

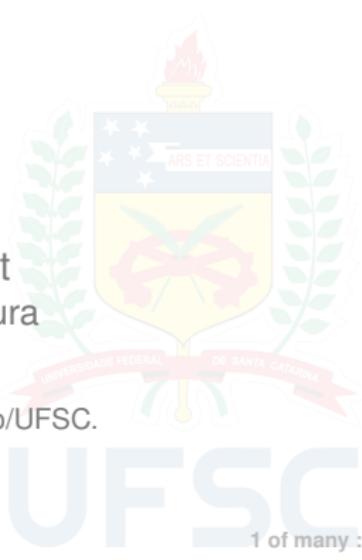
# Assessing the impact of conventional monetary policy on the capital-labor ratio in Brazil.

***Master thesis defense***

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

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

Florianópolis, March 15, 2019.

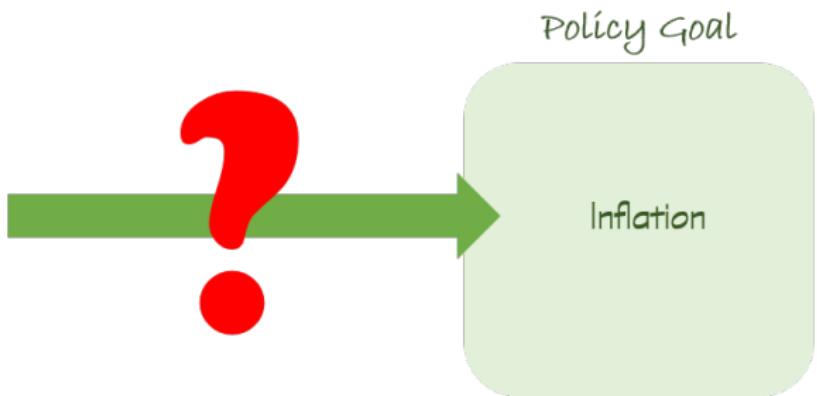


# Motivation

How the Central Bank affects the economy?



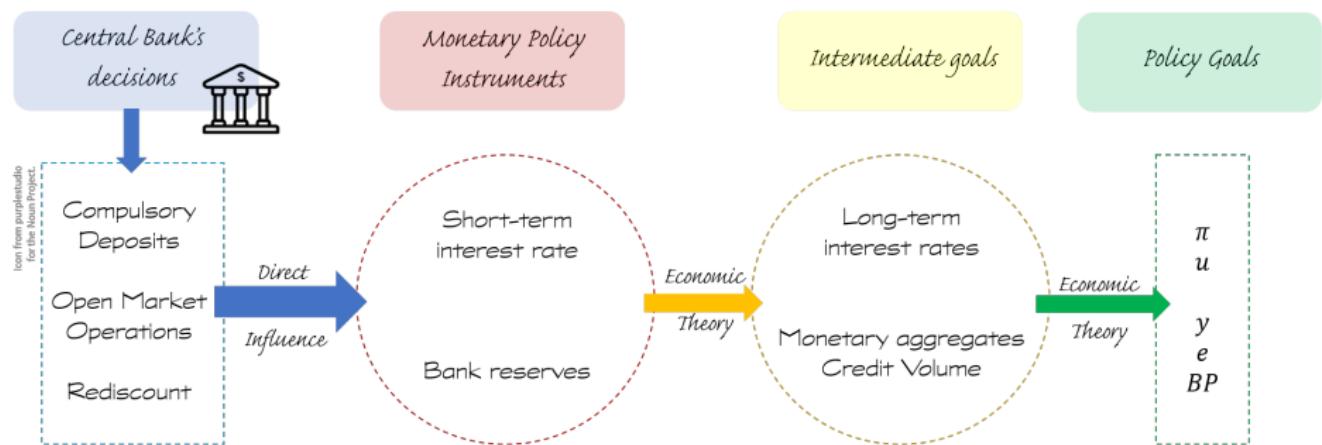
Central Bank



Icon from purplestudio  
for the Noun Project.

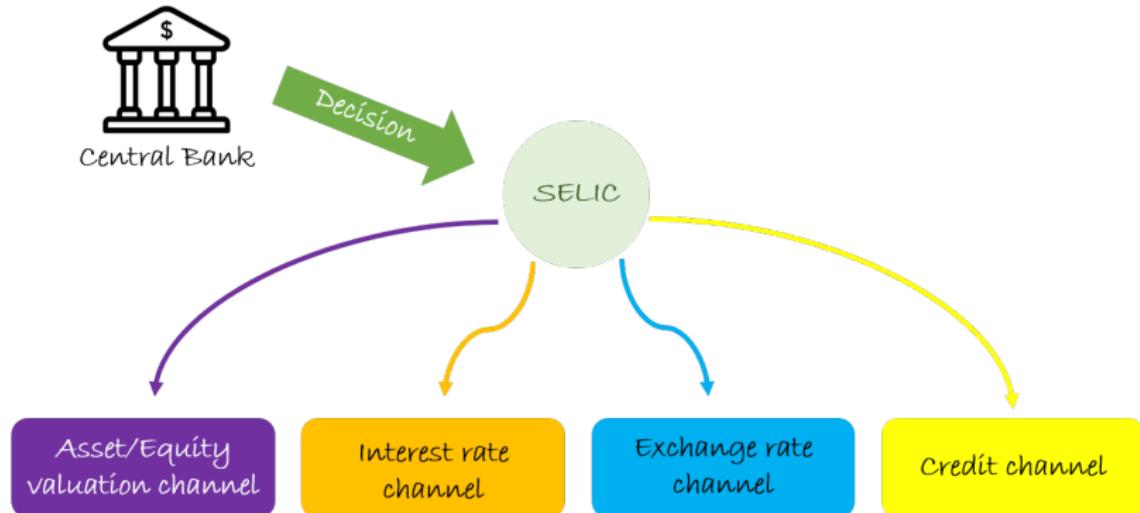
# Motivation

How the Central Bank affects the economy?



# Monetary Policy transmission channels

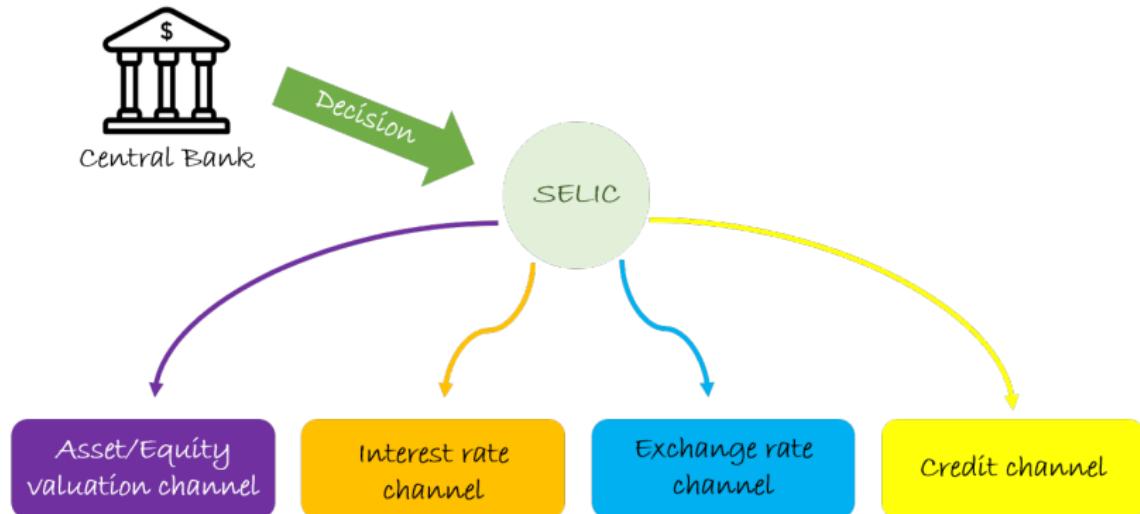
How the MP decisions reach the economic aggregates



Adapted from Mishkin (1996).

# Monetary Policy transmission channels

How the MP decisions reach the economic aggregates

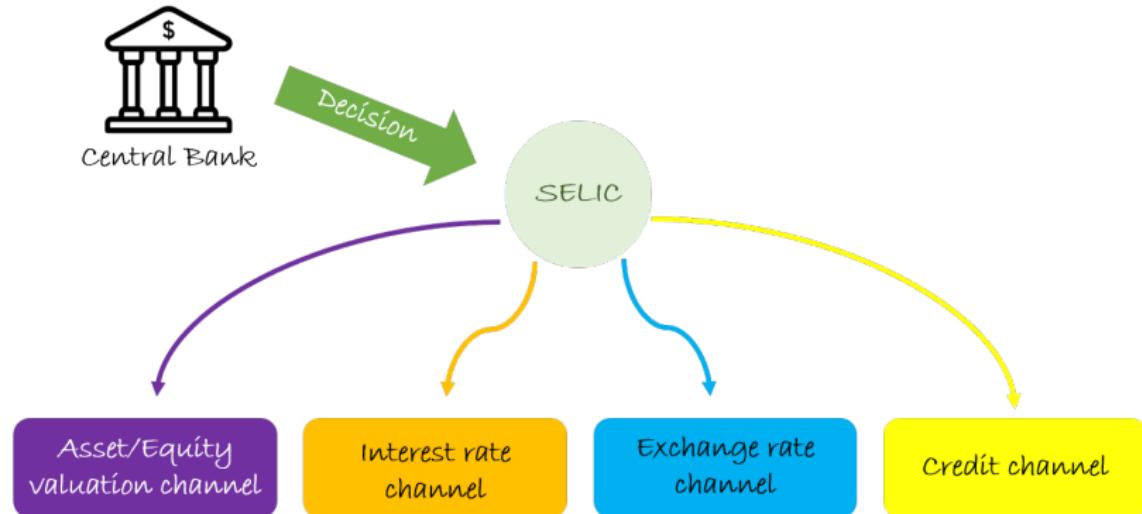


Adapted from Mishkin (1996).

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

# Monetary Policy transmission channels

How the MP decisions reach the economic aggregates



Adapted from Mishkin (1996).

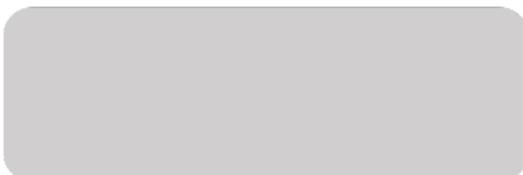
- ▶ Is it reasonable to assume that the MP effects will be **homogeneous** among households?
- ▶ What if the overall effect of monetary policy is conditional to the degree of **heterogeneity** among households?

# 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"

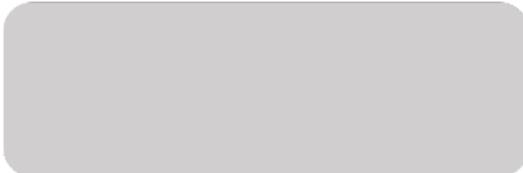
# Outline

*Introduction: the heterogeneous effects of MP*

*The redistribution channels of MP and empirical studies*

*Adding  $T$  to Uhlig's (1997) model*

"Econometrics background"



# Outline

*Introduction: the heterogeneous effects of MP*

*The redistribution channels of MP and empirical studies*

*Adding T to Uhlig's (1997) model*

*Assessing the impact of MP on K/L in Brazil*

"Econometrics background"



# Motivation

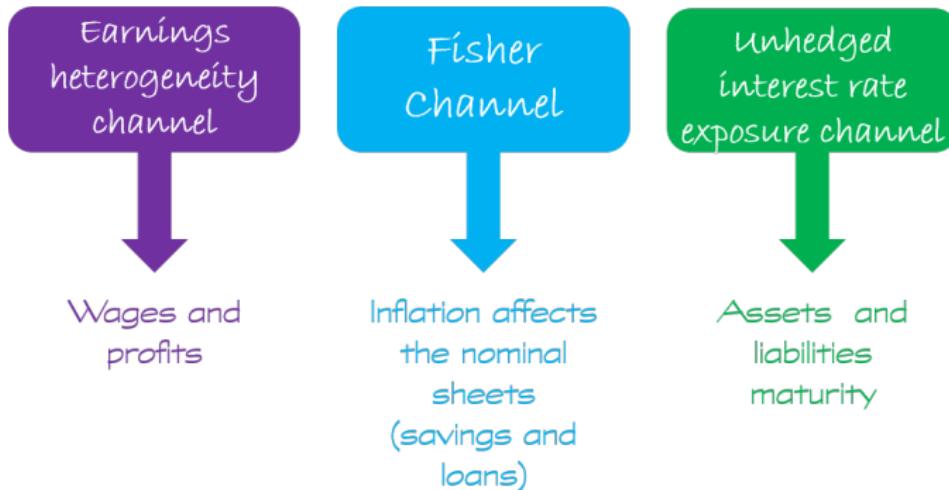
## Aggregation and heterogeneity

“Aggregation would not matter if we could be sure that the marginal propensities to spend from wealth were the same for creditors and debtors. (...) There are indeed reasons for expecting or at least for suspecting, just that. **The population is not distributed between debtors and creditors randomly.** Debtors have borrowed for good reasons, most of which indicate a high marginal propensity to spend from wealth or from current income or from any liquid resources they can command.”

[Tobin, 1982]

# Redistributive channels of monetary policy

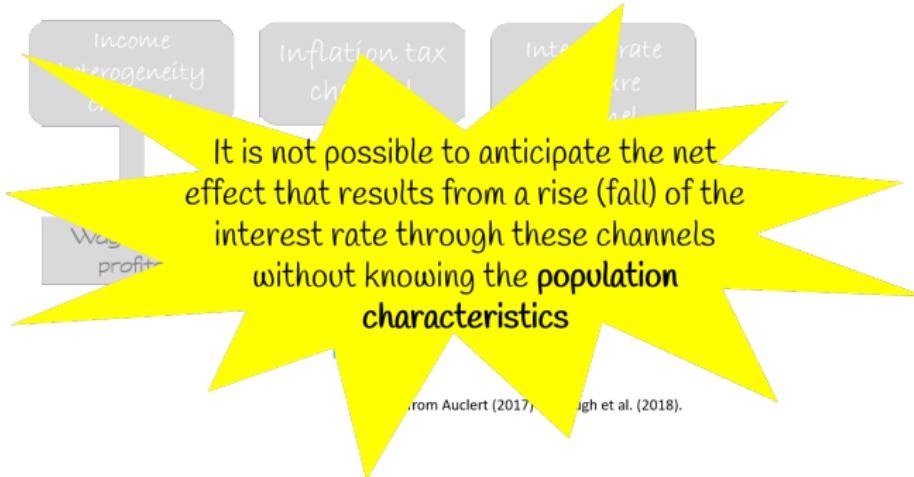
How the MP decisions reach the economic aggregates **agents** and affect their income and wealth



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

# Redistributive channels of monetary policy

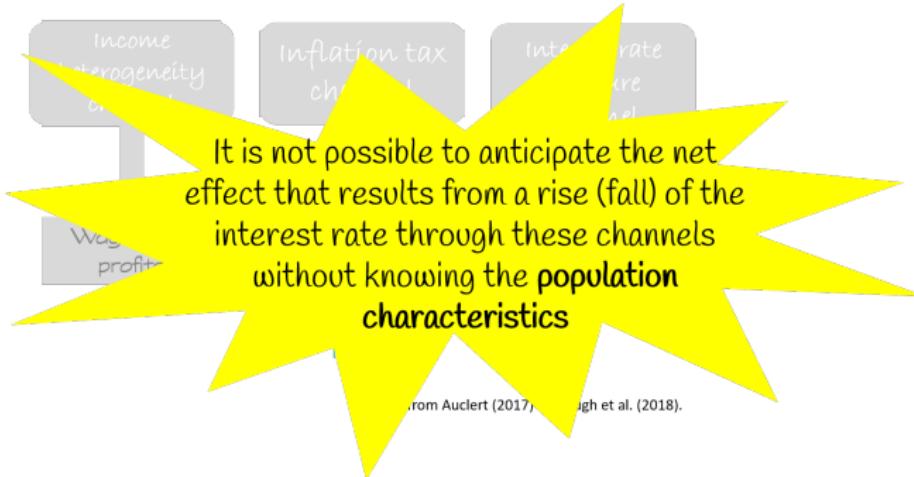
How the MP decisions reach the economic aggregates **agents** and affect their income and wealth



- 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.

# Redistributive channels of monetary policy

## Empirical studies

- ▶ The empirical literature **does** not present a convergence of results.
  - ▶ Increases in the interest rates can **increase**, **decrease** or have **no effect** over inequality (wealth and/or income);

# Redistributive channels of monetary policy

## Empirical studies

- ▶ The empirical literature **does** not present a convergence of results.
  - ▶ Increases in the interest rates can **increase**, **decrease** or have **no effect** over inequality (wealth and/or income);
  - ▶ In studies where researchers found a positive/negative relationship between MP and inequality, **the magnitude was small**;

# Redistributive channels of monetary policy

## Empirical studies

- ▶ The empirical literature **does** not present a convergence of results.
  - ▶ Increases in the interest rates can **increase**, **decrease** or have **no effect** over inequality (wealth and/or income);
  - ▶ 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.

# Redistributive channels of monetary policy

## Empirical studies

- ▶ The empirical literature **does** not present a convergence of results.
  - ▶ Increases in the interest rates can **increase**, **decrease** or have **no effect** over inequality (wealth and/or income);
  - ▶ 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.

# Redistributive channels of monetary policy

## Empirical studies

- ▶ The empirical literature **does** not present a convergence of results.
  - ▶ Increases in the interest rates can **increase**, **decrease** or have **no effect** over inequality (wealth and/or income);
  - ▶ 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.**

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

# Redistributive channels of monetary policy

## Income heterogeneity



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

# Redistributive channels of monetary policy

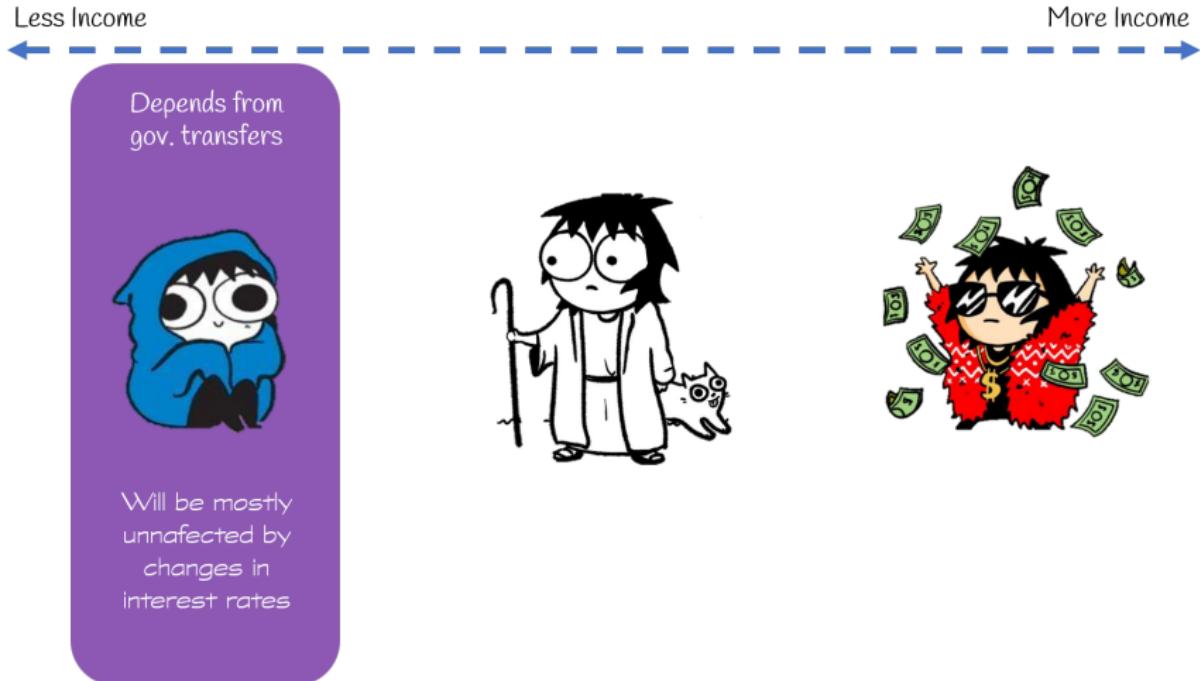
## Income heterogeneity



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

# Redistributive channels of monetary policy

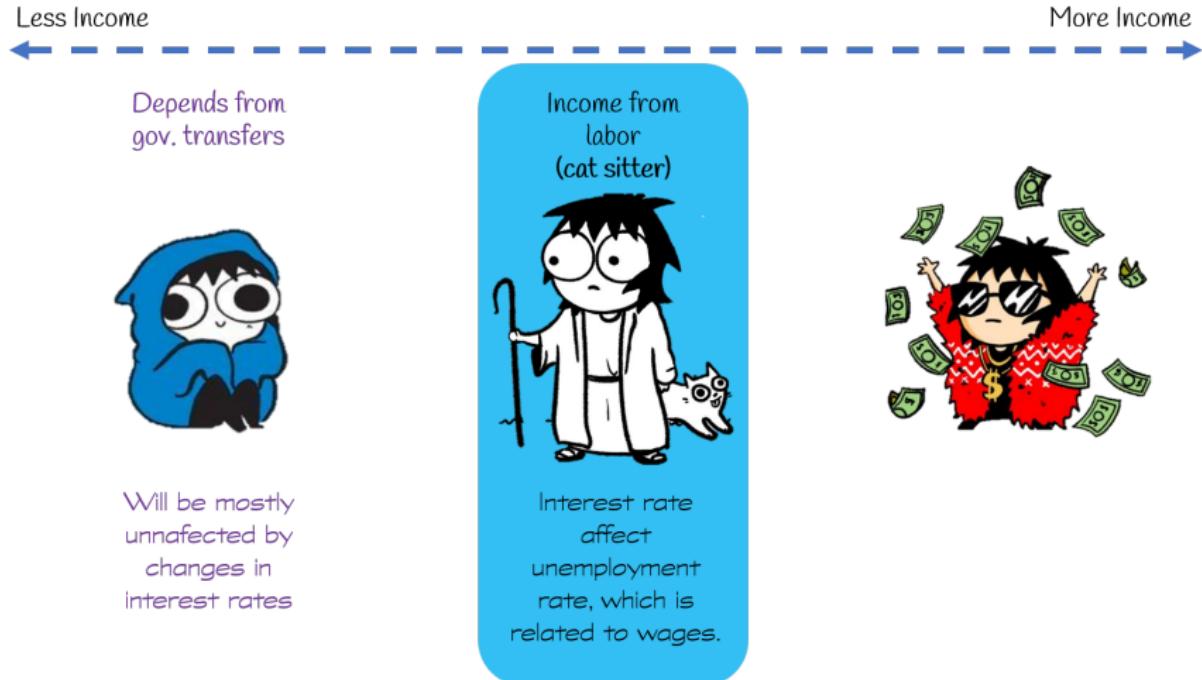
## Income heterogeneity



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

# Redistributive channels of monetary policy

## Income heterogeneity



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

# Redistributive channels of monetary policy

## Income heterogeneity

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

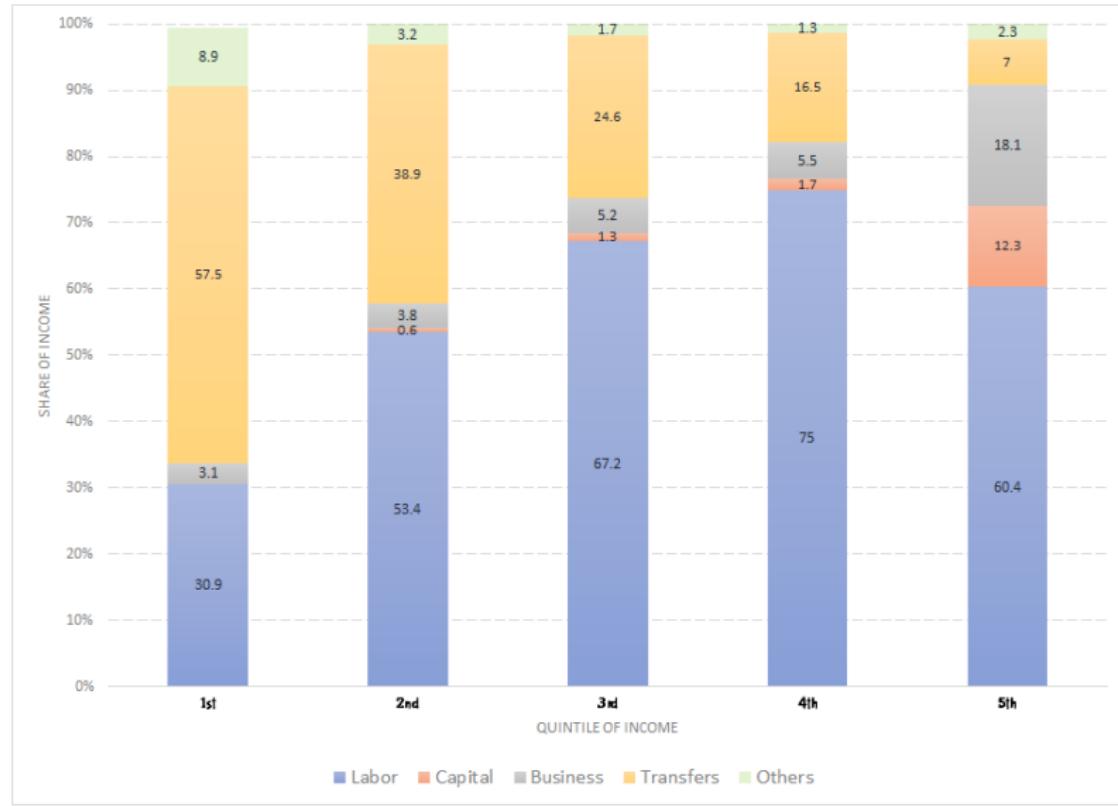


The portion of the  
income derived from  
capital will be  
affected by changes  
in interest rates.

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

# Redistributive channels of monetary policy

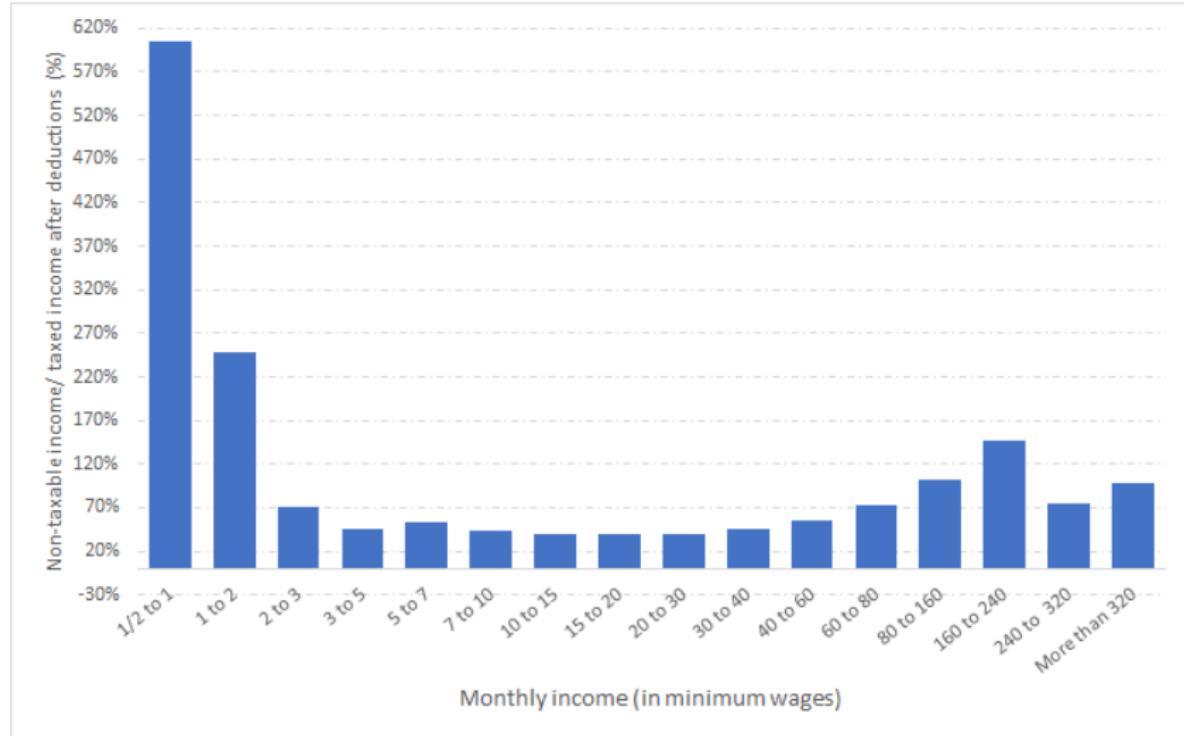
## Income heterogeneity



**Figure:** Income source as a share of household income. United States, 2013. 18 of many :)

# Redistributive channels of monetary policy

## Income heterogeneity



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

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

“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?

“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]

- ▶ 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**;
  - ▶ The few existing series are usually distributed in **years** (ex. Gini);

# The capital-labor ratio

- ▶ Series of income inequality/distribution in Brazil are **scarce**;
  - ▶ The few existing series are usually distributed in **years** (ex. Gini);
- ▶ The Brazilian IRS has monthly data of the **capital income** ( $K$ ) and **labor income** ( $L$ ) that are obtained from the tax returns (households & firms);

# The capital-labor ratio

- ▶ Series of income inequality/distribution in Brazil are **scarce**;
  - ▶ The few existing series are usually distributed in **years** (ex. Gini);
- ▶ The Brazilian IRS has monthly data of the **capital income** ( $K$ ) and **labor income** ( $L$ ) that are obtained from the tax returns (households & firms);
- ▶  $K/L$  is a measure that represents the ***functional distribution of income*** between two factors: labor and capital;

# The capital-labor ratio

- ▶ Series of income inequality/distribution in Brazil are **scarce**;
  - ▶ The few existing series are usually distributed in **years** (ex. Gini);
- ▶ The Brazilian IRS has monthly data of the **capital income** ( $K$ ) and **labor income** ( $L$ ) that are obtained from the tax returns (households & firms);
- ▶  $K/L$  is a measure that represents the ***functional distribution of income*** between two factors: labor and capital;
  - ▶ It is the quotient between the share of capital income by the share of labor income;

# The capital-labor ratio

- ▶ Series of income inequality/distribution in Brazil are **scarce**;
  - ▶ The few existing series are usually distributed in **years** (ex. Gini);
- ▶ The Brazilian IRS has monthly data of the **capital income** ( $K$ ) and **labor income** ( $L$ ) that are obtained from the tax returns (households & firms);
- ▶  $K/L$  is a measure that represents the ***functional distribution of income*** between two factors: labor and capital;
  - ▶ 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).

# 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).

Specific goals:

1. To verify if there is evidence of **changes in the coefficients and volatility** of the model across time.

# 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).

## Specific goals:

1. To verify if there is evidence of **changes in the coefficients and volatility** of the model across time.

## 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  $\alpha_t$  coefficients:

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

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

# Empirical model

## Adding T to Uhlig's model

We can add time variation to the  $\alpha_t$  coefficients:

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

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

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

$$\Omega_{t+1} = \lambda^{-1} \mathcal{U}(\Omega_t)' \Theta \mathcal{U}(\Omega_t), \text{ where } \Theta \sim \mathcal{B}_m(\nu + l/2, 1/2), \text{ and}$$

$$\alpha_{t+1} = \alpha_t + u_t, \text{ with } u_t \sim \mathcal{N}(0, Q^{-1}).$$

- We cannot observe  $\alpha_t$  directly (**latent variable**);

# Empirical model

## Adding T to Uhlig's model

We can add time variation to the  $\alpha_t$  coefficients:

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

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

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

$$\Omega_{t+1} = \lambda^{-1} \mathcal{U}(\Omega_t)' \Theta \mathcal{U}(\Omega_t), \text{ where } \Theta \sim \mathcal{B}_m(\nu + l/2, 1/2), \text{ and}$$
$$\alpha_{t+1} = \alpha_t + u_t, \text{ with } u_t \sim \mathcal{N}(0, Q^{-1}).$$

- We cannot observe  $\alpha_t$  directly (**latent variable**);
- If  $\Omega_t^{-1}$  was deterministic, then we could use the Kalman filter;

# Empirical model

## Adding T to Uhlig's model

We can add time variation to the  $\alpha_t$  coefficients:

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

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

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

$$\Omega_{t+1} = \lambda^{-1} \mathcal{U}(\Omega_t)' \Theta \mathcal{U}(\Omega_t), \text{ where } \Theta \sim \mathcal{B}_m(\nu + l/2, 1/2), \text{ and}$$
$$\alpha_{t+1} = \alpha_t + u_t, \text{ with } u_t \sim \mathcal{N}(0, Q^{-1}).$$

- ▶ We cannot observe  $\alpha_t$  directly (**latent variable**);
- ▶ If  $\Omega_t^{-1}$  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];

# Empirical model

Why this is a good idea?

- ▶ This model is more **parsimonious** than [Primiceri, 2005] and [Cogley and Sargent, 2005];
- ▶ It has a **direct connection** between the multivariate and the **univariate** cases;

# Empirical model

Why this is a good idea?

- ▶ This model is more **parsimonious** than [Primiceri, 2005] and [Cogley and Sargent, 2005];
- ▶ It has a **direct connection** between the **multivariate** and the **univariate** cases;
- ▶ The estimates are **invariant to permutations of the variables** in the VAR.

# Empirical model

Why this is a good idea?

- ▶ This model is more **parsimonious** than [Primiceri, 2005] and [Cogley and Sargent, 2005];
- ▶ It has a **direct connection** between the **multivariate** and the **univariate** cases;
- ▶ The estimates are **invariant to permutations of the variables** in the VAR.

## 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

- ▶ A Bayesian approach allows to incorporate **economic constraints and beliefs** in form of **priors**;
- ▶ Even when the **posterior is unknown**, we can resort to **MCMC methods** to obtain draws of the posterior to make inference;

# Empirical model

## A Bayesian Wishart TVP-VAR

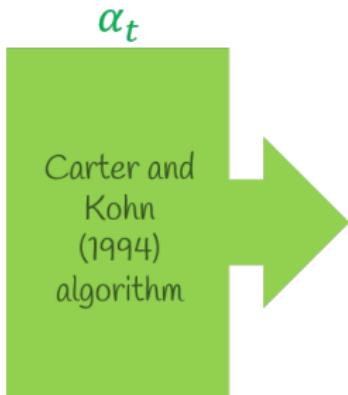
- ▶ A Bayesian approach allows to incorporate **economic constraints and beliefs** in form of **priors**;
- ▶ Even when the **posterior is unknown**, we can resort to **MCMC methods** to obtain draws of the posterior to make inference;
- ▶ We are able to make inference using an **entire posterior density**.

### Proposal

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

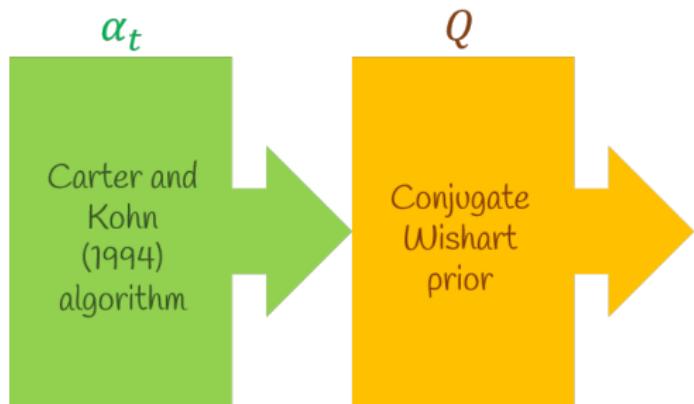
# Estimating Uhlig's extended model

Gibbs sampler scheme



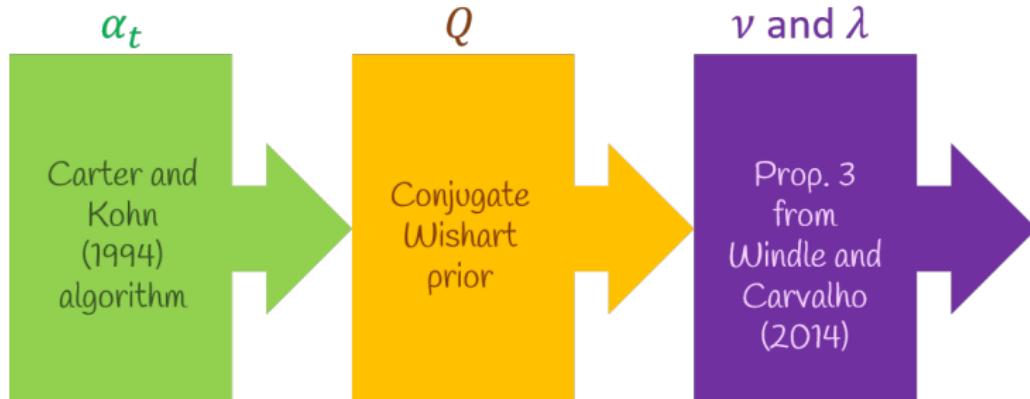
# Estimating Uhlig's extended model

## Gibbs sampler scheme



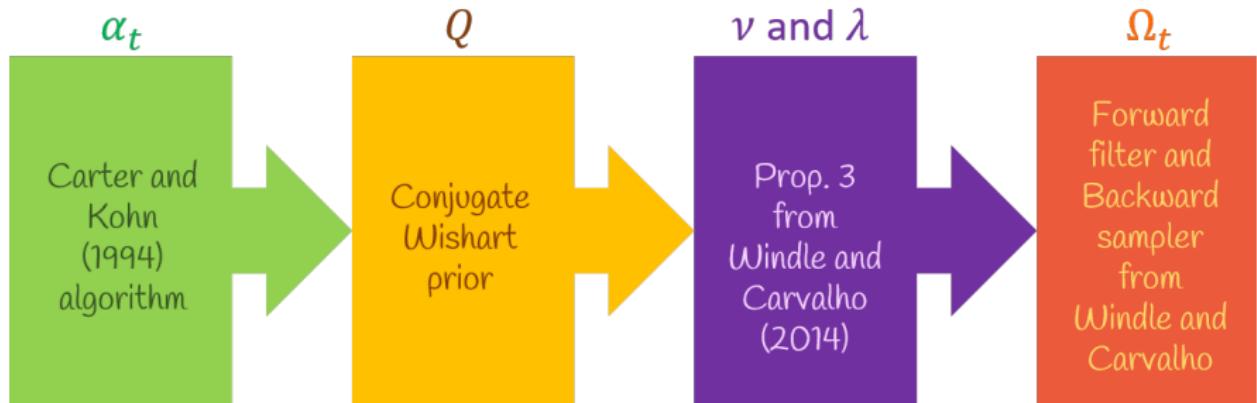
# Estimating Uhlig's extended model

## Gibbs sampler scheme



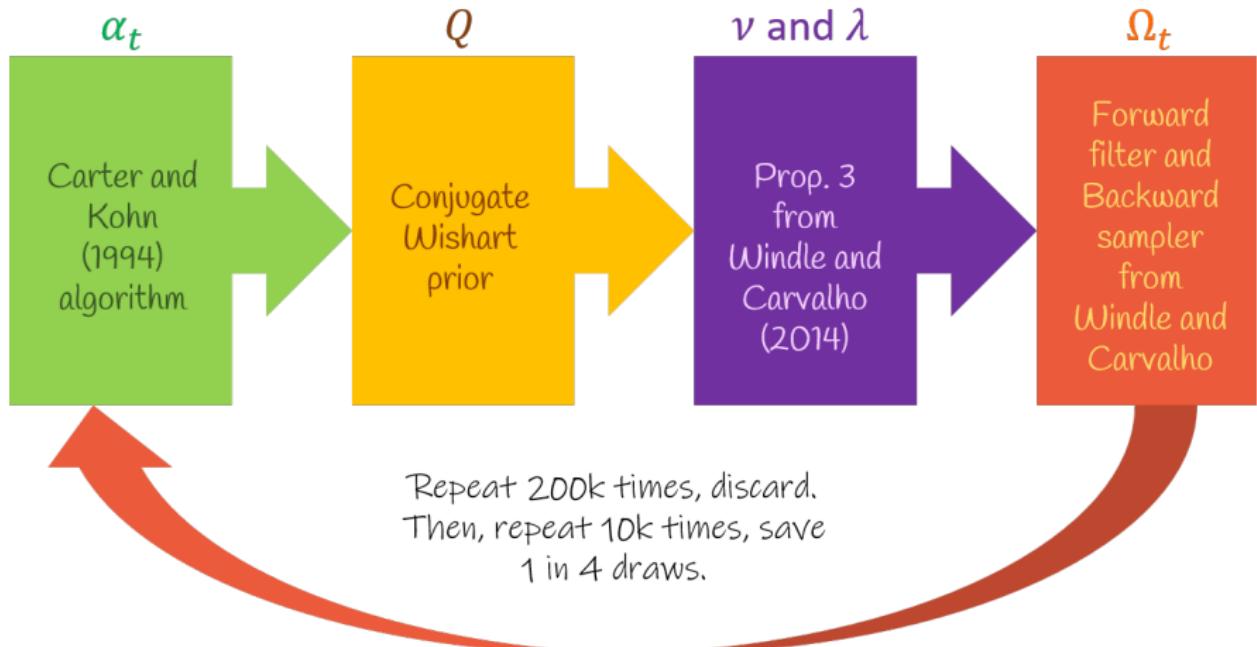
# Estimating Uhlig's extended model

## Gibbs sampler scheme



# Estimating Uhlig's extended model

## Gibbs sampler scheme



# Empirical model

## Data description

- ▶ **Data for a small open economy:**
  - ▶ Capital-labor ratio ( $K/L$ );

# Empirical model

## Data description

- ▶ **Data for a small open economy:**

- ▶ Capital-labor ratio ( $K/L$ );
- ▶ Per capita GDP;

# Empirical model

## Data description

- ▶ **Data for a small open economy:**

- ▶ Capital-labor ratio ( $K/L$ );
- ▶ Per capita GDP;
- ▶ Month inflation (IPCA);

# Empirical model

## Data description

- ▶ **Data for a small open economy:**

- ▶ Capital-labor ratio ( $K/L$ );
- ▶ Per capita GDP;
- ▶ Month inflation (IPCA);
- ▶ Monthly variation of the effective real exchange rate;

# Empirical model

## Data description

- ▶ **Data for a small open economy:**

- ▶ Capital-labor ratio ( $K/L$ );
- ▶ Per capita GDP;
- ▶ Month inflation (IPCA);
- ▶ Monthly variation of the effective real exchange rate;
- ▶ Annualized short term interest rate (SELIC).

# Empirical model

## Data description

- ▶ **Data for a small open economy:**
  - ▶ Capital-labor ratio ( $K/L$ );
  - ▶ Per capita GDP;
  - ▶ Month inflation (IPCA);
  - ▶ Monthly variation of the effective real exchange rate;
  - ▶ Annualized short term interest rate (SELIC).
- ▶ **Period and lags:** Data are in monthly observations that range from January, 1996 to October, 2018. The first 48 observations were used as prior and we used two lags.

# Empirical model

## Data description

- ▶ **Data for a small open economy:**
  - ▶ Capital-labor ratio ( $K/L$ );
  - ▶ Per capita GDP;
  - ▶ Month inflation (IPCA);
  - ▶ Monthly variation of the effective real exchange rate;
  - ▶ Annualized short term interest rate (SELIC).
- ▶ **Period and lags:** Data are in monthly observations that range from January, 1996 to October, 2018. The first 48 observations were used as prior and we used two lags.
- ▶ **Identification of the shocks:**

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

# Empirical model

## Data description

- ▶ **Data for a small open economy:**
  - ▶ Capital-labor ratio ( $K/L$ );
  - ▶ Per capita GDP;
  - ▶ Month inflation (IPCA);
  - ▶ Monthly variation of the effective real exchange rate;
  - ▶ Annualized short term interest rate (SELIC).
- ▶ **Period and lags:** Data are in monthly observations that range from January, 1996 to October, 2018. The first 48 observations were used as prior and we used two lags.
- ▶ **Identification of the shocks:**

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

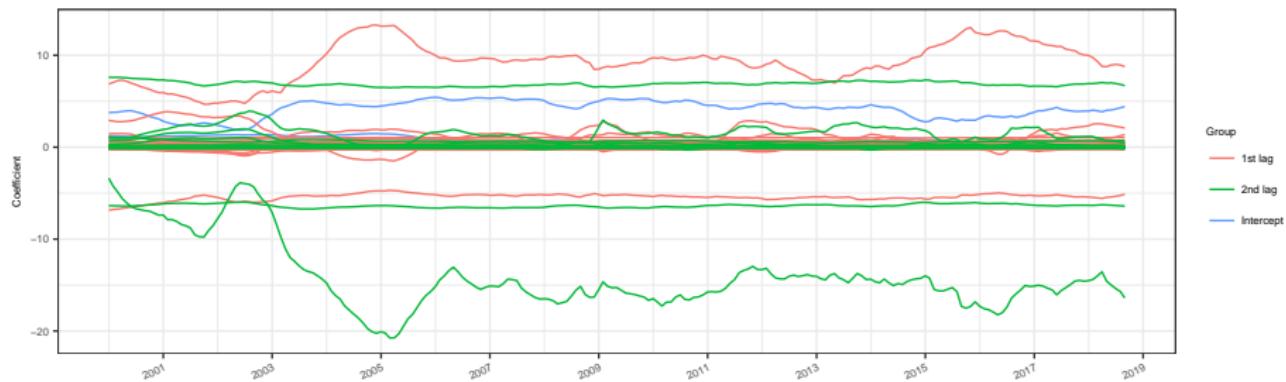
- ▶ **IRF computation:** For each period, a different IRF is calculated using the respective estimated coefficients and volatility.

# Results

Coefficients evolution across time

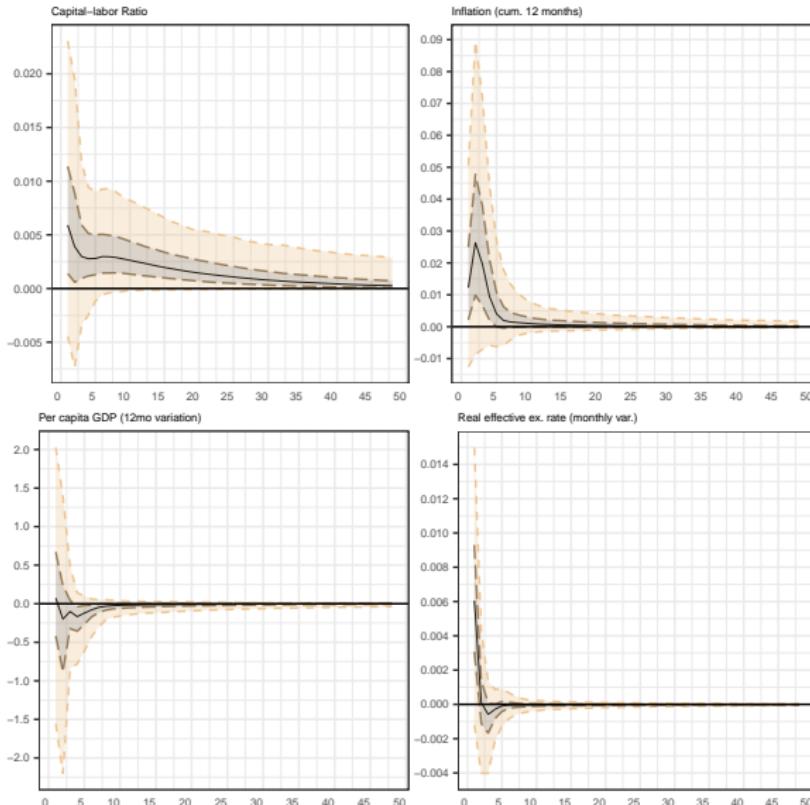
# Results

## 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);

# Wrapping up

- ▶ The **monetary policy shocks** significantly affect the **capital-labor ratio** and its effects last for a year (until shortly after 2010);
  - ▶ Monetary contractions **increase** the capital-labor ratio, suggesting the existence of **a redistributive effect** of the monetary policy;

# Wrapping up

- ▶ The **monetary policy shocks** significantly affect the **capital-labor ratio** and its effects last for a year (until shortly after 2010);
  - ▶ Monetary contractions **increase** the capital-labor ratio, suggesting the existence of **a redistributive effect** of the monetary policy;
- ▶ This **relationship** was **not stable** during the inflation-target period - it became weaker and non-significant after 2010;

# Wrapping up

- ▶ The **monetary policy shocks** significantly affect the **capital-labor ratio** and its effects last for a year (until shortly after 2010);
  - ▶ Monetary contractions **increase** the capital-labor ratio, suggesting the existence of a **redistributive effect** of the monetary policy;
- ▶ 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

- ▶ Polish the diagnostics section;

# Further developments

- ▶ Polish the diagnostics section;
- ▶ Estimate a simpler model using data from the **national accounts** (IBGE, quarterly) - robustness check;

# Further developments

- ▶ Polish the diagnostics section;
- ▶ 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.

# References I

-  Bernanke, B. (2015).  
*The courage to act: A memoir of a crisis and its aftermath.*  
WW Norton New York.  
28, 29
-  Bitto, A. and Frühwirth-Schnatter, S. (2016).  
Achieving shrinkage in a time-varying parameter model framework.  
*arXiv preprint arXiv:1611.01310.*  
71, 72, 73
-  Carter, C. K. and Kohn, R. (1994).  
On gibbs sampling for state space models.  
*Biometrika*, 81(3):541–553.  
46, 47, 48
-  Cogley, T. and Sargent, T. J. (2005).  
Drifts and volatilities: monetary policies and outcomes in the post wwii us.  
*Review of Economic dynamics*, 8(2):262–302.  
42, 43, 44, 45
-  Primiceri, G. E. (2005).  
Time varying structural vector autoregressions and monetary policy.  
*The Review of Economic Studies*, 72(3):821–852.  
42, 43, 44, 45

# References II

-  Pugh, A., Bunn, P., and Yeates, C. (2018).  
The distributional impact of monetary policy easing in the uk between 2008 and 2014.  
Technical report, Bank of England working papers series.  
13, 14
-  Tobin, J. (1982).  
*Asset accumulation and economic activity: Reflections on contemporary macroeconomic theory.*  
University of Chicago Press.  
11
-  Uhlig, H. (1997).  
Bayesian vector autoregressions with stochastic volatility.  
*Econometrica: Journal of the Econometric Society*, pages 59–73.  
35, 36, 37
-  Windle, J. and Carvalho, C. (2014).  
A tractable state-space model for symmetric positive-definite matrices.  
*Bayesian Analysis*, 9(4):759–792.  
46, 47, 48

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

*Thank you!*

<http://aishameriane.github.io>



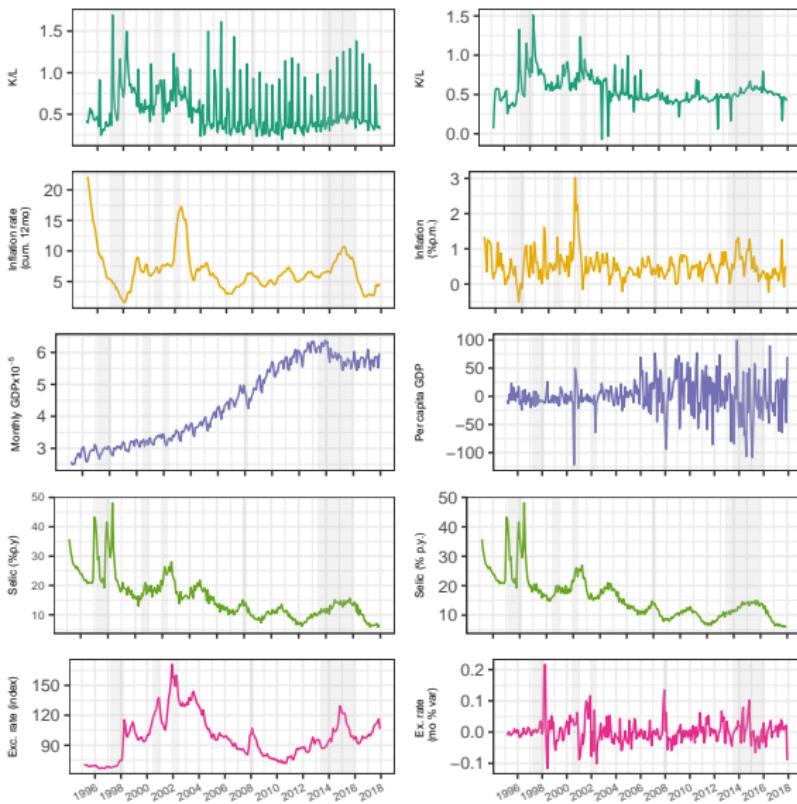
**Candidate:** Aishameriane Schmidt  
**Advisor:** Prof. Dr. Guilherme Valle Moura

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



# Extras

## Series used in the VAR



# Redistributive channels of monetary policy

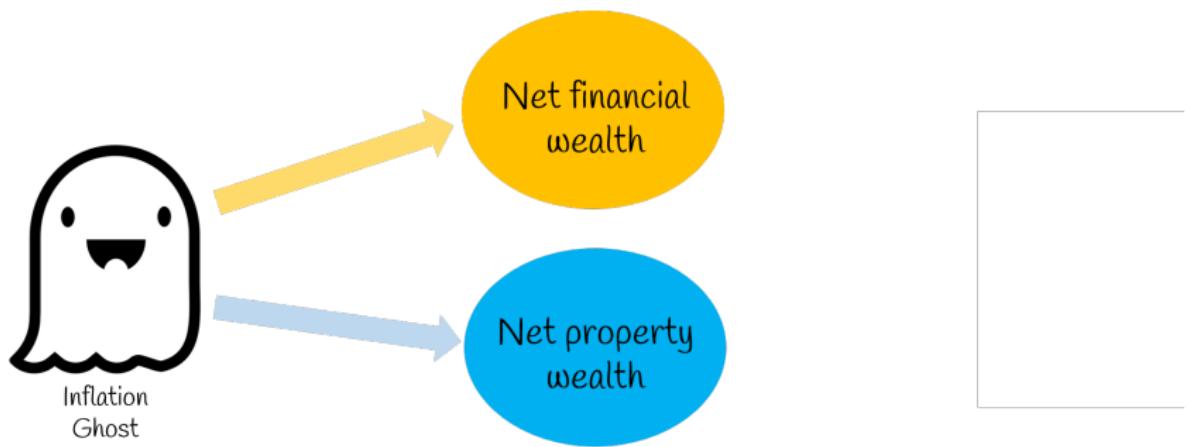
## Wealth heterogeneity



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

# Redistributive channels of monetary policy

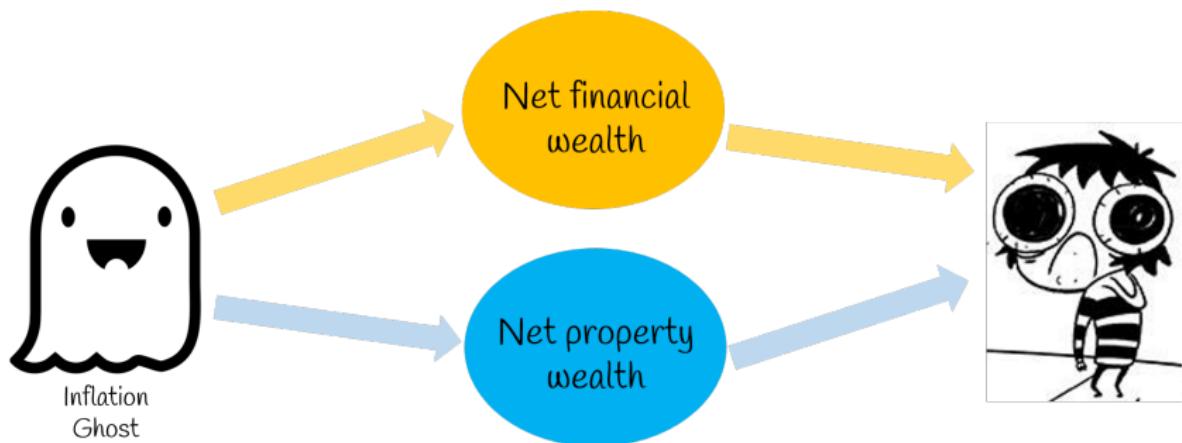
## Fisher (or inflation) channel



Cartoon adapted from Sarah's Scribbles (<https://www.facebook.com/pg/DoodleTimeSarah>) and Ghost by Oksana Latysheva from the Noun Project.

# Redistributive channels of monetary policy

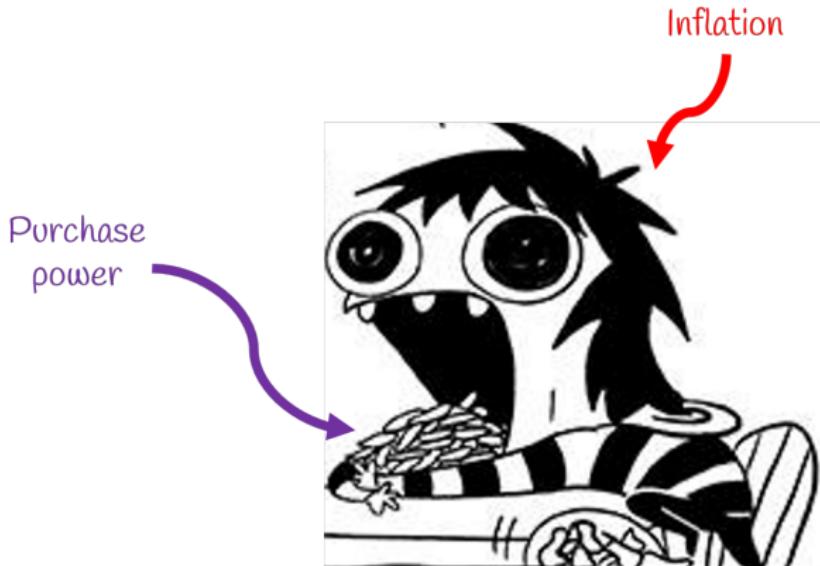
## Fisher (or inflation) channel



Cartoon adapted from Sarah's Scribbles (<https://www.facebook.com/pg/DoodleTimeSarah>) and Ghost by Oksana Latysheva from the Noun Project.

# Redistributive channels of monetary policy

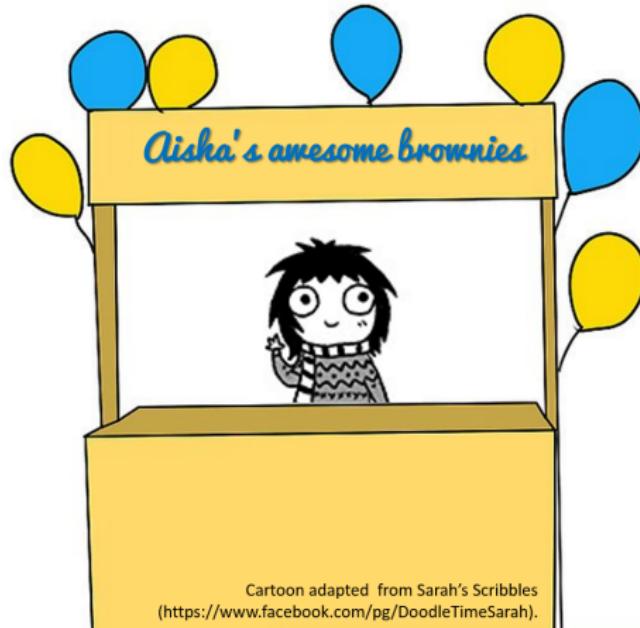
## Fisher (or inflation) channel



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

# Redistributive channels of monetary policy

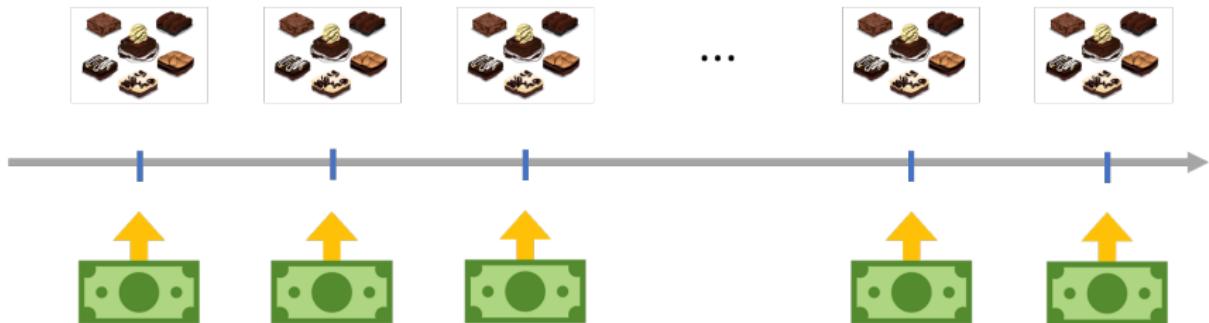
## Interest rate exposure channel



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

# Redistributive channels of monetary policy

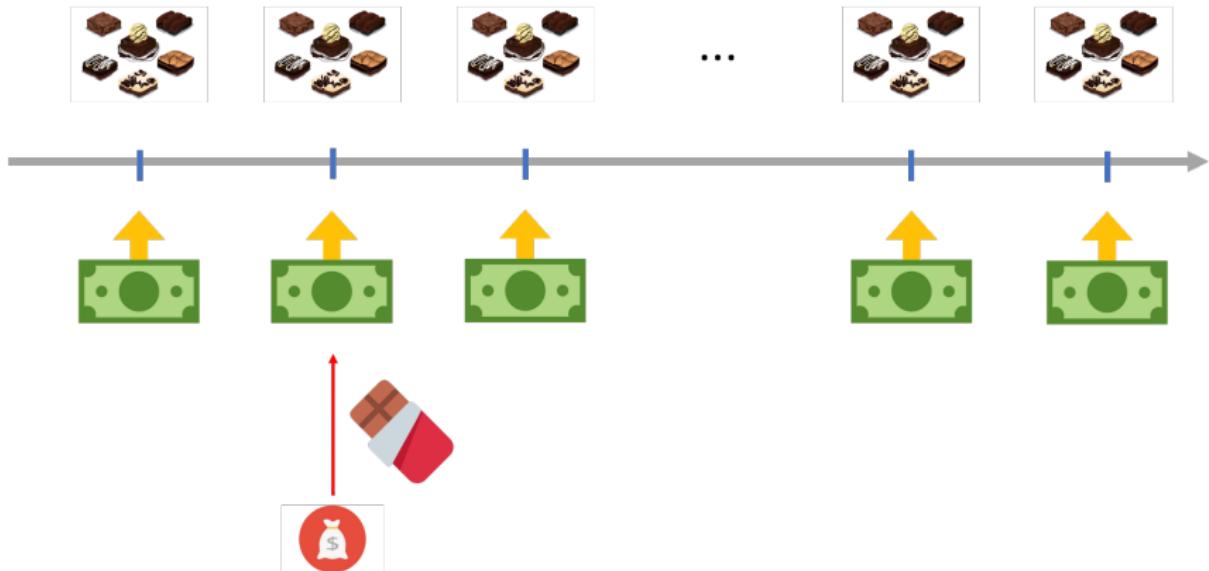
## Interest rate exposure channel



**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

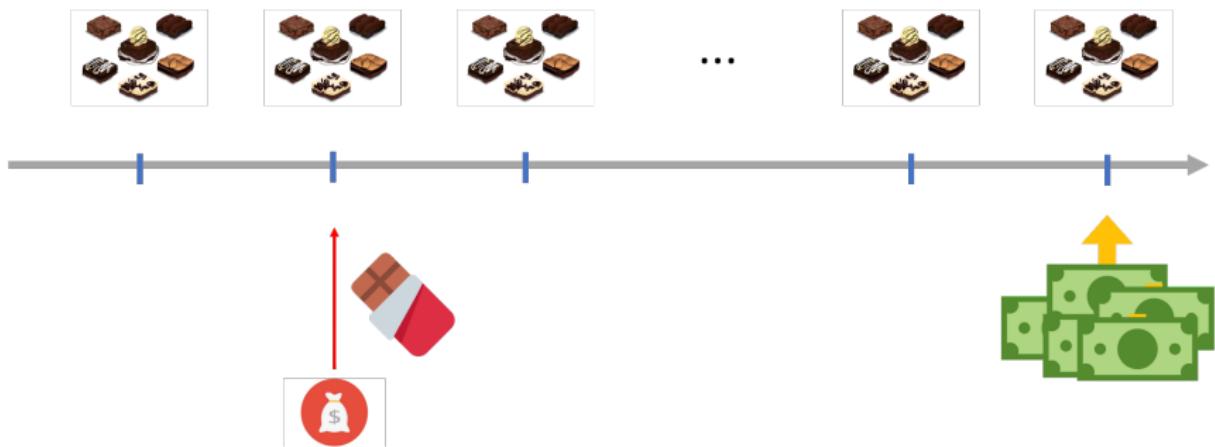
## Interest rate exposure channel



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

# Redistributive channels of monetary policy

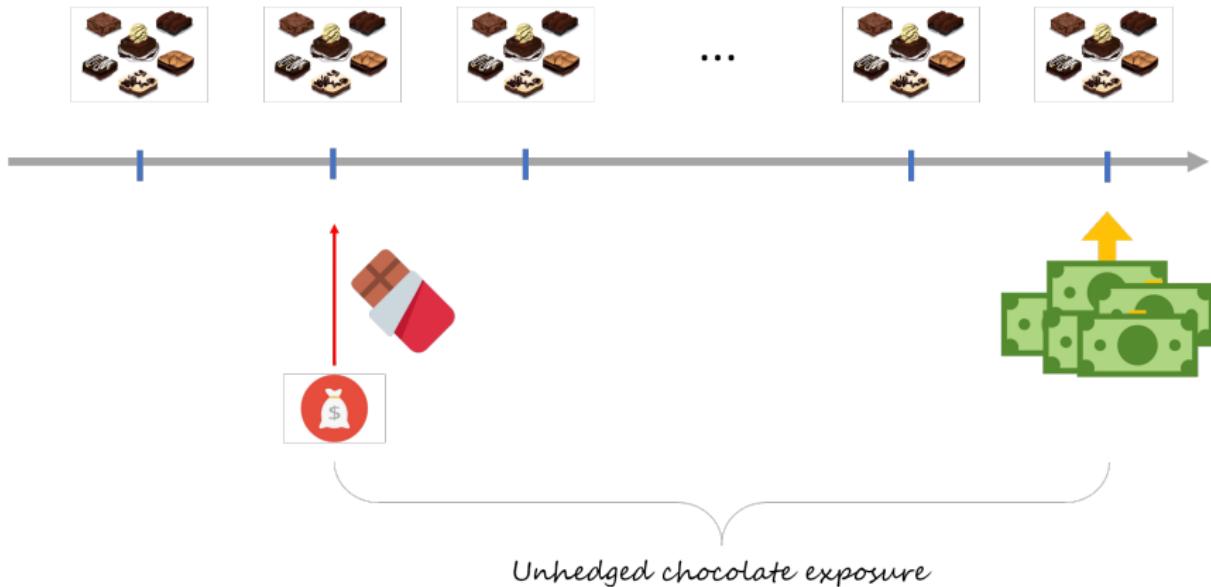
## Interest rate exposure channel



**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*.

# After defense

Join me to celebrate (or not)

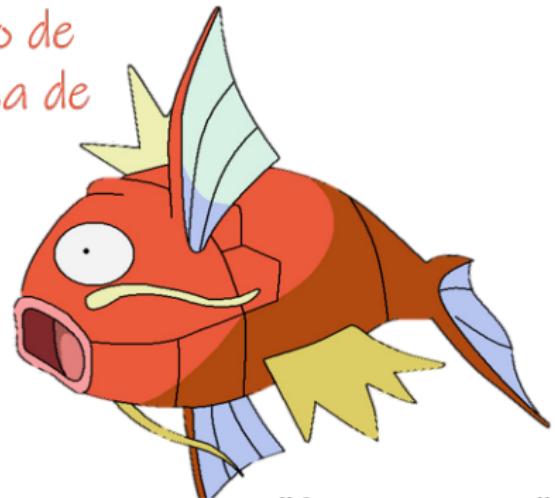
Comemoração ou afogamento de  
mágoas após a n-ésima defesa de  
mestrado da Aisha (n=1)

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. :-)