

1 Literature Review

Define the Scope: Begin by defining the scope of your literature review. Clearly state the research questions or objectives you aim to address and the specific areas of macroeconomic modeling you'll cover.: *ok*

This section provides a literature review, exploring the intersection between Regional Economics and Macroeconomics, emphasizing the importance of monetary policy, and delving into the applicability of DSGE models to address diverse economic challenges, including regional and monetary dilemmas. The discussion also underscores the need for a clear definition and methodological framework in utilizing DSGE models.

Search for Relevant Literature: Conduct a comprehensive search of academic databases, journals, books, and other reputable sources. Use relevant keywords and filters to find literature related to your research topic.: *ok*

Organize the Material: Categorize the literature into themes, topics, or key concepts. This organization will help you structure your review logically.: *ok*

Summarize Key Concepts: For each theme or concept, provide a concise summary of the theories, models, and empirical findings. Explain the main ideas and the contributions of each study.: *ok*

Identify Gaps and Controversies: As you review the literature, pay attention to gaps in the research. Are there areas where the literature is lacking or conflicting? Highlight these gaps and controversies.: *ok*

Include Empirical Studies: Discuss empirical studies related to your research topic. Summarize the methods, data sources, and key findings of these studies. Explain how empirical research has contributed to the field.: *ok*

Relate to Your Research: Throughout the literature review, connect the reviewed material to your own research. Explain how the existing literature informs your research questions and hypotheses.: *ok*

Macroeconomics and Regional Economics

The assessment by [Rickman \(2010\)](#) on the importance of the link between Macroeconomics and Regional Economics was made at a time when the use of structural mod-

els to investigate regional issues was not yet common. Since then, several studies have addressed this connection.

Initially, we present two works that served as inspiration for the present research. The first, developed by [Costa Junior et al. \(2022\)](#), investigates the impacts of fiscal policy on the state of Goiás, considering the other states of the nation. In this work, the authors develop a regionalized and open structure, individualizing a Brazilian state from the rest, considering both a national and a state fiscal authority; state expenses and revenues are disaggregated, and thus, the authors seek to identify whether there are differences between the impacts of a tax exemption in the state under study compared to the others. With the model calibrated to data from 2003 to 2019, the authors demonstrate that there is indeed a difference in state performance due to the distinction of the tax exemption occurring in the state or in the rest of the country.

The second work also presents a DSGE model, but with the objective of evaluating whether there are differences in the effects of Foreign Direct Investment (FDI), considering its location. The model developed by [Mora and Costa Junior \(2019\)](#) encompasses an open economy with the main region (Bogotá, 25% of the national GDP) and the rest of the country (Colombia), two types of households¹, habit formation, capital adjustment costs, as well as typical elements of a New Keynesian (NK) model². With the model calibrated to data from 2002 to 2015, the authors demonstrate that there is indeed a difference in the effects of FDI depending on the region where it is applied, such that when applied in the rest of the country, there are growth effects that spread throughout the country through spillovers, including to the main region.

Both works aim to, despite dealing with distinct causes (fiscal policy and FDI), verify whether differences exist when the cause occurs in one of the two different modeled regions. Additionally, they share the same modeling approach, that of a Dynamic and Stochastic General Equilibrium (DSGE). And this was the advancement that [Rickman \(2010\)](#) wanted to see happen: the use of macroeconomic models to address regional questions.

¹ Ricardian and non-Ricardian agents.

² nominal price rigidity, monopolistic competition, non-neutrality of monetary policy in the short term.

Monetary Policy

DSGE models are widely employed within the macroeconomic literature to examine the effects of monetary policy on macroeconomic aggregates, as pointed by [Galí \(2015\)](#). In this context, it is important to add to the review the papers that develop models describing the monetary policy.

[Smets and Wouters \(2003\)](#) and [Smets and Wouters \(2007\)](#) present models that evaluate various types of shocks in the Eurozone and the United States, respectively. [Walque et al. \(2010\)](#) assess the role of the banking sector in market liquidity recovery, considering the endogenous possibilities of agent default.

[Vinhado and Divino \(2016\)](#) employ a model with financial frictions to examine the transmission of monetary policy to the banking sector and economic activity. The results demonstrate that the banking sector plays a significant role in economic activity and impacts the outcomes of monetary policy by having to adjust the bank spread in response to changes in the interest rate or reserve requirements.

[Soltani et al. \(2021\)](#) investigate financial and monetary shocks on macroeconomic variables, with special attention to the role of banks. For this analysis, the model considers an economy with a banking sector. The results indicate that banking activity can influence the effects of economic policies.

[Holm et al. \(2021\)](#) study the transmission of monetary policy to household consumption, estimating the response of consumption, income, and savings. They utilize a heterogeneous agent New Keynesian model (HANK). The results demonstrate that a restrictive monetary policy prompts households with lower liquidity to reduce consumption as disposable income starts to decline, while households with average liquidity save less or borrow more. The study also highlights the differences in consumption changes between savers and borrowers in the face of a monetary policy alteration.

[Capeleti et al. \(2022\)](#) evaluate the effects of pro-cyclical and counter-cyclical credit expansions by public banks on economic growth. The model implements a banking sector with public and private banks competing in a Cournot oligopoly. The results show that the supply of public credit has a stronger effect when the policy is counter-cyclical.

Macroeconomic Modeling

The scientific literature on DSGE modeling is extensive, as it allows for the formulation of various questions and their answers through a general equilibrium model. This includes the aforementioned topics and, also, labor market, as explored by [Ribeiro \(2023\)](#); the real estate market, as studied by [Albuquerque et al. \(2018\)](#); and even deforestation, as investigated by [Pereira and Góes \(2013\)](#). As remarked by [Solis-Garcia \(2022\)](#): *if you have a cohesive economic idea, you can put it in terms of a DSGE model*.

The works of [Costa Junior \(2016\)](#), [Solis-Garcia \(2022\)](#), [Bergholt \(2012\)](#), and [Galí \(2015\)](#), between others, are essential materials for macroeconomic modeling theory, as they guide the reader in developing a DSGE model step-by-step. [Costa Junior \(2016\)](#) starts from a Real Business Cycles (RBC) model and chapter by chapter adds elements of New Keynesian (NK) theory to the model. [Solis-Garcia \(2022\)](#) focuses on the mathematical details necessary to develop a DSGE model, beginning with a RBC model and turning it into a canonical NK model. [Bergholt \(2012\)](#) discusses the key elements of a New Keynesian model and also demonstrates the necessary programming to run the model using the Dynare software. [Galí \(2015\)](#) shows the evolution from an RBC model to an NK model, adding complexity with each chapter.

Macroeconomic Modeling with Regions

Among the works employing DSGE modeling with regions, beside the already mentioned before, there is the study by [Tamegawa \(2012\)](#), which assesses the effects of fiscal policy on two regions using a model featuring two types of households, firms, banks, a national government, and a regional government. Using literature parameters to calibrate the model, the results indicate that indeed there are differences in the effects of fiscal policy depending on which region implements it. It is important to note that the difference between a macroeconomic model and a regional one lies in the fact that in the former, aggregate variables are considered only at the national level, whereas in the latter, both national and regional variables are considered, and depending on the size of the region, the latter might not be able to affect the former, as explained by [Tamegawa \(2013\)](#). A framework to assess the economic evolution of a region in Japan is constructed by [Okano et al. \(2015\)](#), with the aim of identifying the causes of stagnation in the Kansai region.

In a similar vein of demonstrating regional relationships, [Pytlarczyk \(2005\)](#) investigates aspects of the European Monetary Union (EMU), focusing on the German

economy, using a structural model with two regions; [Galí and Monacelli \(2005\)](#) also evaluates the functioning of the EMU, but with a model where regions form a unitary continuum, such that one region cannot affect the entire economy. [Alpanda and Aysun \(2014\)](#) utilize a two-region model to assess the effects of US financial shocks on the euro area economy.

More recently, the article by [Croitorov et al. \(2020\)](#) seeks to identify spillovers between regions, building a model with three regions: the Euro area, the US, and the rest of the world. Similarly investigating spillovers, [Corbo and Strid \(2020\)](#) present a regional model encompassing Sweden and the rest of the world.³

DSGE Methodology

Discuss Theoretical Foundations: Describe the fundamental macroeconomic models, theories, and frameworks relevant to your research. Explain how these theories have evolved over time and influenced the field.

Emphasize Methodology: If your research involves specific methodologies or econometric techniques, discuss them in this section. Explain the relevance of these methods within the context of macroeconomic modeling.

The DSGE methodology, as the name implies, involves the utilization of a Dynamic and Stochastic General Equilibrium model. This model outlines the problem to be addressed, requiring the definition of agents, variables, and parameters. In this research, the objective is to assess the impact of monetary policy on regional gross domestic product using the Canonical New Keynesian structure, as proposed by [Solis-Garcia \(2022\)](#). The structure comprises four representative agents: a household, a retail firm, a continuum of wholesale firms, and a monetary authority. It incorporates key elements of the New Keynesian theory, including monopolistic competition among wholesale firms, the price stickiness they encounter, and the consequential role of monetary policy in the short run. The role of each agent, variable and parameter will be discussed in detail in the next section.

Cite Properly: Ensure that you cite all the sources accurately and consistently

³ Spillovers: effects that are transmitted from one region to another due to an exogenous factor, such as being neighboring regions.

according to the required citation style (e.g., APA, MLA, Chicago).

Use Subheadings: Use subheadings to clearly delineate different themes or topics within the literature review. This makes it easier for your readers to follow your discussion.

Provide Critical Analysis: Don't just summarize the literature; critically evaluate the strengths and weaknesses of the studies you've reviewed. Discuss any methodological limitations or potential biases in the research.

Keep it Relevant: Stick to the literature that is directly relevant to your research questions. Avoid going off-topic or including excessive detail.

Conclude the Literature Review: Summarize the key takeaways from your review. Restate the gaps in the literature and how your research will address them.

Be Concise and Clear: Write in a clear, concise, and organized manner. Avoid overly technical jargon that might confuse readers.

Revise and Proofread: Review and edit your literature review section for clarity, coherence, and grammatical accuracy.

Seek Feedback: Share your literature review with your thesis advisor or a peer for feedback and suggestions for improvement.

Update as Necessary: If you make significant changes to your research, revisit and update your literature review to reflect any new developments in the field.

Regional Economics

Regional DSGE Models

Impacts of Monetary Policy on Regional Gross Domestic Product

The monetary authority uses the monetary policy to ensure