

Cyclicity of Add-on Pricing

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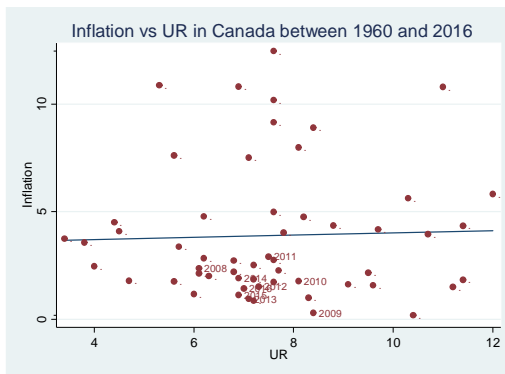
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Prices and Economic Activity at the Aggregate Level

- Is there a trade-off between inflation and unemployment?
- There is a weak (at best) relationship between prices and economic activity at the aggregate level

Figure 1. Inflation vs Unemployment in Canada



This Paper

1. Micro level

- We study the relationship between price dynamics and unemployment rates at the regional level
- We distinguish between base good prices and add-on prices
- The add-on prices display strong procyclicality at the regional level
- The base good prices do not respond to changes in the regional economic activity

2. Macro level

- On aggregate level, both base good measured inflation and add-on adjusted inflation respond to macroeconomic fluctuations
- The response of add-on adjusted inflation is twice as strong as that of inflation without the adjustment

This Paper

Contribution

- A large and growing literature exploiting regional variation to learn about the determinants of aggregate economic variables
- Recent literature focuses on *effective consumer* prices in contrast to posted prices and finds more evidence in favor of price cyclicalities
 - Flexibility of prices increases when sales taken into account (Nakamura and Steinsson 2012 and Anderson et al. 2016)
 - Reallocation of expenditure across retailers (Coibon et al. 2015)
 - Cyclicalities of add-ons of *retailer's* prices

Add-ons are everywhere

- What is an add-on?
 - Quality improvement
 - "[their] prices are not advertised and would be costly or difficult to learn before one arrives at the point of sale" Ellison (2005)
- Durable goods
 - Cars, home appliances, electronics
- Services
 - Airline tickets, hotel rooms

Data

Confidential transaction-based dataset

- Canadian nation-wide retailer of durable goods: home appliances, furniture, electronics
- Universe of transaction data between 2000m1 and 2009m12 (more than 6.5 million transactions)
- Transaction-level data allows us to observe all the prices:
 - Base good price
 - **Suggested** extended warranty price
 - **Effective** warranty price
- Warranty prices are usually hidden and they are discretionary

Data

Extended warranties prices are discretionary

- Salesperson is paid commissions for sales of base goods and extended warranties
- Commission: for extended warranty 15%, for base good 4%
- More discretion over warranty price, less discretion over base good price (competition, price guarantee)
- Effective warranty prices can vary from transaction to transaction

Data

Prices of extended warranties and base good

Table 1. Summary Statistics for Base Good and Add on.

Base good	Extended Warranty			
Price paid	Take Up	Price paid	Average cost	Price - Cost
610.90	0.37	88.65	23.49	65.16
(1727.80)	(0.48)	(93.40)	(164.34)	(0.12)

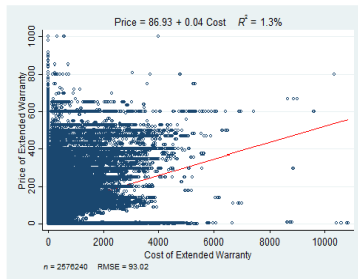
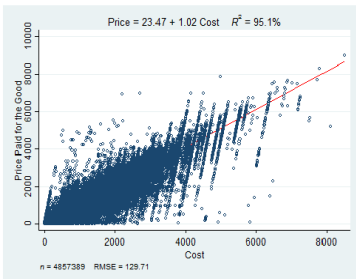
Note: Standard errors in parentheses

- Last column tests for difference between mean price and average cost of extended warranty.

Data

Price vs cost for base good and extended warranty

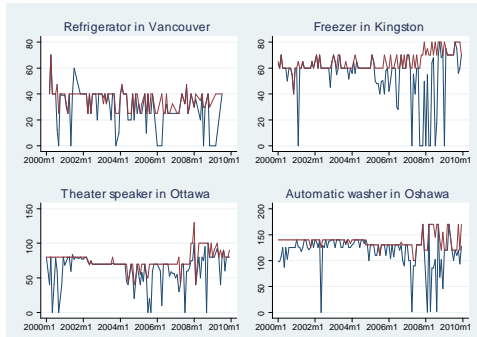
Figure 2. Relationship between prices and costs of base good and extended warranties



Warranty Prices

Suggested and effective prices over time

Figure 3. Behavior of suggested vs effective warranty prices



- Aggregate the transaction data
 - Median prices for each category and each store every month
 - Independent variable is the difference between suggested and effective warranty price

Economic Activity

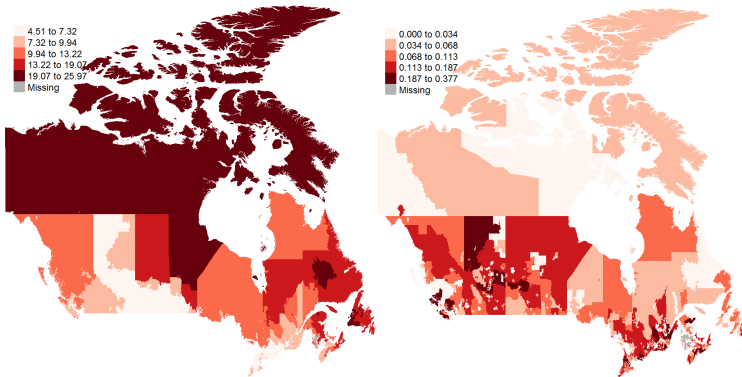
Unemployment rate across space

- Economic activity is measured as monthly 3 month MA unemployment rate in 55 predefined economic regions
- Each region contains several cities but is smaller than any one province
- Substantial regional differences in industrial activity

Economic Activity

Unemployment rate and warranty prices across space

Figure 4. Regional unemployment rate and effective warranty prices



Source: Statistics Canada and authors' calculations

Main Specification

Relationship between warranty prices and economic activity

$$p_{tsc} = \beta u_{tr} + \alpha_c + \gamma_t + \delta_r + \varepsilon_{tsc}$$

- p_{tsc} : difference between suggested and effective warranty price for a good belonging to a category c sold at time t in store s
- u_{tr} : unemployment rate at time t in region r
- α_c : category fixed effects
- γ_t : time fixed effects
- δ_r : region fixed effects

Main Specification

Response is the strongest after one year

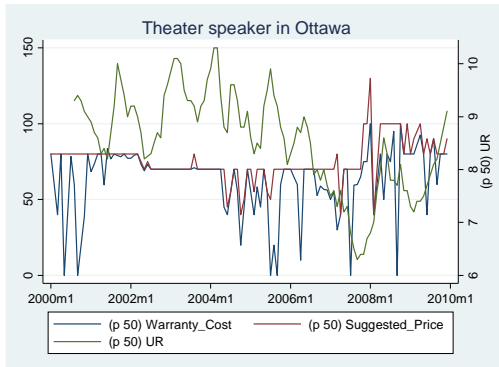
Table 3. Relationship between difference in WPs and local UR

$diffp_{tsc} = \beta u_{tr} + \alpha_c + \gamma_t + \delta_r + \varepsilon_{tsc} + \gamma_t^c * \alpha_c$			
$diffp_{t-1,s,c}$	0.23*** (0.01)	0.23*** (0.01)	0.23*** (0.01)
u_{tr}	0.88** (0.27)		
$u_{t-6,s}$		0.99** (0.27)	
$u_{t-12,s}$			1.01** (0.31)
α_c	✓	✓	✓
γ_t	✓	✓	✓
δ_r	✓	✓	✓
$\gamma_t^c * \alpha_c$	✓	✓	✓
<i>Obs</i>	482,908	482,908	482,908

Main Specification

Visualization of results in time

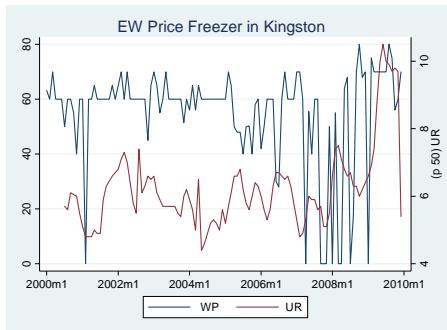
- Retailer decreases the effective warranty price below the suggested price when the local UR increases



Extended warranties prices

Promotions

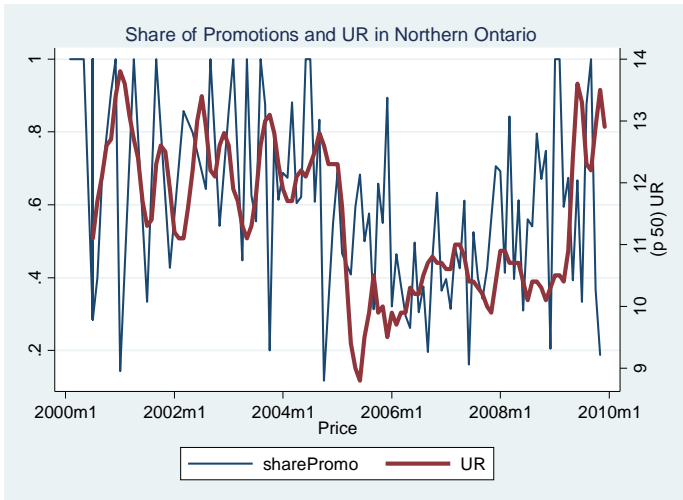
- Only 2.5 % of the observations are official promotions



- We classify a sale as an *unofficial* promotion if the effective warranty price < 2 CAD
- 20% of observations qualify as *unofficial* promotions

Extended warranties prices

Promotions



Extended warranties prices

Promotions

Table 5. Response of the share of promotions: pm to the local UR

	$pm_{trc} = \beta u_{tr} + \alpha_c + \gamma_t + \delta_r + \varepsilon_{trc} + \gamma_t^c * \alpha_c$		
$pm_{t-1,r}$	0.02*** (0.01)	0.02*** (0.01)	0.02*** (0.01)
u_{tr}	0.03 (0.02)		
$u_{t-6,s}$		0.09** (0.03)	
$u_{t-12,s}$			0.06** (0.02)
α_c	✓	✓	✓
γ_t	✓	✓	✓
δ_r	✓	✓	✓
$\gamma_t^c * \alpha_c$	✓	✓	✓
<i>Obs</i>	201, 526	201, 526	201, 526

Alternative Specifications

Does the base good respond to the local economic activity?

Table 6. Response of wp and base good prices to the local economic activity

	Warranty price		Base good price	
p_{t-1rc}	0.23*** (0.01)	0.23*** (0.01)	0.17*** (0.001)	0.17*** (0.001)
u_{tr}	-0.91** (0.27)		0.005 (0.01)	
$u_{t-12,r}$		-1.06** (0.31)		0.006 (0.01)
α_c	✓	✓	✓	✓
γ_t	✓	✓	✓	✓
δ_r	✓	✓	✓	✓
$\gamma_t^c * \alpha_c$	✓	✓	✓	✓
Obs	482, 717	482, 717	482, 717	482, 717

Price Dynamics at Macroeconomic Level

Aggregation

- We create an add-on adjusted (durable goods) price index and a price index without add-ons (naive) for our retailer:

① Equally weighted:
$$P_t^{1*} = \frac{P_t^1}{P_0} = \frac{1}{C} \sum_{c=1}^C p_t^c$$

② Population weighted:
$$P_t^{2*} = \frac{P_t^2}{P_0} = \sum_{r=1}^R w_r^p p_t^r, R = 55$$

- Base month: $P_0 = 2000m7$
- Year on year monthly inflation rate: $\pi_t^1 = \ln P_t^{1*} - \ln P_{t-12}^{1*}$
and $\pi_t^2 = \ln P_t^{2*} - \ln P_{t-12}^{2*}$
- Compare to Bank of Canada (BoC) inflation rate for durable goods

Cyclicity of adjusted vs naive inflation rates

$$\pi_t^i = \alpha + \beta_t \text{YoYu}_t + \varepsilon_t$$

	Adjusted inflation		Naive inflation			
			Our retailer		BoC	
$\text{YoYu}_{t-6,s}$	-0.08** (0.03)		-0.05 (0.03)		0.01 (0.01)	
$\text{YoYu}_{t-12,s}$		-0.15** (0.06)		-0.08 (0.07)		0.01 (0.01)
π_{t-1}^i	0.49*** (0.09)	0.45*** (0.09)	0.65*** (0.08)	0.61*** (0.10)	0.91*** (0.05)	0.91*** (0.06)
Obs	189	189	189	189	189	189

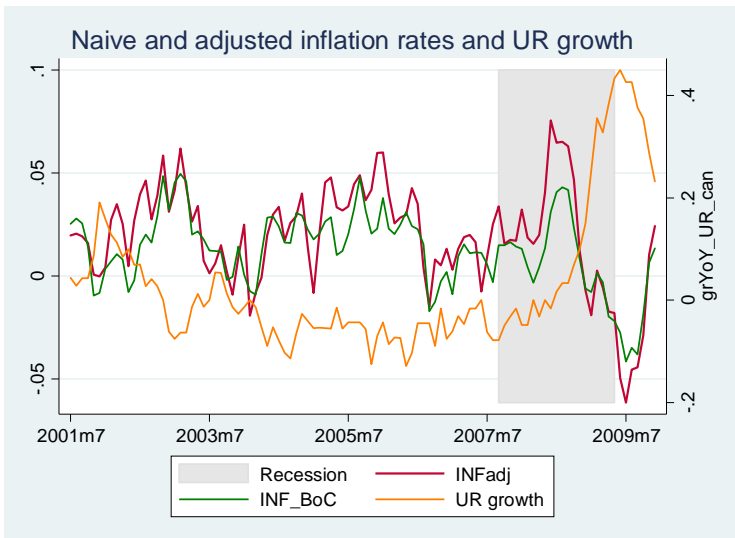
Price Dynamics at Macroeconomic Level

Aggregation

- We create an add-on adjusted goods price index:
- The price index each month t :
- $$P_t^* = \sum_{i=1}^3 w_i P_t^i,$$
- i : *durables adjusted for warranties, nondurables and semi-durables.*
- w_i are defined by the BoC
- $\pi_t^* = \ln P_t^* - \ln P_{t-12}^*$
- Compare to Bank of Canada (BoC) inflation rate for goods

Price Dynamics at Macroeconomic Level

Cyclicality



Cyclicity of adjusted vs naive inflation rates

$\pi_t^{*i} = \alpha + \beta_t \gamma \delta u_t + \varepsilon_t$				
	Adjusted inflation		Unadjusted inflation	
$\gamma \delta u_t$	-0.04*** (0.01)		-0.02** (0.01)	
$\gamma \delta u_{t-1}$		-0.04*** (0.01)		-0.02** (0.01)
π_{t-1}^{*i}	0.67*** (0.05)	0.68*** (0.05)	0.71*** (0.04)	0.71*** (0.04)
Obs	189	189	189	189

Conclusions

- Prices of extended warranties strongly respond to changes in local economic activity
- Their strongest response is observed after one year
- Unofficial promotions whose share increases in recessions seem to (partially) drive the warranty prices' fluctuations
- Base good prices do not respond to the changes of local economic activity but react to aggregate unemployment movements
- The response of aggregate inflation adjusted for warranty prices is 2 times higher than that of standard inflation measure