - \lambda_1 > 0$; that is, the relative professional workers' bargaining power is higher. This shock does not affect earnings inequality in the equilibrium (Equation 1.43) nor the intercept of Equation 1.42. However, it increases the slope of Equation 1.42. Figure 1.7 shows that, after a shock in $\lambda_2 - \lambda_1$, earnings inequality in the equilibrium does not change since it does not affect its equation (Equation 1.43). The impact on the component of employment rate k, however, is negative as shown by Figure 1.7 and by the following derivative of Equation 1.44 (from equilibrium 1 to 2):

[13] The derivative is $\frac{\partial \theta^*}{\partial g_0} = \frac{[\gamma_1 + \gamma_2(1-\psi_W) - \alpha - \beta_T]B - A\psi_W\gamma_2}{B^2}$. However, we rewrote this equation considering that $\theta^* = \frac{A}{B}$, where A and B are the numerator and denominator of Equation 1.43, respectively.

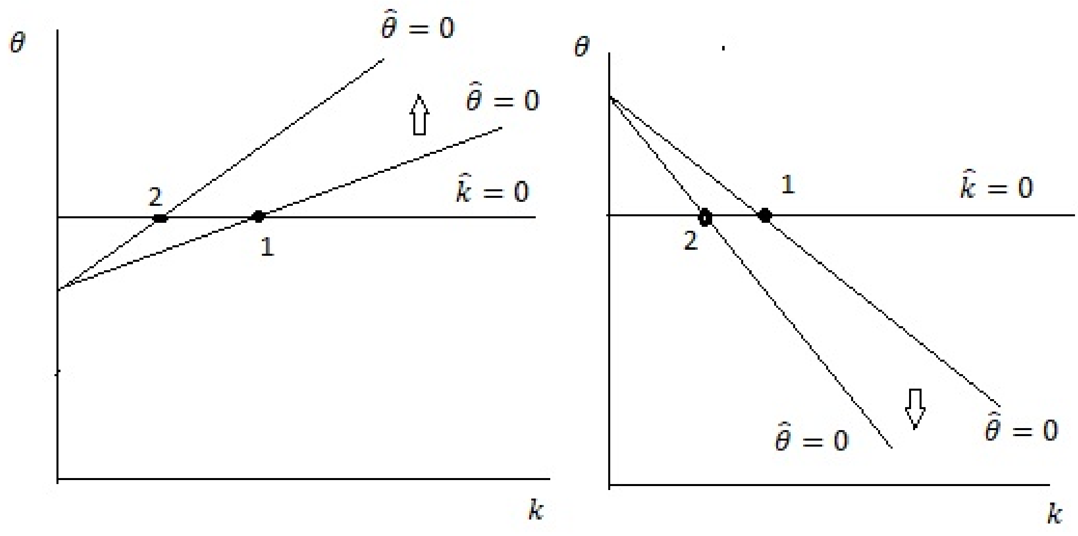

Figure 1.7: The effect of a positive shock in $(\lambda_2 - \lambda_1)$: inequality-led and non-inequality-led, respectively

Source: Author's elaboration.

$$\frac{\partial k^*}{\partial(\lambda_2 - \lambda_1)} = \frac{-F(\gamma_0 + g_0)[\gamma_0(s_C - s_M) + g_0\gamma_2]}{G^2} < 0 \tag{1.61}$$

where $F > 0$ is the numerator of Equation 1.44 and $G > 0$, its denominator. Note this derivative is negative without ambiguity in both regimes.

This exercise also shows that a higher relative production workers' bargaining power (λ_1) related to professional workers' bargaining power (λ_2) has the opposite effect: it does not change earnings inequality but it makes Equation 1.42 less sloped, increasing the employment rate component k. As this shock improves the bargaining of poorer workers, it stimulates demand regardless of the demand regime, increasing k. It does not change earnings inequality itself. However, a policy that increases production workers' bargaining power could result in a higher production workers' share in income ψ_W. As shown in Section 1.3.5.1, this type of redistributive policy decreases earnings inequality without ambiguity.

1.3.5.4 Overhead labor effect

In this section, we consider a shock in β_M[14], representing the overhead labor effect, or the sensitivity of professional labor productivity to aggregate demand u. A positive shock in β_M means a stronger overhead labor effect (or more pro-cyclical productivity). A higher β_M means that the professional workers' productivity responds more to changes in aggregate demand, or, in other words, that the overhead labor effect is more substantial. As professional workers' productivity responds more, the general labor productivity of the economy also responds more, with a higher β_T.

A positive shock in β_M (overhead labor effect) shifts down (up) the intercept of Equation 1.42 when the economy is inequality-led (non-inequality-led), according to the partial derivative:

$$\frac{\partial \theta_C}{\partial \beta_M} = \frac{-(\gamma_0 + g_0)}{\Omega \psi_W (s_C - s_M - \gamma_2)} \tag{1.62}$$

The shock shifts down Equation 1.43, decreasing earnings inequality in both demand regimes:

$$\frac{\partial \theta^*}{\partial \beta_M} = \frac{-(\gamma_0 + g_0)(1-\iota)}{\psi_W[\gamma_0(s_C - s_M) + g_0\gamma_2]} < 0 \tag{1.63}$$

The effect of the shock in β_M on k^* is positive (ambiguous) if the demand is non-inequality led (inequality-led):

$$\frac{\partial k^*}{\partial \beta_M} = \frac{B_1 - \Omega(1-\iota)(s_C - s_M - \gamma_2)}{B_1(\lambda_2 - \lambda_1)} \tag{1.64}$$

Figure 1.8 illustrates this impact on k^*, along with a lower θ^*. As we can see, the economy goes from equilibrium 1 to equilibrium 2. A higher β_M diminishes earnings inequality in the inequality-led regime. The final impact on the employment rate component k is ambiguous, and the impact on earnings inequality is negative. In the non-inequality-led regime, a positive shock in β_M also decreases earnings inequality. As demand is non-inequality-led, a lower earnings inequality level is associated with a higher employment rate component k.

To sum up, a higher overhead labor effect decreases earnings inequality: an increase in u tends to benefit production workers since their employment has a higher variation. Also, a higher response of productivity growth to aggregate demand tends to increase the employment rate component k. However, in the inequality-led regime, the final impact on

[14] As we saw earlier, $\beta_T = (1-\iota)\beta_M$.

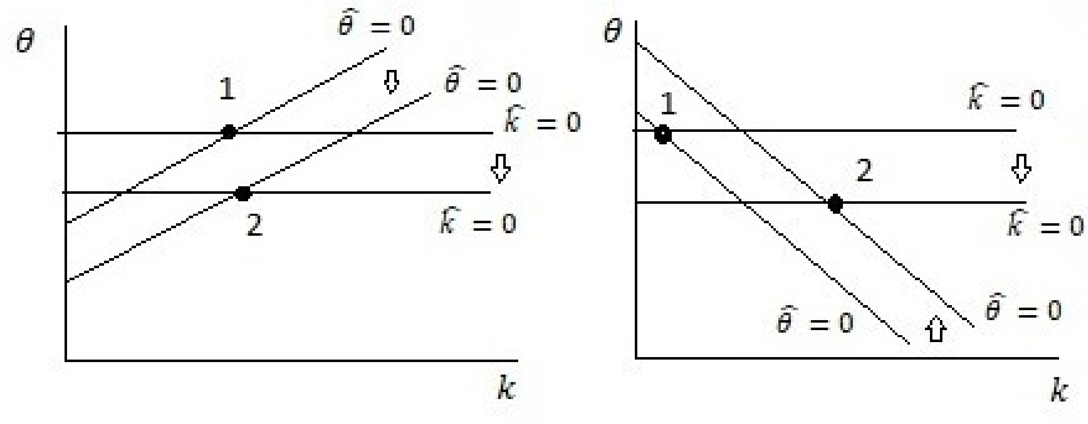

Figure 1.8: The effect of a positive shock in β_M: inequality-led and non-inequality-led, respectively

Source: Author's elaboration.

k is ambiguous since a lower level of earnings inequality is associated with a lower level of k. In the non-inequality-led case, on the other hand, the final impact on k is positive without ambiguity (lower earnings inequality implies a higher employment rate component k in this case).

1.4 Concluding remarks

Inspired by the empirical literature that finds that earnings inequality responds to the economic cyclical flutuations, we build a Kaleckian model to study the relationship between inequality and aggregate demand. The Kaleckian literature typically studies the impact of wage inequality on the rate of capacity utilization. These models commonly find that wage income concentration has contractionary impacts on aggregate demand (Lavoie and Nah, 2020; Palley, 2016, 2017, 2014a, 2014b; Carvalho and Rezai, 2015; Prante, 2018; Prante and Hein, 2018).

The other side of the causality (the impact of aggregate demand on inequality), however, has not been often addressed in this literature. In order to incorporate this other side in our model, we build an earnings inequality measure, motivated by the empirical literature that reports that earnings inequality is countercyclical (Heathcote et al., 2010; Krueger et al., 2010; Maestri and Roventini, 2012; Alessandrini et al., 2016; Bowlus et al., 2022). The evidence of a countercyclical earnings inequality indicates that the productivity of the economy is pro-cyclical since the employment of production workers adjusts more in downturns and recoveries than the employment of professional labor, or what can be called the "overhead labor effect" (Lavoie, 2017; Mutlugün, 2022; Cauvel, 2023; Rolim, 2019). Our contribution in this essay is taking into account the overhead labor effect in a Kaleckian model with inequality among workers.

The model includes three classes in a Kaleckian-Goodwinian approach – capitalists and two types of workers (production and professional). We build a relationship between earnings inequality and aggregate demand mediated by the employment rate in the medium run. We conclude that the stability of this relationship depends on whether the two types of workers are "taking part" in the economic growth (if there is a "conciliation" mechanism among them in a distributive conflict context). If professional workers lead aggregate demand (inequality-led demand), the economy is stable if a mechanism decreases earnings inequality (e.g., overhead labor effect). If production workers lead aggregate demand, stability relies on a mechanism that benefits professional workers relatively more (e.g., greater relative professional workers bargaining effect). Our model shows the importance of policies that aim to conciliate the distributional conflict among workers in the economy (mechanisms that affect the workers' bargaining power, for example).

We simulate some policy impacts on the economy: 1) policies that benefit production workers during expansions and increase their employment variation more than the variation of professional workers' employment (e.g., higher overhead labor effect or more pro-cyclical labor productivity) have the potential to decrease earnings inequality along with a greater aggregate demand (represented by the employment component k). The final impact on k is positive in a non-inequality-led economy but ambiguous in the case of an inequality-led regime; 2) policies that increase the production workers' share in income reduce earnings inequality and stimulate the employment component k in both types of demand regimes and without ambiguity. It includes, for example, labor reforms, better minimum wages, a higher level of formal employment, and income distribution programs that benefit the bottom of the distributive pyramid; 3) a fiscal policy stimulus has an ambiguous final impact on the variables analyzed, but in economies with a higher level of earnings inequality, it tends to have a positive distributive impact, reducing earnings inequality; 4) a higher production workers' relative bargaining power does not change earnings inequality at first, but affects the employment rate component k positively. Also, a policy that strengthens production workers' bargaining power can increase their share in income (which decreases earnings inequality and increases the employment rate component k in both types of demand regimes, without ambiguity).

An important limitation that can be addressed in another version is that we have a three-class model, but the focus is only on inequality between the two types of workers. We could consider an "overall" inequality framework that includes capitalists' profit income in order to have a better picture of the distributional conflict.

Chapter 2

The Impact of Fiscal Austerity Measures on Inequality: A Study of OECD countries

2.1 *Introduction*

The global financial crisis that erupted in 2007-2008 has spurred research on the consequences of austerity measures on aggregate demand (Alesina and Ardagna, 2010; Blanchard and Leigh, 2014; Guajardo et al., 2014; Heimberger, 2017; Jordà and Taylor, 2016, Gechert et al. 2016; Gechert et al. 2019; Alesina et al., 2012; Alesina et al., 2015; Alesina et al., 2019; Carrière-Swallow et al., 2021; Holland and Portes, 2012; Veld, 2013; Yang et al., 2015). Following the crises, several advanced economies implemented fiscal austerity measures in an attempt to address rising government debt levels. Contrary to the hypothesis of an expansionary fiscal adjustment (Alesina and Ardagna, 2010), these countries experienced reduced economic growth rates that contributed to a slow and hesitant economic recovery (Fatás and Summers, 2018).

The econometric literature assessing the impact of fiscal austerity measures on income inequality has received comparatively less attention, as pointed out by Heimberger (2020). Still, as illustrated by Table 2.2, numerous studies on the topic exist for OECD countries (Agnello and Sousa, 2012; Ball et al., 2013; Woo et al., 2013; Schaltegger and Weder, 2014; Agnello and Sousa, 2014; Furceri et al., 2016; Agnello et al., 2016; Schneider et al., 2017; Castro, 2018; Klein and Winkler, 2019; Ciminelli et al., 2019; Heimberger, 2020) and for emerging economies (Cardoso and Carvalho, 2023; Jalles, 2017; Furceri et al., 2018a).

While Castro (2018) focuses only on market income inequality (pre-fiscal income), Agnello and Sousa (2012), Agnello and Sousa (2014), and Woo et al. (2013) argue that the primary impact of austerity measures occurs via the tax and transfer system. As commented by Woo et al. (2013): "*Following Agnello and Sousa (2011), we impose cross-equations restrictions on the coefficients of fiscal consolidation measures in the market income inequality equation (i.e., these coefficients are assumed to be zero) under the common assumption that the fiscal austerity measures (discretionary changes in taxes and spending) only affect disposable income (i.e., income after taxes and transfers)* [...]" (Woo et al., 2013, p.9).

Subsequently, the literature largely focused on the impacts of austerity measures on disposable income (post-fiscal, net of taxes and transfers) inequality (Agnello and Sousa, 2012; Ball et al., 2013; Woo et al., 2013; Schaltegger and Weder, 2014; Agnello and Sousa, 2014; Furceri et al., 2016; Furceri et al., 2018a; Klein and Winkler, 2019; Ciminelli et al., 2019; Heimberger, 2020; Cardoso and Carvalho 2023). As indicated in Table 2.2, the literature consistently reports a significant rise in income inequality in the short and medium term following the implementation of austerity measures.

Some authors, however, also estimate the effects on market income inequality. Ciminelli et al. (2019), with a focus on tax-based measures, find that the responses of disposable income and market income are similar. This leads to the conclusion that "*then we could hypothesize that changes in disposable income inequality are mostly driven by changes in the market income distribution*" (Ciminelli et al., 2019, p.114), thus challenging the assumption made by Agnello and Sousa (2014) and Woo et al. (2013). Klein and Winkler (2019) and Heimberger (2020) estimate both impacts and conclude that they yield similar results, with the impact on market income inequality being more pronounced (refer to Table 2.5).

As the literature focuses on the "final", or overall, impact of austerity on income inequality, by investigating the impact on disposable (post-fiscal) income inequality, some explanations for the increase in inequality include: i) reductions in social transfers may disproportionately affect households in the lower income strata; ii) increases in taxes, especially if they rely on regressive measures, tend to affect the lower end of the income spectrum more (Rawdanowicz et al., 2013; Heimberger, 2020; Cardoso and Carvalho, 2023; Woo et al., 2013; Furceri et al., 2018a; Jalles, 2017; Agnello and Sousa, 2014). We refer to this mechanism as the "redistributive channel" (see Figure 2.1).

In the literature about the decomposition of the Gini index, Lerman and Yitzhaki (1985) and Francese and Mulas-Granados (2015) suggest three more channels through which austerity impacts income inequality, besides the redistributive one (which affects disposable income inequality, representing the overall/final effect): wage inequality, functional distribution inequality, and the non-labor income inequality channel. These channels affect market income inequality.

The literature about austerity's effects on inequality has, to some extent, examined some of the channels pointed out by the Gini decomposition literature individually. For instance, Klein and Winkler (2019) focus on the redistributive channel by assessing the impact of austerity measures on the "redistributive measure", which is the disparity between market and disposable income inequalities. They found that the redistribution measure increases in the short term following fiscal adjustments due to the influence of automatic stabilizers (Klein and Winkler, 2019) and the social safety net (Heimberger, 2020). These results suggest disposable income inequality increases less than market income inequality in response to fiscal consolidations. Certain studies indirectly investigate the redistributive channel through separate estimations, reporting that the impact of austerity is more pronounced on market income inequality compared to disposable income inequality (Furceri et al., 2016; Heimberger, 2020). However, it is worth noting that the difference in these estimations is relatively small (Table 2.5).

The second channel indicated by the Gini decomposition analysis is the "wage inequality channel", which impacts market income inequality. Nevertheless, it is important to note that the econometric literature surveyed in Table 2.2 has not yet delved into the wage inequality channel. The inequality among workers, on the other hand, has been suggested as a possible channel through which austerity measures affect income inequality. Klein and Winkler (2019) call this channel the "earnings inequality channel". The rise in income inequality caused by austerity programs is explained by heterogeneous dynamics of labor earnings of high- and low-income households since earnings at the bottom exhibit greater responsiveness to economic downturns. Some studies in the econometric literature have underscored this channel, including works by Klein and Winkler (2019), Cardoso and Carvalho (2023), and Heimberger (2020).

The rationale behind this can be traced to the body of literature that investigates the consequences of austerity on aggregate demand. Fiscal austerity, as evidenced by numerous studies (Jordà and Taylor, 2016; Heimberger, 2017; Guajardo et al., 2014; Gechert et al., 2016; Gechert et al., 2019; Blanchard and Leigh, 2014; Carrière-Swallow et al., 2021; Carrière-Swallow et al., 2018), exerts contractionary effects on demand and GDP while positively impacting unemployment (Woo et al., 2013; Ball at al., 2013). Some studies have identified earnings inequality as countercyclical (Krueger et al., 2010; Maestri and Roventini, 2012; Heathcote et al., 2010; Heathcote et al., 2020; Bonhomme and Hospido, 2016; Alessandrini et al., 2016; Bowlus et al., 2022; Guvenen et al., 2022; Bernstein and Bentele, 2019), implying that employment at the lower end of the income spectrum is more susceptible to economic fluctuations (Heathcote et al., 2020; Hoynes, 1999; Hoynes et al., 2012; Hoover et al., 2009; Mueller, 2017; Forsythe, 2022; Hershbein and Kahn, 2018). In light of this, it is reasonable to anticipate that austerity measures would result in an increase in earnings inequality.

The earnings inequality channel takes into account not only wage disparities but also employment, considering that earnings result from both wages and the hours worked. We introduce this as an additional channel to be investigated, which we will refer to as the "employment/earnings channel", combining the wage inequality with the employment channels. Some studies have already explored the employment channel in isolation by estimating the negative (positive) effects of austerity measures on employment (unemployment) (Klein and Winkler, 2019; Ball et al., 2013; Woo et al., 2013; Castro, 2018). These authors suggest that the employment channel is pertinent in influencing income inequality. However, there is currently no study that estimates the impact of austerity measures on earnings inequality, or on wage inequality.

The third channel suggested by the Gini decomposition is the "income composition channel" - as termed by Klein and Winkler (2019) (we call "functional distribution channel"). According to this channel, households at the lower end of the income distribution primarily rely on labor income, while wealthier households derive a larger share of their income from capital. As austerity measures negatively impact GDP (Jordà and Taylor, 2016; Heimberger, 2017; Guajardo et al., 2014; Gechert et al., 2016; Gechert et al., 2019; Blanchard and Leigh, 2014; Carrière-Swallow et al., 2021; Carrière-Swallow et al., 2018), the recessions induced by restrictive fiscal policies tend to weaken workers' bargaining power, leading to a reduction in their income share. This idea is well-illustrated by the Goodwin-inspired Kaleckian empirical literature, which emphasizes the importance of expanding aggregate demand to strengthen workers' bargaining power and increase the labor share in GDP[1].

[1] See, for example: Taylor (2004); Barbosa Filho and Taylor (2006); Diallo et al. (2011); Kiefer and Rada (2015); Proaño et al. (2006); Carvalho and Rezai (2015); Barrales-Ruiz and Von Arnim (2021); Basu

The functional distribution channel was analyzed by Klein and Winkler (2019), Ball et al. (2013), and Furceri et al. (2016). These studies typically estimate that austerity measures diminished the portion of income allocated to workers, aligning with the findings in the Goodwin-inspired Kaleckian empirical literature (Barbosa Filho and Taylor, 2006; Kiefer and Rada, 2015).

Finally, the fourth channel implied by the Gini decomposition is the non-labor income inequality channel. Albeit we do not estimate the effect on this channel directly, we can infer its sign by using the Gini decomposition equation (even though we cannot investigate its magnitude).

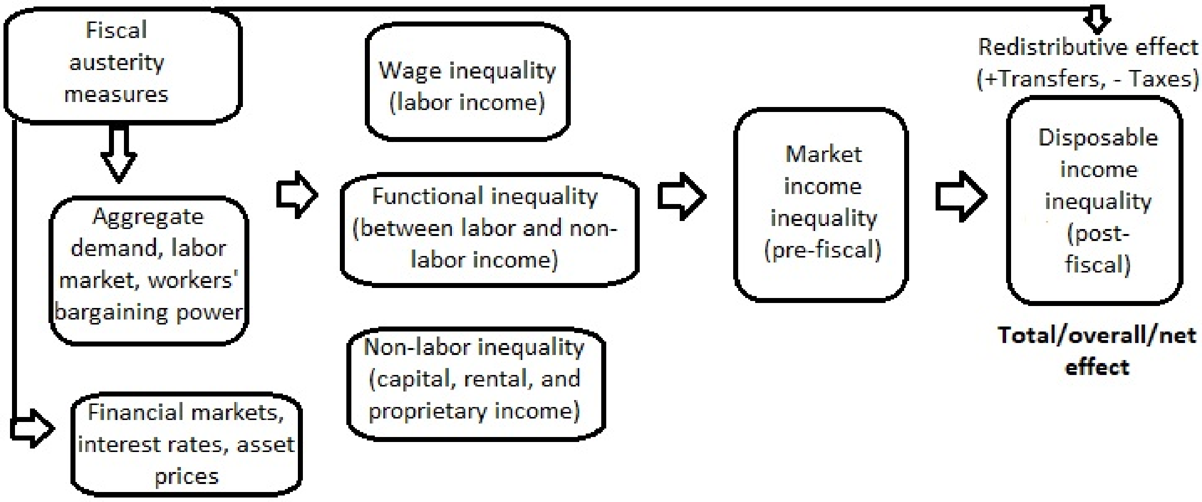

Figure 2.1: Channels through which austerity measures affect inequality
Source: Author's elaboration.

Figure 2.1 illustrates how the individual channels interact to produce the overall or net distributional impact (the effect on the disposable income inequality). Although not the central focus of this study, monetary policy is included in Figure 2.1 (financial markets, interest rates, asset prices) due to the substantial research on its influence on inequality. The empirical literature on this subject typically concludes that a contractionary monetary shock exacerbates inequality (Furceri et al., 2018b; Guerello, 2018; Coibion et al., 2012)[2].

This paper aims to contribute to the macroeconometric literature concerning the link

and Gautham (2019); Barrales-Ruiz et al. (2021); Rolim (2019); Skott and Zipperer (2010); Mendieta-Muñoz et al. (2022); Vechsuruck (2017); Basu et al. (2013); Nikiforos and Foley (2012); Tavani et al. (2011); Marques and Lima (2022).

[2] For a recent survey, see Kappes (2023).

between austerity measures and income inequality that applies the "narrative approach" (Devries et al., 2011) to provide additional evidence on the effects of fiscal austerity in OECD countries. We have three main contributions. First, our study is the first to investigate the channels through which austerity measures increase income inequality in order to assess the individual role of each channel using the Gini index decomposition (Lerman and Yitzhaki, 1985; Francese and Mulas-Granados, 2015). We address the gap in the literature related to the assumption in studies that there is only the overall effect of austerity on income inequality - that is, the effect on disposable income inequality (Woo et al., 2013; Agnelo and Sousa, 2012; Agnelo and Sousa, 2014).

On the contrary, our hypothesis is that changes in disposable income inequality are also driven by changes in market income inequality, beyond the impact of austerity on inequality via taxes and transfers. Using this approach, we are able to infer the relative importance of each channel in the decomposition of the Gini index in the short and medium runs. Although the literature has examined some of these channels individually, they were analyzed in isolation[3].

Secondly, our study is pioneering in this econometric literature by incorporating wage inequality, referred to as the "wage inequality channel". Third, our research is the first to estimate the effects of austerity measures on earnings inequality. Prior studies exploring this channel solely focused on employment (as done by Klein and Winkler, 2019; Ball et al., 2013; Woo et al., 2013; Castro, 2018).

In summary, our study aims to fill these gaps by examining the dynamic effects of fiscal consolidation episodes while considering the three channels highlighted in the empirical literature and implied by the Gini decomposition analysis: i) The role of the transfer and tax system, known as the redistributive channel, which is represented by the disparity between market income inequality (a pre-fiscal measure) and disposable income inequality (a measure that considers income after taxes and with transfers added, post-fiscal); ii) Inequality among workers, or wage inequality (a pre-fiscal measure); iii) Inequality between labor and capital, referred to as functional inequality (a pre-fiscal measure). Furthermore, we consider an additional mechanism: the employment channel, assessed through gross

[3] For instance, as previously mentioned, the redistributive channel has been analyzed by Klein and Winkler (2019) and Ciminelli et al. (2019), while the functional distribution channel has been examined by Klein and Winkler (2019), Ball et al. (2013), and Furceri et al. (2016).

earnings inequality (a pre-fiscal measure).

Regarding the redistributive channel, in the short term (first three years), we found that austerity measures significantly impact market income inequality more than disposable income inequality. This highlights the importance of automatic stabilizers and the social safety net in mitigating the increase in disposable income inequality. Also in the short run, both the wage and functional channels are significant in explaining the impact on austerity on market inequality. Our baseline findings indicate that a fiscal consolidation episode increases the wage inequality index by 1.385% and decreases the labor share in income by 0.816% three years after the episode.

Moving to the medium term, the responses of disposable and market income inequalities become similar, indicating that the "redistributive effect" is not statistically relevant. This suggests that changes in disposable income inequality are primarily influenced by shifts in market income inequality. For instance, automatic stabilizers and the social safety net mitigate the impact of austerity on disposable income inequality, while the fiscal consolidation shock tends to exacerbate this impact. As both disposable and market income inequalities demonstrate similar impacts, these opposing effects counterbalance each other within the redistributive mechanism, leading to disposable income inequality being predominantly shaped by shifts in market income inequality. In the medium run, the functional inequality channel also loses statistical significance at 10%, emphasizing the dominance of wage inequality as the primary driver of inequality changes, significant at 1%.

The findings presented in this paper also suggest that market income inequality responds less to austerity measures than the wage inequality and functional distribution inequality channels combined. Using a Gini index decomposition approach that decomposes the change in market income inequality into changes in its components (functional inequality, wage inequality, and non-labor income inequality), we can infer that the effect of austerity on non-labor inequality might be equalizing.

The employment channel implies that earnings inequality is positively influenced by austerity measures. However, this impact on earnings inequality is noteworthy only when examining the lower end of the income distribution. Specifically, the earnings inequality, as measured by the percentile ratio 50/10, increases by 0.73% two years after the consolidation shock. When considering the percentile ratio 90/10, it rises by 0.874% after eight years, indicating a more lasting impact when assessing inequality between the top and bottom segments of the income distribution.

Finally, when disaggregating fiscal shocks into spending- and tax-based categories, our analysis attributes our findings to the effect of spending-based episodes. These results underscore the predominant influence exerted by spending-based fiscal measures on our observed outcomes. The remainder of this paper is organized as follows: Section 2.2 reviews the econometric literature on the macroeconomic effects of fiscal consolidation measures on inequality. In Section 2.3, we elaborate on the econometric methodology and the data employed in this study. Section 2.4 presents the baseline empirical results, as well as a discussion about the channels. Section 2.5 introduces various robustness checks. In Section 2.6, we draw our conclusions.

2.2 Related Literature

Especially since the global financial crisis erupted in 2007-2008, there has been a considerable increase in the empirical literature on the macroeconomic effects of fiscal consolidation measures. The fiscal policy aimed at reducing the budget deficit from 2010 onward - especially in Europe - has led to a growing empirical econometric literature that investigates the effect of fiscal consolidation episodes on GDP growth and employment (Alesina and Ardagna, 2010; Blanchard and Leigh, 2014; Guajardo et al., 2014; Heimberger, 2017; Jordà and Taylor, 2016, Gechert et al. 2016; Gechert et al. 2019; Alesina et al., 2012; Alesina et al., 2015; Carrière-Swallow et al., 2021; Holland and Portes, 2012; Veld, 2013; Yang et al., 2015).

In addition to the studies focusing on the link between fiscal adjustments and economic growth, there has been a growing econometric literature concerning the distributional effects of austerity in recent years. Despite this growth, as Heimberger (2020) noted, this literature has comparatively fewer research efforts. Table 2.1 provides an overview of the relevant econometric literature concerning the connection between fiscal consolidation episodes and income inequality.

To identify discretionary changes in fiscal policy, this literature has primarily employed two main approaches. The first approach is the CAPB (Cyclically-Adjusted Primary Balance) procedure, often referred to as the “conventional approach”. The second approach is the narrative method, primarily relying on the dataset compiled by Devries et al. (2011)

Study	**Country**	**Period**	**Fiscal consolidation data**	**Econometric method**
Agnello and Sousa (2012)	18 OECD countries	1970-2010	CAPB	Panel static method (SUR).
Ball et al. (2013)	17 OECD countries	1978-2009	Devries et al. (2011)	Panel dynamic method (IRFs based on Jordà, 2005).
Woo et al. (2013)	17 OECD countries	1978-2009	Devries et al. (2011)	Panel static methods (FEE and SUR), and IRFs.
Schaltegger and Weder (2014)	17 OECD countries	1978-2009	Devries et al. (2011)	Panel static approach (FEE).
Agnello and Sousa (2014)	18 OECD countries	1978-2009	Devries et al. (2011)	Panel static approach (SUR).
Furceri et al. (2016)	17 OECD countries	1978-2009	Devries et al. (2011)	Panel dynamic approach (IRFs based on Jordà, 2005).
Agnello et al. (2016)	13 European countries	1980-2008	Devries et al. (2011)	Panel static method (FEE) and IRFs.
Jalles (2017)	28 emerging economies	1980-2014	CAPB	Panel data static and dynamic methods (SUR and IRFs based on Jordà, 2005).
Schneider et al. (2017)	12 European countries	2006-2013	CAPB	Panel data static method (FEE).
Furceri et al. (2018a)	103 emerging economies	1990-2015	Forecast errors method	Panel dynamic approach (IRFs based on Jordà, 2005).
Castro (2018)	15 European countries	1990-2012	Devries et al. (2011) and Kataryniuk and Vallés (2015)	Panel dynamic approach (Least Squares dummy variable estimator).
Klein and Winkler (2019)	17 OECD countries	1980-2011	Devries et al. (2011)	Panel dynamic approach (IRFs based on Jordà, 2005).

Table 2.1 - Econometric literature on the link between fiscal austerity and income inequality - Fiscal consolidation data and econometric methods

Study	**Country**	**Period**	**Fiscal consolidation data**	**Econometric method**
Ciminelli et al. (2019)	16 OECD countries	1978-2012	Devries et al. (2011) and Alesina et al. (2015)	Panel dynamic approach (PVAR).
Heimberger (2020)	17 OECD countries	1978-2013	Devries et al. (2011) and Alesina et al. (2015)	Panel dynamic approach (IRFs based on Jordà, 2005).
Cardoso and Carvalho (2023)	9 South American countries	1991-2017	David and Leigh (2018)	Panel dynamic approach (IRFs based on Jordà, 2005).

Table 2.1 - Econometric literature on the link between fiscal austerity and income inequality - Fiscal consolidation data and econometric methods (continued)

Source: Author's elaboration. IRFs: Impulse Response Functions. CAPB: Cyclically- Adjusted Primary Balance. FEE: Fixed Effects Estimator. SUR: Seemingly Unrelated Regressions. PVAR: Panel Vector Autoregressive.

(see column "fiscal consolidation data" in Table 2.1). As Cardoso and Carvalho (2023) contend, in the 1990s and early 2000s, the empirical literature addressing the identification of fiscal episodes relied on the CAPB approach. This method involves accounting for the effects of the business cycle on government revenues and expenditures (Giavazzi and Pagano, 1996; Alesina and Ardagna, 1998; Afonso, 2010; Alesina and Ardagna, 2010; Agnello and Sousa, 2012; Jalles, 2017; Schneider et al., 2017).

However, since the 2010s, certain limitations associated with this statistical concept have been brought to light (Devries et al., 2011; Ball et al., 2013; Agnello and Sousa, 2012; Heimberger, 2020; Agnello and Sousa, 2014; David and Leigh, 2018; Cardoso and Carvalho, 2023). Devries et al. (2011) and David and Leigh (2018) point out that cyclical adjustment methods suffer from endogeneity problems, which means that the identified fiscal shocks may be correlated with the economic cycle and may not accurately represent discretionary changes in fiscal policy[4]. Furthermore, the authors argue that even if the

[4] For example, according to Devries et al. (2011) (p.3): "*In particular, cyclical adjustment typically fails to remove the impact of sharp swings in economic activity and asset prices from fiscal data, resulting in changes in the CAPB that are correlated with economic activity but not necessarily linked to policy actions. For example, a boom in the stock market improves the CAPB by increasing capital gains and*

Study	Effect of fiscal consolidation (of 1% of GDP or a dummy for episodes) on the Gini index	Effect of a spending-based adjustment on the Gini index	Effect of a tax-based adjustment on the Gini index
Agnello and Sousa (2012)	Decrease of 0.011	-	-
Ball et al. (2013)	Increase: 0.1 ppt. (0.4%) (after 1 year). / 0.9 ppt. (3.4%) (after 8 years).	Increase: about 0.9 ppt. (after 8 years)	Increase: about 0.9 ppt. (after 8 years).
Woo et al. (2013)	Increase: 0.4% (0.13 ppt.) (after 2 years) / 1.3% (0.4 ppt.) (after 5 years).	Increase: 1.5-2%.	No statistically significant effect.
Schaltegger and Weder (2014)	Increase: 0.4 ppt. (following year)	Increase: 0.6 ppt. (following year)	Increase: 0.28 ppt. (following year)
Agnello et al. (2016) (for regional inequality)	Increase: 0.1 ppt. (after 1 year) and 0.3 ppt. (after 5 years)	Increase: 0.2 ppt. (after 1 year) and 0.5 ppt. (after 5 years)	No statistically significant effect.
Agnello and Sousa (2014)	Increase: 0.026	Increase: 0.035	No statistically significant effect.
Furceri et al. (2016)	Increase: 0.2% (after 1 year) and 0.9% (after 8 years).	Increase: 0.24% (after 1 year) and 1.05% (after 8 years).	Increase: 0.09% (after 1 year) and 0.13% (after 8 years).
Jalles (2017)	Increase: 0.65 ppt. (after 1 year) and 0.8 ppt. (after 3 years).	Increase: 2.3 ppt. (after 1 year) and 3.2 ppt. (after 4 years).	Decrease: 0.8 ppt. (after 1 year) and 2.6 ppt. (after 4 years).
Schneider et al. (2017)	Increase: 0.36 ppt.	-	-
Furceri et al. (2018a)	-	Increase: 1 ppt. (after 5 years).	-
Castro (2018)	Increase: 0.0996.	Increase: 0.3022.	No statistically significant effect.

Table 2.2 - Econometric literature on the link between fiscal austerity and income inequality - Main results (disposable income)

Study	**Effect of fiscal consolidation (of 1% of GDP or a dummy for episodes) on the Gini index**	**Effect of a spending-based adjustment on the Gini index**	**Effect of a tax-based adjustment on the Gini index**
Klein and Winkler (2019)	Increase: 0.42 ppt. (after 4 years).	Increase: 2.9 ppt. (after 4 years) (high private debt regime).	Increase: 1.4 ppt. (after 4 years) (high private debt regime).
Ciminelli et al. (2019)	-	-	Decrease of 0.3 ppt. (after 2 years)
Heimberger (2020)	Increase: 0.35 ppt. (1.2%) (after 3 years) and 0.6 ppt. (2%) (after 5 years).	Increase: 0.5 ppt. (after 3 years) and 0.4 ppt. (after 8 years).	Increase: 0.2 ppt. (after 3 years) and 0.3 ppt. (after 8 years).
Cardoso and Carvalho (2023)	Increase: 0.493% (0.21 ppt.) (after 8 years). No statistically significant effect in the short run.	Increase: 0.365% (0.155 ppt.) (after 1 year) and 2.48% (1.056 ppt.) (after 8 years).	No statistically significant effect.

Table 2.2 - Econometric literature on the link between fiscal austerity and income inequality - Main results (disposable income) (continued)

Source: Author's elaboration.

Study	Additional results
Agnello and Sousa (2014)	-Spending-based episodes are more detrimental to disposable income inequality, especially if they are large; -The effects of austerity on income inequality are short-lived -Large tax-based packages contribute to reducing inequality - The effects of austerity on income inequality are amplified in the aftermath of the banking crisis, during relatively low economic growth periods, and combined with inflation.
Agnello et al. (2016)	-Large fiscal consolidations increase regional inequality (only spending-based ones) -This effect is higher during periods of crisis. -The unemployment and inflation rates have a negative impact on regional inequality, while the trade openness measure affects regional inequality positively.
Ball et al. (2013)	-Spending-based and tax-based episodes increase disposable income inequality, and the magnitude is similar in the medium run; - In the short run, spending-based episodes are more detrimental to income inequality; -Fiscal consolidations have a negative impact on the labor share (only spending-based ones); -Fiscal austerity measures typically lead to a significant increase in the long-term unemployment, while they do not affect the short-term unemployment.
Castro (2018)	-Austerity episodes have a significant impact on economic growth in the short run, especially spending-based ones; -The growth rate of unemployment is significantly affected by fiscal consolidations, especially spending-driven episodes; -Spending-based consolidation episodes increase income inequality; -Income inequality decreases significantly when government spending on social protection rises.
Ciminelli et al. (2019)	-This study focuses only on tax-based measures; -Tax-based consolidation programs have a negative effect on output, on disposable income inequality, and no effect on the unemployment rate; -Indirect taxes reduce income inequality and GDP by more than direct taxes.
Furceri et al. (2016)	-Spending-based measures have a higher effect on disposable income inequality than tax-based ones; -Fiscal consolidations have a negative impact on the labor share, especially spending-based programs.

Table 2.3 - Econometric literature on the link between austerity and income inequality (for OECD countries) - Additional results

Study	**Additional results**
Woo et al. (2013)	-Spending-based consolidations tend to exacerbate disposable inequality significantly in comparison to tax-based consolidations; -This effect is even more pronounced in the case of large-sized consolidations; -Fiscal austerity measures result in a substantial rise in unemployment; -Progressive taxation and social benefits are consistently associated with lower inequality for disposable income.
Heimberger (2020)	-Large-sized, long-lasting and spending-based episodes have more pronounced effects on disposable income inequality; -Programs initiated following financial crises and during periods of low economic growth tend to have a more adverse impact on disposable income inequality.
Schaltegger and Weder (2014)	Austerity measures by coalition governments significantly reduce income inequality when compared with single party and minority governments.
Klein and Winkler (2019)	-During periods of high private debt, fiscal consolidations lead to a strong and long-lasting rise in (disposable and market) income inequality; -After fiscal consolidations, the capital income share increases, the employment falls, the redistribution measure rises, and the real interest rate increases; The responses for all these results are stronger in high private debt states.

Table 2.3 - Econometric literature on the link between austerity and income inequality (for OECD countries) - Additional results (continued)

Source: Author's elaboration.

Study / Country/ Time	**Methodology**	**Main results**
Blank and Blinder (1986). United States (1948 - 1983)	Linear regression.	The unemployment rate has a significant regressive effect.
Hoynes (1999). United States (1975 - 1997)	Linear regression.	A less qualified labor force is more vulnerable to economic cycle movements.
Parker (1998). United States (1950 - 1990)	Johansen estimator.	The unemployment rate has regressive and significant effects. Inequality is anti-cyclical.
Dimelis and Livada (1999). UK, Italy, Greece, US	Correlation analysis.	In general, inequality is anti-cyclical.
Hoover et al (2009). United States (1948-2003).	Vector Error Correction Model (asymmetric): IRFs	Inequality is anti-cyclical. It rises during recessions for a longer time than it decreases during booms.
Maestri and Roventini (2012). OCDE countries.	Cross-correlation analysis.	Inequality is generally anti-cyclical, and the unemployment rate has regressive effects.
Atems and Jones (2015). United States (1930-2005).	Panel Vector Autoregressive: IRFs	Inequality is anti-cyclical (negative response to positive shocks in per capita income).
Morin (2019). United States (1967-2014).	Cross-correlation analysis.	Observed wage inequality is anti-cyclical.
Camacho and Palmieri (2019). 43 countries (1960-2016).	Local Projections: IRFs	Inequality is pro-cyclical (in most countries, mainly in emerging nations). However, many results are not significant.
Geiger et al (2020). United States (until 2008).	Vector autoregressive with shocks restrictions: IRFs	Contractionary monetary policy shocks increase expenditure and consumption inequality, whereas income and earnings inequality are less affected. Adverse aggregate supply (inflation) and demand (unemployment mainly) shocks increase income and earnings inequality but reduce expenditure and consumption inequality.
Bishop et al (2020). United States (1950 - 2010)	Linear regression, time series analysis.	The unemployment rate has a significant regressive effect (inequality is anti-cyclical). Transfers are strongly equalizing, budget deficits also have equalizing effects, and openness to trade is moderately disequalizing.

Table 2.4 - Econometric literature on the link between the economic cycle and income inequality

Source: Author's elaboration. IRFs: Impulse-Response functions.

Study	Effect of fiscal consolidation on the Gini index (disposable income)	Effect of fiscal consolidation on the Gini index (gross income)
Klein and Winkler (2019)	Increase: 0.42 ppt. (after 4 years)	Increase: 0.65 ppt. (after 4 years)
Heimberger (2020)	Increase: 0.35 ppt. (after 3 years); 0.6 ppt. (after 5 years)	Increase: 0.6 ppt. (after 3 years); 0.9 ppt. (after 7 years)

Table 2.5 - Econometric literature on the link between fiscal austerity and income inequality- Main results (disposable and gross income)

Source: Author's elaboration.

CAPB accurately reflects discretionary changes in fiscal policy, such changes may be driven by responses to cyclical fluctuations: "*For example, governments may cut government spending in an overheating economy, implying a positive correlation between fiscal policy tightening and rapid growth*" (Devries et al., 2011, p.3)[5]. Moreover, as Heimberger (2020) points out, there are problems related to the fact that the methodology estimates the fiscal balance that would be obtained if the economy operated at non-observable potential GDP (Perotti, 2013).

Agnello and Sousa (2014) and Agnello et al. (2016) also draw attention to other issues associated with the CAPB approach. These include treating the elasticities of budgetary components with respect to output as constant, the potential arbitrariness in selecting the statistical smoothing technique, and the response of social spending (e.g., unemployment benefits) to the business cycle.

The so-called "narrative approach" represents a second major strategy in the econometric literature to cope with endogeneity caveats (Ramey and Shapiro, 1998; Ramey, 2011; Romer and Romer, 2010). This approach draws inspiration from the seminal paper by Romer and Romer (2010), which uses governments' budget documents to identify the

cyclically-adjusted tax revenues and is also likely to raise domestic demand". Ball et al. (2013) (p.5) add: "*For example, in the case of Ireland in 2009, the collapse in stock and housing prices induced a sharp reduction in CAPB despite the implementation of tax hikes and spending cuts exceeding 4.5 percent of GDP*".

[5] Ball et al. (2013, p.5) provide an example: "*[...] in Finland in 2000, there was an asset price boom and rapid growth, and the government decided to cut spending to reduce the risk of economic overheating. If a fiscal tightening is a response to domestic demand pressures, it is not valid for estimating the short-term effects of fiscal policy on economic activity, even if it is associated with a sharp rise in the CAPB*".

size, timing, and principal motivation for all significant postwar tax policy actions in the United States. Through this method, they identify measures motivated primarily by deficit reduction and construct an "exogenous" measure of fiscal policy, which is expected to reflect discretionary changes unaffected by economic cycle fluctuations.

The narrative approach, however, can also have some drawbacks. According to Jordà and Taylor (2016), this methodology largely relies on subjective judgment and may not eliminate endogeneity problems entirely. Ramey (2016, p.11) points out that: "*A cautionary note on the potential of narrative series to identify exogenous shocks is in order [...]. A series on fiscal consolidations, quantified by narrative evidence on the expected size of these consolidations, is not necessarily exogenous. If the series includes fiscal consolidations adopted in response to bad news about the future growth of the economy, the series cannot be used to establish a causal effect of the fiscal consolidation on future output.*"

Despite potential pitfalls related to the narrative approach, this method to identify fiscal shocks has been extensively applied in the most recent macro-econometric literature on the link between fiscal policy and income distribution (see Table 2.1) to tackle the endogeneity issues described above.

Following the Romer and Romer (2010) strategy, Devries et al. (2011) constructed a new dataset of fiscal consolidation episodes for 17 OECD economies during 1978-2009, examining contemporaneous policy documents[6] to identify the motivation and budgetary impact of fiscal policy changes. As can be seen in Table 2.1, most studies in the econometric literature use the Devries et al. (2011) database to estimate the effects of discretionary fiscal policy shocks on income inequality (Ball et al., 2013; Woo et al., 2013; Schaltegger and Weder, 2014; Agnello and Sousa, 2014; Furceri et al., 2016; Agnello et al., 2016; Klein and Winkler, 2019; Castro, 2018; Ciminelli et al., 2019; Heimberger, 2020).

Albeit the database built by Devries et al. (2011) has become popular in the recent econometric literature, our study utilizes the narrative dataset for fiscal shocks developed by Alesina et al. (2019), which comes with two notable advantages: i) It spans a more extended time frame compared to the dataset used by most studies, specifically Devries et al. (2011) (1978- 2009), covering the period from 1978 to 2014; ii) This dataset offers a decomposition of fiscal shocks into components of taxes and expenditures, providing

[6] Such as Budgets, Budget Speeches, central bank reports, Convergence and Stability Programs submitted by the authorities to the European Commission, and IMF and OECD reports.

an intriguing avenue for extending our study, as we can analyze the channels by also disaggregating fiscal shocks. In addition to the Alesina et al. (2019) dataset, we also employ the datasets by Devries et al. (2011), Alesina et al. (2015), and Gupta et al. (2017) as robustness tests.

Table 2.2 provides a comprehensive summary of the main results from the econometric literature investigating the relationship between fiscal consolidation measures and income inequality. With the exception of Agnello and Sousa (2012) (who utilized fiscal consolidation data based on the CAPB approach), the other fourteen studies reveal that fiscal consolidations typically result in an increase in disposable income (post-fiscal) inequality, as measured by the Gini index. This impact is more pronounced in the medium run, manifesting after a few years. The literature suggests that spending-based fiscal consolidations have more relevant distributive consequences than tax-based ones (Woo et al., 2013; Schaltegger and Weder, 2014; Agnello and Sousa, 2014; Furceri et al., 2016; Agnello et al., 2016; Jalles, 2017; Klein and Winkler, 2019; Heimberger, 2020; Castro, 2018; Cardoso and Carvalho, 2023). The studies presented in Table 2.2 also have specific contributions. Table 2.3 shows a summary of the main conclusions of these studies.

Table 2.4 provides a comprehensive overview of the literature concerning the relationship between economic cycles and inequality. Several studies reveal that inequality tends to be countercyclical and increases with rising unemployment rates: the segments at the bottom of the distributive pyramid suffer more from recessions since their incomes are more subject to changes in the unemployment rate (Kuznets, 1953; Hoynes, 1999; Parker, 1998; Blank and Blinder, 1986; Blinder and Esaki, 1978; Dimelis and Livada, 1999; Bishop et al., 2020; Maestri and Roventini, 2012; Hoover et al., 2009; Geiger et al., 2020; Atems and Jones, 2015; Morin, 2019; Bernstein and Bentele, 2019).

Table 2.2 focuses on the impact on the Gini coefficient concerning disposable income (after taxes and transfers, post-fiscal) since the literature predominantly estimates the total/overall effect, as discussed in Section 2.1. Table 2.5 shows some additional results about the impact of fiscal consolidations on market/gross income (before taxes and transfers, or pre-fiscal). The studies find that the effects of fiscal austerity on market income inequality are more pronounced than the effects on the distribution of disposable income (which considers the social safety net) (Heimberger, 2020; Klein and Winkler, 2019).

The results presented in Table 2.2, along with the findings from the literature summarized in Table 2.4, provide evidence for a channel through which fiscal austerity increases income inequality, as discussed in Section 2.1: a fiscal consolidation episode depresses aggregate demand, decreases economic growth, and pushes up unemployment (Blanchard and Leigh, 2014; Heimberger, 2017; Jordà and Taylor, 2016; Guajardo et al., 2014; Gechert et al., 2016). The rise in the unemployment rate mainly affects the income of the most vulnerable individuals (Blank and Blinder, 1986; Clark and Summers, 1981; Hoynes, 1999; Hoynes et al., 2012; Parker, 1998; Morin, 2019; Bishop et al., 2020; Hoover et al., 2009), which might make the market income distribution more unequal. As shown in Table 2.5, few studies (Klein and Winkler, 2019; Heimberger, 2020) have estimated the impacts considering the market income inequality, while the literature tends to focus on the effects of austerity on the post-fiscal income inequality (disposable income).

2.3 *Data and Methodology*

2.3.1 *Data*

As outlined in Section 2.1, this paper aims to assess the influence of austerity on inequality by examining the various channels through which it operates. To comprehensively evaluate this impact, our methodology involves seven key exercises, as we will explain in Section 2.3.2. The first exercise estimates the effect of fiscal consolidations on disposable income inequality, encompassing post-fiscal or post-tax and transfer income. The second exercise, on the other hand, excludes the influence of the tax and transfer system, allowing us to estimate the effect of austerity measures on market income inequality (pre-fiscal income).

To conduct our analysis, we utilized Gini indices for disposable income and market income data sourced from the Standardized World Income Inequality Database (SWIID) (Solt, 2020), version 9.5, as illustrated in Figure 2.2. This database, widely referenced in related literature investigating the connection between inequality and fiscal policy (Agnello and Sousa, 2012; Ball et al., 2013; Woo et al., 2013; Agnello and Sousa, 2014; Schaltegger and Weder, 2014; Furceri et al., 2016; Furceri et al., 2018a; Klein and Winkler, 2019; Heimberger, 2020; Cardoso and Carvalho, 2023), provides harmonized data with a high level of comparability across countries (Heimberger, 2020).

The literature argues that the Solt (2020) database represents the only systematic effort

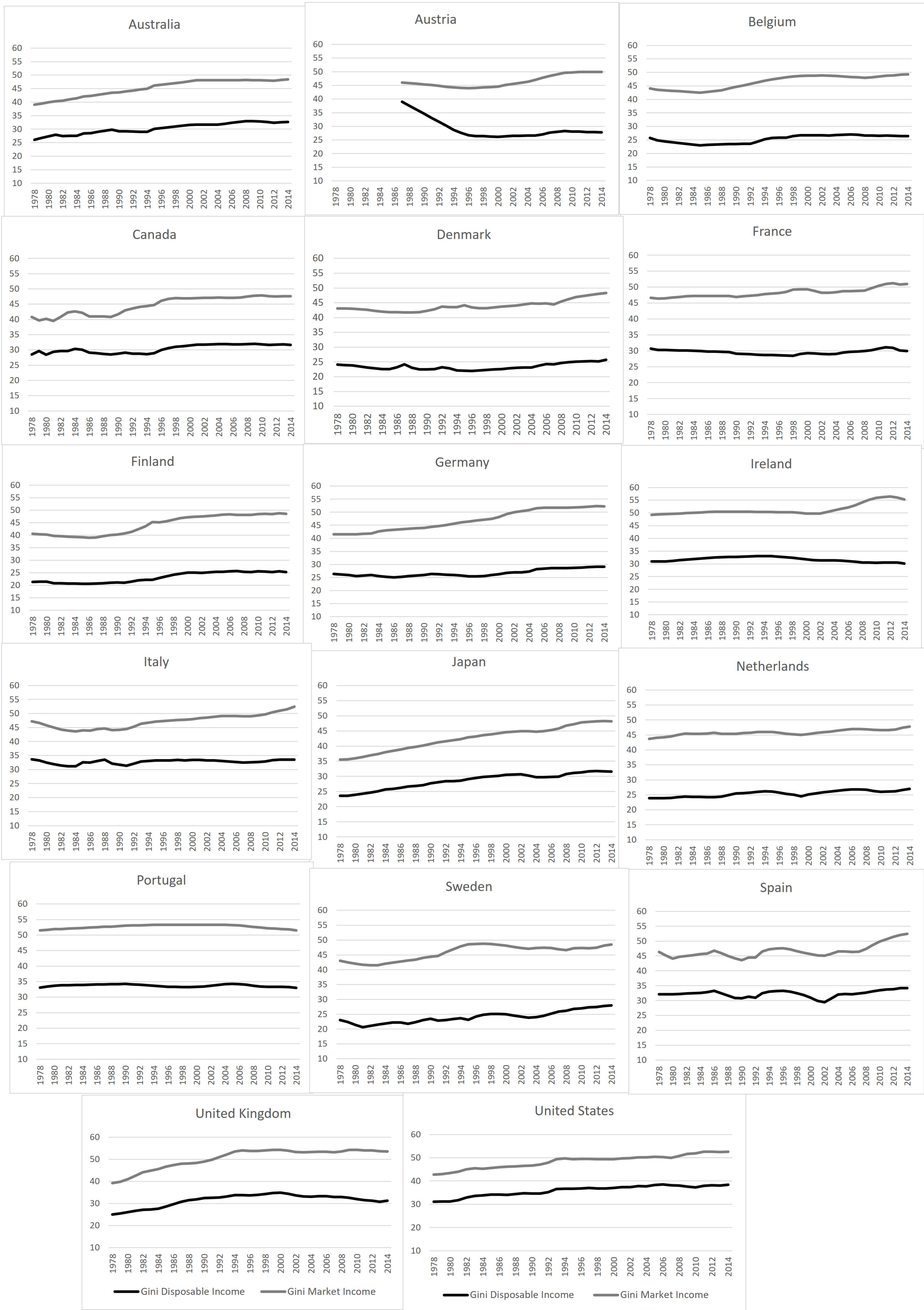

Figure 2.2: Gini index for Disposable Income (in black) and Gini index for Market Income (in gray) for a group of OECD countries

Source: Standardized World Income Inequality Database (SWIID). Version 9.5. Access in September 2023.

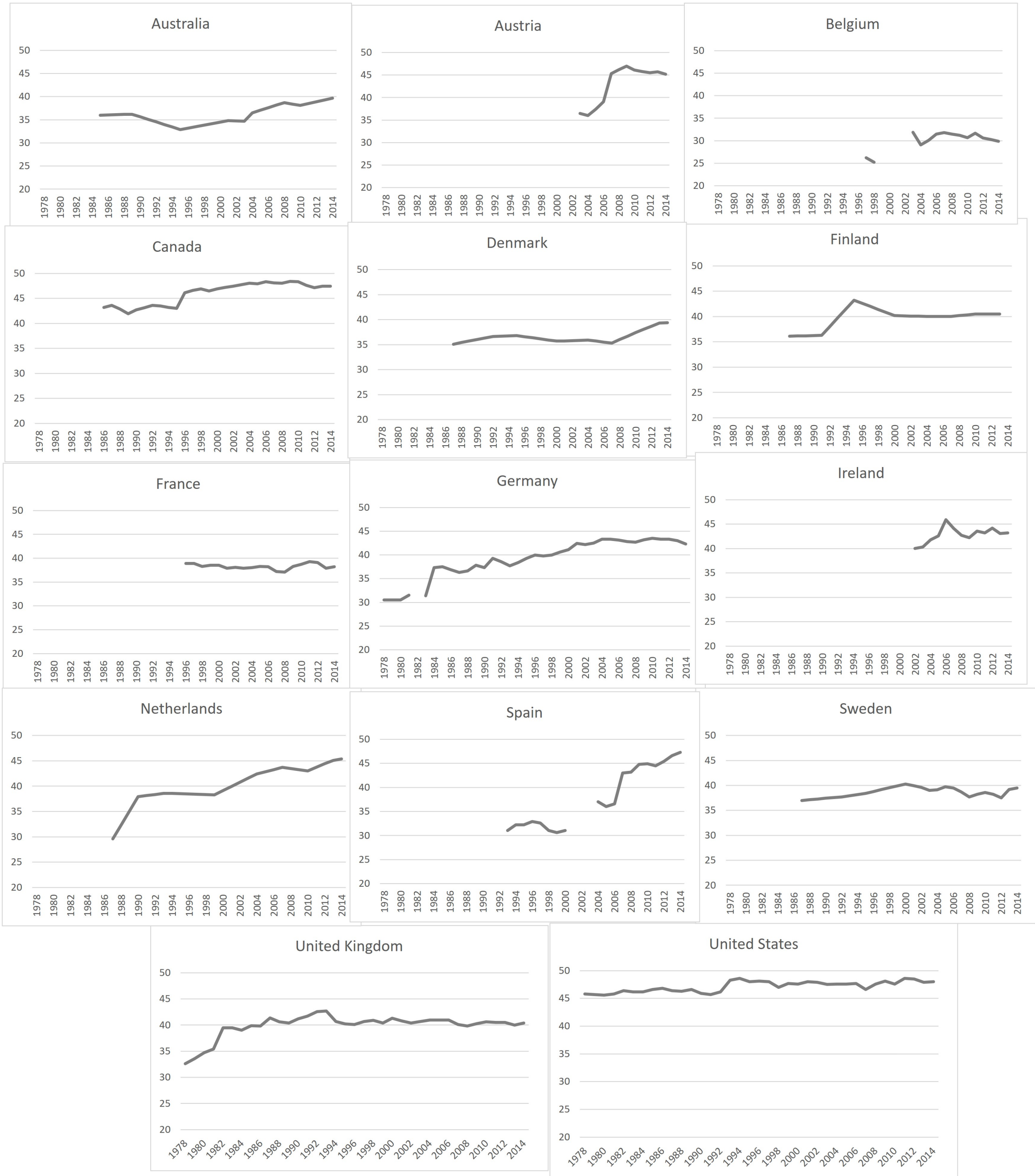

Figure 2.3: Gini index for Gross Wages for a group of OECD countries

Source: Luxembourg Income Study (LIS). Luxembourg Income Study (LIS) Database and LIS Data Access Research Tool (DART), https://dart.lisdatacenter.org/(Access in September 2023).

to address the problem of a lack of comparable data about inequality for a large number of countries (Berg et al., 2018). For this reason, this database became extremely popular in macroeconometric studies. However, the literature has some criticisms regarding the data, especially questions concerning the imputation data model (Jenkins, 2014). Solt (2015), on the other hand, argues that the SWIID database follows the recommendations found in Atkinson and Brandolini (2009) to provide the most comparable data available, being still useful for cross-country studies. Also, in order to compare our results to those in the literature (Agnello and Sousa, 2012; Ball et al., 2013; Woo et al., 2013; Agnello and Sousa, 2014; Schaltegger and Weder, 2014; Furceri et al., 2016; Furceri et al., 2018a; Klein and Winkler, 2019; Heimberger, 2020; Cardoso and Carvalho, 2023), it is useful using the SWIID database[7].

The third analysis focuses on estimating the impact of consolidation programs on gross wage inequality, a pre-fiscal measure as in the case of market income. For this purpose, we gathered Gini index data for gross wages from the Luxembourg Income Study (LIS)[8][9][10]. Figure 2.3 visually presents the data, reflecting varying initial points for each country. Consequently, the panel data for this particular analysis is unbalanced. Linear interpolation was applied to fill gaps in the data for Australia, Finland, Denmark, and the Netherlands (as in Heimberger, 2020). In Section 2.5, we conduct a robustness check by excluding these countries from the sample in order to show they are robust. Moreover, data for Italy, Japan, and Portugal are insufficient and therefore not included.

[7] Heimberger (2020) also performs the exercise of the impact of fiscal austerity on disposable income inequality for the same OECD countries group using an alternative dataset, the measure "all the Ginis" (Milanovic, 2016). However, the data needed to be interpolated in order to get enough observations. The results were also robust, with similar results to those obtained using the SWIID database.

[8] According to LIS methodological note, "Aggregate Gross Wages refers to monetary payments received from regular and irregular dependent employment. This includes cash wage and salary income and monetary supplements to the basic wage, such as overtime pay, employer bonuses, 13th month bonus, profit-share, tips before deduction of income taxes and social contributions. Estimates refer to wage earners aged 16-64 who have non-zero wages. Top and bottom coding has been applied by setting boundaries for extreme values of log transformed Gross wages: at the top Q3 plus 3 times the interquartile range (Q3-Q1), and at the bottom Q1 minus 3 times the interquartile range".

[9] The data were retrieved from the Data Access Research Tool (DART). However, the LIS microdata tool could provide some extra years not initially available in DART.

[10] The LIS Database is the largest available income database of harmonized micro-datasets collected from about 50 countries spanning over five decades (LIS - User Guide, 2019).

To explore the employment channel in the dynamics of the effects of austerity on inequality, we retrieved data from the Comparative Welfare States Data Set by Brady et al. (2020, 2014, 2004)[11]. These authors collected gross earnings inequality data from the OECD, Database on Trends in Earnings Dispersion (various years) and OECD, Labour Force Statistics (database). We initially used the most recent dataset (2020). We were also able to gather more data by using previous versions of the same dataset (2014 and 2004), especially older data, and also from OECD direcly[12]. Figure 2.4 visually presents three distinct measures of gross earnings inequality: the inequality between the top of the earnings distribution and the bottom (Percentile Ratio 90/10), between the middle and the bottom (Percentile Ratio 50/10), and between the top and the middle (Percentile Ratio 90/50). As some data points are missing, the panel data is characterized by its unbalanced nature. In addressing this, we applied linear interpolation for the missing data, a method also employed in similar studies such as Heimberger (2020), and conducted alternative exercises in Section 2.5.

Lastly, to investigate the effects of austerity measures on the disparity between capitalists and workers, we assess its influence on the functional income distribution, specifically utilizing the "share of labor compensation in GDP at current national prices". Figure 2.5 displays this series, sourced from the Penn World Table, version 10.0[13].

[11] David Brady, Evelyne Huber, and John D. Stephens, Comparative Welfare States Data Set, University of North Carolina and WZB Berlin Social Science Center, 2020.

[12] We obtained data from the 2020 version in most of the years. However, some exceptions are the following. For France, we obtained data for 1978-2009 from the 2014 version, and for 2011-2014 from the OCDE Database on Trends in Earnings Dispersion, 2015 and 2021. For Austria, we obtained data for 1980-1986 from the 2004 version. For Belgium and Germany, we obtained 1981 from older documents by OECD (1996) - *Earnings inequality, low-paid employment and earnings mobility,* and OECD (1993) - *Earnings inequality: changes in the 1980s.* For Canada, we obtained the years 1982-1985, 1987, and 1989 from the 2004 version. We used linear interpolated data from 1997 to 2014 for Italy due to its availability. For 1979 - 1996 (Italy), we obtained from the 2004 version. For Sweden, we obtained 2014 and 2015 from the OCDE Database on Trends in Earnings Dispersion, 2020. We used the 2014 version for 1996-2001 for Denmark.

[13] Regarding the self-employed workers, the methodological guide by the Penn World Table suggests that they estimate the self-employed workers' labor income: "It is relatively straightforward to determine the share of labor income of employees in GDP, as this information is a regular part of the National Accounts of countries. Estimating the labor income of self-employed workers is more challenging. If a country reports the total income of self-employed, known as mixed-income, there is a clear upper bound to overall labor income, leading to a reasonable estimate. When such information is not available, PWT8 assumed

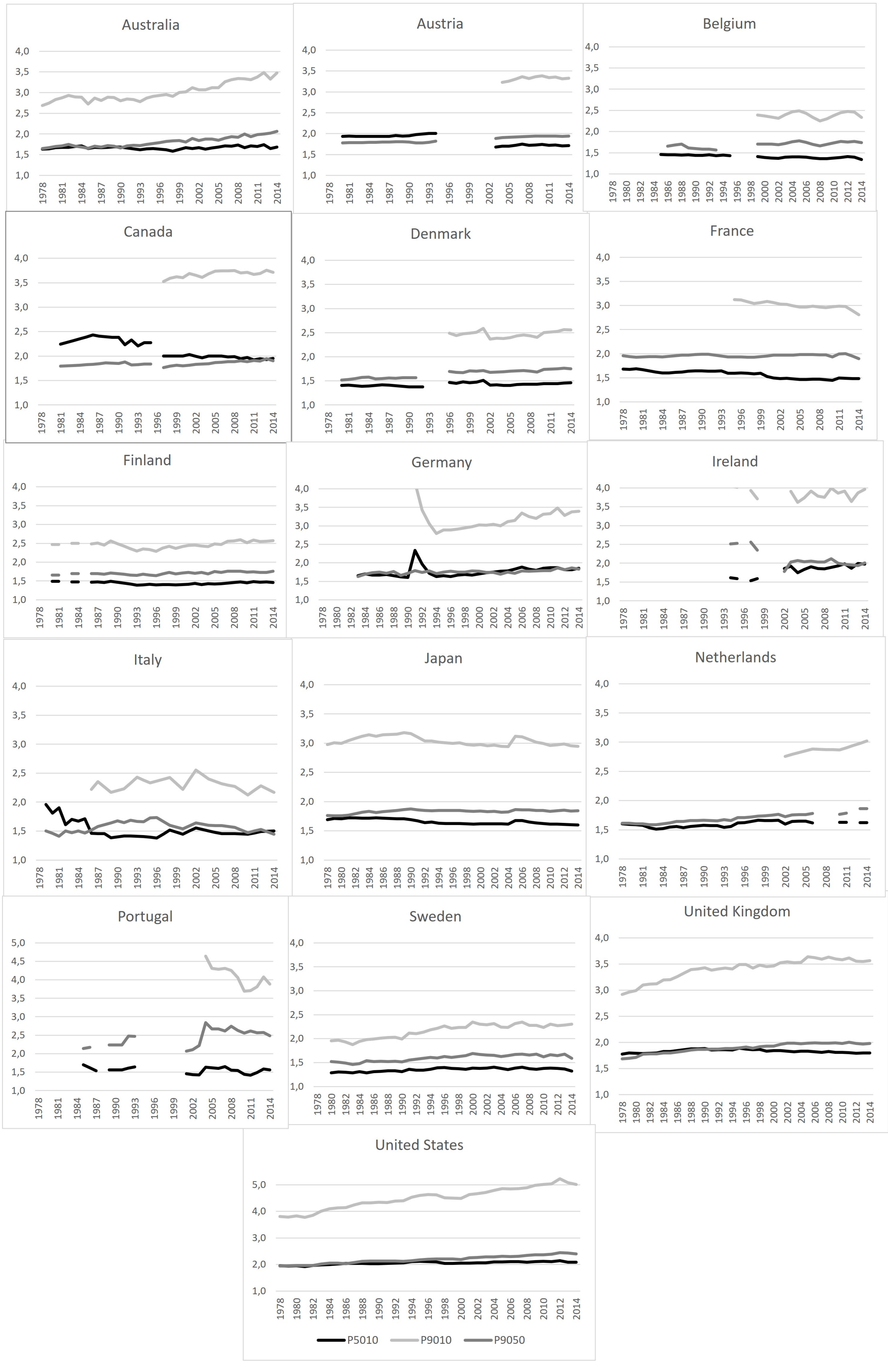

Figure 2.4: Gross Earnings Inequality (Percentile 50/10 in black, Percentile 90/50 in dark gray, and Percentile 90/10 in light gray) for a group of OECD countries

Source: David Brady, Evelyne Huber, and John D. Stephens, Comparative Welfare States Data Set, University of North Carolina and WZB Berlin Social Science Center, versions 2020, 2014, 2004. Original source: OECD, Database on Trends in Earnings Dispersion (various years); OECD, Labour Force Statistics (database). Access in December 2022.

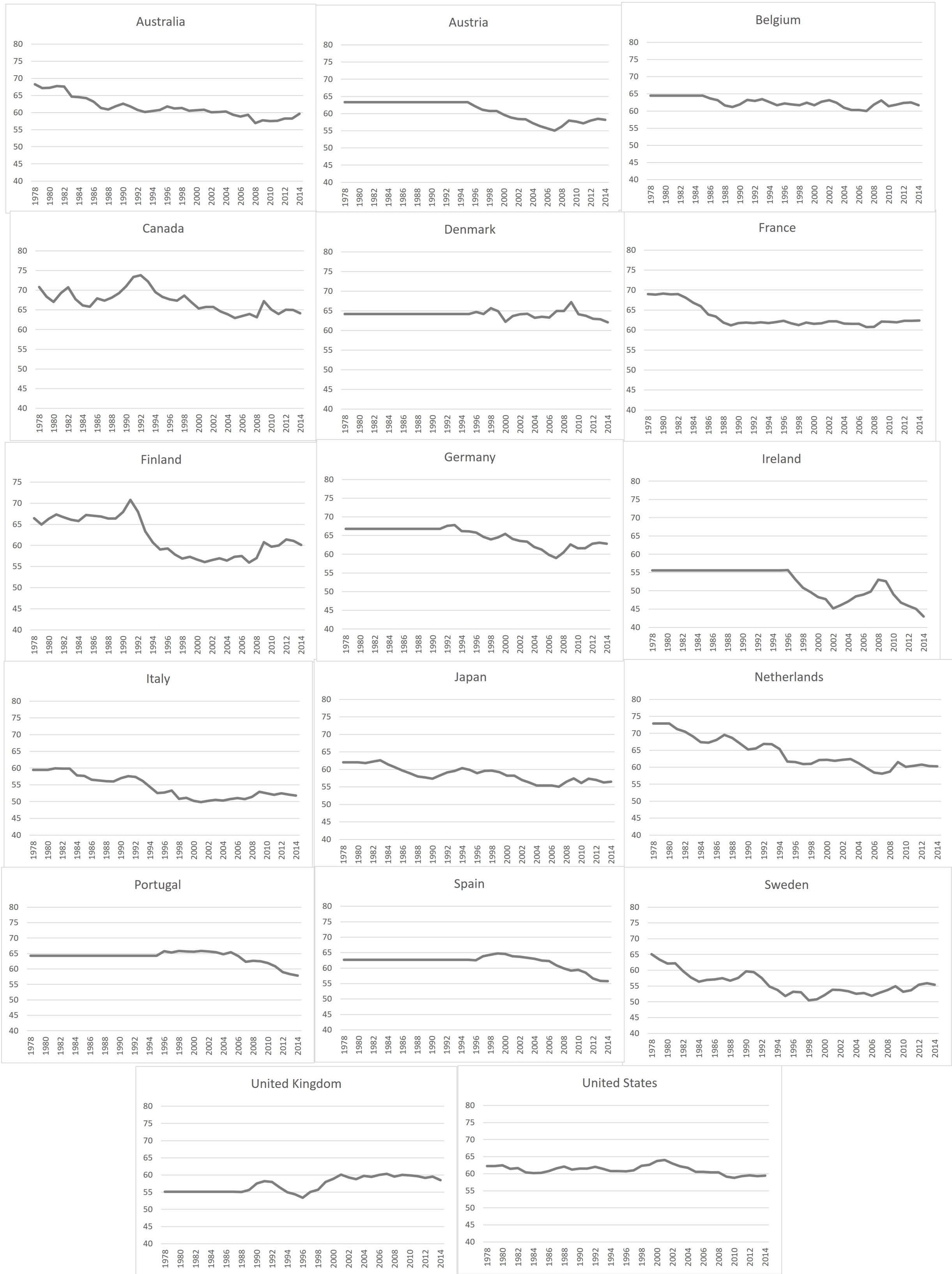

Figure 2.5: Labor Share in income for a group of OECD countries

Source: Penn World Table version 10 (Access in January 2023).

Following recent empirical literature (refer to Section 2.2 for details), the empirical analysis in this paper is based on fiscal consolidation measures identified through the "narrative approach", as outlined in Table 2.1 (Ball et al., 2013; Woo et al., 2013; Schaltegger and Weder, 2014; Agnello and Sousa, 2014; Furceri et al., 2016; Agnello et al., 2016; Klein and Winkler, 2019; Heimberger, 2020; Cardoso and Carvalho, 2023; Ciminelli et al., 2019, Castro, 2018). In the literature focusing on OECD countries, the Devries et al. (2011) dataset is typically employed to identify episodes of government spending cuts and/or tax increases aimed at reducing the budget deficit (see Table 2.1). This dataset covers the period from 1978 to 2009. However, in our study, we choose to utilize the database by Alesina et al. (2019) for two primary reasons: i) it is more up-to-date, including data up to 2014; ii) it provides a disaggregation of the fiscal shocks into various types, such as direct and indirect tax measures, as well as consumption, investment, and transfers shocks for expenditure.

Employing the disaggregated database can be a valued option for future research since no study in the literature reviewed in Section 2.2 explores a disaggregated analysis. As highlighted by Heimberger (2020) (p.78): "*an important limitation of the papers in the existing literature certainly is that the fiscal consolidation data used do not allow to distinguish between different components of tax increases and spending cuts. However, the effects of retrenchment in transfer payments, different types of tax increases and cuts in public investment on the income distribution might differ substantially*" (Heimberger, 2020, p.78). For tax-based measures, Ciminelli et al. (2019) investigate the impacts of tax-based measures on income inequality by disaggregating direct and indirect taxes. However, no study investigates the channels we explore here using a disaggregated analysis for expenditure and tax-based austerity measures.

Heimberger (2020) updates estimations using Alesina et al. (2015) for the years 2010-2013 and employs Devries et al. (2011) for the period 1978-2009. In this study, we utilize Alesina et al. (2019) for the years 1978-2014. To validate the robustness of our findings using different narrative datasets, we conduct the following exercises: i) in Appendix B, we present results using Devries et al. (2011) for 1978-2009 and Alesina et al. (2019) for

self-employed earn the same average wage as employees or alternatively that self-employed labor income equaled value added in agriculture, depending on which method leads to a lower labor share" (Feenstra et al., 2016, p.10).

2010-2014; ii) in Appendix C, we showcase our findings using Gupta et al. (2017), which leverages Devries et al. (2011) for 1978-2009, Alesina et al. (2015)[14], for 2010-2013, and their dataset for 2014 (Gupta et al., 2017, for 2014). As demonstrated in these Appendices, the results remain highly robust[15].

Finally, we incorporate control variables to mitigate potential estimation biases arising from unobservable factors affecting inequality dynamics in the econometric analyses. These variables are included in the analyses presented in Section 2.5 to ensure the robustness of our findings, which indeed prove to be resilient in most cases. We include the following variables recommended by the literature:
i) real GDP per capita (denominated in US dollars in 2015 prices and constant PPP) (Woo et al. (2013), Jalles (2017), Agnello and Souza (2014), Cardoso and Carvalho (2023), Schaltegger and Weder (2014), Heimberger (2020)). It was obtained from the OECD Stat Database;
ii) trade openness (trade-to-GDP). This variable refers to "exports of goods and services plus imports of goods and services (% of GDP)" and was retrieved from the World Development Indicators database (The World Bank) (Woo et al. (2013), Jalles (2017), Agnello and Souza (2014), Agnello et al. (2016), Cardoso and Carvalho (2023), Heimberger (2020));
iii) unemployment rate, from the OECD Stat Database (Ball et al., (2013), Woo et al. (2013), Jalles (2017), Furceri et al. (2016), Cardoso and Carvalho (2023), Heimberger (2020), Agnello et al. (2016));
iv) GDP growth rate, obtained from OECD Stat Database (Ball et al. (2013), Jalles (2017), Cardoso and Carvalho (2023), Heimberger (2020), Klein and Winkler (2019));
v) inflation rate, annual, measured by the Consumer Price Indices (CPI), obtained from the OECD Stat Database (Agnello et al. (2016), Agnello and Sousa (2014), Woo et al. (2013)).

In our analysis, we incorporate several control variables to account for the economic cycle's influence. Factors such as real GDP per capita, GDP growth rate, and the unemployment rate are considered. For instance, a decline in economic activity, as indicated by these parameters, might heighten the likelihood of fiscal consolidation due to automatic

[14] The datasets by Alesina et al. (2015) and Alesina et al. (2019) are highly similar, but Alesina et al. (2019) is more current, encompassing data up to 2014.

[15] There is no data for the Netherlands in Alesina et al. (2015, 2019) database for fiscal shocks. For this reason, we used Devries et al. (2011) for 1978-2009 and Gupta et al. (2017) for 2010-2014 for this country.

stabilizer mechanisms (Heimberger, 2020). Moreover, higher unemployment rates are likely correlated with increased inequality, given that a significant proportion of unemployed individuals fall within the lower income brackets (Woo et al., 2013).

We also consider the inflation rate, as it can potentially exacerbate inequality by disproportionately affecting the lower segments of the income distribution (Easterly and Fisher, 2001; Parker, 1998; Bishop et al., 2020). Moreover, there exists a substantial body of literature exploring the impacts of monetary policy on income distribution (for an extensive review, refer to Kappes, 2023). Additionally, in order to account for the influence of trade globalization on inequality, we integrate the variable of trade openness into our study (Meschi and Vivarelli, 2007).

2.3.2 Econometric Methodology

This paper focuses on the estimation of the distributional impacts induced by fiscal consolidation measures in the short- and medium-term contexts. Our analytical focus encompasses several dimensions of inequality, encompassing disposable income, market income, wage, and functional distributions, evaluated through the Gini index as well as earnings inequality measures. To account for the intricate dynamics associated with fiscal consolidation and its evolving impact on inequality, we adopt a dynamic methodology based on Jordà's (2005) proposition. Specifically, our approach involves estimating impulse response functions (IRFs) through local projections, aligning with recent advancements in econometric methodology studying the distributional effects of fiscal policy (e.g., Ball et al., 2013; Furceri et al., 2016; Furceri et al., 2018; Klein and Winkler, 2019; Heimberger, 2020; Cardoso and Carvalho, 2023).

Diverging from panel static methods (used by Agnello and Sousa, 2012; Woo et al., 2013; Schaltegger and Weder, 2014; Agnello and Sousa, 2014; Agnello et al., 2016; Jalles, 2017; Schneider et al., 2017), this methodology captures the dynamics inherent in the relationship between austerity measures and inequality, justifying its prevalent usage in recent literature addressing distributive implications of such measures.

Additionally, our approach is in consonance with existing economic literature emphasizing the need for dynamic methodologies to comprehensively account for the evolving nature of inequality metrics within economic cycles (Hoover et al., 2009; Atems and Jones, 2015; Camacho and Palmieri, 2019; Geiger et al., 2020).

For each future period k, the following exercises are estimated on annual data by Ordinary Least Squares (OLS). In Exercises 2, 3, 5, 6, and 7 (See Table 2.6), k=1, ..., 8 (Ball et al., 2013; Furceri et al., 2016; Heimberger, 2020; Carvalho e Cardoso, 2023). However, we include one more period in Exercise 1 since results show a higher persistent effect of austerity on disposable income inequality (its peak response occurs in the ninth period so that k=9). In contrast, Exercise 4 considers k=6 due to stationarity problems in the dependent variable when we estimate the impact considering k higher than six. We excluded periods seven and eight to avoid spurious relations in our results. However, Appendix D shows the results considering k=8.

Impulse-response functions are obtained by plotting the estimated β_n^k with confidence bands for the estimated functions being computed using the standard deviations associated with the estimated coefficients β_n^k (Ball et al., 2013). Confidence intervals are estimated based on Driscoll and Kraay's (1998) standard errors, which are robust with respect to heteroskedasticity and serial and cross-sectional correlation (Klein and Winkler, 2019; Cardoso and Carvalho, 2023).

We estimate the following equation:

$$Ineq_{i,t+k} - Ineq_{i,t} = \sum_{n=0}^{x} \beta_n^k S_{i,t-n} + \sum_{j=0}^{y} \delta_j^k \Delta Ineq_{i,t-j} + \gamma_k Z_{i,t} + \xi_i^k + \eta_t^k + \epsilon_{i,t+k} \tag{2.1}$$

$Ineq$ represents the inequality measure (in logarithm), S is the fiscal shock variable from Alesina et al. (2019), as % of GDP, β_n^k measures the distributional impact of fiscal consolidation episodes for each future period k; $\Delta Ineq$ denotes the lags in the change of the measure of inequality; $Z_{i,t}$ represents a vector of additional control variables; ξ_i^k are country fixed effects and η_t^k are time fixed effects. Note x is the number of lags included in the model for the fiscal shock to control its persistence (Furceri et al., 2016; Cardoso and Carvalho, 2023), while y denotes the lags in the change of the measure of inequality, to control its persistence since changes in inequality can be dependent on past changes (Heimberger, 2020; Cardoso and Carvalho, 2023; Ball et al., 2013; Jalles, 2017; Furceri et al., 2016; Furceri et al., 2018a; Woo et al., 2013). We included the number of lags that presented the best exercise[16]. However, exercises are extremely robust to changes in the number of lags, as we will show in Section 2.5.

[16] For Exercise 1: $x = 1$ and $y = 0$ (that is, we included 2 and 1 lags, respectively); Exercise 2: $x = 1$, $y = 0$ (2 and 1 lags); Exercise 3: $x = 1$, $y = 2$ (2 and 3 lags); Exercise 4: $x = 2$, $y = 0$ (3 and 1 lags); Exercise 5: $x = 0$, $y = 1$ (1 and 2 lags); Exercise 6: $x = 0$, $y = 0$ (1 and 1 lag); Exercise 7: $x = 0$, $y = 1$

Table 2.6 presents seven exercises. In each, $Ineq$ in Equation 2.1 corresponds to an inequality measure, as the Table indicates. Also, the Table shows the sample of countries included in each estimation. In our analysis, we initially assembled a sample of 17 countries, as shown in Figure 2.2. The rationale behind selecting these countries is based on data availability in the narrative database by Alesina et al. (2019). The literature uses a similar sample, using the Devries et al. (2011) dataset (see Table 2.1).

For the exercises, we adjusted the country inclusion based on data availability and to ensure the robustness of our findings. In Section 2.5, we will explore various alternative exercises, excluding specific countries and excluding countries that were not part of the baseline exercises, where feasible. Table 2.6 shows a summary of the countries in each estimation, while in Appendix A, we show detailed explanations.

The dependent variables, included in differences in Exercises 1-7, are stationary[17]. Except for the GDP growth rate, the other four additional control variables are included in the first difference (real GDP per capita in logarithm, trade-to-GDP, unemployment rate, and inflation rate[18]) since unit root tests show they are not stationary. Our baseline exercises do not include control variables. In Section 2.5, we conduct robustness tests including these variables, and the results are robust.

2.4 Results and Discussion

2.4.1 The impact of austerity measures on disposable and market income inequalities

Firstly, we examine the impact of austerity measures on disposable income inequality - specifically, post-fiscal or post-tax and transfers. We refer to this impact as the "total effect", as illustrated in Figure 2.1. Secondly, we assess the effect of fiscal consolidation episodes on market income inequality (a pre-fiscal or pre-tax and transfers measure) to understand the impact, excluding the influence of the tax and transfers system.

Figure 2.6 displays the cumulative impact on disposable income inequality resulting from a 1% of GDP fiscal consolidation episode, as estimated by Exercise 1. The shaded

(1 and 2 lags).

[17] For Exercises 1, 2, and 7, we conducted the Levin-Lin-Chu test for balanced panels. For Exercises 3-6, we conducted the Fisher Test for panel unit root using an augmented Dickey-Fuller test recommended for unbalanced panel data (since there are some missing data for the dependent variable).

[18] The inflation rate is included as the logarithm of $(1 + rate)$, following Woo et al. (2013).

Exercise	**Countries included**
Exercise 1: disposable income inequality	15 countries: Australia, Belgium, Canada, Denmark, France, Finland, Germany, Ireland, Italy, Japan, the Netherlands, Portugal, Sweden, the United Kingdom, and the United States.
Exercise 2: market income inequality	13 countries: Australia, Belgium, Canada, Denmark, France, Finland, Germany, Italy, Japan, the Netherlands, Portugal, the United Kingdom, and the United States.
Exercise 3: gross wage inequality	14 countries: Australia, Austria, Belgium, Canada, Denmark, France, Finland, Germany, Ireland, Netherlands, Spain, Sweden, the United Kingdom, and the United States.
Exercise 4: gross earnings inequality (percentile ratio 50/10)	14 countries: Australia, Austria, Belgium, Canada, Denmark, France, Finland, Germany, Ireland, Japan, Portugal, Sweden, the United Kingdom, and the United States.
Exercise 5: gross earnings inequality (percentile ratio 90/50)	15 countries: Australia, Austria, Belgium, Canada, Denmark, France, Finland, Germany, Ireland, Japan, the Netherlands, Portugal, Sweden, the United Kingdom, and the United States.
Exercise 6: gross earnings inequality (percentile ratio 90/10)	13 countries: Australia, Austria, Belgium, Canada, Denmark, France, Finland, Germany, Ireland, Japan, Sweden, the United Kingdom, and the United States.
Exercise 7: labor share in GDP	15 countries: Australia, Belgium, Canada, Denmark, France, Finland, Germany, Ireland, Italy, Japan, the Netherlands, Portugal, Sweden, the United Kingdom, and the United States.

Table 2.6 - Exercises and countries included in each estimation
Source: Author's elaboration.

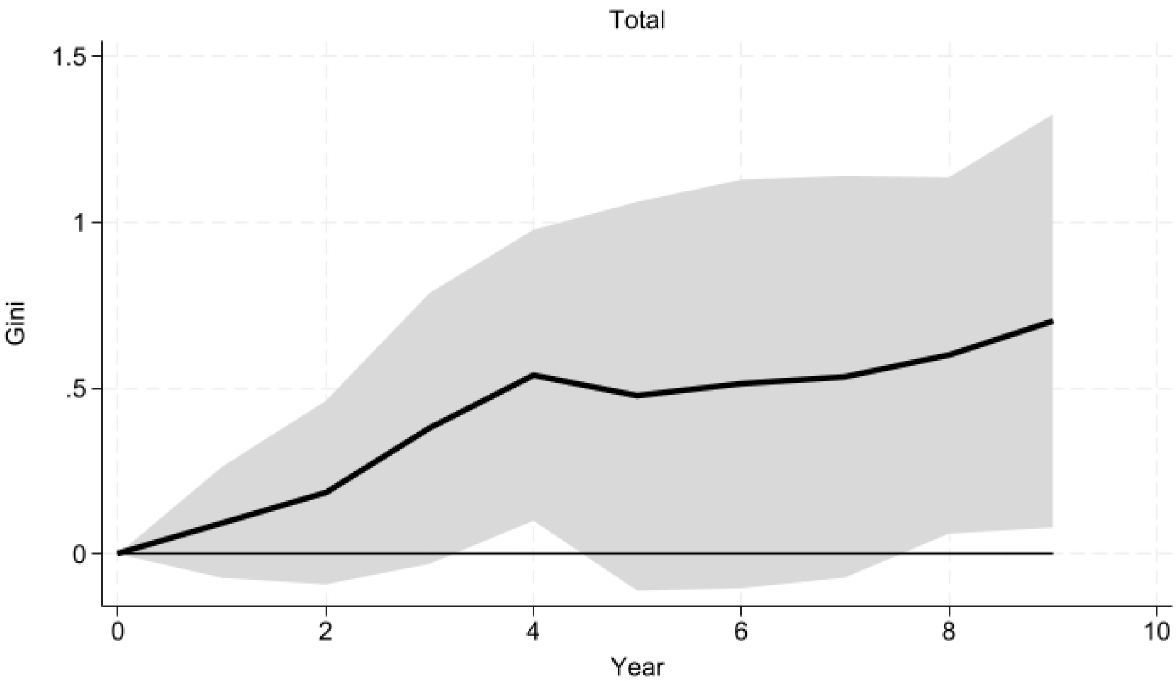

Figure 2.6: Cumulative Response of Disposable Income Inequality (change in %) to a fiscal consolidation of 1% of GDP

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%. "Total" corresponds to all shocks.

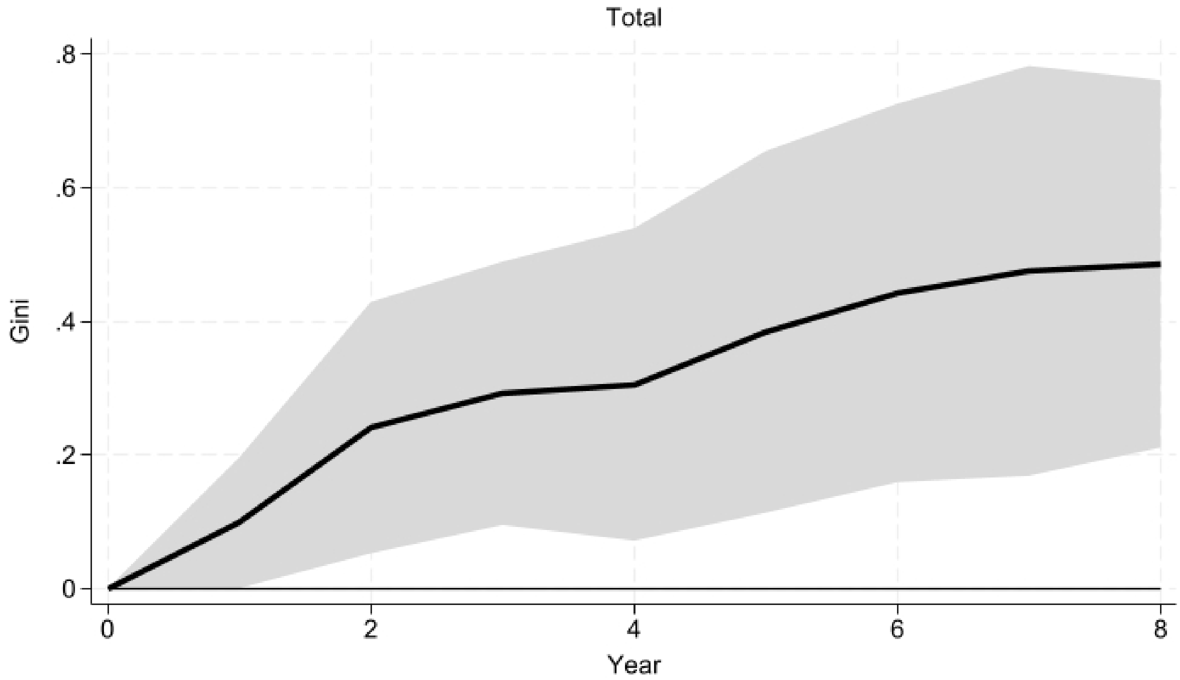

Figure 2.7: Cumulative Response of Market Income Inequality (change in %) to a fiscal consolidation of 1% of GDP

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%. "Total" corresponds to all shocks.

regions in all the graphs represent the confidence intervals of the impulse response functions, corresponding to a 90% confidence level. Table 2.8 shows the estimated coefficients or the cumulative response of disposable income inequality (in %) to a fiscal consolidation equivalent to 1% of GDP, as shown in the impulse response functions in Figure 2.6.

Looking at the figure, it can be noted that fiscal consolidation episodes have long-lasting effects on income inequality. In particular, after a 1% of GDP fiscal adjustment episode, the Gini index for disposable income exhibits a notable increase of 0.703% (equivalent to 0.204 percentage points - ppt.[19]) nine years later. This effect is also substantial in the shorter term, with a 0.539% (0.156 ppt.) rise in the Gini index for disposable income observed four years after a 1% of GDP fiscal adjustment.

Our findings align with existing literature utilizing the "narrative approach" (Devries et al. 2011) on OECD countries, which generally indicates that fiscal consolidation measures tend to result in a short- and medium-term increase in disposable income inequality (Ball

[19] Impacts are calculated in percentage points (ppt.) using the average Gini index of the sample: 0.2902774.

et al., 2013; Woo et al., 2013; Furceri et al., 2016; Agnello et al., 2016; Klein and Winkler, 2019; Heimberger, 2020). As illustrated in Table 2.7, our findings align with the existing literature, specifically showing a medium-term effect of 0.703%. In comparison, Furceri et al. (2016) reported a similar effect of 0.9% for a comparable set of countries.

Figure 2.7 illustrates the cumulative response of market income inequality to a fiscal consolidation episode equating to 1% of GDP, obtained through the estimation of Exercise 2. In Table 2.8, we present the coefficients estimated for the cumulative response of market income inequality (in %) to a fiscal consolidation of 1% of GDP. In Section 2.5, we conducted various robustness tests, and all of them demonstrated that the results in this section are resilient to changes.

The Gini index for market income displays statistically significant effects due to austerity measures in the short term (e.g., years 2 and 3) and the medium term. This is in contrast to the Gini index for disposable income, which exhibits significant effects in the fourth year and even more notably in the eighth and ninth years. This discrepancy suggests that market income inequality responds more vigorously in the short run compared to the disposable income inequality index: the tax and transfer system might play an important role in mitigating part of the increase in inequality. A more detailed investigation of this hypothesis will be carried out in the following section, to assess the "redistributive effect". As shown in Table 2.8, after an austerity measure, the Gini index for market income increases by 0.486% (0.227 ppt.) and by 0.241% (0.113 ppt.)[20] after eight and two years.

[20] Impacts are calculated in percentage points (ppt.) using the average Gini index of the sample: 0.4686661.

Study	Medium-run impact
Ball et al. (2013)	0.9 ppt. (after 8 years)
Woo et al. (2013)	1.3% (0.4 ppt.) (after 5 years)
Furceri et al. (2016)	0.9% (after 8 years)
Heimberger (2020)	0.6 ppt. (after 5 years)
This study	0.703% (0.204 ppt.) (after 9 years)

Table 2.7 - Medium-run impacts of fiscal austerity on disposable income inequality - Comparison with the literature

Source: Author's elaboration.

Type of inequality/year	1	2	3	4	5	6	7	8	9
Impact on disposable income inequality	0.0956	0.185	0.379	0.539*	0.476	0.513	0.535	0.599*	0.703*
Impact on market income inequality	0.0984	0.241**	0.292**	0.306**	0.384**	0.442**	0.476**	0.486***	-

Table 2.8 - Impacts on the Disposable and Market Income Inequalities (%) (following a fiscal adjustment episode of 1% of GDP)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

2.4.2 Investigating the channels

In this section, we analyze the effect of austerity measures on inequality through three channels, as previously discussed in Section 2.1 (Figure 2.1): a) the redistributive effect, which captures the impact of changes in taxes and transfers; b) the impact on the distribution among workers (wage inequality); c) the impact on the distribution between capital and labor, known as functional inequality. We also investigate the employment channel (earnings inequality).

To analyze the role of each channel, we draw upon the work of Francese and Mulas-Granados (2015), Lerman and Yitzhaki (1985), and CBO (2011), which involves decomposing the Gini index by income sources. The change in market income inequality can be further broken down into its components, including changes in the functional distribution and inequalities among each income source (such as labor and capital). As demonstrated by Francese and Mulas-Granados (2015), based on Lerman and Yitzhaki (1985) and CBO (2011), variations in the overall Gini index for market income G_m occurring over a period starting at time t_0 can be summarized by the equation:

$$\Delta G_m = [\Delta s_l(C_l^0 - C_c^0)] + [s_l^0 \Delta C_l + s_c^0 \Delta C_c] + [\Delta s_l(\Delta C_l - \Delta C_c)] \tag{2.2}$$

where s_l is the labor share in income, C_l is the pseudo-Gini coefficient for labor income, and C_c is the pseudo-Gini coefficient for capital income (which, here, we call "non-labor" income, which includes all income sources that are not from labor). The first bracket is the "income shares impact" (functional distribution channel), and the second bracket is the "Gini coefficient for each income component impact" (which depends on each pseudo-Gini coefficient). It includes the wage inequality channel plus the inequality among capital income (non-labor). The third term is a residual close to zero (income shares and inequality tend to move slowly over time).

Then, the impact of transfers and taxation on inequality, that we call "redistributive channel", can be measured by:

$$\Delta G_m - \Delta G_y \tag{2.3}$$

where ΔG_y represents variations in the Gini index for disposable income, and ΔG_m represents variations in the Gini index for market income.

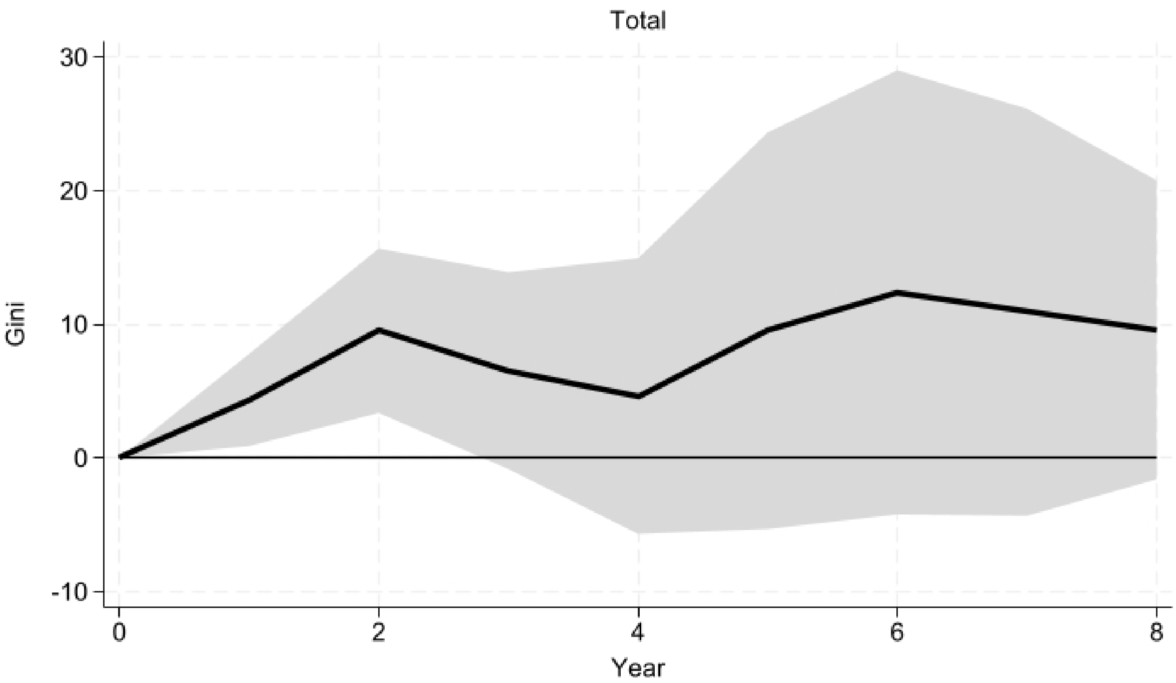

Figure 2.8: Cumulative Response of the Redistributive Measure (change in %) to a fiscal consolidation of 1% of GDP

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%. "Total" corresponds to all shocks.

2.4.2.1 The Redistributive Channel

As shown in Section 2.4.1, the market income inequality reacts more in the short term when compared to the index measuring disposable income inequality. To provide a more comprehensive evaluation of the redistributive aspect, we conducted an analysis inspired by Klein and Winkler (2019). Our approach began by calculating the difference between market income and disposable income inequalities (redistribution measure). Subsequently, we employed the following equation to estimate our findings:

$$Dif_{i,t+k} - Dif_{i,t} = \sum_{n=0}^{1} \beta_n^k S_{i,t-n} + \sum_{n=0}^{2} \delta_j^k \Delta Dif_{i,t-j} + \gamma_k Z_{i,t} + \xi_i^k + \eta_t^k + \epsilon_{i,t+k} \tag{2.4}$$

where Dif represents the difference between market and disposable income inequality. S is the fiscal shock variable from Alesina et al. (2019), as % of GDP - we include two lags in the baseline model, consistent with the market income inequality exercise. β_n^k measures the distributional impact of fiscal consolidation episodes for each future period k. ΔDif denotes the lags in the change of the measure of inequality - we set the number of lags to three in the baseline model, but we show in Appendix H that the results are robust when we change the number of lags. $Z_{i,t}$ represents a vector of additional control variables. ξ_i^k are country fixed effects and η_t^k are time fixed effects.

In Figure 2.8, we illustrate the cumulative response of the redistributive effect to a fiscal consolidation equivalent to 1% of GDP, obtained when estimating Equation 2.4. The standard robustness tests for this analysis are provided in Appendix H. The findings indicate that the outcome illustrated in Figure 2.8 remains resilient in the face of alterations.

An increase in the "redistribution effect" means that disposable income inequality rises by a smaller extent than market income inequality in response to fiscal consolidations (Klein and Winkler, 2019). In Figure 2.8, we observe an increase in the redistribution measure in the short run (the following two years), significant at 5%: the difference of responses between market and disposable income inequalities is statistically significant in the short run. In the medium run, however, the difference is not statistically significant. Our results align with the findings of Klein and Winkler (2019), who observed a positive redistributive effect in the short term, particularly during the first two years following austerity measures. Our findings are also in line with the results presented in Section 2.4.1, indicating that in the short term, market income inequality exhibits a more noticeable response in comparison to the disposable income inequality index.

A potential explanation for observing this effect in the short term is the role played by automatic stabilizers in the tax and transfer system (Espino and Gonzalez-Rozada, 2012), as well as the impact of the social safety net in alleviating immediate inequality effects (Bastagli et al., 2012; Wang et al., 2012; Wang et al., 2014; Cammeraat, 2020; ILO, 2014; Caminada et al., 2019; D'Agostino et al., 2020; Jesuit and Mahler, 2004; Mahler and Jesuit, 2006; Woo et al., 2013, Castro, 2018; Joumard et al. 2012, Paulus et al. 2009). As highlighted by Klein and Winkler (2019):

"*This is not surprising* [the fact that the redistribution measure rises after a fiscal austerity episode], *given the contractionary effects of austerity and the fact that, in general, redistribution rises in economic downturns. The latter reflects the significant role played by automatic stabilizers implicit in the government tax and transfers system, see, e.g., Krueger, Perri, Pistaferri, and Violante (2010). This automatic response of redistribution renders it difficult to identify the importance of discretionary changes in the tax and transfer system for the changes in income inequality after fiscal consolidations as the* *counterfactual - how inequality would have behaved in a non-austerity induced downturn - cannot be directly observed.*" (Klein and Winkler, 2019, p. 29).

The automatic stabilizers can enhance the redistribution effect and mitigate the impact on income inequality through two main channels: i) direct effect: increasing unemployment benefits, for example, inherently reduces inequality (Jesuit and Mahler, 2004; Mahler and Jesuit, 2006); ii) indirect effect: unemployment benefits, with a substantial fiscal multiplier (Furceri and Zdzinieck, 2012), positively influence aggregate demand and employment, thereby reducing income inequality. This negative impact on inequality is supported by two bodies of empirical literature. The Goodwin cycle literature highlights the role of workers' bargaining power during periods of increasing demand, which diminishes functional income inequality (Barbosa-Filho and Taylor, 2006; Kiefer and Rada, 2015). Research also suggests that income inequality tends to increase during economic downturns (Hoover et al., 2009; Maestri and Roventini, 2012; Geiger et al., 2020; Atems and Jones, 2015). Unemployment benefits, for example, could work as a stabilizer element for the aggregate demand and avoid increases in income inequality.

Cardoso et al. (2023) have estimated that social benefits have a robust positive macroeconomic impact, particularly across a diverse range of countries, including OECD countries in the sample. Notably, the social protection multiplier effect tends to be more pronounced in countries with lower income levels and/or greater income inequality. Given that this type of expenditure is typically mandatory, such as pensions, it has the potential to stabilize demand during economic downturns due to its high multiplier effect (Sanches and Carvalho, 2023). These prior findings shed light on the transfer system's importance in mitigating the impact on disposable income inequality compared to market income inequality in the short term.

2.4.2.2 The Wage Inequality Channel

The second channel to be analyzed is the inequality among workers. Figure 2.9 presents the cumulative estimated response of gross wage inequality to a fiscal consolidation shock of 1% of GDP (Exercise 3). Section 2.5 shows the results are robust to changes. In Table 2.9, we outline the coefficients for the cumulative estimated response illustrated in Figure 2.9. Notably, the response of wage inequality to a fiscal shock is statistically significant both in the short and medium run: the Gini index for gross wages increases by 1.588%

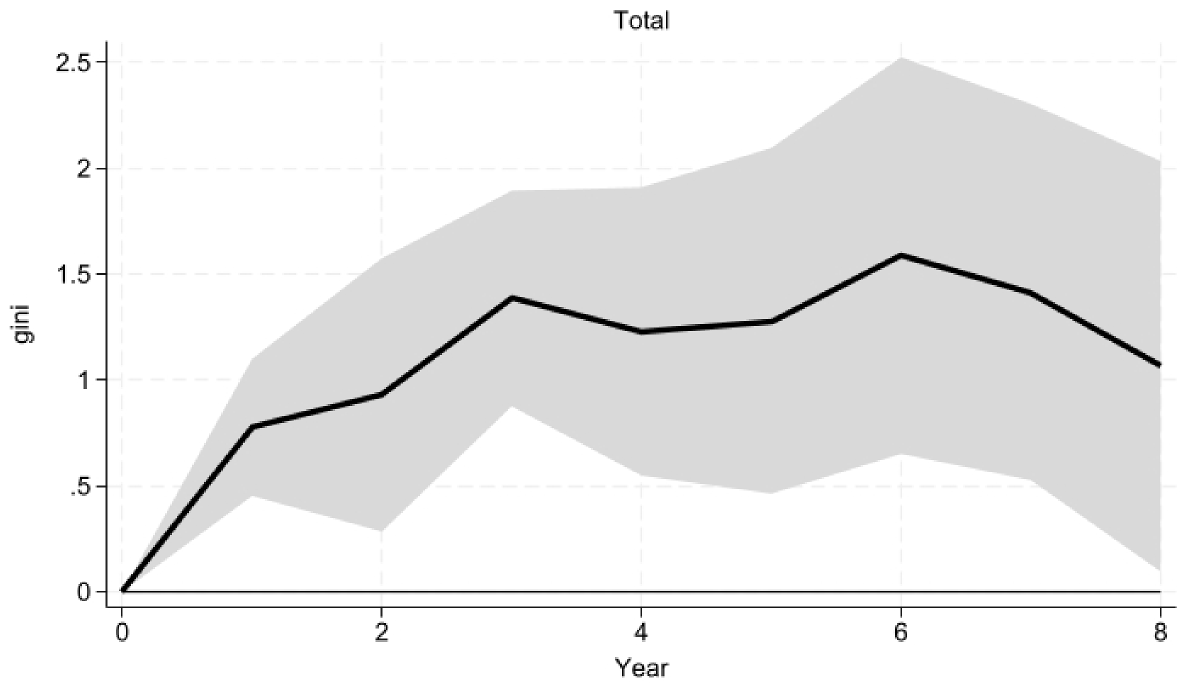

Figure 2.9: Cumulative Response of Gross Wage Inequality (change in %) to a fiscal consolidation of 1% of GDP

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%. "Total" corresponds to all shocks.

(0.635 ppt.) and by 1.385% (0.554 ppt.)[21] after six and three years.

Explanations for the strong response of wage inequality to austerity can be related to the fact that austerity measures negatively affect the aggregate demand (Blanchard and Leigh, 2014; Guajardo et al., 2014; Heimberger, 2017; Jordà and Taylor, 2016, Gechert et al. 2016; Gechert et al. 2019; Alesina et al., 2012; Alesina et al., 2015; Alesina et al., 2019; Carrière-Swallow et al., 2021; Holland and Portes, 2012; Veld, 2013; Yang et al., 2015; Castro, 2018). The adverse effect on aggregate demand can lead to an increase in the unemployment rate (Ball et al., 2013; Klein and Winkler, 2019; Castro, 2018; Woo et al., 2013), primarily affecting those at the lower end of the income distribution, thereby exacerbating income inequality. This aligns with the empirical literature that demonstrates the countercyclical nature of income inequality (Kuznets, 1953; Parker, 1998; Blank and Blinder, 1986; Blinder and Esaki, 1978; Dimelis and Livada, 1999; Bishop et al., 2020; Maestri and Roventini, 2012; Hoover et al., 2009; Geiger et al., 2020; Atems and Jones,

[21] Impacts are calculated in percentage points (ppt.) using the average Gini index of the sample: 0.4002935.

Impact/year	1	2	3	4	5	6	7	8
Effect on wage inequality	0.775***	0.929**	1.385***	1.229***	1.279**	1.588***	1.415**	1.064*
Effect on the labor share	-0.256	-0.552*	-0.816*	-0.846	-0.751	-0.492	-0.658	-0.610

Table 2.9 - Impacts on the Gross Wage Inequality and on the Labor Share in Income (%) (following a fiscal adjustment episode of 1% of GDP)
Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

2015).

Studies on wage inequality and its relationship with the business cycle are less common. Morin (2019), for example, finds that observed wage inequality also follows a countercyclical pattern. Moreover, the empirical literature suggests that low-skilled workers at the bottom of the income distribution are more vulnerable to negative shocks in aggregate demand (Hoynes et al., 2012; Clark and Summers, 1981; Hoynes, 1999; Hershbein and Kahn, 2018; Forsythe, 2022; Kydland, 1984; Morin, 2019; Mueller, 2017; Solon et al., 1994). It suggests a possible channel through which austerity measures increase wage inequality.

In addition to this literature, the literature on fiscal multipliers for OECD countries finds that social spending has a relevant multiplier effect, usually higher than the total government expenditure multiplier (Cardoso et al., 2023), especially unemployment benefits and healthcare expenditures (Furceri and Zdzinieck, 2012; Reeves et al., 2013). Moreover, public investments exhibit a substantial impact on aggregate demand, especially in the long term (Cournède et al., 2013; Ilzetski et al., 2013; Deleidi et al., 2019; Gechert, 2015; Konstantinou and Partheniou, 2021; Barrell et al., 2012) and in countries with a low initial stock of public capital (Izquierdo et al., 2019). Additionally, certain studies highlight that the fiscal multiplier tends to be higher during economic downturns (Auerbach and Gorodnichenko, 2012; Baum et al., 2012; Dufrénot et al., 2016; Fazzari et al., 2015; Gechert and Rannenberg, 2014).

These results combined suggest that spending-based measures have a significant impact on aggregate demand, which in turn affects wage inequality, as explained above. Spending-based measures may reduce items with substantial multipliers, like social benefits and public investments, thereby negatively affecting aggregate demand, especially during recessions. Some studies show that austerity episodes have a significant impact on economic growth in the short run, especially spending-based ones (Castro, 2018).

From the tax-based perspective, these measures directly affect wage inequality via regressive tax increases (typically indirect taxes), exacerbating worker inequality (Rawdanowicz et al., 2013). Moreover, there is evidence, using the same narrative dataset and countries, that indirect tax shocks have a negative impact on output, whereas direct tax episodes do not (see Cardoso et al., 2021). Similar results are found by Ciminelli et al. (2019). This negative impact on output primarily affects workers at the bottom of the income pyramid, who, as seen earlier, are more vulnerable to economic cycles, thereby amplifying wage inequality. Studies for OECD countries also highlight the important contractionary effect of tax-based episodes (Alesina et al., 2019; Alesina et al., 2015; Alesina and Ardagna, 2010; Guajardo et al., 2014; Yang et al., 2015).

2.4.2.3 The Functional Inequality Channel

In this section, we present the results of Exercise 7: the impact of fiscal consolidation episodes on the labor share in income. Figure 2.10 depicts the cumulative responses of the labor share in income to an austerity shock of 1% of GDP. Table 2.9 presents the coefficients of the cumulative response function. The findings consistently point towards a reduction in the income share allocated to wage earners as a consequence of fiscal consolidation measures. They align with the studies by Ball et al. (2013), Furceri et al. (2016), and Klein and Winkler (2019), who also found significant and long-lasting results.

Following the second and third years after the shock, the labor share in income experiences a reduction of 0.55% (0.336 ppt.) and 0.816% (0.5 ppt.)[22][23]. These results are robust to changes in the specification of the model, as shown in Section 2.5. Our findings reveal a decrease of 0.5 percentage points in the labor share as a consequence of austerity measures. This outcome closely aligns with the findings of Klein and Winkler (2019) and Ball et al. (2013) -see a comparison in Table 2.10.

[22] Impacts are calculated in percentage points (ppt.) based on the average labor share of the sample: 0.6090806

[23] Although in the medium term, the response of the labor share is not statistically significant, in Section 2.4.3 we show that only spending-based shocks exhibit a significant influence on the labor share. This impact is also significant in the medium run.

Study	Medium-run impact
Ball et al. (2013)	-0.8 ppt. (after 3 years) and about -0.5 ppt. (after 4 years)
Klein and Winkler (2019)	About 0.5 ppt. (after 4 years) (increase in capital share)
This study	-0.816% (-0.5 ppt.) (after 3 years)

Table 2.10 - Impacts of fiscal austerity on the labor share - Comparison with the literature
Source: Author's elaboration.

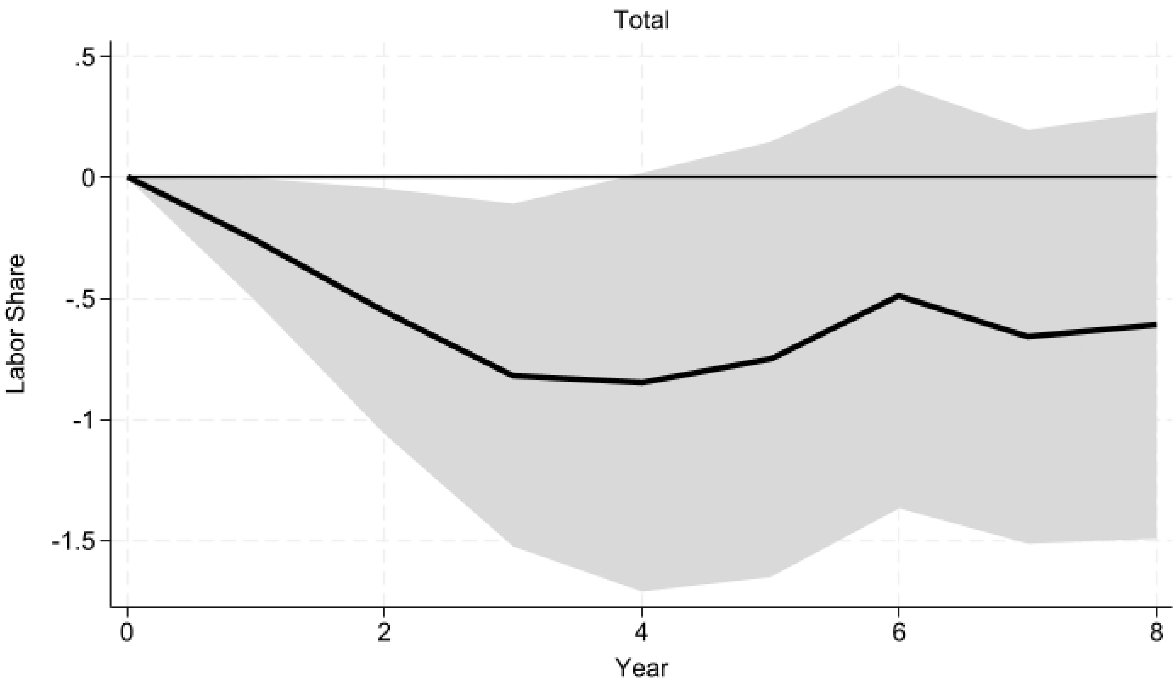

Figure 2.10: Cumulative Response of Labor Share in Income (change in %) to a fiscal consolidation of 1% of GDP

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%. "Total" corresponds to all shocks.

The first possible explanation can be related to direct cuts in wages. Consolidation programs often include measures that entail wage cuts in the public sector. This mechanism operates through two distinct effects: i) the direct effect: these wage cuts, resulting from spending-based measures, directly impact the functional distribution of income. Specifically, they lead to a reduction in the labor share of income; ii) the indirect effect: government employees' compensation generates significantly positive multipliers, as observed in OECD countries by Konstantinou and Partheniou (2021). As fiscal multipliers are relevant (Cardoso et al., 2023; Gechert, 2015; Deleidi et al., 2019; Ilzetzki et al., 2013), especially in recessions (Auerbach and Gorodninchenko, 2012; Baum et al., 2012; Gechert and Rannenberg, 2014), contractionary fiscal policies indirectly affect aggregate demand negatively, which, in turn, diminishes the labor share in income. This is due to the impact on workers' bargaining power, as suggested by the empirical literature on the Goodwin cycle.

Empirical studies on the Goodwin cycle have identified evidence supporting the coexistence of profit-led and profit-squeeze regimes in OECD countries, with a particular emphasis on the United States post-World War II (e.g., Taylor, 2004; Barbosa Filho and Taylor, 2006; Diallo et al., 2011; Kiefer and Rada, 2015; Proaño et al., 2006; Carvalho and Rezai, 2015; Barrales-Ruiz and Von Arnim, 2021; Basu and Gautham, 2019; Barrales-Ruiz et al., 2021; Rolim, 2019; Skott and Zipperer, 2010; Mendieta-Muñoz et al., 2022; Vechsuruck, 2017; Basu et al., 2013; Nikiforos and Foley, 2012; Tavani et al., 2011; Marques and Lima, 2022; Chen and Flaschel, 2006; Flaschel and Krolzig, 2006).

The profit squeeze effect signifies that the labor share increases as aggregate demand rises. This observation underscores the significance of labor bargaining mechanisms when aggregate demand expands, as workers can secure real-term gains. In other words, their wages increase at a faster rate than their productivity, contributing to an increase in the wage share of total income (Barbosa Filho and Taylor, 2006). Consequently, according to this literature, contractionary demand shocks, such as fiscal shocks, tend to undermine workers' bargaining power and reduce their income share.

Similar to the explanations for wage inequality in Section 2.4.2.2, the adverse impact of austerity measures on the labor share can also be attributed to the unemployment channel. Austerity measures, by dampening aggregate demand (Blanchard and Leigh, 2014; Guajardo et al., 2014; Heimberger, 2017), tend to elevate unemployment rates (Ball et al., 2013; Klein and Winkler, 2019; Woo et al., 2013). This disproportionately affects lower-income workers, thereby exacerbating the inequality between labor and capital.

Another potential explanation for the significant impact on the functional inequality channel in response to fiscal shocks lies in the implementation of austerity measures, particularly those centered on reducing expenditures. These measures diminish the "social wage" by curtailing the availability of public services, including access to public education and healthcare (Setterfield and Kim, 2020). The erosion of the social wage can significantly undermine workers' bargaining power, leading to an increase in their cost of job loss for a given level of employment. Importantly, this reduced bargaining effect is not solely correlated with the employment rate.

The "lower social wage effect" can also incentivize workers to borrow and accumulate debt (Setterfield and Kim, 2020), further amplifying their job loss cost and eroding their bargaining power. This is especially true for those who depend on income from the labor market to service their debt. Consequently, this process exacerbates inequality and job insecurity, creating a self-reinforcing cycle (Kim et al., 2019). The process of indebtedness, on its own, also exacerbates functional inequality, as it redistributes income to capitalists over the long term through interest payments (Dutt, 2006).

2.4.2.4 Comparing the Channels

Referring to Equations 2.2 and 2.3, we have created two tables for a comprehensive analysis. Table 2.11 illustrates the short-term effects of austerity measures on various types of inequality. We have converted the impulse-response data from percentages (%) to percentage points (ppt), in order to interpret the results using the Gini decomposition formula. However, we also display in parenthesis the % result. In constructing Table 2.11, we have focused on the peak response of each variable within the initial three years following the shock, all of which are observed in year 3. Table 2.12 holds a similar interpretation but is constructed for the medium run. As the peak responses in the medium run do not occur in the same year, we indicate by "t" the time it happens. In both Tables, we also display the statistical significance of each channel.

In the short run (first three years), we observe that the impact of austerity on market income inequality is more pronounced compared to its effect on disposable income inequality. While the latter does not exhibit a statistically significant response in the initial three

	Short run impact
Effect on disposable income inequality (Total / Overall effect)	not statistically significant
Effect on market income inequality	0.137** (0.292%)
Effect on wage inequality	0.554*** (1.385%)
Effect on functional inequality	0.497* (0.816%)

Table 2.11 - Summary of the results - peak response in the short run (year 3), in percentage points
Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

years, the former shows a positive and significant response at the 5% level. This outcome aligns with our evaluation of the redistributive channel outlined in Section 2.4.2.1: given that market income inequality responds more robustly than disposable income inequality in the short term, both the automatic stabilizer and the social safety net may play pivotal roles in preventing an overall increase in (disposable income) inequality.

In the short term, wage and functional inequalities show similar responses, with positive and statistically significant coefficients. To summarize, in the short run, all three analyzed channels are significant: both the wage and functional channels are similar and relevant, and the overall impact on inequality (specifically, disposable income inequality) is mitigated by the redistributive channel.

In the medium term, the responses of disposable and market income inequalities align, suggesting that changes in disposable income inequality are primarily driven by shifts in market income inequality (Ciminelli et al., 2019). As we estimated, the response of the difference between market and disposable income inequalities is not statistically significant in the medium run. This implies that the redistributive channel lacks statistical significance. For instance, automatic stabilizers and the social safety net work to dampen the response of disposable income inequality, while the austerity shock itself tends to amplify the response of disposable income inequality. With both disposable and market income inequalities exhibiting similar responses, these opposing forces offset each other in the redistributive channel, resulting in disposable income inequality being predominantly influenced by changes in market income inequality. Furthermore, with the functional inequality channel losing statistical significance in the medium term at the 10% level, wage inequality emerges as the primary driver of inequality changes in this context.

	Medium run impact
Effect on disposable income inequality (Total / Overall effect)	0.204* (0.703%) (t=9)
Effect on market income inequality	0.227*** (0.486%) (t=8)
Effect on wage inequality	0.635*** (1.588%) (t=6)
Effect on functional inequality	not statistically significant

Table 2.12 - Summary of the results - peak response in the medium run (indicated by t), in percentage points
Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Finally, the market income inequality responds less to austerity shocks than the wage and functional inequality channels combined in both short and medium runs. As market income inequality exhibits a smaller response compared to wage and functional inequality channels, we can infer, using Equation 2.2[24], that the impact of austerity on non-labor income inequality might be equalizing in both the short and medium run. However, it is important to note that this is an inference based on the Gini decomposition from Lerman and Yitzhaki (1985) (following Equation 2.2), as we do not directly estimate the impact on non-labor inequality.

In the short run, we estimated the labor share decreases due to an austerity shock. This shift in income composition benefits high-income households, mainly those who receive capital income, and it may contribute to a reduction in inequality within the domain of non-labor income sources. For example, austerity measures tend to impact households that are more susceptible to economic fluctuations, especially those at the lower end of the income spectrum who heavily depend on wages and informal job earnings. In contrast, wealthier households at the top of the income ladder, who predominantly receive capital income, are less affected by these measures. These channels are also suggested by Cardoso and Carvalho (2023) and Klein and Winkler (2019).

[24] According to Equation 2.2: a change in the market income inequality can be decomposed into: a change in the functional inequality, a change in the labor income (wage) inequality and a change in the non-labor income inequality. If the increase in the market income inequality is smaller than the increase in the functional and wage inequalities combined, then we can infer there is a decrease in the non-labor inequality.

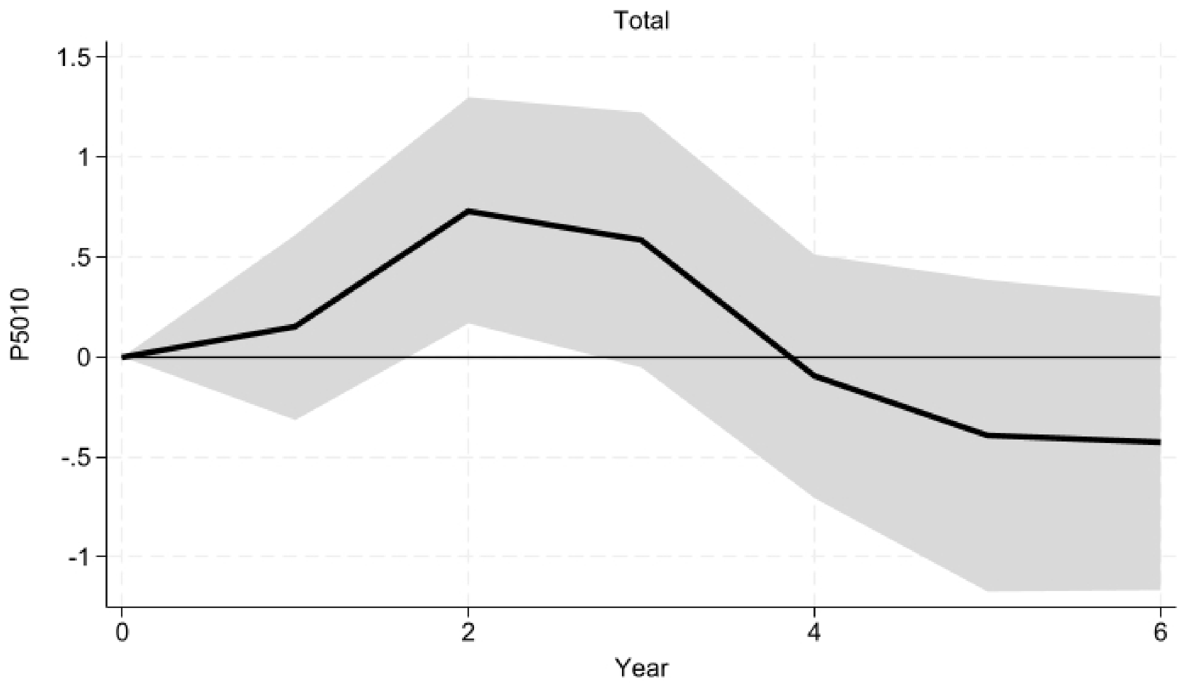

Figure 2.11: Cumulative Response of the Percentile Ratio (50/10) of Gross Earnings (change in %) to a fiscal consolidation of 1% of GDP

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%. "Total" corresponds to all shocks.

2.4.2.5 The Employment Channel

We expand our analysis to encompass not only gross wage inequality but also gross earnings inequality. Given that earnings result from the multiplication of wages by hours worked, evaluating earnings inequality provides insight into the employment aspect in addition to wages. Estimating Exercises 4, 5, and 6 allows us to gain a deeper understanding of the employment channel through which austerity impacts inequality.

Figure 2.11 presents the cumulative estimated response of earnings inequality considering the percentile ratio 50/10 to a fiscal consolidation shock of 1% of GDP (Exercise 4). Table 2.13 outlines the coefficients for the cumulative estimated response illustrated in Figure 2.11. According to our findings, consolidation fiscal episodes affect the gross earnings inequality within the middle-to-bottom segment of the distribution significantly in the short run. Specifically, after two years, the percentile ratio 50/10 experiences a rise of 0.73%. Section 2.5 demonstrates results barely change for different specifications of the model.

In Table 2.13, we present the outcomes for the 90/50 percentile ratio. In contrast to

Ratio/ year	1	2	3	4	5	6	7	8
50/10	0.148	0.733**	0.585	-0.0974	-0.394	-0.431	-	-
90/50	- 0.522**	-0.559**	-0.456	-0.0910	0.0590	-0.151	-0.0938	0.125
90/10	-0.297	-0.130	-0.125	0.280	1.094*	0.834**	0.984**	0.874*

Table 2.13 - Impacts on the Percentile Ratios (50/10, 90/50, 90/10) of Gross Earnings (%) (following a fiscal adjustment episode of 1% of GDP)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

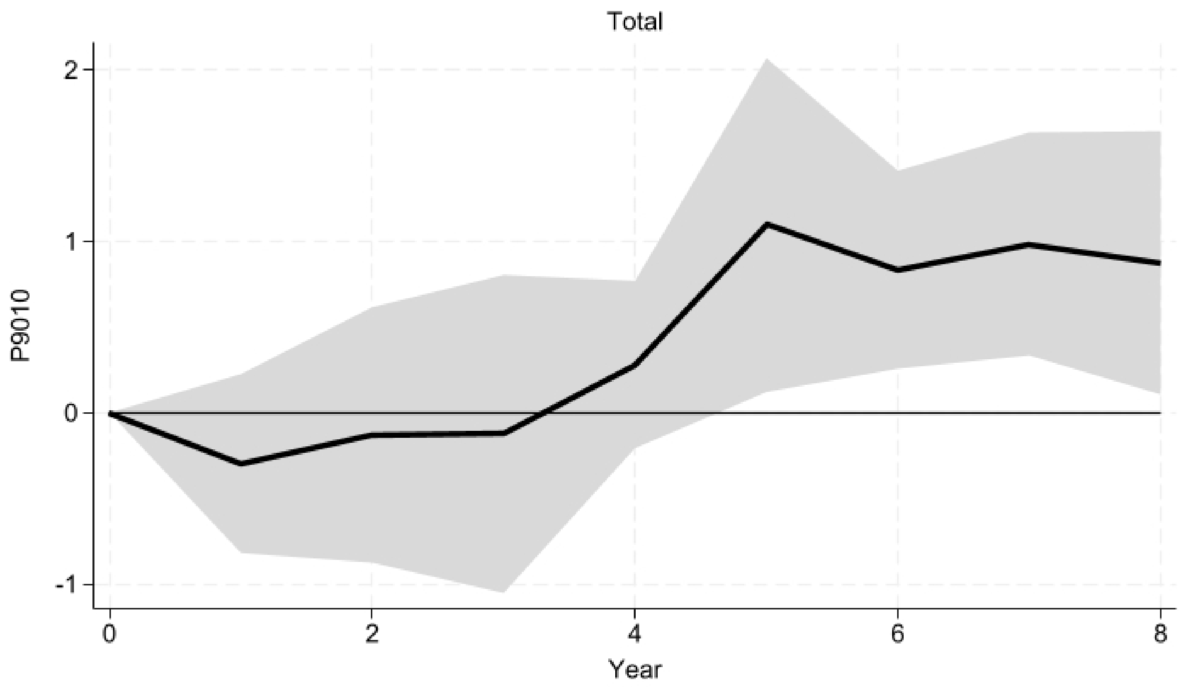

Figure 2.12: Cumulative Response of the Percentile Ratio (90/10) of Gross Earnings (change in %) to a fiscal consolidation of 1% of GDP

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%. "Total" corresponds to all shocks.

the patterns observed in all other analyses, this specific examination indicates a decrease in gross earnings inequality between the top and middle-income segments. However, as detailed in Section 2.5 (Figures 2.40 and 2.41), we demonstrate that this result lacks robustness, becoming statistically non-significant when the model is altered. Due to the fragility of this finding, we choose not to emphasize it, and consequently, we do not display the impulse response function here. In the medium run, the response is not statistically different from zero.

Finally, Table 2.13 presents the coefficients for the cumulative estimated response illustrated in Figure 2.12: the cumulative response of the percentile ratio 90/10 of gross earnings. As observed in the percentile ratio 50/10 exercise, earnings inequality responds positively to fiscal shocks. This effect is statistically significant only in the medium run: the earnings inequality within the top and the bottom of the distribution increases by 1.094% and 0.984% after five and seven years, respectively. Section 2.5 also shows the results are robust.

The results in this subsection reveal a negative impact on the lower end of the earnings distribution, which aligns with the research of Bernstein and Bentele (2019), Bernstein (2016a), and Bernstein (2016b). This outcome can be elucidated by the literature indicating that individuals at the bottom of the earnings spectrum are more susceptible to variations in the employment rate and, as a result, are disproportionately affected by unemployment (as observed in studies by Hoover et al., 2009, Maestri and Roventini, 2012, Hoynes et al., 2012, and Hoynes, 1999). Our findings also can be explained by the literature suggesting that earnings inequality exhibits a strong countercyclical pattern, as evidenced by Krueger et al. (2010), Heathcote et al. (2010), Heathcote et al. (2020), Bonhomme and Hospido (2016), Alessandrini et al. (2016), Bowlus et al. (2022), and Guvenen et al. (2022). Interestingly, the significance of austerity measures on earnings inequality emerges when considering the lower end of the income distribution, given that the percentile ratio 90/50 does not exhibit a statistically significant increase.

The employment channel has also been examined in prior studies by Ball et al. (2013), Woo et al. (2013), Castro (2018), and Klein and Winkler (2019). While these studies do not specifically delve into the impact of austerity on earnings inequality, they offer relevant insights. Ball et al. (2013), for instance, estimate an increase of more than 0.4 ppt. in the long-term unemployment rate four years after the shock, while Woo et al. (2013)

project a substantial impact of 1.5 percentage points after five years. Klein and Winkler (2019) estimate that employment fall by more than 1 percentage point four years after the shock (high private debt scenario). These findings can help elucidate our own observation regarding the rise in earnings inequality, especially when we consider the lower segment of the earnings distribution (which is more susceptible to unemployment) as a consequence of austerity measures.

Moreover, our results also indicate earnings inequality between the middle and the bottom increases in the short term, while earnings inequality between the top and the bottom rises in the medium term. This outcome implies a greater degree of persistence in inequality between the top and the bottom compared to the inequality between the middle and the bottom.

2.4.3 Extension: Spending- and Tax-based Shocks

In this section, we estimate the impacts of austerity on inequality, disaggregating two types of shocks: spending and tax-based episodes. We estimated Exercises 1-7 and Equation 2.4 separately for spending- and tax-based shocks, following Heimberger (2020) and Cardoso and Carvalho (2023). Tables 2.14 and 2.15, and Figures 2.13 and 2.14 present the results for disposable income and market income inequalities.

When analyzing the response of disposable inequality, we notice shocks related to spending have a more pronounced impact on inequality, particularly in the medium term, with the Gini index experiencing a rise of 1.146% (0.332 ppt.) nine years following the shock. Conversely, tax-based measures show a significant impact in the short run, resulting in a 0.697% (0.202 ppt.) increase in the inequality index four years after the shock.

This result is in line with the literature. Shocks stemming from reductions in spending have a more pronounced effect on inequality in terms of magnitude than tax-based ones (Woo et al., 2013; Schaltegger and Weder, 2014; Agnello and Sousa, 2014; Furceri et al., 2016; Agnello et al., 2016; Klein and Winkler, 2019; Heimberger, 2020; Castro, 2018). Spending-based measures also exhibit greater persistence, as evidenced by their peak response nine years after the shock, as depicted in Figure 2.13. In contrast, the effect of tax-based measures is more short-lived.

In Table 2.16, we present a comparison with the literature concerning spending-based shocks. Our analysis reveals a medium-term impact of 1.146% (or 0.332 percentage points).

This is consistent with findings by Woo et al. (2013), Furceri et al. (2016), and Heimberger (2020), who reported impacts of 1.5%, 1.05%, and 0.4 percentage points, respectively. Table 2.17 displays our findings for tax-based shocks, which indicate a medium-term effect of 0.645% (or 0.187 percentage points) on disposable income inequality. These results are in line with the findings of Furceri et al. (2016) and Heimberger (2020), who reported similar effects of 0.13% and 0.3 percentage points, respectively.

Effect/year	1	2	3	4	5	6	7	8	9
Spending-based	0.227	0.306	0.594	0.721	0.614	0.603	0.661	1.023**	1.146**
Tax-based	0.0411	0.230	0.462*	0.697**	0.645*	0.648	0.567	0.401	0.600

Table 2.14 - Impacts on the Disposable Income Inequality (%) (following a fiscal adjustment episode of 1% of GDP)
Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Effect/year	1	2	3	4	5	6	7	8
Spending-based	0.117	0.315	0.454**	0.410*	0.455	0.493	0.499	0.691**
Tax-based	0.128	0.229**	0.242*	0.411**	0.596*	0.684*	0.652	0.495

Table 2.15 - Impacts on the Market Income Inequality (%) (following a fiscal adjustment episode of 1% of GDP)
Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Study	Medium-run impact
Ball et al. (2013)	0.9 ppt. (after 8 years)
Woo et al. (2013)	1.5% (after 5 years)
Furceri et al. (2016)	1.05% (after 8 years)
Heimberger (2020)	0.4 ppt. (after 5 years)
This study	1.146% (0.332 ppt.) (after 9 years)

Table 2.16 - Medium-run impacts of fiscal austerity on disposable income inequality (spending-based shocks) - Comparison with the literature

Source: Author's elaboration.

We also find that the impacts are similar when it comes to the market income inequality exercise (Table 2.15, Figure 2.14), but spending-based shocks still show a more pronounced magnitude as well as a more persistent effect (note the significant peak response in the eighth year) - as in the case of the disposable income inequality. Also, as will be shown in Section 2.5, the short-run impact of tax-based measures on market income inequality is not robust when we include control variables (see Figure 2.26).

Figure 2.15 shows the response of the redistributive measure to each type of shock. In the short term, spanning the first three years, we observe a notable increase in the redistributive effect in the case of spending-based measures, which becomes statistically significant at the 10% level in the second year. This outcome implies that disposable income inequality exhibits a less pronounced response to austerity measures compared to market income inequality in the short term. This result is not statistically significant for tax-based measures. Our findings are in line with our interpretation in Sections 2.4.2.1 and 2.4.2.4. In the short term, market income inequality shows a more vigorous response compared to disposable income inequality after a spending-based measure: both the automatic stabilizer and the social safety net can play pivotal roles in averting a general increase in disposable income inequality.

Table 2.18 shows the disaggregated results for wage inequality. For tax-based results, Appendix I shows the results are not robust to changes in the specification of the model. However, the impact in the fourth year is still statistically significant at 10% using the alternative model[25]. See Section 2.5 for more details. For spending-based shocks, the

[25] Also, when we use an interval considering one standard deviation band, as usual in the literature

Study	Medium-run impact
Ball et al. (2013)	0.9 ppt. (after 8 years)
Woo et al. (2013)	no effect
Furceri et al. (2016)	0.13% (after 8 years)
Heimberger (2020)	0.3 ppt. (after 5 years)
This study	0.645% (0.187 ppt.) (after 5 years)

Table 2.17 - Medium-run impacts of fiscal austerity on disposable income inequality (tax-based shocks) - Comparison with the literature

Source: Author's elaboration.

Effect/year	1	2	3	4	5	6	7	8
Spending-based	0.753***	1.429***	1.762***	1.320***	1.438**	1.110*	0.887	0.271
Tax-based	0.813*	0.778	1.841***	2.101**	2.217**	3.383**	3.534***	3.678**

Table 2.18 - Impacts on the Gross Wage Inequality (%) (following a fiscal adjustment episode of 1% of GDP)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

inequality measure increases by 1.438% (0.57 ppt.) and 1.762% (0.705 ppt.) after five and three years. Figure 2.16 displays the cumulative response of wage inequality.

Furthermore, only spending-based measures exhibit a significant influence on the labor share (Table 2.19, Figure 2.17), which is in line with Ball et al. (2013) and Furceri et al. (2016). Following the third and fourth years after the shock, the labor share in income experiences a reduction of 1.361% (0.829 ppt.) and 1.5% (0.91 ppt.). This impact remains statistically significant in the medium term as well, with the workers' share in income decreasing by 1.546% (0.94 ppt.) seven years after a spending-based fiscal shock.

Tables 2.20 and 2.21 display the results for the percentile ratios (50/10 and 90/10, respectively). Figures 2.18 and 2.19 illustrate their respective cumulative responses. Overall, the more notable effect of spending-based shocks is once again emphasized[26]. In summary, our findings in this section suggest the results for spending-based shocks are, in general, more relevant, as well as more robust to changes.

(Cardoso and Carvalho, 2023), the impact for years 3, 4 and 6 is still significant (see Figure I.9)

[26] Appendix I shows that the tax-based shocks have a statistically significant effect on the 90/10 ratio in the medium run when we use an alternative definition of the shocks. See Section 2.5 for more details.

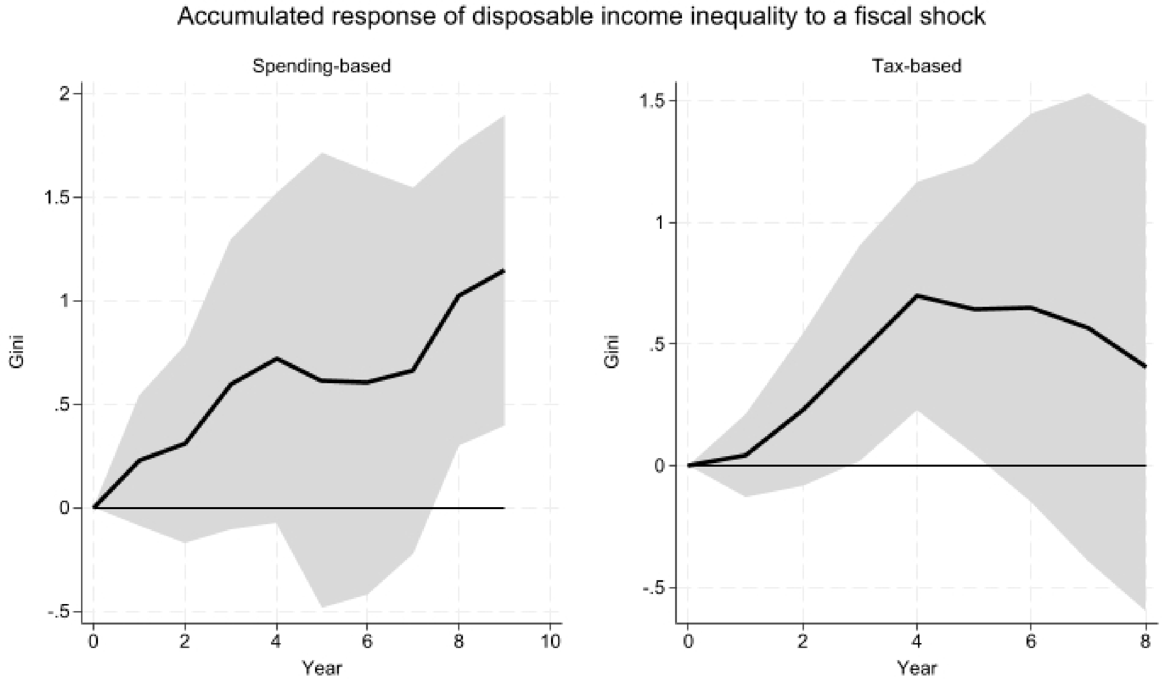

Figure 2.13: Cumulative Response of Disposable Income Inequality (change in %) to a fiscal consolidation of 1% of GDP - Two types of fiscal shock (spending-based and tax-based)

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%. "Spending-based" corresponds to shocks in spending; "Tax-based" corresponds to shocks in taxes.

Effect/year	1	2	3	4	5	6	7	8
Spending-based	-0.466**	-0.999**	-1.361**	-1.501**	-1.511*	-1.382*	-1.546*	-1.321
Tax-based	-0.176	-0.319	-0.617	-0.469	-0.195	0.574	0.301	0.0799

Table 2.19 - Impacts on the Labor Share in Income (%) (following a fiscal adjustment episode of 1% of GDP)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Effect/year	1	2	3	4	5	6
Spending-based	0.420	0.836***	1.071**	-0.317	-0.400	-0.654
Tax-based	0.0332	0.768	0.0757	-0.455	-1.225	-1.206

Table 2.20 - Impacts on the Percentile Ratio (50/10) of Gross Earnings (%) (following a fiscal adjustment episode of 1% of GDP)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

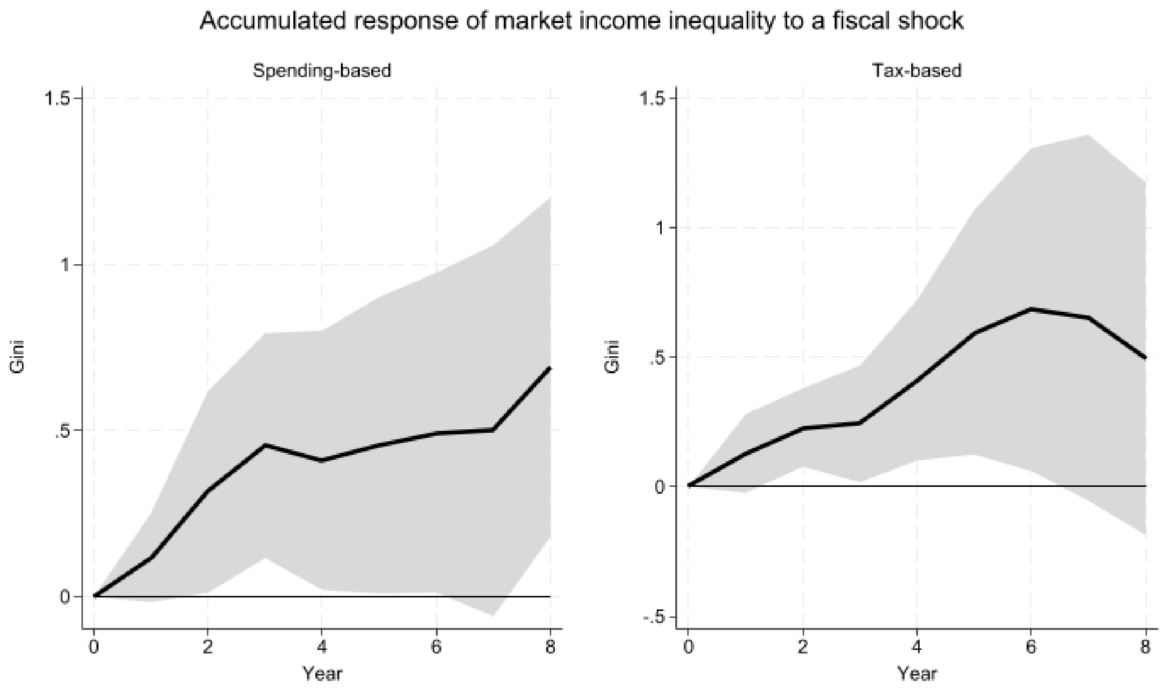

Figure 2.14: Cumulative Response of Market Income Inequality (change in %) to a fiscal consolidation of 1% of GDP - Two types of fiscal shock (spending-based and tax-based)

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%. "Spending-based" corresponds to shocks in spending; "Tax-based" corresponds to shocks in taxes.

Effect/year	1	2	3	4	5	6	7	8
Spending-based	-0.108	0.252	0.339	0.604*	1.929***	1.143***	1.293***	0.875*
Tax-based	-0.822	-0.979	-1.137	-0.149	0.469	0.349	0.529	1.029

Table 2.21 - Impacts on the Percentile Ratio (90/10) of Gross Earnings (%) (following a fiscal adjustment episode of 1% of GDP)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

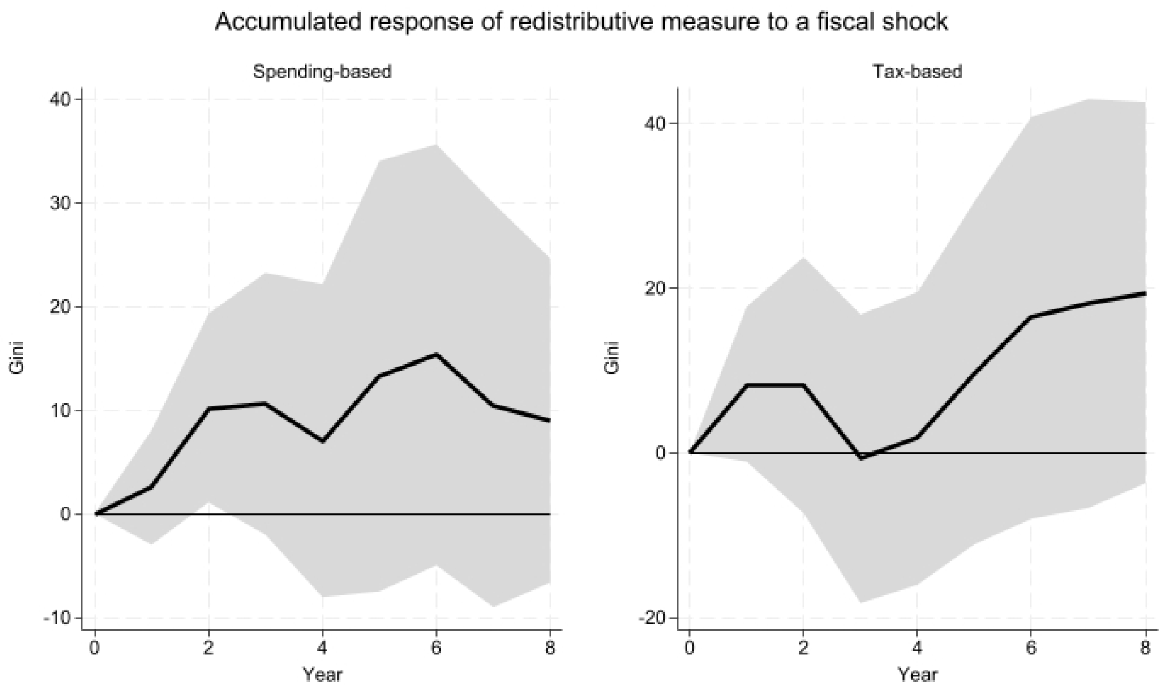

Figure 2.15: Cumulative Response of the Redistribution Measure (change in %) to a fiscal consolidation of 1% of GDP - Two types of fiscal shock (spending-based and tax-based)

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%. "Spending-based" corresponds to shocks in spending; "Tax-based" corresponds to shocks in taxes.

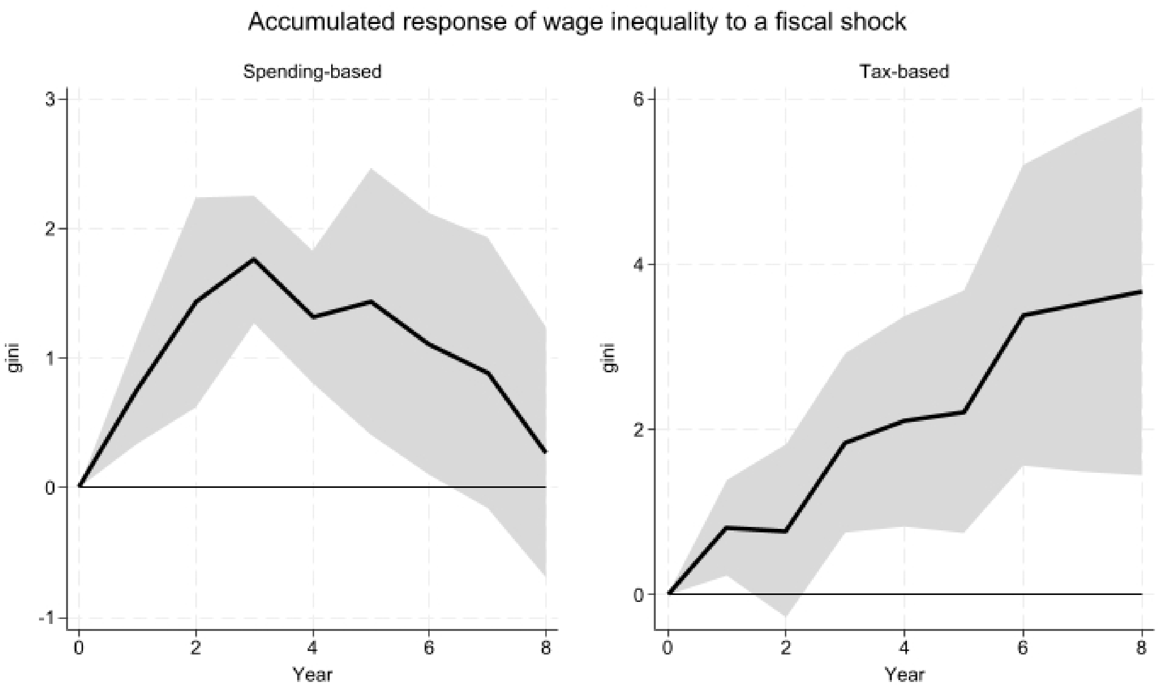

Figure 2.16: Cumulative Response of Gross Wage Inequality (change in %) to a fiscal consolidation of 1% of GDP - Two types of fiscal shock (spending-based and tax-based)

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%. "Spending-based" corresponds to shocks in spending; "Tax-based" corresponds to shocks in taxes.

Figure 2.17: Cumulative Response of the Labor Share (change in %) to a fiscal consolidation of 1% of GDP - Two types of fiscal shock (spending-based and tax-based)

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%. "Spending-based" corresponds to shocks in spending; "Tax-based" corresponds to shocks in taxes.

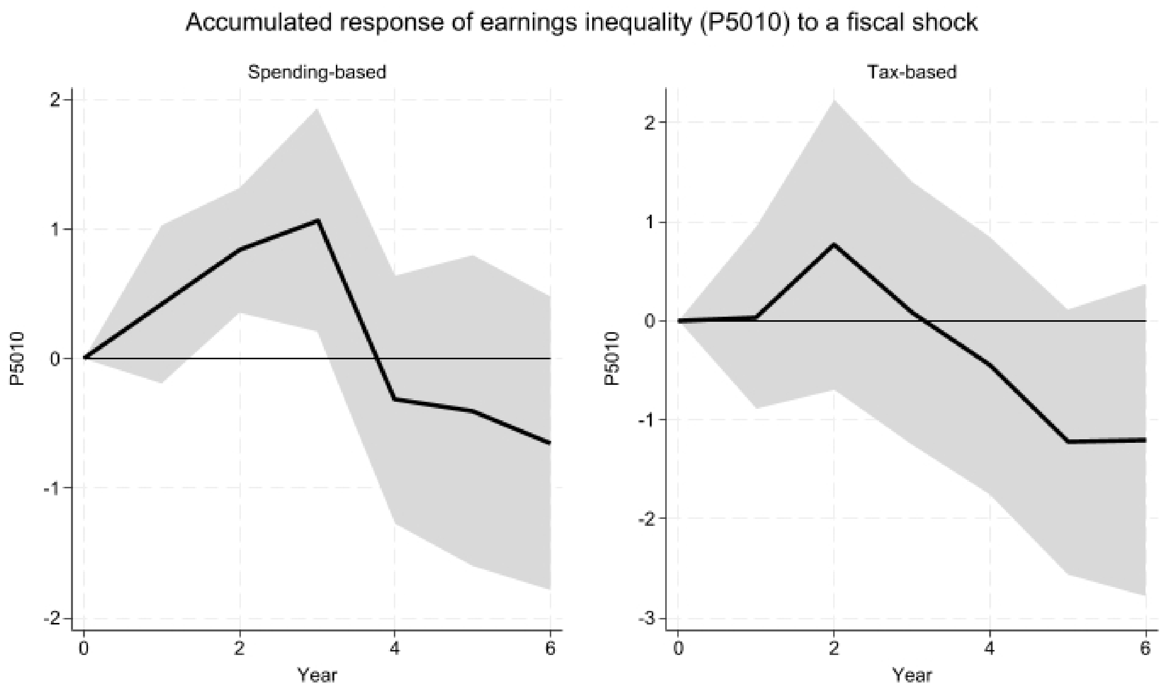

Figure 2.18: Cumulative Response of the Percentile Ratio (50/10) of Gross Earnings (change in %) to a fiscal consolidation of 1% of GDP - Two types of fiscal shock (spending-based and tax-based)

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%. "Spending-based" corresponds to shocks in spending; "Tax-based" corresponds to shocks in taxes.

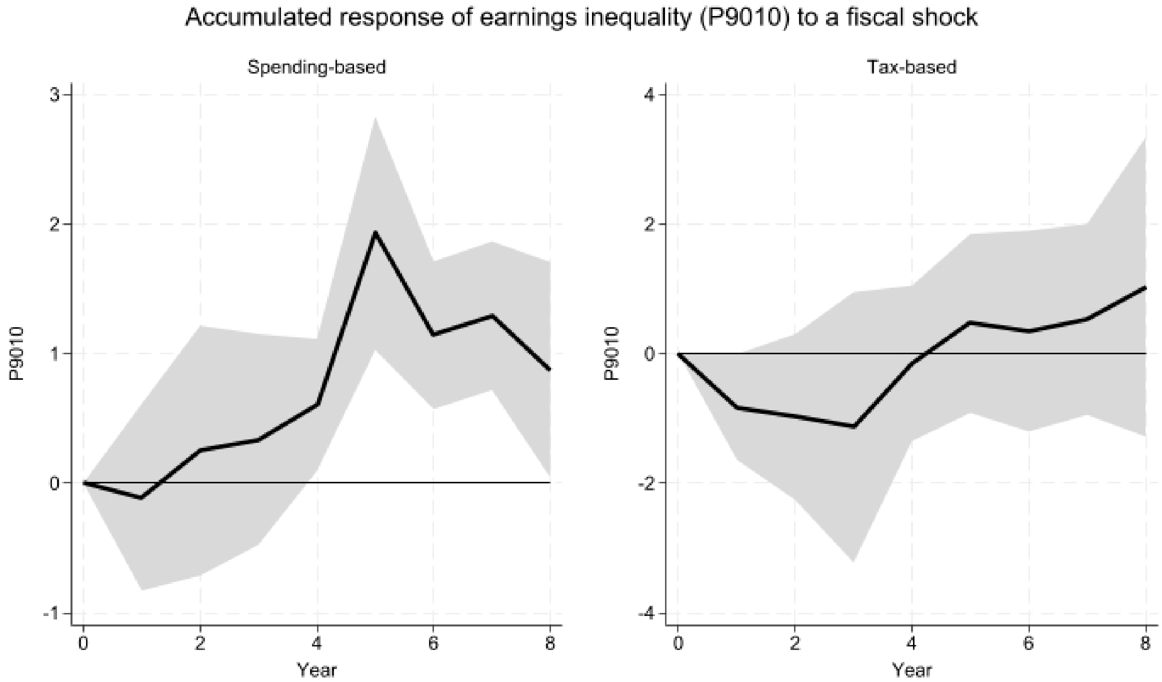

Figure 2.19: Cumulative Response of the Percentile Ratio (90/10) of Gross Earnings (change in %) to a fiscal consolidation of 1% of GDP - Two types of fiscal shock (spending-based and tax-based)

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%. "Spending-based" corresponds to shocks in spending; "Tax-based" corresponds to shocks in taxes.

2.5 Robustness checks

In order to further test the robustness of the baseline results, we conducted several additional tests. Firstly, we explored the impact of using an alternative number of lags to assess its effect on the estimated coefficients. Secondly, we examined the influence of different control variables on the outcomes. Finally, we tested the robustness of our findings by using alternative samples of countries, ensuring that the results hold across different contexts.

These robustness checks provide additional confidence in the reliability of our conclusions. We present the results considering the years in which the responses are more strong or statistically significant, in the short and medium run. For example, for disposable income inequality, the peak response for total and spending-based shocks occurs in the ninth year, while for tax-based ones, it happens in the fourth year. For market income inequality, the peak response for total and spending measures occurs in the years three and eight for the short and medium run, respectively. For tax-based episodes, it occurs in years three and six[27]. The coefficients are presented along with one standard deviation band around them.

Figures 2.20-2.23 present the alternative estimations for Exercise 1. To investigate the sensitivity of our results to the number of lags, we conducted tests by varying the number of lags of fiscal shocks (Figure 2.20). The baseline model includes two lags and is referred to as "2" in the graph. Additionally, we examined the impact of changing the number of lags of the dependent variable (Gini index) in the analysis (Figure 2.21). The baseline model includes one lag. As we can see in Figures 2.20 and 2.21, results are robust to changes in the model specification.

Figure 2.22 presents the results with different sets of control variables. We considered the variables recommended by the literature (as described in Section 2.3.1): "a": all variables (all control variables are included); "g": real GDP growth rate; "i": inflation rate; "pc": real GDP per capita (baseline); "t": trade-to-GDP (openness); "u": unemployment rate, "w": without control variables. In addition, we conducted tests with the same

[27] In some specifications, the peak response changes. For example, for the 90/10 percentile ratio exercise, when including Portugal, the peak response considered is year seven for total and spending-based shocks (instead of five in the baseline). For the wage inequality exercise, when excluding Australia, Finland, Denmark and the Netherlands together, the peak response occurs in years three (short run) and six (medium run) for spending-based shocks.

control variables but adding one lag, denoted as "al", "gl", "il", "pcl", "tl", and "ul". Figure 2.23 displays the estimations when we exclude one country from the sample. The results remained consistent across various specifications, indicating that the impact of fiscal shocks on inequality is robust and not heavily influenced by the choice of control variables or the countries included in the sample.

Figures 2.24-2.27 represent the same tests for Exercise 2. The outcomes demonstrate a consistent pattern of robust results across the majority of tests. However, Figure 2.26 stands out, revealing that the short-term (third year) impact of tax-based measures on market income inequality loses its robustness when controlling for additional variables, specifically GDP growth and per capita income level. The observed effect in Figure 2.26 is not statistically significant, indicating the need for cautious interpretation when accounting for these control variables. On the other hand, the effect of spending-based shocks is highly robust.

Figures 2.28-2.31 display the test results for Exercise 3, focusing on wage inequality. Notably, the results consistently demonstrate robustness across various test scenarios, indicating the stability of findings in the face of alterations.

Moving to Figures 2.32-2.35, we present the standard tests for Exercise 4, showcasing the baseline results for earnings inequality with a focus on the percentile ratio 50/10. These results remain robust across the tests, reaffirming the stability and reliability of our baseline findings.

Furthermore, in Figure 2.36, we present an additional test for the percentile ratio 50/10. Linear interpolation was applied to address missing data in the series (Heimberger, 2020), and the results indicate minimal changes, further underlining the stability and robustness of our findings even when accounting for data imputation.

Figures 2.37-2.41 showcase our tests focusing on earnings inequality, specifically examining the percentile ratio of 90/50 (Exercise 5). Figures 2.40 and 2.41 provide crucial insights: they reveal that the previously identified negative impact of austerity on earnings inequality (90/50) is not robust. This lack of robustness is particularly pronounced in Figure 2.41, where we employed linear interpolation to address missing data in the series. In this case, the negative impact transitions to a state of statistical non-significance. These findings suggest that the observed negative effect should be interpreted with care.

Figures 2.42-2.46 present tests for earnings inequality using the 90/10 percentile ratio (Exercise 6), while Figures 2.47-2.50 depict similar tests for the labor share exercise (Exercise 7). As evident, the baseline results remain robust across all variations.

Figures B.1-B.7 and Tables B.1-B.7 in Appendix B demonstrate high result robustness when altering the narrative shocks database. In this analysis, we utilized the prevalent database in the literature: Devries et al. (2011), for 1978-2009, and Alesina et al. (2019), for 2010-2014. In Appendix C, Figures C.1-C.7 and Tables C.1-C.7 confirm the robustness of the results using different databases: Devries et al. (2011), for 1978-2009; Alesina et al. (2015), for 2010-2013; and Gupta et al. (2017), for 2014.

We estimated Exercises 1-7 separately for spending-based and tax-based shocks following Heimberger (2020) and Cardoso and Carvalho (2023). However, concerns have arisen regarding potential bias in the results since some episodes in the database involve both spending and tax-based measures.

To address this concern, we conducted a robustness test, following the approach proposed by Heimberger (2020). In this test, we categorize measures as spending-based when the absolute magnitude of the shock exceeds that of the corresponding tax-based shock and vice versa.

The results for Exercises 1-7 and Equation 2.4 (discussed in Section 2.4.2.4) are available in Appendix I. Remarkably, these results demonstrate a high degree of robustness to this adjustment. The most notable change observed pertains to: i) the impact of tax-based shocks on wage inequality (Figure I.3). It remains statistically significant at 10% level in year 4. However, the effect in the medium run (years 7 and 8) becomes zero (considering the one standard deviation band, most used in the literature, as in Cardoso and Carvalho, 2023 - see Figure I.9); ii) the impact of tax-based shocks on the earnings inequality measured by the 90/50 measure becomes statistically significant at 10% and positive in the medium run (eighth year) (Figure I.5). However, this result is not robust when we used interpolated data; iii) the impact of tax-based shocks on the earnings inequality measured by the 90/10 measure becomes statistically significant at 5% and positive in the medium run (seventh and eighth year) (Figure I.6). This result remains statistically significant in the medium run when using interpolated data; iv) the redistributive effect lacks significance (Figure I.8). However, Figure I.10 shows that, considering the most used interval in this literature (one standard deviation band - Cardoso and Carvalho, 2023), the effect is still significant in the short term after spending-based measures.

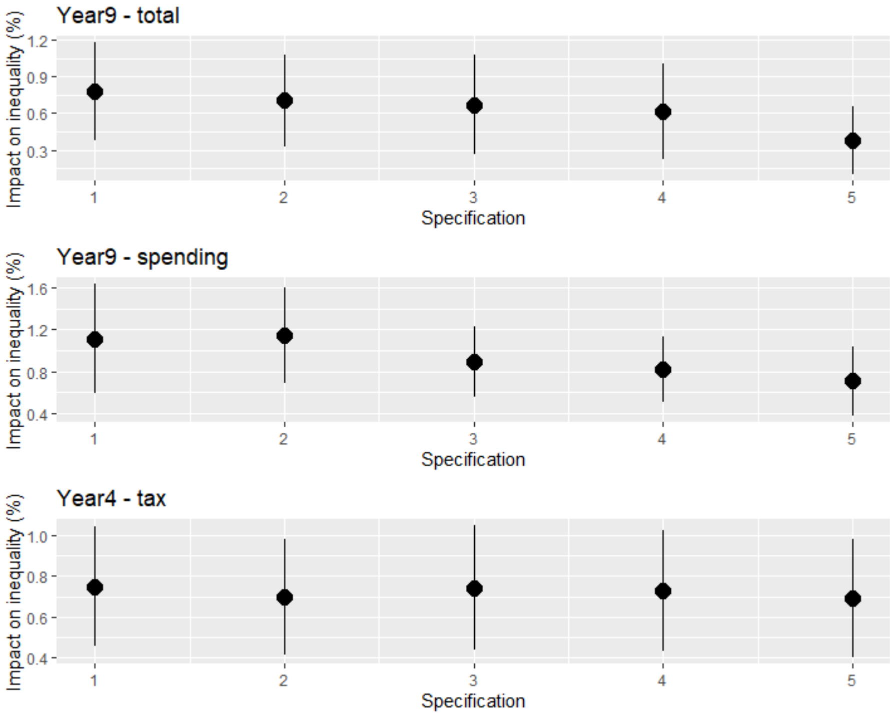

Figure 2.20: Impact of fiscal consolidation (of 1% of GDP) on the disposable income inequality - Different lags of the fiscal shock

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes two lags and refers to "2" in the graph.

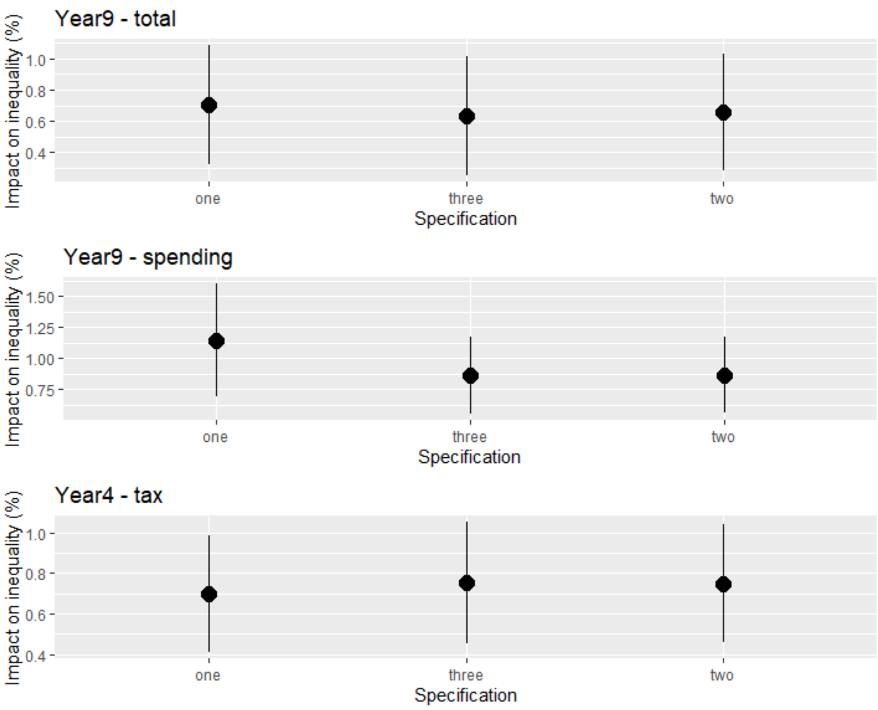

Figure 2.21: Impact of fiscal consolidation (of 1% of GDP) on the disposable income inequality - Different lags of the inequality measure

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes one lag and refers to "one" in the graph.

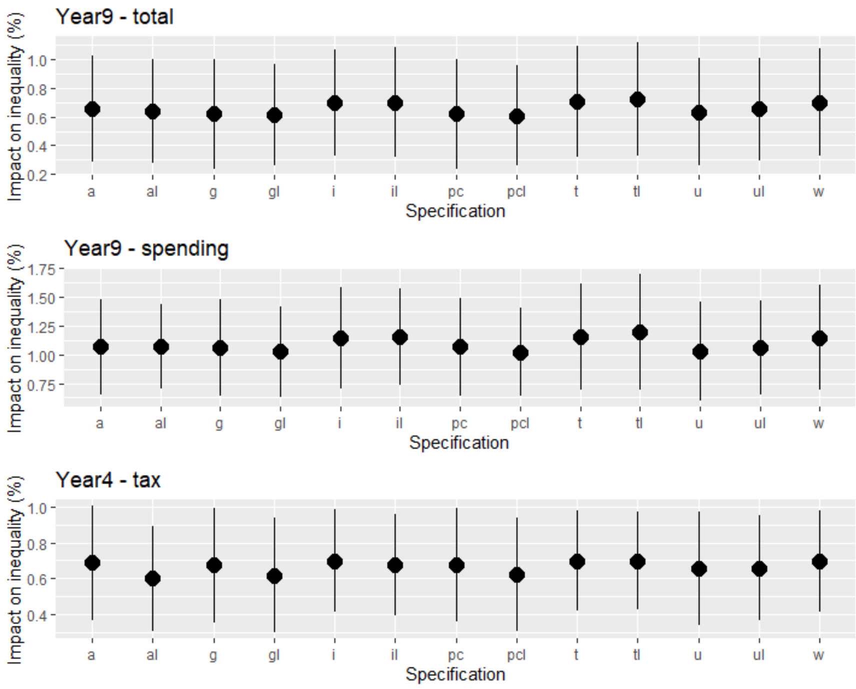

Figure 2.22: Impact of fiscal consolidation (of 1% of GDP) on the disposable income inequality - Different control variables

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "a": all variables (all control variables are included), "g": real GDP growth rate, "i": inflation rate, "pc": real GDP per capita, "t": trade-to-GDP (openness), "u": unemployment rate, "w": without control variables (baseline). "al", "gl", "il", "pcl", "tl" and "ul" control for the same variables, but adding one lag.

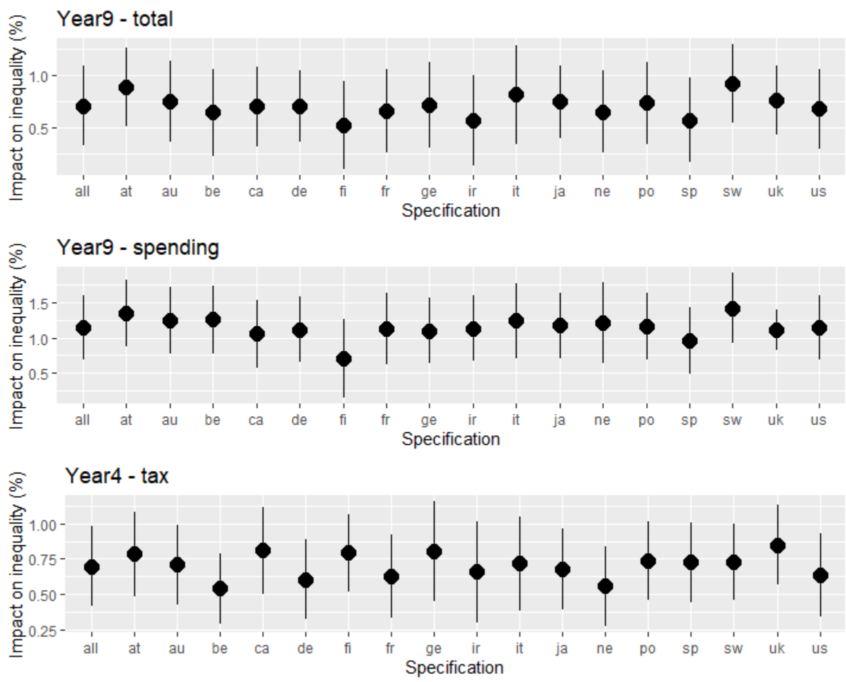

Figure 2.23: Impact of fiscal consolidation (of 1% of GDP) on the disposable income inequality - Different countries

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "all" includes all countries (baseline), "at" includes Austria, "au" excludes Australia, "be": excludes Belgica, "ca": excludes Canada, "de": excludes Denmark, "fi" excludes Finland, "fr" excludes France, "ge" excludes Germany, "ir" excludes Ireland, "ne" excludes Netherlands, "sp" includes Spain, "sw" excludes Sweden, "uk" excludes the United Kingdom, "us" excludes the United States.

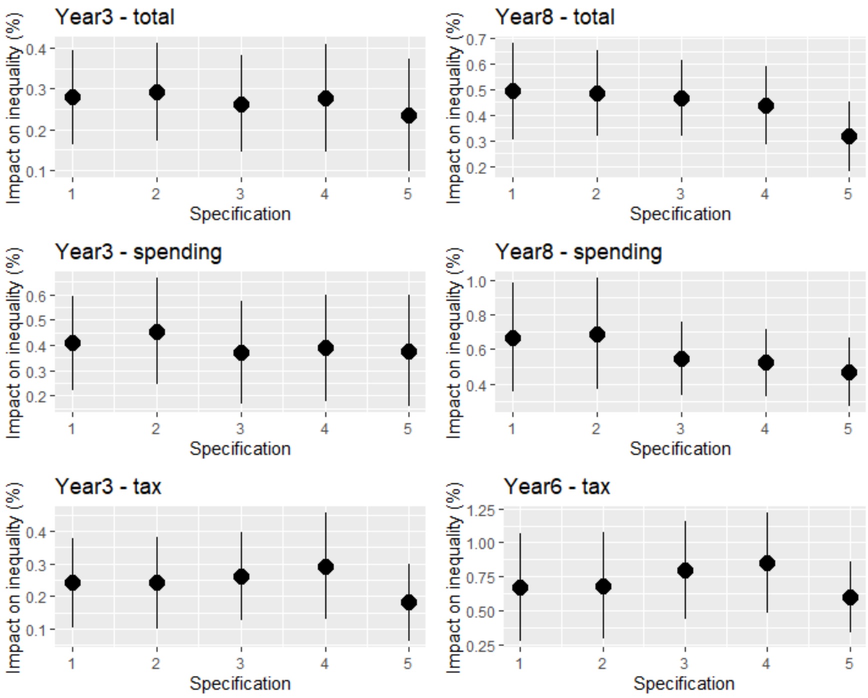

Figure 2.24: Impact of fiscal consolidation (of 1% of GDP) on the market income inequality - Different lags of the fiscal shock

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes two lags and refers to "2" in the graph.

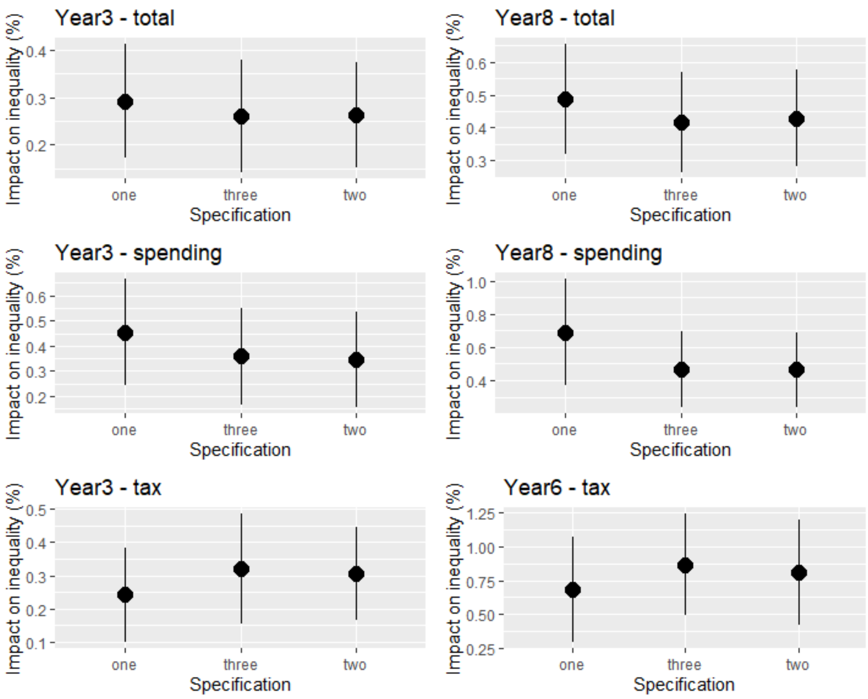

Figure 2.25: Impact of fiscal consolidation (of 1% of GDP) on the market income inequality - Different lags of the inequality measure

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes one lag and refers to "one" in the graph.

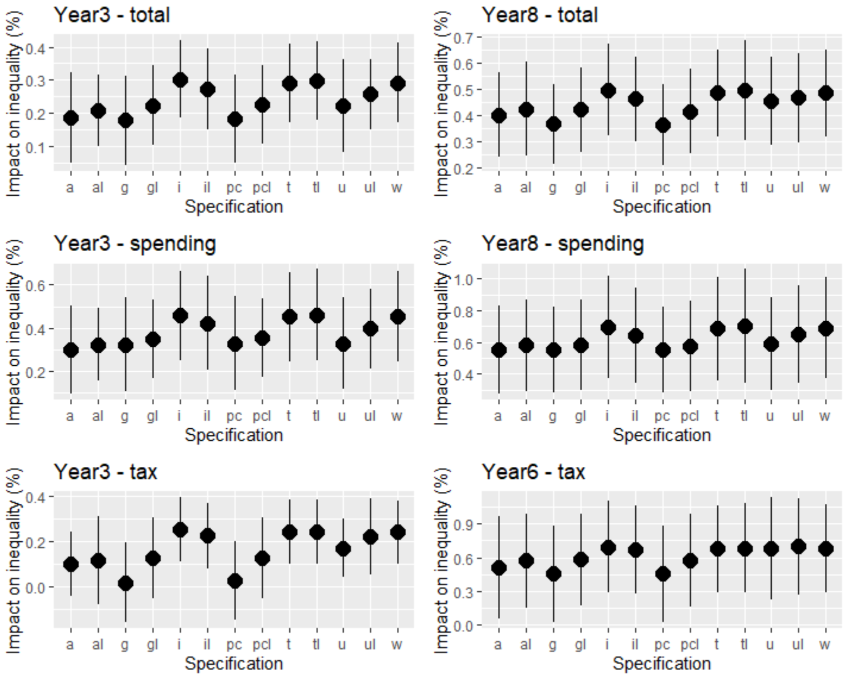

Figure 2.26: Impact of fiscal consolidation (of 1% of GDP) on the market income inequality - Different control variables

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "a": all variables (all control variables are included), "g": real GDP growth rate, "i": inflation rate, "pc": real GDP per capita, "t": trade-to-GDP (openness), "u": unemployment rate, "w": without control variables (baseline). "al", "gl", "il", "pcl", "tl" and "ul" control for the same variables, but adding one lag.

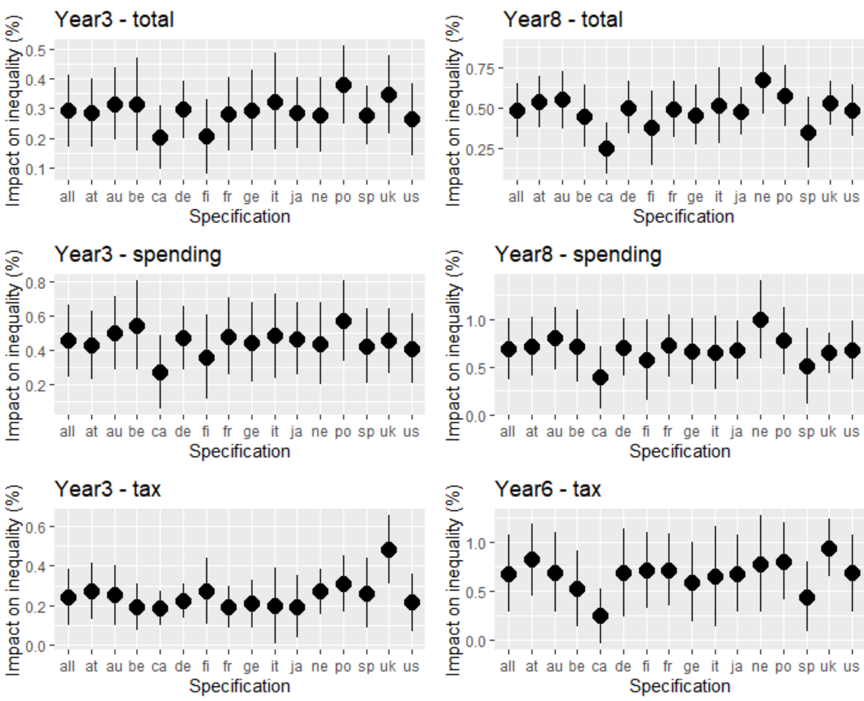

Figure 2.27: Impact of fiscal consolidation (of 1% of GDP) on the market income inequality - Different countries

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "all" includes all countries (baseline), "at" includes Austria, "au" excludes Australia, "be": excludes Belgica, "ca": excludes Canada, "de": excludes Denmark, "fi" excludes Finland, "fr" excludes France, "ge" excludes Germany, "ne" excludes Netherlands, "sp" includes Spain, "uk" excludes the United Kingdom, "us" excludes the United States.

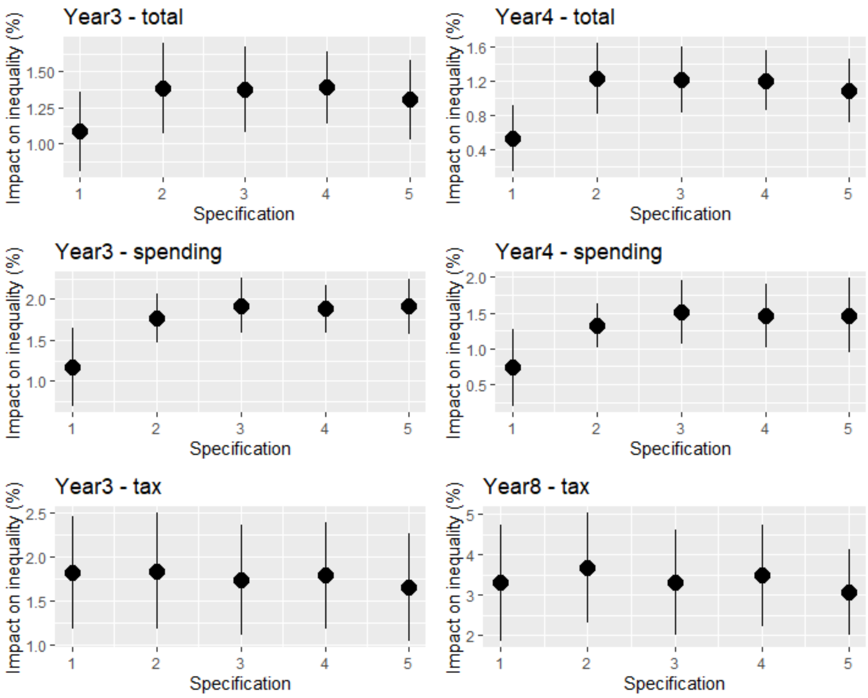

Figure 2.28: Impact of fiscal consolidation (of 1% of GDP) on gross wage inequality - Different lags of the fiscal shock

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes two lags and refers to "2" in the graph.

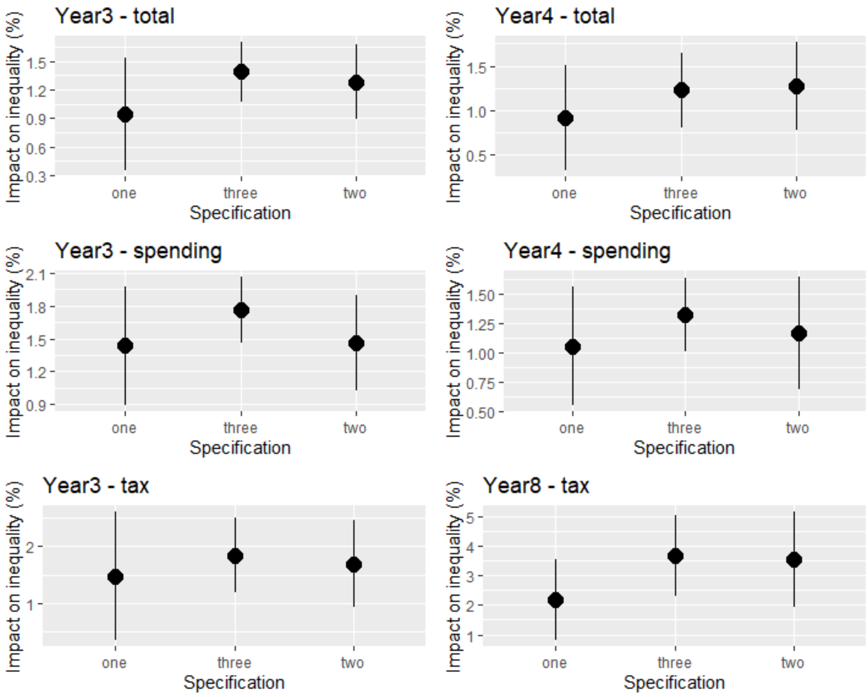

Figure 2.29: Impact of fiscal consolidation (of 1% of GDP) on gross wage inequality - Different lags of the inequality measure

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes three lags and refers to "three" in the graph.

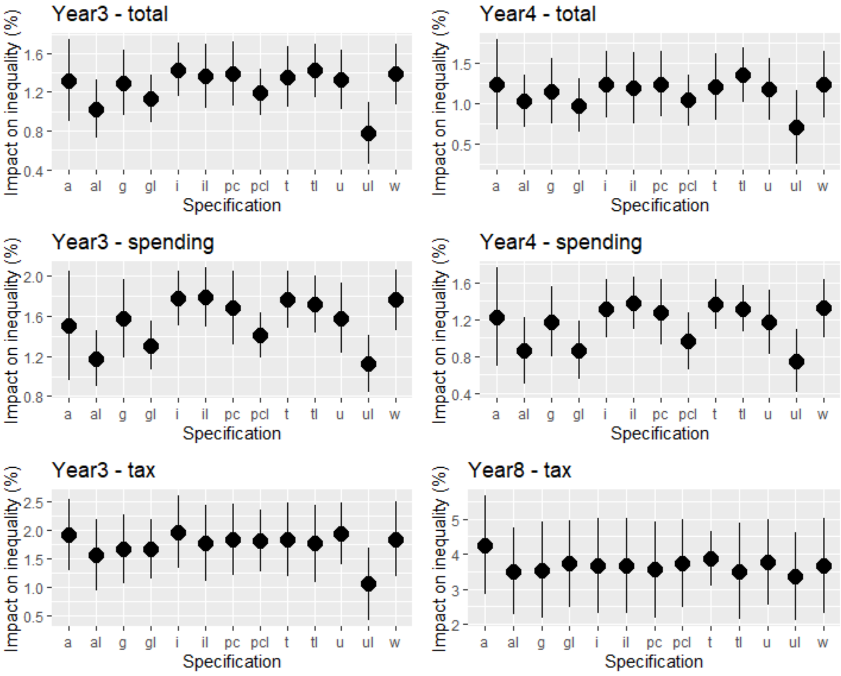

Figure 2.30: Impact of fiscal consolidation (of 1% of GDP) on gross wage inequality - Different control variables

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "a": all variables (all control variables are included), "g": real GDP growth rate, "i": inflation rate, "pc": real GDP per capita, "t": trade-to-GDP (openness), "u": unemployment rate, "w": without control variables (baseline). "al", "gl", "il", "pcl", "tl" and "ul" control for the same variables, but adding one lag.

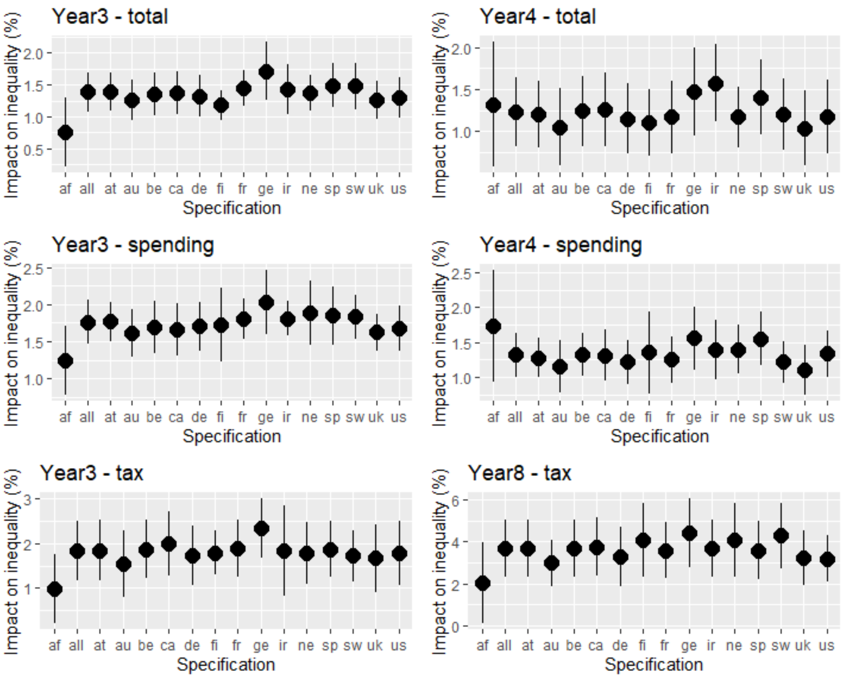

Figure 2.31: Impact of fiscal consolidation (of 1% of GDP) on gross wage inequality - Different countries

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "all" includes all countries (baseline), "af" excludes Australia, Finland, Denmark and the Netherlands, "at" excludes Austria, "au" excludes Australia, "be": excludes Belgica, "ca": excludes Canada, "de": excludes Denmark, "fi" excludes Finland, "fr" excludes France, "ge" excludes Germany, "ir" excludes Ireland, "ne" excludes Netherlands, "sp" excludes Spain, "sw" excludes Sweden, "uk" excludes the United Kingdom, "us" excludes the United States.

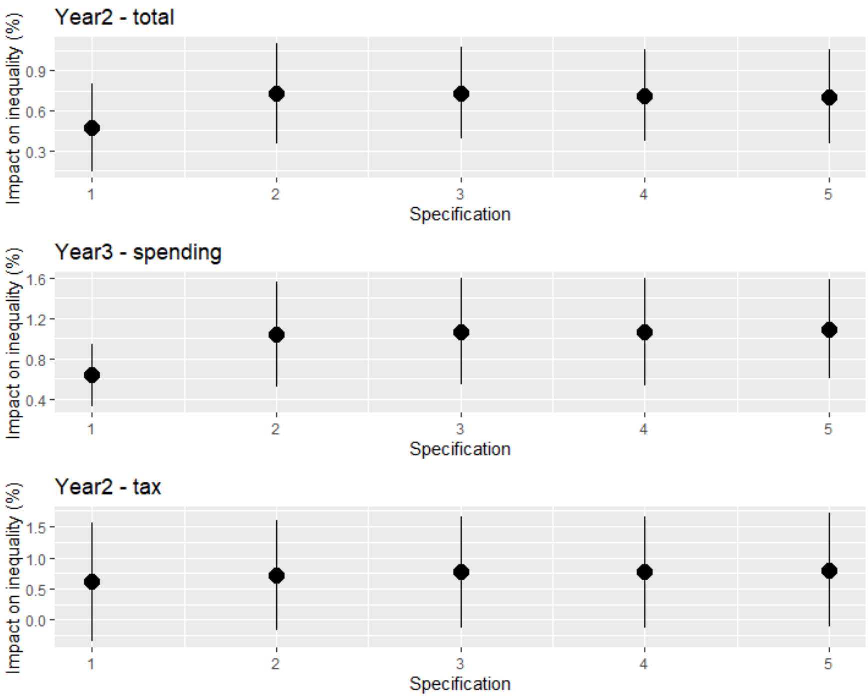

Figure 2.32: Impact of fiscal consolidation (of 1% of GDP) on earnings inequality P5010 - Different lags of the fiscal shock

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes three lags and refers to "3" in the graph.

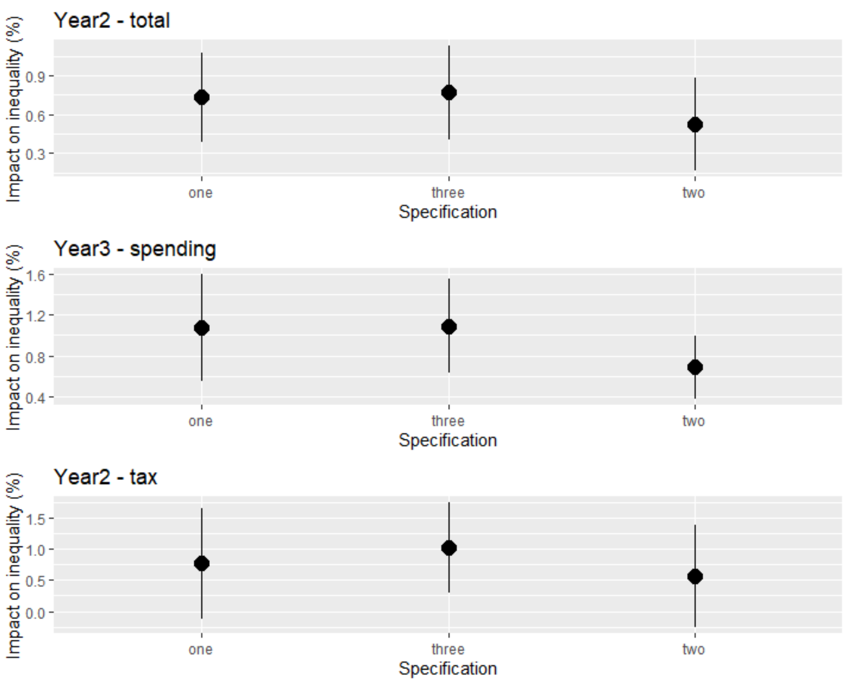

Figure 2.33: Impact of fiscal consolidation (of 1% of GDP) on earnings inequality P5010 - Different lags of the inequality measure

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes one lag and refers to "one" in the graph.

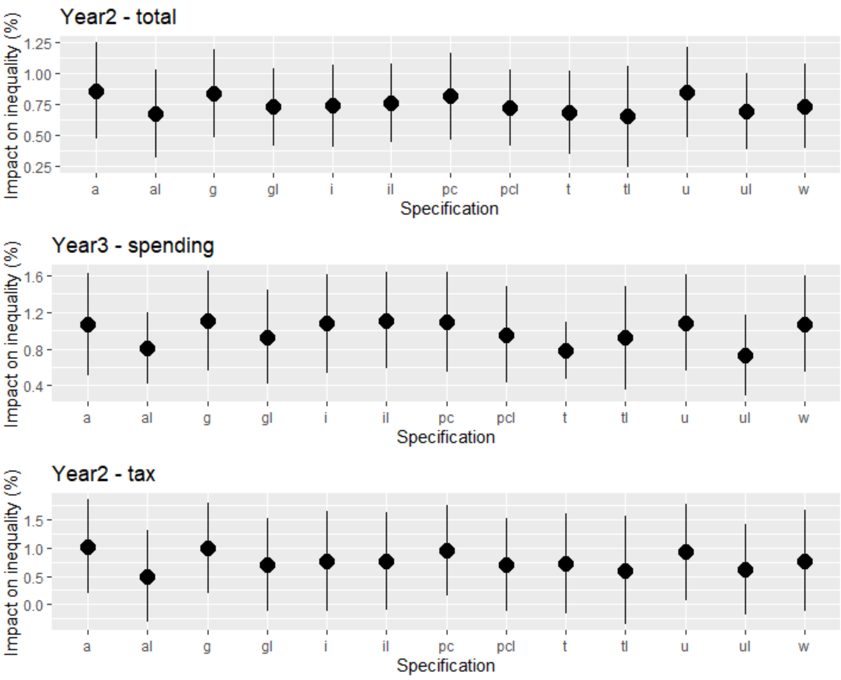

Figure 2.34: Impact of fiscal consolidation (of 1% of GDP) on earnings inequality P5010 - Different control variables

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "a": all variables (all control variables are included), "g": real GDP growth rate, "i": inflation rate, "pc": real GDP per capita, "t": trade-to-GDP (openness), "u": unemployment rate, "w": without control variables (baseline). "al", "gl", "il", "pcl", "tl" and "ul" control for the same variables, but adding one lag.

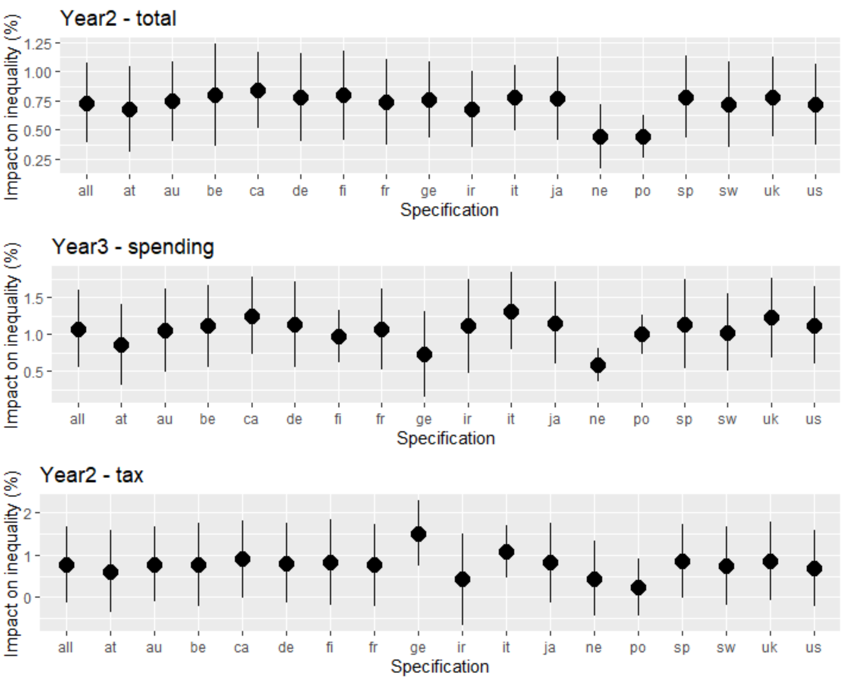

Figure 2.35: Impact of fiscal consolidation (of 1% of GDP) on earnings inequality P5010 - Different countries

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "all" includes all countries (baseline), "at" excludes Austria, "au" excludes Australia, "be": excludes Belgium, "ca": excludes Canada, "de": excludes Denmark, "fi" excludes Finland, "fr" excludes France, "ge" excludes Germany, "ir" excludes Ireland, "it" includes Italy, "ja" excludes Japan, "ne" includes Netherlands, "po" excludes Portugal, "sp" includes Spain, "sw" excludes Sweden, "uk" excludes the United Kingdom, "us" excludes the United States.

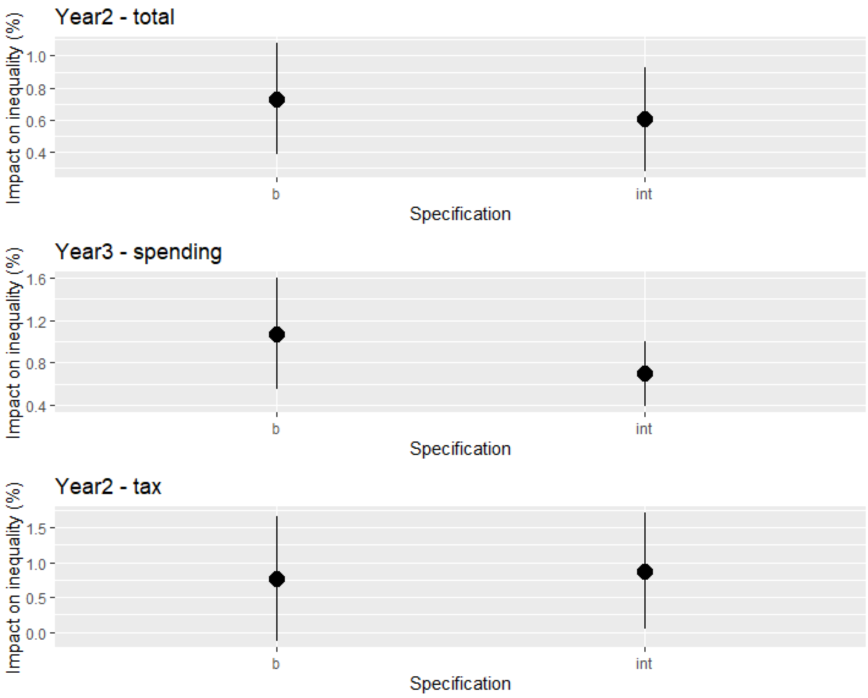

Figure 2.36: Impact of fiscal consolidation (of 1% of GDP) on earnings inequality P5010 - Interpolation

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline is represented by "b", while "int" means the interpolated database.

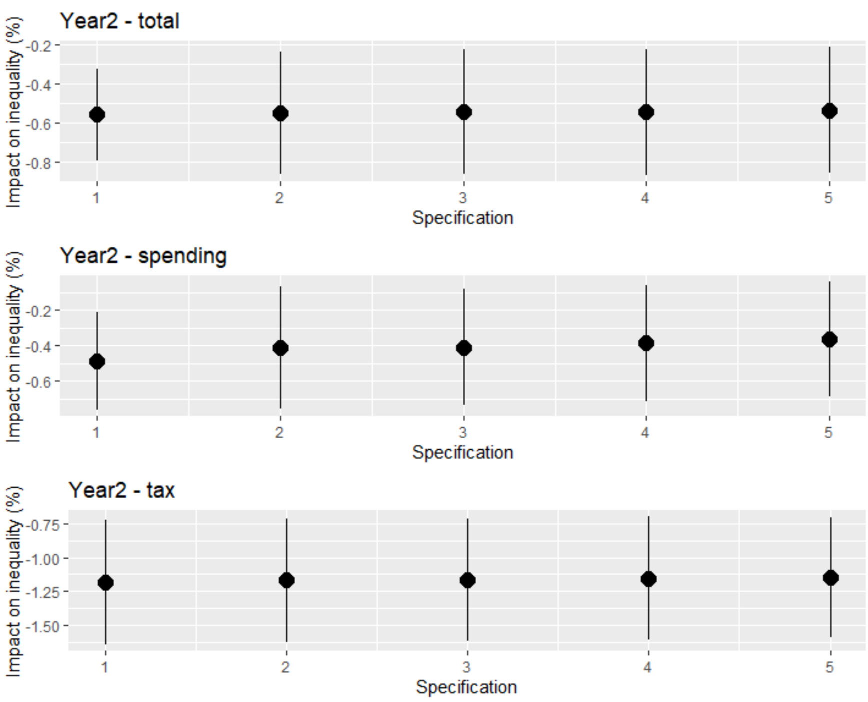

Figure 2.37: Impact of fiscal consolidation (of 1% of GDP) on earnings inequality P9050 - Different lags of the fiscal shock

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes one lag and refers to "1" in the graph.

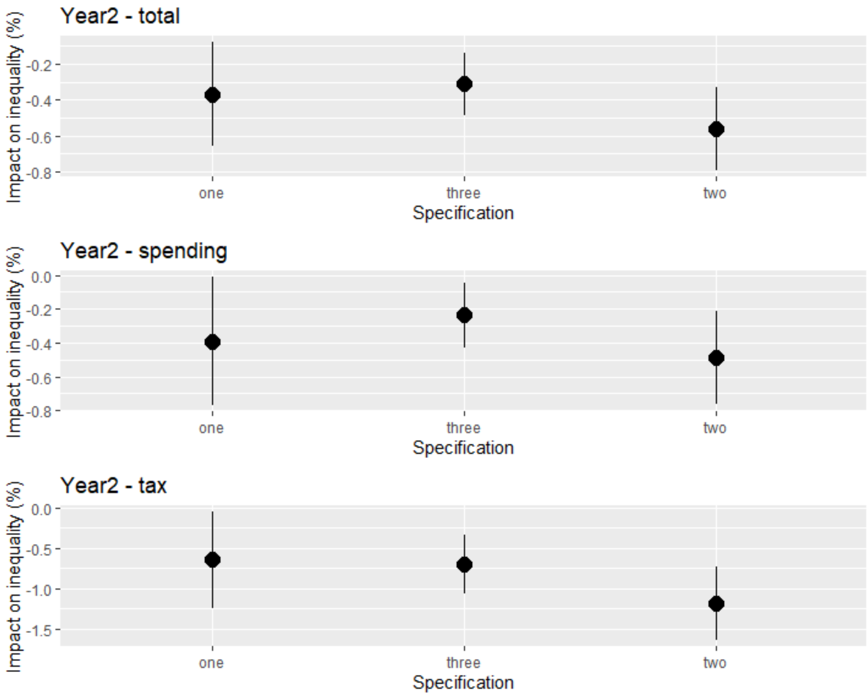

Figure 2.38: Impact of fiscal consolidation (of 1% of GDP) on earnings inequality P9050 - Different lags of the inequality measure

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes two lags and refers to "two" in the graph.

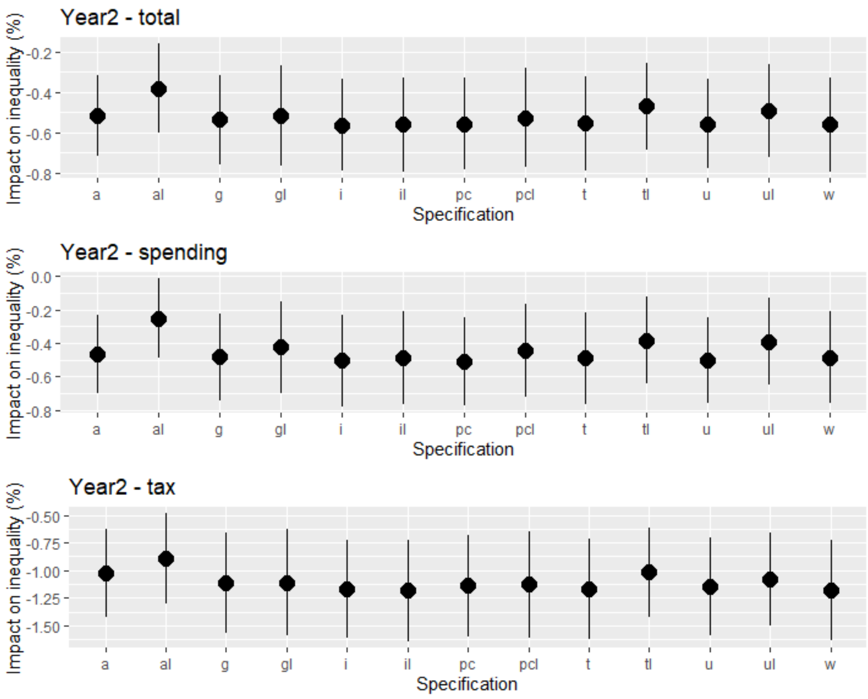

Figure 2.39: Impact of fiscal consolidation (of 1% of GDP) on earnings inequality P9050 - Different control variables

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "a": all variables (all control variables are included), "g": real GDP growth rate, "i": inflation rate, "pc": real GDP per capita, "t": trade-to-GDP (openness), "u": unemployment rate, "w": without control variables (baseline). "al", "gl", "il", "pcl", "tl" and "ul" control for the same variables, but adding one lag.

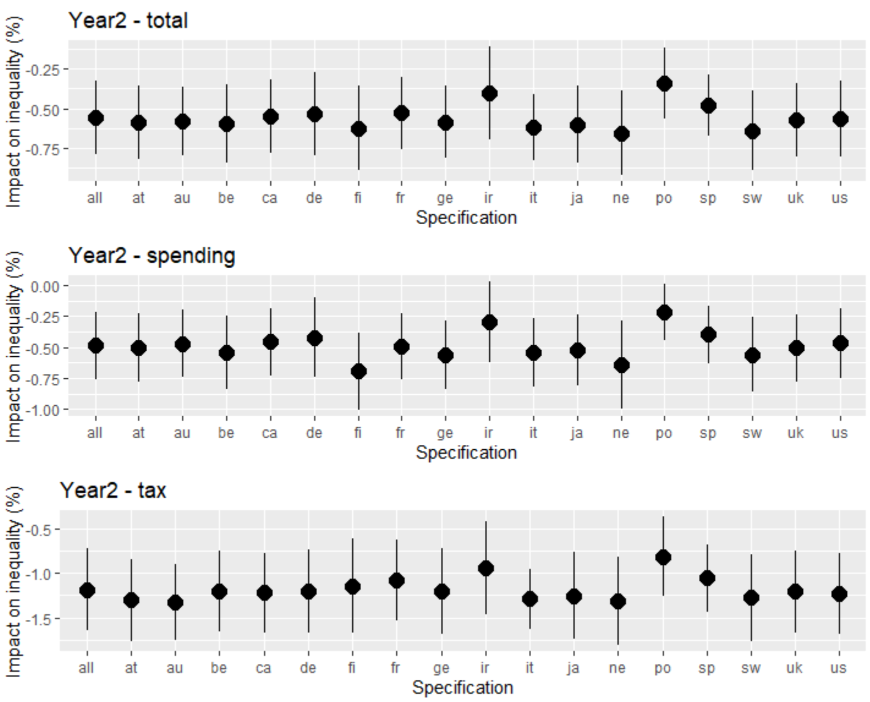

Figure 2.40: Impact of fiscal consolidation (of 1% of GDP) on earnings inequality P9050 - Different countries

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "all" includes all countries (baseline), "at" excludes Austria, "au" excludes Australia, "be": excludes Belgium, "ca": excludes Canada, "de": excludes Denmark, "fi" excludes Finland, "fr" excludes France, "ge" excludes Germany, "ir" excludes Ireland, "it" includes Italy, "ja" excludes Japan, "ne" excludes Netherlands, "po" excludes Portugal, "sw" excludes Sweden, "sp" includes Spain, "uk" excludes the United Kingdom, "us" excludes the United States.

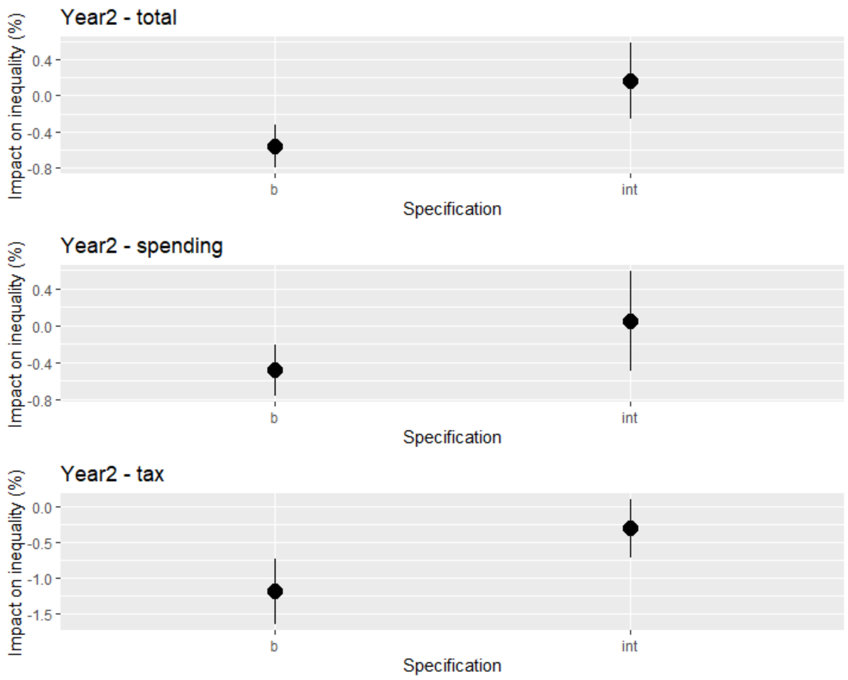

Figure 2.41: Impact of fiscal consolidation (of 1% of GDP) on earnings inequality P9050 - Interpolation

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline is represented by "b", while "int" means the interpolated database.

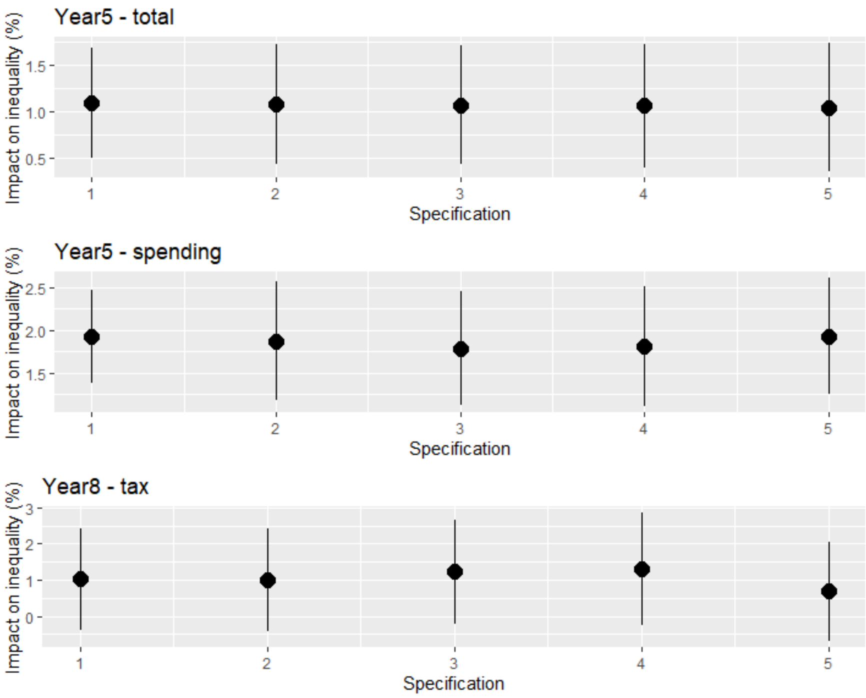

Figure 2.42: Impact of fiscal consolidation (of 1% of GDP) on earnings inequality P9010 - Different lags of the fiscal shock

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes one lag and refers to "1" in the graph.

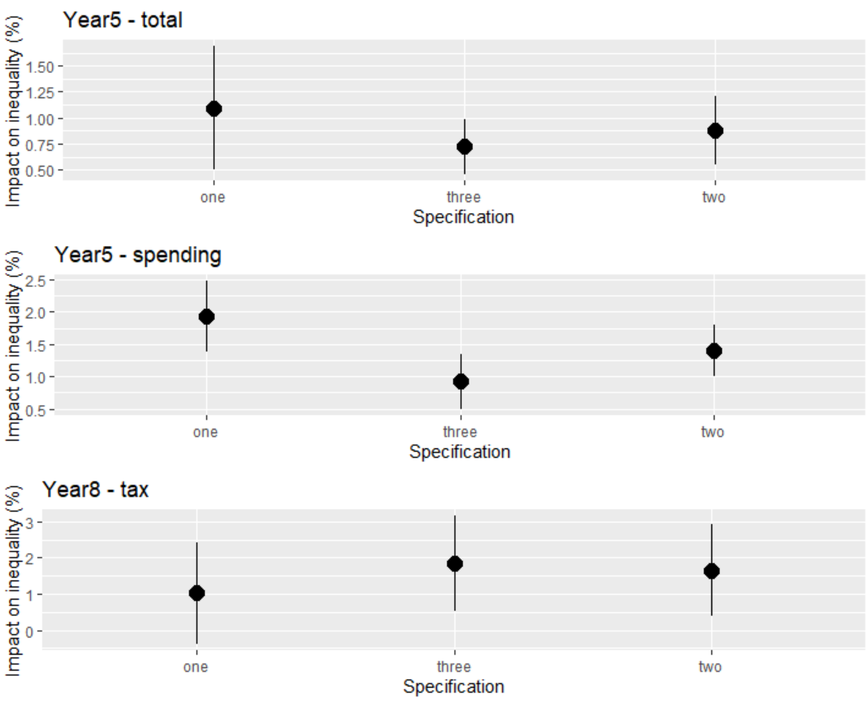

Figure 2.43: Impact of fiscal consolidation (of 1% of GDP) on earnings inequality P9010 - Different lags of the inequality measure

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes one lag and refers to "one" in the graph.

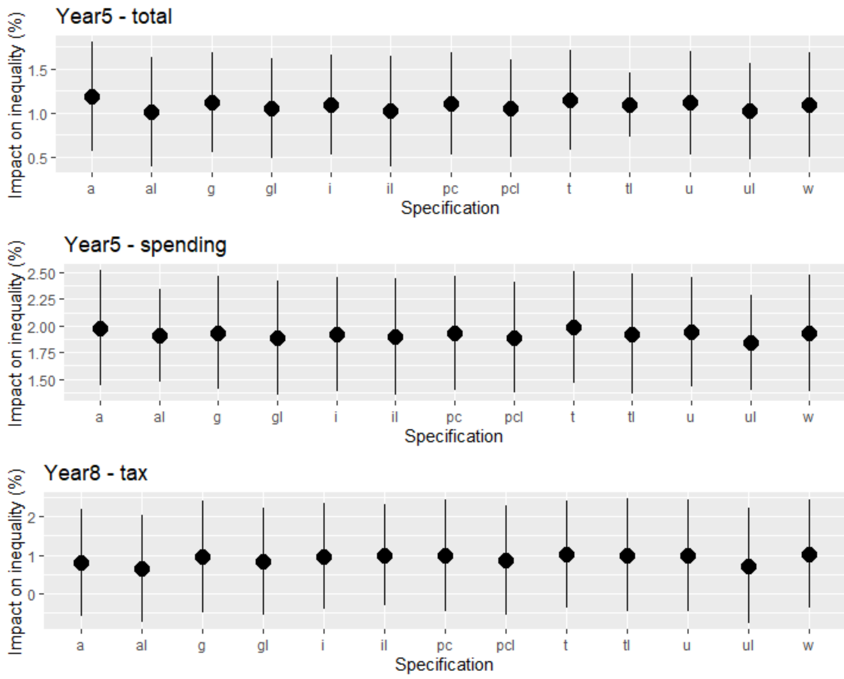

Figure 2.44: Impact of fiscal consolidation (of 1% of GDP) on earnings inequality P9010 - Different control variables

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "a": all variables (all control variables are included), "g": real GDP growth rate, "i": inflation rate, "pc": real GDP per capita, "t": trade-to-GDP (openness), "u": unemployment rate, "w": without control variables (baseline). "al", "gl", "il", "pcl", "tl" and "ul" control for the same variables, but adding one lag.

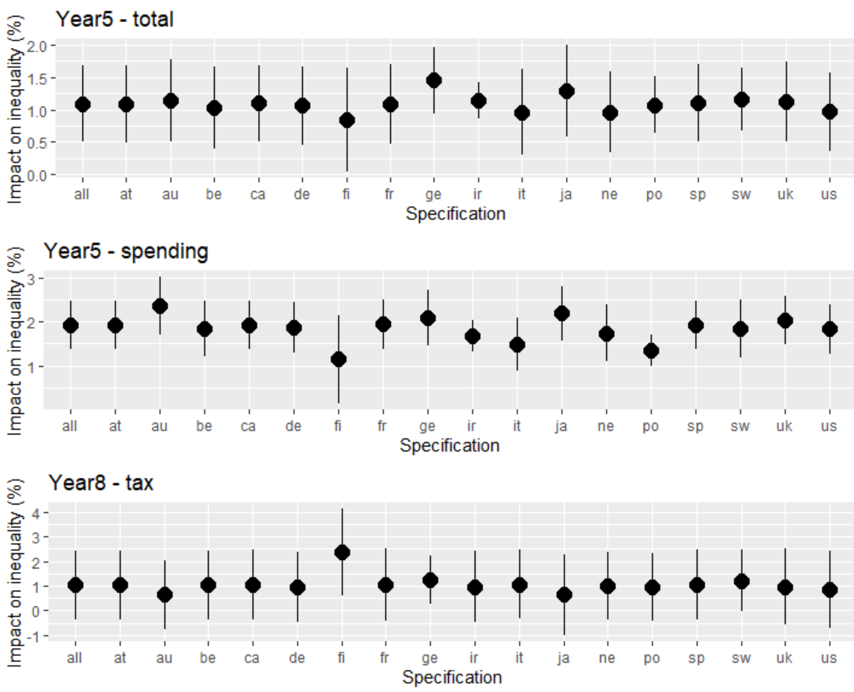

Figure 2.45: Impact of fiscal consolidation (of 1% of GDP) on earnings inequality P9010 - Different countries

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "all" includes all countries (baseline), "at" excludes Austria, "au" excludes Australia, "be": excludes Belgium, "ca": excludes Canada, "de": excludes Denmark, "fi" excludes Finland, "fr" excludes France, "ge" excludes Germany, "ir" excludes Ireland, "it" includes Italy, "ja" excludes Japan, "ne" includes Netherlands, "po" includes Portugal, "sp" includes Spain, "sw" excludes Sweden, "uk" excludes the United Kingdom, "us" excludes the United States.

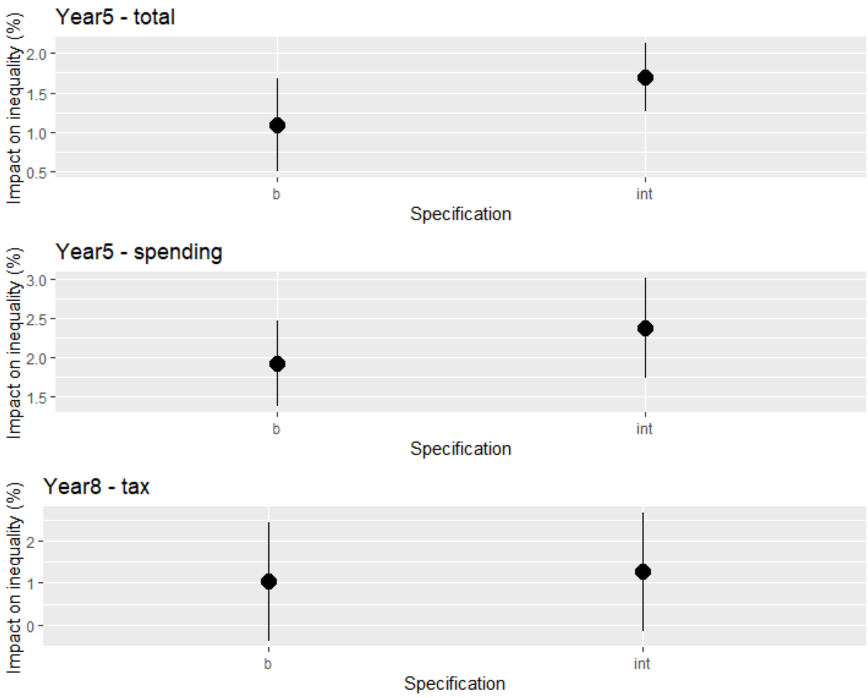

Figure 2.46: Impact of fiscal consolidation (of 1% of GDP) on earnings inequality P9010 - Interpolation

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline is represented by "b", while "int" means the interpolated database.

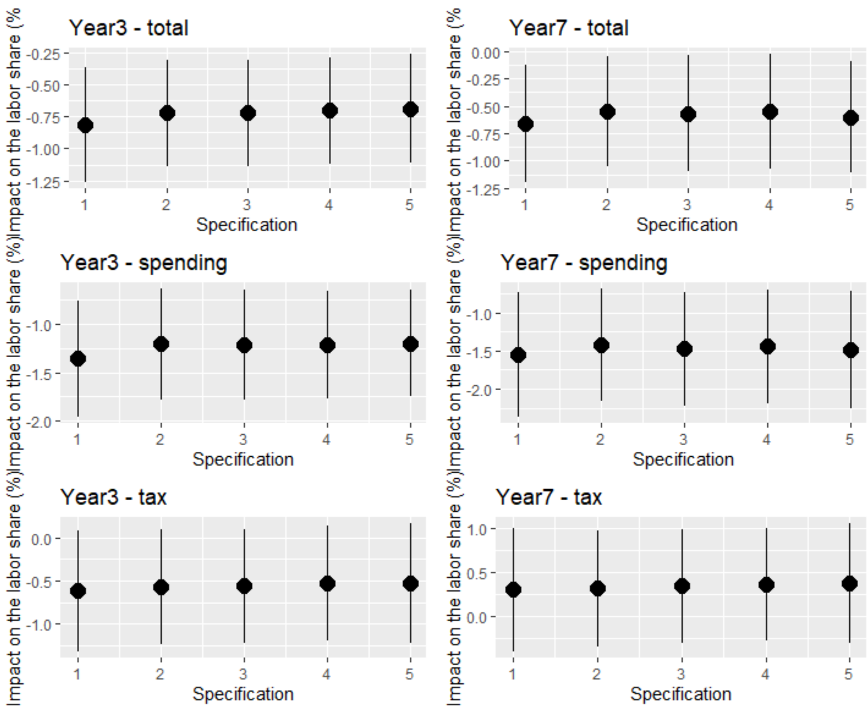

Figure 2.47: Impact of fiscal consolidation (of 1% of GDP) on the labor share - Different lags of the fiscal shock

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes one lag and refers to "1" in the graph.

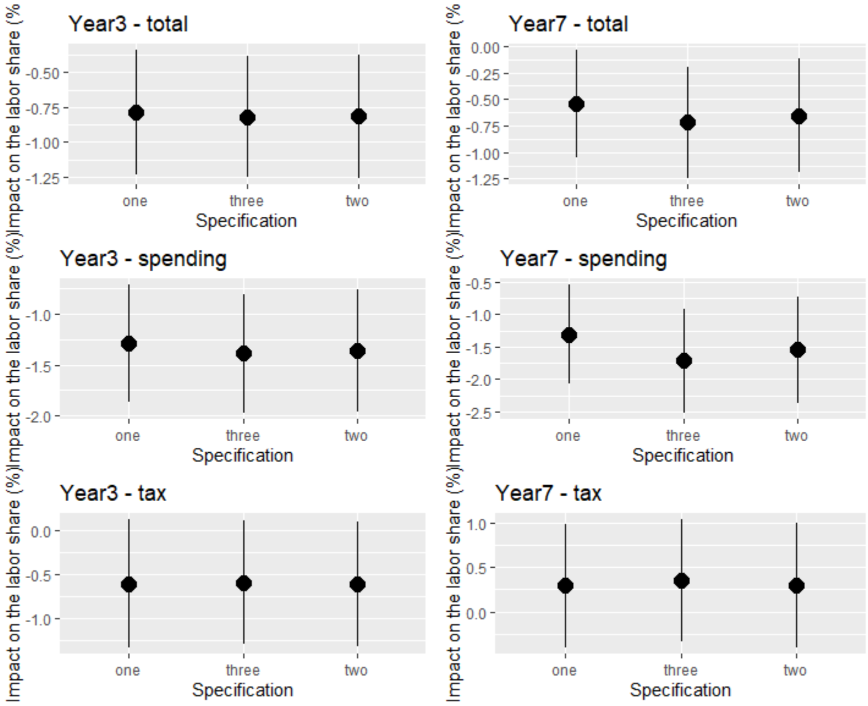

Figure 2.48: Impact of fiscal consolidation (of 1% of GDP) on the labor share - Different lags of the labor share

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes two lags and refers to "two" in the graph.

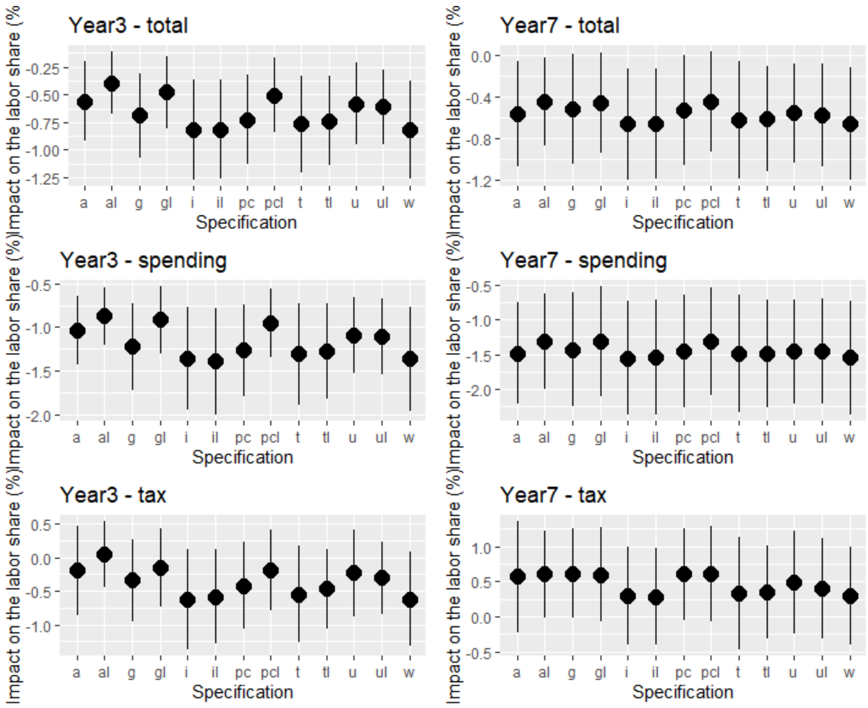

Figure 2.49: Impact of fiscal consolidation (of 1% of GDP) on the labor share - Different control variables

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "a": all variables (all control variables are included), "g": real GDP growth rate, "i": inflation rate, "pc": real GDP per capita, "t": trade-to-GDP (openness), "u": unemployment rate, "w": without control variables (baseline). "al", "gl", "il", "pcl", "tl" and "ul" control for the same variables, but adding one lag.

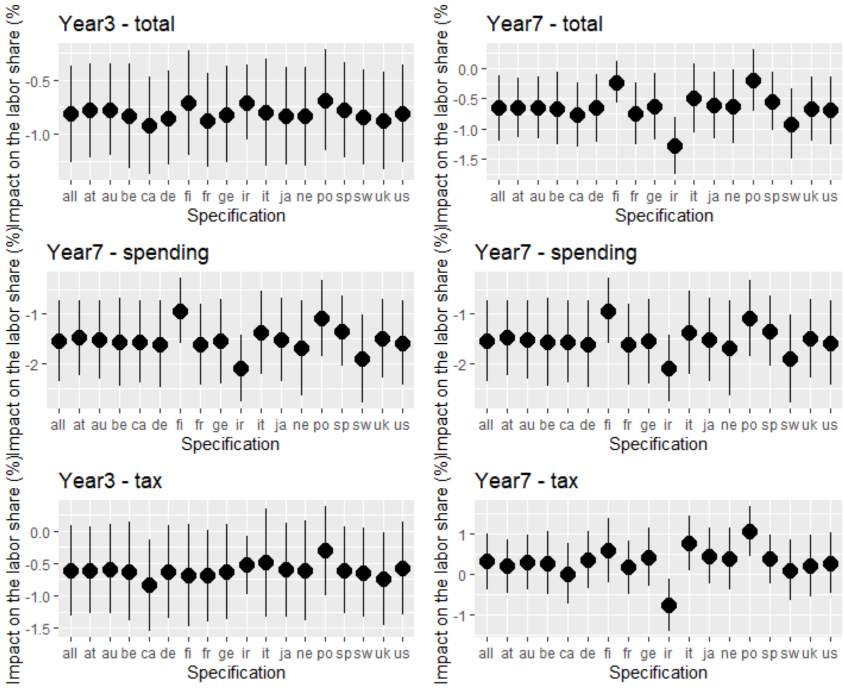

Figure 2.50: Impact of fiscal consolidation (of 1% of GDP) on the labor share - Different countries

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "all" includes all countries (baseline), "at" includes Austria, "au" excludes Australia, "be": excludes Belgium, "ca": excludes Canada, "de": excludes Denmark, "fi" excludes Finland, "fr" excludes France, "ge" excludes Germany, "ir" excludes Ireland, "it" excludes Italy, "ja" excludes Japan, "ne" excludes Netherlands, "po" excludes Portugal, "sp" includes Spain, "sw" excludes Sweden, "uk" excludes the United Kingdom, "us" excludes the United States.

2.6 *Concluding remarks*

This paper has analyzed the dynamic effects of fiscal consolidation episodes on disposable income, market income, gross wage, and functional inequalities in the short and medium-run, utilizing an annual data set covering OECD countries from 1978-2014. We have made significant contributions to the empirical literature by conducting the first econometric study that examines the channels through which austerity affects inequality (Figure 2.1).

In particular, our study delves into the channels through which austerity measures impact income inequality and assesses the individual role of each channel. This approach utilizes the Gini index decomposition, allowing us to gauge the relative importance of each channel in both the short and medium terms.

While previous research has explored some of these channels separately, they often remained isolated in their analysis (Klein and Winkler, 2019; Ciminelli et al., 2019; Ball et al., 2013; Furceri et al., 2016). The channels implied by the Gini decomposition are i) the redistribution channel, ii) the wage inequality channel, iii) the functional income inequality channel, and iv) the non-labor inequality channel. In addition, we also analyzed the employment (earnings inequality) channel.

Using the methodology proposed by Jordà (2005), we derived impulse response functions through local projections. Our baseline findings reveal that following an austerity shock, the gross wage inequality index increases by 0.775% and 1.4% after one and seven years, respectively. In the second and third years post-shock, the labor share in income decreases by 0.55% and 0.816%. After nine and eight years, disposable income and market income inequalities rise by 0.703% and 0.486%, respectively.

In the short run (first three years), the impact of austerity on market income inequality outweighs its effect on disposable income inequality, underscoring the significance of automatic stabilizers and the social safety net in moderating overall inequality (disposable income). Furthermore, during this period, both wage and functional channels exhibit similar and statistically significant responses.

In the medium term, the responses of disposable and market income inequalities are similar, leading to a loss of significance in the redistributive effect. Additionally, functional inequality does not show a statistically significant response at the 10% level, while wage inequality emerges as the primary channel affecting market income inequality (significant at 1%).

By employing a Gini index decomposition equation, which separates the alterations in market income inequality into adjustments in its constituents (functional inequality, wage inequality, and non-labor income inequality), we can infer that the impact of austerity on non-labor inequality may lead to an equalizing effect, in both short and medium runs.

The employment channel suggests that austerity measures exert a positive influence on earnings inequality. However, this impact on earnings inequality becomes significant when including the lower end of the income distribution. Specifically, the earnings inequality, measured by the percentile ratio 50/10, increases by 0.73% two years after the consolidation shock. When considering the percentile ratio 90/10, this increase is more persistent and pronounced, rising by 1.094% after five years.

Finally, when disaggregating fiscal shocks, we demonstrated that our findings are largely explained by spending-based shocks, which exhibited more pertinent and robust results. Our findings carry important implications for policymakers as they underscore the substantial impact of fiscal consolidation austerity episodes on inequality, both in the short and medium terms, in line with the literature.

A significant limitation of this study, which is also common in the existing literature, is that we did not disaggregate fiscal austerity shocks in their types. Since different types of spending and tax-based shocks may have varying effects on inequality dynamics (for example, shocks in transfers, public investment, government consumption, and direct and indirect taxes), a possible extension of this study could involve using disaggregated shocks by Alesina et al. (2019). This would provide a more nuanced understanding of how specific fiscal policy measures influence inequality outcomes.

Chapter 3

The Impact of Fiscal Austerity Measures on Inequality: A Study of Latin America and the Caribbean

3.1 Introduction

In this chapter, our objective parallels that of Chapter 2: we explore the channels through which fiscal consolidation episodes affect income inequality for a group of countries in Latin America and the Caribbean. As seen in Chapter 2, inspired by the literature on Gini decomposition, we estimate three main channels through which austerity boosts inequality in OECD countries: a) the redistributive effect, which relates to changes in taxes and transfers and their impact on disposable income inequality; b) the impact on the distribution among workers, specifically wage inequality; c) the effect on the distribution between capital and labor, also known as functional inequality – see Figure 2.1. A fourth channel can also be inferred (non-labor income inequality channel).

Nevertheless, the econometric studies in this literature typically concentrate solely on the overall effect, which is the impact of austerity measures on disposable income inequality (Agnello and Sousa, 2012; Ball et al., 2013; Woo et al., 2013; Schaltegger and Weder, 2014; Agnello and Sousa, 2014; Furceri et al., 2016; Furceri et al., 2018a; Klein and Winkler, 2019; Ciminelli et al., 2019; Heimberger, 2020; Cardoso and Carvalho, 2023). As disposable income encompasses post-tax and transfer income and includes labor and non-labor sources, it represents the total or net effect of austerity on income inequality.

Some studies in the econometric literature have investigated the three individual channels for OECD countries. However, these studies only estimated isolated results. Klein and Winkler (2019) specifically explore the redistributive measure, while Heimberger (2020) and Furceri et al. (2016) also touch upon this aspect to some extent. Regarding the impact on workers, Ball et al. (2013) and Klein and Winkler (2019) conduct estimations to assess the effect of austerity on employment. Finally, Ball et al. (2013), Furceri et al. (2016), and Klein and Winkler (2019) examine the impact of austerity on the functional distribution of income. In Chapter 2, we contribute to this literature by being the first study to estimate the contribution of each channel in the short and medium runs for OECD countries. The study in Chapter 2 was also the first to analyze the impact of austerity measures on wage and earnings distributions.

However, the studies in the literature have been focusing on OECD countries, including Chapter 2, neglecting emerging economies. No study estimates the impact of austerity on the labor share for emerging countries, for example. Specifically, for Latin American countries, no study investigates the mentioned channels (wage inequality, functional distribution inequality, and redistributive channel).

This paper aims to contribute to the macroeconometric literature concerning the link between austerity measures and income inequality that applies the "narrative approach" (Romer and Romer, 2010; Devries et al., 2011; David and Leigh, 2018) to provide evidence on the effects of fiscal austerity in Latin America and the Caribbean. Our study offers two main contributions.

First, with the exception of Chapter 2, no prior research has explored the role of the three individual channels through which adverse shocks in fiscal policy increase inequality using a Gini decomposition interpretation framework to evaluate their relative importance. The existing literature generally focuses on estimating the total or overall effect of austerity, specifically the impact on disposable income inequality. In the context of Latin American countries, only one study by Cardoso and Carvalho (2023) examines the effects of austerity on inequality, estimating the overall effect on disposable income inequality.

Our study aims to address this gap by analyzing the dynamic effects of fiscal consolidation episodes on three distributive measures, considering the three channels mentioned in the empirical literature: i) inequality among workers (wage inequality, a pre-fiscal measure), ii) inequality between labor and capital (functional inequality, a pre-fiscal measure), and iii) the role of the transfer and tax system, or redistributive channel, represented by the difference between market income inequality (a pre-fiscal measure) and disposable income inequality (a post-fiscal measure that considers income after taxes and with transfers added).

Secondly, we contribute to the scarce empirical literature for Latin American countries on this topic. Cardoso and Carvalho (2023) emphasize that, following the conclusion of the commodity price boom and a political shift away from the Pink Tide governments (Loureiro, 2018), the region adopted austerity measures, leading to a reversal in social gains. This shows the importance of conducting further research on the distributional consequences of austerity in this region, which is recognized as the most unequal in the world (IMF, 2014).

In addition to addressing the gaps in the existing empirical literature, our motivation to contribute to this field can be justified as follows. While some heterogeneity and contradictory findings exist (e.g., Li and Zou, 1998; Forbes, 2000), the most recent empirical literature on the relationship between economic growth and income disparities tends to demonstrate that higher inequality is detrimental to GDP growth (Hezner and Vollmer, 2012; Ostry et al., 2014; Cingano, 2014; Gründler and Scheuermeyer, 2018; Berg et al., 2018; Santiago et al., 2019; Aiyar and Ebeke, 2020; Breunig and Majeed, 2020)[1]. Few studies have explored this topic regarding Latin America. Among them, Santiago et al. (2019) find a significant adverse effect of unequal income distribution on economic growth in the region, while Delbianco et al. (2014) suggest this adverse effect is relevant for countries with a low level of income.

The literature points out that inequality negatively influences economic growth through various possible channels, such as unequal access to education, restrictions related to the availability of credit for the lower-income population, unequal opportunities in the labor market, lower investment in physical capital, as well as greater political and social instabilities (Gründler and Scheuermeyer, 2018; Aiyar and Ebeke, 2020; Berg et al., 2018; Alesina and Perotti, 1996; Perotti, 1996; Cingano, 2014; Berg and Ostry, 2011). Furthermore, the Kaleckian literature suggests another mechanism: less inequality can strengthen aggregate demand by redistributing income to low-income classes with a greater propensity to consume (Kalecki, 1942; Kalecki, 1952). This income redistribution stimulates household consumption and investments, generating a multiplier effect (Cardoso et al., 2023; Sanches and Carvalho, 2023; Carvalho and Rezai, 2015).

As a result, policies that exacerbate inequality, such as austerity policies, can have

[1] For older studies, see, for example, Alesina and Rodrik (1994); Persson and Tabellini (1994); Clarke (1995); Banerjee and Duflo (2003); Knowles (2005).

detrimental effects on economic growth and development, particularly in Latin America, the most unequal region in the world. In this context, studying the distributional effects of austerity becomes essential to adopt policies that foster economic growth in the region. However, there is currently only one study by Cardoso and Carvalho (2023) focusing on this group of countries. Their research centers on the impact of consolidation episodes on disposable income inequality, representing the total or overall effect. In this study, we expand on their work in the following ways: i) we broaden the scope by incorporating a more comprehensive sample of countries, including both South American countries and those from the Caribbean; ii) we delve into the investigation of the three individual channels mentioned earlier (Figure 2.1), providing econometric estimations to assess the roles of wage inequality, functional distribution, and the redistribution channels; iii) we deliver novel insights into how the dynamic effects of fiscal austerity on inequality depend on the size of fiscal consolidation programs and on the business cycle - this is based on Heimberger (2020), who made a similar contribution for OECD countries.

When investigating the individual channels, our findings reveal that fiscal consolidation episodes have enduring effects on wage inequality, as measured by the Gini coefficient of hourly wages, and on the labor share in income. Based on our baseline results, we observe that the Gini index for hourly wages increases by 2.3% over an eight-year period following a fiscal adjustment of 1% of GDP. Additionally, the labor share in income declines by 1.3% and 1.9% in the two and eight years after a fiscal adjustment of 1% of GDP, respectively. Both spending and tax-based shocks significantly impact labor share and wage inequality, but the effects of spending-based consolidations are of greater magnitude. Furthermore, we find evidence suggesting that the impact of fiscal austerity measures on wage and functional distributions is more pronounced under two conditions: i) when the size of the fiscal consolidation package is large, and ii) when the episode occurs during a period of low economic growth.

The results presented in this paper indicate that the wage and functional distribution individual channels play the most crucial role in the way austerity increases inequality. Since market income inequality responds less than both of these individual channels to fiscal consolidations, we can infer - using a decomposition concept of the Gini index - that the effect of austerity on non-labor inequality might be equalizing. Additionally, wage inequality emerges as the primary channel in the medium run, while the functional distribution assumes a more prominent role in the short run. As for the redistribution effect, we found that the redistribution measure responds positively to fiscal shocks in the short run, implying that the social safety net might play a pivotal role, as disposable income inequality responds less than market income inequality to austerity. However, in the medium run, the redistribution effect turns negative, indicating that the regressive impact of fiscal adjustments outweighs the role of the taxes and transfers system.

The remainder of this paper is organized as follows: Section 3.2 reviews the econometric literature on the macroeconomic effects of fiscal consolidation measures on inequality. In Section 3.3, we elaborate on the econometric methodology and the data employed in this study. Section 3.4 presents the baseline empirical results and a discussion about them. Section 3.5 introduces extensions to our model, while Section 3.6 outlines various robustness checks. In Section 3.7, we draw our conclusions.

3.2 Related Literature

In Chapter 2, we provided an extensive review on the econometric literature about the topic. Tables 2.1-2.5 provide a summary of the results. As shown in Table 2.2, a general result of this literature is an increase in disposable income inequality following austerity measures, especially in the medium run.

As shown in Table 2.3, the studies presented in Table 2.2 also have specific contributions. For instance, Ball et al. (2013) and Furceri et al. (2016) demonstrate that austerity measures lead to an increase in the long-run unemployment rate and negatively affect the wage share in income. Heimberger (2020) and Agnello and Sousa (2014) highlight that the rise in income inequality is notably stronger when fiscal adjustments occur during periods of low economic growth and when the consolidation starts in the aftermath of a financial crisis. Schaltegger and Weder (2014) suggest this impact is more relevant when the household debt is high. Lastly, the study by Heimberger (2020) estimates that the impact of contractionary fiscal episodes on income distribution is more pronounced when the size of the fiscal austerity package is more prominent and when its duration is longer.

While the literature has been focusing on estimating the impact of fiscal consolidations on economic growth and on income inequality for advanced economies[2], Latin American

[2] Alesina and Ardagna, 2010; Blanchard and Leigh, 2014; Guajardo et al., 2014; Heimberger, 2017;

countries have received much less attention. This fact is surprising since it is the most unequal region in the world (IMF, 2014).

As discussed in Chapter 2, most econometric studies on the relationship between austerity measures and income inequality have been applying the "narrative approach" (see Table 2.1). Albeit the database built by Devries et al. (2011) has become popular in the recent econometric literature, it does not include emerging countries. To fill this gap, David and Leigh (2018) constructed a narrative database of fiscal consolidations for fourteen Latin American and Caribbean economies during 1989-2016, also inspired by Romer and Romer (2010). The authors focus on discretionary exogenous changes in taxes and government spending primarily motivated by a desire to reduce the budget deficit in order to eliminate the responses to the economic conditions and obtain exogenous fiscal shocks[3]. As Table 2.1 shows, Cardoso and Carvalho (2023) is the only study that uses this database to estimate the impact of fiscal consolidations on income inequality.

Two recent studies, both utilizing the narrative approach and based on David and Leigh's (2018) dataset, stand out for estimating the impact of fiscal austerity on economic growth and income inequality in a panel of Latin American countries (Carrière-Swallow et al. (2021) and Cardoso and Carvalho (2023), respectively). Carrière-Swallow et al. (2021) conducted their study on a sample of fourteen emerging economies in Latin America and the Caribbean from 1989 to 2016. Their findings indicate that a fiscal consolidation equivalent to 1% of GDP leads to an average reduction in GDP of 0.9% over a two-year period. Interestingly, the estimated effects are similar to those observed in advanced economies, suggesting that fiscal multipliers have comparable magnitudes in both groups of countries (Carrière-Swallow et al., 2018).

Jordà and Taylor, 2016, Gechert et al. 2016; Alesina et al. 2012; Alesina et al., 2015; Holland and Portes, 2012; Veld, 2013; Yang et al., 2015; Agnello and Sousa, 2012; Ball et al., 2013; Woo et al., 2013; Schaltegger and Weder, 2014; Agnello and Sousa, 2014; Furceri et al., 2016; Agnello et al., 2016; Schneider et al., 2017; Klein and Winkler, 2019; Heimberger, 2020

[3] According to David and Leigh (2018) (p.4): "*The historical sources we examine include reports from multilateral institutions such as IMF staff reports and OECD Country Economic Surveys; as well as budget-related documents (such as several issues of the Informe de Finanzas Publicas for Chile and Paraguay, the Marco Fiscal de Mediano Plazo report for Colombia, the Criterios Generales de Política Económica for Mexico, and the Marco Macroeconomico Multinaual report for Peru) and reports by Central Banks. In some instances, these primary sources were complemented by information from working papers or other research documents.*"

In their study, Cardoso and Carvalho (2023) examine nine South American economies spanning the period from 1991 to 2017 (refer to Table 2.2). Their findings indicate that spending-based fiscal consolidations have a substantial impact on the Gini index for disposable income, showing a significant increase. On the other hand, tax-based fiscal consolidations do not reveal statistically significant effects on income inequality. Specifically, the Gini index for disposable income rises by nearly 0.5% after eight years following a fiscal consolidation, while it increases by 2.48% in the subsequent eight years after a spending-based fiscal adjustment equivalent to 1% of GDP.

The empirical literature highlights three primary channels through which austerity exacerbates inequality (Figure 2.1). The redistributive channel operates through fiscal consolidation measures that increase disposable income inequality by implementing spending cuts in social welfare programs and imposing regressive tax hikes, disproportionately affecting individuals at the lower end of the income distribution. As economic downturns weaken workers' bargaining power and reduce their share in GDP (Barbosa-Filho and Taylor, 2006), wage disparities may rise as wages at the bottom respond more to the cycle (wage inequality channel). Also, households at the bottom earn a relevant share of their income from wages and informal job earnings, while the top receives primarily capital income (functional distribution channel).

The econometric literature for Latin American countries only explores the total/overall effect: the impact of austerity measures on disposable income inequality (Cardoso and Carvalho, 2023). However, there has been a lack of studies that decompose the potential channels through which austerity contributes to inequality using a Gini decomposition framework, allowing for an assessment of their relative importance in the short and medium run (redistributive effect, wage inequality, and functional distribution). Our study seeks to address this gap and serves as an extension of Cardoso and Carvalho's research, which primarily analyzed the overall effect of austerity on inequality (disposable income inequality).

Moreover, analyzing the redistributive effect is crucial for Latin American countries to understand the role of their tax and transfer systems. The expansion of the social safety net has been responsible for reducing income inequality in the last two decades in Latin America (Ocampo and Gomez-Arteaga, 2017; Sánchez-Ancochea, 2021; Lustig, 2017). According to Sánchez-Ancochea (2021), social spending by the central governments in Latin

America increased by almost 50 percent between 2002 and 2013 (per capita basis). This expansion was particularly significant in the case of social protection, which has benefited the poor more than other income groups (Antía 2018; Franzoni and Sánchez-Ancochea, 2014) and contributed to diminishing income inequality (Quiñonez, 2022; Stampini and Tornarolli, 2012; Hanni et al., 2015).

3.3 Data and Methodology

3.3.1 Data

To perform our first and second exercises - the impact of austerity measures on disposable income inequality (total effect, post-fiscal or post-tax and transfer) and market income inequality (pre-fiscal, or pre-tax and transfer) - we obtained income inequality data (Gini index for disposable income and for market income) from the Standardized World Income Inequality Database (SWIID) (Solt, 2019)[4]. The use of the SWIID database[5] has been widely adopted in the literature reviewed in Section 2.2 (Cardoso and Carvalho, 2023; Agnello and Sousa, 2012; Ball et al., 2013; Woo et al., 2013; Agnello and Sousa, 2014; Schaltegger and Weder, 2014; Furceri et al., 2016; Furceri et al., 2018a; Klein and Winkler, 2019; Castro, 2018; Heimberger, 2020) due to its provision of harmonized data on income inequality, enabling a high level of comparability across countries (Heimberger, 2020).

As commented in Chapter 2, although there is a debate about the use of the SWIID dataset (see Jenkins, 2014; and Solt, 2015), the literature argues that the Solt (2020) database represents the only systematic effort to address the problem of a lack of comparable data about inequality for a large number of countries (Berg et al., 2018). For this reason, this database became extremely popular in macroeconometric studies. Also, in order to compare our results to those in the literature, it is convenient to use the SWIID database.

For our third exercise - the impact of consolidation programs on the hourly wage distribution - we obtained hourly wage inequality data from the Socioeconomic Database for Latin America and the Caribbean (SEDLAC), compiled by The World Bank and by the Center for Distributive, Labor and Social Studies of the Universidad Nacional de La

[4] Due to data availability reasons, we used version 8.2.

[5] Solt, Frederick, 2019, "The Standardized World Income Inequality Database, Versions 8-9", https://doi.org/10.7910/DVN/LM4OWF, Harvard Dataverse, V10.

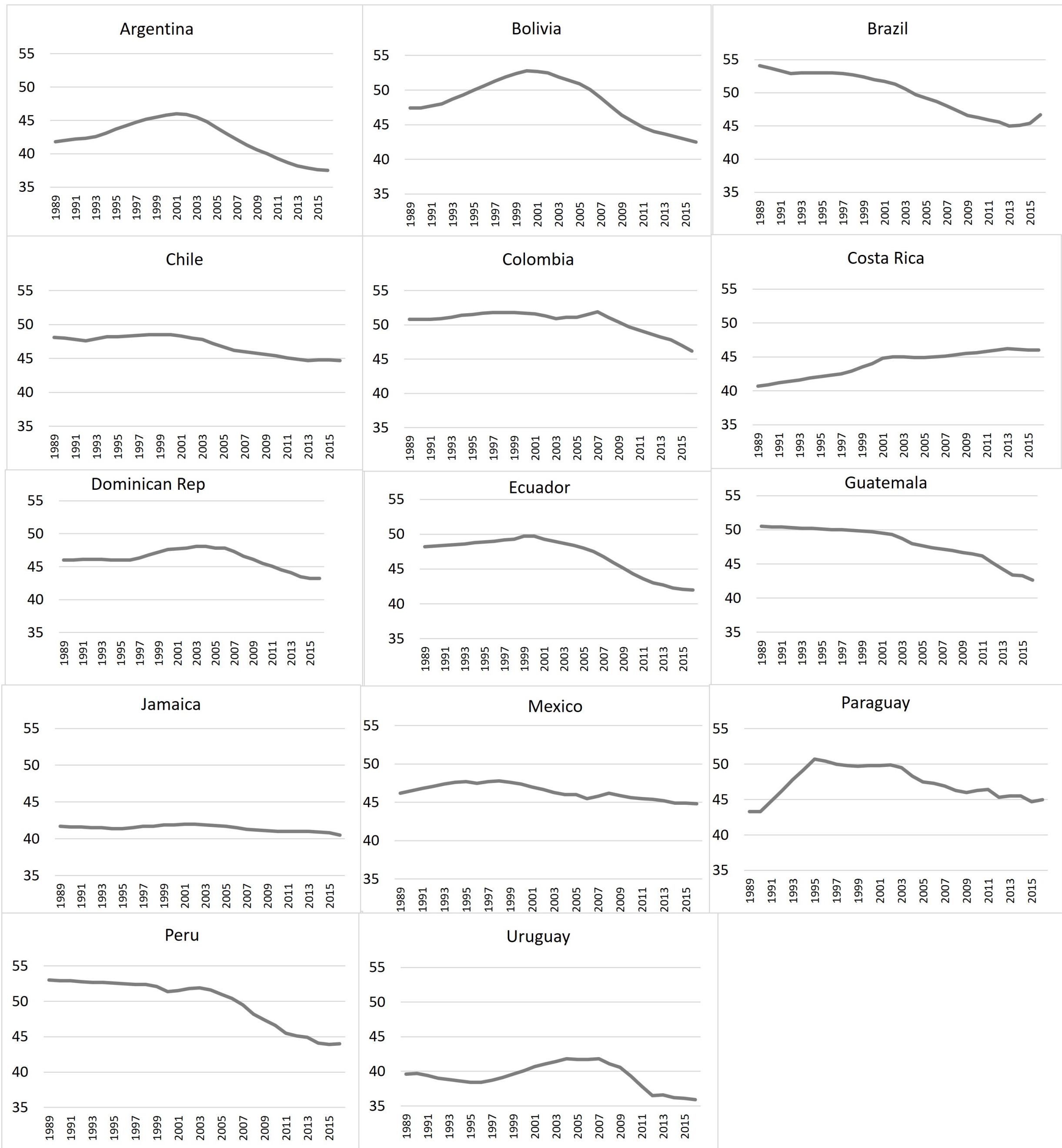

Figure 3.1: Gini index for Disposable Income for a group of countries from Latin America and the Caribbean
Source: Author's calculations based on the Standardized World Income Inequality Database (SWIID) (version 8.2).

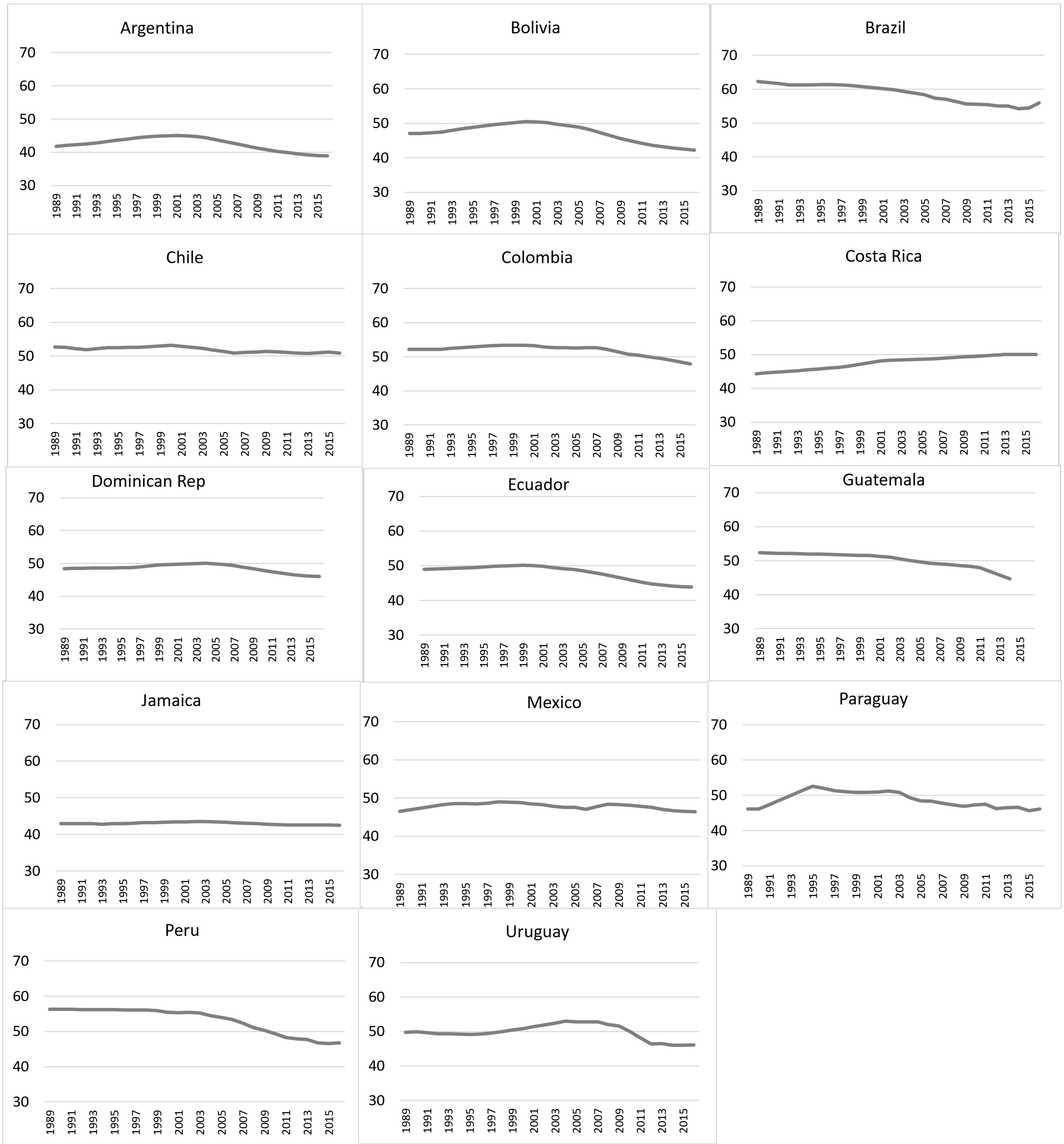

Figure 3.2: Gini index for Market Income for a group of countries from Latin America and the Caribbean

Source: Author's calculations based on the Standardized World Income Inequality Database (SWIID) (version 8.2).

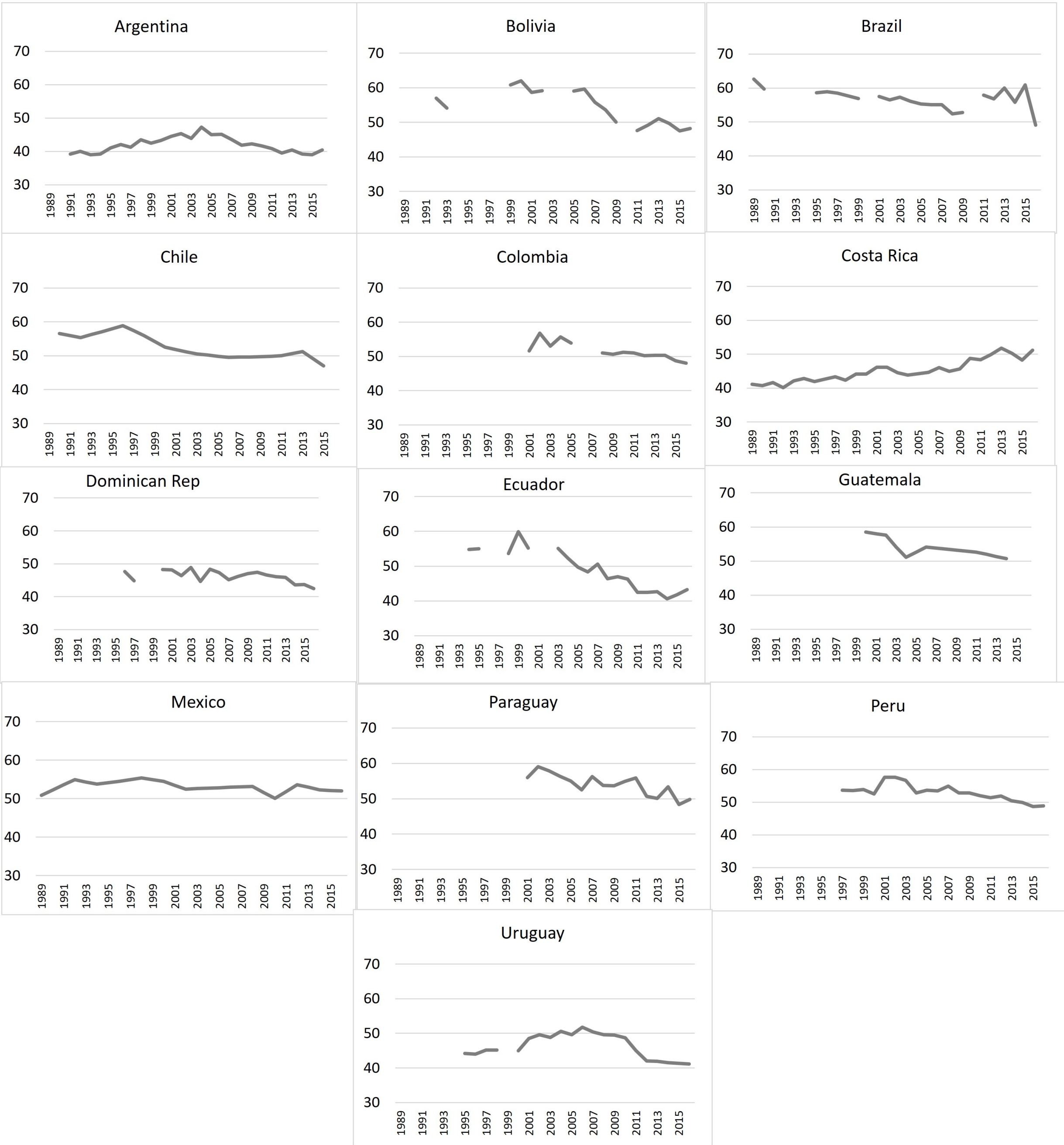

Figure 3.3: Gini index for hourly wages in the main job for a group of countries from Latin America and the Caribbean

Source: Author's calculations based on the Socioeconomic Database for Latin America and the Caribbean (SEDLAC) - compiled by The World Bank and by the Center for Distributive, Labor and Social Studies of the Universidad Nacional de La Plata (CEDLAS) (version September 2021).

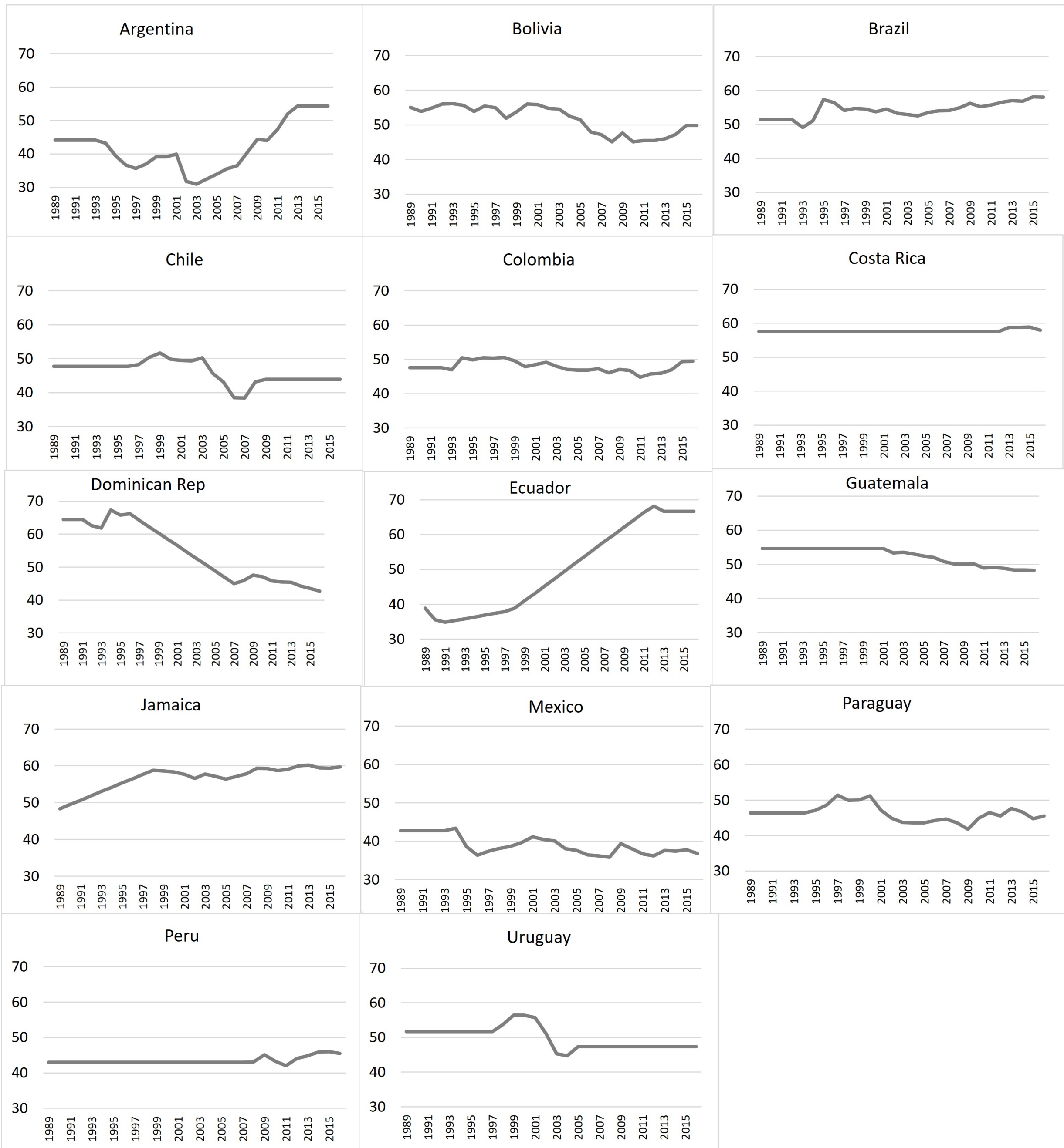

Figure 3.4: Share of labor in GDP for a group of countries from Latin America and the Caribbean

Source: Author's calculations based on the Penn World Table (version 10.0).

Plata (CEDLAS). This database has harmonized household datasets on wages, hours, and labor income for 16 countries (Messina and Silva, 2019)[6]. We use the Gini index considering hourly wages in the primary job, which is obtained by harmonizing the earnings and hours of work information from the different household surveys[7]. We conducted robustness exercises also using the Gini index for labor income - see Section 3.6.

Finally, for our fourth exercise (the impact of austerity on the functional distribution of income), the series for labor share in national income refers to "share of labor compensation in GDP at current national prices" and was retrieved from the Penn World Table (version 10.0)[8]. Figures 3.1, 3.2, 3.3, and 3.4 plot the Gini index for disposable income, the Gini index for market income, the Gini index for hourly wages, and the workers' share in GDP.

To identify fiscal policy discretionary episodes (cuts in government spending and/or

[6] According to the SEDLAC methodological guide (p.2): "*We make all possible efforts to make statistics comparable across countries and over time by using similar definitions of variables in each country/year, and by applying consistent methods of processing the data. However, perfect comparability is not assured, as the coverage and questionnaires of household surveys differ among countries, and frequently also within countries over time. Hence, a trade-off arises between accuracy and coverage. If we want to be ambitious in the analysis, we have to pay the cost of losing accuracy and getting into comparability problems*". According to the guide, household surveys are not strictly comparable during some years for some countries, especially Bolivia and Ecuador. We carried out the exercise without these countries in the sample, and the results were robust to this change. Also, as we will show in Section 3.6, results are robust when we exclude each country from the sample.

[7] Hourly wages are total labor income from the main activity divided by hours of work in that activity. In the SEDLAC database, labor income is calculated considering workers who are employees (salaried workers) or self-employed. According to the methodological guide (p.49): "*An individual is considered an informal worker if (s)he belongs to any of the following categories: (i) unskilled self-employed, (ii) salaried worker in a small private firm, (iii) zero-income worker*". From this point of view, we can infer that the database takes into account informality, a big issue in Latin American countries.

[8] Regarding the self-employed workers, the methodological guide by the Penn World Table suggests that they estimate the self-employed workers' labor income: "It is relatively straightforward to determine the share of labor income of employees in GDP, as this information is a regular part of the National Accounts of countries. Estimating the labor income of self-employed workers is more challenging. If a country reports the total income of self-employed, known as mixed-income, there is a clear upper bound to overall labor income, leading to a reasonable estimate. When such information is not available, PWT8 assumed self-employed earn the same average wage as employees or alternatively that self-employed labor income equaled value added in agriculture, depending on which method leads to a lower labor share" (Feenstra et al., 2016, p.10).

Country	**Spending-based fiscal consolidations**	**Spending-based fiscal expansions**	**Tax-based fiscal consolidations**	**Tax-based fiscal expansions**
Argentina			1996, 1997	
Bolivia			1995, 2004, 2005	
Brazil	2015		2015	
Chile	2003	2008	1990, 1991, 2003, 2004, 2014, 2015, 2016	
Colombia	2000, 2015, 2016		2003, 2011, 2012	
Costa Rica	1995, 1997, 2016		1990, 1991, 1992, 1995, 1996, 2016	1993, 1994
Dominican Republic	2004, 2011, 2013		2004, 2007, 2011, 2013	2006
Ecuador	1993		1990, 1993, 2000	
Guatemala	2000, 2002, 2012		1995, 1996, 2000, 2002, 2013	
Jamaica	1999, 2000, 2003, 2004, 2013, 2014		1992, 2003, 2004, 2012, 2013, 2014	
Mexico			1989, 2010, 2014	
Paraguay	1989, 2001, 2016		1989, 2001, 2003, 2004, 2014	2005, 2006
Peru			1992, 2002, 2003, 2012	2011
Uruguay	1995, 2000, 2002, 2003, 2015		1990, 1995, 1996, 2002, 2003	2004, 2005

Table 3.1 - Fiscal consolidation episodes in Latin America and the Caribbean (1989-2016)
Source: Author's calculations based on David and Leigh (2018).

increases in taxes) which aim at reducing the budget deficit and are not a response to prospective economic conditions, we obtained annual data from David and Leigh (2018) for the period 1989-2016. As already stated in Chapter 2 (Section 2.2), the most recent econometric literature agrees on the endogeneity problems associated with the CAPB methodology (Heimberger, 2020; Devries et al., 2011; Ball et al., 2013; Agnello and Sousa, 2012; Agnello and Sousa, 2014; David and Leigh, 2018; Cardoso and Carvalho, 2023). Since it can lead to biased estimates (Perotti, 2013; Guajardo et al., 2014), nearly all recent papers follow the "narrative" approach to identify fiscal shocks (Table 2.1). Therefore, we follow the most recent macro-econometric literature and apply the narrative approach based on the dataset provided by David and Leigh (2018), as in Cardoso and Carvalho (2023). The countries included in David and Leigh's (2018) sample are Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Guatemala, Jamaica, Mexico, Paraguay, Peru, and Uruguay.

Table 3.1 summarizes the occurrence of fiscal consolidation episodes in our dataset. Following Cardoso and Carvalho (2023), we divide these episodes into spending- and tax-based episodes; and expansion and consolidation shocks. Table 3.2 presents some descriptive statistics. There are 67 and 9 consolidation and expansion episodes, respectively. The average size of the 67 fiscal consolidation programs amounts to 1.1% of GDP. The panel data are unbalanced since there are some missing data in the Gini index for hourly wages (mainly during the 1990s)[9][10]. On the other hand, the panel data are balanced regarding the exercise for the wage share in GDP and the Gini index for disposable income and market income[11].

To avoid estimation bias due to unobserved factors influencing the dynamics of the Gini coefficient in the econometric exercises, we control for five additional variables recom-

[9] For Chile, Guatemala, and Mexico, linear interpolation was needed to include these countries in the sample. The linear method was chosen based on Heimberger (2020), who also used interpolated data for the Gini index.

[10] In Section 3.6, we will conduct an exercise using linear interpolation (following Heimberger, 2020) to fill the gaps with data missing. Results are robust.

[11] The exercises carried out for the disposable income and for market income inequality start in 1992 and 1991, respectively. We excluded the years 1989 and 1990 from the sample due to the availability of data in order to estimate a balanced panel since the unbalanced panel showed stationary issues in these exercises. The year 1991 was also excluded from the sample for Equation 3.1 due to stationary issues (its inclusion, however, does not change our baseline results).

Shock type	**Number of annual shocks**	**Average size (% GDP)**	**Standard deviation**	**Maximum size (% GDP)**	**Minimum size (% GDP)**
Consolidation (total)	67	1.1%	0.91%	4.1%	0.096%
Consolidation (tax-based)	57	0.9%	0.76%	4.1%	0.096%
Consolidation (spending-based)	29	0.78%	0.48%	2%	0.2%
Expansion (total)	9	0.57%	0.19%	0.9%	0.3%
Expansion (tax-based)	8	0.58%	0.2%	0.9%	0.3%
Expansion (spending-based)	1	0.5%	-	0.5%	0.5%

Table 3.2 - Fiscal consolidation episodes in Latin America and the Caribbean (1989-2016): descriptive statistics

Source: Author's calculations based on David and Leigh (2018).

mended by the literature:

i) real GDP per capita (denominated in US dollars in 2015 prices), obtained from the World Development Indicators database (The World Bank) (Woo et al. (2013), Jalles (2017), Agnello and Souza (2014), Cardoso and Carvalho (2023), Schaltegger and Weder (2014), Heimberger (2020)).

ii) trade openness (trade-to-GDP). This variable refers to "exports of goods and services plus imports of goods and services (% of GDP)" and was also retrieved from the World Development Indicators database (The World Bank) (Woo et al. (2013), Jalles (2017), Agnello and Souza (2014), Cardoso and Carvalho (2023), Heimberger (2020));

iii) unemployment rate, from the International Labour Organization database. (Ball et al., (2013), Woo et al. (2013), Jalles (2017), Furceri et al. (2016), Cardoso and Carvalho (2023), Heimberger (2020));

iv) GDP growth rate (denominated in US dollars in 2015 prices), obtained from the World Development Indicators database (The World Bank) (Ball et al. (2013), Jalles (2017), Cardoso and Carvalho (2023), Heimberger (2020), Klein and Winkler (2019));

v) inflation rate (obtained from the World Development Indicators database - The World Bank) (Woo et al., 2013), measured by the GDP deflator (% annual).

We include real GDP per capita, GDP growth rate, and the unemployment rate to control the economic cycle. For example, a decrease in economic activity, measured by these variables, might increase the probability of fiscal consolidation episodes due to automatic stabilizer mechanisms (Heimberger, 2020). Also, higher unemployment is probably associated with greater inequality since many unemployed workers are at the bottom of the income distribution (Woo et al., 2013).

We include the inflation rate as it might contribute to increase inequality since it tends to affect the bottom of the income distribution more than other groups (Easterly and Fisher, 2001; Parker, 1998; Bishop et al., 2020). Additionally, there exists extensive literature that examines the effects of monetary policy on income distribution (for a review, see Kappes, 2023). Furthermore, to account for the impact of trade globalization on inequality, we include the variable of trade openness in our study (Meschi and Vivarelli, 2007).

3.3.2 Econometric Methodology

As seen in Chapter 2 (Table 2.1), several authors use panel static techniques to estimate the impact of fiscal austerity on income inequality for a group of countries, such as SUR models (Seemingly Unrelated Regressions) (Agnello and Sousa, 2012; Woo et al., 2013; Agnello and Sousa, 2014, Jalles, 2017) and FEE estimations (Fixed Effects Estimator) (Woo et al., 2013; Schaltegger and Weder, 2014; Agnello et al., 2016; Schneider et al. 2017).

The most recent literature, however, makes widespread use of impulse-response functions based on the local projections (LP) method of Jordà (2005) (Heimberger, 2020; Cardoso and Carvalho, 2023; Klein and Winkler, 2019; Furceri et al., 2018a, Jalles, 2017, Ball at al., 2013; Carrière-Swallow et al., 2021; Carrière-Swallow et al., 2018). The most recent studies examining the relationship between inequality and the economic cycle (Table 2.3) also employ methodologies that allow the evaluation of the effect in a dynamic dimension, using impulse-response functions (Vector Autoregressive models (VAR), Vector Error Correction models (VEC), local projections and variations) (Hoover et al., 2009; Atems and Jones, 2015; Camacho and Palmieri, 2019; Geiger et al., 2020; Ciminelli et al., 2019). As stated by Atems and Jones (2015) and Cardoso and Carvalho (2023), since the distributional impacts of fiscal consolidation tend to change over time, static approaches are not sufficient.

Besides Jordà's (2005) methodology, there are other possibilities to measure dynamic effects, such as Panel Vector Autoregression (PVAR) and Autoregressive-Distributed-Lag Model (ARDL). According to the literature, both options are inferior to the local projections (LP) method.

First, VAR models are more subject to misspecification issues since they constrain the shape of the impulse response functions. This approach also suffers from identification and size limitation problems (Gupta et al., 2017; Carrière-Swallow et al., 2021; Heimberger, 2020; Jalles, 2017; Klein and Winkler, 2019). Secondly, the literature criticizes the use of ARDL models in this context. Ball et al. (2013) and Heimberger (2020) point out that the impulse-response functions derived using this method are potentially unstable because of their lag sensitivity.

Finally, Cai and DenHaan (2009) highlight that when the dependent variable is very persistent (Gini index data, for example), the long-run effects are likely to be significant if the estimated model is "one-type-of-shock models"[12]. The local projection approach, on the other hand, does not suffer from these caveats because the coefficients associated with the lags of the change in the dependent variable enter only as control variables and are not used to derive the impulse-response function (Ball et al., 2013; Furceri et al., 2016; Jalles, 2017; Heimberger, 2020). Therefore, confidence intervals can be estimated directly from the standard errors of the estimated coefficients, and Monte Carlo simulations are not required (Furceri et al., 2016; Heimberger, 2020; Ball et al., 2013). In light of this methodological discussion, recent literature has recently converged on the Local Projections approach (Jordà, 2005).

This paper estimates the distributional effects of fiscal consolidation measures over the short- and medium-run. In doing so, we estimate impulse response functions (IRFs) from local projections based on the methodology proposed by Jordà (2005). For each future period k, the following equation is estimated on annual data by Ordinary Least Squares (OLS). The first exercise equation is given by:

$$Gdi_{i,t+k} - Gdi_{i,t} = \sum_{n=0}^{2} \beta_n^k S_{i,t-n} + \sum_{j=0}^{1} \delta_j^k \Delta Gdi_{i,t-j} + \gamma_k Z_{i,t} + \xi_i^k + \eta_t^k + \epsilon_{i,t+k} \tag{3.1}$$

[12] "*One-type-of-shock would mean that the response of the dependent variable is always the same, no matter of why there is a shock to the system*" (Heimberger, 2020, p.61).

The second exercise equation is given by:

$$Gmk_{i,t+k} - Gmk_{i,t} = \sum_{n=0}^{2} \beta_n^k S_{i,t-n} + \sum_{j=0}^{1} \delta_j^k \Delta Gmk_{i,t-j} + \gamma_k Z_{i,t} + \xi_i^k + \eta_t^k + \epsilon_{i,t+k} \quad (3.2)$$

The third exercise:

$$Gw_{i,t+k} - Gw_{i,t} = \sum_{n=0}^{1} \beta_n^k S_{i,t-n} + \sum_{j=0}^{1} \delta_j^k \Delta Gw_{i,t-j} + \gamma_k Z_{i,t} + \xi_i^k + \eta_t^k + \epsilon_{i,t+k}^k \quad (3.3)$$

Finally, for our fourth exercise, we estimate a very similar equation:

$$W_{i,t+k} - W_{i,t} = \sum_{n=0}^{1} \beta_n^k S_{i,t-n} + \delta^k \Delta W_{i,t-1} + \gamma_k Z_{i,t} + \xi_i^k + \eta_t^k + \epsilon_{i,t+k}^k \quad (3.4)$$

Following the literature, with k=1, ..., 8 (Ball et al., 2013; Furceri et al., 2016; Heimberger, 2020; Cardoso and Carvalho, 2023).

In Equation 3.1:

Gdi represents the Gini index for disposable income (in logarithm);

S is the fiscal shock variable from David and Leigh's (2018) database, as % of GDP - we include three lags in the baseline model, consistent with Cardoso and Carvalho (2023), to control for its persistence[13];

β_n^k measures the distributional impact of fiscal consolidation episodes for each future period k;

ΔGdi denotes the lags in the change of the measure of inequality - we set the number of lags to two in the baseline model, following the literature (Heimberger, 2020; Cardoso and Carvalho, 2023; Ball et al., 2013; Jalles, 2017; Furceri et al., 2016; Furceri et al., 2018a; Woo et al., 2013)[14]. According to Heimberger (2020), controlling for lags in the change of the Gini is important to control its persistence since changes in the coefficient can be expected to depend on past changes;

$Z_{i,t}$ represents a vector of additional control variables - explained in Section 3.3.1;

ξ_i^k are country fixed effects and η_t^k are time fixed effects.

Equation 3.2 has the same interpretation, and *Gmk* means the Gini index of market income. Equation 3.3 is very similar, where *Gw* represents the Gini coefficient for hourly wages. We include two lags of the fiscal shock, consistent with Furceri et al. (2016)[15]. In

[13] We will show in Section 3.6 that the exercise is robust when we change the number of lags.

[14] We will show in Section 3.6 that the exercise is robust when we change the number of lags.

[15] We will show in Section 3.6 that the exercise is robust when we change the number of lags.

Equation 3.4, W is the wage share in GDP. For this last exercise, we set to one the number of lags of the dependent variable in the baseline results (ΔW)[16].

Impulse-response functions are obtained by plotting the estimated β_n^k, for k= 1,..8, with confidence bands for the estimated functions computed using the standard deviations associated with the estimated coefficients β_n^k (Ball et al., 2013). Confidence intervals are estimated based on Driscoll and Kraay's (1998) standard errors, which are robust with respect to heteroskedasticity and serial and cross-sectional correlation (Klein and Winkler, 2019; Cardoso and Carvalho, 2023).

According to unit root tests, the Gini index (for disposable income, for market income, and for hourly wages) and the labor share in income (both in logarithm) are not stationary. Therefore, the dependent variable is included in differences, which are stationary[17]. The dependent variables are also included in first difference as control variables. With the exception of the GDP growth rate and the inflation rate[18], the other three additional control variables are included in first-difference (real GDP per capita in logarithm, trade-to-GDP, and unemployment rate) since unit root tests show they are not stationary.

Our baseline exercise for Equations 3.1, 3.2, and 3.3 includes real GDP per capita as a control variable (significant at at least 10% level). The baseline estimation using Equation 3.4 includes the unemployment rate, which is significant at 1%. Section 3.6 will show that the results of the baseline estimations are extremely robust to changes in the control variables.

Equations 3.1 and 3.2 are estimated for 11 countries (Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Jamaica, Mexico, Paraguay, Peru, and Uruguay). To avoid spurious results, we excluded the Dominican Republic from the baseline model due to stationary issues about the dependent variable. However, in Section 3.6, we included this country in the sample. The results are highly robust[19]. We estimate Equations 3.3 and 3.4 to investigate the effect of fiscal episodes on hourly wage and functional distributions,

[16] We will show in Section 3.6 that the exercise is robust when we change the number of lags.

[17] To estimate Equation 3.3, we conducted the Fisher Test for panel unit root using an augmented Dickey-Fuller test recommended for unbalanced panel data (since there are some missing data for the Gini index). We conducted the Levin-Lin-Chu test for balanced panels to estimate Equations 3.1, 3.2, and 3.4.

[18] The inflation rate is included as the logarithm of $(1 + rate)$, following Woo et al. (2013).

[19] We excluded Guatemala in the baseline exercise (balanced panel) due to the unavailability of data for 2015 and 2016. The year 2016 for Jamaica was obtained from a later database version (9.1).

respectively. To carry out these two channels exercise, we excluded Jamaica from the sample since its Gini index for hourly wages is unavailable[20]. Equation 3.3 is estimated considering 12 countries (Argentina, Bolivia, Brazil, Chile, Colombia, Dominican Republic, Ecuador, Guatemala, Mexico, Paraguay, Peru, and Uruguay). Costa Rica was excluded from the sample because its inclusion made the model sensitive to the choice of the number of fiscal shock lags (robustness checks show that results do not change too much when we include this country - see Section 3.6). Finally, Equation 3.4 is estimated for 11 countries (Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Guatemala, Mexico, Paraguay, Peru, and Uruguay). We excluded Argentina and Ecuador due to stationary issues regarding the dependent variable in order to avoid spurious estimations. The results are, however, robust to their inclusion in the sample, as Section 3.6 will demonstrate.

We also excluded Bolivia from the sample for Equations 3.1 and 3.2 in our baseline estimations. When this country is included, the effects on disposable income and market income inequalities of tax-based adjustment episodes are not statistically significant due to a specific tax-based shock in 2004 - see estimations in Appendix J and K, including Bolivia. On the other hand, excluding Bolivia from the sample does not affect the results for spending-based measures. The results presented in Appendix J and K (that tax-based measures do not affect inequality) are not robust since they are due to a specific shock driving the results to zero. Thus, for the sake of robustness, we excluded Bolivia from our baseline estimations for Equations 3.1 and 3.2. This finding is in line with Cardoso and Carvalho (2023), who argue that:

"*The tax-based fiscal adjustments with the highest magnitude (in % of GDP) from David and Leigh's (2018) database were implemented in Bolivia in 2004 and 2005. In 2004, implementing a tax on financial transactions generated a fiscal adjustment of 2% of GDP. Assuming that financial assets are held disproportionately by members of the upper-income classes, this type of tax will be predominantly progressive. In 2005, a new direct tax on hydrocarbons (IDH) implied an increase in royalties from 18 to 50 percent of turnover, accounting for a 3.1% of GDP fiscal adjustment. Revenues from IDH and royalties increased from US$338 million in 2004 to over US$726 million in 2005 and*

[20] In Section 3.6, we excluded Jamaica from the sample for Equation 3.1 and 3.2 (disposable income and market income exercises), and included Jamaica in the sample for Equation 3.4 (labor share exercise), as a robustness check.

became a key to Bolivia's social development. Therefore, the magnitude, characteristics, and indirect effects of these measures may have driven tax-based baseline results closer to zero." (Cardoso and Carvalho, 2023, p.19).

In fact, these results suggest the importance of taking into account the disaggregation of tax-based measures since they have different impacts on inequality. A more progressive tax-based measure, for example, could mitigate the increase in inequality. For this reason, it would be interesting to estimate the impact of different types of austerity measures on inequality (see, for example, Ciminelli et al., 2019, for OECD countries).

Equations 3.1-3.4 have been estimated separately for spending-based and tax-based shocks, following the methodologies of Heimberger (2020) and Cardoso and Carvalho (2023). However, there are concerns about potential bias in the results due to a few episodes in the database involving both spending reductions and tax-based measures. To address this issue, we adopt a robustness test, as suggested by Heimberger (2020). In this test, we classify measures as spending-based when the shock's absolute magnitude exceeds the corresponding tax-based shock and vice versa.

The results for Equations 3.1-3.4, as well as Equation 3.5 (found in Section 3.4.2.1), can be found in Appendix M. Notably, these results prove to be highly robust to this adjustment. The most significant change observed was in the impact of tax-based shocks on wage inequality, which remains statistically significant at the 10% level in the seventh year[21].

3.4 Results and Discussion

3.4.1 The effect of fiscal consolidation episodes on disposable and market income inequalities

Figure 3.5 graphically depicts the accumulated response of disposable income inequality to a fiscal consolidation episode of 1% of GDP, obtained by estimating Equation 3.1. The grey areas in all the plots represent the confidence bands of the impulse response functions, at 10% level (confidence level of 90%).

Tables 3.3 presents the estimated coefficients for Equation 3.1 considering total fiscal

[21] Also, if we consider the most used standard deviation band in the literature - one standard deviation - the effect is still significant for years 6 and 7 (Figure M.6)

Effect/year	1	2	3	4	5	6	7	8
Fiscal shock t-1	**0.113**	**0.211**	**0.211**	**0.479***	**0.863*****	**1.135****	**1.290****	**0.995***
Fiscal shock t-2	0.0390	0.0215	0.232	0.426**	0.687**	0.827*	0.565	0.380
Fiscal shock t-3	-0.0254	0.180	0.410**	0.666*	0.882**	0.649	0.569	0.410
Real GDP per capita	-0.0161	-0.0645	-0.119*	-0.142*	-0.190**	-0.217**	-0.212*	-0.230
Sample	242	231	220	209	198	187	176	165

Table 3.3 - Impacts on disposable income inequality (%) (following a fiscal adjustment episode of 1% of GDP)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

adjustments. The bold line in each table represents the cumulative response of disposable income inequality (in %) to a fiscal consolidation equivalent to 1% of GDP, as shown in the impulse response functions (IRFs) in Figure 3.5[22].

The Gini index for disposable income increases by 0.479% (0.22 ppt.) and by 1.290% (0.596 ppt.)[23] at four and seven years after a fiscal adjustment episode of 1% of GDP, respectively (statistically significant at the 10% and 5% levels). Notably, the impact on disposable income inequality is significant in the medium run, indicating a persistent effect.

Figure 3.6 graphically presents the accumulated response of market income inequality to a fiscal consolidation episode of 1% of GDP, obtained by estimating Equation 3.2. Table 3.4 presents the estimated coefficients for Equation 3.2 considering total fiscal adjustments.

[22] This exercise is an extension of the estimation by Cardoso and Carvalho (2023). The authors estimate the impact of fiscal shocks identified by David and Leigh (2018) on the Gini index for disposable income, obtained from the SWIID Database, for nine South American countries. Our study includes four more countries: Costa Rica, the Dominican Republic (robustness check), Mexico, and Jamaica. As discussed in Section 3.3.2, we excluded Bolivia from the sample in the baseline model for Equations 3.1 and 3.2. Results including Bolivia are available in Appendix J and K. Note the results in Appendix J are similar to the estimations by Cardoso and Carvalho (2023): spending-based fiscal austerity measures have long-lasting effects on disposable income inequality, while tax-based fiscal consolidation episodes do not show a statistically significant impact on the Gini index.

[23] Impacts are calculated in percentage points (ppt.) using the average Gini index of the sample: 0.4624.

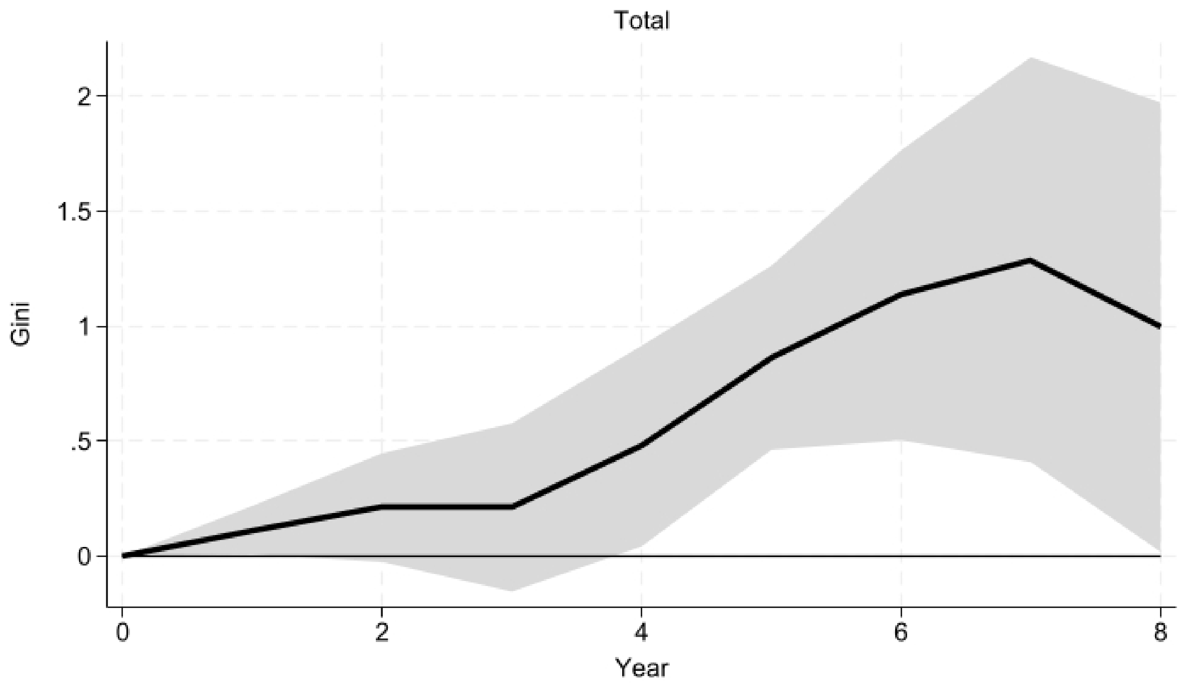

Figure 3.5: Cumulative Response of Disposable Income Inequality (change in %) to a fiscal consolidation of 1% of GDP

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%. "Total" corresponds to all shocks.

Effect/year	1	2	3	4	5	6	7	8
Fiscal shock t-1	**0.107**	**0.191**	**0.239**	**0.356**	**0.584****	**0.760****	**0.924***	**0.634**
Fiscal shock t-2	0.0683	0.0437	0.147	0.277*	0.406	0.562	0.317	0.129
Fiscal shock t-3	-0.0500	-0.00023	0.0932	0.173	0.317	0.148	0.0791	-0.0807
Real GDP per capita	-0.00496	-0.0502	-0.0996*	-0.119	-0.162*	-0.189**	-0.179*	-0.176
Sample	253	242	231	220	209	198	187	176

Table 3.4 - Impacts on market income inequality (%) (following a fiscal adjustment episode of 1% of GDP)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

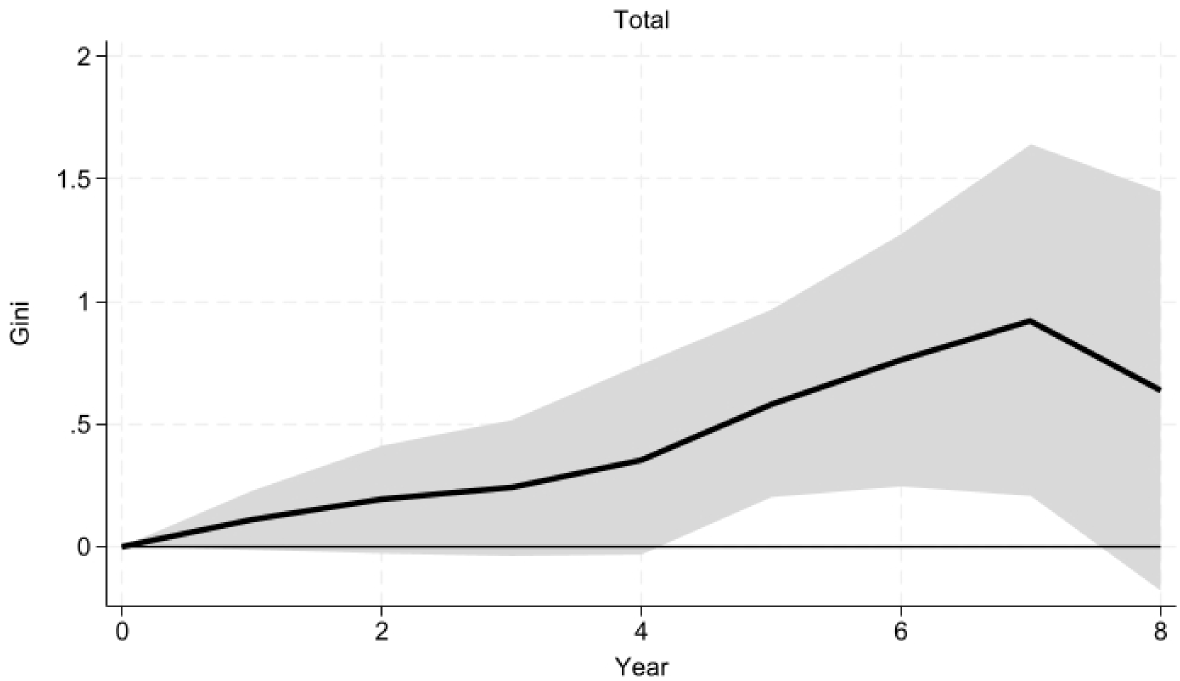

Figure 3.6: Cumulative Response of Market Income Inequality (change in %) to a fiscal consolidation of 1% of GDP

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%. "Total" corresponds to all shocks.

The bold line indicates the cumulative response of market income inequality (in %) to a fiscal consolidation of 1% of GDP (IRFs in Figure 3.6).

Table 3.4 shows that the Gini index for market income increases by 0.584% (0.287 ppt.)[24] and 0.924% (0.454 ppt.) after five and seven years following the fiscal shock.

Section 3.6 presents several robustness checks. Our conclusions in this section do not change with these tests.

3.4.2 Investigating the Channels

To analyze the role of each channel, we draw upon the work of Francese and Mulas-Granados (2015), Lerman and Yitzhaki (1985), and CBO (2011), which involves decomposing the Gini index by income sources. As shown in Equation 2.2, Section 2.4.2 (Chapter 2), the change in market income inequality can be further broken down into its components, including changes in the functional distribution and inequalities among each income source (such as labor and capital).

We analyze the effect of austerity measures on inequality through three channels, as previously discussed in Chapter 2 (Figure 2.1): a) the redistributive effect, which captures the impact of changes in taxes and transfers; b) the impact on the distribution among workers (wage inequality); c) the impact on the distribution between capital and labor, known as functional inequality.

3.4.2.1 The Redistributive Channel

As shown in Section 3.4.1, while the response of disposable income (post-fiscal) inequality to an austerity shock appears to be greater than the response of the Gini index for market income (pre-fiscal) in the medium run, both peak responses are similar and not statistically different.

To assess this result, the redistributive channel, we conducted an exercise inspired by Klein and Winkler (2019) for OECD countries to measure the degree of redistribution through the tax and transfer system, given the similarity of the responses of disposable and market income inequalities. Initially, we calculated the difference between market and disposable income inequality (as shown in Figure 3.7). Next, we estimated the following

[24] Impacts are calculated in percentage points (ppt.) using the average Gini index of the sample: 0.491544.

equation:

$$Dif_{i,t+k} - Dif_{i,t} = \sum_{n=0}^{2} \beta_n^k S_{i,t-n} + \sum_{j=0}^{1} \delta_j^k \Delta Dif_{i,t-j} + \gamma_k Z_{i,t} + \xi_i^k + \eta_t^k + \epsilon_{i,t+k} \tag{3.5}$$

where Dif represents the difference between market and disposable income inequality. S is the fiscal shock variable from David and Leigh's (2018) database, as % of GDP - we include three lags in the baseline model, consistent with Cardoso and Carvalho (2023) and the disposable income and market income inequality exercises. β_n^k measures the distributional impact of fiscal consolidation episodes for each future period k. ΔDif denotes the lags in the change of the measure of inequality - we set the number of lags to two in the baseline model, consistent with our previous exercises. $Z_{i,t}$ represents a vector of additional control variables. ξ_i^k are country fixed effects and η_t^k are time fixed effects[25].

An increase in this redistribution measure implies that disposable income inequality rises by a smaller extent than market income inequality in response to fiscal consolidations. Klein and Winkler (2019) found that the redistribution effect tends to increase after a fiscal adjustment, primarily driven by the role played by automatic stabilizers.

Figure 3.8 depicts the cumulative response of the redistributive effect to a fiscal consolidation of 1% of GDP. The usual robustness tests for this exercise are presented in Appendix L (see Figures L.1-L.4). The redistributive measure response to fiscal shocks is not statistically significant at 10%. For this reason, we perform one more exercise in this section, disaggregating fiscal shocks into spending- and tax-based types (Equation 3.5 is estimated separately for spending and tax-based measures, following Cardoso and Carvalho (2023)). Figure 3.9 shows the cumulative responses of the redistributive measure to a fiscal consolidation of 1% of GDP for spending- and tax-based shocks.

In the short run, the redistribution effect increases significantly, particularly for spending-based measures (significant at 5% in the first two years, and at 10% in the third year). This finding suggests that disposable income inequality responds less to austerity shocks than market income inequality in the short run. However, in the medium run, the redistributive channel is not statistically different from zero.

[25] Similar to the approach taken for disposable and market income inequalities (Equations 3.1 and 3.2), in order to ensure comparability, the baseline exercise incorporates two lags of the difference variable as independent variables, along with three lags of fiscal shocks, real GDP per capita, and country and time fixed effects.

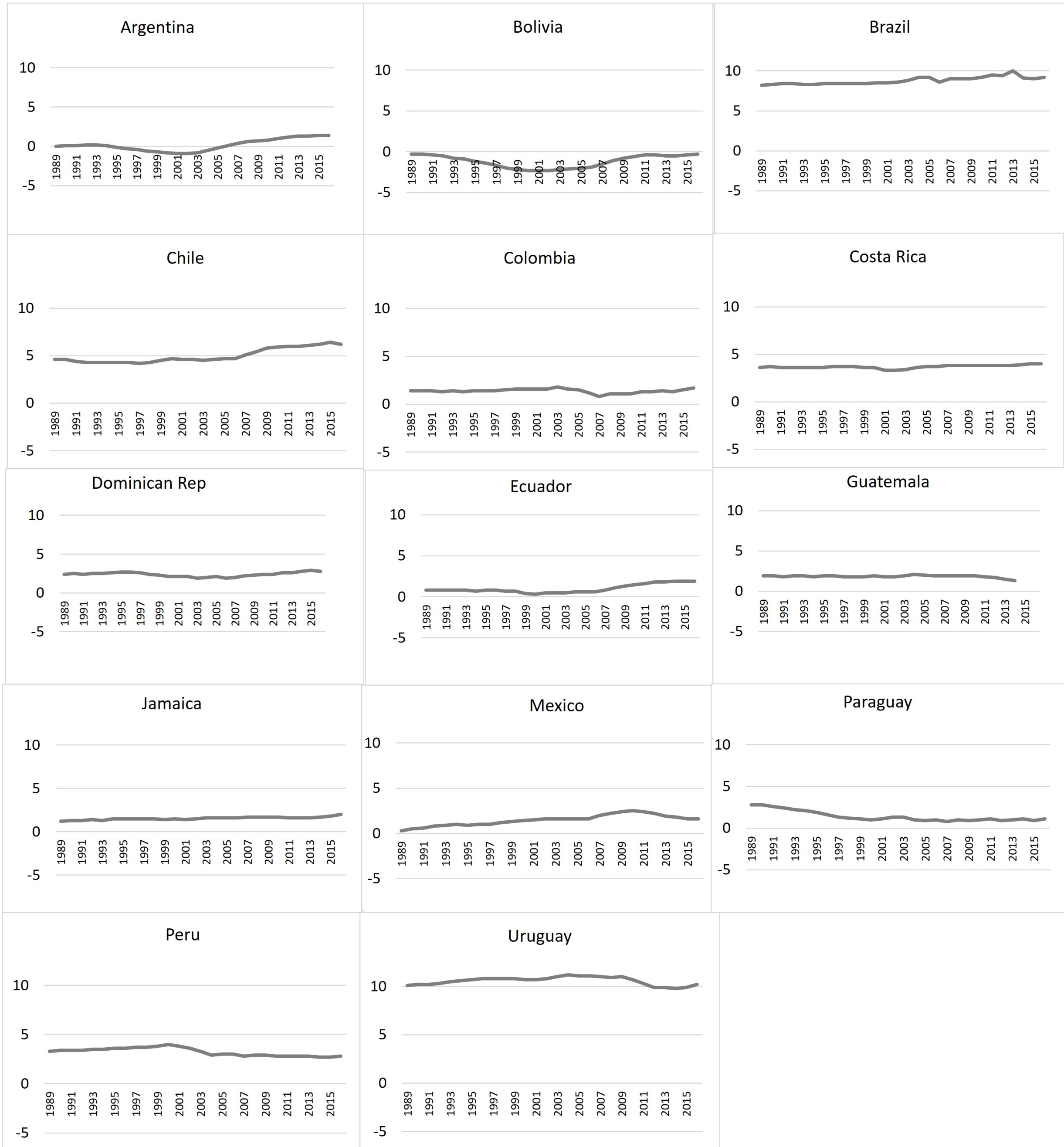

Figure 3.7: Redistributive measure (difference between market income inequality and disposable income inequality)

Source: Author's calculations based on the Standardized World Income Inequality Database (SWIID) (version 8.2).

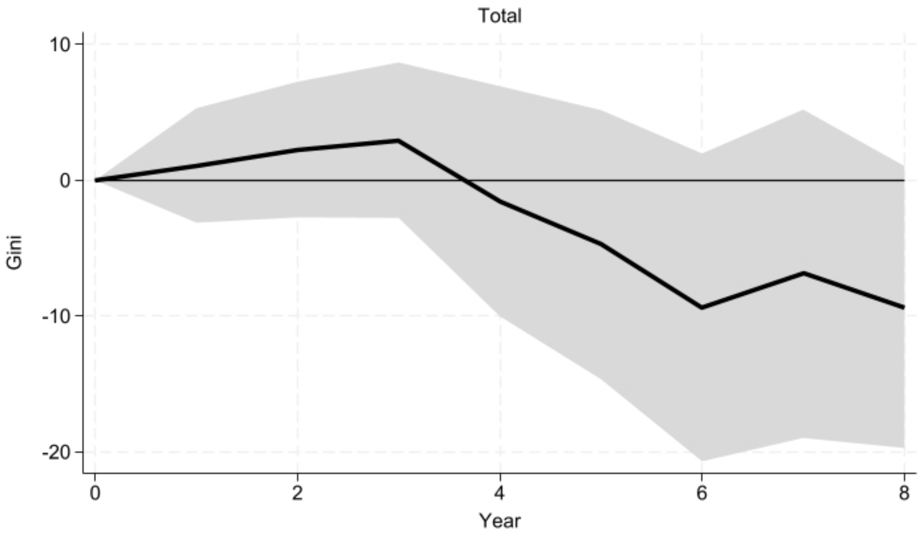

Figure 3.8: Cumulative Response of the Redistributive Measure (change in %) to a fiscal consolidation of 1% of GDP

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%. "Total" corresponds to all shocks.

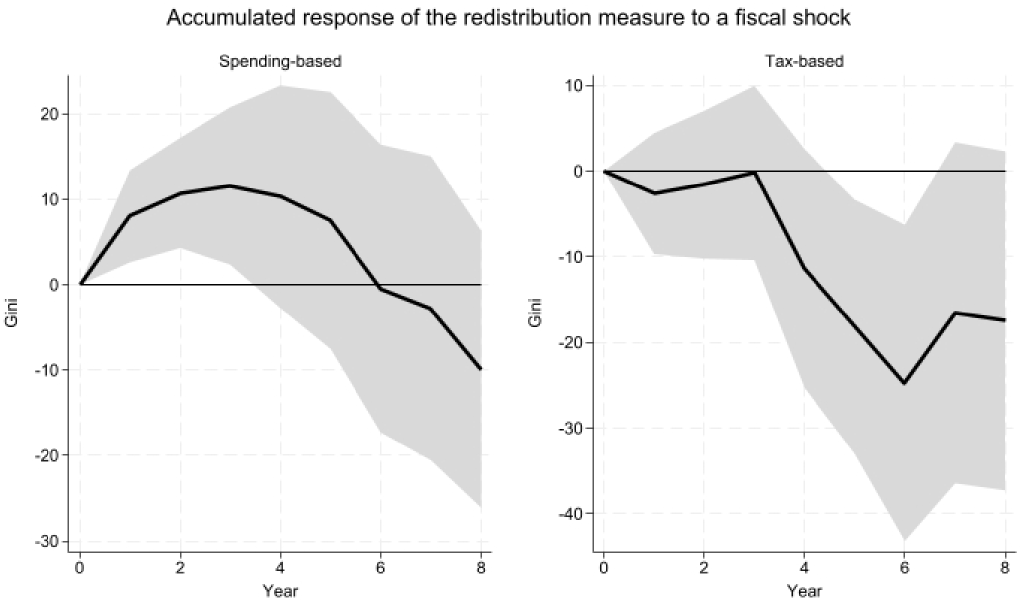

Figure 3.9: Cumulative Response of the Redistributive Measure (change in %) to a fiscal consolidation of 1% of GDP - Two types of fiscal shock (spending-based and tax-based)

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%."Spending-based" corresponds to shocks in spending; "Tax-based" corresponds to shocks in taxes.

The result for the short run is consistent with Klein and Winkler's findings (2019) for OECD countries. It highlights the significance of the social safety net in Latin American countries, which plays a crucial role in generating a positive redistribution effect following austerity measures. This effect partially offsets the negative distributional consequences, at least in the short run, as disposable income inequality responds less to fiscal consolidation measures. The importance of this redistributive effect becomes even more apparent when considering that some fiscal episodes explicitly focus on transfers and social assistance programs[26]. As commented by Heimberger (2020, p. 67):

"*The finding that the effect of consolidation episodes on market income is stronger than on disposable (after-taxes, after-transfers) income may be expected if the increase works through the channels of higher (long-term) unemployment–fiscal austerity decreases demand, lowers growth and pushes up unemployment (e.g. Guajardo et al. 2014; Jorda and Taylor 2016) –, skewing the distribution of market incomes (Ball et al. 2013; Furceri et al. 2016). However, the social safety net (consisting of unemployment benefits and other types of social spending) may still be able to bridge parts of the consolidation shock to income inequality*" (Heimberger, 2020, p.67).

The social safety net structure appears to play a crucial role in explaining the positive impact of austerity on the redistributive measure in the short run, even though automatic stabilizers have a limited role in Latin American countries compared to developed nations. For instance, Espino and Gonzalez-Rozada (2012) estimate that the size of automatic stabilizer coefficients is much smaller in Latin America than in Europe and the United States.

However, studies in the literature highlight the significance of the social safety net in Latin American countries for reducing inequality (Ocampo and Gomez-Arteaga, 2017; Sánchez-Ancochea, 2021; Lustig, 2017; Quiñonez, 2022; Stampini and Tornarolli, 2012; Hanni et al., 2015; Antía 2018; Franzoni and Sánchez-Ancochea, 2014). For instance, Hanni et al. (2015) demonstrate that public cash transfers, such as conditional transfer schemes and others, as well as public pension systems and personal income tax, contribute significantly to reducing income distribution inequality in the region. The authors find

[26] David and Leigh (2018) mention cuts in "current" government spending, but they do not explicitly clarify whether transfers are included in their analysis. However, they do specify that transfers are considered in the case of Brazil 2015 and Colombia 2016.

Category	Latin America and the Caribbean	OECD countries
Taxes on income and profits	6.2	11.3
Taxes on property	0.8	1.8
Social security contributions	3.9	8.9
Taxes on goods and services	11.2	10.8
Other taxes	0.4	0.2

Table 3.5 - Tax Structure: OECD and Latin America (2019; % of GDP)
Source: Cardoso and Carvalho, 2023 (based on OECD, 2021).

that public transfers have a more substantial redistributive impact compared to direct taxes: "*On average, public cash transfers (including pensions) are responsible for 61% of the reduction in the Gini coefficient of market income and the rest of the decrease is the effect of income tax and the payment of social security contributions.*" (Hanni et al. (2015, p. 13)).

Cardoso et al. (2023) estimate that social benefits have a robust positive macroeconomic impact, particularly in a diverse group of countries. Notably, the social protection multiplier effect tends to be more significant in countries that are poorer and/or more unequal[27]. Since this type of expenditure is typically mandatory, such as pensions, it has the potential to stabilize demand during economic downturns due to its high income multiplier effect (Sanches and Carvalho, 2023). These previous findings can help elucidate the importance of the transfer system in moderating the response of disposable income inequality relative to market income inequality in the short run.

On the other hand, the redistributive effect after tax-based austerity measures turns negative in the medium run (see Figure 3.9), indicating that disposable income inequality responds more strongly than market income inequality to tax-based austerity. This negative redistribution effect leads us to conclude that the impact of fiscal adjustments outweighs the role of the tax and transfer system in the medium run. The effect becomes significant in the fifth and sixth years after the shock (at 10% and 5% levels of significance,

[27] The authors calculate income multipliers for social benefits across 42 countries, including several Latin American countries (Brazil, Ecuador, Mexico, and Paraguay).

respectively).

The regressivity of tax measures can provide an explanation. The existing literature demonstrates that tax income and social contributions have a progressive role in Latin America (Hanni et al., 2015; Clifton et al., 2020). Cardoso et al. (2022), analyzing a similar group of countries and also based on the David and Leigh (2018) narrative dataset, estimated that, after five years, a fiscal consolidation episode decreases disposable income inequality when based on direct taxes. Despite this finding, the tax system structure in the region remains regressive due to its heavy reliance on indirect taxes (ECLAC, 2021; OECD, 2021) - a comparison to OECD economies is shown in Table 3.5. As most fiscal shocks in our sample are based on indirect tax measures (almost 60%)[28], we can conclude that the regressivity of taxes may explain the negative redistribution effect in the medium run.

3.4.2.2 The Wage Inequality Channel

Figure 3.10 illustrates the cumulative estimated response of hourly wage inequality to a fiscal consolidation shock of 1% of GDP (Equation 3.3). Table 3.6 displays the estimated coefficients. The bold line in the figures represents the cumulative response of hourly wage inequality (in %) to a fiscal consolidation of 1% of GDP (IRFs in Figure 3.10).

Although there is no significant effect in the short run (up to three years after the shock), fiscal consolidations lead to a persistent increase in hourly wage inequality in the medium run. As shown in the IRF presented in Figure 3.10 (see Table 3.6), the Gini index rises by approximately 2.26% (1.14 ppt.)[29] after eight years from the occurrence of the consolidation episode (of 1% of GDP) and by 3.04% (1.53 ppt.) after seven years (peak response), with statistical significance at 5% and 1%, respectively. Even in a shorter period, the response of hourly wage inequality to a consolidation episode remains significant. After the fourth and sixth year, the Gini coefficient increases by nearly 1.4% (0.7 ppt.) (significant at 10%) and 2.04% (1.02 ppt.) (significant at 1%), respectively.

[28] We analyzed the database for tax-based measures as in Cardoso et al. (2022): 59% of tax-based episodes are majority driven by indirect taxes, while only 26.7% of them are primarily based on direct taxes (and 14.3% are neutral).

[29] Impacts are calculated in percentage points (ppt.) using the average Gini index of the sample: 0.5028.

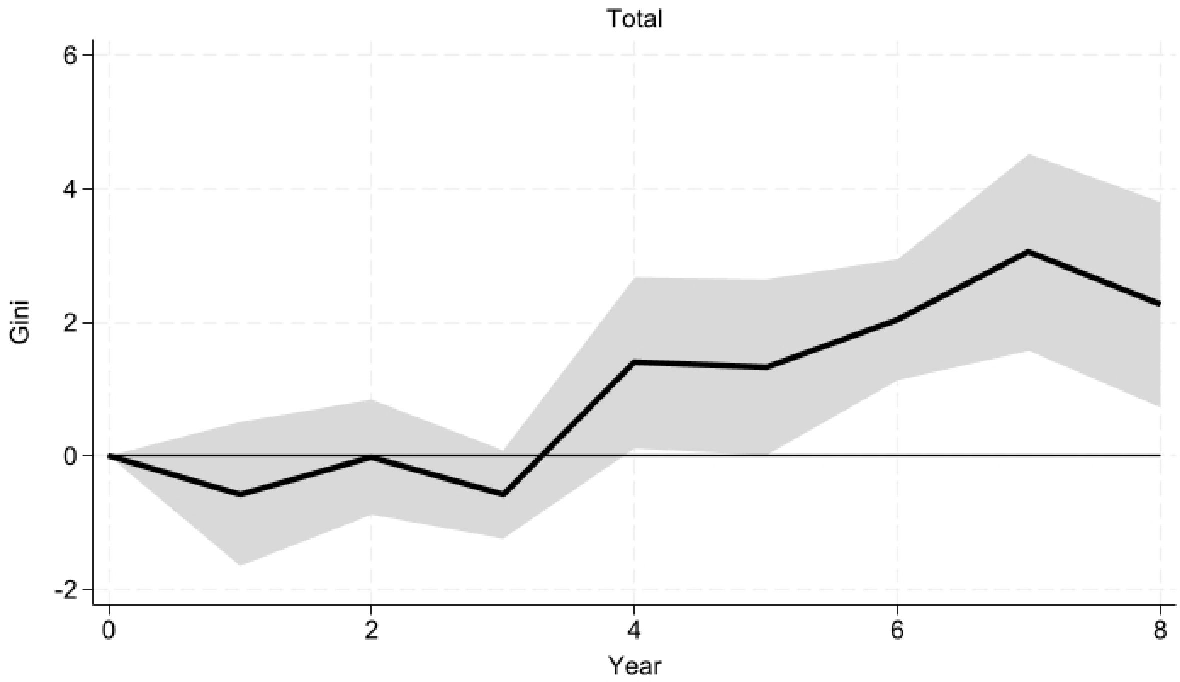

Figure 3.10: Cumulative Response of Hourly Wage Inequality (change in %) to a fiscal consolidation of 1% of GDP

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%. "Total" corresponds to all shocks.

Effect/year	1	2	3	4	5	6	7	8
Fiscal shock t-1	**-0.570**	**-0.019**	**-0.579**	**1.393***	**1.325**	**2.038*****	**3.048*****	**2.265****
Fiscal shock t-2	-0.0542	-0.459	1.420	0.938	2.160***	2.986***	1.966**	-0.101
Real GDP per capita	-0.0245	0.149	-0.37**	-0.386*	-0.367*	-0.591**	-0.548**	-0.586**
Sample	178	164	155	147	138	128	118	107

Table 3.6 - Impacts on hourly wage inequality (%) (following a fiscal adjustment episode of 1% of GDP)
Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

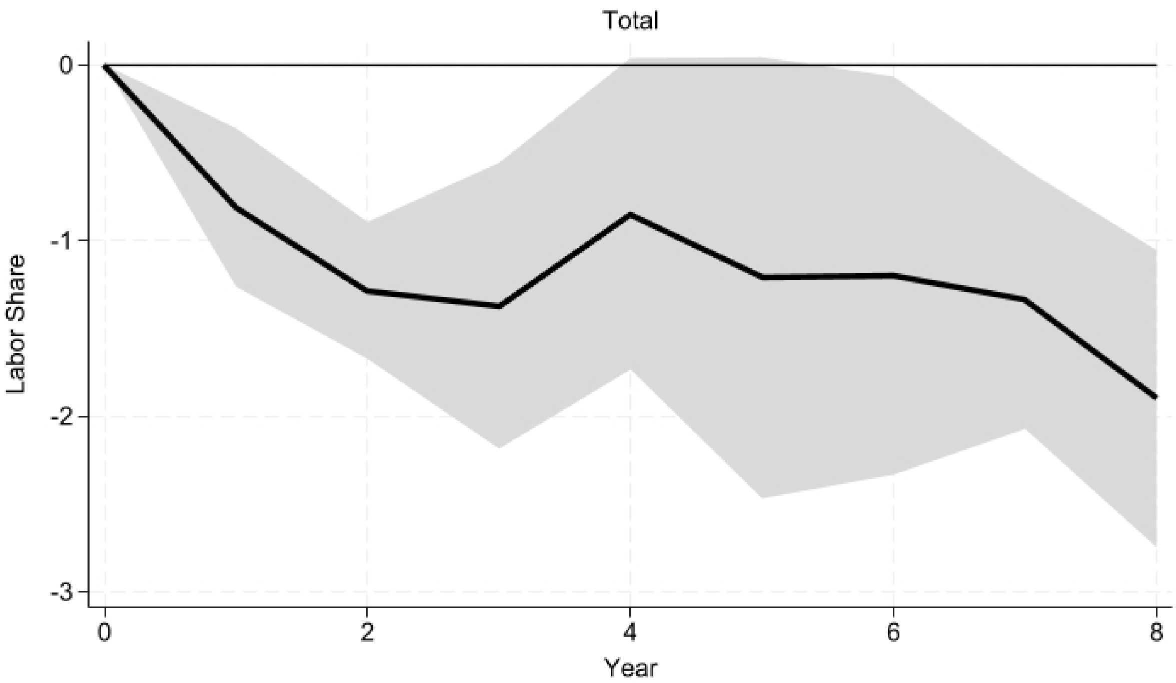

Figure 3.11: Cumulative Response of Labor Share in Income (change in %) to a fiscal consolidation of 1% of GDP

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%. "Total" corresponds to all shocks.

3.4.2.3 The Functional Inequality Channel

As our paper aims to estimate the impact of fiscal austerity on workers' income, we conduct an exercise using the labor share in GDP as our dependent variable (Equation 3.4). Among the existing literature, only Ball et al. (2013), Furceri et al. (2016), and Klein and Winkler (2019) have examined the impact of fiscal consolidation episodes on the functional distribution of income, but for OECD countries.

Figure 3.11 depicts the cumulative responses of the labor share to an austerity shock of 1% of GDP, indicating that fiscal consolidation measures generally lead to a reduction in the income share going to wage earners. Table 3.7 presents the coefficients obtained from estimating Equation 3.4. Once more, the bold line represents the accumulated response of the labor share (in %) to a fiscal consolidation of 1% of GDP (IRFs in Figure 3.11).

Contrary to the case of hourly wage inequality, the response of the wage share is statistically significant in the short run: it decreases by 0.813% (0.40 ppt.) and nearly 1.3%

	1	2	3	4	5	6	7	8
Fiscal shock t-1	**-0.813*** **	**-1.285*** **	**-1.373** **	**-0.849**	**-1.213**	**-1.201***	**-1.334*** **	**-1.90*** **
Fiscal shock t-2	-0.043	-0.181	0.269	-0.003	-0.163	-0.292	-0.547	0.208
Unemp. rate	-0.33*	-1.185***	-1.4***	-1.37***	-1.184***	-1.2***	-1.14***	-1.056***
Sample	275	264	253	242	231	220	209	198

Table 3.7 - Impacts on the labor share (%) (following a fiscal adjustment episode of 1% of GDP)
Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

(0.642 ppt.)[30] in the first and second years following the austerity measure, respectively (both significant at the 1% level). The medium-run effects are also robust and significant: after eight years, the workers' share in income declines by 1.9% (0.938 ppt.) (significant at 1%). These results are similar to those obtained by Ball et al. (2013) for a group of OECD countries, where the labor share diminishes by approximately 1.7% after four years and by 0.8% after one year.

In Section 3.6, we conduct robustness checks for the wage and functional inequalities. Our baseline estimations are robust to those changes.

3.4.2.4 Possible Explanations

Sections 3.4.2.2 and 3.4.2.3 show that the wage and functional channels exhibit a strong impact of austerity measures on hourly wages and functional inequalities, surpassing the effect on market income inequality.

Carrière-Swallow et al. (2021) studied fourteen countries in Latin America and the Caribbean using the database by David and Leigh (2018). They concluded that a fiscal consolidation of 1% of GDP leads to an average reduction of 0.9% in real GDP over two years. This adverse effect on aggregate demand helps to explain the increase in hourly wages and functional inequalities. Extensive literature demonstrates that employment losses disproportionately impact low-income groups (Blank and Blinder, 1986; Blinder and

[30] Impacts are calculated in percentage points (ppt.) using the average labor share of the sample: 0.494.

Esaki, 1978; Parker, 1998; Hoover et al., 2009; Geiger et al., 2020; Hoynes et al., 2012; Clark and Summers, 1981; Hoynes, 1999; Hershbein and Kahn, 2018; Forsythe, 2022; Kydland, 1984; Morin, 2019; Mueller, 2017; Solon et al., 1994). As austerity measures depress aggregate demand, they impact more lower-income groups and increase inequality.

The adverse impact of austerity on the wage and functional channels can also be inferred from the composition of our sample. Approximately 62% of the contractionary spending-based measures involve cuts in public investment, while this figure rises to around 72% when considering a sub-sample of South American countries. There is substantial evidence in the literature indicating that public investments have a significant impact on the economy, particularly for emerging countries, as shown in studies by Izquierdo et al. (2019), Ardanaz et al. (2021), and Deleidi et al. (2019).

Furthermore, some shocks in our sample explicitly target social transfer cuts, as observed in the cases of Brazil in 2015 and Colombia in 2016. These measures also lead to a decline in demand and result in increased unemployment since social transfers have a high multiplier effect on GDP, especially in developing countries (see, for example, Sanches and Carvalho (2023) for Brazil, and Cardoso et al. (2023) for a set of countries). These austerity shocks may have an impact on the bottom of the income distribution through two channels: their macroeconomic effect on aggregate demand (the multiplier effect) and their direct effect, as social protection programs play a crucial role in decreasing inequality (Quiñonez, 2022). Finally, it is worth noting that cuts in current expenditure could also significantly impact inequality, as some studies demonstrate the equalizing effect of public expenditure on health and education (Clifton et al., 2020; Lustig, 2017).

The increase in functional inequality, observed in both the short and medium run following fiscal consolidation programs, can be attributed to three factors. Firstly, many consolidation shocks involve wage cuts in the public sector. Secondly, there is an effect through aggregate demand. As austerity measures lead to a decrease in aggregate demand (Carrière-Swallow et al., 2021), workers' bargaining power might be weakened (as discussed in the Goodwin-inspired Kaleckian empirical literature mentioned in Chapter 2: Taylor, 2004; Barbosa Filho and Taylor, 2006; Diallo et al., 2011; Kiefer and Rada, 2015; Proaño et al., 2006; Carvalho and Rezai, 2015; Barrales-Ruiz and Von Arnim, 2021; Basu and Gautham, 2019; Barrales-Ruiz et al., 2021; Rolim, 2019; Mendieta-Muñoz et al., 2022; Vechsuruck, 2017; Basu et al., 2013; Nikiforos and Foley, 2012; Tavani et al., 2011; Marques and Lima, 2022).

Finally, a third potential mechanism is that austerity measures decrease the "social wage" by reducing the provision of public services, such as access to public education and healthcare (Setterfield and Kim, 2020). The decline in the social wage could weaken workers' bargaining power, leading to an increase in their job loss cost for a given level of employment. In this case, the reduced bargaining effect is not linked to the employment rate. The "lower social wage effect" may also encourage borrowing and debt accumulation among workers (Setterfield and Kim, 2020), which can further elevate their job loss cost and diminish their bargaining power, particularly if they rely on labor-market income to service the debt. Consequently, this process results in more inequality and job insecurity, creating a vicious cycle (Kim et al., 2019).

3.4.2.5 Comparing the Channels

In the short run, there are two relevant channels, discussed earlier:

i) Section 3.4.2.1 showed that, in the short run, the redistribution effect increases after spending-based measures. This finding suggests that disposable income inequality responds less to austerity shocks than market income inequality in the short run. We highlighted the crucial role of the social safety net in mitigating immediate inequality impacts. In summary, the redistributive channel is significant in the short run, but only when considering the spending-based shocks.

ii) In the short run, the hourly wage inequality channel does not show a significant response to an austerity measure (see Table 3.6). In contrast, the functional distribution inequality shows a significant impact (see Table 3.7).

To analyze the medium-run, Table 3.8 presents the medium-run responses of each type of inequality to austerity measures, as estimated in earlier Sections. We have converted the impulse-response data from percentages (%) to percentage points (ppt.), in order to interpret the Gini decomposition equation[31]. But we also present the result in terms of %. To construct Table 3.8, we also considered the peak response of each variable in the medium run[32]. For instance, a fiscal austerity shock increases the Gini index for hourly

[31] To perform this conversion, we used the average of the sample: 0.4624 (Gini for disposable income), 0.49154 (Gini for market income), 0.5028 (Gini for hourly wages), and 0.494 (workers' share in income).

[32] For instance, when analyzing the impact of total shocks, the peak response for disposable income,

	Impact
Effect on disposable income inequality (Total / Overall effect)	0.596** (1.29%)
Effect on market income inequality	0.454* (0.924%)
Effect on hourly wage inequality	1.532*** (3.048%)
Effect on functional inequality	0.939*** (1.9%)

Table 3.8 - Summary of the results (peak response in the medium run, in percentage points)
Source: Author's calculations.

wages by 3.04% (equivalent to 1.532 ppt.) after seven years (see row 3).

We highlight three main results for the medium-run:

iii) The redistributive channel in the medium run suggests that disposable income inequality responds more to austerity measures than market income inequality (see Table 3.8). In Section 3.4.2.1, we demonstrated that this outcome is attributed to tax-based shocks, suggesting that the regressivity of taxes exacerbates disposable income inequality.

iv) The roles of wage and functional inequalities are pronounced in the medium run, as their responses to austerity measures are higher than the response of market income inequality.

v) Among wage and functional inequalities, the hourly wage inequality channel has a higher magnitude than the functional distribution inequality in the medium run (Table 3.8).

We have already discussed Results (i) and (iii) in Section 3.4.2.1.

Result (v) reveals that the hourly wage inequality channel is more significant in increasing inequality after a fiscal shock than functional inequality in the medium run. Francese and Mulas-Granados (2015), for example, find that changes in income inequality across 93 countries between 1970 and 2013 were significantly driven by changes in wage inequality, whereas the functional distribution of income between labor and capital did not play a major role. Similar results are observed when the authors separate advanced and emerging

market income, and hourly wage inequalities occurs seven years after the shock, while the peak response for the wage share in income takes place in the eighth year.

economies.

As mentioned by Francese and Mulas-Granados (2015), a report by the International Labour Organisation (ILO) explores the relationship between wages and inequality using various sources and concludes that "Inequality starts in the labor market":

"*In many countries, inequality starts in the labour market. Changes in the distribution of wages and paid employment have been key factors behind recent inequality trends. In developed economies where inequality increased most, this was frequently due to a combination of more wage inequality and job losses [...]. A number of emerging and developing economies experienced declines in inequality. In these countries, a more equitable distribution of wages and paid employment was a predominant factor. In Argentina and Brazil, where inequality fell most, changes in the distribution of wages and paid employment accounted for 87 per cent of the decade-long reduction in top-bottom inequality in Argentina, as they did for 72 per cent in Brazil.*" (ILO, 2015, p.xvii).

Nevertheless, functional inequality still plays a crucial role in explaining the total effect of the wage and functional distribution channels. Numerous studies have demonstrated that a lower labor share is associated with higher income inequality (Dao et al., 2017; IMF, 2017; Sauer et al., 2020; Daudey and García-Peñalosa, 2007; Erauskin, 2020). In the short run, the functional distribution channel is the main one among wage and functional (Result (ii)): as austerity measures adversely affect the labor market as a consequence of the negative impacts of fiscal consolidation on the workings of the goods market, it might take some time to increase inequality among workers.

Finally, Result (iv) reveals that market income inequality exhibits a smaller response compared to the wage and functional inequality channels, we can infer that the impact of austerity on non-labor income inequality might be equalizing[33]. However, it is important to

[33] As demonstrated by Francese and Mulas-Granados (2015), based on Lerman and Yitzhaki (1985) and CBO (2011), variations in the overall Gini index for market income Gm occurring over a period starting at time t0 can be summarized by the equation: $\Delta G_m = [\Delta s_l(C_l^0 - C_c^0)] + [s_l^0 \Delta C_l + s_c^0 \Delta C_c] + [\Delta s_l(\Delta C_l - \Delta C_c)]$. Where s_l is the labor share in income, C_l is the pseudo-Gini coefficient for labor income, and C_c is the pseudo-Gini coefficient for capital income (which, here, we call "non-labor" income, which includes all income sources that are not from labor). The first bracket is the "income shares impact" (functional distribution channel), and the second bracket is the "Gini coefficient for each income component impact" (which depends on each pseudo-Gini coefficient). It includes the wage inequality channel plus the inequality among capital income (non-labor). The third term is a residual close to zero (income shares and inequality

note that this is an inference based on the Gini decomposition from Lerman and Yitzhaki (1985), as we do not directly estimate the impact on non-labor inequality.

Our estimations for the functional distribution channel reveal an increase in the non-labor income share in GDP (or a decrease in the labor share) resulting from austerity programs. This relative benefit to high-income households (who receive capital income) could contribute to reducing inequality among non-labor income sources. For instance, austerity measures tend to affect households more vulnerable to economic cycle fluctuations, particularly those at the bottom who rely heavily on wages and informal job earnings. In contrast, higher-income households at the top, who primarily receive capital income, are less affected by these measures, as suggested by Cardoso and Carvalho (2023) and Klein and Winkler (2019).

3.4.3 Disaggregating spending and tax-based shocks

In this section, we follow Heimberger (2020) and Cardoso and Carvalho (2023) in estimating Equations 3.1-3.4 separately for spending and tax-based fiscal shocks, as we have done in Section 3.4.2.1, for the redistribution measure exercise.

Tables 3.9 and 3.10, and Figure 3.12 show the results for disposable income inequality. The Gini index increases by 1.169% (0.54 ppt.) and by 1.395% (0.645 ppt.) at five and seven years after a spending-based fiscal adjustment episode of 1% of GDP, respectively (statistically significant at the 5% level) (Table 3.9). On the other hand, tax-based fiscal consolidations increase disposable income inequality by 1.387% (0.641 ppt.) and by 2.398% (1.108 ppt.) after five and seven years following the shock, respectively (Table 3.10).

Tables 3.11 and 3.12, and Figure 3.13 show the results for market income inequality. According to Table 3.11, the Gini index for market income increases by 1.158% (0.569 ppt.) seven years after a spending-based fiscal adjustment episode of 1% of GDP. Notably, there is also a significant response in the short run: the Gini coefficient for market income increases by 0.306% (0.15 ppt.) and 0.513% (0.252 ppt.) one and two years after the fiscal consolidation episode, respectively. Following a tax-based episode, the market income inequality rises 1.528% (0.751 ppt.) in the seventh year after the shock (Table 3.12), while

tend to move slowly over time). Therefore, as the market income inequality responds less to austerity shocks than the wage and functional inequality channels, we can infer there is an equalizing effect among non-labor income after austerity measures.

Effect/year	1	2	3	4	5	6	7	8
Fiscal shock t-1	**0.209****	**0.393***	**0.270**	**0.634***	**1.169****	**1.321****	**1.395****	**1.012**
Fiscal shock t-2	0.106	-0.0280	0.363	0.754**	1.033**	1.146*	0.911	0.818
Fiscal shock t-3	-0.191	0.212	0.726	0.991*	1.263*	1.082	1.174	0.784
Renda GDP per capita	-0.0150	-0.0637	-0.121*	-0.147*	-0.195**	-0.227**	-0.226*	-0.243
Sample	242	231	220	209	198	187	176	165

Table 3.9 - Impacts on disposable income inequality (%) (following a spending-based fiscal adjustment episode of 1% of GDP)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Effect/year	1	2	3	4	5	6	7	8
Fiscal shock t-1	**0.148**	**0.222**	**0.305**	**0.769**	**1.387****	**2.007*****	**2.398****	**1.970**
Fiscal shock t-2	0.0141	0.0729	0.319	0.523*	0.988**	1.240*	0.723	0.294
Fiscal shock t-3	0.0446	0.246	0.474	0.916	1.245	0.877	0.693	0.577
Real GDP per capita	-0.0165	-0.0632	-0.113*	-0.130*	-0.172**	-0.198**	-0.194*	-0.216
Sample	242	231	220	209	198	187	176	165

Table 3.10 - Impacts on disposable income inequality (%) (following a tax-based fiscal adjustment episode of 1% of GDP)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

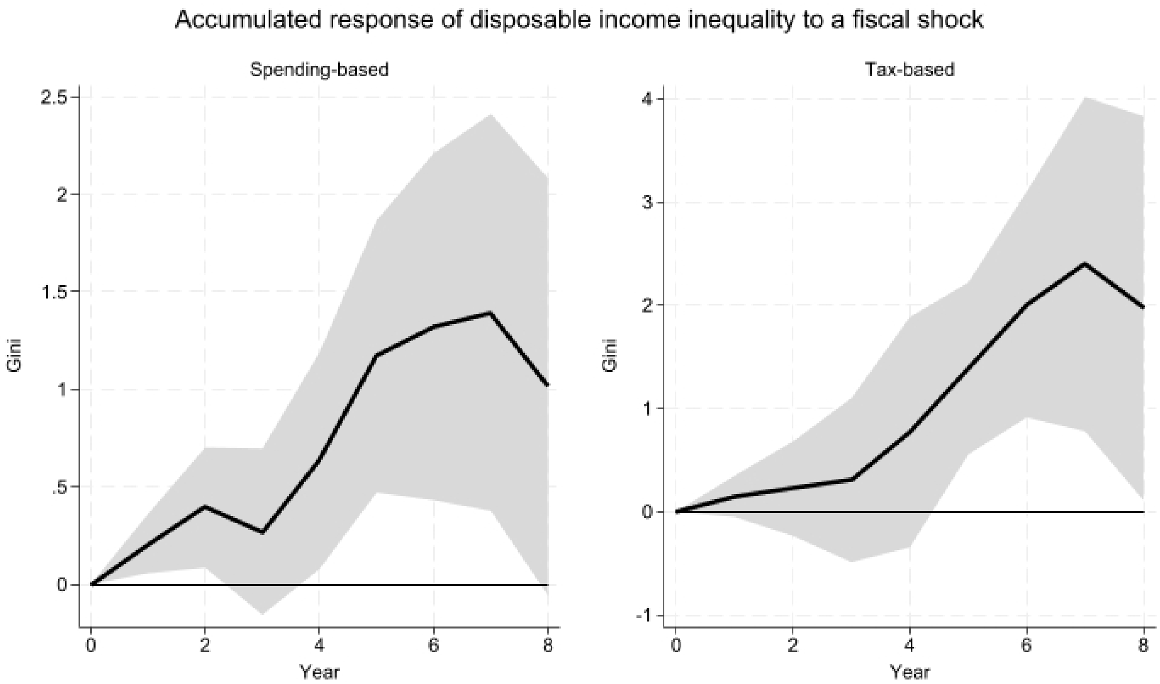

Figure 3.12: Cumulative Response of Disposable Income Inequality (change in %) to a fiscal consolidation of 1% of GDP - Two types of fiscal shock (spending- and tax-based)

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%. "Spending-based" corresponds to shocks in spending; "Tax-based" corresponds to shocks in taxes.

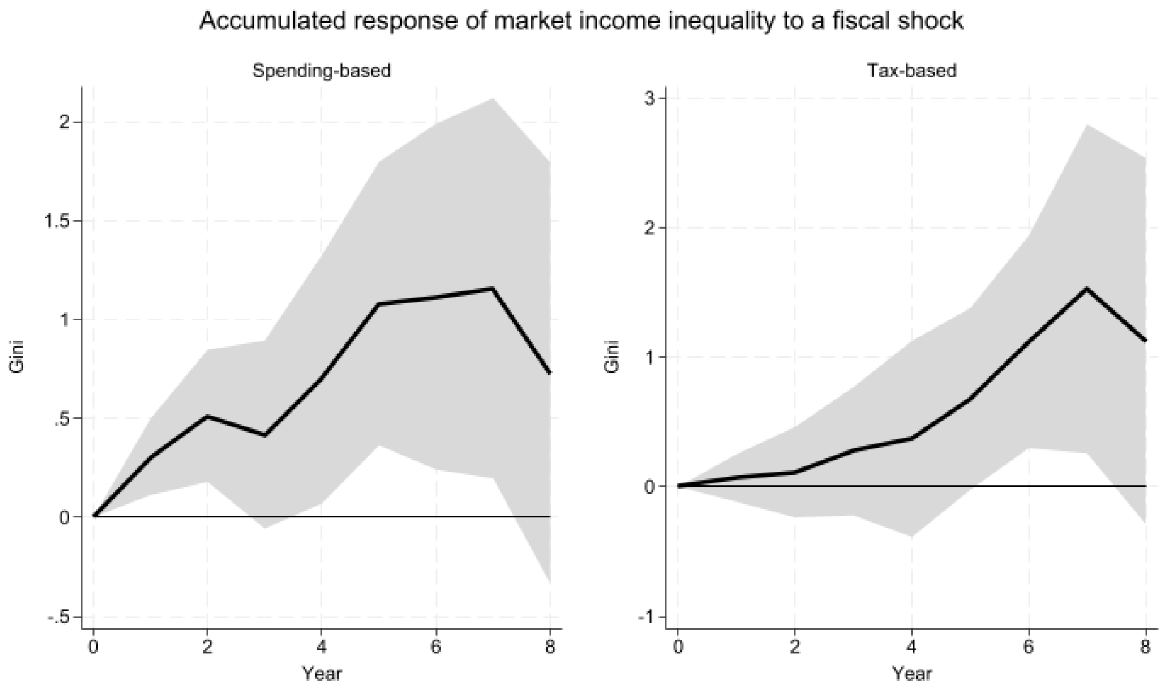

Figure 3.13: Cumulative Response of Market Income Inequality (change in %) to a fiscal consolidation of 1% of GDP - Two types of fiscal shock (spending- and tax-based)

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%. "Spending-based" corresponds to shocks in spending; "Tax-based" corresponds to shocks in taxes.

the impact in the short run is not statistically significant.

For both exercises, disposable and market income inequalities, the effect of tax-based measures is stronger in terms of magnitude in the medium run. However, spending-based episodes show a higher persistence effect in both cases since they also affect inequality in the short run.

For wage inequality (Tables 3.13 and 3.14, Figure 3.14), we find a substantial and statistically significant impact of both types of fiscal consolidation (spending and tax-based) on the Gini coefficient for hourly wages. Six and seven years after a spending-based fiscal consolidation of 1% of GDP, the austerity measure pushes up wage inequality by 4.6% (2.3 ppt.) and by 4.8% (2.4 ppt.), respectively (both significant at 5%) (see Table 3.13). Moreover, the Gini index boosts by 4.3% (2.1 ppt.) (significant at 1%) and 2.4% (1.2 ppt.) (significant at 5%) in the seventh and sixth years following a tax-based consolidation of 1% of GDP (see Table 3.14).

Even though both types of fiscal adjustment have similar effects on hourly wage inequa-

Effect/year	1	2	3	4	5	6	7	8
Fiscal shock t-1	**0.306****	**0.513****	**0.418**	**0.698***	**1.080****	**1.115***	**1.158***	**0.729**
Fiscal shock t-2	0.131	0.0321	0.310	0.668*	0.770*	0.887	0.661	0.527
Fiscal shock t-3	-0.198	0.111	0.502	0.648	0.875*	0.698	0.759	0.325
Real GDP per capita	-0.00377	-0.0517	-0.106*	-0.131*	-0.176**	-0.204*	-0.197*	-0.190
Sample	253	242	231	220	209	198	187	176

Table 3.11 - Impacts on market income inequality (%) (following a spending-based fiscal adjustment episode of 1% of GDP)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Effect/year	1	2	3	4	5	6	7	8
Fiscal shock t-1	**0.0672**	**0.112**	**0.274**	**0.369**	**0.678**	**1.118****	**1.528***	**1.126**
Fiscal shock t-2	0.0789	0.1000	0.165	0.258	0.491	0.751	0.336	-0.0113
Fiscal shock t-3	-0.0281	-0.0675	-0.0317	0.0612	0.232	0.0236	-0.0829	-0.202
Real GDP per capita	-0.00538	-0.0503	-0.0972*	-0.114	-0.153*	-0.179**	-0.170*	-0.172
Sample	253	242	231	220	209	198	187	176

Table 3.12 - Impacts on market income inequality (%) (following a tax-based fiscal adjustment episode of 1% of GDP)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Figure 3.14: Cumulative Response of Hourly Wage Inequality (change in %) to a fiscal consolidation of 1% of GDP - Two types of fiscal shock (spending-based and tax-based)

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%. "Spending-based" corresponds to shocks in spending; "Tax-based" corresponds to shocks in taxes.

lity, spending-based consolidation impacts still have more elevated magnitudes (see Tables 3.13 and 3.14). Furthermore, spending-based fiscal austerity episodes seem more persistent since they boost wage inequality, starting with statistical significance in the fourth year. Conversely, tax-based adjustments appear to foster wage inequality with statistical significance only after six, seven, and eight years.

We also find that both shocks - spending and tax-based - have a negative and statistically significant effect on the labor share (Tables 3.15 and 3.16, Figure 3.15). However, in line with Ball et al. (2013) and Furceri et al. (2016), spending-based consolidations are more detrimental than tax-based adjustments in terms of their consequences for workers. In the second year following the shock, the contraction in the labor share reaches almost 2.9% and 1.32% for a spending and a tax-based shock, respectively - both significant at the 1% level. Nevertheless, tax-based consolidations seem to have a more persistent impact, significantly reducing the workers' share in income over time (from year five to year eight). On the other hand, spending-based episodes have a more substantial impact in terms of

Effect/year	1	2	3	4	5	6	7	8
Fiscal shock t-1	**-1.582**	**0.066**	**-1.208**	**3.207***	**3.645****	**4.654****	**4.882****	**4.662***
Fiscal shock t-2	0.272	-1.231	2.704	2.588	4.336***	5.032**	4.076**	0.805
Real GDP per capita	-0.022	0.155	-0.37**	-0.41**	-0.400 *	-0.642**	-0.589**	-0.610**
Sample	178	164	155	147	138	128	118	107

Table 3.13 - Impacts on hourly wage inequality (%) (following a spending-based adjustment episode of 1% of GDP)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Effect/year	1	2	3	4	5	6	7	8
Fiscal shock t-1	**-0.46**	**-0.12**	**-0.665**	**1.612**	**1.394**	**2.427****	**4.342*****	**2.692****
Fiscal shock t-2	-0.324	-0.453	1.711	0.991	2.764***	4.278***	2.631**	-0.266
Real GDP per capita	-0.0269	0.144	-0.37**	-0.375*	-0.351 *	-0.560**	-0.521**	-0.582**
Sample	178	164	155	147	138	128	118	107

Table 3.14 - Impacts on hourly wage inequality (%) (following a tax-based adjustment episode of 1% of GDP)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

	1	2	3	4	5	6	7	8
Fiscal shock t-1	**-1.758***	**-2.895*****	**-2.802*****	**-1.39**	**0.353**	**1.063**	**-0.956**	**-2.97****
Fiscal shock t-2	-0.507	-1.05	0.172	2.277**	3.051**	1.765	-0.714	0.012
Unemp. rate	-0.318*	-1.169***	-1.384***	-1.303***	-1.088***	-1.129***	-1.111***	-1.041***
Sample	275	264	253	242	231	220	209	198

Table 3.15 - Impacts on the labor share (%) (following a spending-based adjustment episode of 1% of GDP)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

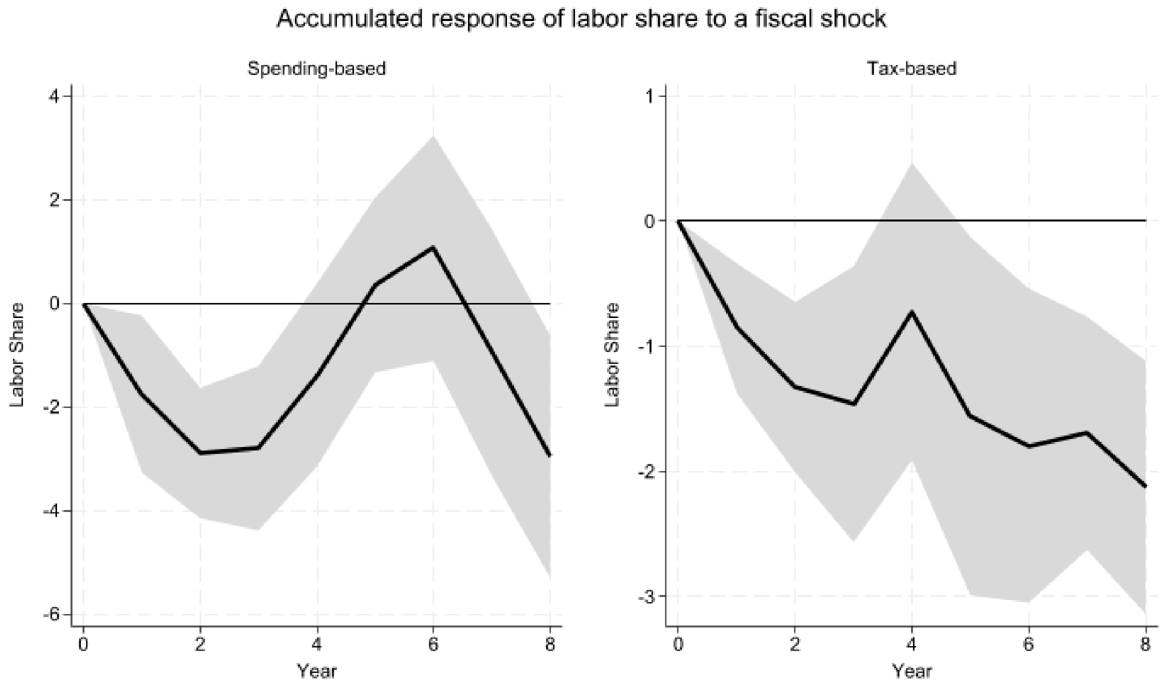

Figure 3.15: Cumulative Response of the Labor Share (change in %) to a fiscal consolidation of 1% of GDP - Two types of fiscal shock (spending-based and tax-based)

Source: Author's calculations. Grey areas indicate the confidence bands of the impulse response functions, representing a confidence interval of 90%. "Spending-based" corresponds to shocks in spending; "Tax-based" corresponds to shocks in taxes.

	1	2	3	4	5	6	7	8
Fiscal shock t-1	**-0.855****	**-1.326*****	**-1.462****	**-0.72**	**-1.558***	**-1.793****	**-1.694*****	**-2.126*****
Fiscal shock t-2	0.067	-0.014	0.355	-0.458	-0.642	-0.493	-0.472	0.379
Unemp. rate	-0.329*	-1.174***	-1.401***	-1.389***	-1.203***	-1.211***	-1.132***	-1.072***
Sample	275	264	253	242	231	220	209	198

Table 3.16 - Impacts on the labor share (%) (following a tax-based adjustment episode of 1% of GDP)
Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

magnitude in the medium-run (after eight years): it diminishes the wage share in GDP by almost 3%, while the effect is more moderate in the case of a tax-based shock (2.1%).

In summary, spending-based consolidations seem to have a greater impact on wage and functional inequalities than tax-based ones - which can also be explained by some ideas discussed in Sections 3.4.2.4 and 3.4.2.5. Government expenditure cuts have a significant income multiplier effect on the economy (Izquierdo et al., 2019; Deleidi et al., 2019; Ardanaz at al., 2021; Sanches and Carvalho, 2023; Cardoso et al., 2023), which means they may have a more relevant macroeconomic impact on employment. Moreover, spending-based measures often include transfers and other essential public expenditures that directly impact inequality, such as investments in education and health (Clifton et al., 2020; Lustig, 2017). The adverse macroeconomic impacts of spending-based measures tend to increase wage and functional inequalities, as employment losses tend to fall disproportionately on the lower end of the income distribution, as suggested by Hoover et al. (2009).

In this context, Alesina et al. (2018) conclude that tax-based fiscal consolidations are more recessionary than spending-based fiscal austerity measures for OECD countries. However, for Latin American countries, Carrière-Swallow et al. (2021) find that spending-based episodes are more costly in terms of short-run output losses than tax-based ones, with effects of -1.6% and -0.8% after two years, respectively. Nonetheless, the difference is not statistically distinguishable[34].

3.4.4 Comparison with the literature

Tables 3.17-3.19 present a comparison of our results with the literature reviewed in Chapter 2 (Table 2.2). Remarkably, our baseline findings for the medium-term impact of austerity on inequality are consistent with earlier research findings. Specifically, our results for disposable income inequality align with the findings by Cardoso and Carvalho (2023) (considering the results in Appendix J, including Bolivia in the sample, as previously explained).

[34] Restrepo (2020) conducts VARs based on Blanchard and Perotti (2002) to estimate expenditure and revenue fiscal multipliers in Latin American countries. The results, however, vary significantly across countries, with some countries showing higher cumulative multipliers associated with expenditures, while others exhibit greater tax fiscal multipliers.

Study	Medium-run impact	Countries
Ball et al. (2013)- Disposable income inequality	0.9 ppt. (after 8 years)	17 OECD countries
Woo et al. (2013)- Disposable income inequality	1.3% (0.4 ppt.) (after 8 years)	17 OECD countries
Furceri et al. (2016)- Disposable income inequality	0.9% (after 8 years)	17 OECD countries
Jalles (2017)- Disposable income inequality	0.8 ppt. (after 3 years)	28 emerging countries
Klein and Winkler (2019)- Disposable income inequality	0.42 ppt. (after 4 years)	17 OECD countries
Klein and Winkler (2019)- Gross income inequality	0.65 ppt. (after 4 years)	17 OECD countries
Heimberger (2020)- Disposable income inequality	0.6 ppt. (after 5 years)	17 OECD countries
Heimberger (2020)- Gross income inequality	0.9 ppt. (after 7 years)	17 OECD countries
Cardoso and Carvalho (2023)- Disposable income inequality	0.493% (0.21 ppt.) (after 8 years)	9 South American countries
This study - Disposable income inequality (Appendix J)	0.39% (0.18 ppt.) (after 7 years)	12 Latin American countries
This study - Disposable income inequality (baseline)	1.29% (0.59 ppt.) (after 7 years)	11 Latin American countries
This study - Market income inequality (Appendix K)	0.274% (0.13 ppt.) (after 7 years)	12 Latin American countries
This study - Market income inequality (baseline)	0.924% (0.45 ppt.) (after 7 years)	11 Latin American countries
This study - Wage inequality	3.04% (1.53 ppt.) (after 7 years); 2.26% (1.14 ppt.) (after 8 years); 1.4% (0.7 ppt.) (after 4 years)	12 Latin American countries
This study - Functional inequality	1.33% (0.659 ppt.) (after 7 years); 1.9% (0.939 ppt.) (after 8 years); 1.28% (0.63 ppt.) (after 2 years)	12 Latin American countries

Table 3.17 - Medium-run impacts of fiscal austerity on inequality - Comparison
Source: Author's elaboration.

Study	Medium-run impact	Countries
Ball et al. (2013)- Disposable income inequality	About 0.9 ppt. (after 8 years)	17 OECD countries
Woo et al. (2013)- Disposable income inequality	1.5-2% (after 8 years)	17 OECD countries
Furceri et al. (2016)- Disposable income inequality	1.05% (after 8 years)	17 OECD countries
Furceri et al. (2018a)- Disposable income inequality	1 ppt. (after 5 years)	103 emerging countries
Jalles (2017)- Disposable income inequality	3.2 ppt. (after 4 years)	28 emerging countries
Klein and Winkler (2019)- Disposable income inequality	2.9 ppt. (after 4 years)	17 OECD countries
Heimberger (2020)- Disposable income inequality	0.4 ppt. (after 8 years)	17 OECD countries
Cardoso and Carvalho (2023)- Disposable income inequality	2.48% (1.056 ppt.) (after 8 years)	9 South American countries
This study - Disposable income inequality (Appendix J)	1.516% (0.7 ppt.) (after 7 years); 1.175% (0.54 ppt.) (after 5 years)	12 Latin American countries
This study - Disposable income inequality (baseline)	1.395% (0.64 ppt.) (after 7 years); 1.169% (0.54 ppt.) (after 5 years)	11 Latin American countries
This study - Market income inequality (Appendix K)	1.193% (0.58 ppt.) (after 7 years); 1.042% (0.51 ppt.) (after 5 years)	12 Latin American countries
This study - Market income inequality (baseline)	1.158% (0.57 ppt.) (after 7 years); 1.08% (0.53 ppt.) (after 5 years)	11 Latin American countries
This study - Wage inequality	4.88% (2.25 ppt.) (after 7 years); 4.66% (2.3 ppt.) (after 8 years); 3.6% (1.83 ppt.) (after 5 years)	12 Latin American countries
This study - Functional inequality	2.97% (1.46 ppt.) (after 8 years); 2.89% (1.43 ppt.) (after 2 years)	12 Latin American countries

Table 3.18 - Medium-run impacts of fiscal austerity (spending-based shocks) on inequality - Comparison
Source: Author's elaboration.

Study	Medium-run impact	Countries
Ball et al. (2013)- Disposable income inequality	About 0.9 ppt. (after 8 years)	17 OECD countries
Woo et al. (2013)- Disposable income inequality	No statistical significant effect	17 OECD countries
Furceri et al. (2016)- Disposable income inequality	0.13% (after 8 years)	17 OECD countries
Jalles (2017)- Disposable income inequality	-2.6 ppt. (after 4 years)	28 emerging countries
Klein and Winkler (2019)- Disposable income inequality	1.4 ppt. (after 4 years)	17 OECD countries
Heimberger (2020)- Disposable income inequality	0.3 ppt. (after 8 years)	17 OECD countries
Cardoso and Carvalho (2023)- Disposable income inequality	no statistical significant effect	9 South American countries
This study - Disposable income inequality (Appendix J)	no statistical significant effect	12 Latin American countries
This study - Disposable income inequality (baseline)	2.398% (1.108 ppt.) (after 7 years); 2% (0.92 ppt.) (after 6 years); 1.38% (0.64 ppt.) (after 5 years)	11 Latin American countries
This study - Market income inequality (Appendix K)	no statistical significant effect	12 Latin American countries
This study - Market income inequality (baseline)	1.528% (0.75 ppt.) (after 7 years); 1.118% (0.55 ppt.) (after 6 years)	11 Latin American countries
This study - Wage inequality	2.69% (1.35 ppt.) (after 8 years); 4.3% (2.18 ppt.) (after 7 years)	12 Latin American countries
This study - Functional inequality	2.12% (1.05 ppt.) (after 8 years); 1.32% (0.65 ppt.) (after 2 years)	12 Latin American countries

Table 3.19 - Medium-run impacts of fiscal austerity (tax-based shocks) on inequality - Comparison
Source: Author's elaboration.

3.5 Extensions

3.5.1 The role of the economic cycle

In this section, we examine whether the impacts of fiscal adjustments on inequality vary during different economic cycles. Specifically, we estimate the effects of fiscal consolidation episodes during years of low growth (real GDP growth lower than 2%) and years of high GDP growth (higher than 2%). We adopt a similar approach as Agnello and Sousa (2014) and Heimberger (2020) by distinguishing between high and low-growth episodes.

Section 3.6 also conducts a robustness test by considering a different definition of low (high) growth regime, where the episode occurs in a year when the GDP grew under/above 1%. Additionally, in Section 3.6, we perform the same analysis but take into account the average GDP growth rate of the last five years to capture its trend rather than relying on a single point in time.

Figures 3.16, 3.17, and 3.18 depict the results of the exercises on disposable income, market income, and hourly wage inequality, respectively. We present the estimated coefficients for years two, seven, and eight to assess the short and medium-term effects of fiscal consolidation on hourly wage inequality (and for years two and seven for the disposable income and market income exercises). Coefficients are shown with one standard deviation band around them. The label "all" refers to the baseline model, while "high" and "low" represent estimations considering only the fiscal shocks that occurred when the real GDP growth rate was higher (above 2%) or lower (below 2%), respectively.

Although the impact on the Gini index (for disposable income, market income, and hourly wages) in the medium run does not exhibit a statistically significant difference between the two regimes, there is a noticeable contrast in the short run. Two years after a fiscal consolidation, the Gini index increases more significantly when the adjustment measure occurs during a period of low economic growth compared to high growth - it is important to note that this difference is statistically significant in almost all cases (see Figures 3.16-3.18).

Tables 3.20, 3.21, and 3.22 present the estimated coefficient for each regime for disposable income, market income, and hourly wage inequality exercises, respectively. A spending-based adjustment, in particular, seems to be quite harmful in the short run (year 2) when the economy is not growing since it makes the distribution of hourly wages more

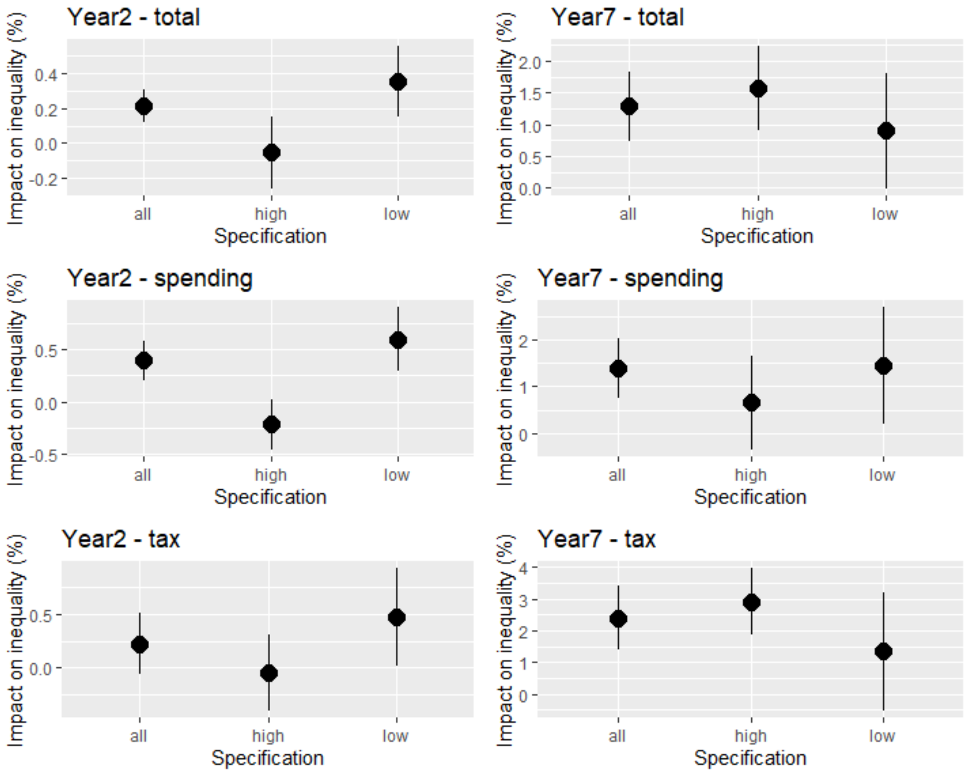

Figure 3.16: Impact of fiscal consolidation (of 1% of GDP) on disposable income inequality - Low and high GDP growth (under and above 2%)

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "All" means the baseline model, "high" ("low") represents the estimations considering only the fiscal shocks that happen when the real GDP growth rate is higher (lower) than 2%.

unequal by 5.43%. In the medium run (year 7), the impact of fiscal adjustments during low-growth periods is also higher and more significant (see Table 3.22). Therefore, inequality is typically less affected if an adjustment episode starts during relatively high growth, in agreement with the results found by Heimberger (2020) and Agnello and Sousa (2014).

The business cycle appears to be even more critical for studying the impact of fiscal shocks on the labor share in income. Figure 3.19 depicts the effect of a fiscal consolidation measure on the wage share in the short and medium run (years one, two, and eight). There is a statistically significant difference in both the short and medium run. Table 3.23 presents the coefficients for each case. Upon examining the table, we observe that the medium-run impact of a spending-based shock stands out: the wage share in income decreases by almost 7% (significant at 1%) when the fiscal episode occurs during a low growth regime. If it occurs during high GDP growth, the impact is not statistically different from zero.

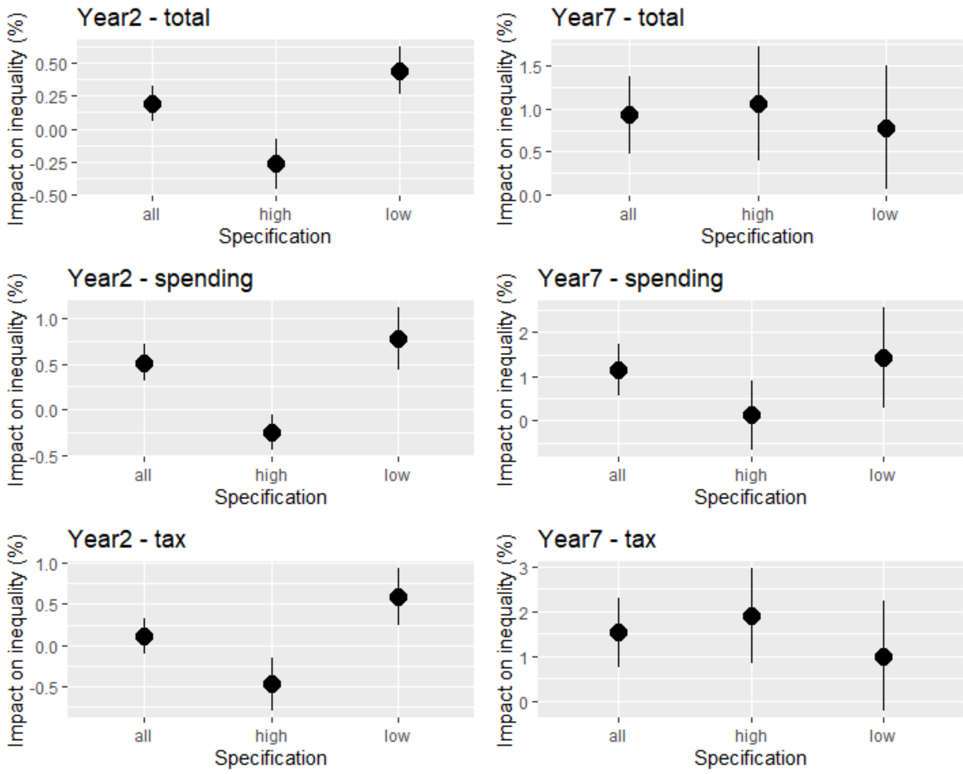

Figure 3.17: Impact of fiscal consolidation (of 1% of GDP) on market income inequality - Low and high GDP growth (under and above 2%)

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "All" means the baseline model, "high" ("low") represents the estimations considering only the fiscal shocks that happen when the real GDP growth rate is higher (lower) than 2%.

Regime	Consolidation	Impact on the Gini index (%) (Year 2)	Impact on the Gini index (%) (Year 7)
Low growth regime	Total	0.351*	0.900
Low growth regime	Spending-based	0.597**	1.445
Low growth regime	Tax-based	0.471	1.348
High growth regime	Total	-0.0536	1.566**
High growth regime	Spending-based	-0.214	0.656
High growth regime	Tax-based	-0.0438	2.909**

Table 3.20 - Impact of fiscal consolidation on disposable income inequality (in %) - low and high GDP growth (under and above 2%) (short run and medium run - Years 2 and 7)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

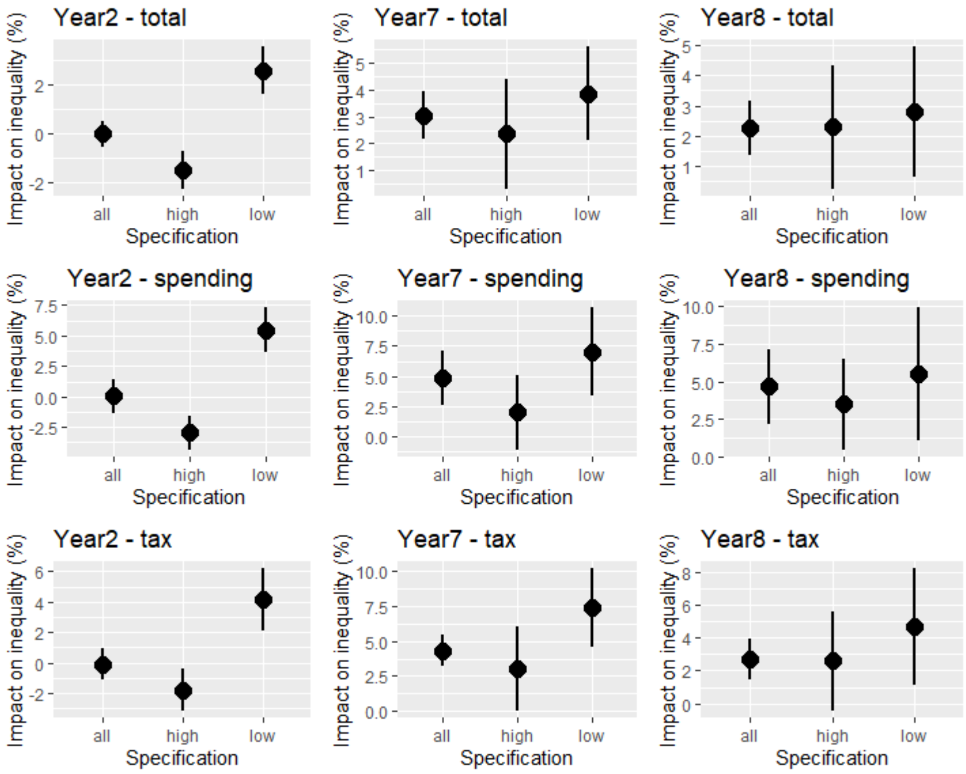

Figure 3.18: Impact of fiscal consolidation (of 1% of GDP) on hourly wage inequality - Low and high GDP growth (under and above 2%)

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "All" means the baseline model, "high" ("low") represents the estimations considering only the fiscal shocks that happen when the real GDP growth rate is higher (lower) than 2%.

Regime	Consolidation	Impact on the Gini index (%) (Year 2)	Impact on the Gini index (%) (Year 7)
Low growth regime	Total	0.439**	0.780
Low growth regime	Spending-based	0.773**	1.415
Low growth regime	Tax-based	0.584*	1.006
High growth regime	Total	-0.262	1.050
High growth regime	Spending-based	-0.250	0.119
High growth regime	Tax-based	-0.472	1.892*

Table 3.21 - Impact of fiscal consolidation on market income inequality (in %) - low and high GDP growth (under and above 2%) (short run ad medium run - Years 2 and 7)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

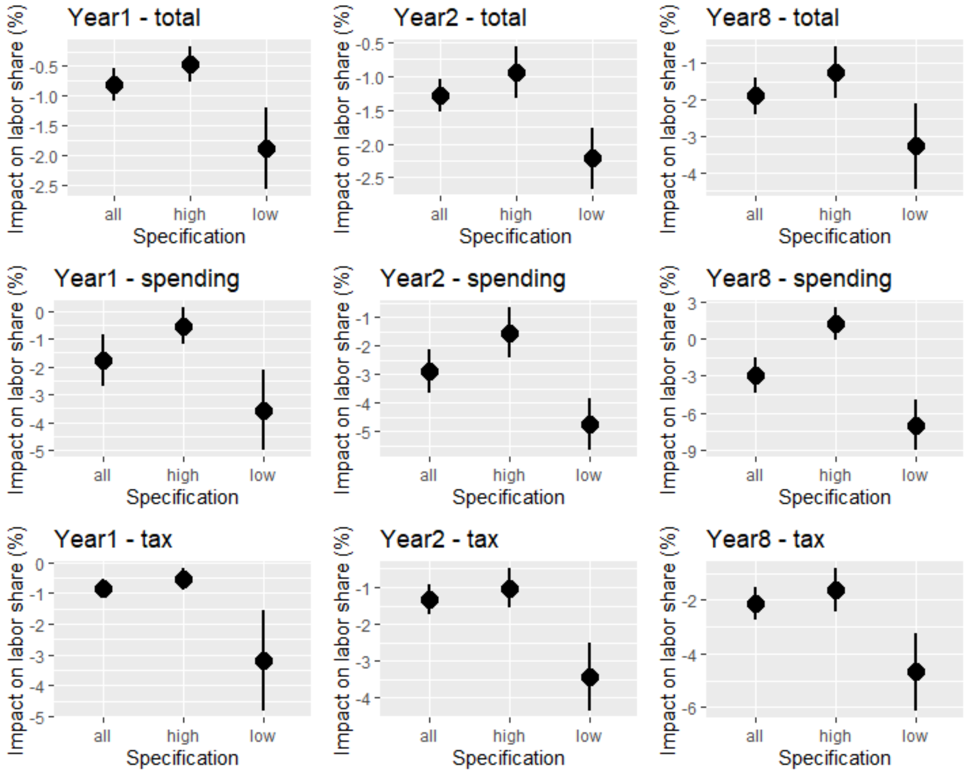

Figure 3.19: Impact of fiscal consolidation (of 1% of GDP) on the labor share - Low and high GDP growth (under and above 2%)

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "All" means the baseline model, "high" ("low") represents the estimations considering only the fiscal shocks that happen when the real GDP growth rate is higher (lower) than 2%.

Regime	Consolidation	Impact on the Gini index (%) (Year 2)	Impact on the Gini index (%) (Year 7)
Low growth regime	Total	2.56**	3.853**
Low growth regime	Spending-based	5.43***	7.029*
Low growth regime	Tax-based	4.14*	7.405**
High growth regime	Total	-1.50*	2.29
High growth regime	Spending-based	-2.97*	2.024
High growth regime	Tax-based	-1.77	3.047

Table 3.22 - Impact of fiscal consolidation on hourly wage inequality (in %) - low and high GDP growth (under and above 2%) (short run and medium run - Years 2 and 7)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Regime	Consolidation	Impact on the wage share (%) (Year 2)	Impact on the labor share (%) (Year 8)
Low growth regime	Total	-2.219***	-3.279**
Low growth regime	Spending-based	-4.757***	-6.996***
Low growth regime	Tax-based	-3.427***	-4.675***
High growth regime	Total	-0.949**	-1.264*
High growth regime	Spending-based	-1.534*	1.228
High growth regime	Tax-based	-1.027*	-1.619*

Table 3.23 - Impact of fiscal consolidation on the labor share in income (in %) - low and high GDP growth (under and above 2%) (short and medium run - Years 2 and 8)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

3.5.2 The size of the fiscal episodes

In this section, we estimate the baseline model excluding fiscal shocks larger than "average plus one standard deviation"[35]. The averages and the standard deviations are calculated from their groups: fiscal consolidations (total, spending, and tax-based) and fiscal expansions (total, spending, and tax-based). These statistics are available in Table 3.2. We excluded shocks greater than: 2.016% (total - consolidations)[36], 1.66% (tax-based - consolidations)[37], 1.27% (spending-based - consolidations)[38]; 0.77% (in modulus) (total - expansions)[39]; 0.79% (in modulus) (tax-based - expansions)[40]. In the following graphs (Figures 3.20-3.23), "wbs" means "without big shocks", and "all" includes all shocks (baseline model).

Figures 3.20 and 3.21, as well as Tables 3.24 and 3.25, illustrate that there is no statistically significant difference in the impact on disposable income and market income inequalities between the two scenarios (baseline and without big shocks). However, it seems

[35] As a robustness test, we also excluded shocks bigger than "average plus two standard deviations". Baseline results barely changed.

[36] We excluded the following shocks: Costa Rica, 1991; Dominican Republic, 2013; Ecuador, 1993; Paraguay, 1989; Uruguay, 2002.

[37] We excluded the following shocks: Costa Rica, 1991; Dominican Republic, 2013; Ecuador, 1993; Paraguay, 1989; Uruguay, 1990.

[38] We excluded the following shocks: Dominican Republic, 2013; Paraguay, 2001; Uruguay, 2002.

[39] We excluded the following shocks: Dominican Republic, 2006; Uruguay, 2005.

[40] We excluded the following shocks: Dominican Republic, 2006; Uruguay, 2005.

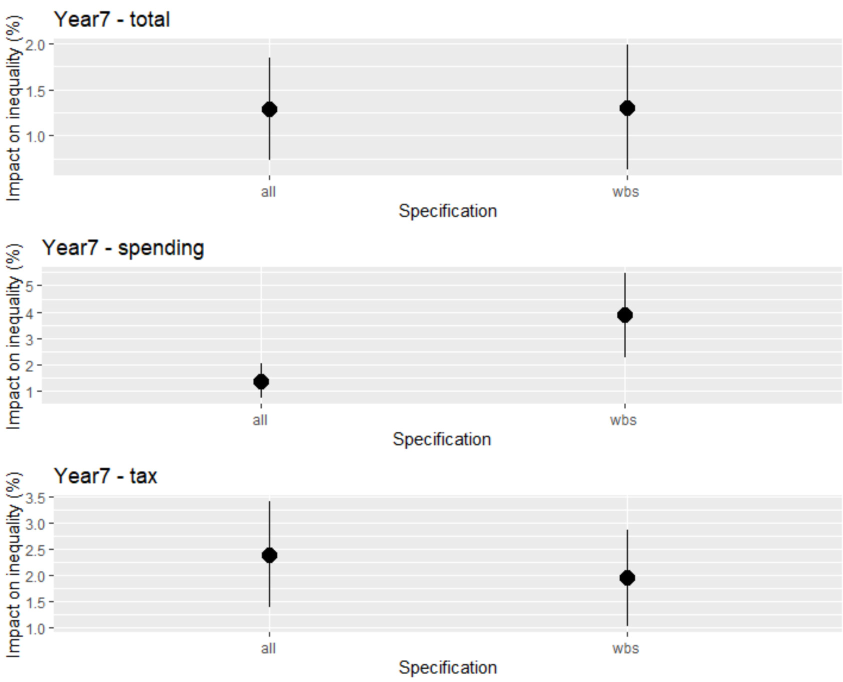

Figure 3.20: Impact of fiscal consolidation (of 1% of GDP) on disposable income inequality - Without big shocks

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "wbs" means "without big shocks", "all" includes all shocks.

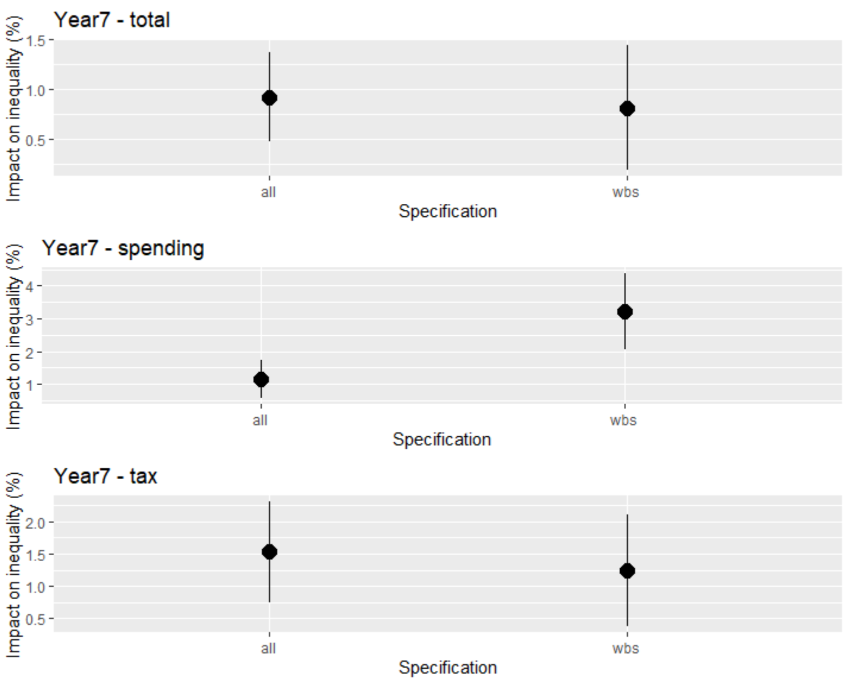

Figure 3.21: Impact of fiscal consolidation (of 1% of GDP) on market income inequality - Without big shocks

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "wbs" means "without big shocks", "all" includes all shocks.

Regime	Consolidation	Impact on the Gini index (%) (Year 7)	Impact on the Gini index (%) (Year 8)
Baseline	Total	1.290**	0.995*
Baseline	Spending-based	1.395**	1.012
Baseline	Tax-based	2.398**	1.970
wbs	Total	1.307*	1.165
wbs	Spending-based	3.875**	2.993*
wbs	Tax-based	1.952*	1.612

Table 3.24 - Impact of fiscal consolidation on disposable income inequality (in %) - all shocks (baseline) and without big shocks ("wbs") (medium run - Years 7 and 8)
Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

that the size of the fiscal consolidation package plays a more crucial role when analyzing the effects on the wage and functional distributions. This observation is evident from Figures 3.22 and 3.23, which present the results without big shocks ("wbs"). In Tables 3.26 and 3.27, the significance of our results "wbs" appears to be less pronounced, further suggesting that the impact of fiscal austerity measures on the hourly wage distribution and the labor share in GDP becomes more notable when larger fiscal austerity packages are implemented[41].

Note, though, that the disparities between the specifications in Figures 3.22 and 3.23 lack statistical significance. Nonetheless, it is essential to highlight that the baseline model, which incorporates significant shocks, shows a higher level of statistical significance in the analysis of Tables 3.24-3.27.

The differences are more pronounced in the labor share exercise. For instance, in the scenario without the biggest shocks, a spending-based austerity package leads to a decrease in the labor share in income by 1.6% and 1.1% after two and eight years, respectively (refer to Table 3.27). In the baseline scenario, these impacts are even more significant, with reductions of 2.89% and 2.97% after two and eight years.

Furthermore, in the scenario where the largest shocks are excluded, the labor share in income only declines by 0.98% and 0.19% after two and eight years, respectively, following a tax-based consolidation episode. In contrast, in the baseline scenario, which includes all

[41] A similar result is found by Heimberger (2020) for disposable income distribution in OECD countries.

Regime	Consolidation	Impact on the Gini index (%) (Year 7)	Impact on the Gini index (%) (Year 8)
Baseline	Total	0.924*	0.634
Baseline	Spending-based	1.158*	0.729
Baseline	Tax-based	1.528*	1.126
wbs	Total	0.817	0.722
wbs	Spending-based	3.206**	2.860**
wbs	Tax-based	1.241	0.825

Table 3.25 - Impact of fiscal consolidation on market income inequality (in %) - all shocks (baseline) and without big shocks ("wbs") (medium run - Years 7 and 8)
Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Regime	Consolidation	Impact on the Gini index (%) (Year 7)	Impact on the Gini index (%) (Year 8)
Baseline	Total	3.048***	2.265**
Baseline	Spending-based	4.882**	4.662*
Baseline	Tax-based	4.342***	2.692**
wbs	Total	2.652	0.678
wbs	Spending-based	2.731	3.321
wbs	Tax-based	4.173**	1.898

Table 3.26 - Impact of fiscal consolidation on hourly wage inequality (in %) - all shocks (baseline) and without big shocks ("wbs") (medium run - Years 7 and 8)
Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Regime	Consolidation	Impact on the labor share (%) (Year 2)	Impact on the labor share (%) (Year 8)
Baseline	Total	-1.285***	-1.9***
Baseline	Spending-based	-2.895***	-2.97**
Baseline	Tax-based	-1.326***	-2.126***
wbs	Total	-0.909	-1.177
wbs	Spending-based	-1.634*	-1.114
wbs	Tax-based	-0.988	-0.193

Table 3.27 - Impact of fiscal consolidation on the labor share in income (in %) - all shocks (baseline) and without big shocks ("wbs") (short and medium run - Years 2 and 8)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

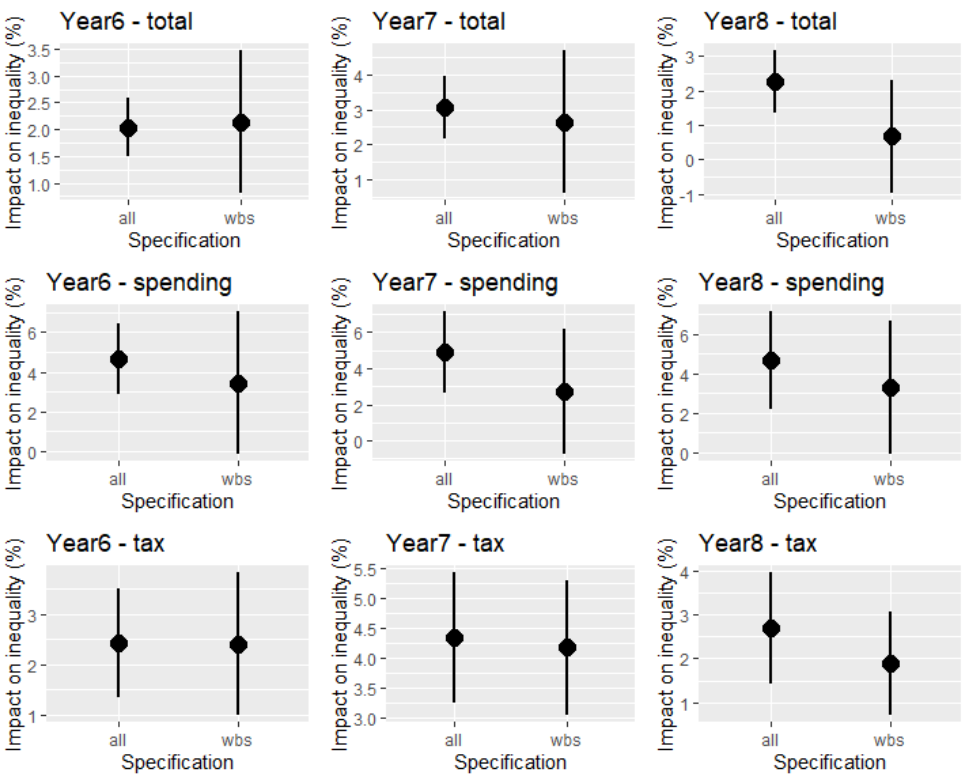

Figure 3.22: Impact of fiscal consolidation (of 1% of GDP) on hourly wage inequality - Without big shocks

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "wbs" means "without big shocks", "all" includes all shocks.

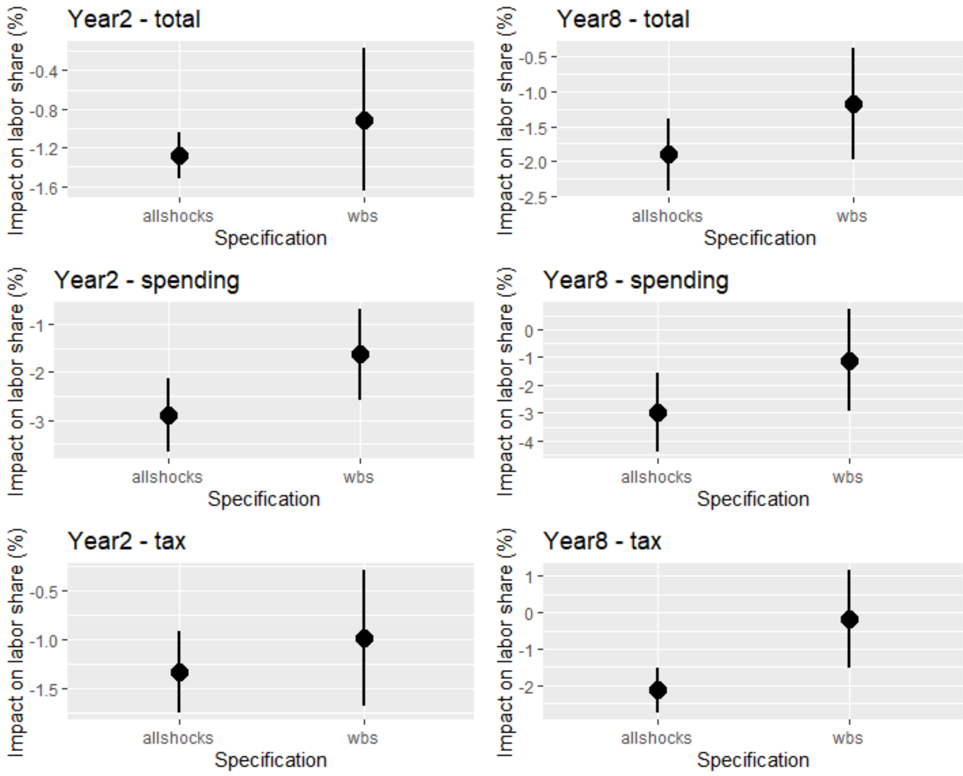

Figure 3.23: Impact of fiscal consolidation (of 1% of GDP) on the labor share in GDP - Without big shocks

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "wbs" means "without big shocks", "all" includes all shocks.

shocks, the wage share in GDP experiences more substantial declines of 1.32% and 2.12% after two and eight years (refer to Table 3.27).

3.6 Robustness checks

3.6.1 Robustness checks for Equations 3.1-3.4

In order to further test the robustness of the baseline results, we conducted several additional tests. Firstly, we explored the impact of using an alternative number of lags to assess its effect on the estimated coefficients. Secondly, we examined the influence of different control variables on the outcomes. Finally, we tested the robustness of our findings by using alternative samples of countries, ensuring that the results hold across different contexts. These robustness checks provide additional confidence in the reliability of our conclusions.

In the disposable income and market income exercises, we focused on the medium-run impact, considering the peak response, which usually occurs in the seventh year (in some cases, it may occur in year eight). As there was no statistically significant response of the Gini index to fiscal shocks in the short run, we concentrated on assessing the effects in the medium term. The coefficients are presented along with one standard deviation band around them.

To investigate the sensitivity of our results to the number of lags, we conducted tests by varying the number of lags of fiscal shocks in the disposable income inequality and market income inequality exercises. The baseline model includes three lags and is referred to as “3” in the graphs (Figures 3.24 and 3.28). Additionally, we examined the impact of changing the number of lags of the dependent variable (Gini index) in the analysis. The baseline model includes two lags, and the results are shown in Figures 3.25 and 3.29. These robustness tests allow us to assess the stability and consistency of our findings under different specifications.

Figures 3.26 and 3.30 present the results with different sets of control variables. We considered the variables recommended by the literature (as described in Section 3.3.1): “a”: all variables (all control variables are included); “g”: real GDP growth rate; “i”: inflation rate; “pc”: real GDP per capita (baseline); “t”: trade-to-GDP (openness); “u”: unemployment rate, “w”: without control variables. In addition, we conducted tests with the same control variables but adding one lag, denoted as “al”, “gl”, “il”, “pcl”, “tl”, and “ul”. The results remained consistent across various control variable specifications, indicating that the impact of fiscal shocks on inequality is robust and not heavily influenced by the choice of control variables.

Figures 3.27 and 3.31 display the estimations when we exclude one country from the sample. The baseline, denoted as “b”, includes all countries in the baseline analysis. The following abbreviations are used to represent the exclusion of specific countries: “ar”: excludes Argentina; “br”: excludes Brazil; “ch”: excludes Chile; “co”: excludes Colombia; “cri”: excludes Costa Rica; “do”: includes Dominican Republic[42]; “ec”: excludes Ecuador; “gu”: excludes Guatemala; “jam”: excludes Jamaica; “me”: excludes Mexico; “pa” excludes Paraguay; “pe” excludes Peru; “ur” excludes Uruguay. Across these various exclusions, the positive impact on disposable income and market income inequalities of both

[42] Note that we estimated the baseline without Dominican Republic, but here we included it for this specific test.

spending and tax-based episodes remains evident. These findings indicate that the overall results are robust and not dependent on the inclusion or exclusion of specific countries in the analysis.

The tests for the wage inequality exercise are also conducted to assess the medium-run impact (years 6, 7, and 8), as there is no statistically significant response of the Gini index to fiscal shocks in the short run (except when we consider the effect of the business cycle). As before, we present the coefficients and one standard deviation band around them to provide a comprehensive view of the results.

Figure 3.32 examines if the results change when we vary the number of lags of fiscal shocks (the baseline includes two lags and is represented as “2” in the graph). Figure 3.33 depicts the robustness test when we alter the number of lags of the dependent variable (Gini index) (baseline includes two lags). Additionally, Figure 3.34 presents our results using the Gini index for labor income (“gini2”) instead of the Gini index for hourly wages (baseline - “gini”). As evident from the graphs, the results remain robust to variations in the lag structure specification.

Figure 3.35 examines the variation in results when we adjust the control variables. Specifically, we consider the following scenarios: “a”: all variables (all control variables are included); “g”: real GDP growth rate; “i”: inflation rate; “pc”: real GDP per capita (baseline); “t”: trade-to-GDP (openness); “u”: unemployment rate; “w”: without control variables. Additionally, “al”, “gl”, “il”, “pcl”, “tl”, and “ul” represent the same variables, but with the inclusion of one lag. Once again, we observe that the results remain largely consistent regardless of the addition or omission of control variables.

Figure 3.36 shows the results when we exclude one country from the sample. The “all” scenario represents the baseline, including all countries, while the other scenarios exclude specific countries as follows: “ar”: excludes Argentina; “bo”: excludes Bolivia; “br”: excludes Brazil; “ch”: excludes Chile; “co”: excludes Colombia; “do”: excludes Dominican Republic; “ec”: excludes Ecuador; “gu”: excludes Guatemala; “me”: excludes Mexico; “pa” excludes Paraguay; “pe” excludes Peru; “ur” excludes Uruguay. Although there is more pronounced variation in some cases, the results are generally robust. For instance, even when we exclude Uruguay, which affects the significance of the spending-based shock’s impact on inequality in year seven, the effects for years six and eight remain strong and statistically different from zero.

Figure 3.37 displays the results of including Costa Rica in the sample. It is important to note that the results are sensitive to the number of lags (1, 2, 3, 4, 5) of the fiscal shock, which is why we excluded this country from the baseline sample. Nevertheless, the impact on wage inequality remains significant, and the overall results show minimal changes.

Finally, Figure 3.38 presents the results when we interpolate the missing data in the Gini index series for wages for Bolivia, Brazil, Colombia, Dominican Republic, Ecuador, and Uruguay. We use linear interpolation following Heimberger (2020). In this test, we consider three scenarios: “interp1” where we interpolate all series, excluding the tax shock in 2004 for Bolivia; “interp2” where we interpolate all series; and “interp3” where we interpolate all series excluding Bolivia from the sample. Observing the results, “interp1” and “interp3” scenarios show minimal changes. However, “interp2” displays a significant difference, particularly regarding the impact of tax-based measures: in this scenario, the effect of tax-based episodes on hourly wage inequality is much lower. Nevertheless, the effects of spending-based measures remain highly robust.

As discussed in Section 3.3.2, we excluded Bolivia from the baseline model when estimating Equations 3.1 and 3.2 due to a specific shock (tax-based, in 2004) that influenced the results shown in Appendix J and K. This shock also affected the results to zero in the hourly wage inequality exercise with interpolated data, as the scenario excluding the 2004 shock yielded similar results to the baseline[43].

We conduct similar tests for the labor share exercise to examine the short and medium-run impacts (years 1 and 8) of fiscal shocks. In Figures 3.39 to 3.42, we present the coefficients along with one standard deviation band around them.

Figure 3.39 displays the results of the robustness test when we alter the number of lags of fiscal shocks (the baseline includes two lags and is referred to as “2” in the graph). On the other hand, Figure 3.40 illustrates the variations in the number of lags of the dependent variable (labor share in GDP) (the baseline includes one lag).

Figure 3.41 presents the results when we exclude or include control variables. The different scenarios are denoted as follows: “a” includes all variables (all control variables are included); “g” includes only the real GDP growth rate; “i” includes only the inflation rate; “pc” includes only real GDP per capita; “t” includes only trade-to-GDP (openness);

[43] The baseline exercise for hourly wage inequality, without linear interpolation, is robust to the exclusion of Bolivia because the 2004 shock has missing data for the Gini index.

"u" includes only the unemployment rate (baseline); "w" represents the model without any control variables. Additionally, "al", "gl", "il", "pcl", "tl", and "ul" include the same variables but with one additional lag. It can be observed that the results remain robust to these changes.

Figure 3.42 illustrates the results when we exclude one country from the sample: "all" is the baseline (all countries included in the baseline model); "ae": includes Argentina and Ecuador; "bo": excludes Bolivia; "br": excludes Brazil; "ch": excludes Chile; "co": excludes Colombia; "cri" excludes Costa Rica; "do": excludes Dominican Republic; "gu": excludes Guatemala; "me": excludes Mexico; "pa" excludes Paraguay; "pe" excludes Peru; "ur" excludes Uruguay. As mentioned earlier, our study on the channels of wage and functional distributions (wage inequality and wage share exercises) excludes Jamaica from the sample due to the unavailability of its Gini for wages data. However, to test the robustness of our results, we include Jamaica in our sample (denoted as "jam" in the graph).

Figure 3.42 illustrates the outcomes, and despite observing a more pronounced variation in some cases, the impact of fiscal austerity on the labor share remains negative and statistically significant.

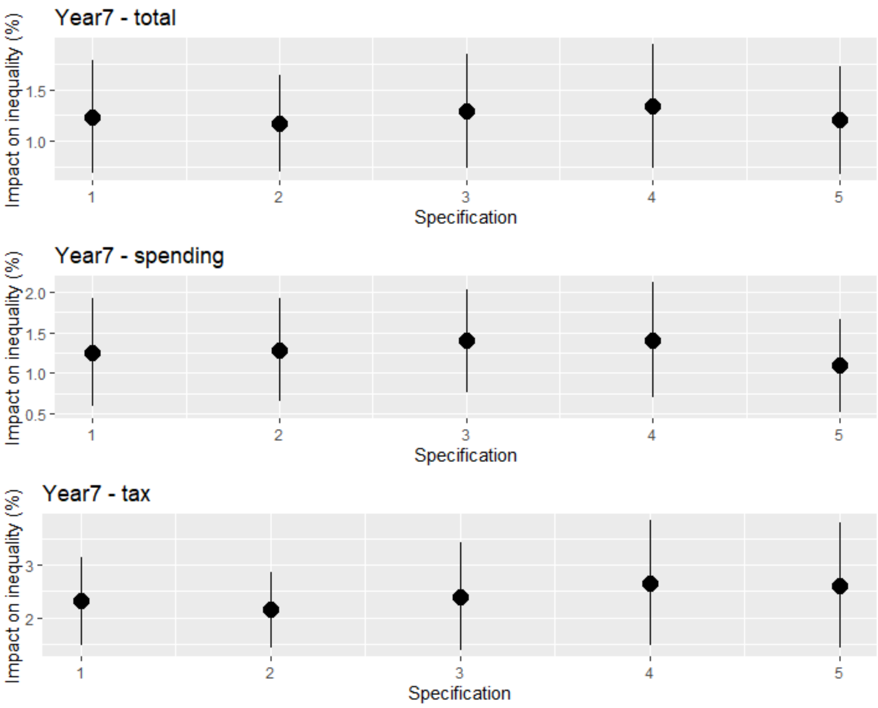

Figure 3.24: Impact of fiscal consolidation (of 1% of GDP) on disposable income inequality - Different lags of the fiscal shock

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes three lags and refers to "3" in the graph.

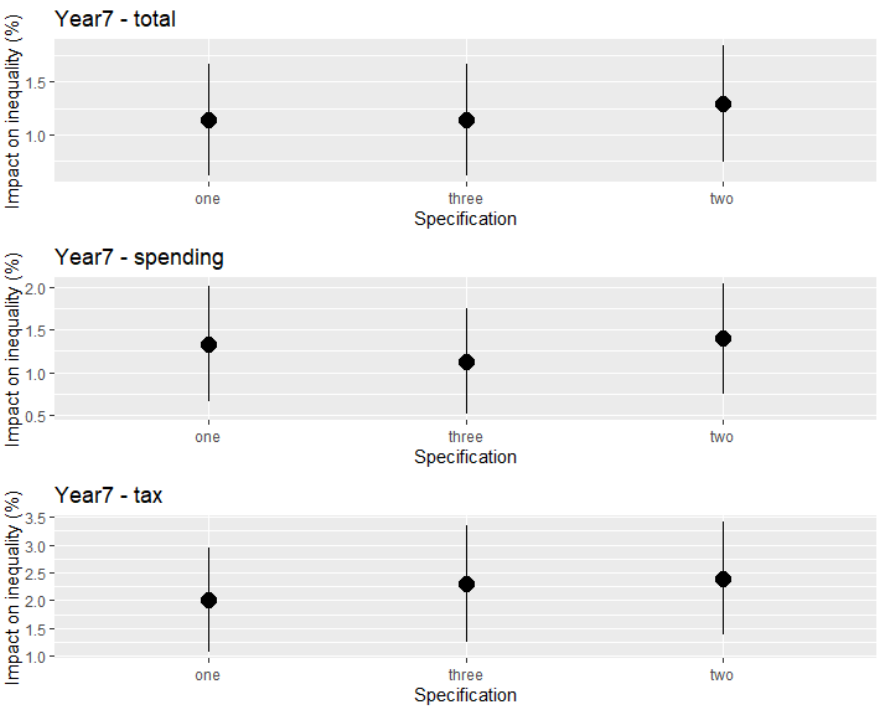

Figure 3.25: Impact of fiscal consolidation (of 1% of GDP) on disposable income inequality - Different lags of the Gini index

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes two lags and refers to "2" in the graph.

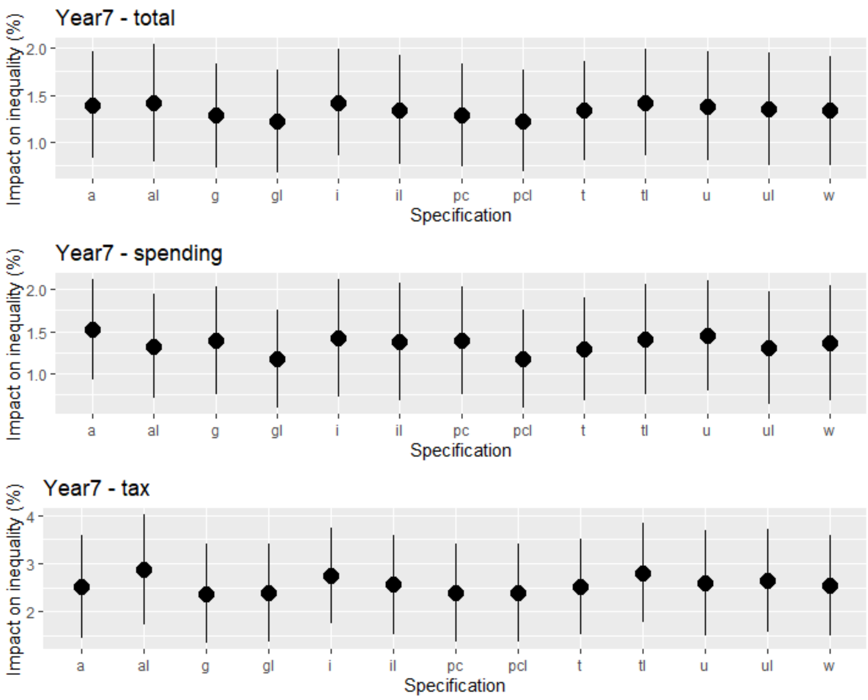

Figure 3.26: Impact of fiscal consolidation (of 1% of GDP) on disposable income inequality - Different control variables

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "a": all variables (all control variables are included in Equation 3.1); "g": real GDP growth rate; "i": inflation rate; "pc": real GDP per capita (baseline); "t": trade-to-GDP (openness); "u": unemployment rate, "w": without control variables. "al", "gl", "il"; "pcl", "tl" and "ul" control for the same variables, but adding one lag.

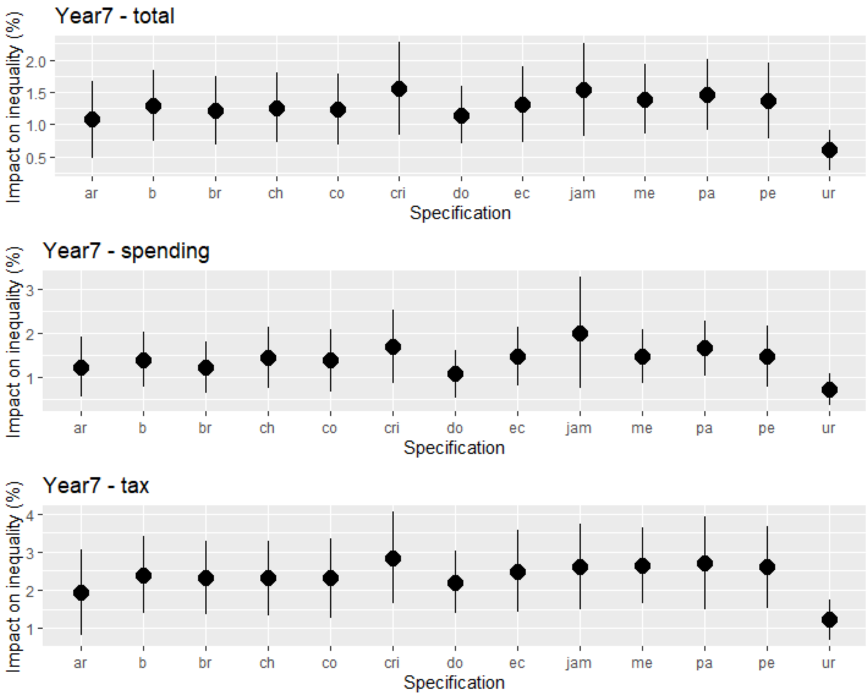

Figure 3.27: Impact of fiscal consolidation (of 1% of GDP) on disposable income inequality - Different countries

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "b" is the baseline; "ar": excludes Argentina; "br": excludes Brazil; "ch": excludes Chile; "co": excludes Colombia; "cri": excludes Costa Rica; "do": includes Dominican Republic; "ec": excludes Ecuador; "jam": excludes Jamaica; "me": excludes Mexico; "pa" excludes Paraguay; "pe" excludes Peru; "ur" excludes Uruguay.

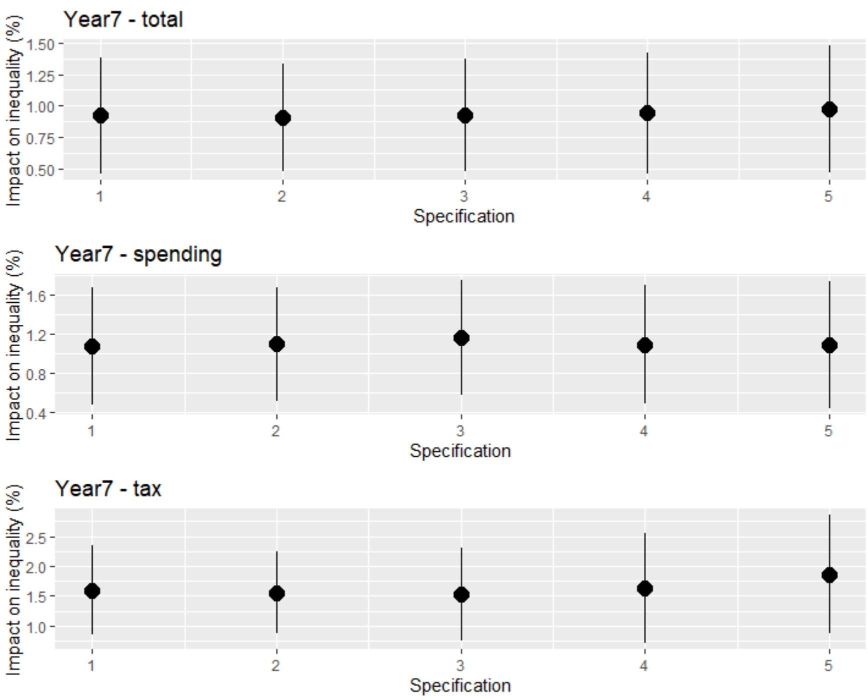

Figure 3.28: Impact of fiscal consolidation (of 1% of GDP) on market income inequality - Different lags of the fiscal shock

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes three lags and refers to "3" in the graph.

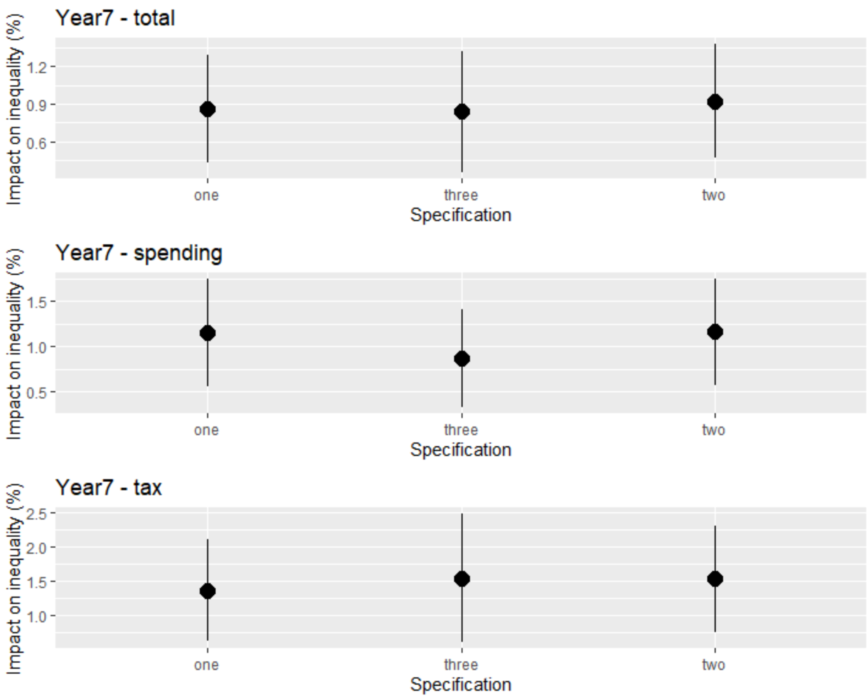

Figure 3.29: Impact of fiscal consolidation (of 1% of GDP) on market income inequality - Different lags of the Gini index

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes two lags and refers to "2" in the graph.

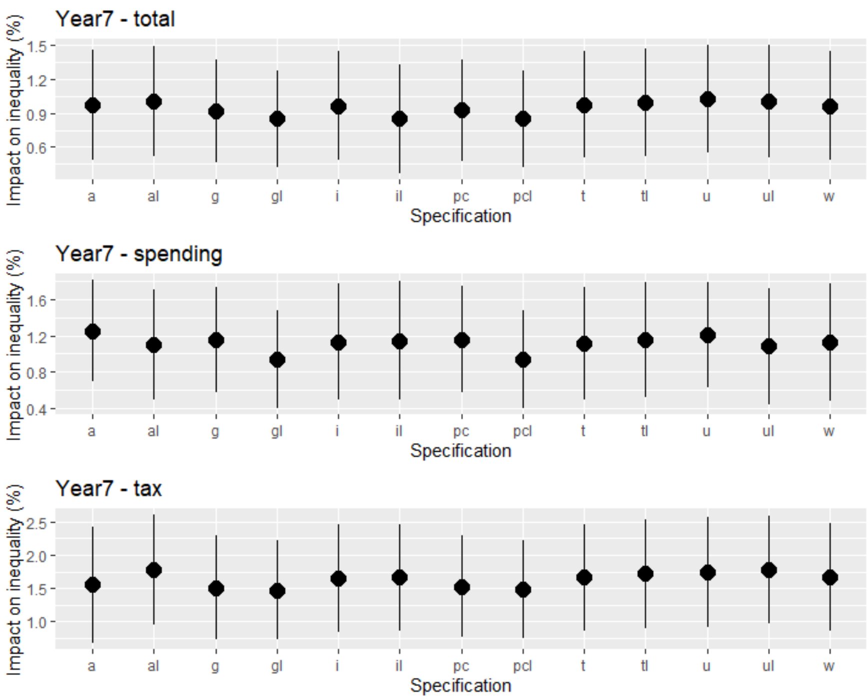

Figure 3.30: Impact of fiscal consolidation (of 1% of GDP) on market income inequality - Different control variables

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "a": all variables (all control variables are included in Equation 3.2); "g": real GDP growth rate; "i": inflation rate; "pc": real GDP per capita (baseline); "t": trade-to-GDP (openness); "u": unemployment rate, "w": without control variables. "al", "gl", "il"; "pcl", "tl" and "ul" control for the same variables, but adding one lag.

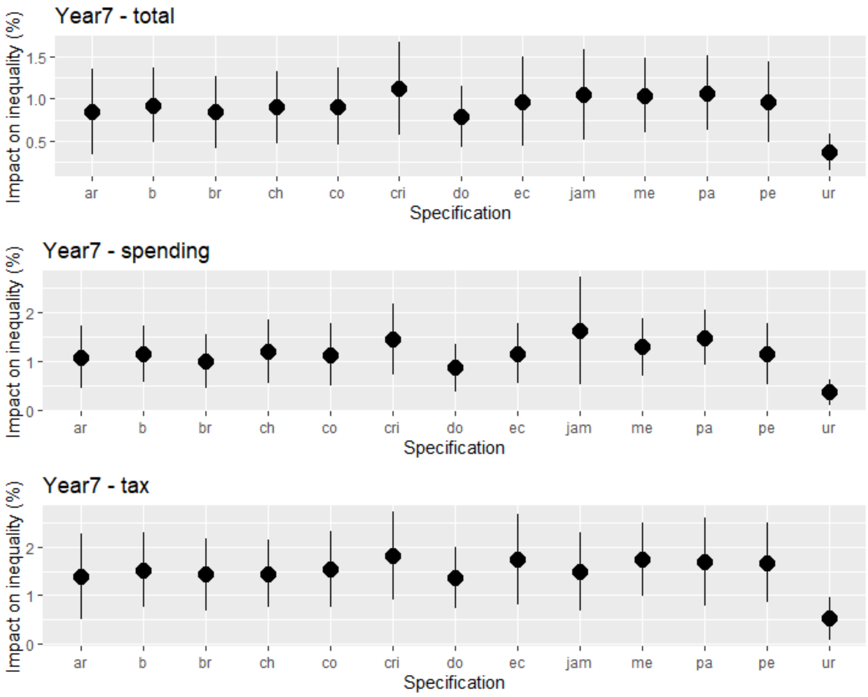

Figure 3.31: Impact of fiscal consolidation (of 1% of GDP) on market income inequality - Different countries

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "b" is the baseline; "ar": excludes Argentina; "br": excludes Brazil; "ch": excludes Chile; "co": excludes Colombia; "cri": excludes Costa Rica; "do": includes Dominican Republic; "ec": excludes Ecuador; "jam": excludes Jamaica; "me": excludes Mexico; "pa" excludes Paraguay; "pe" excludes Peru; "ur" excludes Uruguay.

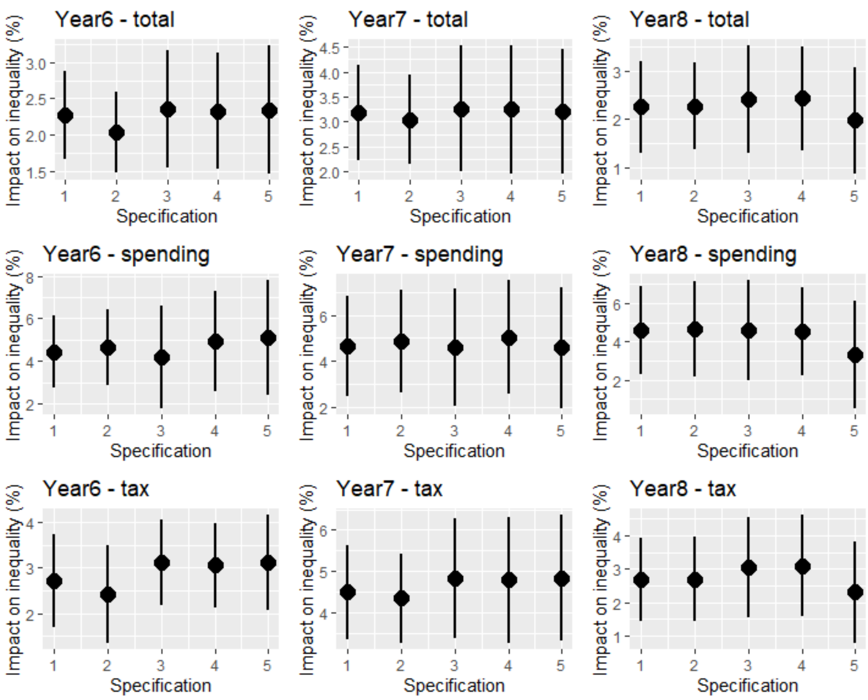

Figure 3.32: Impact of fiscal consolidation (of 1% of GDP) on hourly wage inequality - Different lags of the fiscal shock

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes two lags and refers to "2" in the graph.

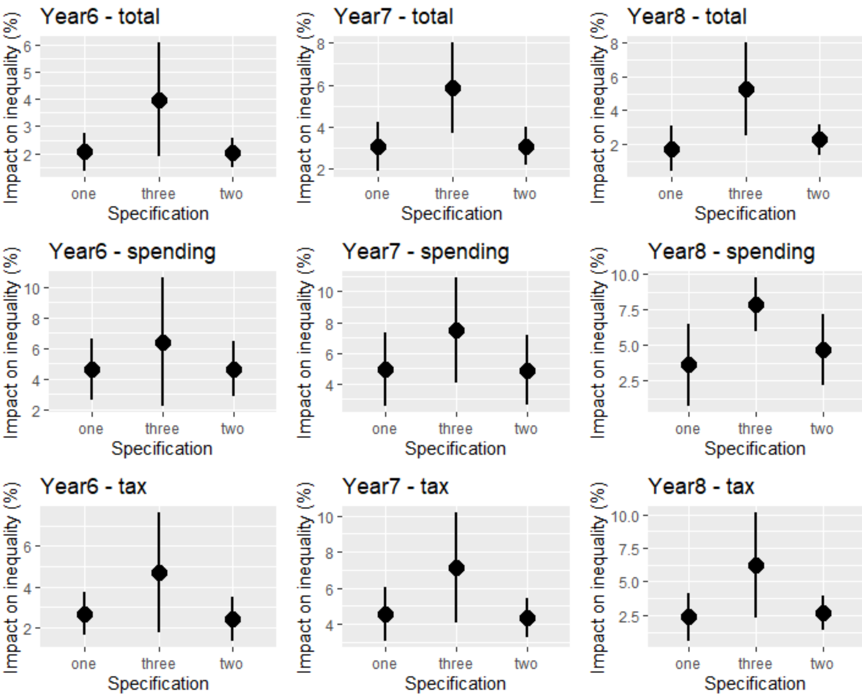

Figure 3.33: Impact of fiscal consolidation (of 1% of GDP) on hourly wage inequality - Different lags of the Gini index

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes two lags and refers to "2" in the graph.

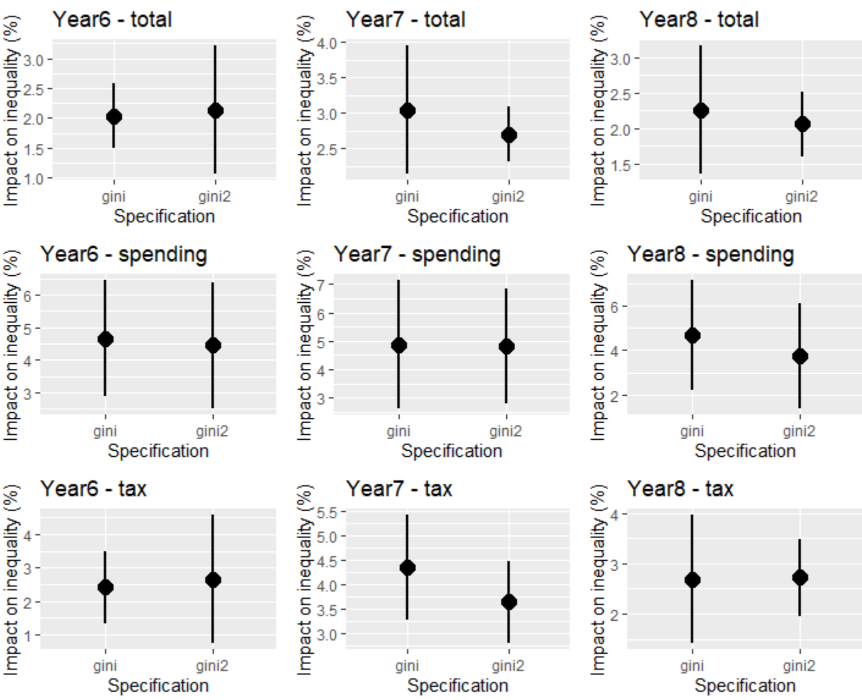

Figure 3.34: Impact of fiscal consolidation (of 1% of GDP) on wage inequality - Different Gini index

Source: Author's calculations. We present the coefficients with one standard deviation band around them. Gini index for labor income ("gini2"); Gini index for hourly wages (baseline - "gini").

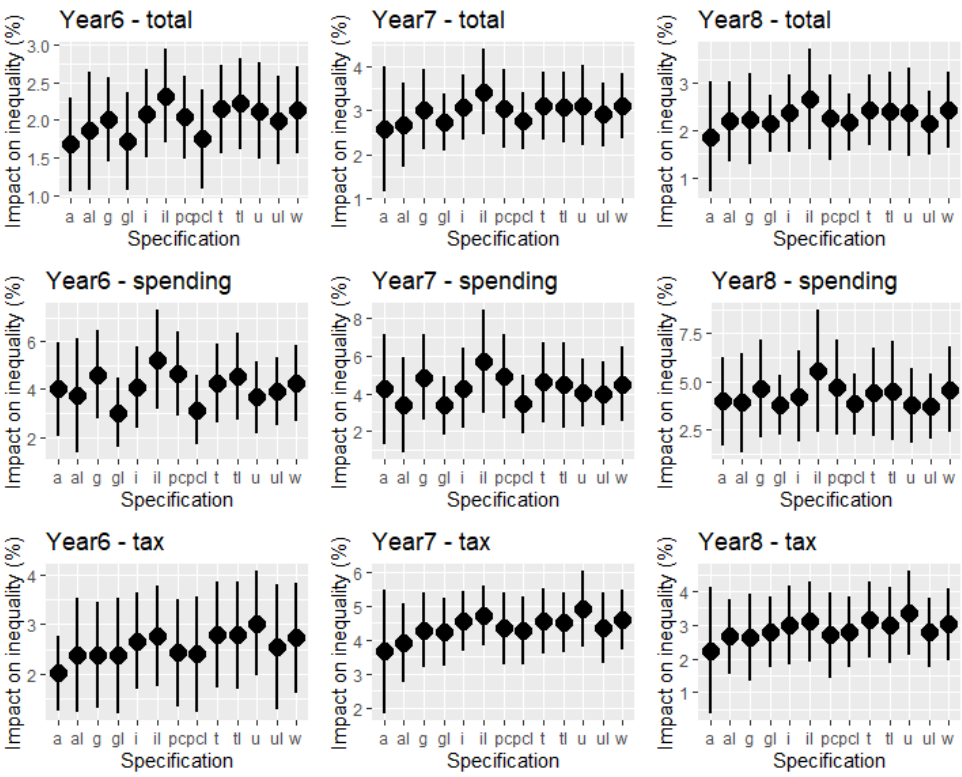

Figure 3.35: Impact of fiscal consolidation (of 1% of GDP) on hourly wage inequality - Different control variables

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "a": all variables (all control variables are included in Equation 3.3); "g": real GDP growth rate; "i": inflation rate; "pc": real GDP per capita (baseline); "t": trade-to-GDP (openness); "u": unemployment rate, "w": without control variables. "al", "gl", "il"; "pcl", "tl" and "ul" control for the same variables, but adding one lag.

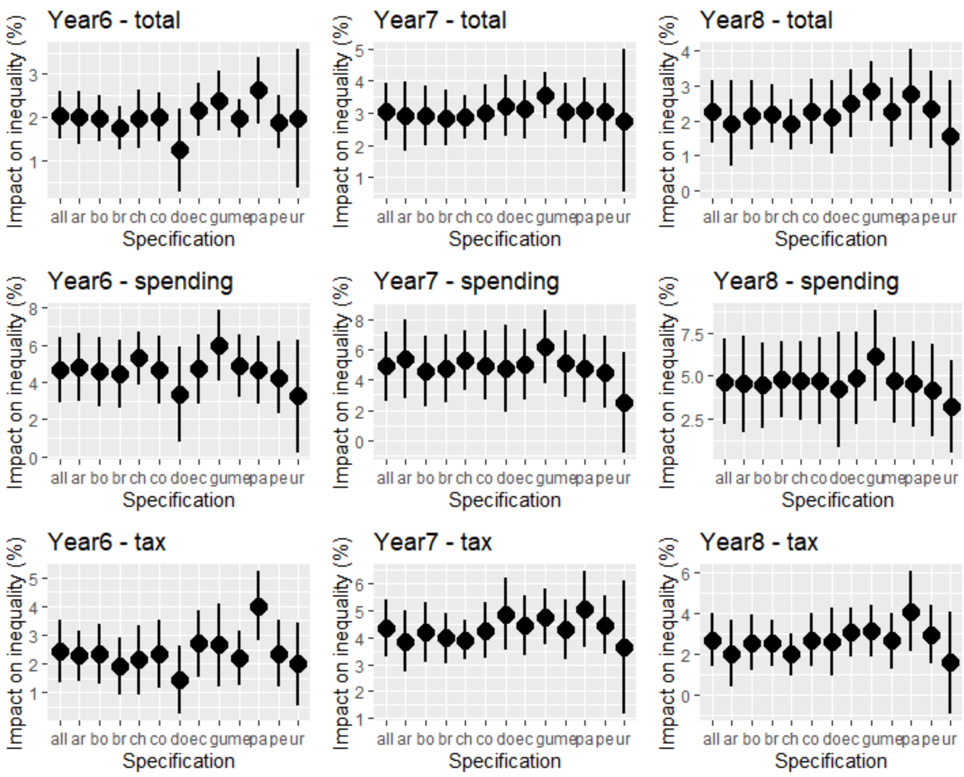

Figure 3.36: Impact of a fiscal consolidation (of 1% of GDP) on hourly wage inequality - Different countries

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "all" is the baseline (includes all countries); "ar": excludes Argentina; "bo": excludes Bolivia; "br": excludes Brazil; "ch": excludes Chile; "co": excludes Colombia; "do": excludes Dominican Republic; "ec": excludes Ecuador; "gu": excludes Guatemala; "me": excludes Mexico; "pa" excludes Paraguay; "pe" excludes Peru; "ur" excludes Uruguay.

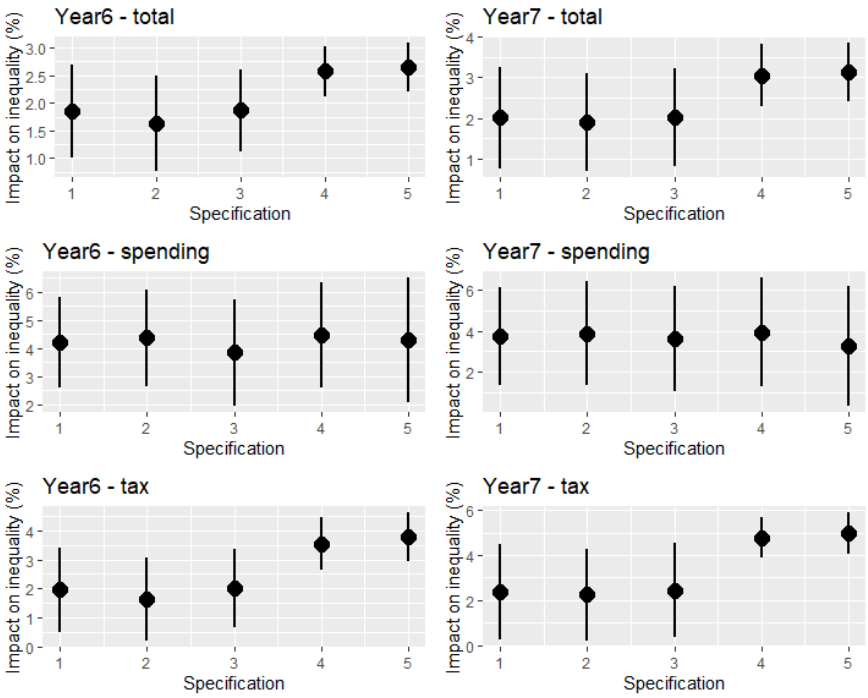

Figure 3.37: Impact of fiscal consolidation (of 1% of GDP) on hourly wage inequality - Including Costa Rica in the sample (different lags of the fiscal shock)

Source: Author's calculations. We present the coefficients with one standard deviation band around them. Results of including Costa Rica in the sample. "1, 2, 3, 4, 5" are the number of lags of the fiscal shock.

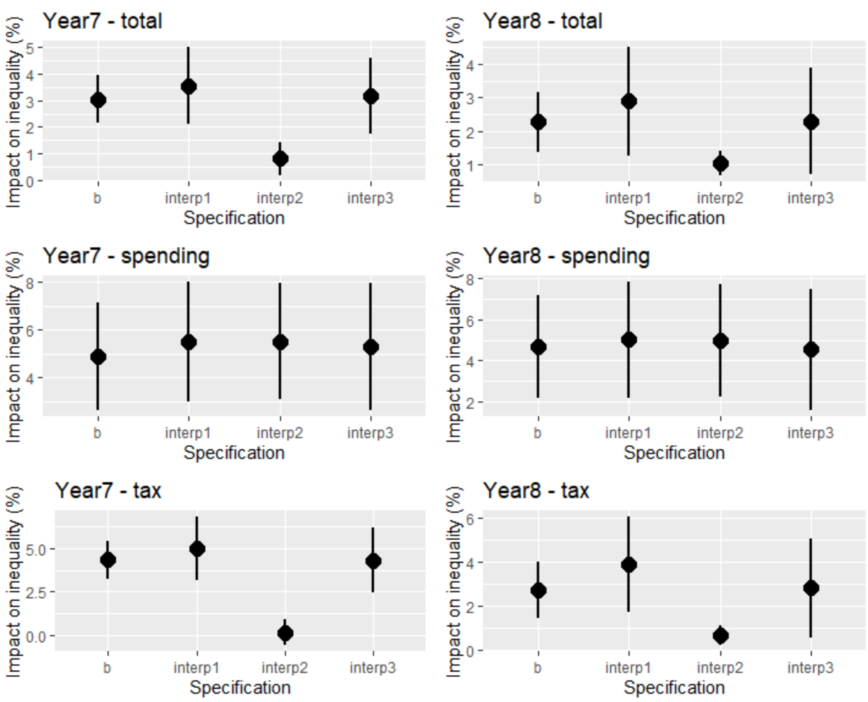

Figure 3.38: Impact of fiscal consolidation (of 1% of GDP) on hourly wage inequality - Using linear interpolation for missing data

Source: Author's calculations. "b" is the baseline scenario. "interp1": we interpolate all series, excluding the tax shock in 2004 for Bolivia; "interp2": we interpolate all series; "interp3": we interpolate all series excluding Bolivia from the sample.

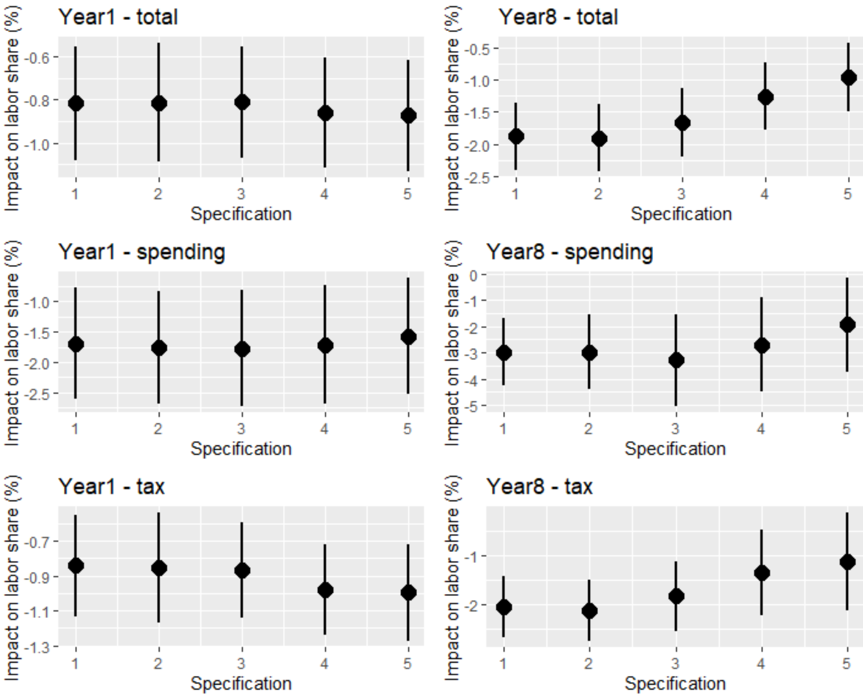

Figure 3.39: Impact of fiscal consolidation (of 1% of GDP) on the labor share - Different lags of the fiscal shock

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes two lags and refers to "2" in the graph.

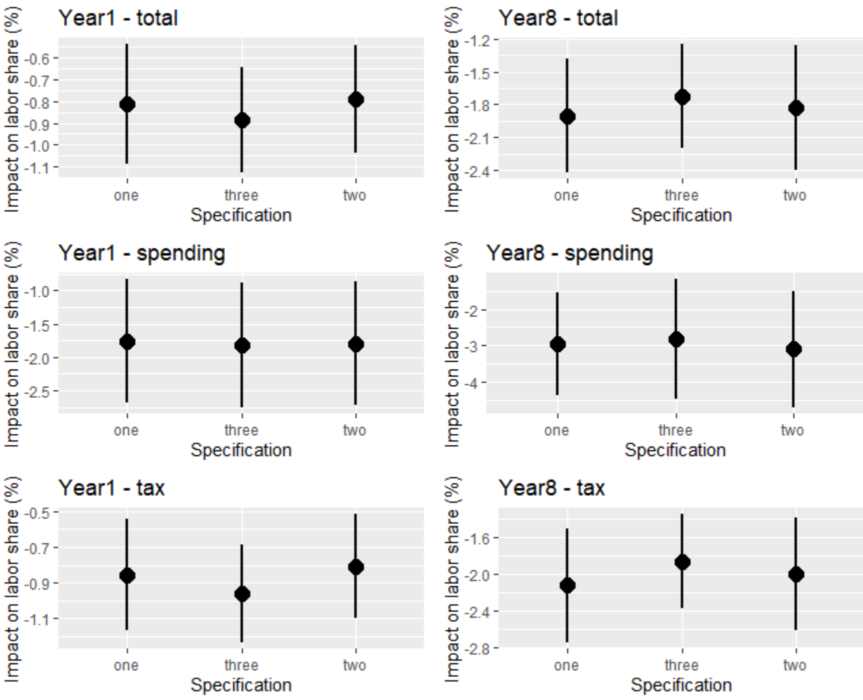

Figure 3.40: Impact of fiscal consolidation (of 1% of GDP) on the labor share - Different lags of the labor share

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes one lag and refers to "one" in the graph.

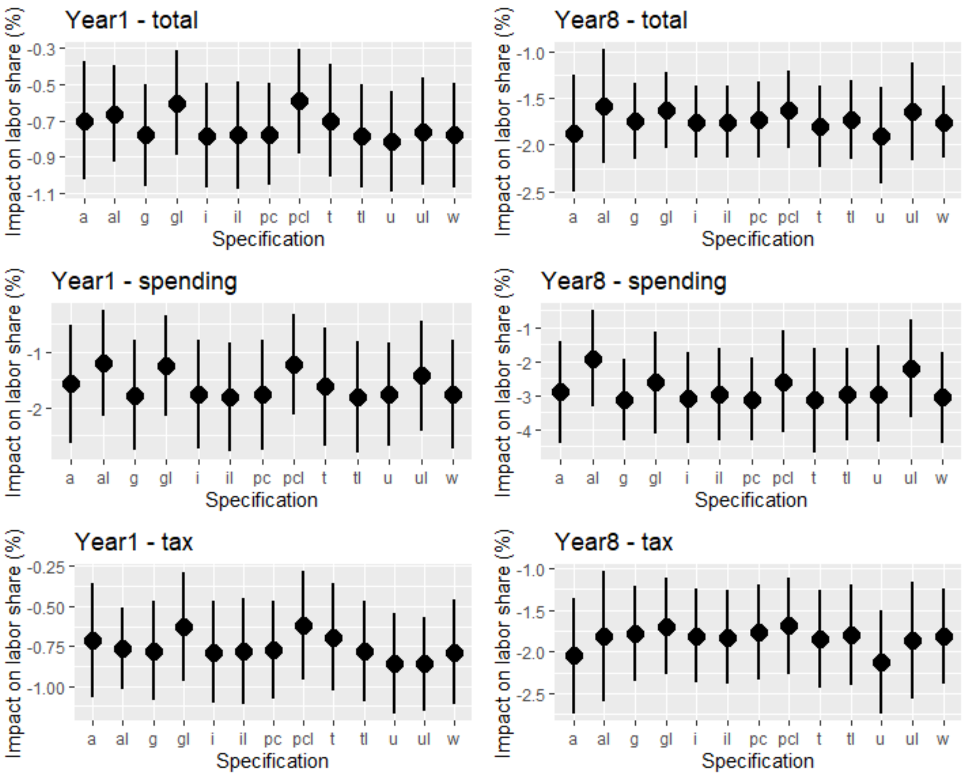

Figure 3.41: Impact of fiscal consolidation (of 1% of GDP) on the labor share - Different control variables

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "a": all variables (all control variables are included in Equation 3.4); "g": real GDP growth rate; "i": inflation rate; "pc": real GDP per capita; "t": trade-to-GDP (openness); "u": unemployment rate (baseline), "w": without control variables. "al", "gl", "il"; "pcl", "tl" and "ul" control for the same variables, but adding one lag.

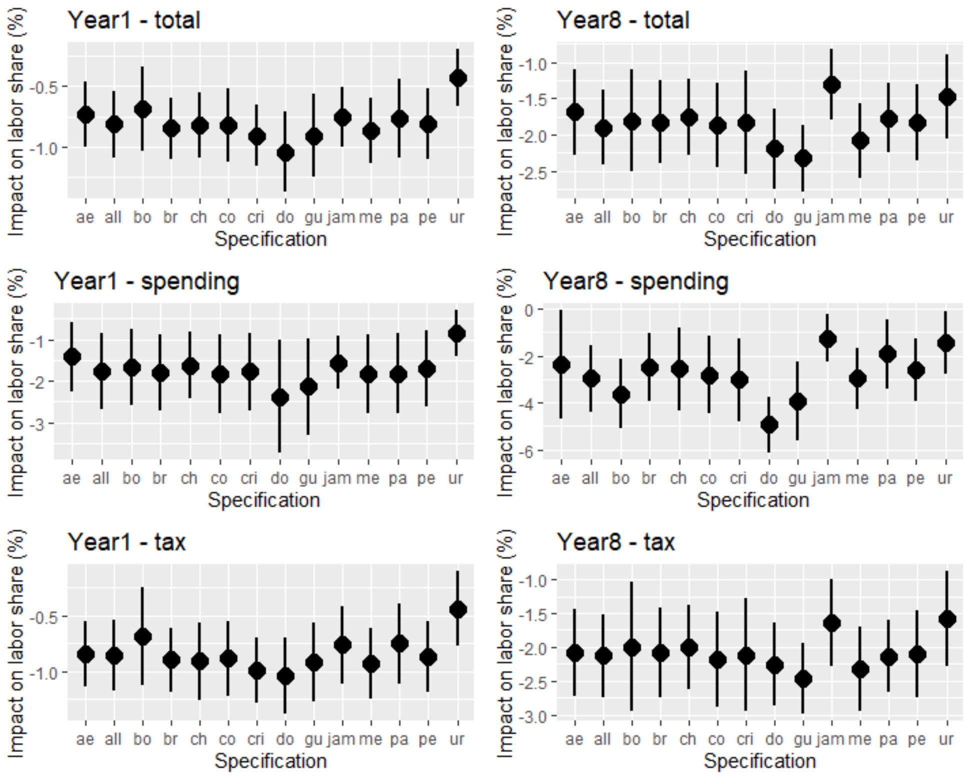

Figure 3.42: Impact of fiscal consolidation (of 1% of GDP) on the labor share - Different countries

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "all" is the baseline (includes all countries); "ae": includes Argentina and Ecuador; "bo": excludes Bolivia; "br": excludes Brazil; "ch": excludes Chile; "co": excludes Colombia; "cri" excludes Costa Rica; "do": excludes Dominican Republic; "gu": excludes Guatemala; "jam" includes Jamaica; "me": excludes Mexico; "pa" excludes Paraguay; "pe" excludes Peru; "ur" excludes Uruguay.

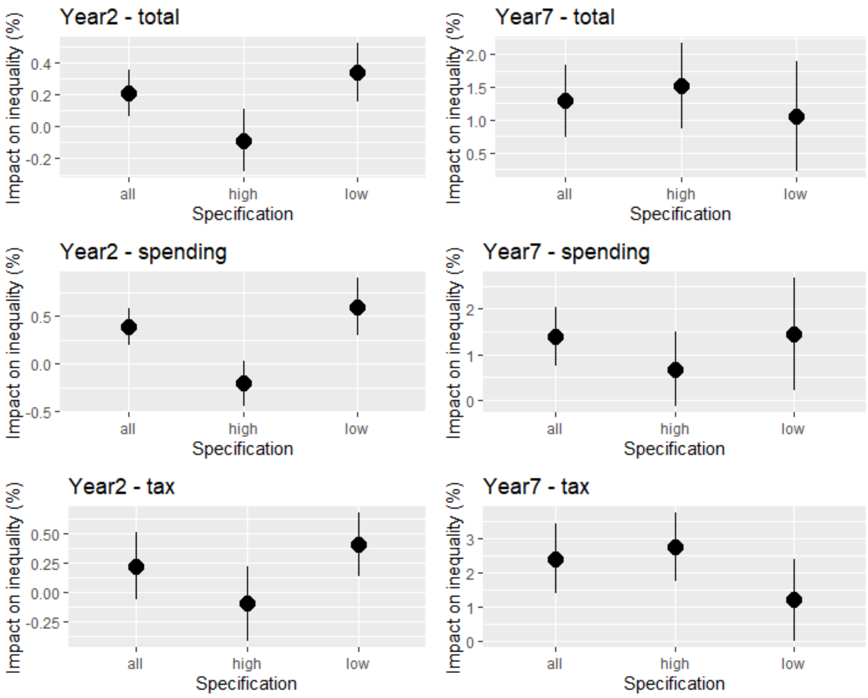

Figure 3.43: Impact of fiscal consolidation (of 1% of GDP) on disposable income inequality - Low and high GDP growth (under and above 1%)

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "All" means the baseline model, "high" ("low") represents the estimations considering only the fiscal shocks that happen when the real GDP growth rate is higher (lower) than 1%.

3.6.2 Robustness checks for Section 3.5

In this section, we conduct a re-estimation of the exercise aimed at assessing whether the impacts of fiscal adjustments differ during the economic cycle. Instead of considering a real GDP growth rate lower (higher) than 2%, we now examine a threshold of 1% for low (high) growth years. The results are presented in Figures 3.43-3.46 and exhibit minimal variation, demonstrating the robustness of our exercise to this change.

We also estimate the effects of fiscal consolidation episodes in years of low (high) growth, considering a real GDP growth rate lower (higher) than 2%. Additionally, we incorporate the average GDP growth rate of the last five years to capture its trend rather than relying solely on a single point in time when the adjustment episode occurs. The results are presented in Figures 3.47-3.50. While the results are somewhat less robust, there is still evidence to suggest that inequality responds more during low-growth periods, particularly in terms of functional inequality in the short run (Figure 3.50).

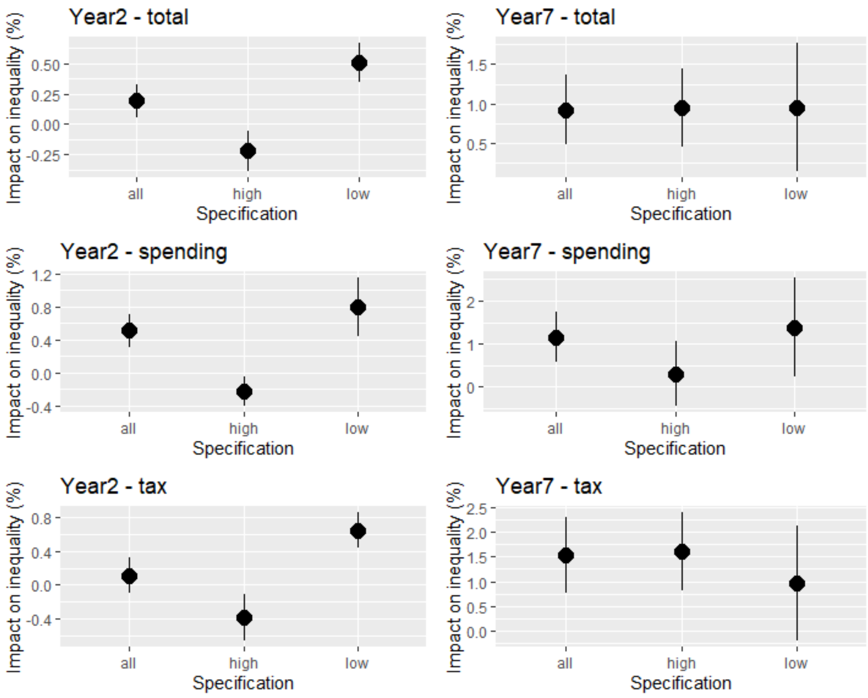

Figure 3.44: Impact of fiscal consolidation (of 1% of GDP) on market income inequality - Low and high GDP growth (under and above 1%)

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "All" means the baseline model, "high" ("low") represents the estimations considering only the fiscal shocks that happen when the real GDP growth rate is higher (lower) than 1%.

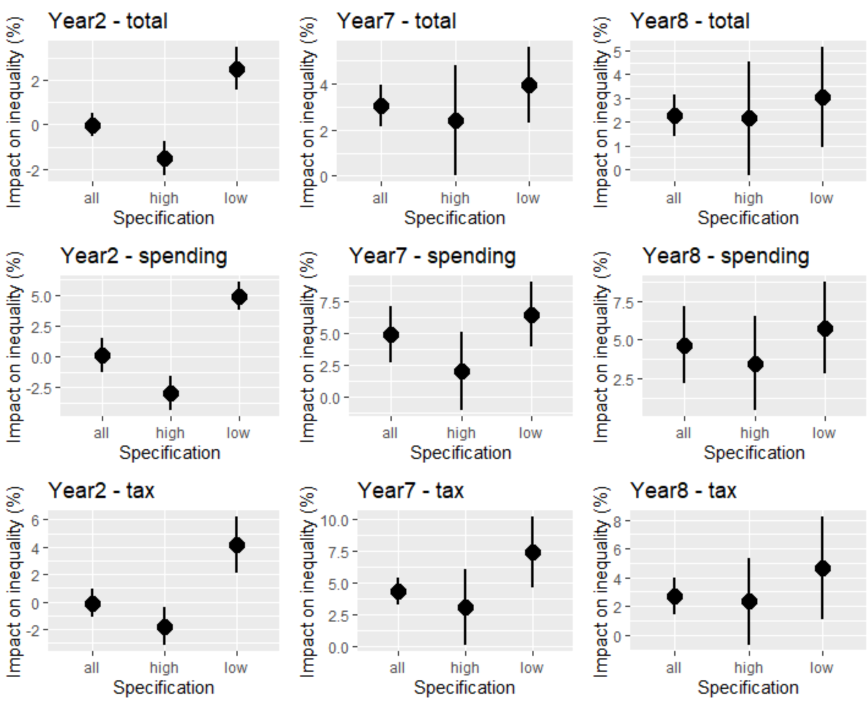

Figure 3.45: Impact of fiscal consolidation (of 1% of GDP) on hourly wage inequality - Low and high GDP growth (under and above 1%)

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "All" means the baseline model, "high" ("low") represents the estimations considering only the fiscal shocks that happen when the real GDP growth rate is higher (lower) than 1%.

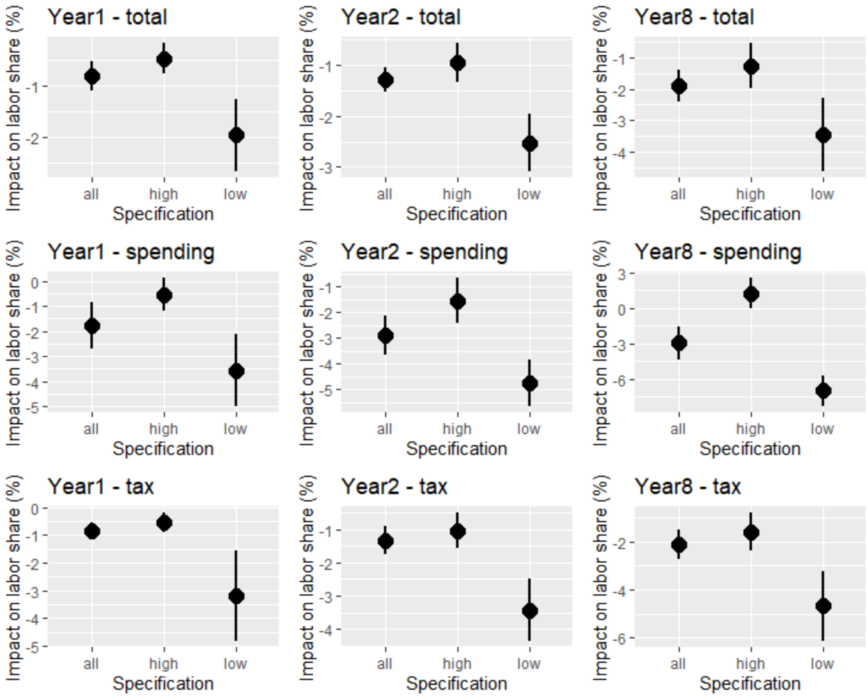

Figure 3.46: Impact of fiscal consolidation (of 1% of GDP) on the labor share - Low and high GDP growth (under and above 1%)

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "All" means the baseline model, "high" ("low") represents the estimations considering only the fiscal shocks that happen when the real GDP growth rate is higher (lower) than 1%.

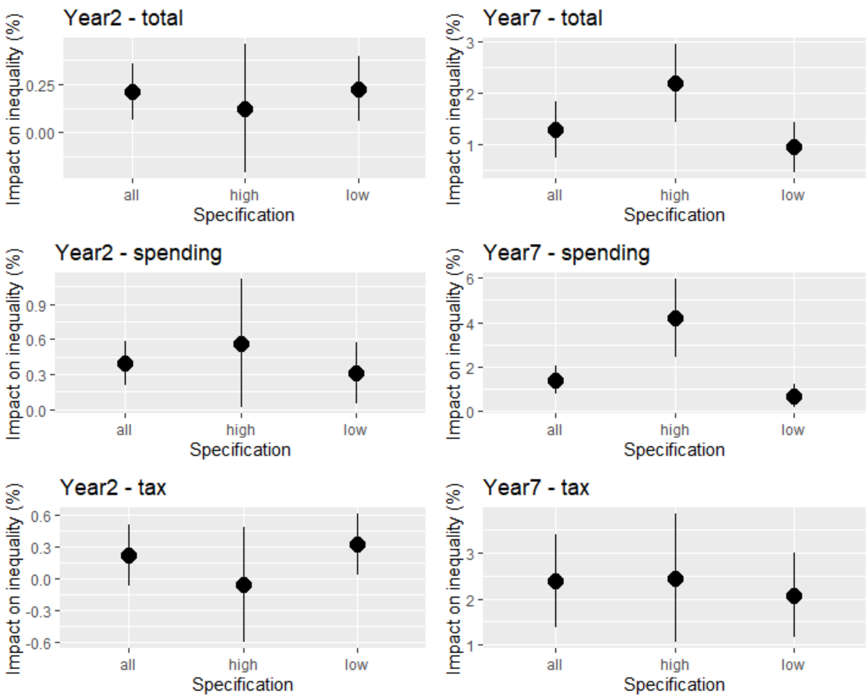

Figure 3.47: Impact of fiscal consolidation (of 1% of GDP) on disposable income inequality - Low and high GDP growth (under and above 2% - trend)

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "All" means the baseline model, "high" ("low") represents the estimations considering only the fiscal shocks that happen when the real GDP growth rate is higher (lower) than 2%.

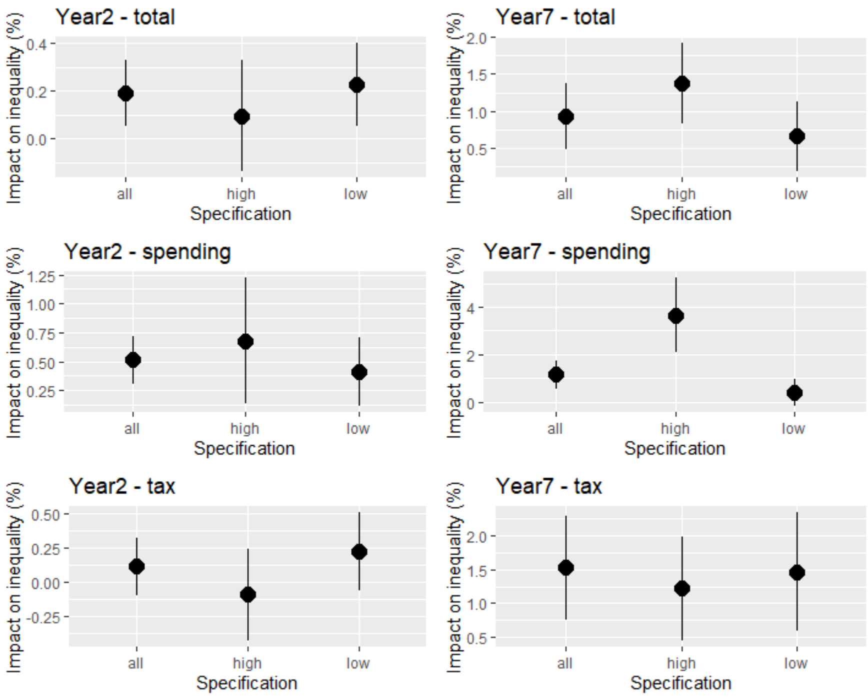

Figure 3.48: Impact of fiscal consolidation (of 1% of GDP) on market income inequality - Low and high GDP growth (under and above 2% - trend)

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "All" means the baseline model, "high" ("low") represents the estimations considering only the fiscal shocks that happen when the real GDP growth rate is higher (lower) than 2%.

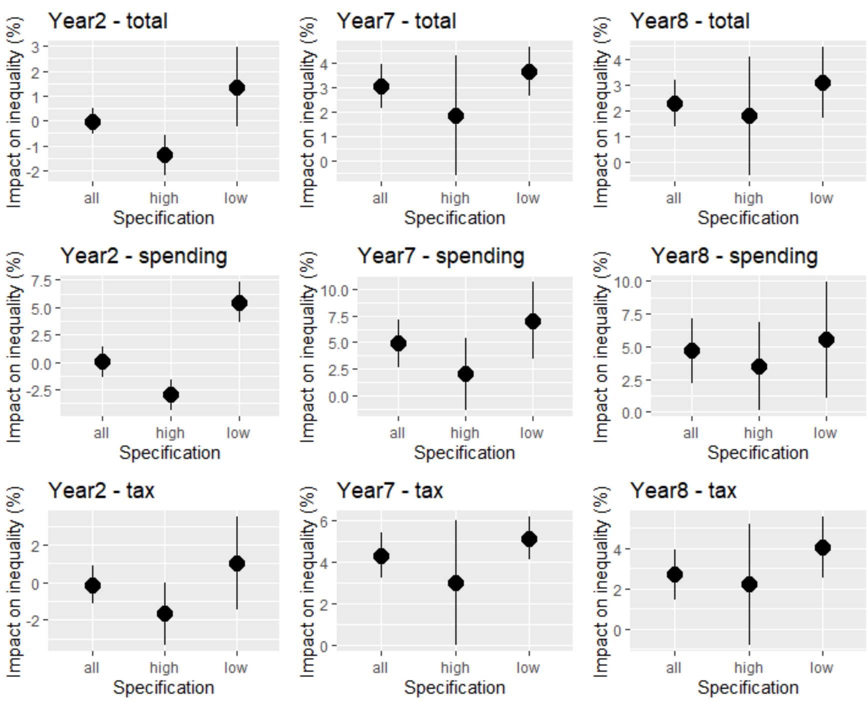

Figure 3.49: Impact of fiscal consolidation (of 1% of GDP) on hourly wage inequality - Low and high GDP growth (under and above 2% - trend)

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "All" means the baseline model, "high" ("low") represents the estimations considering only the fiscal shocks that happen when the real GDP growth rate is higher (lower) than 2%.

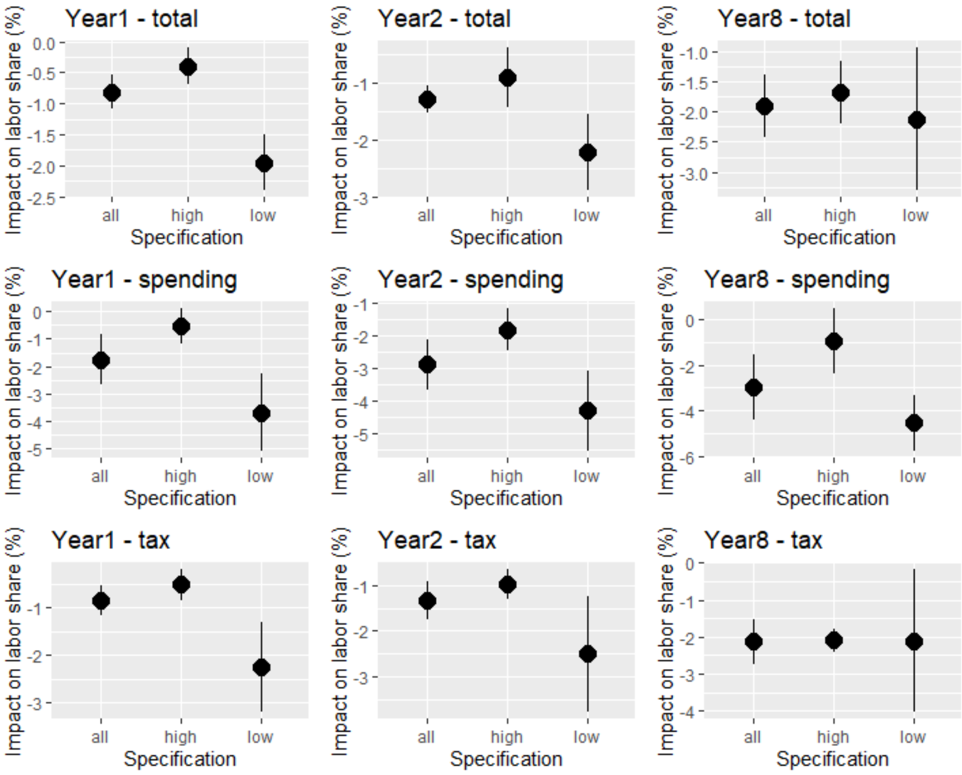

Figure 3.50: Impact of fiscal consolidation (of 1% of GDP) on the labor share - Low and high GDP growth (under and above 2% - trend)

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "All" means the baseline model, "high" ("low") represents the estimations considering only the fiscal shocks that happen when the real GDP growth rate is higher (lower) than 2%.

3.7 Concluding Remarks

This paper has analyzed the dynamic effects of fiscal consolidation episodes on disposable income, market income, hourly wage, and functional inequalities in the short- and medium-run, utilizing an annual data set covering countries from Latin America and the Caribbean from 1989-2016. We have made significant contributions to the empirical literature by conducting the first econometric study that examines the channels through which austerity affects inequality (Figure 2.1) for Latin American countries. Our approach involves a Gini decomposition interpretation to assess the role of hourly wage and functional disparities, as well as the redistributive impact of taxes and transfers in the short and medium run.

Additionally, we have expanded the existing literature by estimating these impacts under different business cycle regimes and considering the size of austerity measure packages. Our study stands out as the first in the macroeconometric literature for Latin American countries to estimate the effects of austerity on functional distribution and the redistributive measure (market income minus disposable income inequality). Lastly, we have provided a novel contribution to this literature by estimating the impact of austerity on inequality among workers.

Using the methodology proposed by Jordà (2005), we derived impulse response functions from local projections. Our baseline findings indicate that eight years after a fiscal consolidation episode, the hourly wage inequality index increases by 2.26%, and the labor share in income declines by 1.9%. This suggests that both channels play a significant role in explaining the rise in inequality. Furthermore, their responses are more pronounced when the adjustment occurs during a period of low economic growth and when the size of the fiscal consolidation package is large.

Regarding the redistributive channel, we found that the redistribution measure responds positively to fiscal shocks in the short run. This result suggests that the social safety net plays a crucial role since disposable income inequality responds less than market income inequality. However, the redistributive effect decreases in the medium run after tax-based fiscal episodes. Therefore, the regressive impact of fiscal adjustments is more significant than the role of the taxes and transfers system in the medium run.

In terms of wage and functional disparities, hourly wage inequality is the most important channel in the medium run. In contrast, the functional distribution channel has a more substantial effect in the short run. These results indicate that fiscal consolidations have adverse effects on the labor market, particularly for workers at the bottom of the wage distribution. As fiscal austerity programs depress aggregate demand and increase unemployment (as observed in Latin America by Carrière-Swallow et al., 2021), they primarily affect the income of people at the bottom of the income pyramid and exacerbate inequality between workers and between workers and capitalists. Since these two channels respond more strongly to austerity measures than market income inequality, we can indirectly infer, using a Gini decomposition by income source, that the inequality among non-labor income decreases.

By decomposing fiscal shocks, we find that spending-based shocks have a more significant effect on the Gini coefficient for hourly wages (4.88%, after seven years) and on workers' share in income (-2.97% after eight years) compared to the impact on the Gini index for disposable income (1.39%, after seven years) and the Gini index for market income inequality (1.158% after seven years).

Similarly, tax-based austerity measures also seem to have a more pronounced impact on hourly wage and functional disparities than on disposable income and market income inequalities. After seven years, a tax-based austerity episode pushes hourly wage inequality by 4.3%. The effect on functional, disposable income, and market income inequality is around 2.12%, 2.4%, and 1.53% in the medium run, respectively.

Our findings have important implications for policymakers as they highlight the significant impact of fiscal consolidation austerity episodes on inequality in both the short and medium runs, especially during periods of low economic growth. Therefore, fiscal policy should carefully consider its distributional effects, particularly in the context of the most unequal region in the world.

One limitation of our analysis that warrants further investigation in future research is exploring other potential channels in Figure 2.1. Specifically, it would be valuable to examine the impact of monetary policy shocks, and perhaps their interaction with fiscal policy, on various measures of inequality. This could provide valuable insights into the combined effects of fiscal and monetary policies on inequality dynamics.

Another significant limitation of this study, which is also common in the existing literature, is the inability to distinguish between different components of tax increases and spending cuts in the fiscal consolidation data used. Since different types of spending and tax-based shocks may have varying effects on inequality dynamics, a possible extension of this study could involve constructing a narrative dataset that distinguishes different shock types. This would provide a more nuanced understanding of how specific fiscal policy measures influence inequality outcomes.

Chapter 4

Concluding remarks

Chapter 1 built a neo-Kaleckian model to study the relationship between earnings inequality and fluctuations in aggregate demand. While the Kaleckian literature typically studies the impact of wage inequality on the rate of capacity utilization, we build an earnings inequality measure, motivated by the empirical literature that reports that earnings inequality is countercyclical. The evidence of a countercyclical earnings inequality indicates that the productivity of the economy is pro-cyclical since the employment of production workers adjusts more in downturns and recoveries than the employment of professional labor.

The model includes three classes in a Kaleckian-Goodwinian approach – capitalists and two types of workers (production and professional). We build a relationship between earnings inequality and aggregate demand mediated by the employment rate in the medium run. We conclude that the stability of this relationship depends on whether the two types of workers are "taking part" in the economic growth. For instance, if professional workers lead aggregate demand (inequality-led demand), the economy is stable if a mechanism decreases earnings inequality (e.g., overhead labor effect). If production workers lead aggregate demand, stability relies on a mechanism that benefits more relatively professional workers (e.g., greater relative professional workers bargaining effect).

We simulate some policy impacts:

a) policies that benefit production workers during expansions and increase their employment variation more than the variation of professional workers' employment (e.g., higher overhead labor effect or more pro-cyclical labor productivity) have the potential to decrease earnings inequality along with a greater employment rate. The final impact on the employment rate is positive in a non-inequality-led economy but ambiguous in the case of an inequality-led regime;

b) policies that increase the production workers' share in income reduce earnings inequality and stimulate the employment rate in both types of demand regimes and without ambiguity;

c) a fiscal policy stimulus has an ambiguous final impact on the variables analyzed, but in economies with a higher level of earnings inequality, it tends to have a positive distributive impact, reducing earnings inequality;

d) a higher production workers' relative bargaining power does not change earnings inequality at first, but affects the employment rate positively. Also, a policy that strengthens production workers' bargaining power can increase their share in income (which decreases earnings inequality and increases the employment rate).

In summary, the paper highlights the importance of policies that increase the production workers' share in income, as they have positive effects on both distributional and aggregate demand aspects, regardless of the demand regime. This type of policy includes, for example, policies that strengthen production workers' bargaining power, such as a real increase in minimum wage, a higher level of employment formalization and social expenditure programs.

Chapter 2 and Chapter 3 contribute to the empirical literature on the impacts of fiscal austerity on inequality by analyzing the dynamic effects of fiscal consolidation episodes on disposable income, market income, wage, and functional inequalities. While Chapter 2 uses the narrative dataset from Alesina et al. (2019) for a group of OECD countries from 1978 to 2014, Chapter 3 employs a narrative dataset covering 1989-2016, from David and Leigh (2018) for a group of countries from Latin America and the Caribbean. Using the methodology proposed by Jordà (2005), we derive impulse response functions from local projections and conduct a comprehensive Gini decomposition analysis to evaluate the channels through which austerity affects inequality: the redistributive effect, wage inequality, and functional inequality. A fourth channel can also be inferred (non-labor inequality).

We have found some similarities and differences in the results for the two groups of countries. The similarities are:

i) The redistribution measure responds positively to fiscal shocks in the short run, suggesting the crucial role of the social safety net in mitigating immediate inequality impacts.

While the automatic stabilizers can be an explanation for OECD countries (Klein and Winkler, 2019), in Latin America we highlight the role by the social safety net.

ii) In general, the effect of spending-based shocks on inequality is more relevant for both samples of countries.

iii) In both short and medium runs, we infer that the impact of austerity on non-labor income inequality might be equalizing.

The differences are:

iv) The redistributive measure does not have a statistically significant response in the medium run for OECD sample, while it responds negatively in the medium run for Latin American countries. By disaggregating the shocks, we showed this result occurs after tax-based episodes. It indicates the disposable income inequality responds more than market income inequality in the medium run.

v) The wage inequality channel is important in both the short and medium runs for OECD countries, while for the Latin American sample the impact occurs in the medium run. Despite this finding, the impact on wage inequality in terms of magnitude is higher in the mediun run for Latin American countries.

vi) The functional channel is significant in both short and medium runs in Latin American countries, while in the case of OECD it is significant only in the short run. Also, the magnitude of the effect is higher in Latin America.

vii) While for OECD countries only spending-based shocks increase functional inequality, for Latin American countries both spending- and tax- shocks display statistically significant effects on the labor share.

A possible explanation for items iv and vii is that the tax system structure in Latin American region is more regressive due to its heavy reliance on indirect taxes (ECLAC, 2021; OECD, 2021) - see Table 3.5. For this reason, tax-based measures in Latin America tend to be more regressive, increasing inequality. In fact, the result summarized in item "iv" above is an important result of this dissertation and deserves more investigation in future works.

Finally, the magnitude of the impact of fiscal consolidation measures on inequality is, in general, stronger for Latin American countries. Considering the peak response, an austerity episode of 1% of GDP increases the disposable income, market income, wage, and functional inequalities by 0.703%, 0.486%, 1.588%, and 0.816%, respectively, for OECD countries (Chapter 2). These impacts for Latin American countries are: 1.29%, 0.924%, 3.04% and 1.9% (Chapter 3).

Our findings carry significant implications for policymakers, particularly in Latin America, as they underscore the substantial impact of fiscal consolidation austerity episodes on inequality. The regressive nature of tax systems in Latin American countries, characterized by heavy reliance on indirect taxes, exacerbates inequality dynamics. Furthermore, strengthening social protection programs and enhancing access to essential services can also mitigate the impacts of austerity on inequality.

Chapter 5

References

AFONSO, A. Expansionary Fiscal Consolidations in Europe: New Evidence. Applied Economics Letters, v.17, n.2, p.105-9, 2010.

AGNELLO, L.; FAZIO, G.; SOUSA, R. National fiscal consolidations and regional inequality in Europe. Cambridge Journal of Regions, Economy and Society, v.9, n.1, p.59-80, 2016.

AGNELLO, L.; SOUSA, R. Fiscal adjustment and income inequality: a first assessment. Applied Economic Letters, v.19, n.16, p.1627-1632, 2012.

AGNELLO, L.; SOUSA, R. How does fiscal consolidation impact on income inequality. Review of Income and Wealth, v.60, n.4, p.702-726, 2014.

AIYAR, S.; EBEKE, C. Inequality of opportunity, inequality of income and economic growth. World Development, v.136(-), p. 105-115, 2020.

ALESINA, A.; ARDAGNA, S. Tales of Fiscal Adjustments. Economic Policy, v.13, n.27, p. 489-545, 1998.

ALESINA, A.; ARDAGNA, S. Large Changes in Fiscal Policy: Taxes versus Spending. In: Brown J (ed). Tax Policy and the Economy, Volume 24, The University of Chicago Press, Chicago, p.35-68, 2010.

ALESINA, A.; BARBIERO, O.; FAVERO, C.; GIAVAZZI, F.; PARADISI, M. Austerity in 2009-2013. Economic Policy, v.30, n.83, p. 385-437, 2015.

ALESINA, A.; FAVERO, C.; GIAVAZZI, F. The output effects of fiscal consolidations. NBER Working Paper Series. Working Paper n.18336, 2012.

ALESINA, A.; FAVERO, C.; GIAVAZZI, F. What do we Know About the Effects of Austerity? NBER Working Paper n.24246, 2018.

ALESINA, A.; FAVERO, C.; GIAVAZZI, F. Effects of austerity: expenditure and tax-based approaches. Journal of Economic Perspectives, v.33, n.2, p.141-162, 2019.

ALESINA, A.; PEROTTI, R. Income distribution, political instability, and investment. European Economic Review, v.40, n.6, p.1203-1228, 1996.

ALESINA, A.; RODRIK, D. Distributive politics and economic growth. Quarterly Journal of Economics, v.109, n.2, p.465-490, 1994.

ALESSANDRINI, D.; KOSEMPEL, S.; PELLONI, A.; STENGOS, T. Earnings inequality, the business cycle, and the life cycle. Working Paper n.1602. University of Guelph, 2016.

ALVAREDO, F.; ATKINSON, A.; PIKETTY, T.; SAEZ, E. The top 1 percent in international and historical perspective. Journal of Economic Perspectives, v.27, n.3, p. 3-20, 2013.

ANTÍA, F. Regímenes de política social en América Latina: una revisión crítica de la literatura. Desafíos, v.30, n.2, p.193-235, 2018.

ARDANAZ, M.; CAVALLO, E.; IZQUIERDO, A.; PUIG, J.The Output Effects of Fiscal Consolidations. Does Spending Composition Matter? Inter-American Development Bank Working Paper Series, n.1302, 2021.

ATEMS, B.; JONES, J. Income inequality and economic growth: a panel VAR approach. Empirical Economics, n.48, p.1541-1561, 2015.

ATKINSON, A.; BRANDOLINI, A. The evolution of income inequality across time and across countries. Cambridge Journal of Economics, v.33, n.3, p.381-404, 2009.

AUERBACH, A.; GORODNICHENKO, Y. Measuring the output responses to fiscal policy. American Economic Journal: Economic Policy, v.4, n.2, p.1-27, 2012.

BAKIJA, J. A.; COLE, A.; HEIM, B. Jobs and Income Growth of Top Earners and the Causes of Changing Income Inequality: Evidence from U.S. Tax Return Data. Department of Economics Working Papers 2010-22. Williams College, 2012.

BALL, L.; FURCERI, D.; LEIGH, D.; LOUNGANI, P. The Distributional Effects of Fiscal Austerity. IMF Working Paper 13/151, 2013.

BANERJEE, A. V.; DUFLO, E. Inequality and growth: What can the data say? Journal of Economic Growth, v.8(-), p.267-299, 2003.

BARBOSA-FILHO, N.; TAYLOR, L. Distributive and demand cycles in the US economy: a structuralist Goodwin model. Metroeconomica, v.57, n.3, p.389-411, 2006.

BARRALES-RUIZ, J.; MENDIETA-MUÑOZ, I.; RADA, C.; TAVANI, D.; VON ARNIM, R. The distributive cycle: Evidence and current debates. Journal of Economic Surveys, special issue, p.1-36, 2021.

BARRALES-RUIZ, J.; VON ARNIM, R. Longer-Run Distributive Cycles: Wavelet Decompositions for the US, 1948-2011. Review of Keynesian Economics, v.5, n.2, p. 196-217, 2017.

BARRALES-RUIZ, J.; VON ARNIM, R. Endogenous fluctuations in demand and distribution: An empirical investigation. Structural Change and Economic Dynamics, v.58(C), p.204-220, 2021.

BARRELL, R.; HOLLAND, D.; HURST, I. Fiscal consolidation Part 2: fiscal multipliers and fiscal consolidation. OECD Economics Department Working Papers, n.933, 2012.

BASTAGLI, F.; COADY, D.; GUPTA, S. Income Inequality and Fiscal Policy. IMF Staff Discussion Note SDN/12/08, 2012.

BASU, D.; GAUTHAM, L. What is the impact of an exogenous shock to the wage share? VAR results for the US economy, 1973-2018. Working Paper n.266. University of Massachusetts, Department of Economics, Amherst, 2019.

BASU, D.; CHEN, Y.; OH, J. Class struggle and economic fluctuations: VAR analysis of the post-war US economy. International Review of Applied Economics, v.27, n.5, p.575-596, 2013.

BAUM, A.; POPLAWSKI-RIBEIRO, M.; WEBER, A. Fiscal Multipliers and the State of the Economy. IMF Working Paper 12/286, 2012.

BERG, A.; OSTRY, J. Inequality and Unsustainable Growth: two sides of the same coin? Research Department, International Monetary Fund, Washington D.C., 2011.

BERG, A.; OSTRY, J.; TSANGARIDES, C. G.; YAKHSHILIKOV, Y. Redistribution, inequality, and growth: new evidence. Journal of Economic Growth, v.23, n.3, p. 259-305, 2018.

BERNSTEIN, J.; BENTELE, K. The Increasing Benefits and Diminished Costs of Running a High-Pressure Labor Market. Center on Budget and Policy Priorities, 2019.

BERNSTEIN, J. Wage outcomes and macroeconomic conditions: what's the connection? Center on Budget and Policy Priorities, 2016a.

BERNSTEIN, J. Wages in the United States: Trends, Explanations, and Solutions. In: Kirsch I., Braun H. (eds) The Dynamics of Opportunity in America. Springer, 2016b.

BISHOP, J.; LIU, H; ZEAGER, L.; ZHAO, Y. Revisiting macroeconomic activity and income distribution in the USA. Empirical Economics, n.59, n.3, p.1107-1125, 2020.

BIVENS, J.; MISHEL, L. The pay of corporate executives and financial professionals as evidence of rents in top 1 percent incomes. Journal of Economic Perspectives, v.27, n.3, p.57-78, 2013.

BLANCHARD, O.; LEIGH, D. Learning about Fiscal Multipliers from Growth Forecast Errors. IMF Economic Review, v.62, n.2, p.179-212, 2014.

BLANCHARD, O.; PEROTTI, R. An empirical characterization of the dynamic effects of changes in government spending and taxes on output. Quarterly Journal of Economics, v.117, n.4, p. 1329-1368, 2002.

BLANK, R.; BLINDER, A. Macroeconomics, Income Distribution, and Poverty. In: Danziger, S.H., Weinberg, D.H. (Eds.). Fighting Poverty: What Works and What Doesn't. Cambridge, MA, Harvard University Press, p.180-208, 1986.

BLAU, F.; KAHN, L. Inequality and earnings distribution. In: The Oxford Handbook of Economic Inequality, 2020.

BLECKER, R.; CAUVEL, M.; KIM, Y. Systems estimation of a structural model of distribution and demand in the US economy. Cambridge Journal of Economics, v.46, n.2, p.391-420, 2022.

BLECKER, R.; SETTERFIELD, M. Heterodox Macroeconomics Models of Demand, Distribution and Growth. Edward Elgar Publishing, 2019.

BLINDER, A.; ESAKI, H. Macroeconomic activity and income distribution in the postwar United States. The Review of Economics and Statistics, v.60, n.4, p.604-609, 1978.

BONHOMME, S.; HOSPIDO, L. The cycle of earnings inequality: evidence from Spanish social security data. The Economic Journal, v.127 (August), p.1244-1278, 2016.

BOWLUS, A.; GOUIN-BONENFANT, E.; LIU, H.; LOCHNER, L.; PARK, Y. Four decades of Canadian earnings inequality and dynamics across workers and firms. Quantitative Economics, v.13, n.4, p.1447-1491, 2022.

BRADY, D.; HUBER, E.; STEPHENS, J. Comparative Welfare States Data Set, University of North Carolina and WZB Berlin Social Science Center, 2020.

BRADY, D.; HUBER, E.; STEPHENS, J. Comparative Welfare States Data Set, University of North Carolina and WZB Berlin Social Science Center, 2014.

BREUNIG, R.; MAJEED, O. Inequality, poverty and economic growth. International Economics, v.161(-), p. 83- 99, 2020.

CAI, X.; DENHAAN, W. Predicting recoveries and the importance of using enough information. CEPR discussion paper n.7508, 2009.

CAMACHO, M.; PALMIERI, G. Do economic recessions cause inequality to rise? Journal of Applied Economics, v.22, n.1, p.304-320, 2019.

CAMMERAAT, E. The relationship between different social expenditure schemes and poverty, inequality and economic growth. International Social Security Review, v.73, n.2, p.101-123, 2020.

CAMINADA, K.; GOUDSWAARD, K.; WANG, C.; WANG, J. Has the redistributive effect of social transfers and taxes changed over time across countries? International Social Security Review, v.72, n.1, p.3-31, 2019.

CARDOSO, D.; CARDOMINGO, M.; SANCHES, M.; RIBAS, T.; PEREIRA, F. Impactos dos ajustes fiscais baseados em tributos diretos e indiretos sobre a distribuição de renda e o crescimento econômico: uma análise para a América do Sul. Nota de Política Econômica n.20, Made USP, 2022.

CARDOSO, D.; CARVALHO, L. Effects of fiscal consolidation on income inequality: narrative evidence from South America. Empirical Economics, v.64, p.1177-1218, 2023.

CARDOSO, D.; CARVALHO, L.; LIMA, G.; NASSIF-PIRES, L.; RUGITSKY, F.; SANCHES, M. The multiplier effects of government expenditures on social protection: A multi-country study. Working Paper n.18, Made USP, 2023.

CARDOSO, D.; MARQUES, P.; CARDOMINGO, M. Qual forma de ajuste fiscal é menos danosa para o crescimento econômico? Uma análise do efeito de tributos diretos e indiretos para países da OCDE. Nota de Política Econômica n.16, Made USP, 2021.

CARRIÈRE-SWALLOW, Y.; DAVID, A.; LEIGH, D. The macroeconomic effects of fiscal consolidation in emerging economies: evidence from Latin America. International Monetary Fund. IMF Working Papers, n.142, 2018.

CARRIÈRE-SWALLOW, Y.; DAVID, A.; LEIGH, D. Macroeconomic Effects of Fiscal Consolidation in Emerging Economies: New Narrative Evidence from Latin America and the Caribbean. Journal of Money, Credit and Banking, v.53, n.6, p.1313-1335, 2021.

CARVALHO, L.; REZAI, A. Personal income inequality and aggregate demand. Cambridge Journal of Economics, v.40, n.2, p.491-505, 2015.

CASSETTI, M. Conflict, inflation, distribution and terms of trade in the Kaleckian model. In Setterfield, M. (ed.). The Economics of Demand-led Growth; Challenging the Supply side Vision of the Long Run, Cheltenham, Edward, 2002.

CASSETTI, M. Bargaining power, effective demand and technical progress: a Kaleckian model of growth. Cambridge Journal of Economics, v.27, n.3, p.449-464, 2003.

CASTRO, V. Functional components of public expenditure, fiscal consolidations, and economic activity. Economics & Politics, v.30, n.1 p. 124-150, 2018.

CAUVEL, M. The neo-Goodwinian model reconsidered. European Journal of Economics and Economic Policies: Intervention, v.20, n.2, p.183-246, 2023.

CHEN, P.; FLASCHEL, P. Measuring the Interaction of Wage and Price Phillips Curves for the U.S. Economy. Studies in Nonlinear Dynamics & Econometrics, v.10, n.4, p.1-33, 2006.

CIMINELLI, G.; ERNST, E.; MEROLA, R.; GIULIODORI, M. The composition effects of tax-based consolidation on income inequality. European Journal of Political Economy, v.57(C), p. 107-124, 2019.

CINGANO, F. Trends in Income Inequality and its Impacts on Economic Growth. OECD Social, Employment and Migration. Working paper n.163. OECD: Paris, 2014.

CLARK, K.B.; SUMMERS, L.H. Demographic differences in cyclical employment variation. Journal of Human Resources, v.16, n.1, p.61-79, 1981.

CLARKE, G. More evidence on income distribution and growth. Journal of Development Economics, v.47, n.2, p. 403-427, 1995.

CLIFTON, J.; DÍAS-FUENTES, D.; REVUELTA, J. Falling Inequality in Latin America: The Role of Fiscal Policy. Journal of Latin American Studies, p.1-26, 2020.

COIBION O.; GORODNICHENKO, Y.; KUENG, L.; SILVIA, J. Innocent Bystanders? Monetary Policy and Inequality in the U.S. IMF Working Paper n.12/199, 2012.

Congressional Budget Office (CBO). Trends in the Distribution of Household Income Between 1979 and 2007. CBO Study Pub. n.4031, Congress of the United States, Washington D.C., 2011.

COURNÈDE, B.; GOUJARD, A.; PINA, A. Reconciling fiscal consolidation with growth and equity. OECD Journal: Economic Studies, 2013.

DAO, M.; DAS, M.; KOCZAN, Z.; LIAN, W. Why is labor receiving a smaller share of global income? Theory and empirical evidence. IMF Working Paper n.17/169, 2017.

D'AGOSTINO, G.; PIERONI, L.; SCARLATO, M. Social transfers and income inequality in OECD countries. Structural Change and Economic Dynamics, v.52, p.313-327, 2020.

DAUDEY, E.; GARCÍA-PEÑALOSA, C. The personal and the factor distributions of income in a cross-section of countries. The Journal of Development Studies, v.43, n.5, p.812-819, 2007.

DAVID, A.; LEIGH, D. A New Action-based Dataset of Fiscal Consolidation in Latin America and the Caribbean. IMF Working paper n.18/94, 2018.

DELBIANCO, F.; DABÚS, C.; CARABALLO, M. Income inequality and economic growth: New evidence from Latin America. Cuadernos de Economía, v.33, n.63, p.381-398, 2014.

DELEIDI, M.; IAFRATE, F.; LEVRERO, E. Public investment fiscal multipliers: an empirical assessment for european countries. Structural Change and Economic Dynamics, v.52, p.354-365, 2019.

DEVRIES, P.; GUAJARDO, J.; LEIGH, D.; PESCATORI, A. A new action-based dataset of fiscal consolidation. IMF Working Paper n.11/128, 2011.

DIALLO, M. B.; FLASCHEL, P. H.; KROLZIG, M.; PROAÑO, C. R. Reconsidering the dynamic interaction between real wages and macroeconomic activity. Research in World Economy, v.2, n.1, p.77-93, 2011.

DIMELIS, S.; LIVADA, A. Inequality and business cycles in the U.S. and European Union countries. International Advances in Economic Research, v.5, p.321-338, 1999.

DRISCOLL, J.; KRAAY, A. Consistent Covariance Matrix Estimation with Spatially Dependent Panel Data. Review of Economics and Statistics, v.80, p.549-560, 1998.

DUFRÈNOT, G.; JAMBOIS, A.; JAMBOIS, L.; KHAYAT, G. Regime-Dependent Fiscal Multipliers in the United States. Open Economies Review, v.27, n.5, p.923-44, 2016.

DUMÉNIL, G.; LÉVY, D. The Crisis of Neoliberalism. Cambridge, MA: Harvard University Press, 2010.

DUMÉNIL, G.; LÉVY, D. Économie marxiste du capitalisme. Paris: La De'couverte, 2004.

DUTT, A. K. Unproductive sectors and economic growth: a theoretical analysis. Review of Political Economy, v.4, n.2, p.178-202, 1992a.

DUTT, A. K. Conflict inflation, distribution, cyclical accumulation and crises. European Journal of Political Economy, v.8, n.4, p.579-597, 1992b.

DUTT, A. Maturity, stagnation and consumer debt: a Steindlian approach. Metroeconomica, v.57, n.3, p.339-364, 2006.

DUTT, A. K. Growth and distribution in heterodox models with managers and financiers. Metroeconomica, v.67, n.2, p.364-396, 2016.

EASTERLY, W.; FISHER, S. Inflation and the Poor. Journal of Money, Credit and Banking, v.33, n.2, p.160-178, 2001.

Economic Commission for Latin America and the Caribbean (ECLAC). Preliminary overview of the economies of Latin America and the Caribbean, Santiago, 2021.

Economic Policy Institute (EPI). Ratio of average CEO total direct compensation to average production worker compensation. 1965-2009, State of Working America, 2011.

EPSTEIN, B. Labor Force Participation Dynamics. MPRA Paper n. 88776. University Library of Munich, Germany, 2018.

ERAUSKIN, I. The labor share and income inequality: some empirical evidence for the period 1990-2015. Applied Economic Analysis, v.28, n.84, p.173-195, 2020.

ESPINO, E.; GONZALEZ-ROZADA, M. Automatic stabilization and fiscal policy: some quantitative implications for Latin America and the Caribbean. Inter-American Development Bank Working Paper Series, n.367, 2012.

FATÁS, A.; SUMMERS, L. The permanent effects of fiscal consolidations. Journal of International Economics, v.112, p. 238-250, 2018.

FAZZARI, S.; MORLEY, J.; PANOVSKA, I. State-dependent effects of fiscal policy. Studies in Nonlinear Dynamics and Econometrics, v.19, n.3, p.285-315, 2015.

FEENSTRA, R.; INKLAAR, R.; TIMMER, M. What is new in PWT 9.0? June 2016.

FLASCHEL, P.; KROLZIG, H. M. Wage-Price Phillips curves and macroeconomic stability: basic structural form, estimation and analysis. Contributions to Economic Analysis, v.277, p.7-47, 2006.

FORBES, K. A reassessment of the relationship between inequality and growth. American Economic Review, v.90, n.4, p.869-887, 2000.

FORSYTHE, E. Why Don't Firms Hire Young Workers During Recessions? The Economic Journal, v.132, n.645, p.1765-1789, 2022.

FRANCESE, M.; MULAS-GRANADOS, C. Functional Income Distribution and Its Role in Explaining Inequality. IMF Working Paper n.15/244, 2015.

FRANZONI, J.; SÁNCHEZ-ANCOCHEA. The double challenge of market and social incorporation: progress and bottlenecks in Latin America. Development Policy Review, v.32, n.3, p.275-298, 2014.

FURCERI, D.; GE, J.; LOUNGANI, P.; MELINA, G. The distributional effects of government spending shocks in developing economies. IMF Working Paper n.18/57, 2018a.

FURCERI, D.; JALLES, J.; LOUNGANI, P. Fiscal consolidation and inequality in advanced economies: how robust is the link? In: Momigliano S (ed). Beyond the Austerity Dispute: New Priorities for Fiscal Policy, Banca d'Italia 20, p. 13-32, 2016.

FURCERI, D.; LOUNGANI, P.; ZDZIENICKA, A. The effects of monetary policy shocks on inequality. Journal of International Money and Finance, v.85, p.168-186, 2018b.

FURCERI, D.; ZDZIENICKA, A. The effects of social spending on economic activity: empirical evidence from a panel of OECD countries, Fiscal Studies, v.33, n.1, p.129-152, 2012.

GALBRAITH, J. K. Inequality and economic and political change: A comparative perspective. Cambridge Journal of Regions, Economy and Society, v.4, n.1, p.13-27, 2011.

GALBRAITH, J. K. Inequality and Instability: A Study of the World economy just before the crisis. Oxford, UK, Oxford University Press, 2012.

GECHERT, S. What fiscal policy is most effective? A meta-regression analysis. Oxford Economic Papers, v.67, n.3, p. 553-580, 2015.

GECHERT, S.; HALLETT, A.; RANNENBERG, A. Fiscal multipliers in downturns and the effects of Euro Area consolidation. Applied Economics Letters, v.23, n.16, pp.1138-1140, 2016.

GECHERT, S.; HORN, G.; PAETZ, C. Long-term effects of fiscal stimulus and austerity in Europe. Oxford Bulletin of Economics and Statistics, v.81, p.647-666, 2019.

GECHERT, S.; RANNENBERG, A. Are Fiscal Multipliers Regime-Dependent? A Meta Regression Analysis. IMK Working Paper n.139. Berlin: Hans Boeckler Foundation, Macroeconomic Policy Institute, 2014.

GEIGER, M.; MAYER, E.; SCHARLER, J. Inequality and the business cycle: evidence from U.S. survey data. Applied Economics, v.52, n.31, p.3418-3435, 2020.

GIAVAZZI, F.; PAGANO, M. Non-Keynesian effects of fiscal policy changes: international evidence and the Swedish experience. Swedish Economic Policy Review, v.3, n.1, p.67-103, 1996.

GOODWIN, R. A growth cycle. In Feinstein, C. (ed.). Socialism, Capitalism, and Growth, Cambridge, MA, Harvard University Press, 1967.

GRIGOLI, F.; KOCZAN, Z.; TOPALOVA, P. Drivers of labor force participation in advanced economies: macro and micro evidence. IMF Working Paper n.150, 2018.

GRÜNDLER, K.; SCHEUERMEYER, P. Growth effects of inequality and redistribution:

What are the transmission channels? Journal of Macroeconomics, v.55(-), p. 293-313, 2018.

GUAJARDO, J.; LEIGH, D.; PESCATORI, A. Expansionary austerity? International evidence. Journal of the European Economic Association, v.12, n.4, p.949-968, 2014.

GUERELLO, C. Conventional and unconventional monetary policy vs. households income distribution: an empirical analysis for the Euro Area. Journal of International Money and Finance v.85, p.187-214, 2018.

GUPTA, S.; JALLES, J.; MULAS-GRANADOS, J.; SCHENA, M. Governments and promised fiscal consolidations: Do they mean what they say? IMF Working Paper n.17/39, 2017.

GUVENEN, F.; KAPLAN, G.; SONG, J.; WEIDNER, J. Lifetime earnings in the United States over six decades. American Economic Journal: Applied Economics, v.14, n.4, p.446-479, 2022.

HANNI, M.; MARTNER, R.; PODESTÁ, A. The redistributive potential of taxation in Latin America. Cepal Review 116, August, 2015.

HARRIGAN, J.; RESHEF, A. Skill-biased heterogeneous firms, trade liberalization and the skill premium. The Canadian Journal of Economics, v.48, n.3, p.1024-1066, 2015.

HARVIE, D. Testing Goodwin: growth cycles in ten OECD countries. Cambridge Journal of Economics, v.24, p.349-376, 2000.

HEATHCOTE, J.; PERRI, F.; VIOLANTE, G. Unequal we stand: an empirical analysis of economic inequality in the United States: 1967-2006. Review of Economic Dynamics, v.13, p.15-51, 2010.

HEATHCOTE, J.; PERRI, F.; VIOLANTE, G. The rise of US earnings inequality: Does the cycle drive the trend? Review of Economic Dynamics, v.37, p.S181-S204, 2020.

HEIMBERGER, P. Did fiscal consolidation cause the double-dip recession in the Euro area? Review of Keynesian Economics, v.5, n.3, p.439-458, 2017.

HEIMBERGER, P. The dynamic effects of fiscal consolidation episodes on income inequality: evidence for 17 OECD countries over 1978-2013. Empirica, v.47, p.53-81, 2020.

HEIN, E.; PRANTE, F. Functional distribution and wage inequality in recent Kaleckian growth models. Institute for International Political Economy Berlin. Working Paper n.110/2018, 2018.

HERSHBEIN, B.; KAHN, L. Do recessions accelerate routine-biased technological change?

Evidence from vacancy postings. American Economic Review, v.108, n.7, p.1737-1772, 2018.

HERZER, D.; VOLLMER, S. Inequality and growth: evidence from panel cointegration. Journal of Economic Inequality, v.10, n.4, p.489-503, 2012.

HOLLAND, D.; PORTES, J. Self-defeating austerity? National Institute Economic Review n.222, 2012.

HOOVER, G.; GIEDEMAN, D.; DIBOOGLU, S. Income inequality and the business cycle: A threshold cointegration approach. Economic Systems, v.33, p.278-292, 2009.

HOYNES, H. The employment, earnings, and income of less skilled workers over the business cycle. Conference on Labor Markets and Less Skilled Workers, Washington D.C., 1999.

HOYNES, H.; MILLER, D.; SCHALLER, J. Who suffers during recessions? Journal of Economic Perspectives, v.26, n.3, p.27-48, 2012.

HUBER, E.; RAGIN, C.; STEPHENS, J.; BRADY, D.; BECKFIELD, J. Comparative Welfare States Data Set, Northwestern University, University of North Carolina, Duke University and Indiana University, 2004.

ILZETZKI, E.; MENDOZA, E.; VEGH, C. How Big (Small?) Are Fiscal Multipliers? Journal of Monetary Economics, v.60, p.239-54, 2013.

International Labor Organization (ILO). World social protection report 2014/15: Building economic recovery, inclusive development and social justice. Geneva, International Labour Office, 2014.

International Labour Organization (ILO). Global Wage Report 2014/15: Wage and Income Inequality. Geneva: International Labour Office, 2015.

International Monetary Fund (IMF). Fiscal Policy and income inequality. IMF Policy Paper, Washington D.C., 2014.

International Monetary Fund (IMF). Gaining momentum? World Economic Outlook, Washington D.C., April 2017.

IZQUIERDO, A.; LAMA, R.; MEDINA, J.; PUIG, J.; RIERA-CRICHTON, D.; VEGH, C.; VULETIN, G. Is the public investment multiplier higher in developing countries? an empirical investigation. IMF Working Paper n.19/289, 2019.

JALLES, J. How do fiscal adjustments change the income distribution in emerging market economies? International Journal of Emerging Markets, v.12, n.2, p.310-334, 2017.

JENKINS, S. World income inequality database: An assessment of WIID and SWIID, ISIR Working Paper Series 2014-31. Essex: Institute for Social and Economic Research, 2014.

JESUIT, D.; MAHLER, V. State redistribution in comparative perspective: A cross-national analysis of the developed countries. LIS Working Paper n.392. Luxembourg Income Study, 2004.

JORDÀ, O. Estimation and inference of impulse responses by Local Projections. American Economic Review, v.95, n.1, p.161-82, 2005.

JORDÀ, O.; TAYLOR A. The time for austerity: estimating the average treatment effect of fiscal policy, The Economic Journal, v.126, n.590, p.219-255, 2016.

JOUMARD, I.; PISU, M.; BLOCH, D. Less income inequality and more growth - are they compatible? Part 3. Income redistribution via taxes and transfers across OECD countries. OECD Economic Department Working Papers n.926, 2012.

KALECKI, M. A Theory of Profits. The Economic Journal, v.52, n.206/207, p.258-267, 1942.

KALECKI, M. Teoria da dinâmica econômica. Coleção Os Economistas. Editora Abril Cultural, [1952] 1978.

KALECKI, M. Selected essays on the dynamics of the capitalist economy. Cambridge: Cambridge University Press, 1971.

KAPPES, S. Monetary Policy and Personal Income Distribution: A Survey of the Empirical Literature. Review of Political Economy, v.35, n.1, p.211-230, 2023.

KATARYNIUK, I.; VALLÉS, J. Fiscal consolidation after the great recession: The role of composition. Bank of Spain Working Paper n.1515, 2015.

KIEFER, D.; RADA, C. Profit maximizing goes global: The race to the bottom. Cambridge Journal of Economics, v.39, n.5, p.1333-1350, 2015.

KIM, Y.; LIMA, G.; SETTERFIELD, M. Political aspects of household finance: debt, wage bargaining and macroeconomic (in)stability. Journal of Post Keynesian Economics, v.42, n.1, p.16-38, 2019.

KLEIN, M.; WINKLER, R. Austerity, inequality, and private debt overhang. European Journal of Political Economy v.57, p.89-106, 2019.

KNOWLES, S. Inequality and economic growth: The empirical relationship reconsidered in the light of comparable data. Journal of Development Studies, v.41, n.1, p. 135-159, 2005.

KONSTANTINOU, P.; PARTHENIOU, A. The effects of government spending over the business cycle: a disaggregated analysis for OECD and non-OECD Countries. The Quarterly Review of Economics and Finance, v. 80(C), p.809-22, 2021.

KRUEGER, D.; PERRI, F.; PISTAFERRI, L.; VIOLANTE, G. Cross-sectional facts for macroeconomists. Review of Economic Dynamics, v.13, p.1-14, 2010.

KUZNETS, S. The shares of upper-income groups in income and savings. New York: NBER, 1953.

KYDLAND, F. Labor-force heterogeneity and the business cycle. Carnegie-Rochester Conference Series on Public Policy, v.21, n.1, p.173-208, 1984.

LAVOIE, M. Unproductive outlays and capital accumulation with target-return pricing, Review of Social Economy, v.54, n.3, p.303-321, 1996.

LAVOIE, M. Cadrisme within a post-Keynesian model of growth and distribution. Review of Political Economy, v.21, n.3, p.369-391, 2009.

LAVOIE, M. Post-Keynesian Economics: New Foundations. Cheltenham, UK and Northampton, MA, USA: Edward Elgar, 2014.

LAVOIE, M. The origins and evolution of the debate on wage-led and profit-led regimes. European Journal of Economics and Economic Policies: Intervention, v.14, n.2, p.200-221, 2017.

LAVOIE, M.; NAH, W. Overhead labour costs in a Neo-Kaleckian growth model with autonomous non-capacity creating expenditures. Review of Political Economy, v.32, n.4, p.511-537, 2020.

LERMAN, R.; YITZHAKI, S. Income inequality effects by income source: a new approach and applications to the United States. Review of Economics and Statistics, v.67, p.151-56, 1985.

LI, H.; ZOU, H. Income inequality is not harmful for growth: theory and evidence. Review of Development Economics, v.2, n.3, p.318-334, 1998.

LIMA, G. T.; CARVALHO, L. B.; SERRA, G. P. Human capital accumulation, income distribution, and economic growth: a demand-led analytical framework. Review of Keynesian Economics, v.9, n.3, p.319-336, 2021.

LOUREIRO, P. Reformism, class conciliation and the pink tide: material gains and their limits. In: Ystanes M, Stronen I (eds). The social life of economic inequalities in contemporary Latin America - decades of change. Palgrave Macmillan, Cham, p.35-56, 2018.

LUSTIG, N. El impacto del Sistema tributario y el gasto social en la distribución del ingreso y la pobreza en América Latina. Una aplicación del marco metodológico del proyecto Compromiso con la Equidad (CEQ). Trimestre Económico, v.84, n.3, p.493-568, 2017.

Luxembourg Income Study (LIS). Luxembourg Income Study (LIS) Database and LIS Data Access Research Tool (DART), https://dart.lisdatacenter.org/(Access in September 2023).

MAESTRI, V.; ROVENTINI, A. Stylized facts on business cycles and inequality. GINI Discussion Paper n.30, 2012.

MAHLER, V.; JESUIT, D. Fiscal redistribution in the developed countries: New insights from the Luxembourg Income Study. Socio-Economic Review, v.4, n.3, p.483-511 2006.

MARQUES, A.; LIMA, G. Testing for Granger causality in quantiles between the wage share in income and productive capacity utilization. Structural Change and Economic Dynamics, 62, p. 290-312, 2022.

MENDIETA-MUÑOZ, I.; RADA, C.; SANTETTI, M.; VON ARNIM, R. The US labour share of income: What shocks matter? Review of Social Economy, v.80, n.4, p.514-549, 2022.

MESCHI, E.; VIVARELLI, M. Globalization and Income Inequality. IZA Discussion Paper n.2958, July 2007.

MESSINA, J.; SILVA, J. Twenty years of wage inequality in Latin America. The World Bank Economic Review, p.1-31, 2019.

MILANOVIC, B. All the Ginis (ALG) dataset. Online dataset, 2016.

MISHEL, L.; BIVENS, J. Identifying the policy levers generating wage suppression and wage inequality. Economic Policy Institute Report, 2021.

MOHUN, S. Distributive shares in the US economy, 1964-2001. Cambridge Journal of Economics, v.30, n.3, p.347-370, 2006.

MOHUN, S. Unproductive Labor in the U.S. Economy 1964-2010. Review of Radical Political Economics, v.46, n.3, p.355-379, 2014.

MORIN, A. Wage dispersion over the business cycle. Economics Letters, n.181, p.17-21, 2019.

MUELLER, A. Separations, sorting, and cyclical unemployment. American Economic Review, v.107, n.7, p.2081-2107, 2017.

MUTLUGÜN, B. Endogenous income distribution and aggregate demand: Empirical evidence from heterogeneous panel structural vector autoregression. Metroeconomica, v.73, n.2, p.583-637, 2022.

NIKIFOROS, M.; FOLEY, D. K. Distribution and capacity utilization: conceptual issues and empirical evidence. Metroeconomica, v.63, n.1, p.200-229, 2012.

OCAMPO, J.; GÓMEZ-ARTEAGA, N. Los sistemas de protección social, la redistribución y el crecimiento en América Latina. Revista de la CEPAL, n.122, p.7-33, 2017.

OECD. Earnings inequality: changes in the 1980s. Employment Outlook, 1993.

OECD. Earnings inequality, low-paid employment and earnings mobility. Employment Outlook, 1996.

OECD. Structural reforms in Europe. Achievements and homework. Better policies series - Organization for Economic Cooperation and Development, April, 2015.

OECD. Revenue Statistics in Latin America and the Caribbean 2021. OECD Publishing, Paris, 2021.

ONARAN, Ö.; GALANIS, G. Is aggregate demand wage-led or profit-led? National and global effects. Conditions of Work and Employment Series, n.40. International Labour Organization, 2012.

OSTRY, J.; BERG, A.; TSANGARIDES, C. Redistribution, Inequality and Growth. IMF Staff Discussion Note, n.14/02. IMF, Washington D.C., 2014.

OYVAT, C.; ÖZTUNALI, O.; ELGIN, C. Wage-led versus profit-led demand: A comprehensive empirical analysis. Metroeconomica, v.71, n.3, p.458-486, 2020.

PALLEY, T. A neo-Kaleckian-Goodwin model of capitalist economic growth: monopoly power, managerial pay and labour market conflict. Cambridge Journal of Economics, v.38, n.6, p.1355-1372, 2014a.

PALLEY, T. The middle class in macroeconomics and growth theory: a three-class neo-Kaleckian-Goodwin model. Cambridge Journal of Economics, v.39, n.1, p.221-243, 2014b.

PALLEY, T. Wage- vs. profit-led growth: the role of the distribution of wages in determining regime character. Cambridge Journal of Economics, v. 41, n.1, p.49-61, 2016.

PALLEY, T. Inequality and growth in neo-Kaleckian and Cambridge growth theory. Review of Keynesian Economics, v.5, n.2, p.146-169, 2017.

PARKER, S. Income inequality and the business cycle: a survey of the evidence and some new results. Journal of Post Keynesian Economics, v.21, n.2, p.201-225, 1998.

PAULUS, A.; COK, M.; FIGARI, F.; HEGEDÜS, P.; KUMP, N.; LELKES, O.; LEVY, H.; LIETZ, C.; LÜPSIK, S.; MANTOVANI, D.; MORAWSKI, L.; SUTHERLAND, H.; SZIVOS, P.; and VÕRK, A. The effects of taxes and benefits on income distribution in the enlarged EU. Working Paper n.EM8/09, EUROMOD, 2009.

PEROTTI, R. Growth, income distribution and democracy: what the data say. Journal of Economic Growth, v.1, n.2, p.149-187, 1996.

PEROTTI, R. The “austerity myth”: gain without pain? In: Fiscal policy after the financial crisis. NBER Chapters, National Bureau of Economic Research, p.307-354, 2013.

PERSSON, T.; TABELLINI, G. Is inequality harmful for growth? American Economic Review, v.84, n.3, p.600-621, 1994.

PIKETTY, T. Capital in the Twenty-first Century, Cambridge, MA, Harvard University Press. 2014.

PIKETTY, T. and SAEZ, E. Income inequality in the United States, 1913-1998. Quarterly Journal of Economics, v.118, n.1, p.1-39, 2003.

PRANTE, F. Macroeconomic Effects of Personal and Functional Income Inequality: Theory and Empirical Evidence for the US and Germany. Panoeconomicus, v.65, n.3, p.289-318, 2018.

PROAÑO, C., FLASCHEL, P.; ERNST,E.; SEMMLER, W. Disequilibrium macroeconomic dynamics, income distribution and wage-price Phillips curves. Evidence from the US and the Euro area. IMK Working Paper n.4, 2006.

QUIÑONEZ, P. Social spending and income inequality in Latin America. A panel data approach. Social Policy and Society, p.1-28, 2022.

RAMEY, V.; SHAPIRO, M. Costly capital reallocation and the effects of government spending. Carnegie-Rochester Conference Series on Public Policy, v.48, n.1, p.145-94, 1998.

RAMEY, V. Identifying government spending shocks: it’s all in the timing. The Quarterly Journal of Economics, v.126, n.1, p.1-50, 2011.

RAMEY, V. Macroeconomic shocks and their propagation. Handbook of Macroeconomics, v.2, p.71-162, 2016.

RAWDANOWICZ, L.; WURZEL, E.; CHRISTENSEN, A. The equity implications of fiscal consolidation. OECD Economics Department Working Papers n.1013, OECD Publishing, 2013.

REENEN, J. Wage inequality, technology and trade: 21st century evidence. Labour Economics, v.18, n.6, p. 730-741, 2011.

REEVES, A.; BASU, S.; MCKEE, M.; MEISSNER, C.; STUCKLER, D. Does investment in the health sector promote or inhibit economic growth? Globalization and Health, v.43, p.9, p. 1-12, 2013.

RESTREPO, J. How big are fiscal multipliers in Latin America? IMF Working Paper n.20/17, 2020.

REZAI, A. Goodwin cycles, distributional conflict, productivity growth. Metroeconomica, v.63, n.1, p.29-39, 2012.

ROLIM, L. Overhead labour and feedback effects between capacity utilization and income distribution: estimations for the USA economy. International Review of Applied Economics, v.33, n.6, p.756-773, 2019.

ROMER, C.; ROMER, D. The macroeconomic effects of tax changes: estimates based on a new measure of fiscal shocks. American Economic Review, v.100, n.3, p.763-801, 2010.

ROWTHORN, R. Conflict, inflation and money. Cambridge Journal of Economics, v.1, n.3, p.215-239, 1977.

ROWTHORN, R. Demand, Real Wages and Growth. Thames Papers in Political Economy, p.1-39, 1981.

SAEZ, E.; VEALL, M. The evolution of high incomes in North America: lessons from the Canadian experience, American Economic Review, v.95, n.3, p.831-849, 2005.

SANCHES, M.; CARVALHO, L. B. Multiplier effects of social protection: a SVAR approach for Brazil. International Review of Applied Economics, v.23, n.1, p.93-112, 2023.

SÁNCHEZ-ANCOCHEA, D. The surprising reduction of inequality during a commodity boom: What do we learn from Latin America? Journal of Economic Policy Reform, v.24, n.2, p.95-118, 2021.

SANTIAGO, R.; FUINHAS, J. A.; MARQUES, A. C. Income inequality, globalization, and economic growth: a panel vector autoregressive approach for Latin American countries. IN: FUINHAS, J. A.; MARQUES, A. C. (Eds.). The extended energy-growth nexus. Elsevier, 2019.

SASAKI, H. Cyclical growth in a Goodwin-Kalecki-Marx model. Journal of Economics, v.108, n.2, p.145-171, 2013.

SASAKI, H.; MATSUYAMA, J.; SAKO, K. The macroeconomic effects of the wage gap between regular and non-regular employment and of minimum wages. Structural Change and Economic Dynamics, v.26, p.61-72, 2013.

SAUER, P.; RAO, N.; PACHAURI, S.Explaining income inequality trends: an integrated approach. WIDER Working Paper n.2020/65, 2020.

SCHALTEGGER, C.; WEDER, M. Austerity, inequality and politics. European Journal of Political Economy, v.35, p.1-22, 2014.

SCHNEIDER, M.; KINSELLA, S.; GODIN, A. Redistribution in the age of austerity: evidence from Europe 2006-2013. Applied Economics Letters, v.24, n.10, p.672-676, 2017.

SETTERFIELD, M.; KIM, Y. Varieties of capitalism, increasing income inequality and the sustainability of long-run growth. Cambridge Journal of Economics, v.44, p.559-582, 2020.

SETTERFIELD, M. Whatever happened to the Goodwin pattern? Profit squeeze dynamics in the modern American labour market. Review of Political Economy, v.35, n.1, p.263-286, 2023.

SHERMAN, H.; EVANS, G. Macroeconomics: Keynesian, Monetarist and Marxist Views. New York: Harper & Row, 1984.

SILVEIRA, J.; LIMA, G. T. Effort elicitation, wage differentials and income distribution in a wage-led growth regime. Metroeconomica, v.67, n.1, p.44-75, 2016.

SILVEIRA, J.; LIMA, G. T. Wage inequality as a source of endogenous macroeconomic fluctuations. Structural Change and Economic Dynamics, v.56, p.35-52, 2021.

SKOTT, P. Conflict and effective demand in economic growth. Cambridge, Cambridge university Press, 1989.

SKOTT, P.; ZIPPERER, B. Dynamic patterns of accumulation and income distribution. Mimeo, 2010.

SKOTT, P.; ZIPPERER, B. An empirical evaluation of three post-Keynesian models. Intervention, v.9, n.2, p.277-308, 2012.

SOLON, G.; BARSKY, R.; PARKER, J. Measuring the cyclicality of real wages: How important is composition bias? The Quarterly Journal of Economics, v.109, n.1, p.1-25, 1994.

SOLT, F. On the assessment and use of cross-national income inequality datasets. The Journal of Economic Inequality, v.13, n.4, p.683-691, 2015.

SOLT, F. Measuring income inequality across countries and over time: the standardized world income inequality database (SWIID Version 8.2), 2019.

SOLT, F. Measuring Income Inequality Across Countries and Over Time: The Standardized World Income Inequality Database. Social Science Quarterly, v.101, n.3, p.1183-1199, 2020.

SONODA, R.; SASAKI, H. Differences in wage-determination systems between regular and non-regular employment in a Kaleckian model. Review of Keynesian Economics, v.7, n.3, p.341-360, 2019.

STAMPINI, M.; TORNAROLLI, L. The growth of conditional cash transfers in Latin America and the Caribbean: did they go too far? IZA Policy Paper n.49, 2012.

STOCKHAMMER, E. Wage-led versus profit-led demand: what have we learned? A Kaleckian- Minskyan view. Review of Keynesian Economics, v.5, n.1, p.25-42, 2017.

STOCKHAMMER, E.; MICHELL, Pseudo-Goodwin cycles in a Minsky model. Cambridge Journal of Economics, v.41, n.1, p.105-125, 2016.

STOCKHAMMER, E.; STEHRER, R. Goodwin or Kalecki in Demand? Functional Income Distribution and Aggregate Demand in the Short Run. Review of Radical Political Economics, p.1-17, 2011.

TAVANI, D.; FLASCHEL, P.; TAYLOR, L. Estimated non-linearities and multiple equilibria in a model of distributive demand cycles. International Review of Applied Economics, v.25, n.5, p.519-538, 2011.

TAVANI, D.; VASUDEVAN, R. Capitalists, workers, and managers: wage inequality and effective demand, Structural Change and Economic Dynamics, v.30, p.120-31, 2014.

TAYLOR, L. Reconstructing Macroeconomics: Structuralist Proposals and Critiques of the Mainstream, Cambridge, MA, Harvard University Press, 2004.

VECHSURUCK, T. A global analysis of income distribution and capacity utilization interactions: the structuralist view. Working Paper - University of Utah, n.08, 2017.

VELD, J. Fiscal consolidations and spillovers in the Euro area periphery and core. European Economy-Economic Papers n.506, Directorate General Economic and Financial Affairs (DG ECFIN), European Commission, 2013.

WANG, C.; CAMINADA, K.; GOUDSWAARD, K. Income redistribution in 20 countries over time. International Journal of Social Welfare, v.23, p.262-275, 2014.

WANG, C.; CAMINADA, K.; GOUDSWAARD, K. The redistributive effect of social transfer programmes and taxes: A decomposition across countries. International Social

Security Review, v.65, n.3, p.27-48, 2012.

WEISSKOPF, T. Marxian Crisis Theory and the Rate of Profit in the Postwar US Economy. Cambridge Journal of Economics, v.3, n.4, p.341-378, 1979.

WOO, J.; BOVA, E.; KINDA, T.; ZHANG, S. Distributional consequences of fiscal consolidation and the role of fiscal policy: what do the data say? IMF Working Paper n.13/195, 2013.

YANG, W.; FIDRMUC, J.; GHOSH, S. Macroeconomic effects of fiscal adjustment: a tale of two approaches. Journal of International Money and Finance, v.57, p.31-60, 2015.

ZIPPERER, B; SKOTT, P. Cyclical patterns of employment, utilization, and profitability. Journal of Post Keynesian Economics, v.34, n.1, p.25-57, 2012.

Appendix

Appendix A

Details about the sample in each exercise

In Exercise 1 of the baseline model, we incorporated data from 15 countries: Australia, Belgium, Canada, Denmark, France, Finland, Germany, Ireland, Italy, Japan, the Netherlands, Portugal, Sweden, the United Kingdom, and the United States. Austria and Spain were omitted from this baseline due to concerns about stationarity related to the dependent variable. However, we reintroduced these countries in Section 2.5 (refer to Figure 2.23), and our analysis confirms the robustness of the results with their inclusion.

Exercise 2 encompasses data from 13 countries: Australia, Belgium, Canada, Denmark, France, Finland, Germany, Italy, Japan, the Netherlands, Portugal, the United Kingdom, and the United States. Again, we opted to exclude Austria and Spain from the baseline due to concerns regarding stationarity issues related to the dependent variable. The robustness of the results is further validated in Section 2.5, where we include these two countries - see Figure 2.27. Also, we excluded from the baseline for Exercise 2 Ireland and Sweden. The reason is that when we estimate the baseline including these two countries, the robustness tests show that they are not robust when we exclude these two countries. For this reason, we estimate the baseline model excluding them. It means specific fiscal episodes in these two countries drove the results not to be statistically significant - similar to the studies by Cardoso and Carvalho (2023) and our Chapter 3 when they included Bolivia in the sample. Appendix G shows the exercise including Ireland and Sweden. As shown, the results are not statistically significant in the medium run. Following Cardoso and Carvalho (2023), we excluded these countries from the sample since the results with them are not robust.

Exercise 3 includes 14 countries: Australia, Austria, Belgium, Canada, Denmark, France, Finland, Germany, Ireland, Netherlands, Spain, Sweden, the United Kingdom, and the United States. We excluded Japan, Italy, and Portugal due to data availability.

The baseline for Exercise 4 includes 14 countries: Australia, Austria, Belgium, Canada, Denmark, France, Finland, Germany, Ireland, Japan, Portugal, Sweden, the United Kingdom, and the United States. Spain had limited observations, totaling just four, leading to its exclusion from the baseline. However, to maintain a comprehensive analysis, we employed linear interpolation to incorporate Spain's data (as in Heimberger, 2020) to include this country in the sample, as depicted in Figure 2.35 of Section 2.5.

Our decision to exclude Italy from the baseline in Exercise 4 was influenced by its substantial impact on the panel data results, aligning with the approach of Cardoso and Carvalho (2023) and of our Chapter 3 in handling Bolivia. The inclusion of Italy appeared to significantly alter the outcomes, presumably due to specific shocks affecting the results related to earnings inequality, encompassed in Exercises 4-6. For the sake of robustness and consistent results, Italy was deliberately omitted from the sample for these equations. Moreover, the Netherlands was also excluded from the sample for Exercise 4, as including it without Italy compromised the robustness of the results. Appendix E illustrates the exercise incorporating Italy and the Netherlands, showcasing the effect of austerity shocks on the 50/10 percentile ratio in the medium run, which is positive and statistically significant. However, this positive impact in the medium run is not robust when we exclude these countries. In Section 2.5, we reintroduced Italy and the Netherlands (refer to Figure 2.35), reaffirming the highly robust positive impact of austerity shocks in the short run while incorporating these countries.

The baseline analysis for Exercise 5 involved estimation using data from 15 countries: Australia, Austria, Belgium, Canada, Denmark, France, Finland, Germany, Ireland, Japan, the Netherlands, Portugal, Sweden, the United Kingdom, and the United States. Italy's exclusion from this exercise was motivated by its notable influence on altering results in the medium run, consistent with prior observations. Appendix F presents the analysis including Italy, revealing a negative impact of austerity measures on the 90/50 percentile ratio in the medium run. However, this effect lacked statistical significance and was not robust when Italy was excluded from the sample. In the short term, however, the impact remained robust with Italy's inclusion -see Figure 2.40 of Section 2.5. Furthermore, Spain had limited observations in the baseline data, prompting its exclusion from the initial analysis. Nonetheless, we reintroduced Spain in Section 2.5 (Figure 2.40) to maintain a comprehensive approach, utilizing linear interpolation to account for data scarcity. The subsequent results affirm the robustness of the findings.

The baseline estimation for Exercise 6 involved data from 13 countries: Australia, Austria, Belgium, Canada, Denmark, France, Finland, Germany, Ireland, Japan, Sweden, the United Kingdom, and the United States. Italy was intentionally excluded due to the previously noted concerns regarding its impact on measures of earnings inequality. However, it is noteworthy that the robustness of this exercise was confirmed even with Italy's inclusion, as demonstrated in Section 2.5 (refer to Figure 2.45). Additionally, Spain, the Netherlands, and Portugal were excluded from the baseline due to the limited observations available in the dataset. To ensure a comprehensive analysis, we reintroduced these countries in Section 2.5 (Figure 2.45) using linear interpolation to address data scarcity. The subsequent results confirm our results are robust.

Lastly, Exercise 7 was estimated using data from 15 countries: Australia, Belgium, Canada, Denmark, France, Finland, Germany, Ireland, Italy, Japan, the Netherlands, Portugal, Sweden, the United Kingdom, and the United States. Austria and Spain were deliberately excluded from the baseline due to concerns related to the stationarity of the dependent variable. However, to provide a comprehensive analysis, we incorporated these two countries in Section 2.5 (refer to Figure 2.50). Notably, the results remained highly robust when including Austria and Spain.

Appendix B

Robustness test: Estimations using Devries et al. 2011 (1978-2009) and Alesina et al. 2019 (2010-2014)

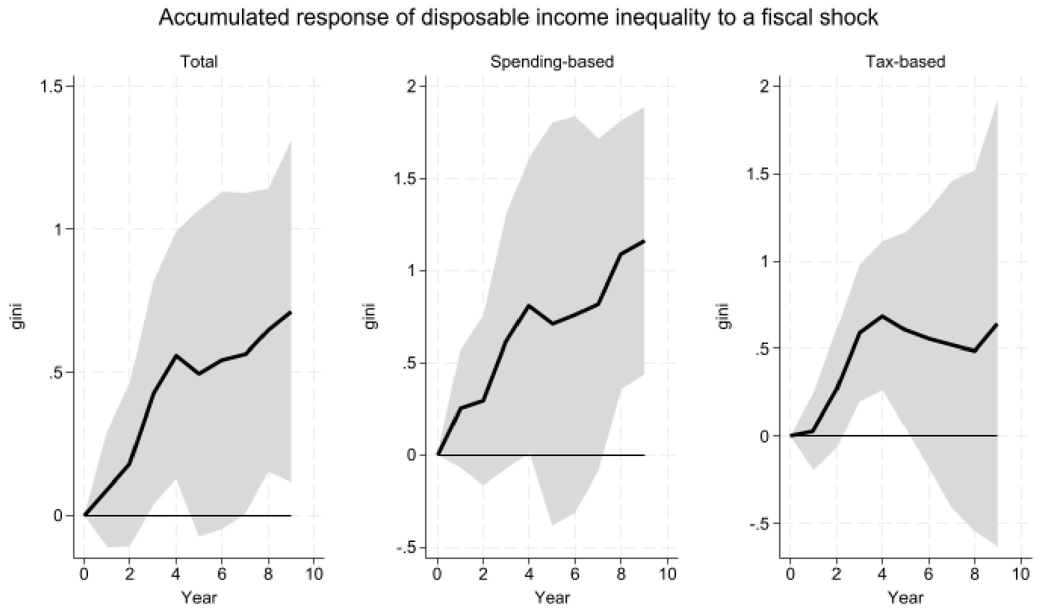

Figure B.1: Cumulative Response of Disposable Income Inequality (change in %) to a fiscal consolidation of 1% of GDP - Three types of fiscal shock (total, spending-based and tax-based) - Robustness test

Source: Author's calculations.

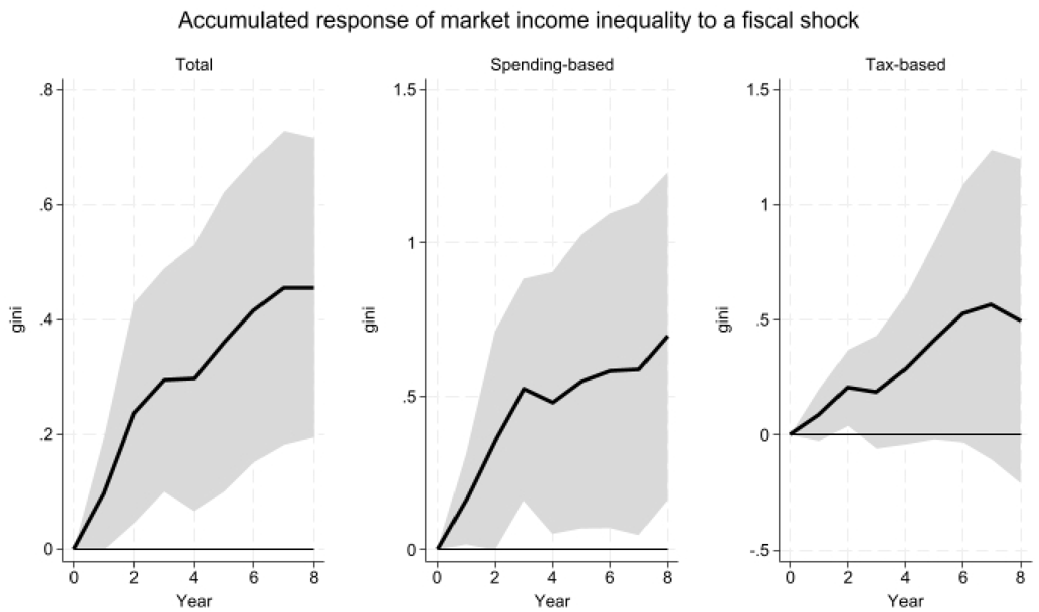

Figure B.2: Cumulative Response of Market Income Inequality (change in %) to a fiscal consolidation of 1% of GDP - Three types of fiscal shock (total, spending-based and tax-based) - Robustness test

Source: Author's calculations.

Effect/year	1	2	3	4	5	6	7	8	9
Total	0.0909	0.179	0.425*	0.560**	0.497	0.542	0.565	0.647**	0.713*
Spending-based	0.249	0.295	0.614	0.812	0.708	0.761	0.814	1.085**	1.161**
Tax-based	0.0261	0.271	0.588**	0.688**	0.606*	0.557	0.525	0.488	0.646
Sample	525	510	495	480	465	450	435	420	405

Table B.1 - Impacts on the Disposable Income Inequality (%) (following a fiscal adjustment episode of 1% of GDP) - Robustness test
Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Effect/year	1	2	3	4	5	6	7	8
Total	0.0963	0.237*	0.294**	0.297**	0.360**	0.415**	0.454**	0.455***
Spending-based	0.166	0.356	0.522**	0.479*	0.548*	0.584*	0.590*	0.696**
Tax-based	0.0862	0.204**	0.186	0.282	0.411	0.528	0.565	0.495
Sample	455	442	429	416	403	390	377	364

Table B.2 - Impacts on the Market Income Inequality (%) (following a fiscal adjustment episode of 1% of GDP) - Robustness test
Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Effect/year	1	2	3	4	5	6	7	8
Total	0.754***	0.938**	1.340***	1.157***	1.196**	1.576***	1.429**	0.993
Spending-based	0.958***	1.554***	1.930***	1.455***	1.535***	1.374**	1.199*	0.506
Tax-based	0.784*	0.837	2.053***	2.417***	2.452**	3.721***	3.721***	3.810**
Sample	306	291	276	262	248	234	221	208

Table B.3 - Impacts on the Gross Wage Inequality (%) (following a fiscal adjustment episode of 1% of GDP) - Robustness test

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

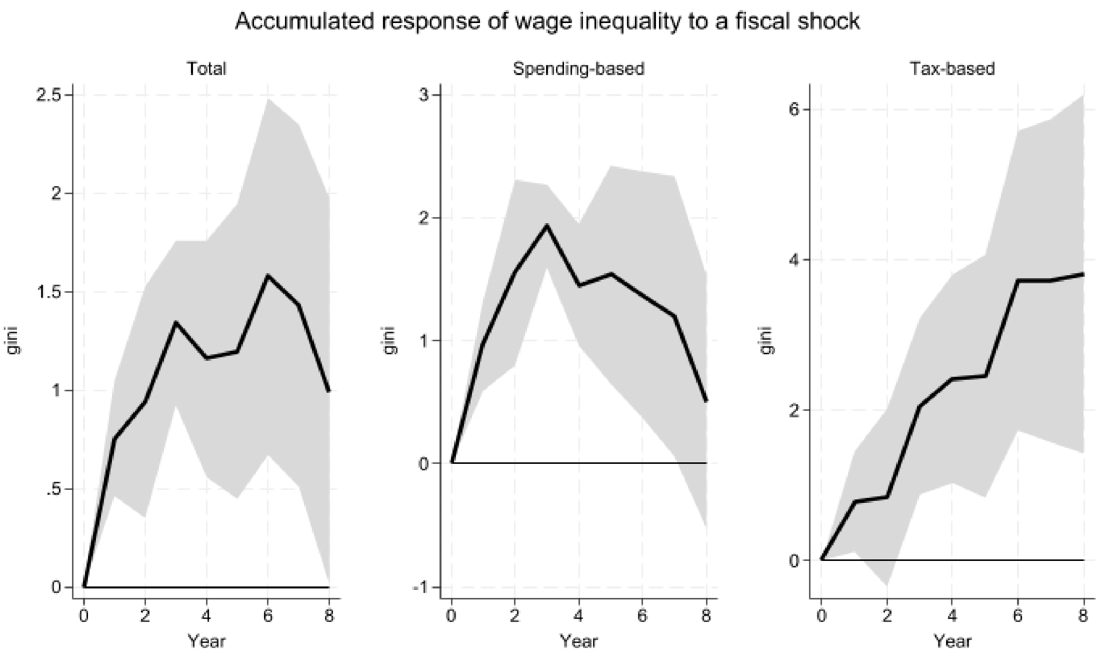

Figure B.3: Cumulative Response of Gross Wage Inequality (change in %) to a fiscal consolidation of 1% of GDP - Three types of fiscal shock (total, spending-based and tax-based) - Robustness test

Source: Author's calculations.

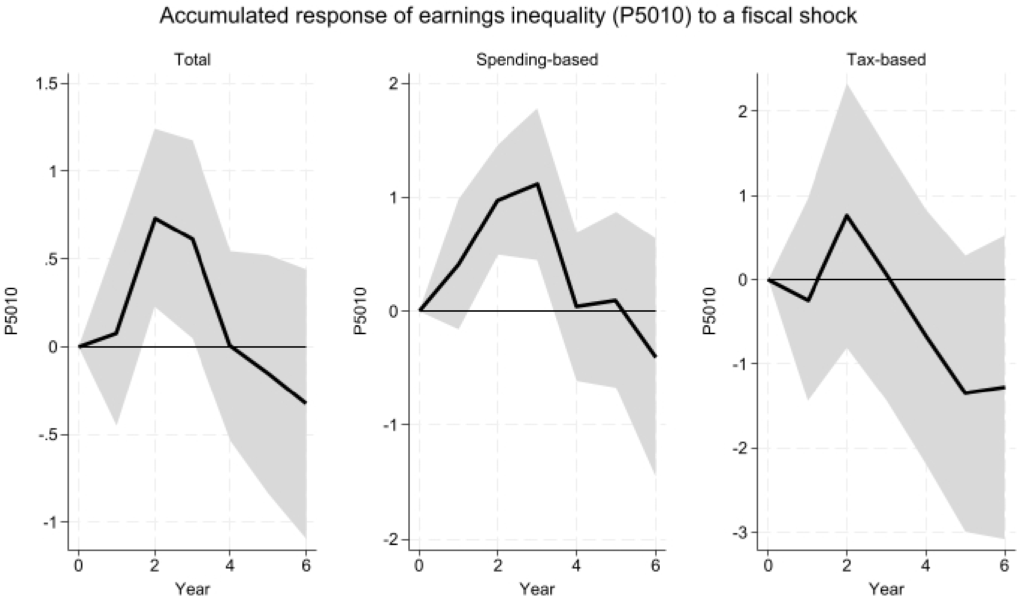

Figure B.4: Cumulative Response of the Percentile Ratio (50/10) of Gross Earnings (change in %) to a fiscal consolidation of 1% of GDP - Three types of fiscal shock (total, spending-based and tax-based) - Robustness test

Source: Author's calculations.

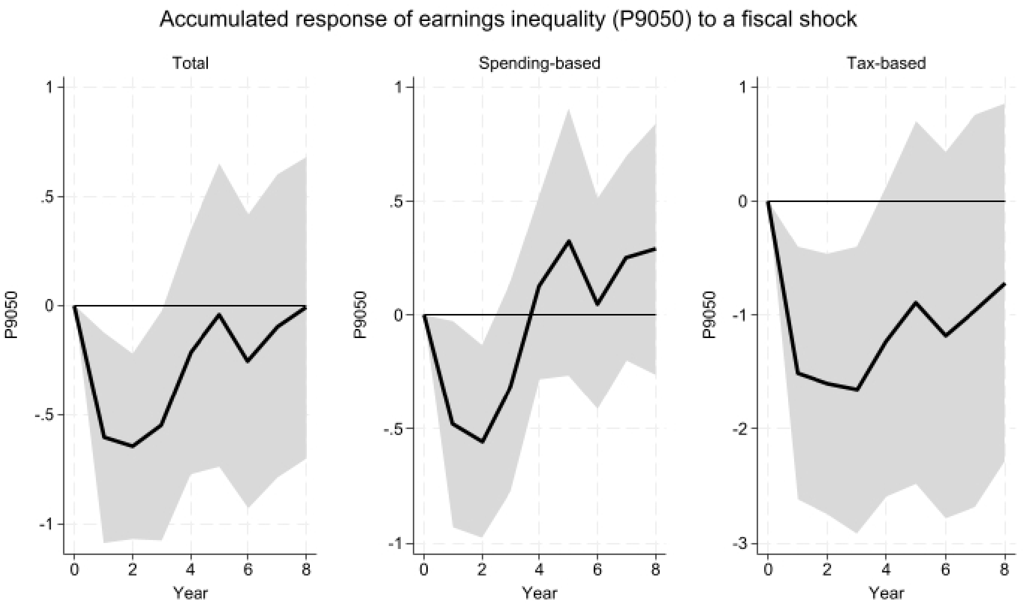

Figure B.5: Cumulative Response of the Percentile Ratio (90/50) of Gross Earnings (change in %) to a fiscal consolidation of 1% of GDP - Three types of fiscal shock (total, spending-based and tax-based) - Robustness test

Source: Author's calculations.

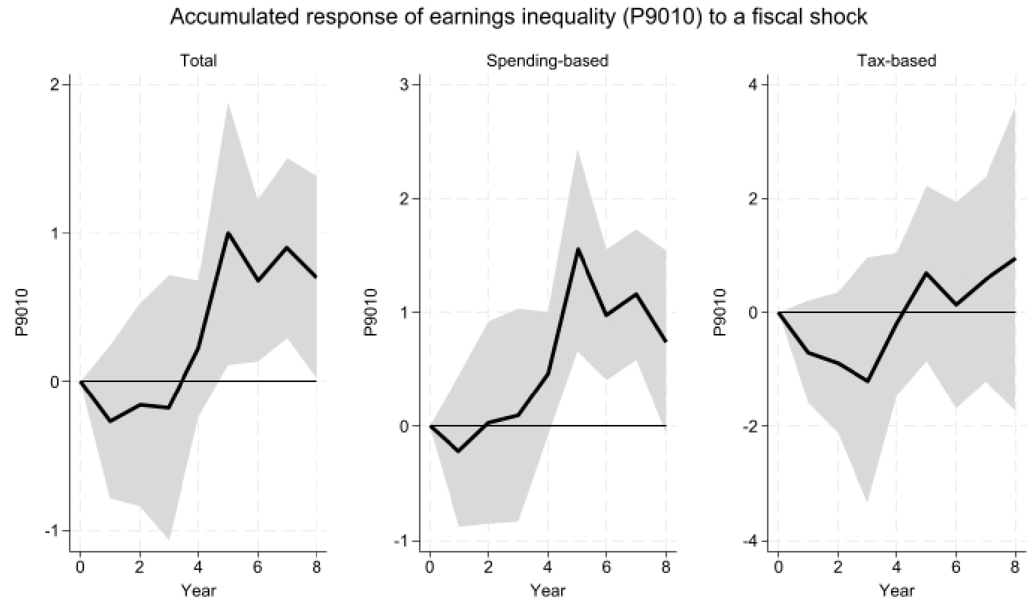

Figure B.6: Cumulative Response of the Percentile Ratio (90/10) of Gross Earnings (change in %) to a fiscal consolidation of 1% of GDP - Three types of fiscal shock (total, spending-based and tax-based) - Robustness test

Source: Author's calculations.

Effect/year	1	2	3	4	5	6
Total	0.0783	0.735**	0.612	0.00365	-0.158	-0.328
Spending-based	0.414	0.979***	1.115***	0.0401	0.1000	-0.407
Tax-based	-0.239	0.762	0.0675	-0.677	-1.354	-1.278
Sample	387	371	353	336	321	305

Table B.4 - Impacts on the Percentile Ratio (50/10) of Gross Earnings (%) (following a fiscal adjustment episode of 1% of GDP) - Robustness test

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Effect/year	1	2	3	4	5	6	7	8
Total	-0.606**	-0.645**	-0.551*	-0.214	-0.0447	-0.256	-0.0944	-0.0110
Spending-based	-0.479*	-0.554**	-0.312	0.124	0.320	0.0501	0.250	0.288
Tax-based	-1.511**	-1.606**	-1.660**	-1.230	-0.891	-1.176	-0.964	-0.716
Sample	395	376	357	340	323	307	292	279

Table B.5 - Impacts on the Percentile Ratio (90/50) of Gross Earnings (%) (following a fiscal adjustment episode of 1% of GDP) - Robustness test

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Effect/year	1	2	3	4	5	6	7	8
Total	-0.271	-0.156	-0.176	0.222	0.997*	0.680**	0.899**	0.702
Spending-based	-0.214	0.0349	0.0998	0.460	1.549***	0.979***	1.157***	0.741
Tax-based	-0.691	-0.880	-1.190	-0.207	0.685	0.129	0.582	0.939
Sample	306	295	281	267	256	242	229	217

Table B.6 - Impacts on the Percentile Ratio (90/10) of Gross Earnings (%) (following a fiscal adjustment episode of 1% of GDP) - Robustness test

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Effect/year	1	2	3	4	5	6	7	8
Total	-0.263*	-0.563*	-0.836*	-0.857	-0.767	-0.493	-0.662	-0.625
Spending-based	-0.506**	-1.078**	-1.508**	-1.679**	-1.659**	-1.430*	-1.623*	-1.414
Tax-based	-0.147	-0.251	-0.494	-0.254	-0.0283	0.623	0.367	0.162
Sample	510	495	480	465	450	435	420	405

Table B.7 - Impacts on the Labor Share in Income (%) (following a fiscal adjustment episode of 1% of GDP) - Robustness test

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

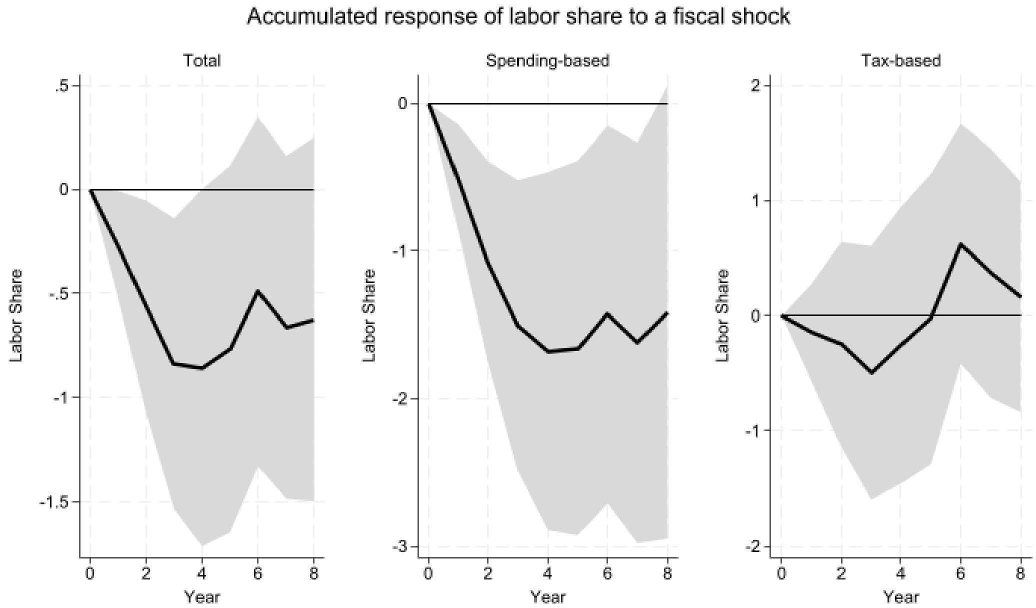

Figure B.7: Cumulative Response of the Labor Share in Income (change in %) to a fiscal consolidation of 1% of GDP - Three types of fiscal shock (total, spending-based and tax-based) - Robustness test

Source: Author's calculations.

Appendix C

Robustness test: Estimations using Gupta et al. 2017: Devries et al., 2011 (1978-2009), Alesina et al. 2015 (2010-2013), Gupta et al. 2017 (2014)

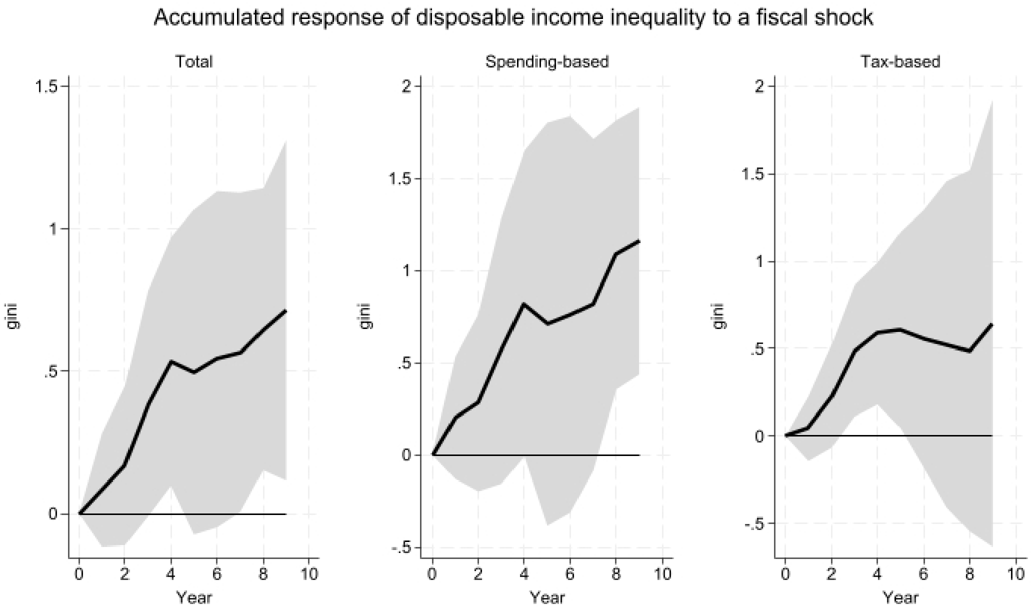

Figure C.1: Cumulative Response of Disposable Income Inequality (change in %) to a fiscal consolidation of 1% of GDP - Three types of fiscal shock (total, spending-based and tax-based) - Robustness test 2

Source: Author's calculations.

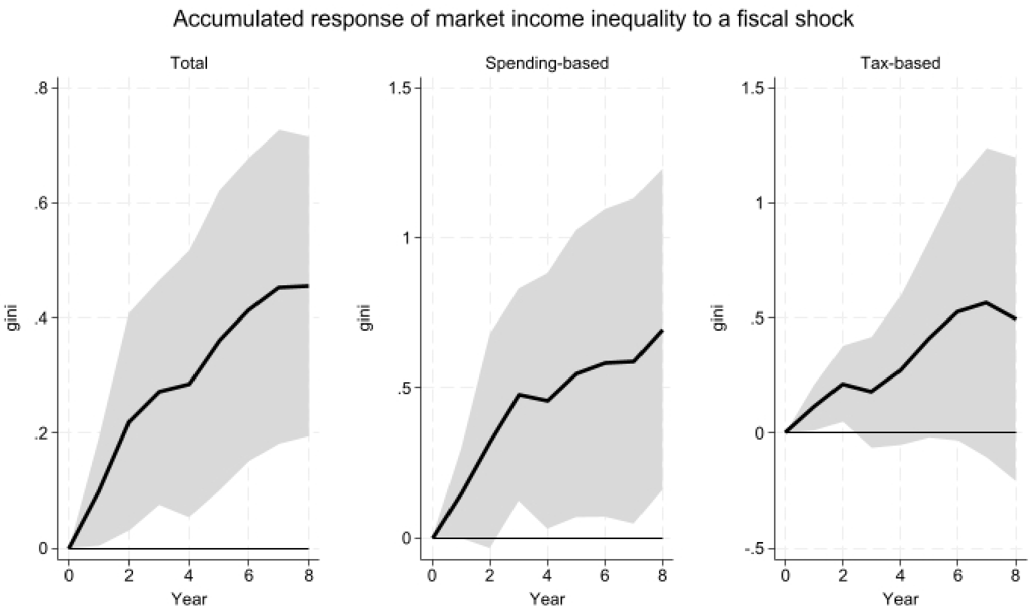

Figure C.2: Cumulative Response of Market Income Inequality (change in %) to a fiscal consolidation of 1% of GDP - Three types of fiscal shock (total, spending-based and tax-based) - Robustness test 2

Source: Author's calculations.

Effect/year	1	2	3	4	5	6	7	8	9
Total	0.0822	0.168	0.386	0.533**	0.497	0.542	0.565	0.647**	0.713*
Spending-based	0.200	0.281	0.561	0.820	0.708	0.761	0.814	1.085**	1.161**
Tax-based	0.0427	0.227	0.488**	0.586**	0.606*	0.557	0.525	0.488	0.646
Sample	525	510	495	480	465	450	435	420	405

Table C.1 - Impacts on the Disposable Income Inequality (%) (following a fiscal adjustment episode of 1% of GDP) - Robustness test 2
Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Effect/year	1	2	3	4	5	6	7	8
Total	0.0984	0.220*	0.271**	0.285*	0.360**	0.415**	0.454**	0.455***
Spending-based	0.149	0.323	0.478**	0.457*	0.548*	0.584*	0.590*	0.696**
Tax-based	0.111	0.214**	0.177	0.273	0.411	0.528	0.565	0.495
Sample	455	442	429	416	403	390	377	364

Table C.2 - Impacts on the Market Income Inequality (%) (following a fiscal adjustment episode of 1% of GDP) - Robustness test 2
Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Effect/year	1	2	3	4	5	6	7	8
Total	0.554**	0.880**	1.332***	1.120***	1.196**	1.576***	1.429**	0.993
Spending-based	0.867***	1.482***	2.125***	1.469***	1.535***	1.374**	1.199*	0.506
Tax-based	0.537	0.601	1.003	1.334	2.452**	3.721***	3.721***	3.810**
Sample	306	291	276	262	248	234	221	208

Table C.3 - Impacts on the Gross Wage Inequality (%) (following a fiscal adjustment episode of 1% of GDP) - Robustness test 2
Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

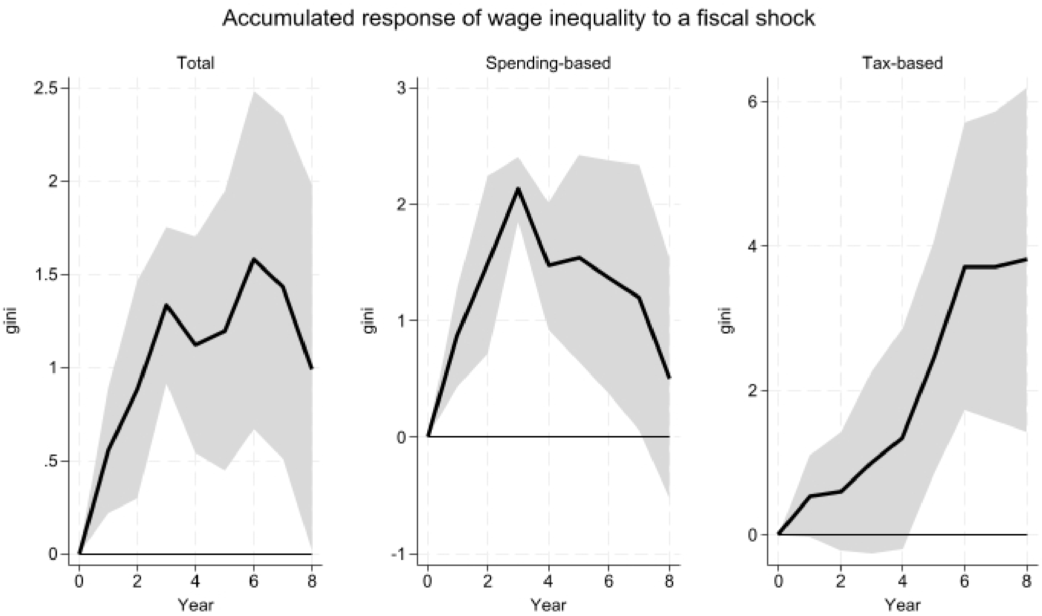

Figure C.3: Cumulative Response of Gross Wage Inequality (change in %) to a fiscal consolidation of 1% of GDP - Three types of fiscal shock (total, spending-based and tax-based) - Robustness test 2

Source: Author's calculations.

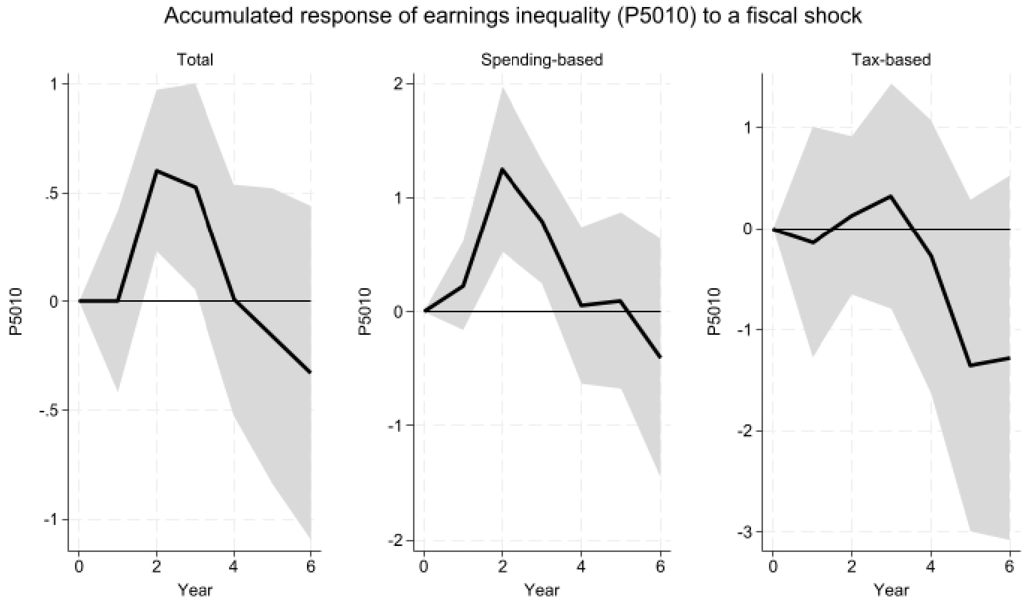

Figure C.4: Cumulative Response of the Percentile Ratio (50/10) of Gross Earnings (change in %) to a fiscal consolidation of 1% of GDP - Three types of fiscal shock (total, spending-based and tax-based) - Robustness test 2

Source: Author's calculations.

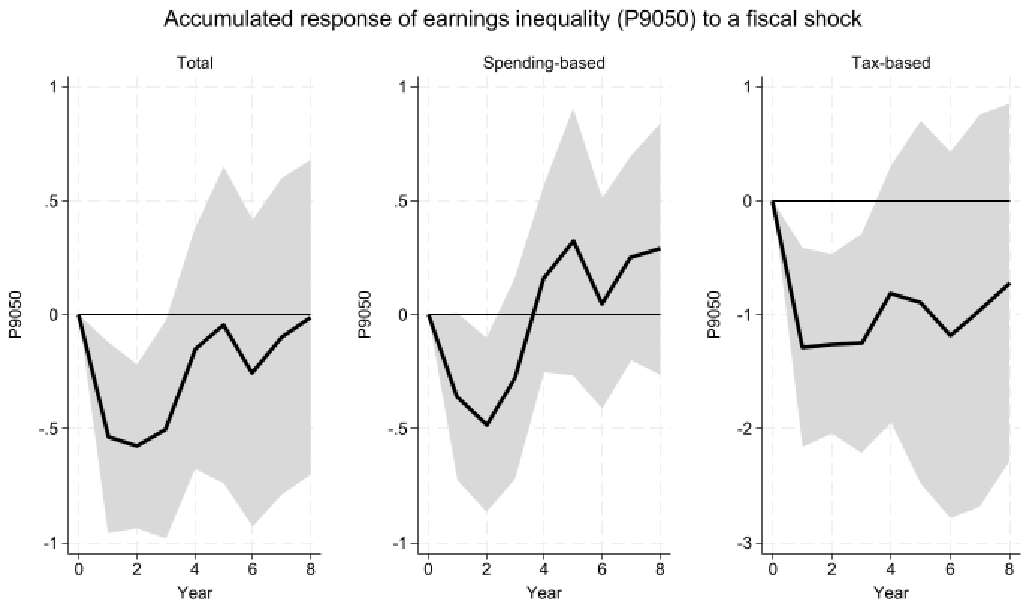

Figure C.5: Cumulative Response of the Percentile Ratio (90/50) of Gross Earnings (change in %) to a fiscal consolidation of 1% of GDP - Three types of fiscal shock (total, spending-based and tax-based) - Robustness test 2

Source: Author's calculations.

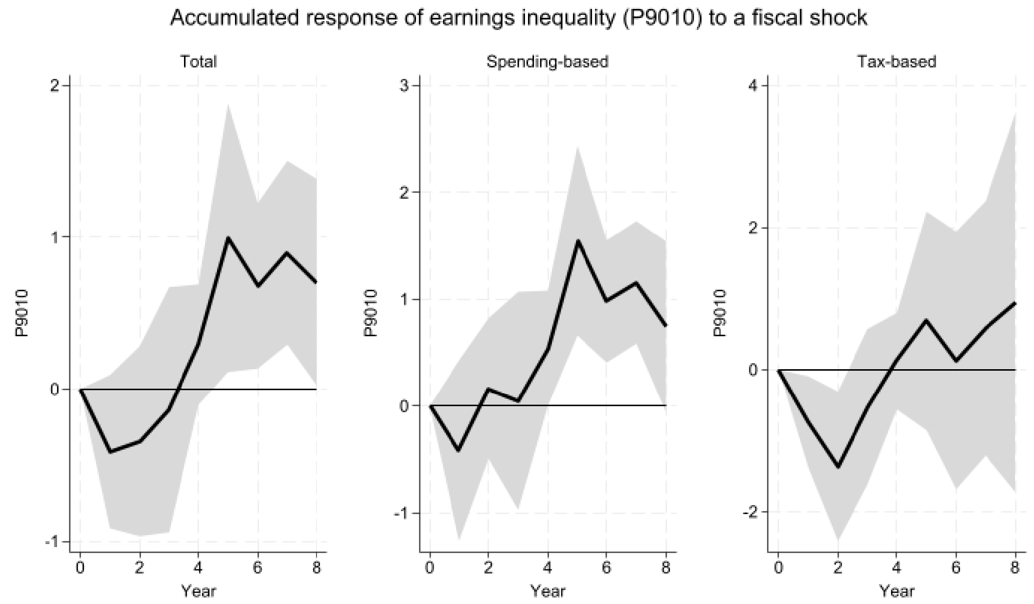

Figure C.6: Cumulative Response of the Percentile Ratio (90/10) of Gross Earnings (change in %) to a fiscal consolidation of 1% of GDP - Three types of fiscal shock (total, spending-based and tax-based) - Robustness test 2

Source: Author's calculations.

Effect/year	1	2	3	4	5	6
Total	0.00126	0.603**	0.528*	0.00656	-0.158	-0.328
Spending-based	0.231	1.249***	0.788**	0.0565	0.1000	-0.407
Tax-based	-0.133	0.131	0.320	-0.277	-1.354	-1.278
Sample	387	371	353	336	321	305

Table C.4 - Impacts on the Percentile Ratio (50/10) of Gross Earnings (%) (following a fiscal adjustment episode of 1% of GDP) - Robustness test 2

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Effect/year	1	2	3	4	5	6	7	8
Total	-0.538**	-0.577**	-0.503*	-0.147	-0.0447	-0.256	-0.0944	-0.0110
Spending-based	-0.359	-0.483**	-0.277	0.124	0.320	0.0501	0.250	0.288
Tax-based	-1.287**	-1.256**	-1.253**	-0.818	-0.891	-1.176	-0.964	-0.716
Sample	395	376	357	340	323	307	292	279

Table C.5 - Impacts on the Percentile Ratio (90/50) of Gross Earnings (%) (following a fiscal adjustment episode of 1% of GDP) - Robustness test 2

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Effect/year	1	2	3	4	5	6	7	8
Total	-0.412	-0.343	-0.136	0.292	0.997*	0.680**	0.899**	0.702
Spending-based	-0.418	0.164	0.0486	0.540*	1.549***	0.979***	1.157***	0.741
Tax-based	-0.740*	-1.362*	-0.528	0.118	0.685	0.129	0.582	0.939
Sample	306	295	281	267	256	242	229	217

Table C.6 - Impacts on the Percentile Ratio (90/10) of Gross Earnings (%) (following a fiscal adjustment episode of 1% of GDP) - Robustness test 2

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Effect/year	1	2	3	4	5	6	7	8
Total	-0.236	-0.448	-0.754*	-0.833	-0.767	-0.493	-0.662	-0.625
Spending-based	-0.403**	-0.868**	-1.328**	-1.472**	-1.659**	-1.430*	-1.623*	-1.414
Tax-based	-0.220	-0.262	-0.577	-0.612	-0.0283	0.623	0.367	0.162
Sample	510	495	480	465	450	435	420	405

Table C.7 - Impacts on the Labor Share in Income (%) (following a fiscal adjustment episode of 1% of GDP) - Robustness test 2

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Figure C.7: Cumulative Response of the Labor Share in Income (change in %) to a fiscal consolidation of 1% of GDP - Three types of fiscal shock (total, spending-based and tax-based) - Robustness test 2

Source: Author's calculations.

Appendix D

Exercise for the Percentile Ratio 50/10 of Gross Earnings considering 8 periods

Effect/year	1	2	3	4	5	6	7	8
Total	0.148	0.733**	0.585	-0.0974	-0.394	-0.431	-0.228	0.0736
Spending-based	0.420	0.836***	1.071**	-0.317	-0.400	-0.654	0.248	0.303
Tax-based	0.0332	0.768	0.0757	-0.455	-1.225	-1.206	-1.631	-0.709
Sample	387	371	353	336	321	305	290	275

Table D.1 - Impacts on the Percentile Ratio (50/10) of Gross Earnings (%) (following a fiscal adjustment episode of 1% of GDP) - Robustness test (8 periods)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

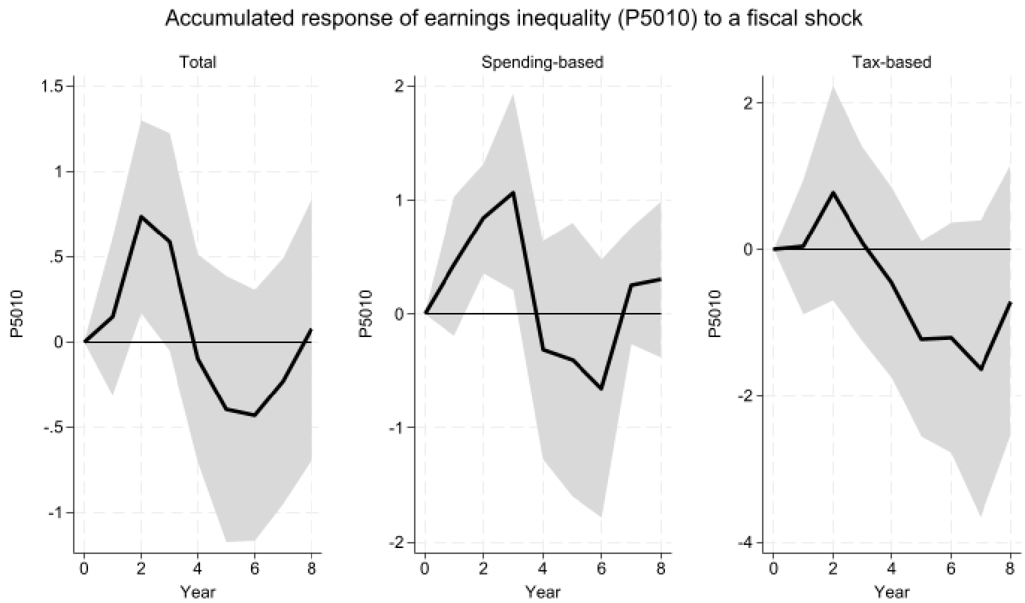

Figure D.1: Cumulative Response of the Percentile Ratio (50/10) of Gross Earnings (change in %) to a fiscal consolidation of 1% of GDP - Three types of fiscal shock (total, spending-based and tax-based) - Robustness test for 8 periods

Source: Author's calculations.

Appendix E

Exercise for the Percentile Ratio 50/10 of Gross Earnings including Italy and Netherlands

Effect/year	1	2	3	4	5	6	7	8
Total	0.156	0.538*	0.598**	0.136	0.174	0.487	0.636	0.961**
Spending-based	0.252	0.485*	0.847*	0.0425	0.292	0.314	0.833	1.176*
Tax-based	0.286	0.851	0.588	0.228	0.315	1.175	1.155	1.608*
Sample	447	429	410	391	375	357	340	324

Table E.1 - Impacts on the Percentile Ratio (50/10) of Gross Earnings (%) (following a fiscal adjustment episode of 1% of GDP) - Including Italy and Netherlands

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

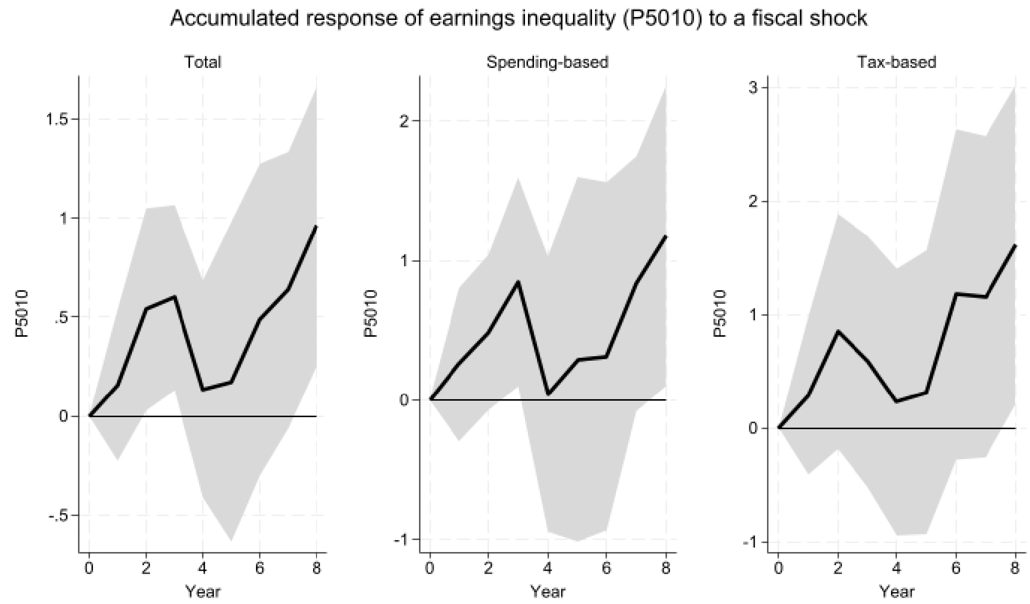

Figure E.1: Cumulative Response of the Percentile Ratio (50/10) of Gross Earnings (change in %) to a fiscal consolidation of 1% of GDP - Three types of fiscal shock (total, spending-based and tax-based) - Including Italy and Netherlands

Source: Author's calculations.

Appendix F

Exercise for the Percentile Ratio 90/50 of Gross Earnings including Italy

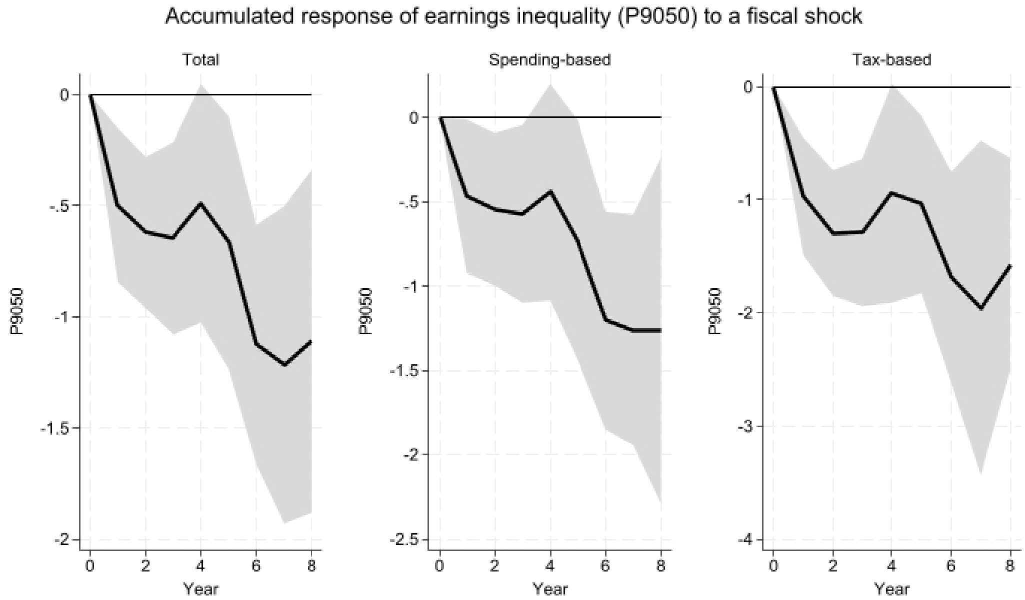

Figure F.1: Cumulative Response of the Percentile Ratio (90/50) of Gross Earnings (change in %) to a fiscal consolidation of 1% of GDP - Three types of fiscal shock (total, spending-based and tax-based) - Including Italy

Source: Author's calculations.

Effect/year	1	2	3	4	5	6	7	8
Total	-0.496**	-0.620***	-0.647**	-0.489	-0.665*	-1.125***	-1.216***	-1.108**
Spending-based	-0.466	-0.542*	-0.570*	-0.442	-0.729	-1.203***	-1.260***	-1.263*
Tax-based	-0.971***	-1.292***	-1.287***	-0.942	-1.040**	-1.684***	-1.957**	-1.570**
Sample	428	408	388	370	352	335	319	305

Table F.1 - Impacts on the Percentile Ratio (90/50) of Gross Earnings (%) (following a fiscal adjustment episode of 1% of GDP) - Including Italy

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Appendix G

Exercise for Market Income Inequality including Ireland and Sweden

Effect/year	1	2	3	4	5	6	7	8
Total	0.0669	0.140	0.131	0.0812	0.0806	0.174	0.149	0.124
Spending-based	0.0792	0.211	0.228	0.106	0.139	0.182	0.126	0.255
Tax-based	0.0698	0.0742	0.0427	0.0572	0.0555	0.181	0.0928	-0.124
Sample	525	510	495	480	465	450	435	420

Table G.1 - Impacts on the Market Income Inequality (%) (following a fiscal adjustment episode of 1% of GDP) - Robustness test including Ireland and Sweden

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

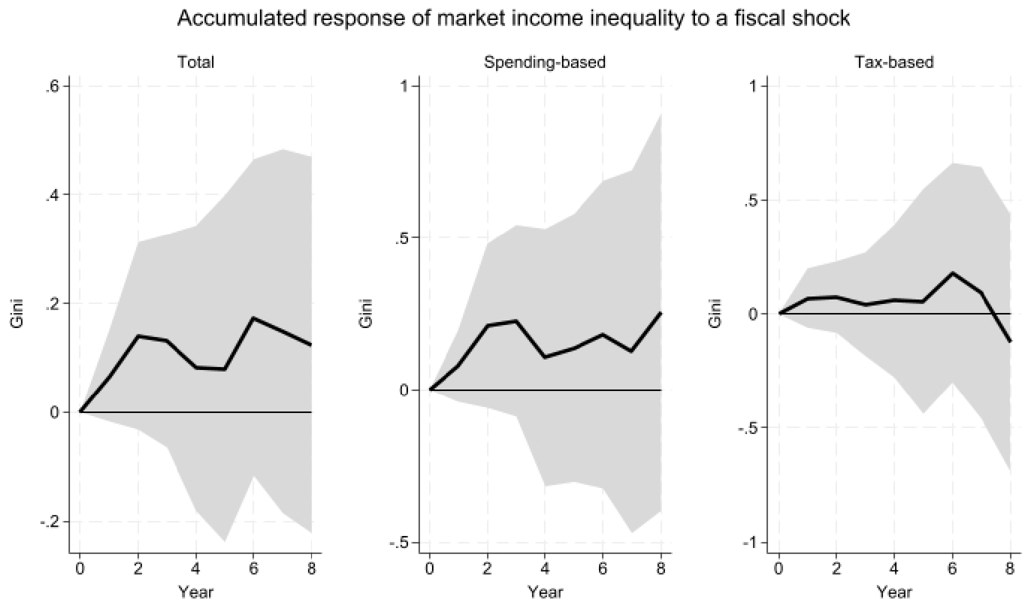

Figure G.1: Cumulative Response of Market Income Inequality (change in %) to a fiscal consolidation of 1% of GDP - Three types of fiscal shock (total, spending-based and tax-based) - Robustness test including Ireland and Sweden

Source: Author's calculations.

Appendix H

Robustness tests for the Redistribution Measure exercise (Ch.2)

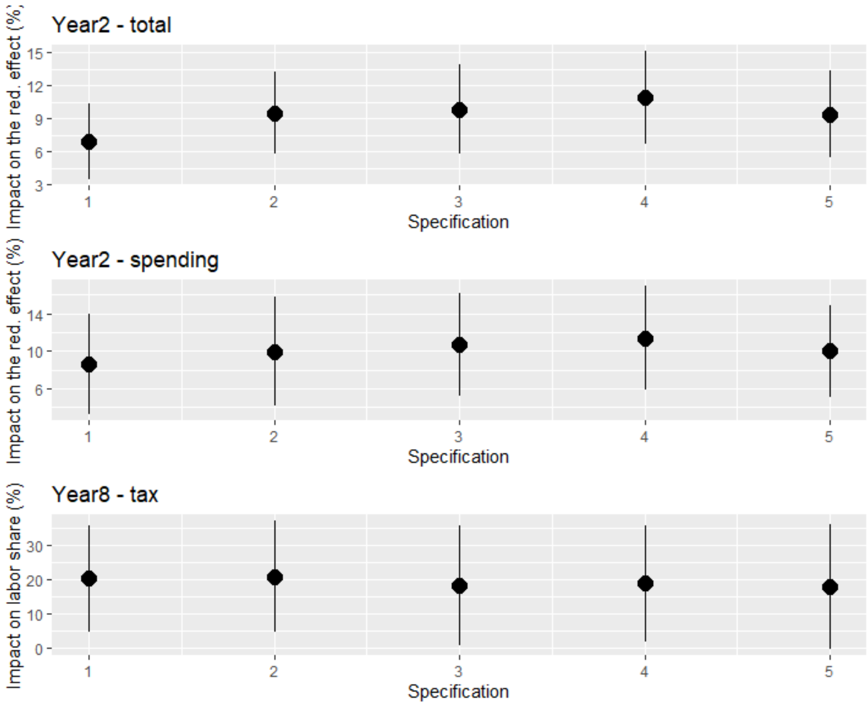

Figure H.1: Impact of fiscal consolidation (of 1% of GDP) on the redistribution measure - Different lags of the fiscal shock

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes two lags and refers to "2" in the graph.

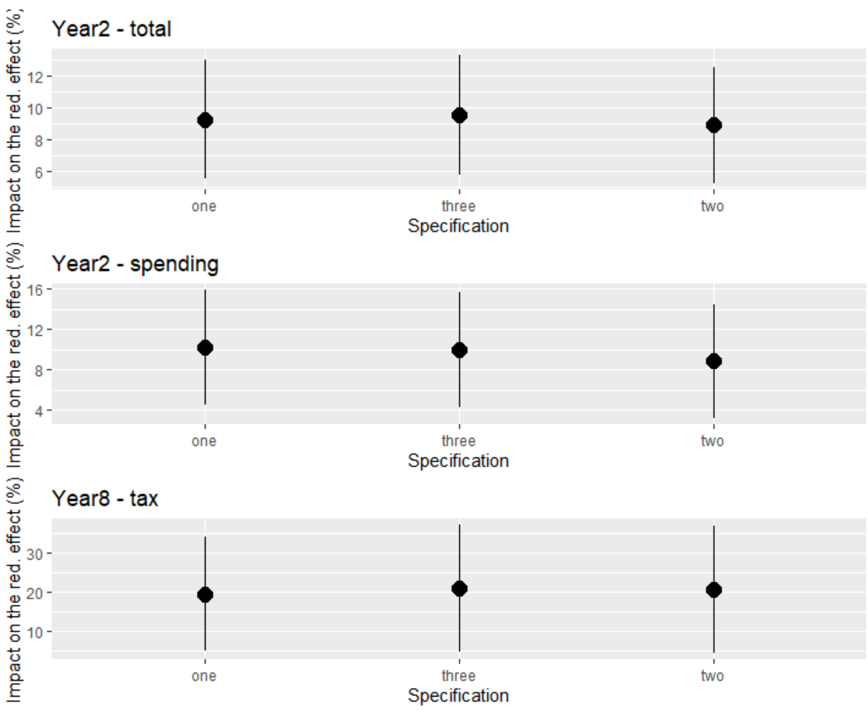

Figure H.2: Impact of fiscal consolidation (of 1% of GDP) on the redistribution measure - Different lags of the redistribution measure

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes one lag and refers to "three" in the graph.

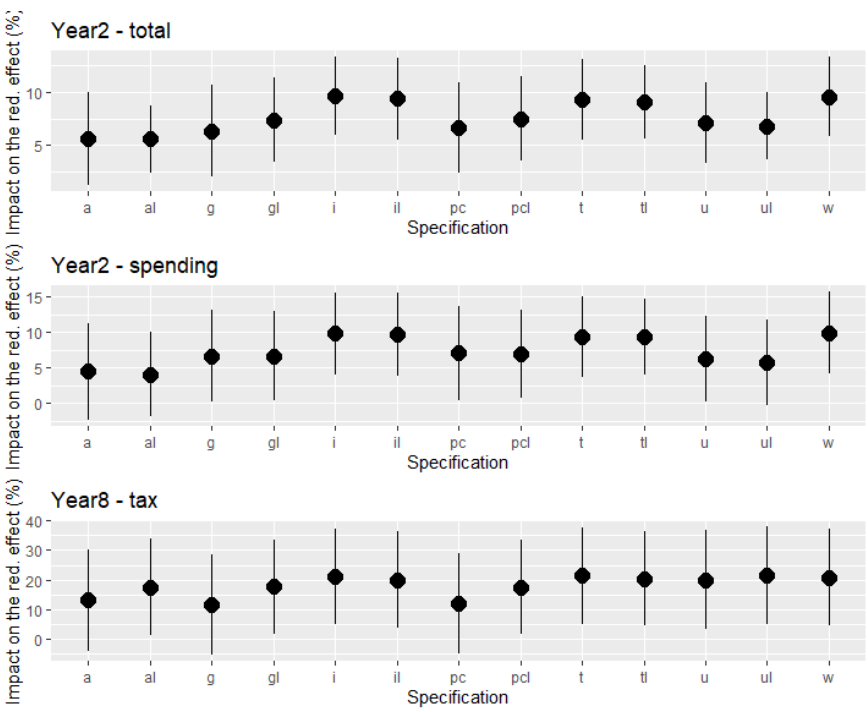

Figure H.3: Impact of fiscal consolidation (of 1% of GDP) on the redistribution measure - Different control variables

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "a": all variables (all control variables are included), "g": real GDP growth rate, "i": inflation rate, "pc": real GDP per capita, "t": trade-to-GDP (openness), "u": unemployment rate, "w": without control variables (baseline). "al", "gl", "il", "pcl", "tl" and "ul" control for the same variables, but adding one lag.

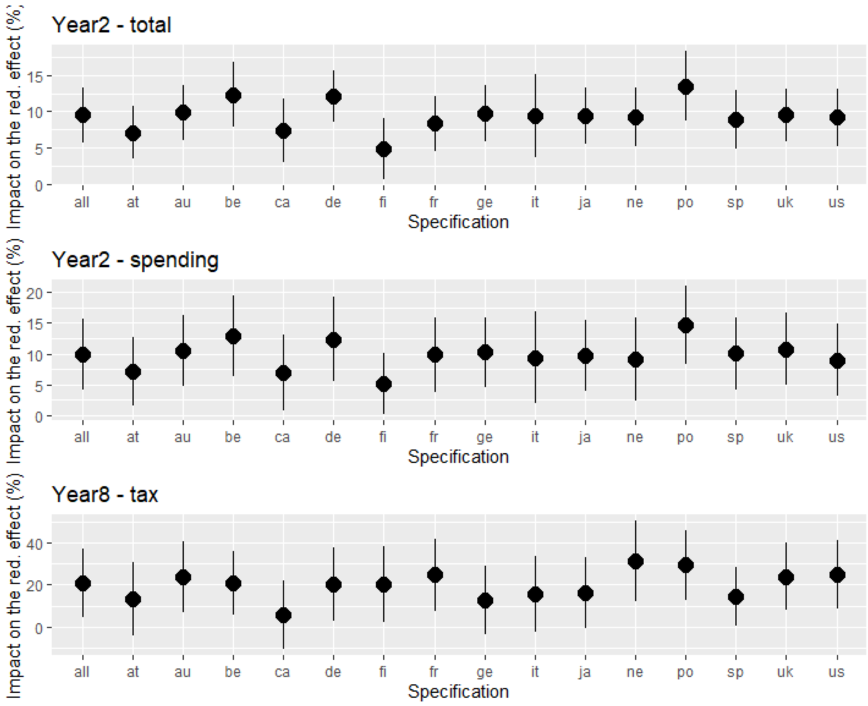

Figure H.4: Impact of fiscal consolidation (of 1% of GDP) on the redistribution measure - Different countries

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "all" includes all countries (baseline), "at" includes Austria, "au" excludes Australia, "be": excludes Belgica, "ca": excludes Canada, "de": excludes Denmark, "fi" excludes Finland, "fr" excludes France, "ge" excludes Germany, "ne" excludes Netherlands, "sp" includes Spain, "uk" excludes the United Kingdom, "us" excludes the United States.

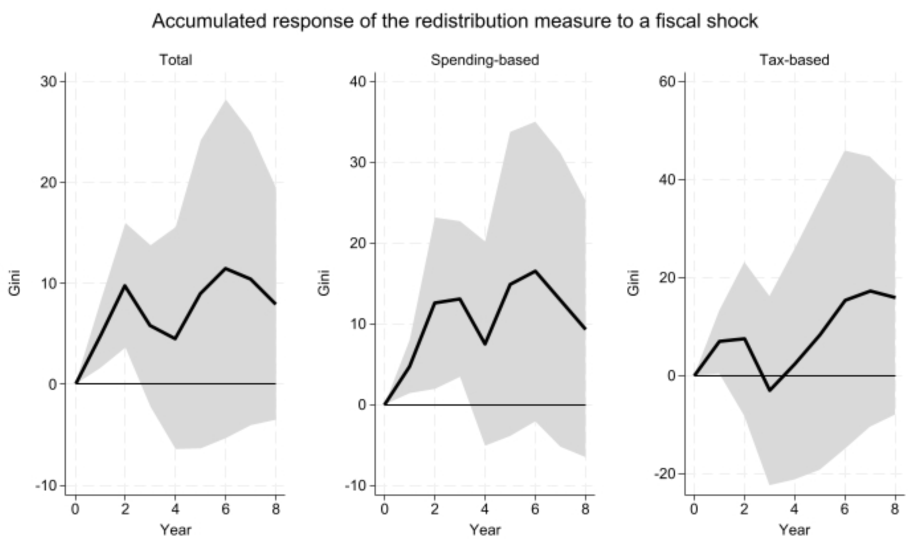

Figure H.5: Cumulative Response of the Redistribution Measure (change in %) to a fiscal consolidation of 1% of GDP- Three types of fiscal shock (total, spending-based and tax-based) - Robustness test using Devries at al. (2011) and Alesina et al. (2019)

Source: Author's calculations.

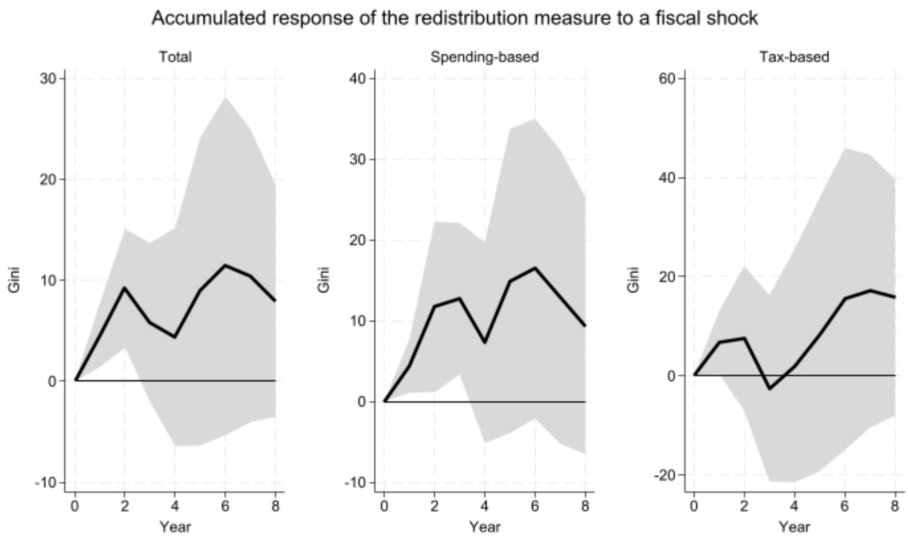

Figure H.6: Cumulative Response of the Redistribution Measure (change in %) to a fiscal consolidation of 1% of GDP- Three types of fiscal shock (total, spending-based and tax-based) - Robustness test using Gupta et al. (2017)

Source: Author's calculations.

Appendix I

Robustness tests for spending and tax-based shocks (Ch.2)

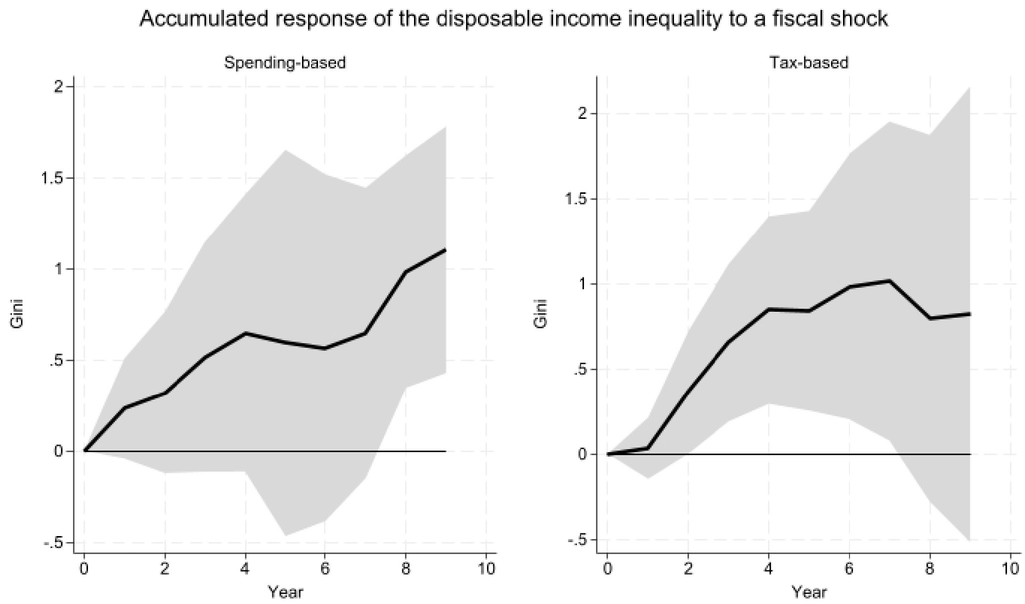

Figure I.1: Cumulative Response of Disposable Income Inequality (change in %) to a fiscal consolidation of 1% of GDP- Two types of fiscal shock (spending-based and tax-based) - Additional robustness test

Source: Author's calculations.

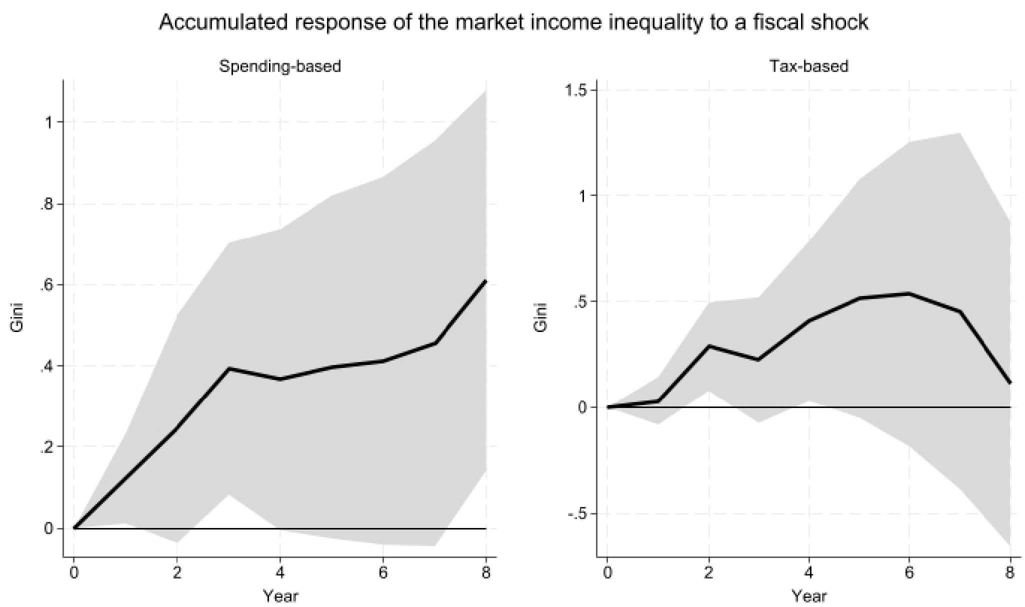

Figure I.2: Cumulative Response of Market Income Inequality (change in %) to a fiscal consolidation of 1% of GDP- Two types of fiscal shock (spending-based and tax-based) - Additional robustness test

Source: Author's calculations.

Figure I.3: Cumulative Response of Gross Wage Inequality (change in %) to a fiscal consolidation of 1% of GDP- Two types of fiscal shock (spending-based and tax-based) - Additional robustness test

Source: Author's calculations.

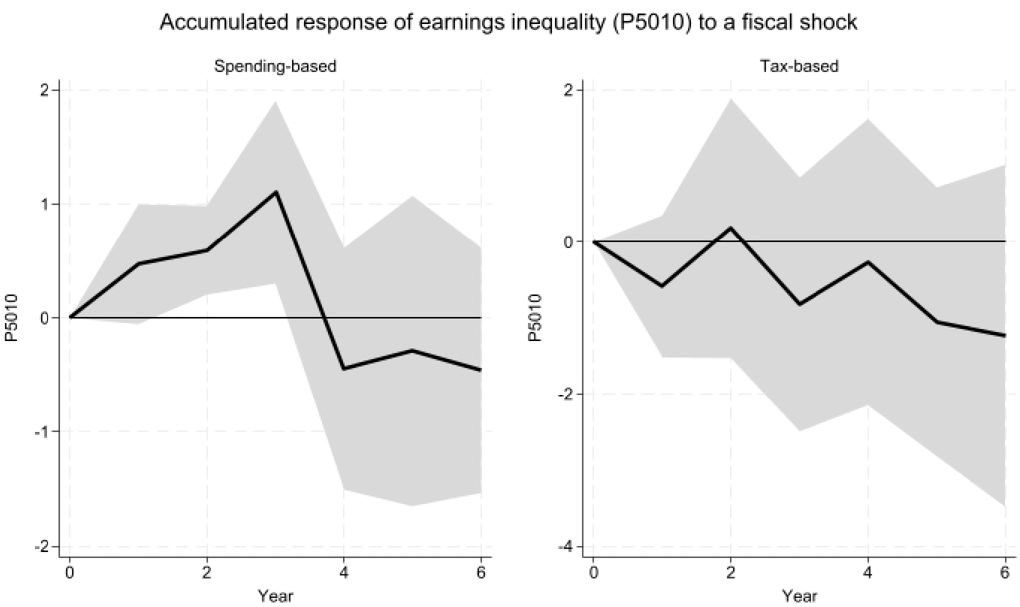

Figure I.4: Cumulative Response of the Percentile Ratio (50/10) (change in %) to a fiscal consolidation of 1% of GDP- Two types of fiscal shock (spending-based and tax-based) - Additional robustness test

Source: Author's calculations.

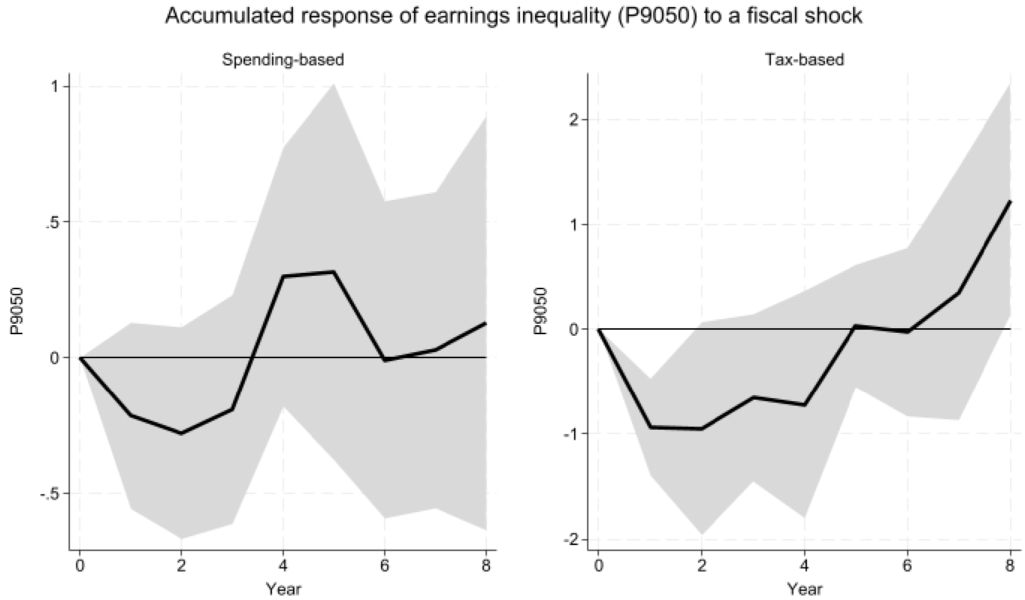

Figure I.5: Cumulative Response of the Percentile Ratio (90/50) (change in %) to a fiscal consolidation of 1% of GDP- Two types of fiscal shock (spending-based and tax-based) - Additional robustness test

Source: Author's calculations.

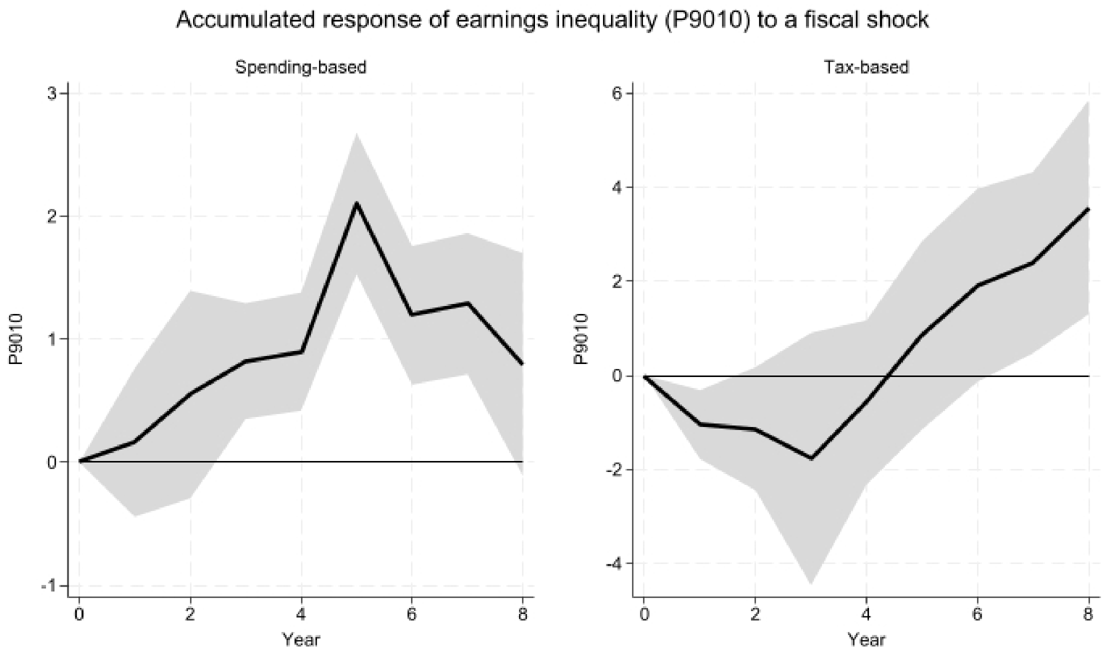

Figure I.6: Cumulative Response of the Percentile Ratio (90/10) (change in %) to a fiscal consolidation of 1% of GDP- Two types of fiscal shock (spending-based and tax-based) - Additional robustness test

Source: Author's calculations.

Figure I.7: Cumulative Response of the Labor Share in Income (change in %) to a fiscal consolidation of 1% of GDP- Two types of fiscal shock (spending-based and tax-based) - Additional robustness test

Source: Author's calculations.

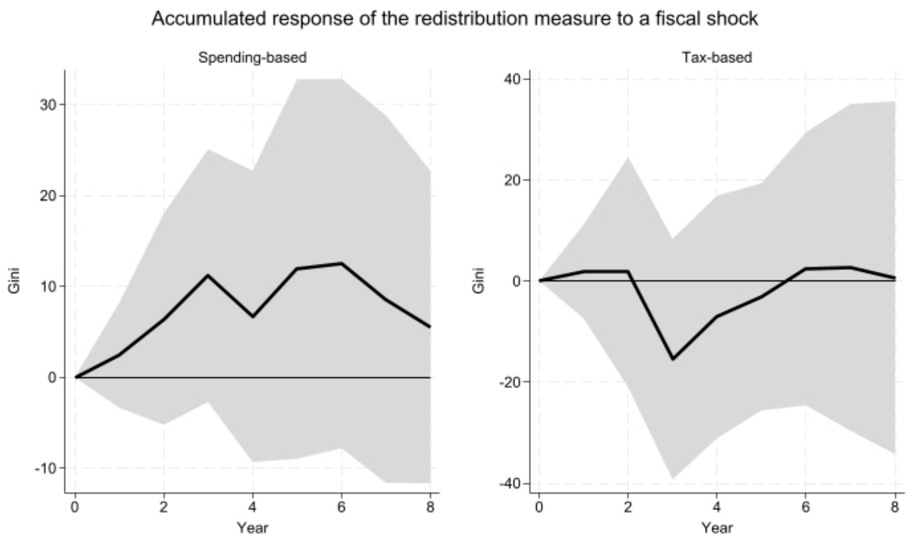

Figure I.8: Cumulative Response of the Redistributive Measure (change in %) to a fiscal consolidation of 1% of GDP- Two types of fiscal shock (spending-based and tax-based) - Additional robustness test

Source: Author's calculations.

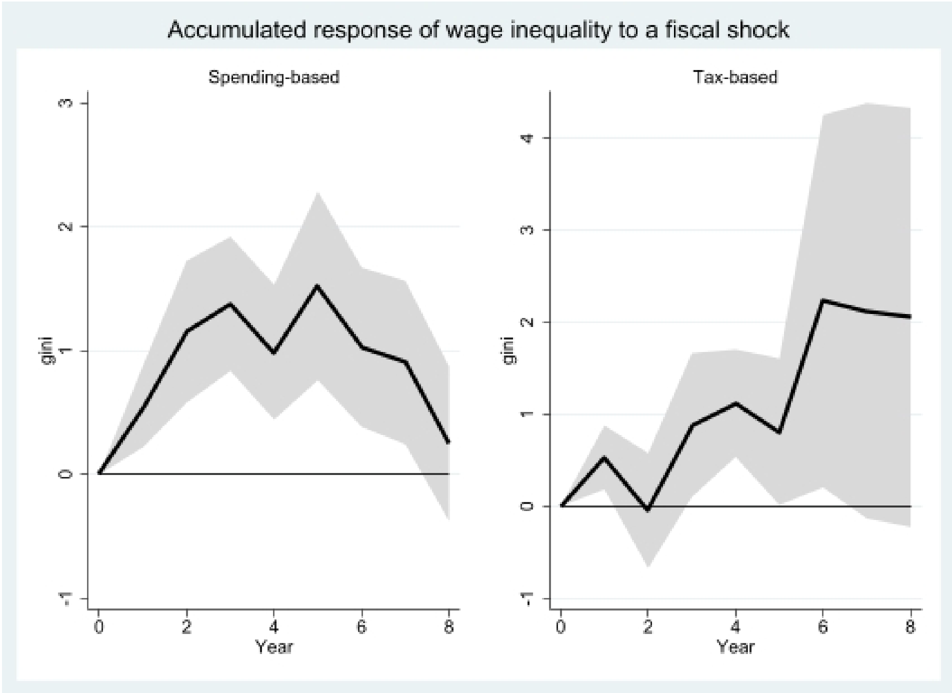

Figure I.9: Cumulative Response of Gross Wage Inequality (change in %) to a fiscal consolidation of 1% of GDP- Two types of fiscal shock (spending-based and tax-based) - Additional robustness test - one standard deviation band

Source: Author's calculations.

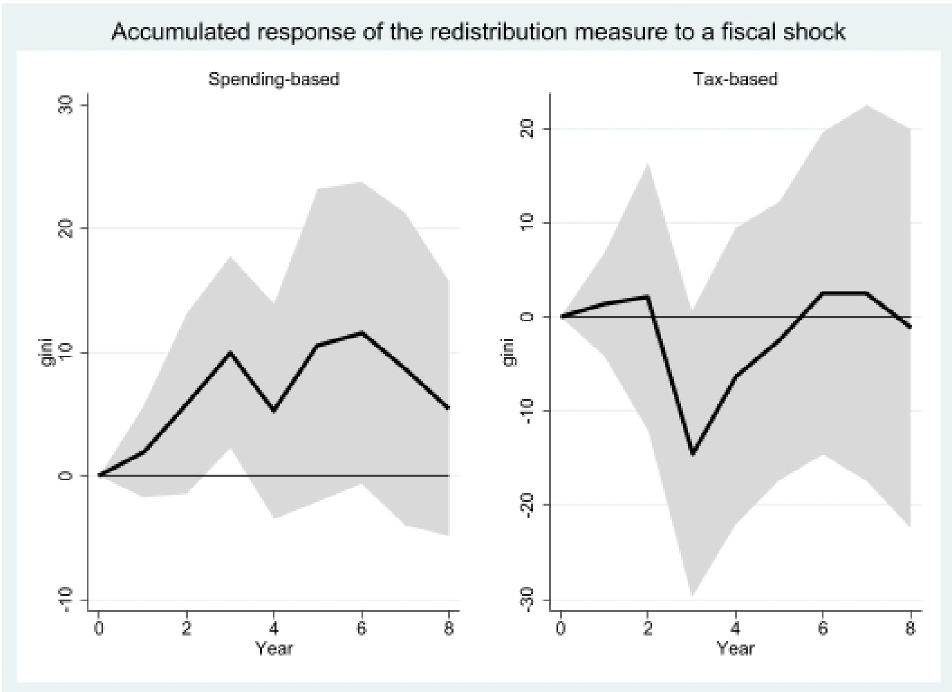

Figure I.10: Cumulative Response of the Redistributive Measure (change in %) to a fiscal consolidation of 1% of GDP- Two types of fiscal shock (spending-based and tax-based) - Additional robustness test, with one standard deviation band

Source: Author's calculations.

Appendix J

Exercise for disposable income inequality including Bolivia

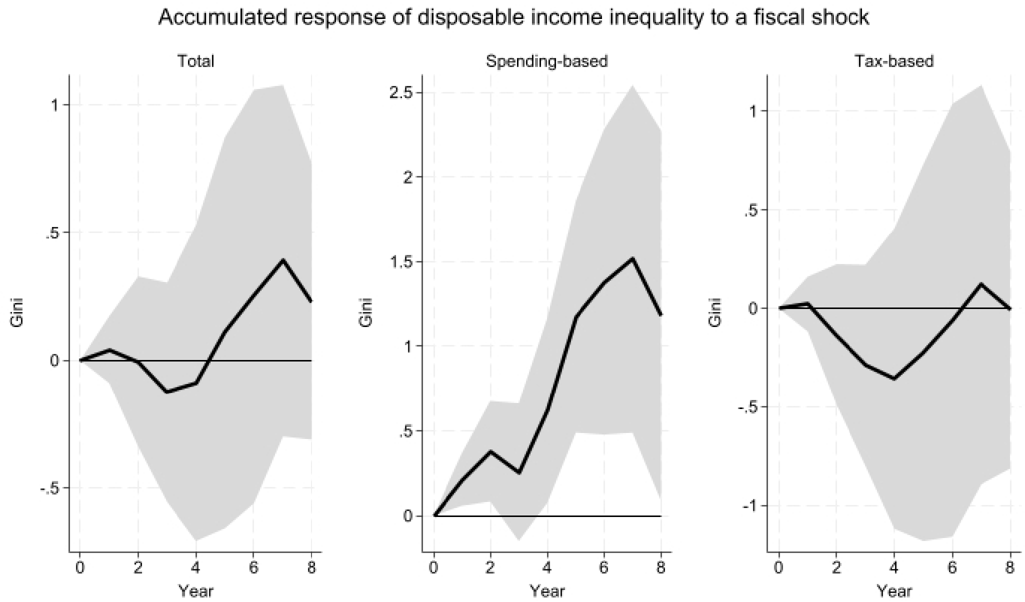

Figure J.1: Cumulative Response of Disposable Income Inequality (change in %) to a fiscal consolidation of 1% of GDP - Three types of fiscal shock (total, spending- and tax-based) - Including Bolivia

Source: Author's calculations.

Effect/year	1	2	3	4	5	6	7	8
Fiscal shock t-1	**0.0417**	**-0.00524**	**-0.126**	**-0.0889**	**0.108**	**0.250**	**0.390**	**0.229**
Fiscal shock t-2	-0.0545	-0.163	-0.125	-0.0470	0.0760	0.202	0.0622	-0.0153
Fiscal shock t-3	-0.0642	0.00225	0.0993	0.237	0.400*	0.266	0.239	0.131
Real GDP per capita	-0.0111	-0.0496	-0.0927	-0.103	-0.136	-0.158*	-0.152	-0.173
Sample	264	252	240	228	216	204	192	180

Table J.1 - Impacts on disposable income inequality (%) (following a fiscal adjustment episode of 1% of GDP)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Effect/year	1	2	3	4	5	6	7	8
Fiscal shock t-1	**0.212****	**0.380****	**0.257**	**0.622***	**1.175****	**1.379****	**1.516****	**1.181***
Fiscal shock t-2	0.0884	-0.0589	0.323	0.700**	1.009**	1.163**	0.960	0.880
Fiscal shock t-3	-0.190	0.208	0.719*	1.003*	1.314**	1.167	1.269	0.887
Real GDP per capita	-0.0114	-0.0524	-0.101*	-0.117	-0.156*	-0.181**	-0.176	-0.192
Sample	264	252	240	228	216	204	192	180

Table J.2 - Impacts on disposable income inequality (%) (following a spending-based fiscal adjustment episode of 1% of GDP)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Effect/year	1	2	3	4	5	6	7	8
Fiscal shock t-1	**0.0213**	**-0.133**	**-0.289**	**-0.356**	**-0.224**	**-0.0607**	**0.120**	**-0.00725**
Fiscal shock t-2	-0.115	-0.205	-0.238	-0.203	-0.0618	0.110	-0.0531	-0.188
Fiscal shock t-3	-0.0416	-0.0681	-0.0493	0.0846	0.243	0.0685	0.00047	-0.0403
Real GDP per capita	-0.0126	-0.0518	-0.0941	-0.103	-0.134	-0.156	-0.151	-0.176
Sample	264	252	240	228	216	204	192	180

Table J.3 - Impacts on disposable income inequality (%) (following a tax-based fiscal adjustment episode of 1% of GDP)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Appendix K

Exercise for market income inequality including Bolivia

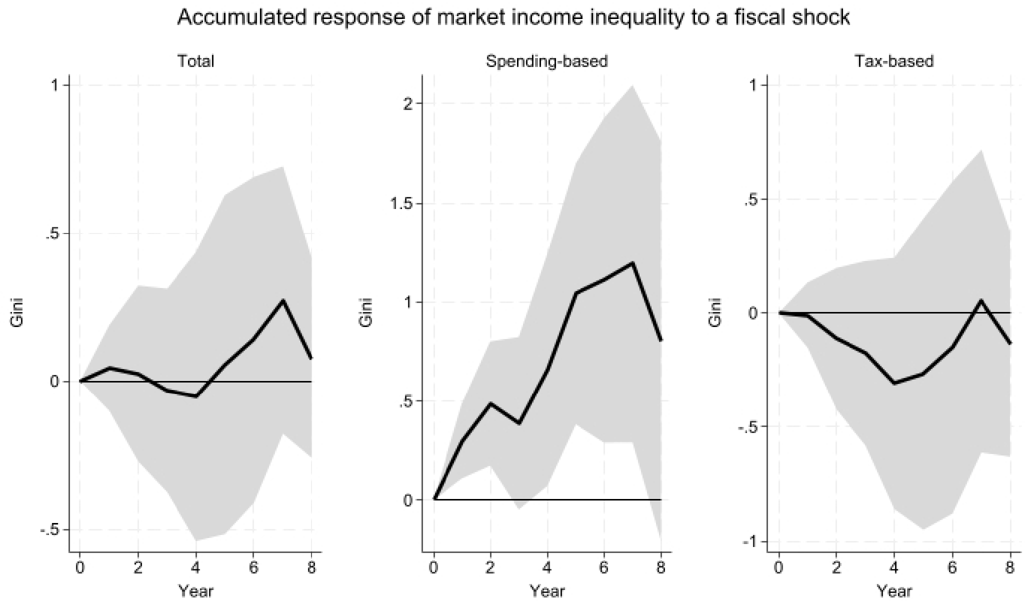

Figure K.1: Cumulative Response of Market Income Inequality (change in %) to a fiscal consolidation of 1% of GDP - Three types of fiscal shock (total, spending- and tax-based) - Including Bolivia

Source: Author's calculations.

Effect/year	1	2	3	4	5	6	7	8
Fiscal shock t-1	**0.0441**	**0.0252**	**-0.0319**	**-0.0526**	**0.0560**	**0.139**	**0.274**	**0.0757**
Fiscal shock t-2	-0.00534	-0.0938	-0.0955	-0.0423	0.0125	0.126	-0.0617	-0.151
Fiscal shock t-3	-0.0753	-0.0976	-0.0650	-0.0454	0.0576	-0.0928	-0.139	-0.236
Real GDP per capita	-0.00317	-0.0431	-0.0861	-0.0989	-0.135*	-0.157*	-0.147	-0.152
Sample	276	264	252	240	228	216	204	192

Table K.1 - Impacts on market income inequality (%) (following a fiscal adjustment episode of 1% of GDP)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Effect/year	1	2	3	4	5	6	7	8
Fiscal shock t-1	**0.297****	**0.488****	**0.388**	**0.657***	**1.042****	**1.109****	**1.193****	**0.802**
Fiscal shock t-2	0.117	0.0138	0.277	0.616	0.735	0.876	0.673	0.562
Fiscal shock t-3	-0.197	0.106	0.486	0.637	0.888*	0.733	0.812	0.405
Real GDP per capita	-0.00308	-0.0430	-0.0947*	-0.113	-0.153*	-0.177**	-0.168*	-0.165
Sample	276	264	252	240	228	216	204	192

Table K.2 - Impacts on market income inequality (%) (following a spending-based fiscal adjustment episode of 1% of GDP)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Effect/year	1	2	3	4	5	6	7	8
Fiscal shock t-1	**-0.00908**	**-0.113**	**-0.177**	**-0.309**	**-0.268**	**-0.151**	**0.0523**	**-0.136**
Fiscal shock t-2	-0.0297	-0.105	-0.169	-0.158	-0.0803	0.0608	-0.185	-0.317
Fiscal shock t-3	-0.0711	-0.187*	-0.219*	-0.232	-0.152	-0.339	-0.409	-0.451
Real GDP per capita	-0.00462	-0.0462	-0.0895	-0.104	-0.138	-0.161*	-0.152	-0.161
Sample	276	264	252	240	228	216	204	192

Table K.3 - Impacts on market income inequality (%) (following a tax-based fiscal adjustment episode of 1% of GDP)

Source: Author's calculations. (***) significant at 1%. (**) significant at 5%. (*) significant at 10%.

Appendix L

Robustness tests for the Redistribution Measure exercise (Ch.3)

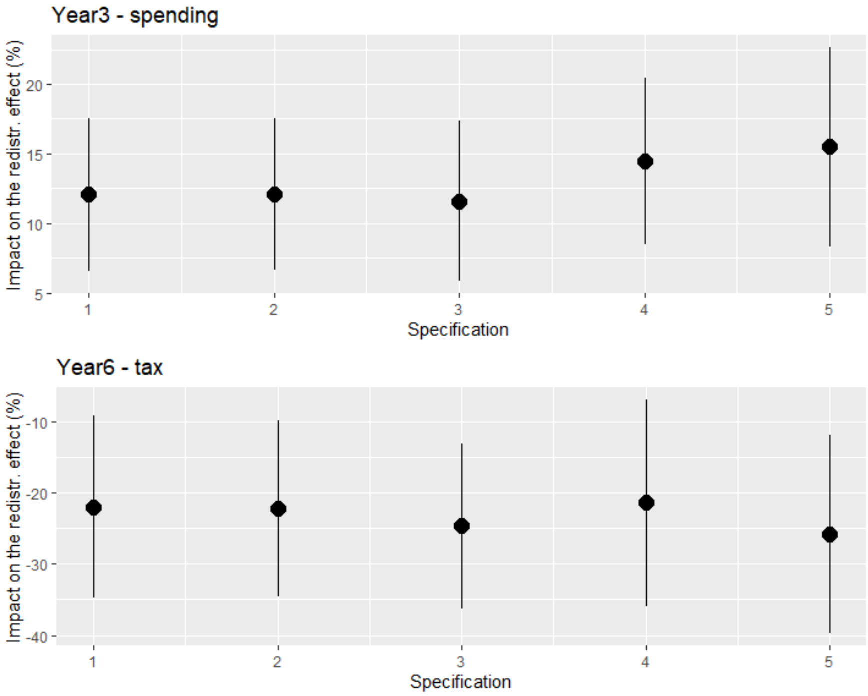

Figure L.1: Impact of fiscal consolidation (of 1% of GDP) on the redistribution effect - Different lags of the fiscal shock

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes three lags and refers to "3" in the graph.

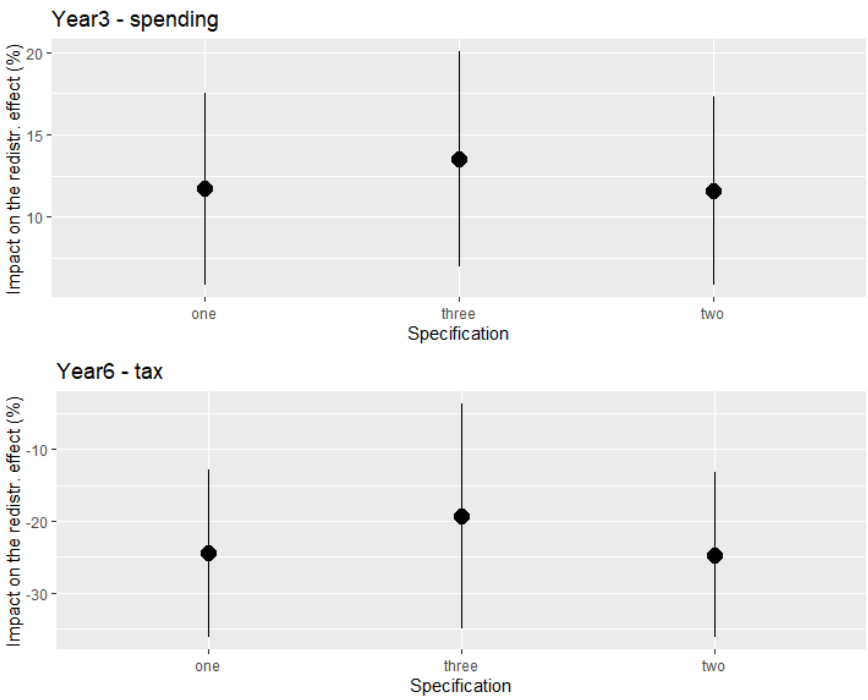

Figure L.2: Impact of fiscal consolidation (of 1% of GDP) on the redistribution measure - Different lags of the redistribution measure

Source: Author's calculations. We present the coefficients with one standard deviation band around them. The baseline includes two lags and refers to "2" in the graph.

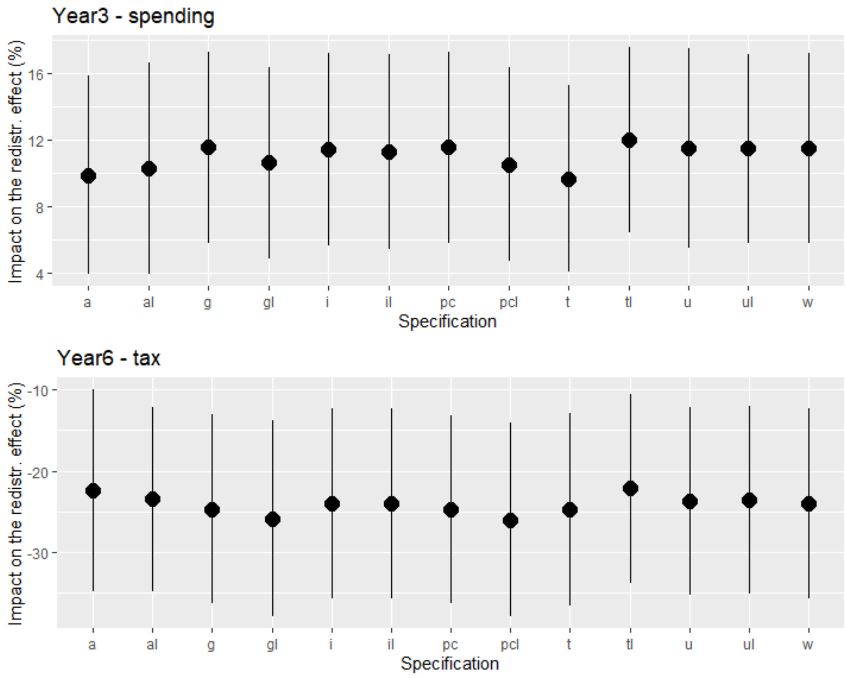

Figure L.3: Impact of fiscal consolidation (of 1% of GDP) on the redistribution measure - Different control variables

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "a": all variables (all control variables are included in Equation 3.5), "g": real GDP growth rate, "i": inflation rate, "pc": real GDP per capita, "t": trade-to-GDP (openness), "u": unemployment rate, "w": without control variables (baseline). "al", "gl", "il", "pcl", "tl" and "ul" control for the same variables, but adding one lag.

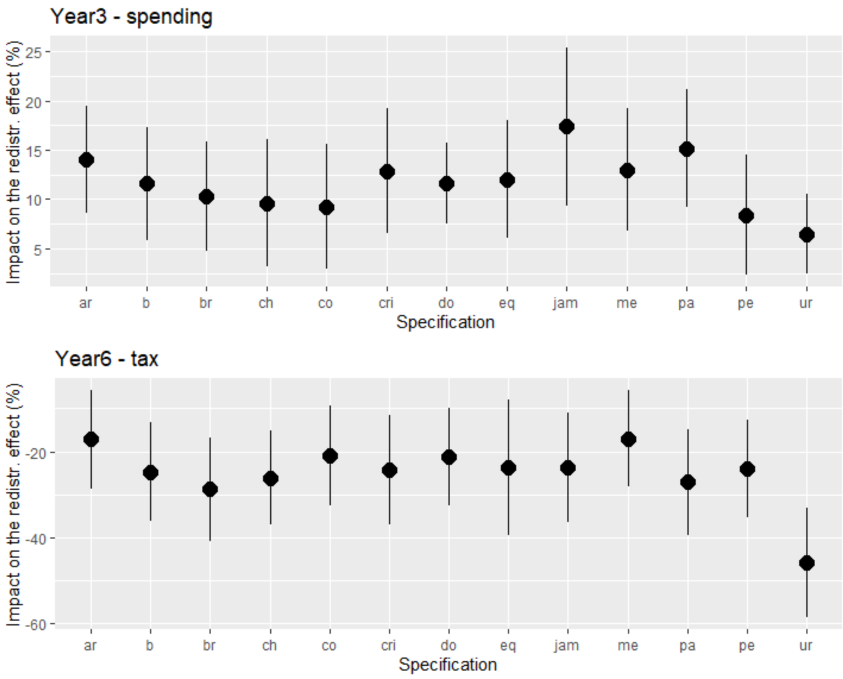

Figure L.4: Impact of fiscal consolidation (of 1% of GDP) on the redistribution measure - Different countries

Source: Author's calculations. We present the coefficients with one standard deviation band around them. "b" is the baseline; "ar": excludes Argentina; "br": excludes Brazil; "ch": excludes Chile; "co": excludes Colombia; "cri": excludes Costa Rica; "do": includes Dominican Republic; "eq": excludes Ecuador; "jam": excludes Jamaica; "me": excludes Mexico; "pa" excludes Paraguay; "pe" excludes Peru; "ur" excludes Uruguay.

Appendix M

Robustness tests for spending and tax-based shocks (Ch.3)

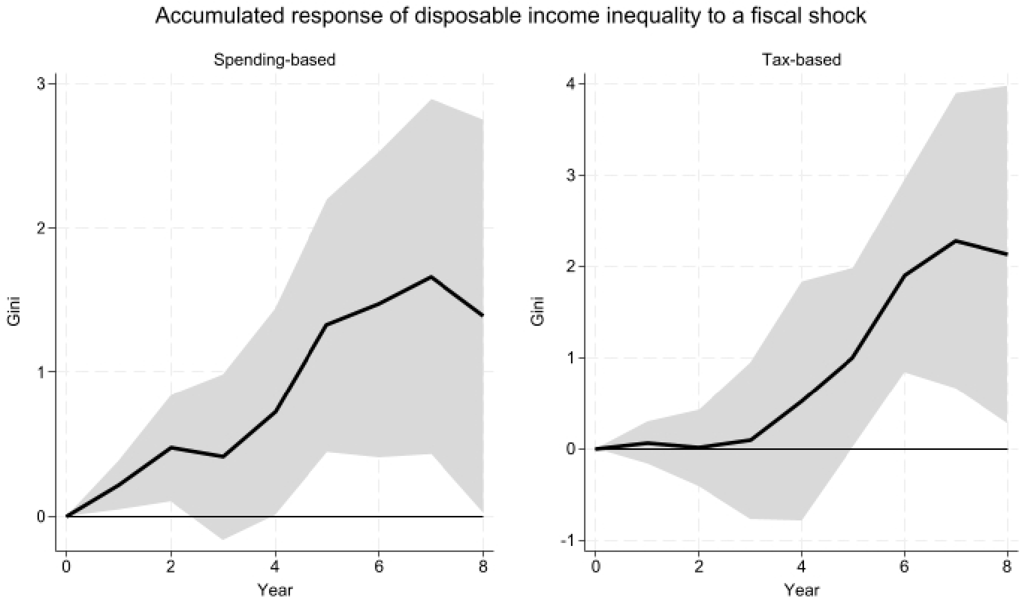

Figure M.1: Cumulative Response of Disposable Income Inequality (change in %) to a fiscal consolidation of 1% of GDP- Two types of fiscal shock (spending-based and tax-based) - Additional robustness test

Source: Author's calculations.

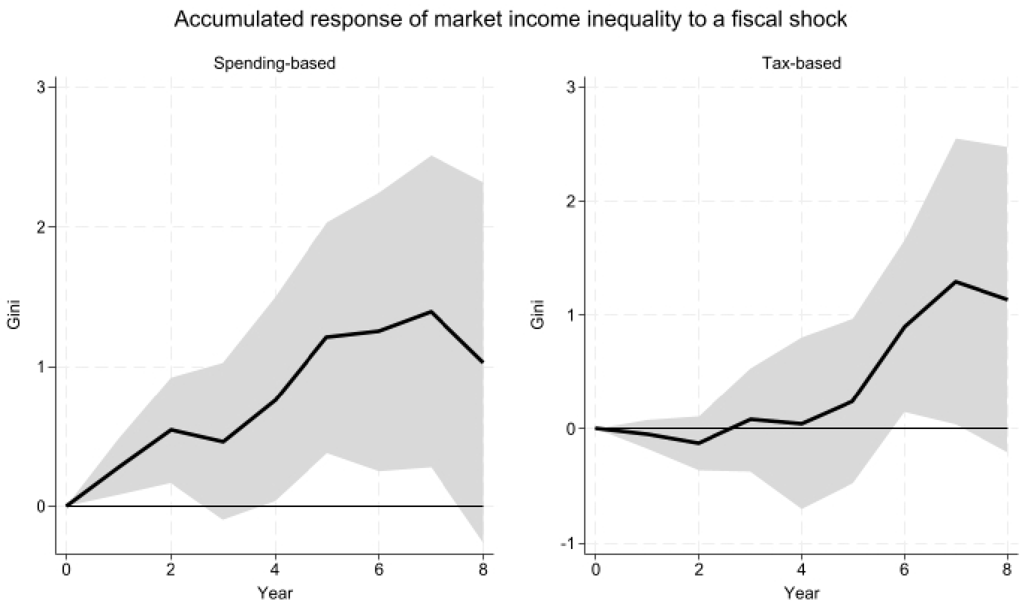

Figure M.2: Cumulative Response of Market Income Inequality (change in %) to a fiscal consolidation of 1% of GDP- Two types of fiscal shock (spending-based and tax-based) - Additional robustness test

Source: Author's calculations.

Figure M.3: Cumulative Response of Gross Wage Inequality (change in %) to a fiscal consolidation of 1% of GDP- Two types of fiscal shock (spending-based and tax-based) - Additional robustness test

Source: Author's calculations.

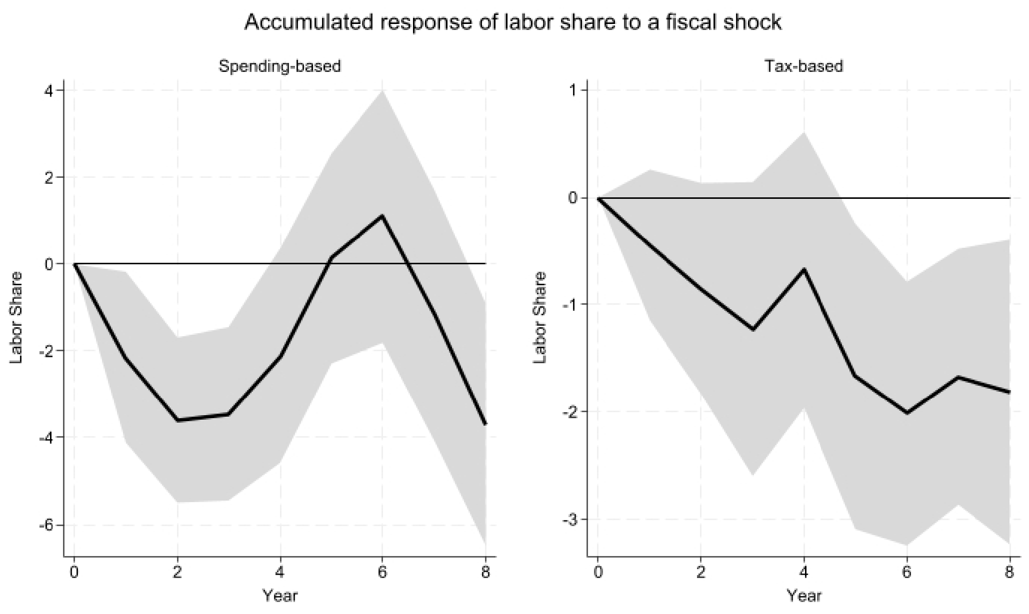

Figure M.4: Cumulative Response of the Labor Share in Income (change in %) to a fiscal consolidation of 1% of GDP- Two types of fiscal shock (spending-based and tax-based) - Additional robustness test

Source: Author's calculations.

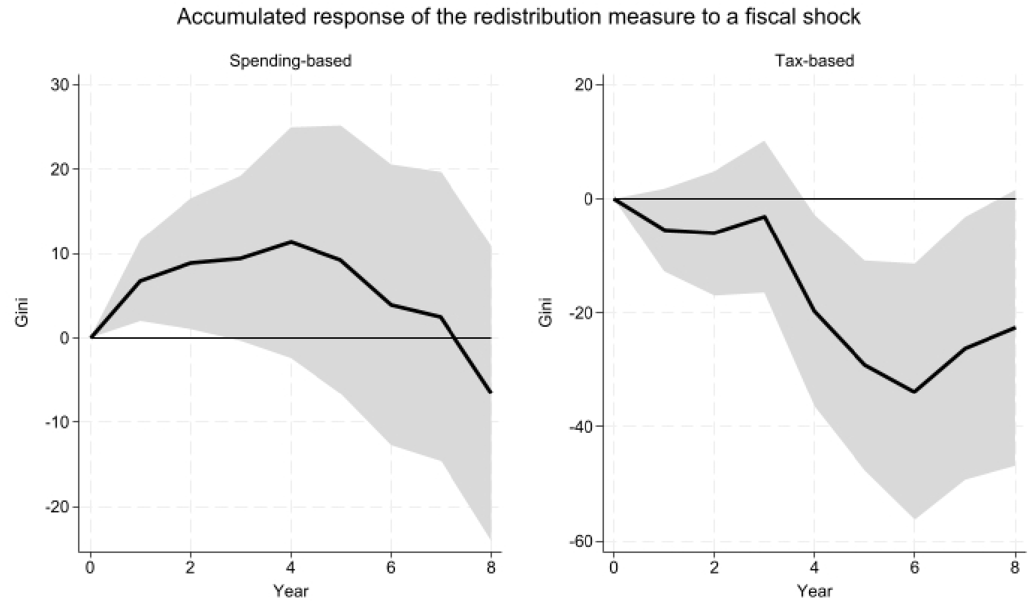

Figure M.5: Cumulative Response of the Redistributive Measure (change in %) to a fiscal consolidation of 1% of GDP- Two types of fiscal shock (spending-based and tax-based) - Additional robustness test

Source: Author's calculations.

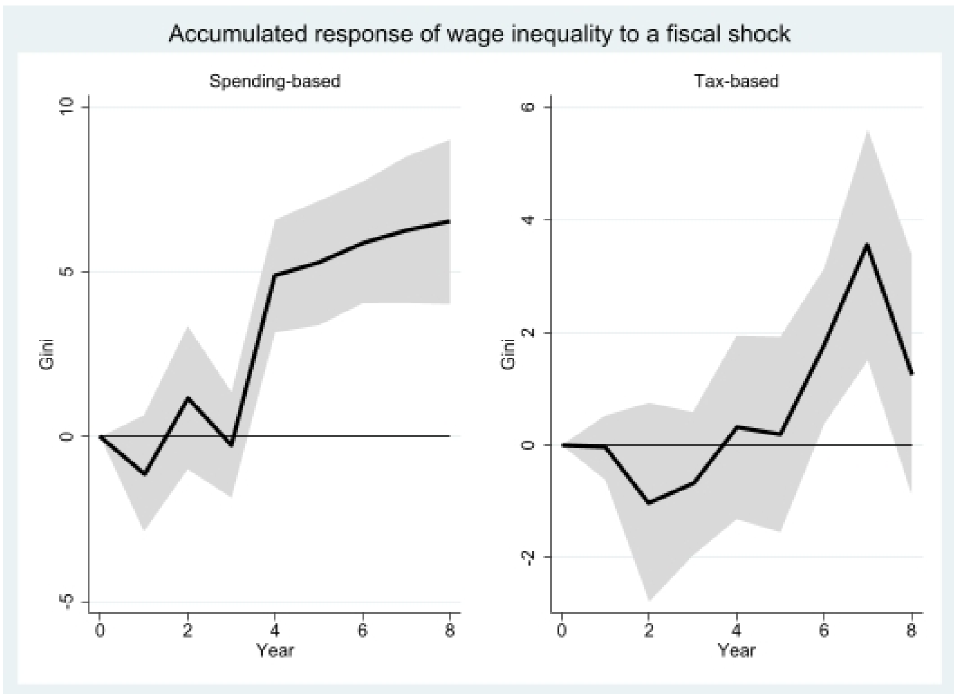

Figure M.6: Cumulative Response of Gross Wage Inequality (change in %) to a fiscal consolidation of 1% of GDP- Two types of fiscal shock (spending-based and tax-based) - Additional robustness test (one standard deviation band)

Source: Author's calculations.