

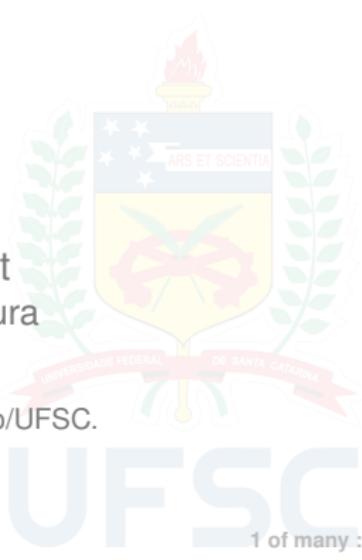
Assessing the impact of conventional monetary policy on the capital-labor ratio in Brazil.

Master thesis defense

Candidate: Aishameriane Schmidt
Advisor: Prof. Dr. Guilherme Valle Moura

Programa de Pós-Graduação em Economia - PPGEco/UFSC.

Florianópolis, March 15, 2019.

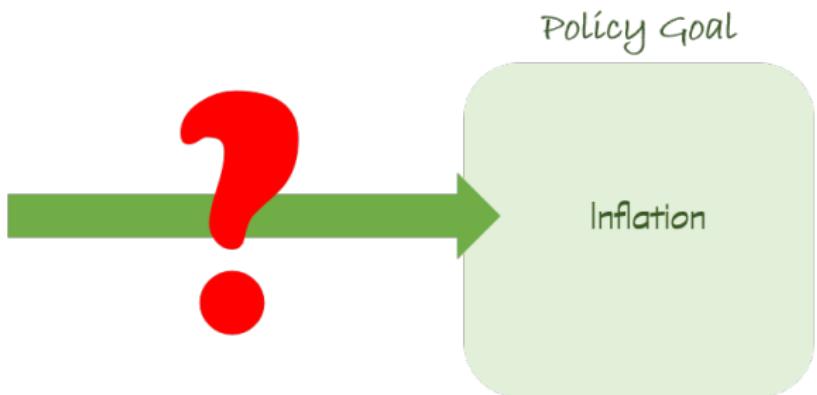


Motivation

How the Central Bank affects the economy?



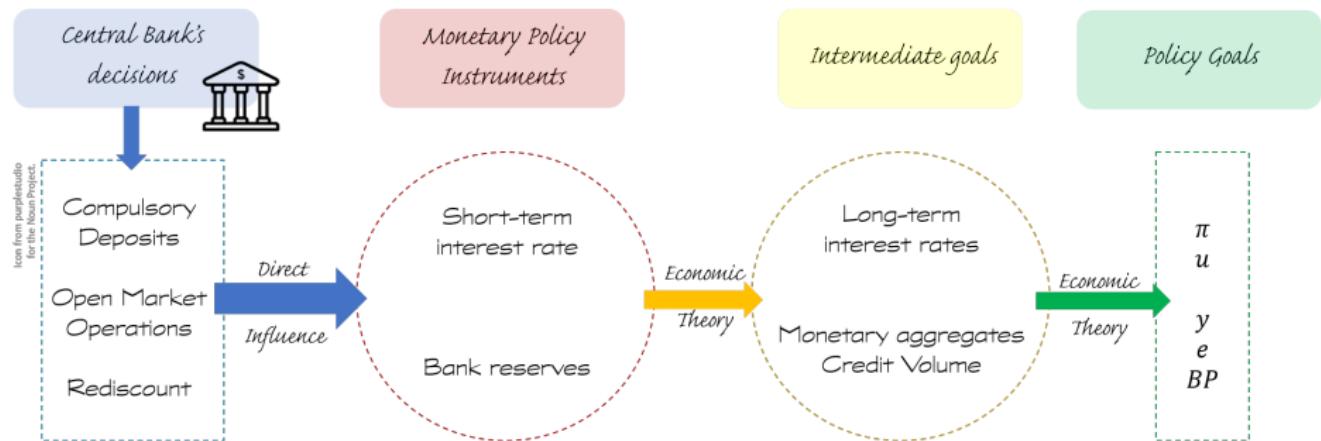
Central Bank



Icon from purplestudio
for the Noun Project.

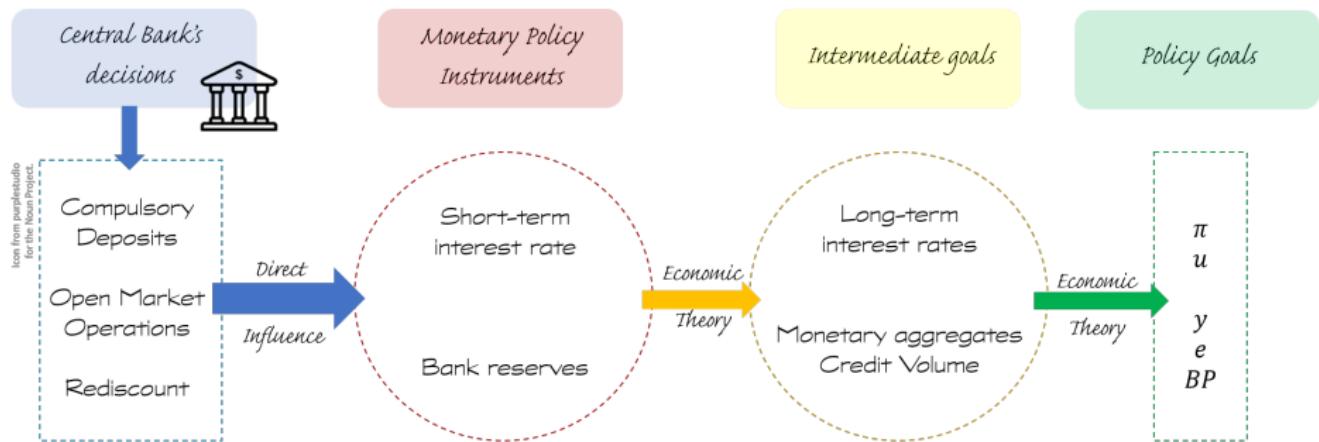
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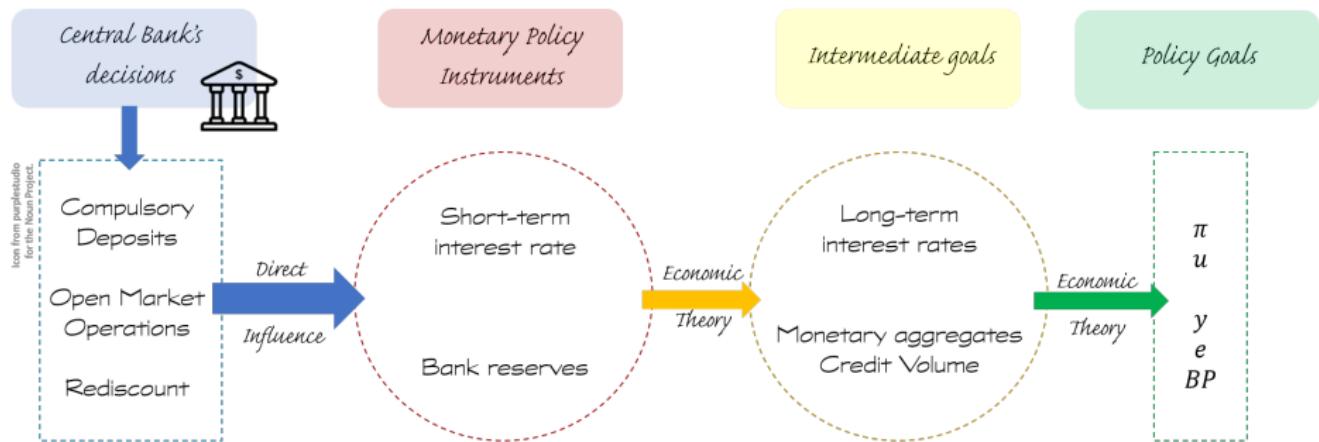
How the Central Bank affects the economy?



- ▶ Is it reasonable to assume that the MP effects will be **homogeneous** among households?

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How the Central Bank affects the economy?



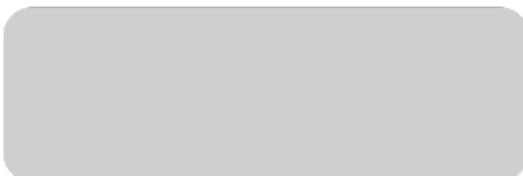
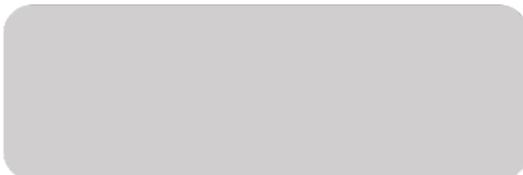
- ▶ Is it reasonable to assume that the MP effects will be **homogeneous** among households?
- ▶ What if the overall effect of monetary policy is conditional to the degree of **heterogeneity** among households?

Outline

Introduction: the
heterogeneous
effects of MP



You are here!



Outline

Introduction: the heterogeneous effects of MP

The redistribution channels of MP and empirical results

"Economics background"



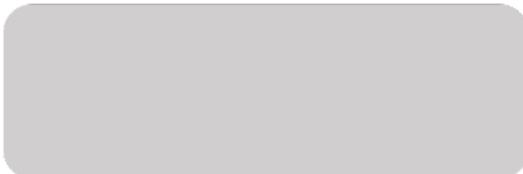
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Introduction: the heterogeneous effects of MP

The redistribution channels of MP and empirical studies

Adding T to Uhlig's (1997) model

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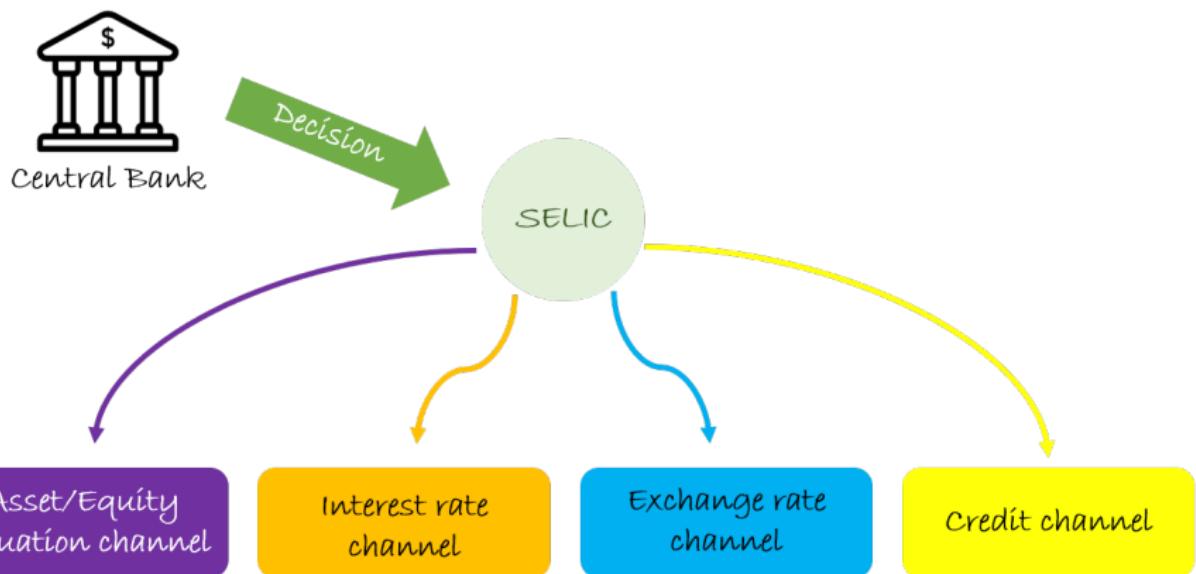
Assessing the impact of MP on K/L in Brazil

"Econometrics background"



Monetary Policy transmission channels

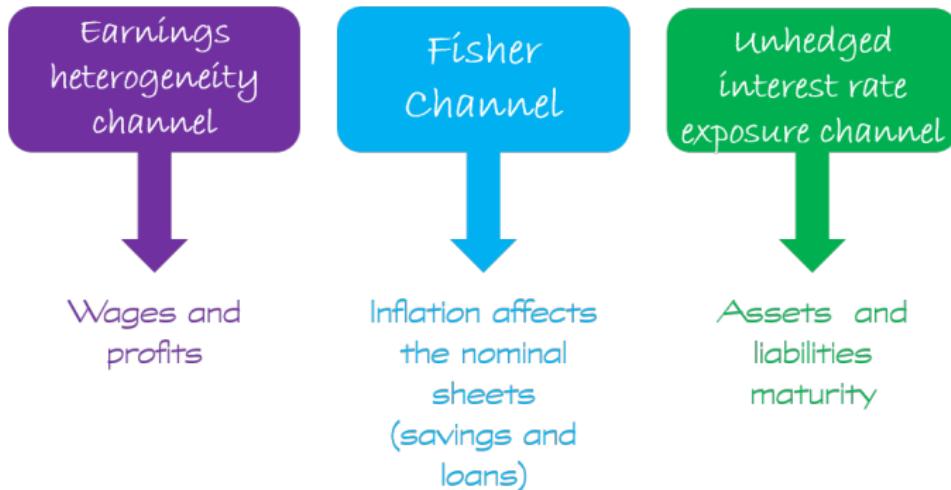
How the MP decisions reach the economic aggregates



Adapted from Mishkin (1996).

Redistributive channels of monetary policy

How the MP decisions reach the economic aggregates **agents** and affect their income and wealth



Adapted from Auclert (2017) and Pugh et al. (2018).

Redistributive channels of monetary policy

Income heterogeneity channel

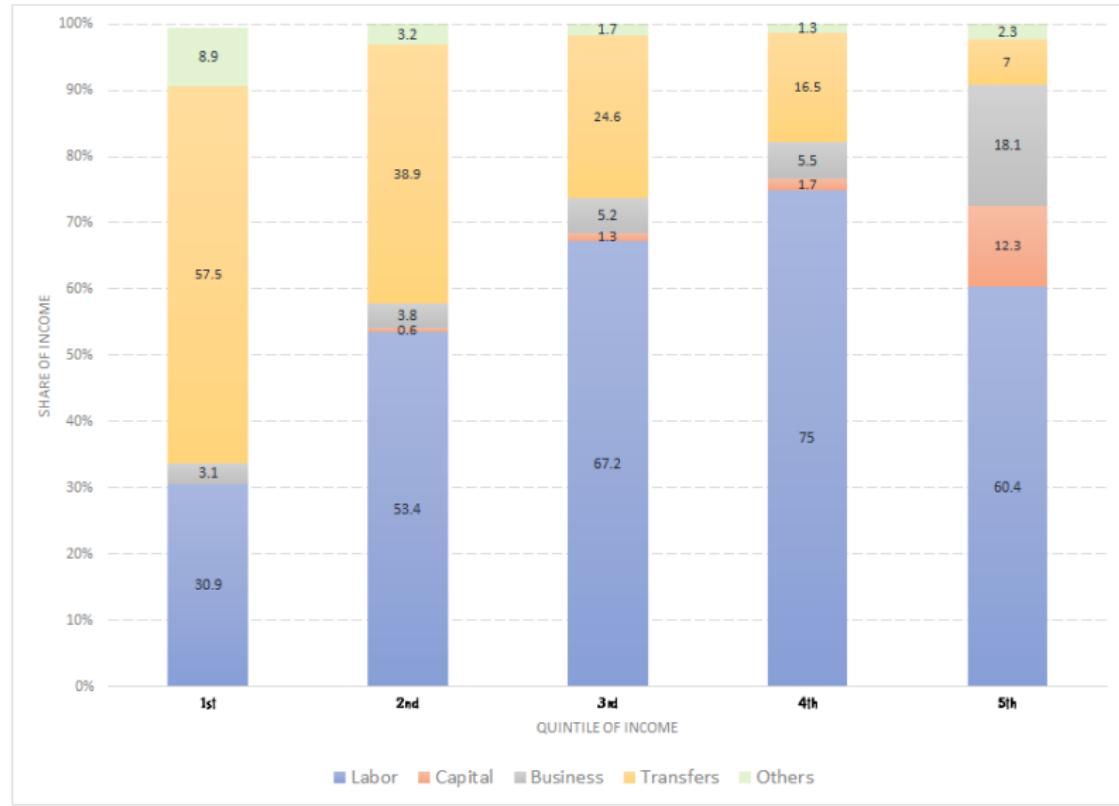


Figure: Income source as a share of household income. United States, 2013. 10 of many :)

Redistributive channels of monetary policy

Income heterogeneity channel

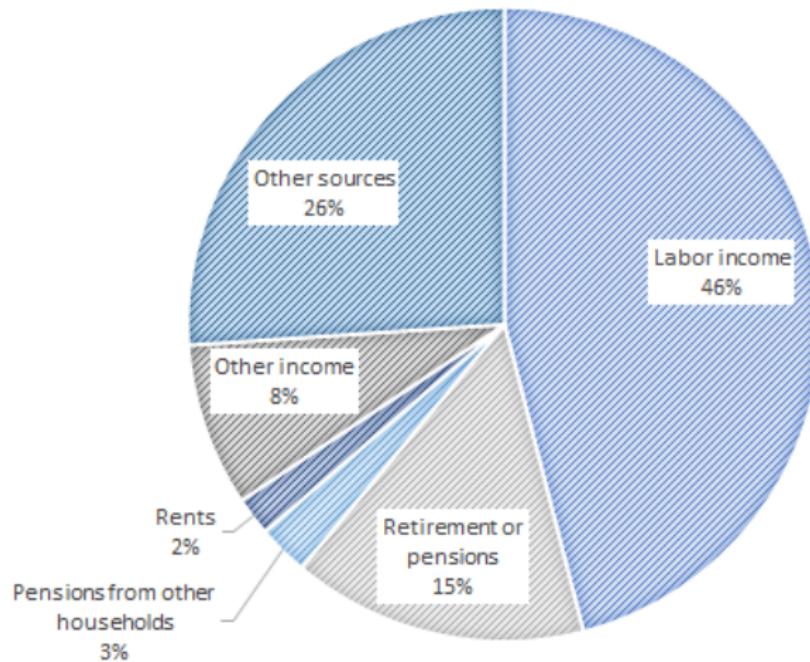


Figure: Income composition. Brazil, 2017.

Redistributive channels of monetary policy

Income heterogeneity channel

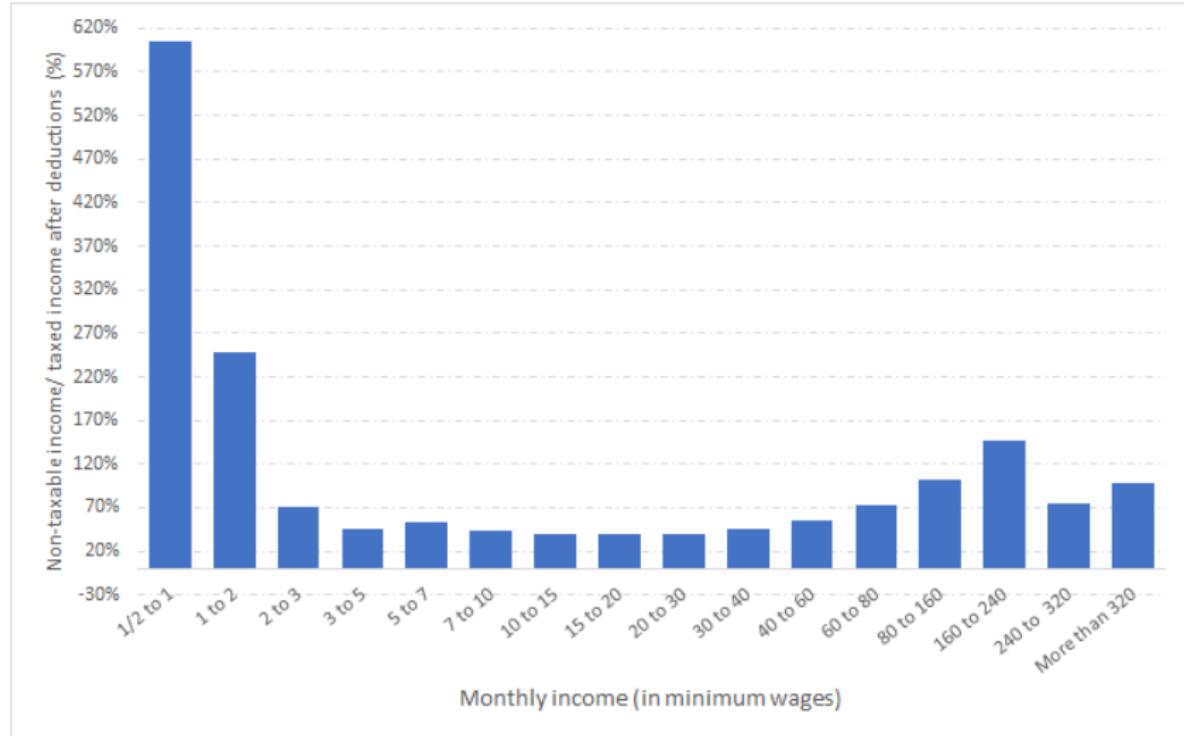


Figure: Non-taxable income as proportion of the taxed income accordingly to groups of total declared income, Brazil, 2016.

Redistributive channels of monetary policy

Income heterogeneity channel



Cartoon adapted from Sarah's Scribbles
(<https://www.facebook.com/pg/DoodleTimeSarah>).

Redistributive channels of monetary policy

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Redistributive channels of monetary policy

Income heterogeneity channel

Less Income

More Income



Depends from
gov. transfers



Will be mostly
unaffected by
changes in
interest rates



Cartoon adapted from Sarah's Scribbles
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Redistributive channels of monetary policy

Income heterogeneity channel

Less Income



Depends from
gov. transfers



Will be mostly
unaffected by
changes in
interest rates

Income from
labor
(cat sitter)



Interest rate
affect
unemployment
rate, which is
related to wages.

More Income



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(<https://www.facebook.com/pg/DoodleTimeSarah>).

Redistributive channels of monetary policy

Income heterogeneity channel

Less Income



Depends from
gov. transfers



Will be mostly
unaffected by
changes in
interest rates

Income from
labor



Interest rate
indirectly affects
unemployment
rate, which is
related to wages.

More Income

Income from
labor + capital



The portion of the
income derived from
capital will be
affected by changes
in interest rates.

Cartoon adapted from Sarah's Scribbles
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Redistributive channels of monetary policy

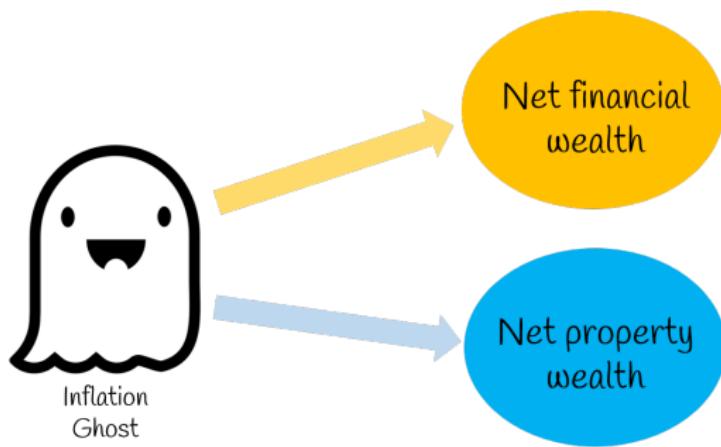
Fisher (or inflation) channel



Figure: Wealth composition for different household groups in the USA, 2001.

Redistributive channels of monetary policy

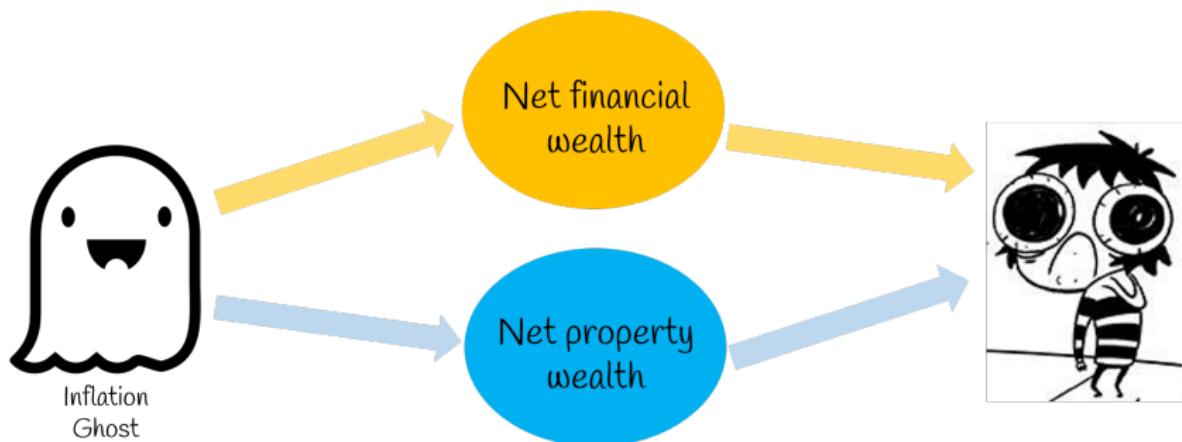
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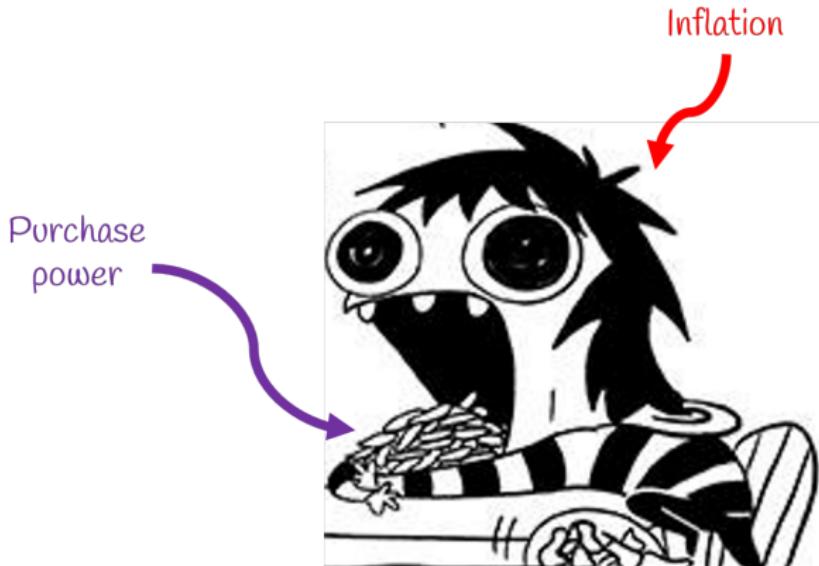
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Interest rate exposure channel

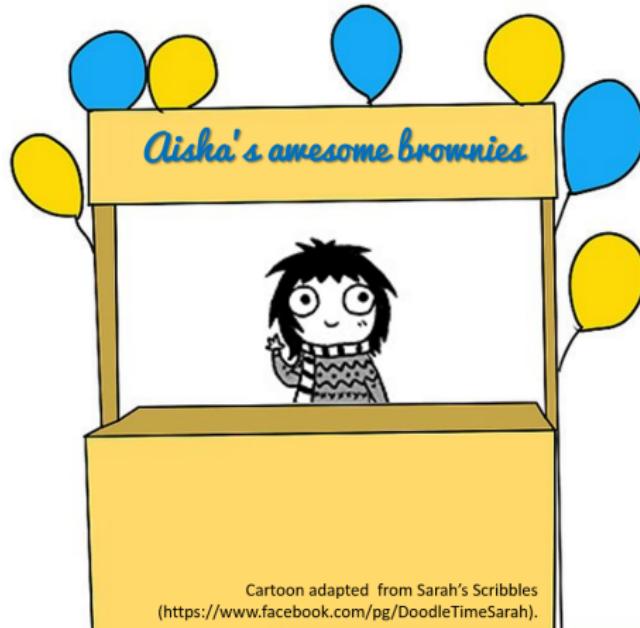


Figure: Aisha's plan B if the PhD applications go wrong.

Redistributive channels of monetary policy

Interest rate exposure channel

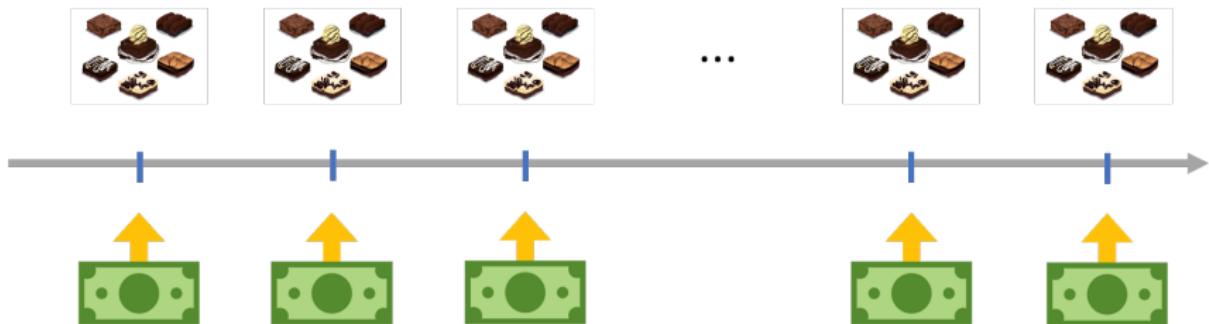


Figure: Payments for goods made on the same day of the inputs purchase.

Redistributive channels of monetary policy

Interest rate exposure channel

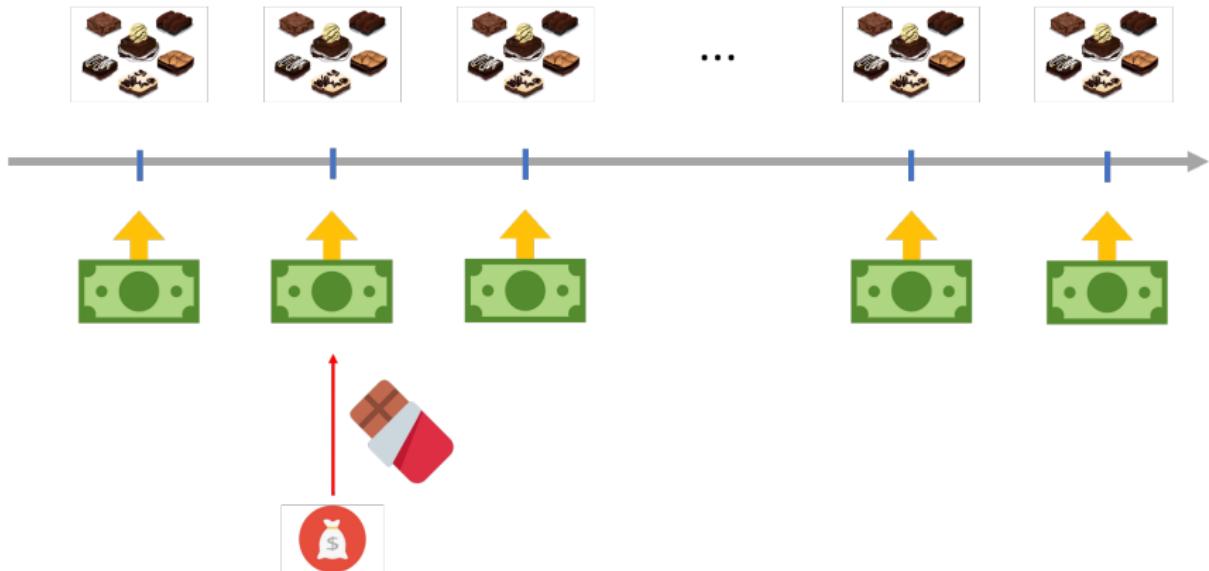


Figure: A shock on the Belgian chocolate price will be covered by the daily payment.

Redistributive channels of monetary policy

Interest rate exposure channel



Figure: Payments for goods made by the end of the month - the contract includes raises in the inputs.

Redistributive channels of monetary policy

Interest rate exposure channel

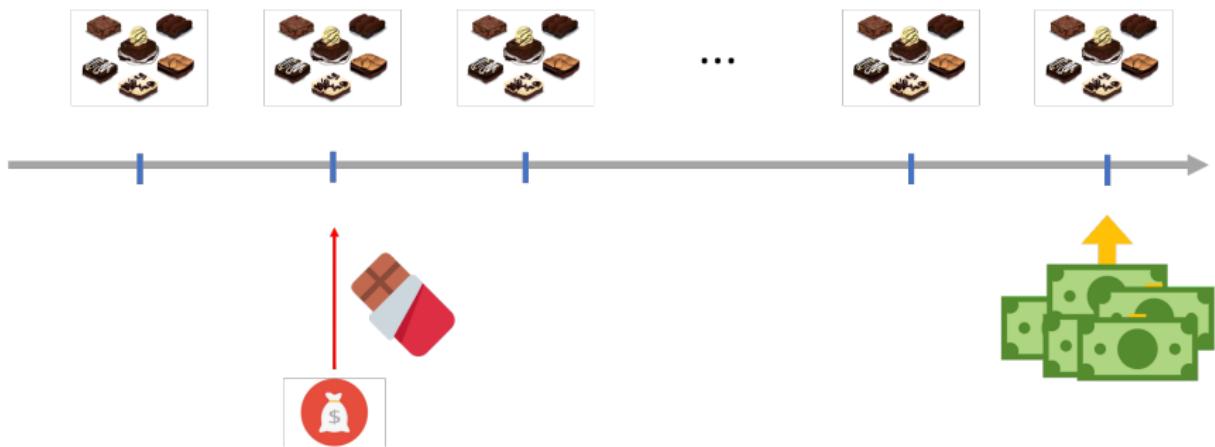


Figure: A shock on the Belgian chocolate price will be compensated only by the end of the month, and that might be too late.

Redistributive channels of monetary policy

Interest rate exposure channel

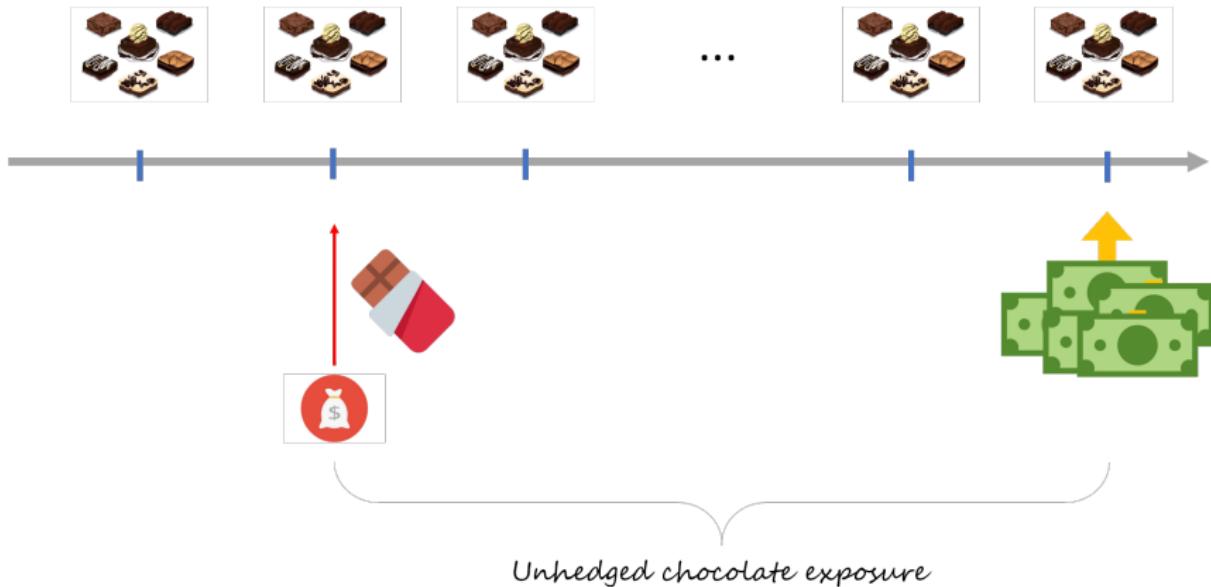
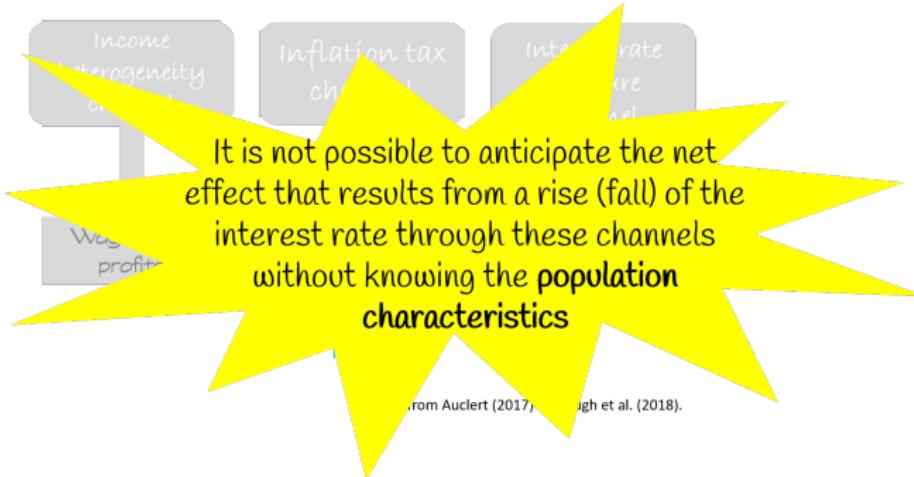


Figure: The time between the input purchase and the payment for the brownies is the period of the *Unhedged Chocolate Exposure*.

Redistributive channels of monetary policy

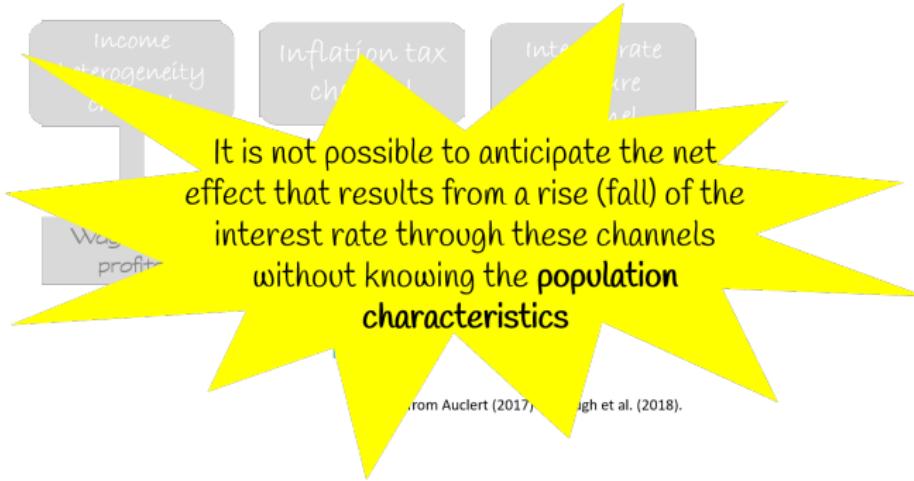
How the MP decisions reach the economic aggregates **agents** and affect their income and wealth



- The net effects of the MP transmission through these channels are **uncertain** and depend on the characteristics of a particular economy.

Redistributive channels of monetary policy

How the MP decisions reach the economic aggregates **agents** and affect their income and wealth



- The net effects of the MP transmission through these channels are **uncertain** and depend on the characteristics of a particular economy.
- Theory by itself **cannot assess** the direction or global magnitude of the MP on income and wealth distribution when we consider all channels together - **empirical studies are needed** [Pugh et al., 2018].

Redistributive channels of monetary policy

Empirical studies

- ▶ The empirical literature **does** not present a convergence of results.

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 - ▶ In studies where researchers found a positive/negative relationship between MP and inequality, **the magnitude was small**;
 - ▶ For studies using data from multiple countries, the results changed from country to country.
- ▶ **There are no studies for Brazil linking MP and inequality or distribution.**

“The better way to look at the distributional effect of monetary policy is to compare changes in the income flowing from **capital investments** with the income from **labor**. ”

[Bernanke, 2015]

What if we want to make an empirical study for Brazil?

- ▶ A common characteristic between the three redistributive channels shown before is that the **income composition** matters: wages, financial assets, savings, loans, etc.

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- ▶ A common characteristic between the three redistributive channels shown before is that the **income composition** matters: wages, financial assets, savings, loans, etc.
- ▶ In order to capture the relationship between the interest rate changes and some income distribution variable, we are going to need at least **quarterly data**.

The capital-labor ratio

- ▶ Series of income inequality/distribution in Brazil are **scarce**;
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 - ▶ It is the quotient between the share of capital income by the share of labor income;
- ▶ If these two factors are not evenly distributed among the population then **changes in K/L represent redistribution effects**.

Research proposal

Our quest

To assess **if there is** an impact from **monetary policy shocks** on the **capital-labor ratio** in Brazil, considering the inflation targeting period (2000-2018).

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Specific goals:

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Side quest:

1. To **extend** [Uhlig, 1997] BVAR to a **TVP-VAR** model.

Empirical model

Adding T to Uhlig's model

We can add time variation to the α_t coefficients:

$$y_t = Z_t \alpha_t + \epsilon_t, \quad (1)$$

with $\epsilon_t = \mathcal{U}(\Omega_t^{-1})' \xi_t$ and $\xi_t \sim \mathcal{N}(0, \mathbb{I}_m)$.

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And now we need two law of motions to describe the states:

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- ▶ We cannot observe α_t directly (**latent variable**);
- ▶ If Ω_t^{-1} was deterministic, then we could use the Kalman filter;
 - ▶ Since it is not the case, we have an **high dimensional integral that cannot be solved in closed-formula**.

Empirical model

Why this is a good idea?

- ▶ This model is more **parsimonious** than [Primiceri, 2005] and [Cogley and Sargent, 2005];

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Problem

We are going to need a method to estimate the parameters!

Empirical model

A Bayesian Wishart TVP-VAR

- ▶ A Bayesian approach allows to incorporate **economic constraints and beliefs** in form of **priors**;

Empirical model

A Bayesian Wishart TVP-VAR

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Empirical model

A Bayesian Wishart TVP-VAR

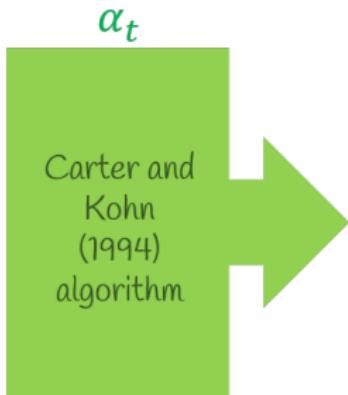
- ▶ A Bayesian approach allows to incorporate **economic constraints and beliefs** in form of **priors**;
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- ▶ We are able to make inference using an **entire posterior density**.

Proposal

To use [Windle and Carvalho, 2014]'s propositions in a Gibbs sampler algorithm combined with [Carter and Kohn, 1994] and a conjugate prior.

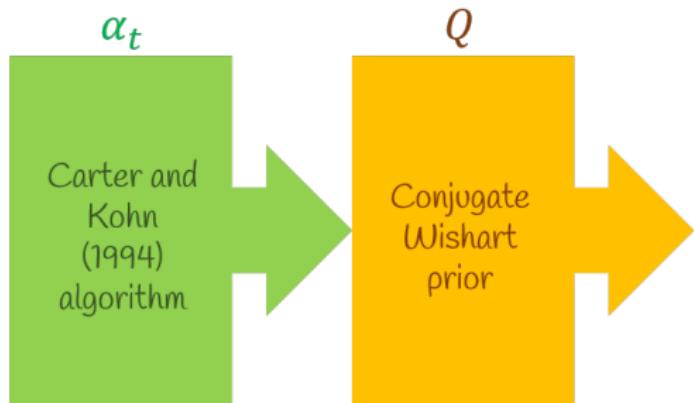
Estimating Uhlig's extended model

Gibbs sampler scheme



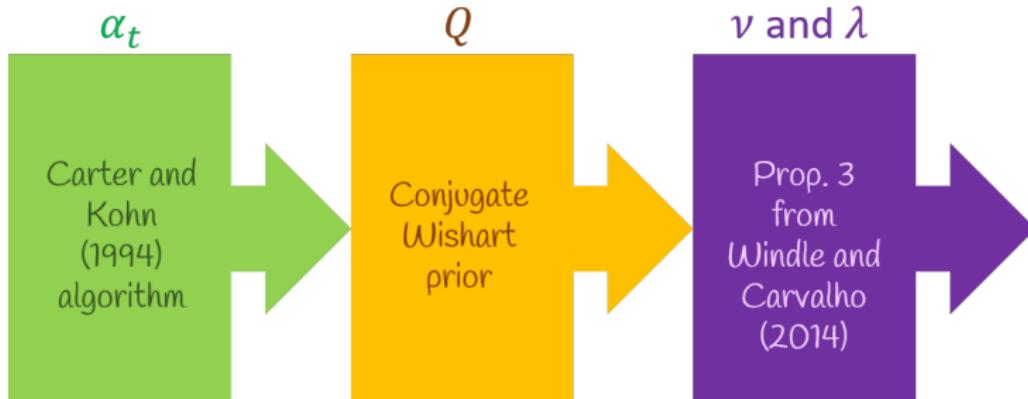
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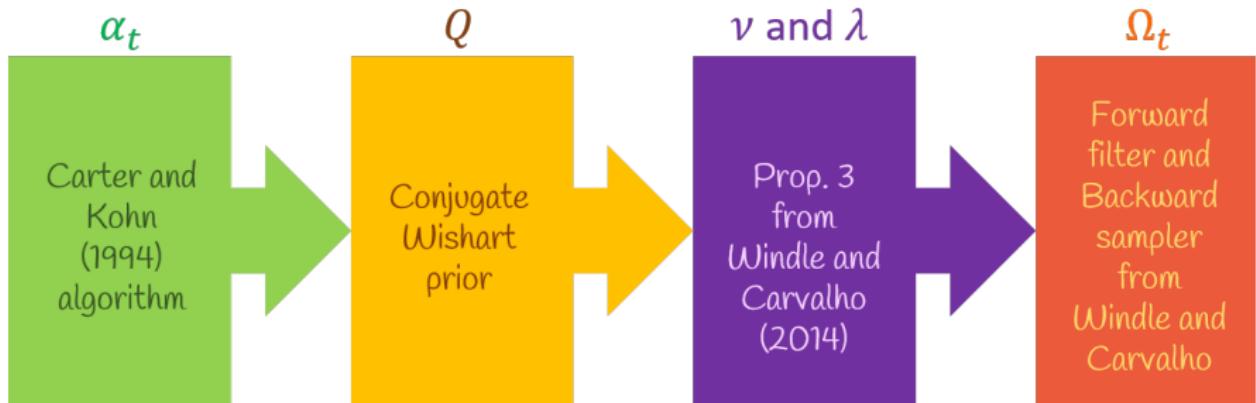
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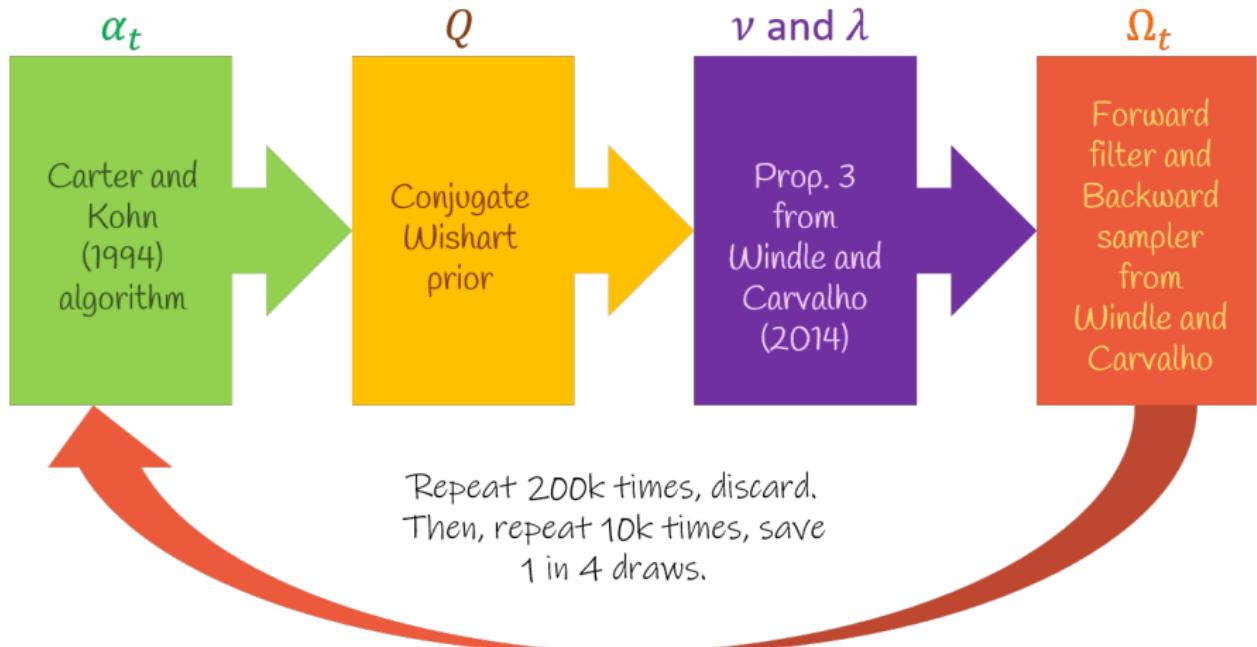
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Empirical model

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$K/L \rightarrow$ IPCA \rightarrow GDP \rightarrow SELIC \rightarrow Ex. Rate

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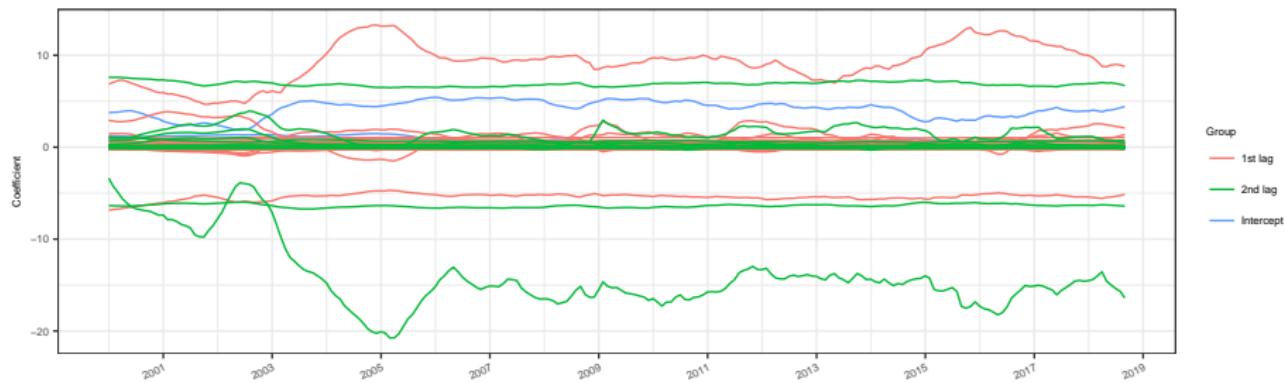
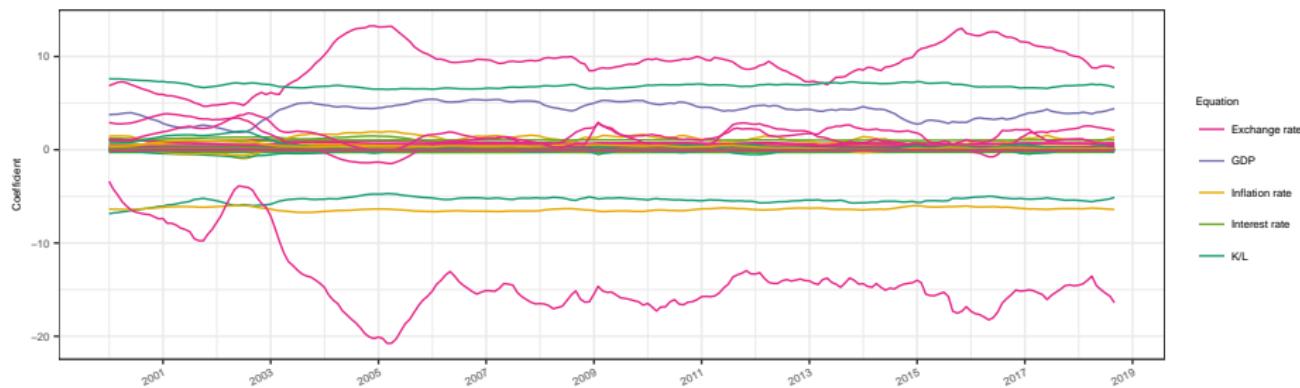
- ▶ **IRF computation:** For each period, a different IRF is calculated using the respective estimated coefficients and volatility.

Results

Coefficients evolution across time

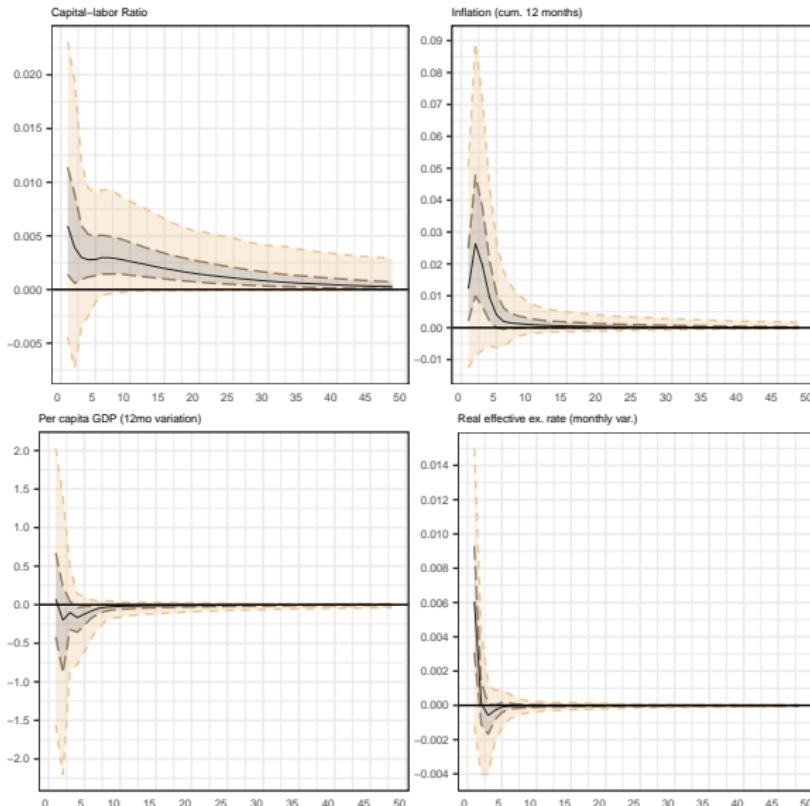
Results

Coefficients evolution across time



Results

Effects from a unitary shock of the interest rate on the other variables - last period



Results

Effects from a unitary s.d. shock of the interest rate on K/L and Inflation - selected periods based on changes in the CB or the Min. of Finance

Results

Effects from a unitary s.d. shock of the interest rate on the capital-income ratio - all periods

Wrapping up

- ▶ The **monetary policy shocks** significantly affect the **capital-labor ratio** and its effects last for a year (until shortly after 2010);

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- ▶ This **relationship** was **not stable** during the inflation-target period - it became weaker and non-significant after 2010;
 - ▶ Although there is no evidence of large drifts in the coefficients, there is sufficient noise in the estimated variance to suggest the presence of stochastic volatility.
- ▶ Our findings are compatible with the hypothesis of the **income heterogeneity channel**, although it is not possible to discard completely the existence of a **interest exposure channel** effect.

Further developments

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- ▶ Estimate a simpler model using data from the **national accounts** (IBGE, quarterly) - robustness check;
- ▶ **Shrinkage** methods such as the one described in [Bitto and Frühwirth-Schnatter, 2016] could be used in order to improve our estimates.

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Assessing the impact of conventional monetary policy on the capital-labor ratio in Brazil.

Thank you!

<http://aishameriane.github.io>



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Advisor: Prof. Dr. Guilherme Valle Moura

Programa de Pós-Graduação em Economia - PPGEco/UFSC.



After defense

Join me to celebrate (or not)

Comemoração ou afogamento de
mágoas após a n-ésima defesa de
mestrado da Aisha (n=1)

Local: O Viking hamburguer e chopp (Lauro Linhares, próximo à Madre Benvenuta, no Posto de Gasolina da Vovó)

Dia: 15/03/2019 (sexta-feira)

Horário: 20h

* Para não estragar o evento, é proibido perguntar “*E agora, vai fazer o quê?*”, “*Como vão os applications?*”, “*Vai publicar em algum lugar?*”, “*Se inscreveu no doutorado?*” e similares :D

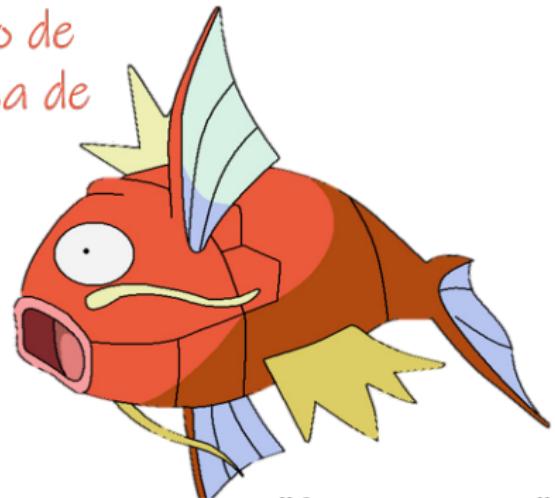


Figure: We are going to celebrate or join Aisha in misery tonight (8 pm) at “O Viking Hamburguer e Chopp”, at Lauro Linhares Street, 1619 (it is in a gas station). It is forbidden to ask her about PhD applications unless you want to talk about making a funded offer. :-)