Frugal Consumers and the Labor Market

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Preliminary

How do consumers adjust to lower income?

1. Search/shop more intensely to get a better price
2. Reduce quantities consumed across all categories
3. Postpone purchases of some categories (e.g. large durables)
4. Substitute across categories from luxuries to necessities (e.g. from eating in restaurants to eating at home)
5. Within each category (e.g. hotel stays) reduce the quality of the goods consumed.

Relevant for understanding consumption and labor dynamics:

- during recessions
- for segments of U.S. population with large income declines

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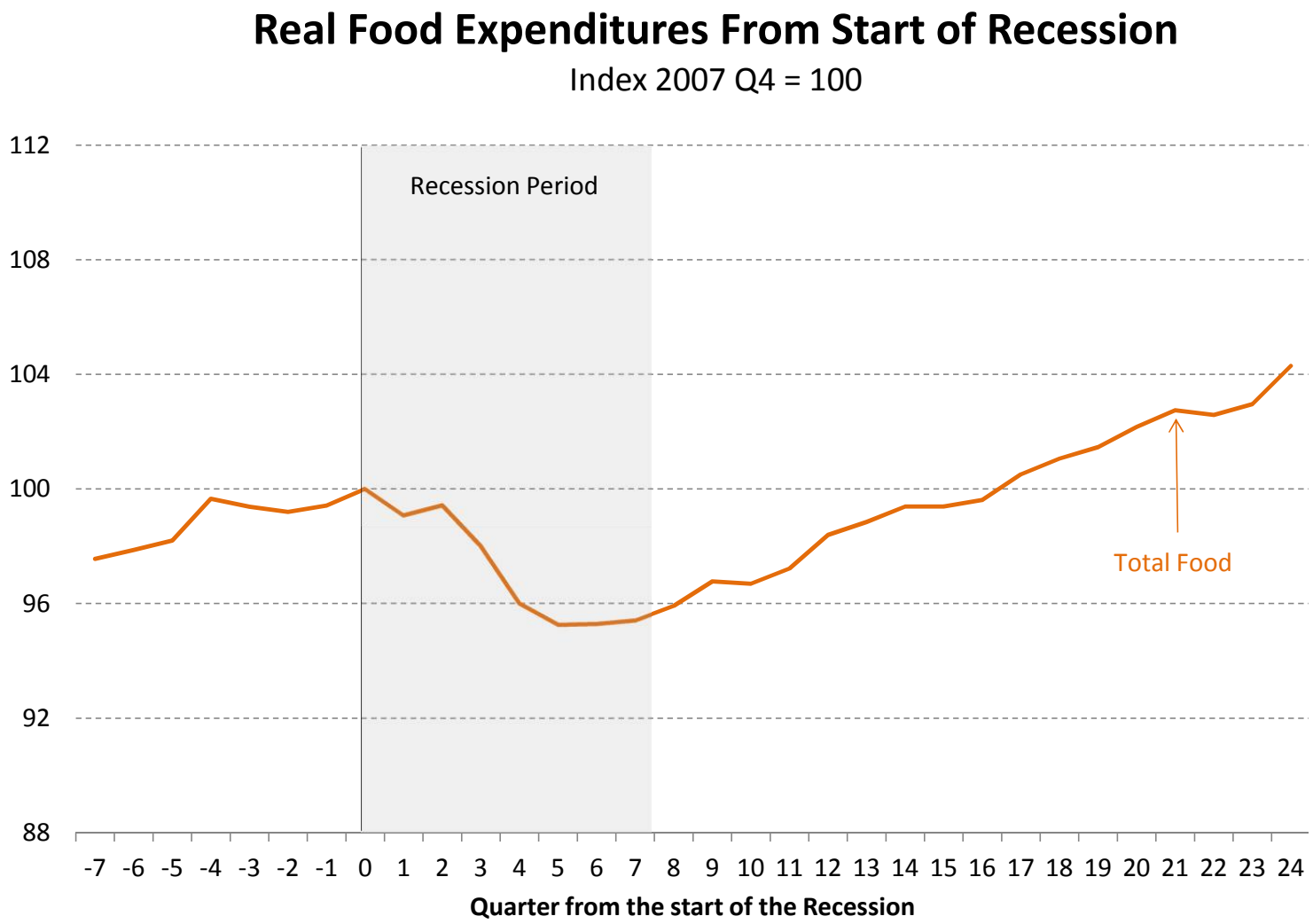
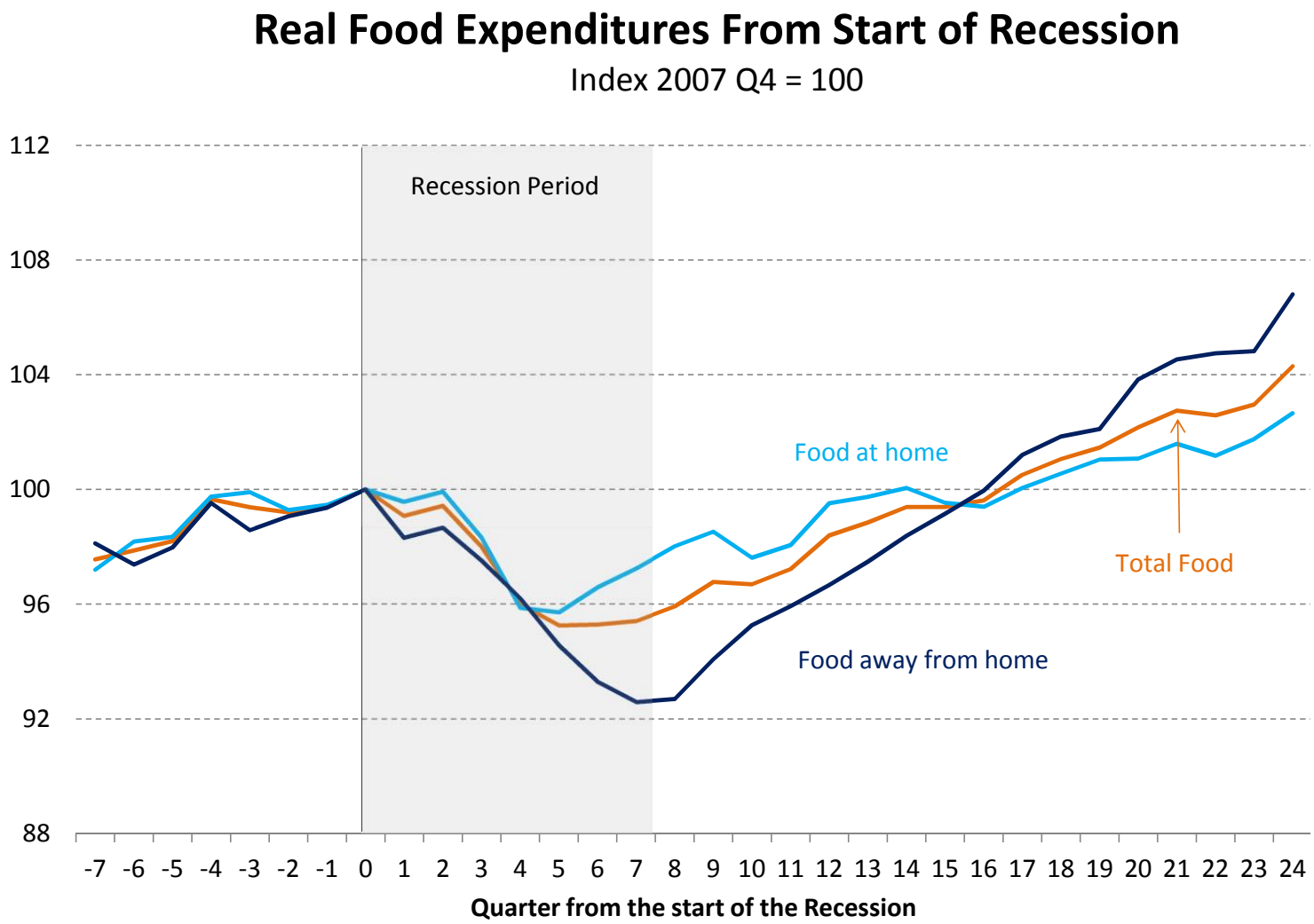
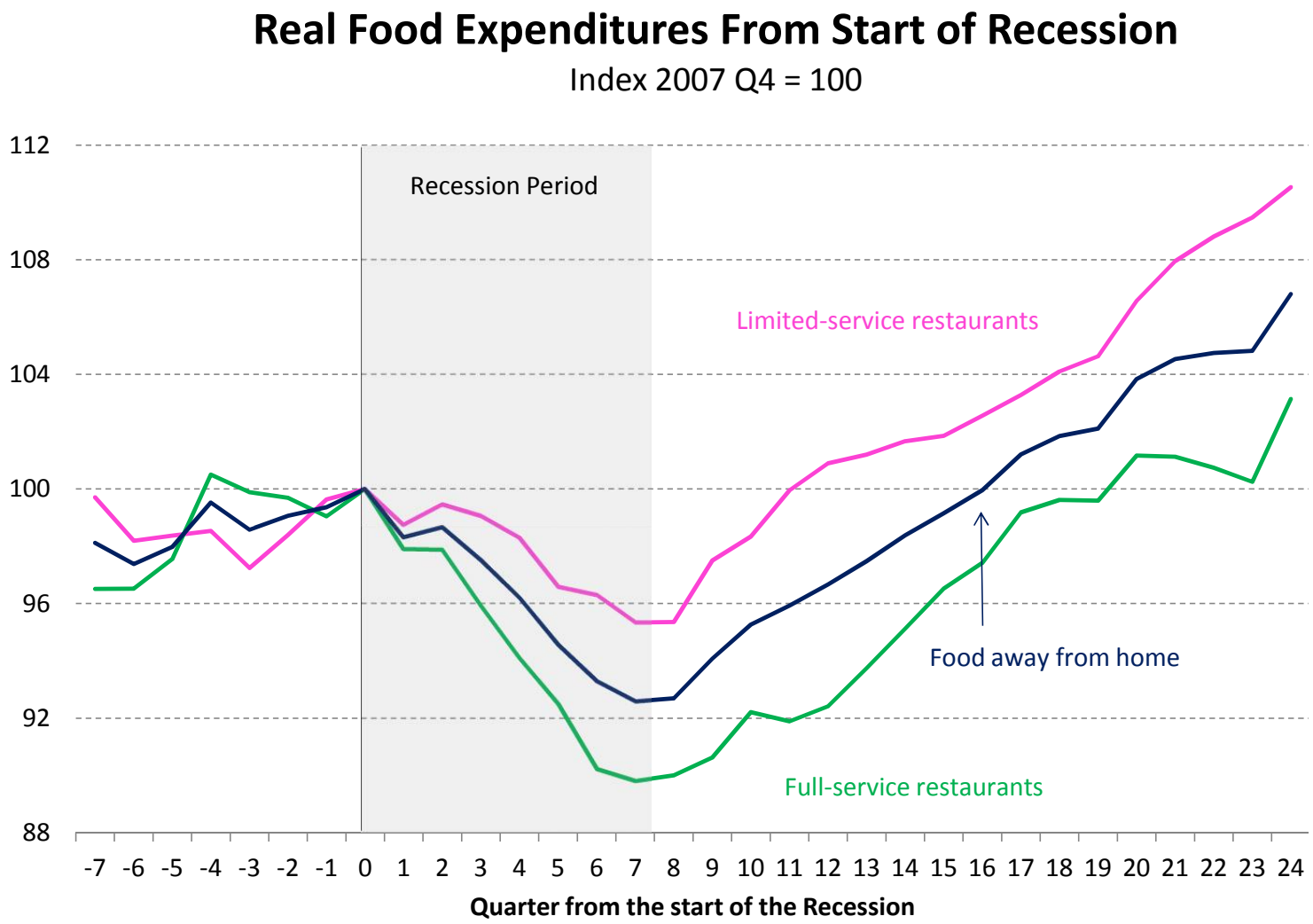
Example - Food Expenditure



Example - Substitution across product categories



Example - Substitution across quality within product



Questions and Approach

1. How do consumers adjust to lower income?

2. How do the substitution patterns affect labor?

3. What are the aggregate effects of trading-down?

Questions and Approach

1. How do consumers adjust to lower income?
   - Micro data to document two forms of substitution:

     across and within product categories

2. How do the substitution patterns affect labor?
   - Firm data on quality and labor intensity
   - Empirical document shifts in quality and labor during the recent recession

3. What are the aggregate effects of trading-down?
   - Embed quality choice into RBC and Calvo models

Preview of Results

1. How do consumers adjust to lower income?
   - Trading-down in quality
   - Substitution from luxuries to necessities
2. How do the substitution patterns affect labor?
   - Lower labor intensity for low-end stores and necessities
   - Large labor effect from substituting across quality, but not from substituting across categories
3. What are the aggregate effects of trading-down?
   - Large amplification of shocks
   - Generate co-movement in labor
   - New theory of labor wedge
   - Flattening of the Phillips curve

Related Literature

- Home production:
  Becker (1965), Aguiar and Hurst (2007, 2008), Aguiar, Hurst, and Karabarbounis (2012), Benhabib et al. (1991), Baxter and Jermann (1999), Nevo and Wong (2014), and others.

- Income and consumption bundles:
  Banks, Blundell, and Lewbel (1997), Bils and Aguiar (2013), Bils and Klenow (2001), Nakamura and Steinsson (2011), others

- Plant size, product quality, and international trade:
  Holmes and Stevens (2013), Kugler and Verhoogen (2012), Fajgelbaum, Grossman and Helpman (2009), and others

- Aggregate effects of demand shocks:
  Mian and Sufi (2014), Guerreri and Lorenzoni (2012), Kaplan and Menzio (2014), Huo and Rios-Rull (2013)

- Cyclical fluctuations in labor wedge:
  Karabarbounis (2013), Hall (2009), Mulligan (2002), Chari, Kehoe and McGrattan (2007), Shimer (2009).

Outline

1. Empirical evidence:
   - Trading down in terms of quality within product categories
   - Substitution across product categories
2. RBC and Calvo models with quantity and quality choice
3. Quantitative analysis and implications

Empirical Approach

Document relationship between consumption, quality and labor:

1. For each firm:
   - Assign "quality" category
   - Measure labor intensity
2. Document shifts in household expenditures across different quality of same category
3. Implied change in employment during recent recession

Data

Focus on 6 NAICS sectors: Accommodation, Apparel, Grocery Stores, Restaurants, Home Furnishing and General Merchandise

- Listed U.S. companies from Compustat
  - Sub-sample of 189 companies: half of the revenues of the retail trade, leisure and hospitality sectors
  - NAICS code, historical sales and number of employees over 2007-2012
  - Use Yelp price categorization to sort into quality
- Census data for General Merchandise stores:
  - Aggregate industry sales and employee numbers
  - NAICS split for quality: Wholesale clubs and supercentres (Low-end), Discount department stores (Middle), Non-Discount department stores (High-end)

Data Caveats

Compustat:

- Only listed firms on the U.S. Stock Exchanges
- Under-sampling of high-end firms

Robustness:

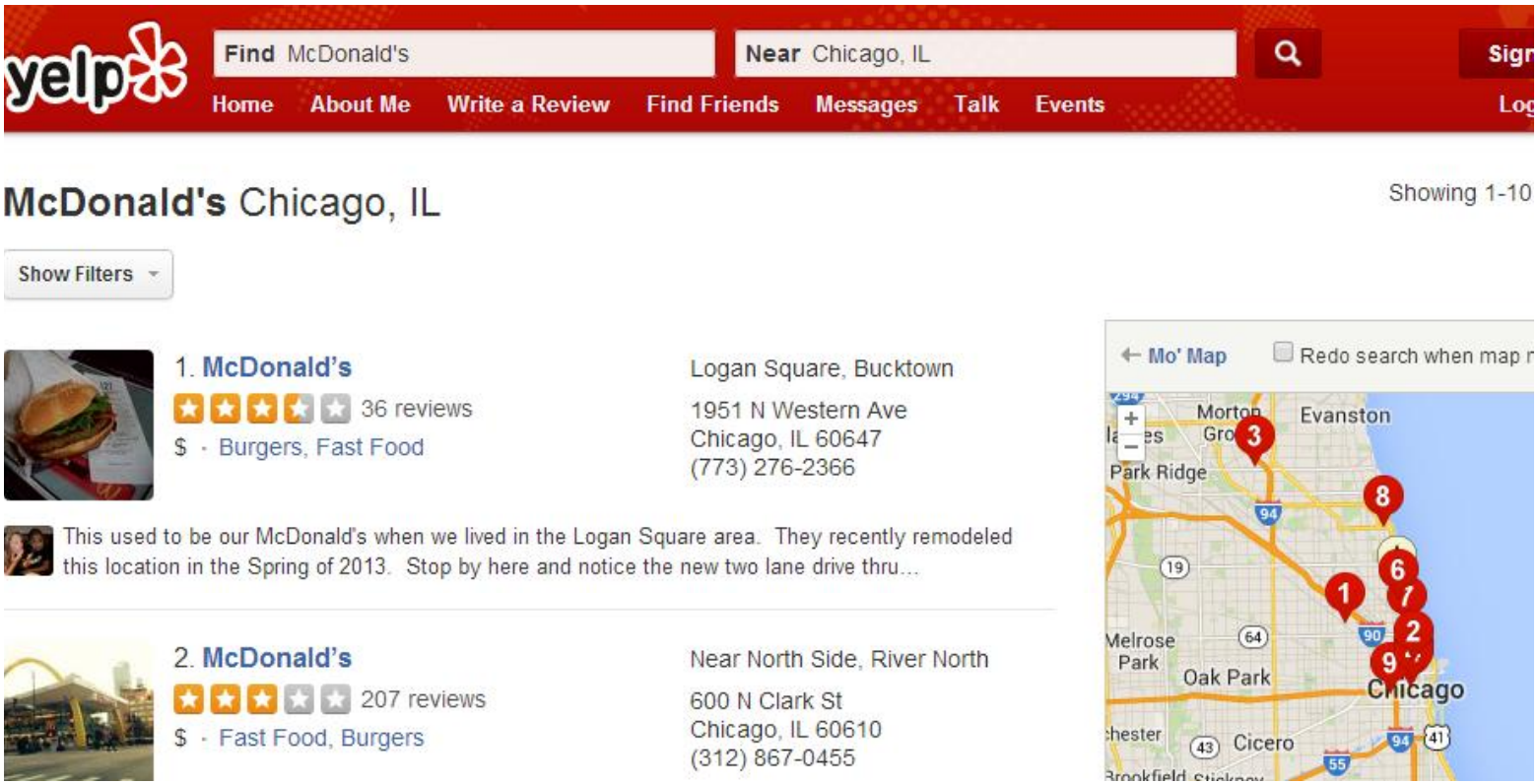
- Cross-check against alternative data sources: Census Retail Trade Survey for food away from home (limited vs. full service)
- Add additional apparel firms listed on other stock exchanges

Assigning firms into quality ranges

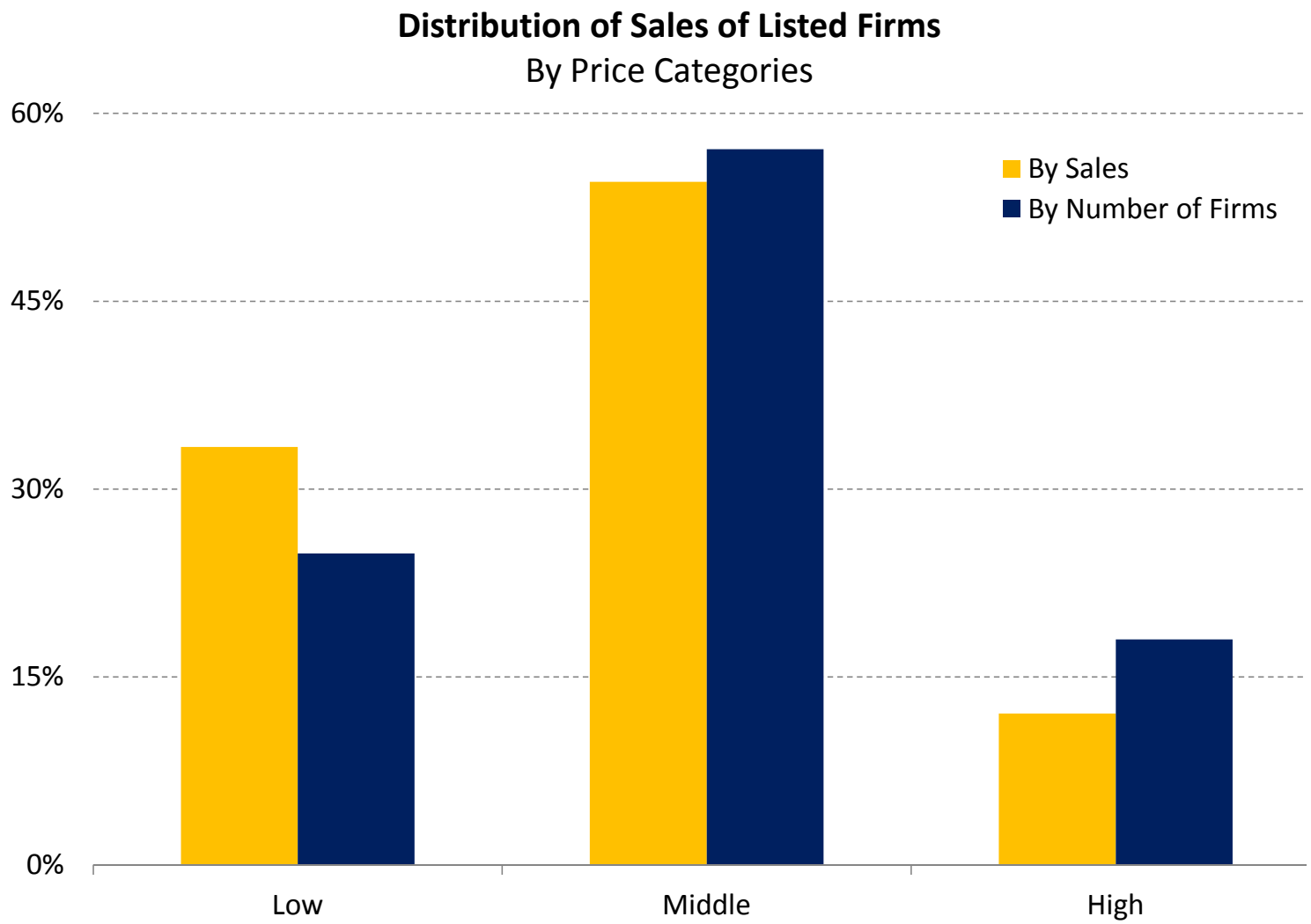
- Use price as a proxy for quality.
- Use Yelp price ranges to categorize quality of firms:
  $ (Low), $$ (Middle), $$$ or $$$$ (High)
- For example - Yelp determines the price ranges of restaurants based on the cost of a main meal + drink + tip

Yelp scraping example: McDonald's Corporation

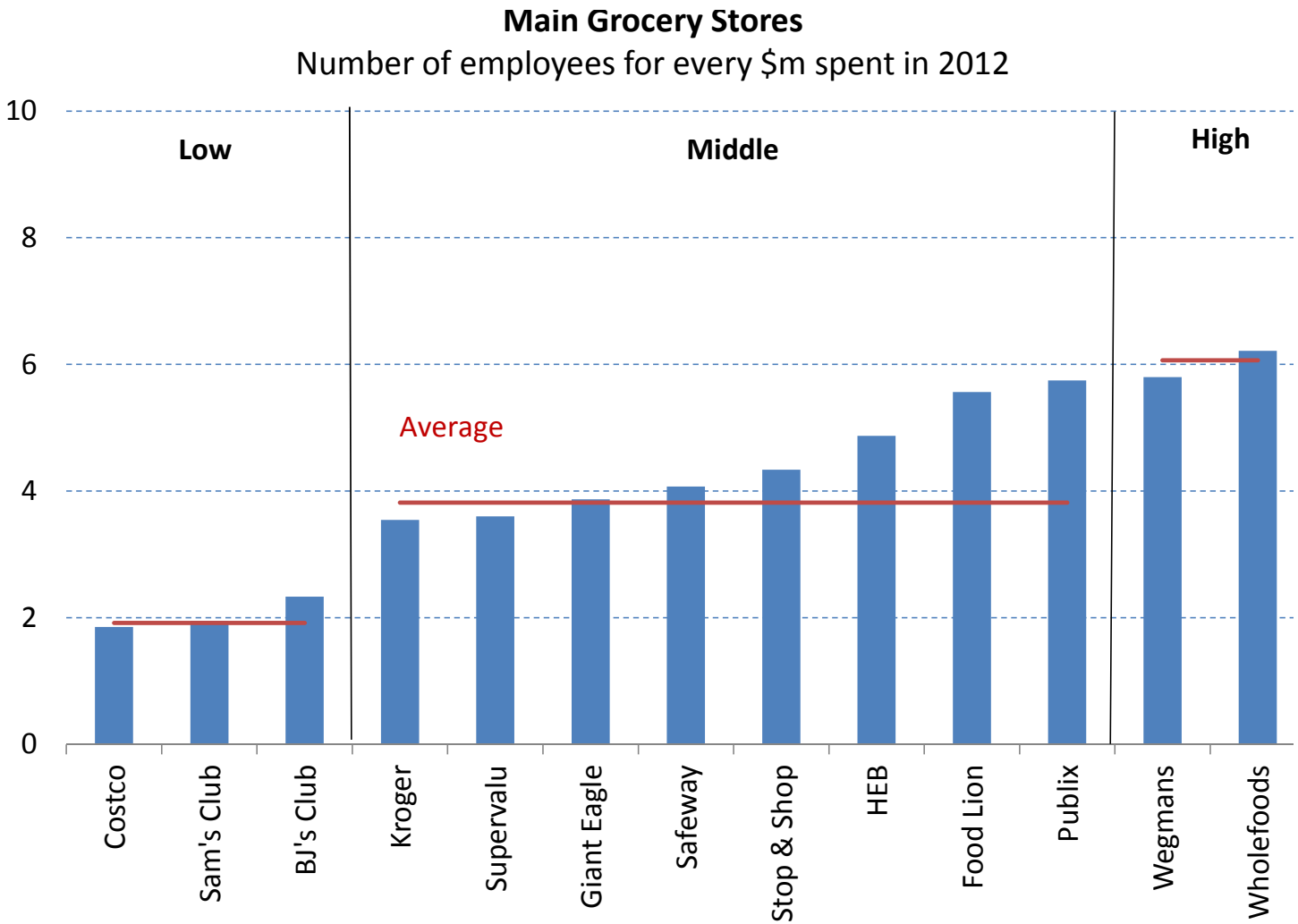
1. Associate each firm with its retail chain: McDonald's
2. In Yelp, match the stores in 18 largest U.S. cities and collect the first match: e.g. McDonald's in Chicago, IL



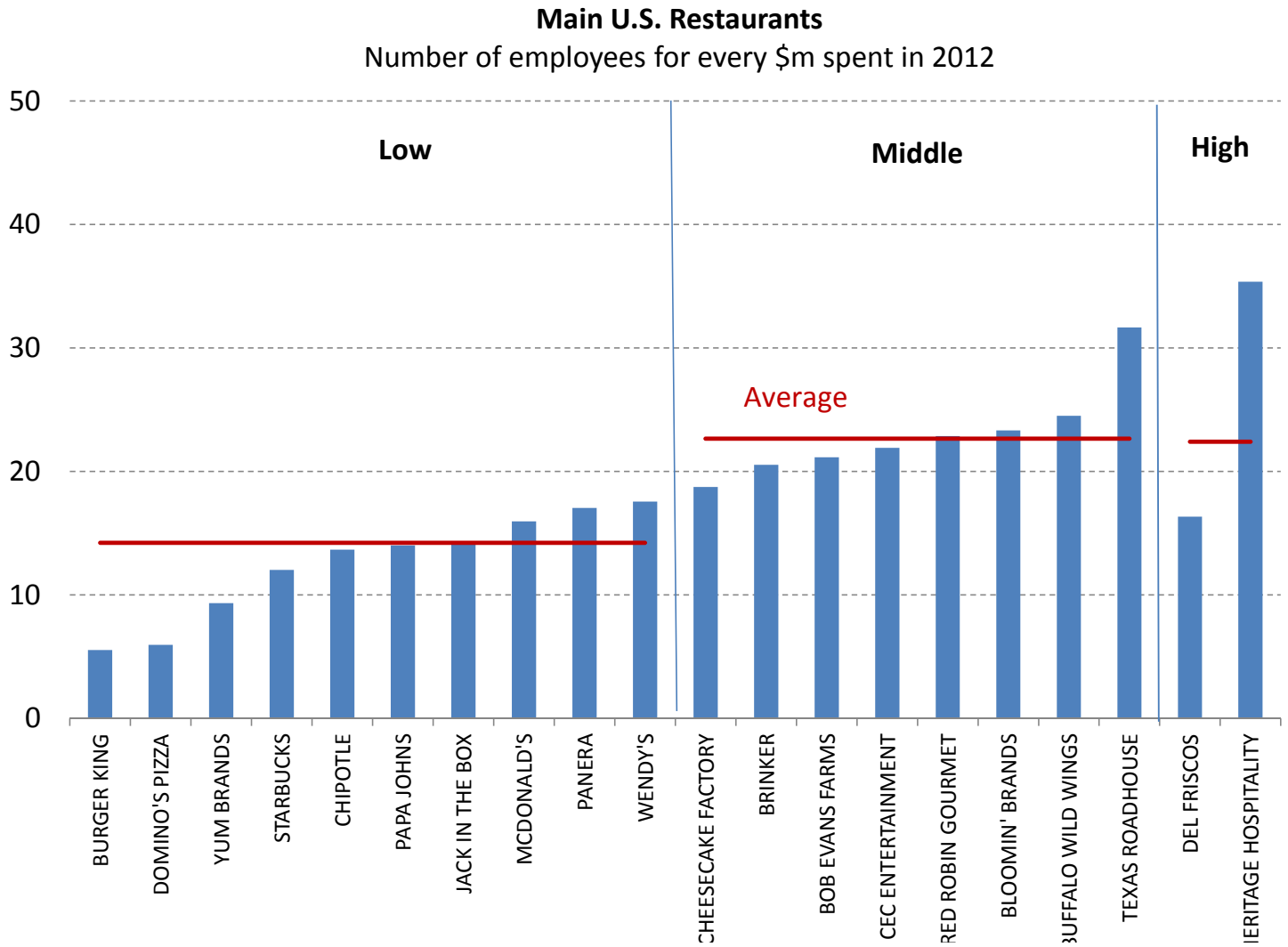
Yelp price distribution of firms



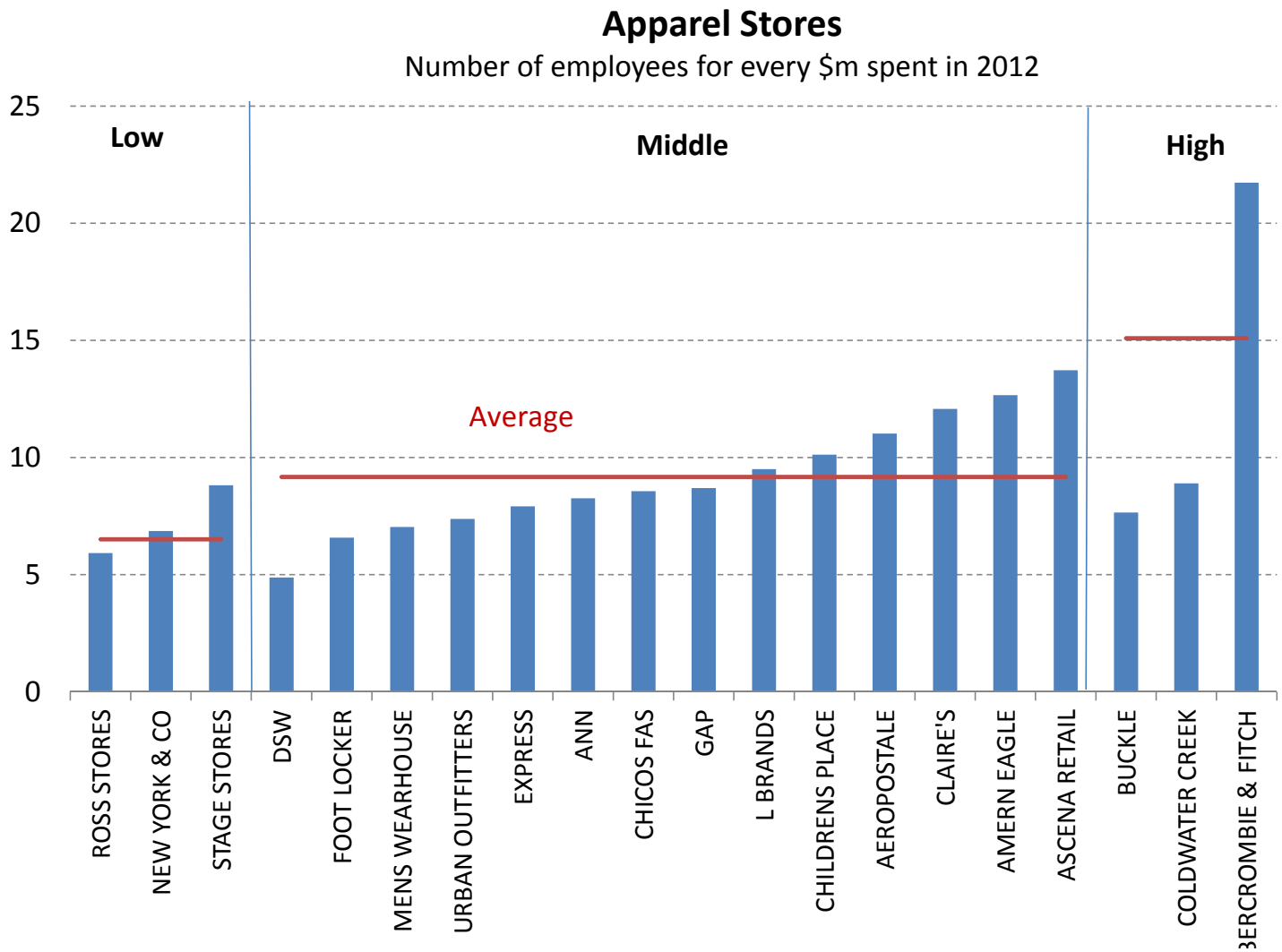
Labor Intensity Across Grocery Stores



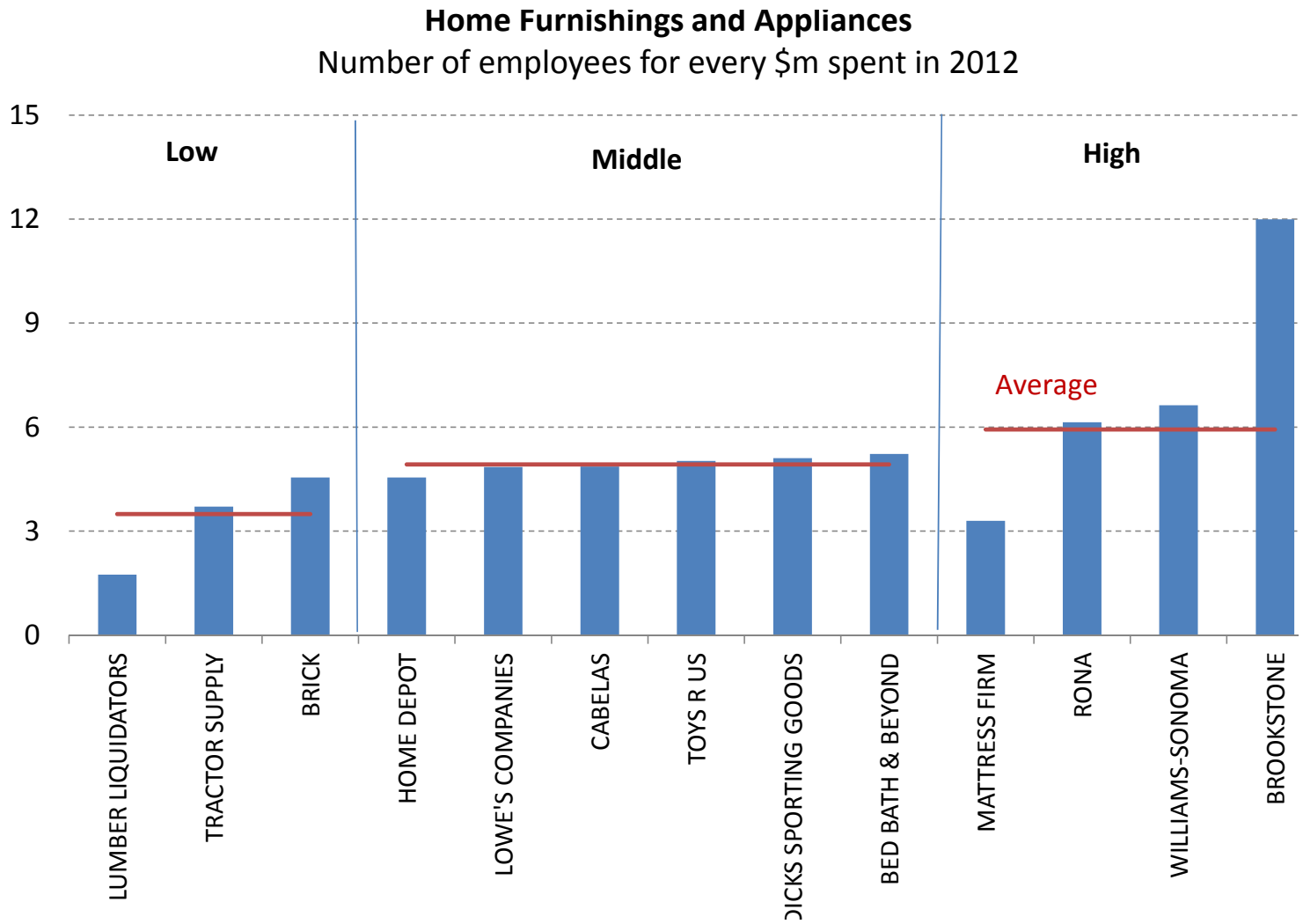
Labor Intensity Across Restaurants



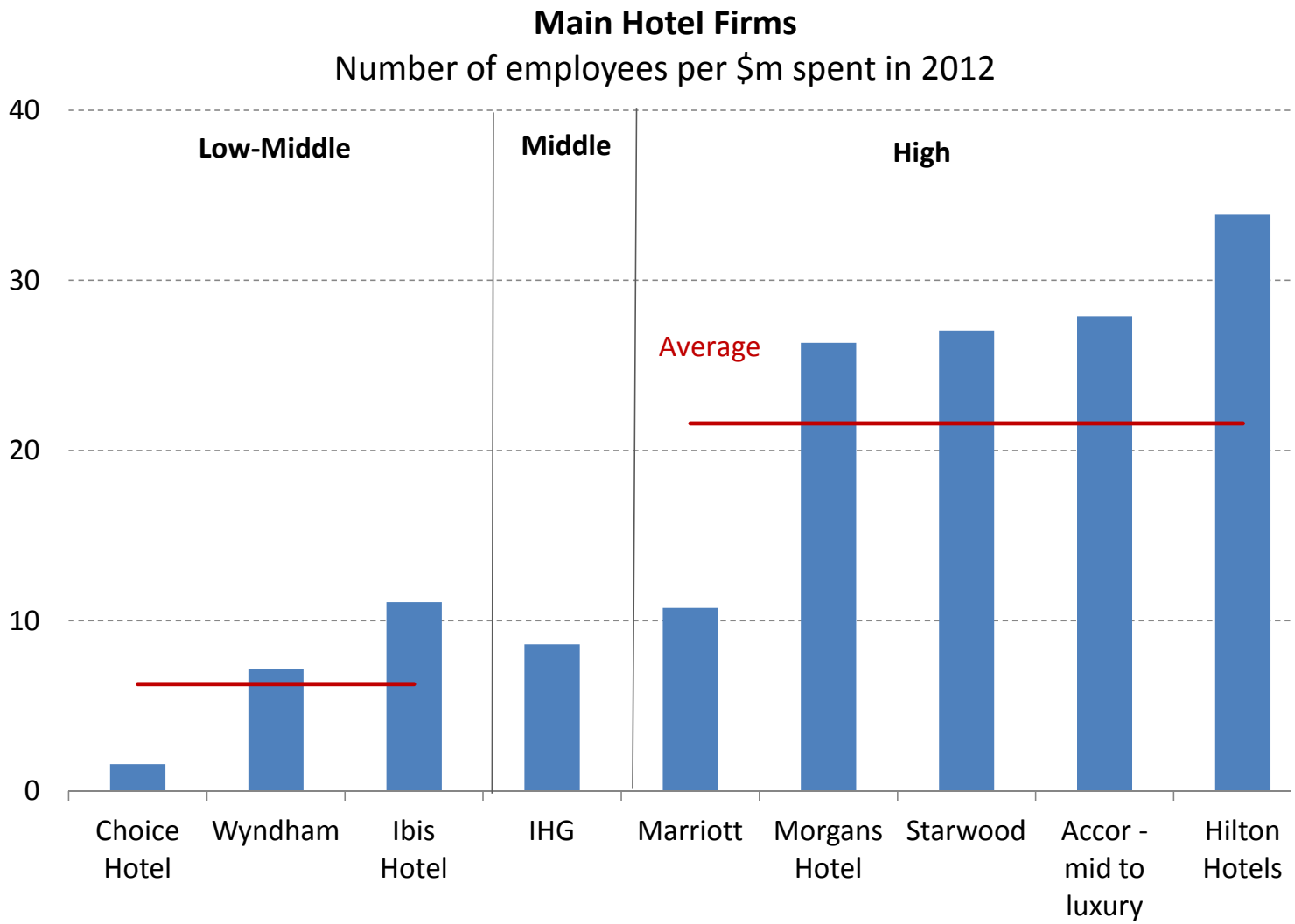
Labor Intensity Across Apparel Stores



Labor Intensity Across Home Furnishing Stores

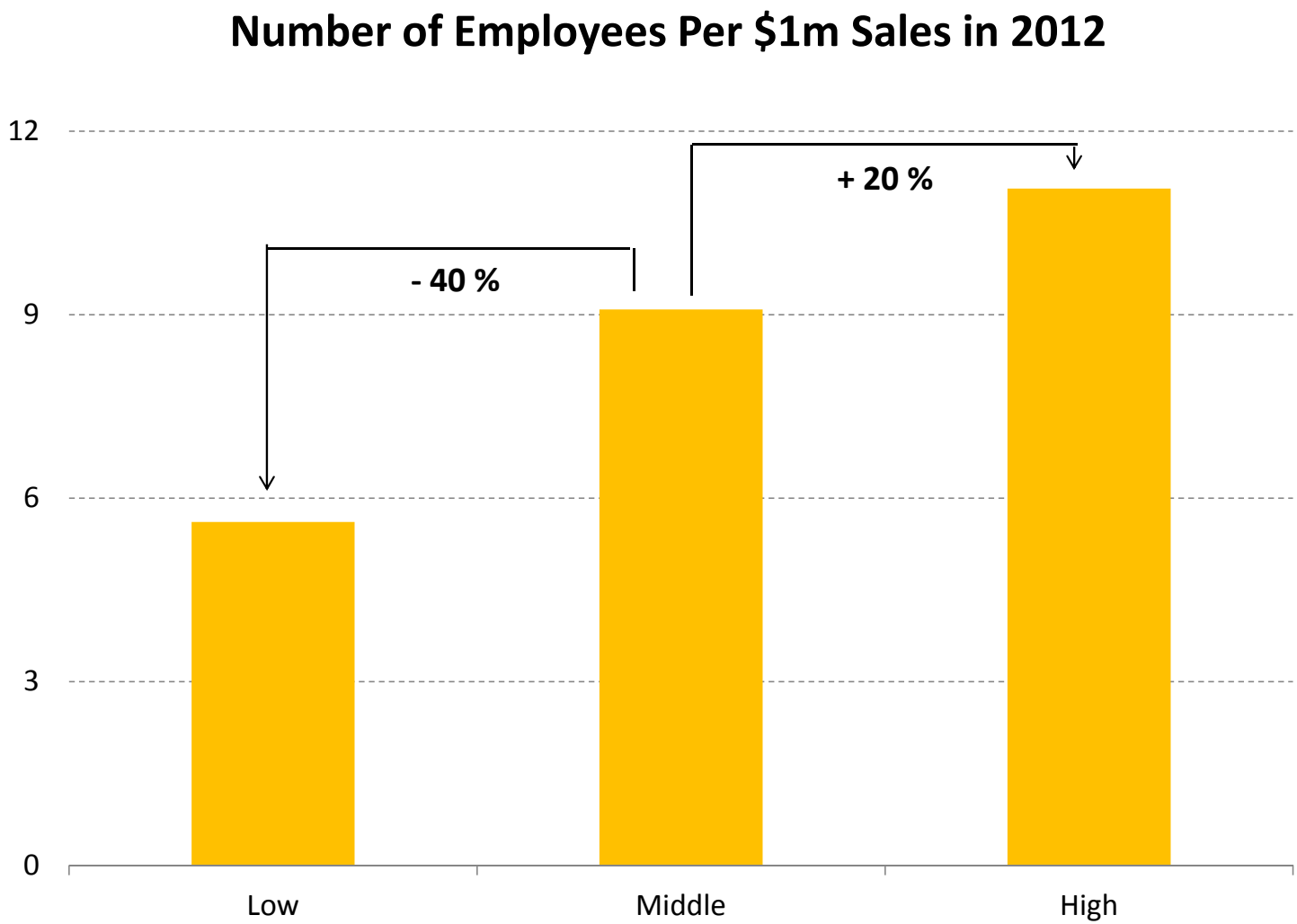


Labor Intensity Across Hotels

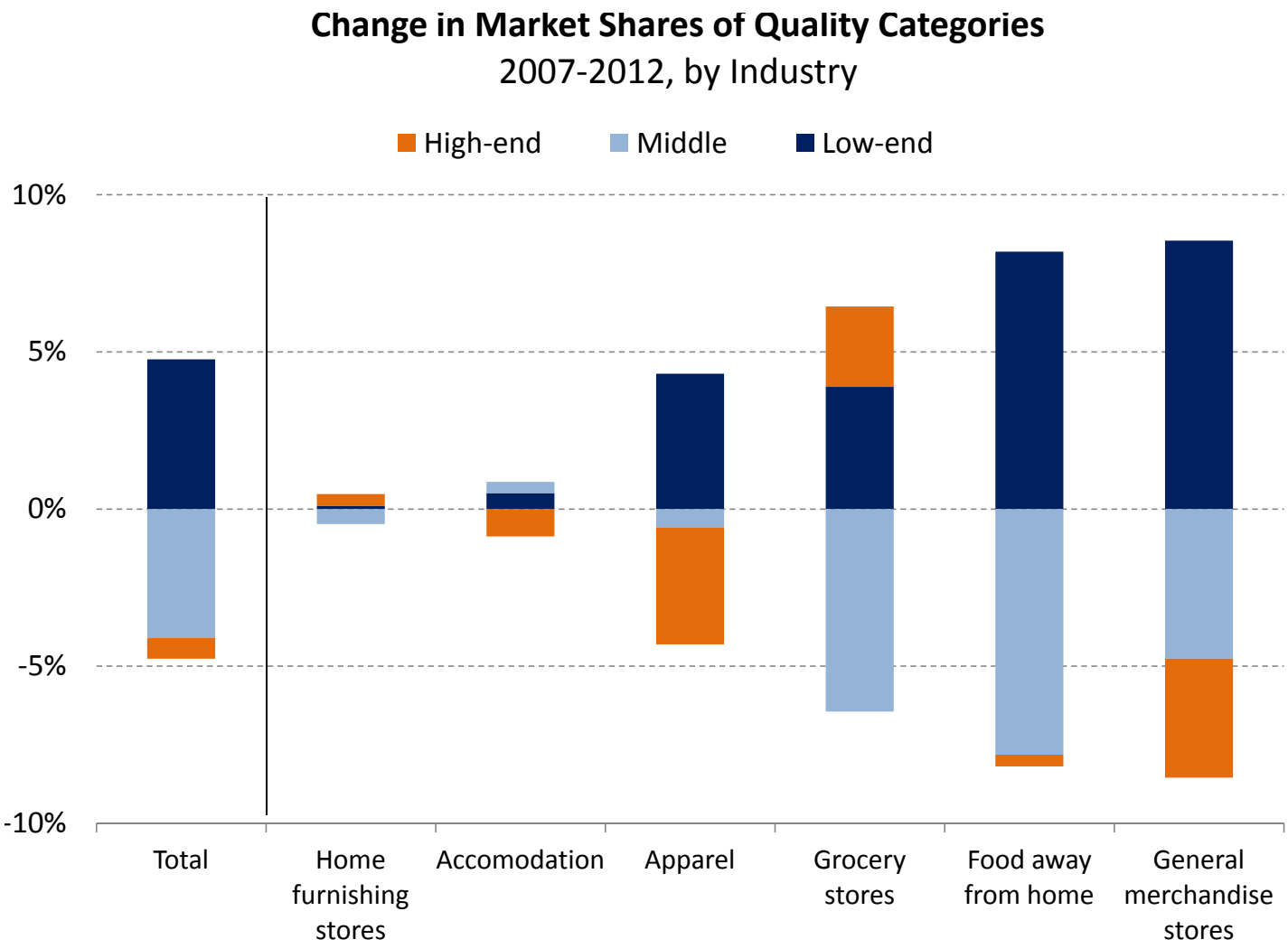


Split of hotels by rooms

Differences in Labor Intensity



Households Are Trading-Down in Quality



Effect of change in quality on employment

$$\triangle \text{Emp} = \text{Sales}^{2012} \cdot \sum_q \triangle \text{Market share}_q \cdot \text{Labor Intensity}_q^{2012}$$

Quality (q)	△ Market share	Labor Intensity	△ Emp
Low	5ppt	5.6	927,000
Middle	−4ppt	9.1	-1,294,000
High	−1ppt	11.1	-251,000
Implied total change			-619,000
Implied percentage change			-2.79%
Actual percentage change (per capita)			-7.87%

Trading-down accounted for 35% of actual decline in employment

Extending to the rest of the economy

Two different calculations: Both imply trading-down in quality accounts for around 25% of aggregate decline in employment.

1. Same decline in labor (-2.79%) applies to all sectors:
   - Excluding utilities, transportation and warehousing, educational services, mining, agriculture, government (i.e. 30% of aggregate employment)

2. Use labor intensity to allocate other 10,885 Compustat firms in other sectors into quality categories.

▸ Go to employment by industries

Extending to the rest of the economy

2. Use labor intensity to allocate firms into quality categories.
   - Yelp categorization of 6 sectors showed lower quality stores also had lower labor intensity, with average cut-off:
     - Low-end: Bottom 33% of labor intensity
     - Middle: 33-80% of labor intensity
     - High-end: Top 20% of labor intensity
   - Apply same cut-offs to sort 10,885 firms from Compustat across 55 NAICS sectors to sort firms into 3 'quality' categories.
   - Compute average labor intensity, market share shifts and implied labor change

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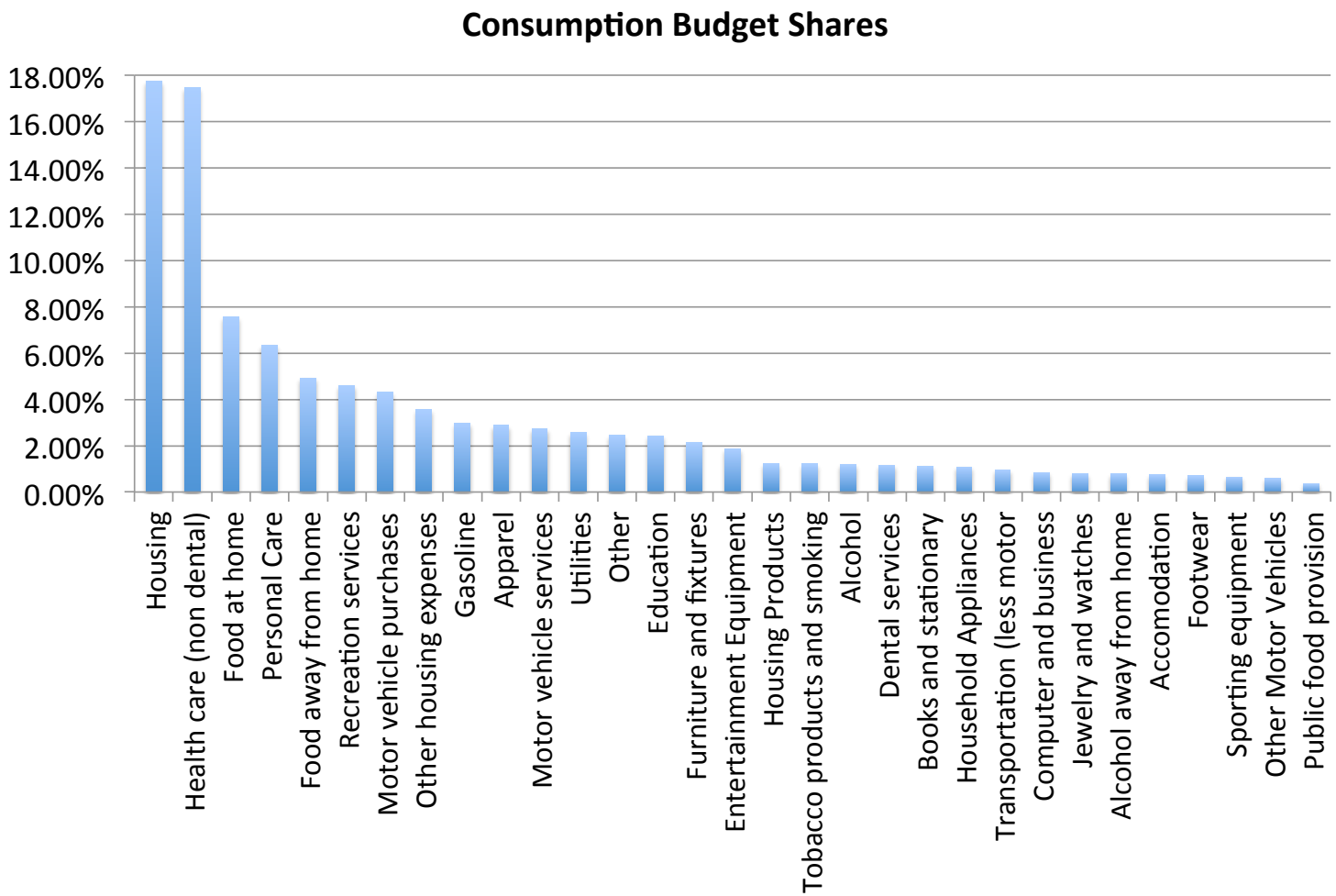
Implied trading-down in quality accounts for around 25% of aggregate decline in employment.

Second Form of Substitution: Across categories



Notes: Data from NIPA. Shares are based on real consumption in the IV quarter of 2007

Second Form of Substitution: Across categories

Use same approach to determine effect on labor:

1. Document shifts in budget shares across 31 broad categories
2. Document differences in labor intensity associated with producing each category
3. Quantify effect on labor from substituting across categories

1. Changes in budget shares of categories

Document shifts in budget shares from 2007-2012 across 31 broad categories using two different methods:

1. Using NIPA PCE data: Match 362 NIPA PCE categories to CEX categories and aggregate to 31 categories

2. Estimating Engel curves to isolate the budget share shifts due to changes in income.

Both methods give basically the same result.

▸ Go to Engel curve estimation

Labor effect from shifts in budget shares

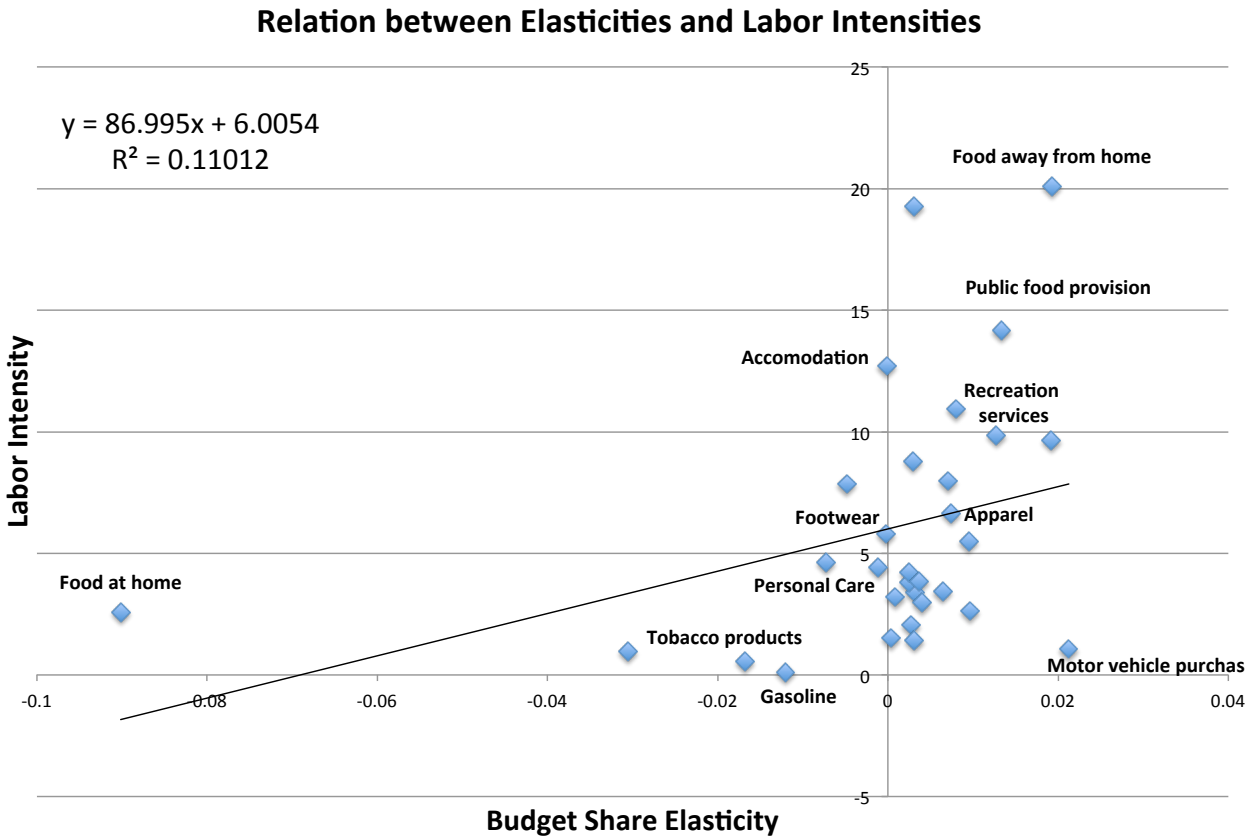
1. Document shifts in budget shares across 31 broad categories

2. Document differences in labor intensity associated with producing each category:
   - Use BEA Total Requirements (direct+indirect) Table
   - 2012 Census measures of labor intensity

3. Quantify effect on labor:
   - Use shares' changes together with labor intensity

No labor effects from across-category shifts

Labor intensity differences average out



Summary of Empirical Evidence

- During the recession, households substituted within product categories towards lower quality and across product categories towards necessities.
- Lower quality products and necessities required lower labor intensity to supply.
- Large implied labor effects from trading down to lower quality, and negligible effects from across-category substitution.

Introducing quality into business cycle models

RBC Models:

- Large amplifications of shocks
- Generate comovement in labor used to produce consumption and investment goods
- Provide a new theory for the labor wedge

Calvo Models:

- Flattening of the Phillips curve
- Amplification of monetary policy shocks

Production Function with Quality

Production Function:

$$Y(q) = A\left[\alpha\left(\frac{N}{q}\right)^{\rho} + (1-\alpha)(K)^{\rho}\right]^{\frac{1}{\rho}}$$

$\frac{1}{1-\rho}$: elasticity of substitution between N and K.

$P(q)$: the price of a good of quality q.

Producer's Problem:

$$\max P(q)A\left[\alpha\left(\frac{N}{q}\right)^{\rho} + (1-\alpha)(K)^{\rho}\right]^{\frac{1}{\rho}} - wN - rK$$

Production Function with Quality

Factor ratio:

$$\frac{N}{K} = \left[\frac{w}{r}\frac{(1-\alpha)}{\alpha}\right]^{\frac{1}{\rho-1}} (q)^{\frac{\rho}{\rho-1}}$$

If $\rho < 0$, the ratio N/K is increasing with quality.

Price:

$$P(q) = \frac{1}{A}\left[\alpha^{\frac{1}{1-\rho}} (qw)^{\frac{\rho}{\rho-1}} + (1-\alpha)^{\frac{1}{1-\rho}} r^{\frac{\rho}{\rho-1}}\right]^{\frac{\rho-1}{\rho}}$$

Natural implication:

$$P'(q) > 0,$$

$$\text{price elasticity} \frac{P'(q)q}{P(q)} > 0$$

Static Consumer Problem

Three requirements of the utility function:

(1) Increasing with quality,

(2) Concave in quality,

(3) Quality increases in income,

Static Consumer Problem

Three requirements of the utility function:

(1) Increasing with quality,

(2) Concave in quality,

(3) Quality increases in income,

(4) Simple....

Static Consumer Problem

$$U = \max_{q} \frac{q^{1-\theta}}{1-\theta} log\left[C(q)\right]$$

subject to

$$C(q) = \frac{Y}{P(q)}$$

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FOC:

$$log\left[\frac{Y}{P(q)}\right] = \frac{1}{1-\theta}\frac{qP'(q)}{P(q)}$$

$\frac{qP'(q)}{P(q)}$: Elasticity increases with q

Recall $P'(q) > 0$

Optimal chosen quality increases with income

Basic intuition: Abstract from capital/investment:

Production function $Y(q_t) = \frac{A_t}{q_t} N_t \Rightarrow P(q_t) = \frac{W_t}{A_t} q_t$

Household FOC for labor:

$$\phi N_t^{\nu} = \frac{q_t^{1-\theta}}{1-\theta} \left[\frac{W_t}{P(q_t)} \frac{1}{C(q_t)} \right] = \frac{q_t^{1-\theta}}{1-\theta} \left[\frac{W_t}{P(q_t)} \frac{P(q_t)}{W_t N_t} \right]$$

$$\Rightarrow q_t = \left[(1-\theta) \phi N_t^{1+\nu} \right]^{\frac{1}{1-\theta}}$$

Household FOC for consumption:

$$\log(C(q_t)) = \frac{1}{1-\theta} \frac{P'(q_t) q_t}{P(q_t)} = \frac{1}{1-\theta}$$

Combining: $C(q_t) = \frac{A_t}{q_t} N_t = A_t N_t \left[(1-\theta) \phi N_t^{1+\nu} 1 - \theta \right]^{\frac{-1}{1-\theta}} = C$

$$\widehat{N}_t = \frac{1-\theta}{\theta+\nu} * \widehat{A}_t$$

Back

Basic intuition: Why is there magnification for labor?

Utility: $$U = G(q)V\left[\frac{Y}{P(q)}\right] - D(N)$$

FOC for N with quality: $$G(q)V'\left[\frac{WN}{P(q)}\right]\frac{W}{P(q)} = D'(N)$$

FOC for N without quality: $$V'\left[\frac{WN}{P}\right]\frac{W}{P} = D'(N)$$

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Without quality the marginal benefit of an extra hour of work declines with consumption (why do I need 10 Toyota Camry?!)

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Without quality the marginal benefit of an extra hour of work declines with consumption (why do I need 10 Toyota Camry?!)

With quality, an increase in optimal q (relative to no quality):

1: "Shifts up" the MU of C $\Rightarrow$ MB to work $\Uparrow$

2: Reduces C-units $\Rightarrow$ mitigates fall in MU of C $\Rightarrow$ MB to work $\Uparrow$

Instead of 10 Toyota Camry I get 1 Ferrari F12-Berlinetta !!!

Work effort

Quality in the utility function may also help explain the puzzle of why the rich work so hard (Kahneman et al (2006) and Aguiar and Hurst (2009)).

- In an economy with constant quality the marginal utility of consumption declines rapidly with income. This decline reduces the incentive to work.
- In an economy where consumers can choose quality, the marginal utility of consumption declines less rapidly, so there is more incentive to work

RBC model with Quality

Consumption Goods Sector:

$$\max_{\{N_C,K_C\}} P(q)A\left[\alpha\left(\frac{N_C}{q}\right)^{\rho}+(1-\alpha)\left(K_C\right)^{\rho}\right]^{\frac{1}{\rho}}-wN_C-rK_C,$$

Investment Goods Sector:

$$\max_{\{N_I,K_I\}} P_I Z\left[\alpha\left(N_I\right)^{\rho}+(1-\alpha)\left(K_I\right)^{\rho}\right]^{\frac{1}{\rho}}-wN_I-rK_I,$$

Optimal allocation across sectors:

$$\left(\frac{K_I}{K_C}\right)^{\frac{\rho-1}{\rho}}=\left(\frac{N_I}{N_C}\right)^{\frac{\rho-1}{\rho}}q$$

Consumer Problem

Representative agent solves

$$U = \max_{q, C(q_t), N_t, K_{t+1}} \sum \beta^t \left\{ \frac{q^{1-\theta}}{1-\theta} log\left(C(q_t)\right) - \phi \frac{N_t^{1+\nu}}{1+\nu} \right\}$$

subject to

$$C(q_t)P(q_t) + P_I I_t = w_t N_t + r_t K_t$$

$$K_t = K_{Ct} + K_{It}$$

$$N = N_{Ct} + N_{It}$$

Consumer Problem

- Inter-temporal condition:

$$P_{I,t}\lambda_t = \beta\lambda_{t+1}\left[r_{t+1} + (1-\delta)P_{I,t+1}\right]$$

- Trade-off between quality and consumption:

$$\log\left[C(q_t)\right] = \frac{1}{1-\theta}\frac{P'(q_t)q_t}{P(q_t)}$$

- Intra-temporal condition

$$\phi N_t^{\nu} = \left[\frac{q_t^{1-\theta}}{1-\theta}\right]\left[\frac{w}{P(q_t)}\frac{1}{C(q_t)}\right]$$

Labor wedge τ_t:

$$(1-\tau_t) = \frac{q_t^{1-\theta}}{1-\theta}$$

Theory of counter-cyclical labor wedge due to procyclical q

Equilibrium

Given price functions $\{w(\Omega_t), r(\Omega_t), P_I(\Omega_t), P(q, \Omega_t)\}$ and state variables $\Omega_t = \{K_t, A_t\}$:

- Household optimizes, choosing $\{C(q_t), q_t, N_t, K_{t+1}\}$
- Investment good sector firms optimize $\{K_{It}, N_{It}\}$
- Consumption good sector firms optimize $\{K_{Ct}, N_{Ct}\}$
- Markets clear:
  $$K_t = K_{It} + K_{Ct}, \quad N_t = N_{It} + N_{Ct}, \quad Y(q_t) = C(q_t)$$
- Law of motion for state variables Ω_t

$$K_{t+1} = I_t + K_t(1 - \delta)$$

$$A_t = \rho Z_{t-1} + \eta_t^a$$

Parameterization (quarterly model)

Parameter	Moment/Description	Value
β	Discount rate	0.985
ν	Inverse of Frisch elasticity	0.001
ϕ	Match N^{SS}	5.31
θ	Elasticity of utility to quality	?
δ	Depreciation rate	0.025
α	Production function share	0.5
ρ	EOS K and N: $\frac{1}{1-\rho}$	-1
ξ	AR(1) coefficient of TFP	0.95

Parameterization: Calibrating θ

- Empirics: about $20\% - 30\%$ of the change in labor is due to quality
- Implement the same approach in our model

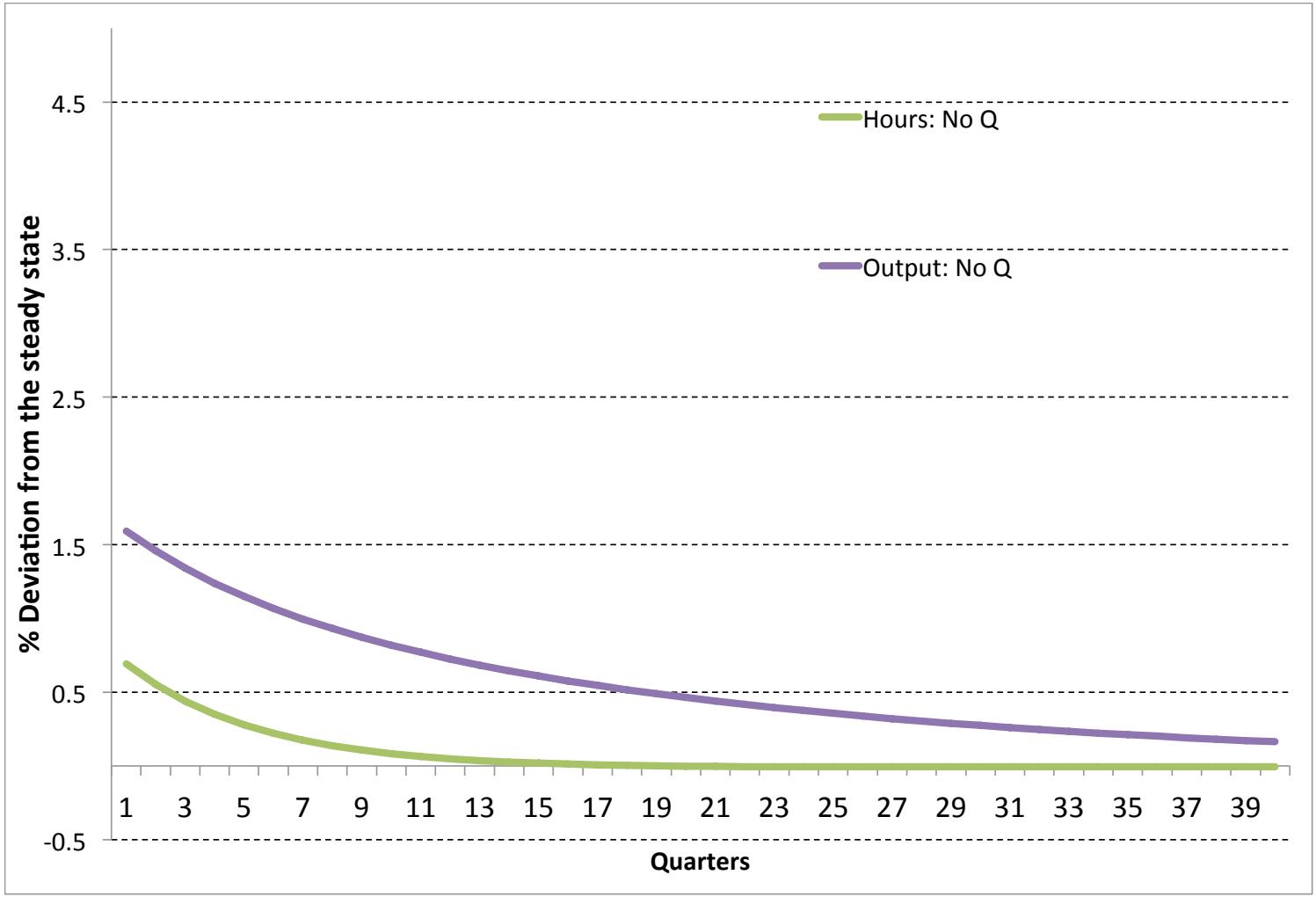
$$\triangle \text{Emp}_{data} = \sum_q \triangle \text{Market share}_q \cdot \left(\text{LI}_q^{2012} \cdot \text{Sales}^{2012}\right)$$

$$\triangle \text{Emp}_{model} = \sum_q \triangle \text{Market share}_q \cdot \left(\text{LI(q)}^{ss} \cdot P(q)^{ss} C(q)^{ss}\right)$$

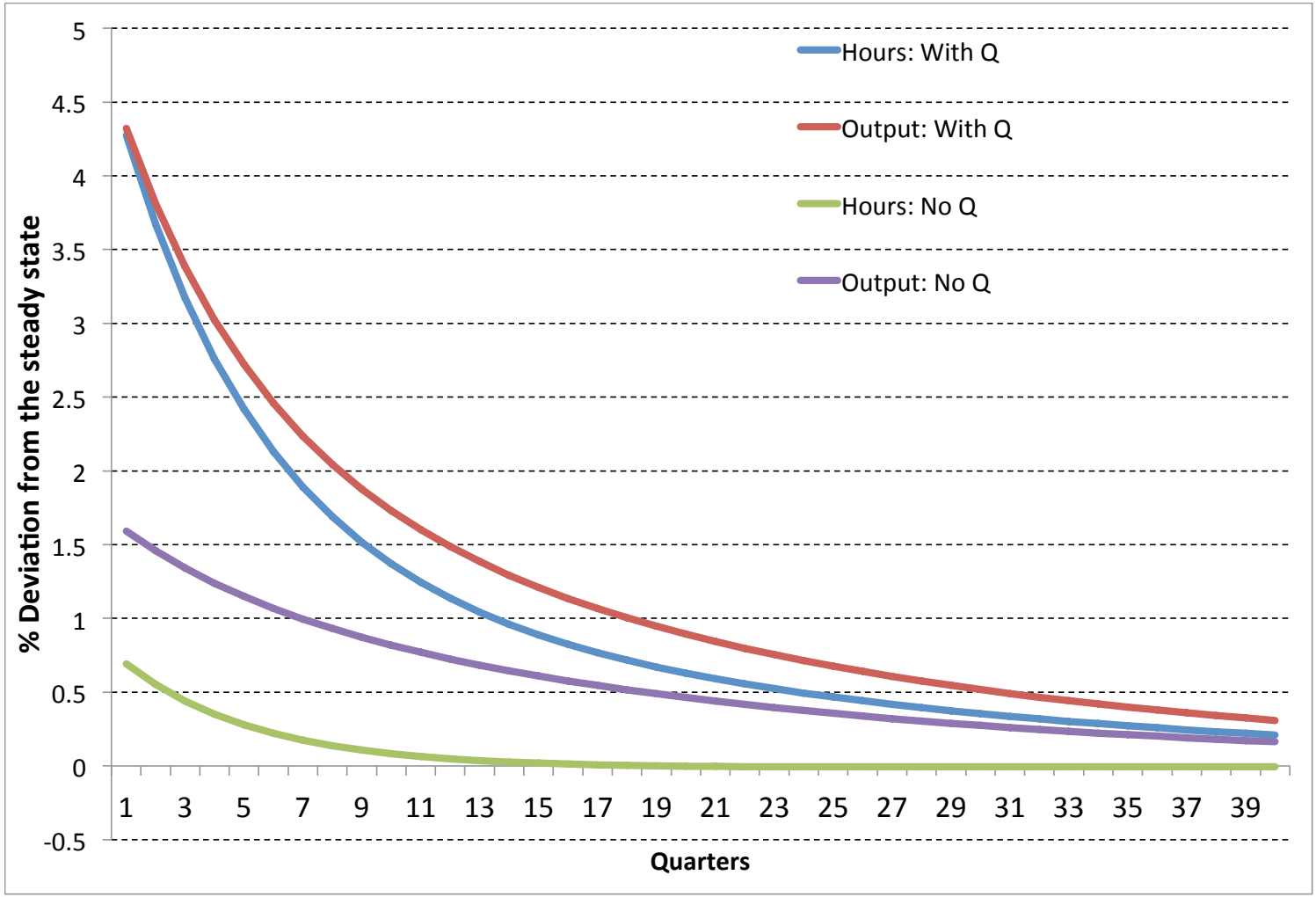
$$LI(q) = \frac{N_C}{P(q)C(q)} = \frac{1}{w}\left[\left\{1 + \left(\frac{1-\alpha}{\alpha}\right)^{\frac{1}{1-\rho}}\left[\frac{Ar}{qw}\right]^{\frac{\rho}{\rho-1}}\right\}\right]^{-1}$$

$\theta = 0.5$: Mean of IRF of $\frac{\triangle \text{Emp}_{model}}{\triangle \text{Total Emp}_{model}} = \frac{\triangle \text{Emp}_{data}}{\triangle \text{Total Emp}_{data}} = 0.25$

Findings


4.5
3.5
2.5
1.5
0.5
-0.5
% Deviation from the steady state
Hours: No Q
Output: No Q
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39
Quarters

Findings


Hours: With Q
Output: With Q
Hours: No Q
Output: No Q
% Deviation from the steady state
Quarters
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39

Findings

	Data		Model with Quality		Model without Quality	
VARIABLE	Std relative to output	Cor with output	Std relative to output	Cor with output	Std relative to output	Cor with output
Total Hours	1.10	0.78	**0.98**	1.00	0.42	0.95
Consumption	0.80	0.85	0.49	0.86	0.61	0.94
Investment	3.16	0.87	3.47	0.96	5.92	0.93
Hours in C	0.80	0.48	0.37	**0.66**	0.09	-0.45
Hours in I	2.48	0.86	3.29	**0.95**	5.42	0.90
Q	NA	NA	0.56	0.86	NA	NA
Relative Price of Inv	1.07	-0.39	0.42	**-0.98**	NA	NA
Labor Wedge	1.10	-0.69	0.37	**-0.86**	NA	NA

Generating Comovement

Basic RBC models fail to generate comovement in labor between the consumption and investment good sectors:

$$U = log(C) - \phi \frac{N^{1+\nu}}{1+\nu}$$

FOC for hours worked:

$$\phi N^{\nu} = \lambda w = \frac{w}{P_C C}$$

With Cobb-Douglas:

$$\phi (N_C + N_I)^{\nu} = \frac{(1-\alpha)}{Nc}$$

N_I increases while N_C falls after a positive TFP shock.

CES by itself alters FOC but does not generate comovement

Generating Comovement

FOC for hours with quality choice:

$$\phi(N_C + N_I)^{\nu} = \frac{q^{1-\theta-\rho}}{1-\theta} \frac{1}{N_C^{1-\rho}} \left[\alpha \left(\frac{A}{C} \right)^{\rho} \right]$$

Quality is in the FOC: $\frac{q^{1-\theta-\rho}}{1-\theta}$

Comovement is possible because: quality is procyclial $\Rightarrow N_C \Uparrow \Rightarrow$ Moreover... N_C increases with quality

Both N_I and N_C can rise after a positive TFP shock.

A theory of labor wedges

- Intra-temporal condition

$$\frac{C(q_t)P(q_t)}{W_t}\phi N_t^{\nu} = \frac{q_t^{1-\theta}}{1-\theta} = (1-\tau_t)$$

  Theory of counter-cyclical labor wedge due to procyclical q

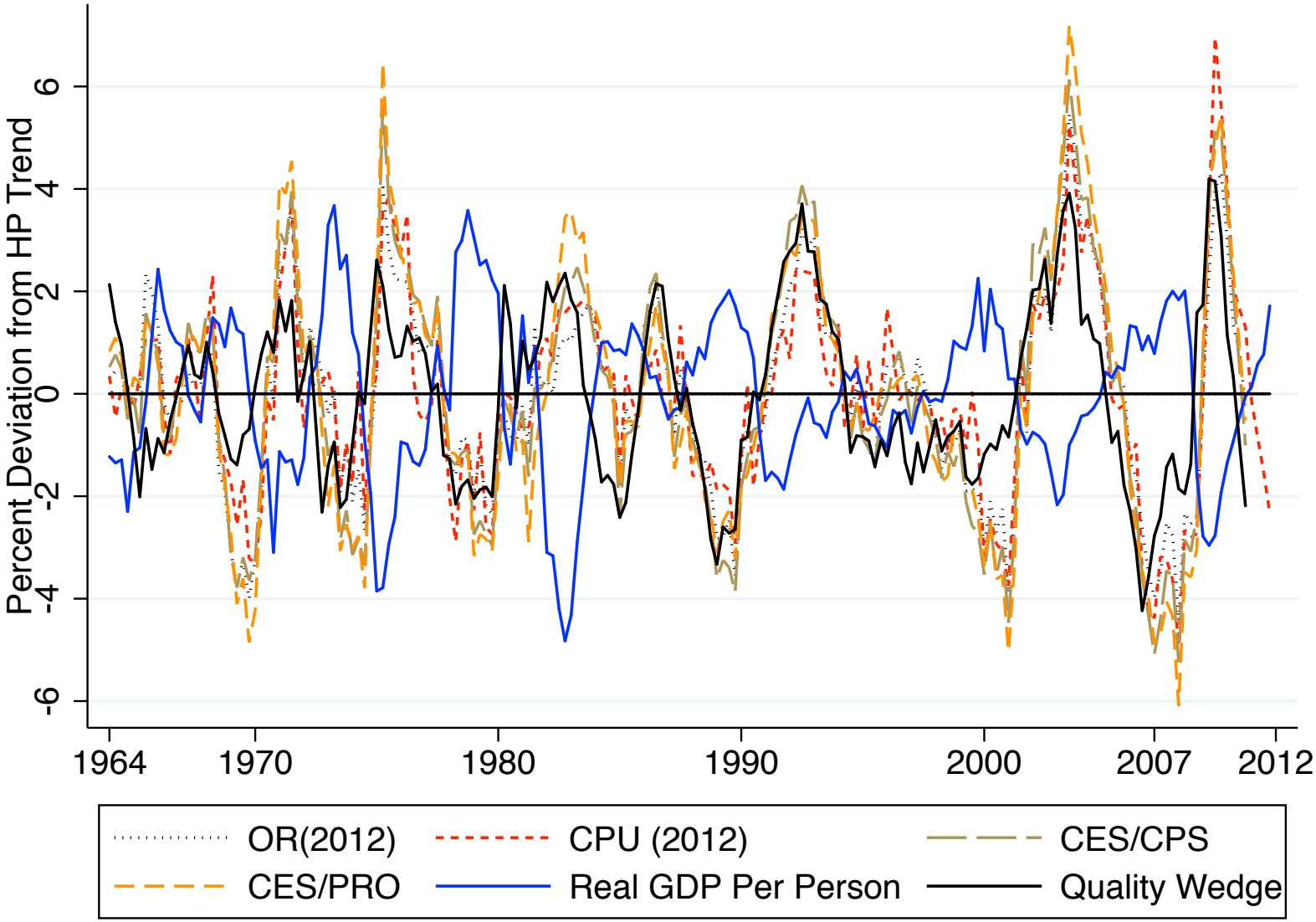
- Simulate the model and compute the labor wedge implied by the model.

- Construct the empirical equivalent of the left hand side

$$\frac{C(q_t)P(q_t)}{W_t}\phi N_t^{\nu}$$

  using 4 different measures of hours from Karabarbounis (2014)

A theory of labor wedges



A theory of labor wedges

- Correlation of 0.7 between the labor wedge of the data and the model.
- The model accounts for 75% of the steady state value

Consumer's Problem

$$U = \max_{q, C(q_t), N_t, B_{t+1}} \sum \beta^t \left\{ \frac{q^{1-\theta}}{1-\theta} log\left(C(q_t)\right) - \phi \frac{N_t^{1+\nu}}{1+\nu} \right\}$$

s.t.

$$P(q_t)C_t + B_{t+1} = B_t \cdot R_t + W_t N_t + T_t$$

Production

- Final Good Firm: $Y(q_t) = \left(\int_0^1 \left[Y_t^i (q_t) \right]^{\frac{\varepsilon-1}{\varepsilon}} di \right)^{\frac{\varepsilon}{\varepsilon-1}}$
- Profit maximization leads to: $P^i (q_t) = P(q_t) \left[\frac{Y(q_t)}{Y^i(q_t)} \right]^{\frac{1}{\varepsilon}}$
- Intermediate good produced by a monopolist: $Y^i (q_t) = \frac{A_t}{q_t} N_t^i$

Pricing

- Frictionless Price: $P^i(q_t) = \frac{\varepsilon}{\varepsilon - 1} \frac{W_t}{A_t} q_t$
- Assume firms post a price schedule linear in q_t:

$$P^i(q_t) = \mu_t^i q_t$$

and can change prices with probably $(1 - \psi)$

- Aggregate price: $P(q_t) = \left[(1 - \psi) \left(\tilde{\mu}_t^i \right)^{1-\varepsilon} + \psi \mu_{t-1}^{1-\varepsilon} \right]^{\frac{1}{1-\varepsilon}} q_t$

Pricing

- Solve:

$$E_t \sum_{j=0}^{\infty} (\beta\psi)^j \lambda_{t+j} \left[\tilde{\mu}_t^i q_{t+j} Y^i \left(q_{t+j} \right) - W_{t+j} N^i \left(q_{t+j} \right) \right]$$

- Real cost per unit of quality:

$$s_{t+j} = \frac{W_{t+j}}{\mu_{t+j} A_{t+j}}$$

- $X_{t,j} = \left(\pi_{t+1} \pi_{t+2} ... \pi_{t+j} \right)^{-1}$
- Solution: $\frac{\tilde{\mu}_t^i}{\mu_t} = \tilde{p}_t = \frac{E_t \sum_{j=0}^{\infty} (\beta\psi)^j \frac{q_{t+j}^{1-\theta}}{1-\theta} \left(X_{t,j} \right)^{-\varepsilon} \frac{\varepsilon}{\varepsilon - 1} s_{t+j}}{E_t \sum_{j=0}^{\infty} (\beta\psi)^j \frac{q_{t+j}^{1-\theta}}{1-\theta} \left(X_{t,j} \right)^{1-\varepsilon}}$

Phillips Curve

Usual Phillips Curve:

$$\widehat{\pi}_t = \kappa x_t + \beta E_t \left(\widehat{\pi}_{t+1} \right)$$

where $x_t = \%$ deviation of Real GDP from natural rate

- Smaller κ (flatter curve) means firms adjust prices by smaller amount $\Rightarrow$ amplification of monetary policy shocks
- Consider a negative monetary policy shock:

  R $\Uparrow \Rightarrow$ r $\Uparrow \Rightarrow$ C and Y $\Downarrow \Rightarrow$ MC $\Downarrow \Rightarrow$ Sticky prices so Mkup $\Uparrow \Rightarrow$ Labor demand $\Downarrow$

Phillips Curve

$$\widehat{\pi}_t = \kappa x_t + \beta E_t \left(\widehat{\pi}_{t+1} \right)$$

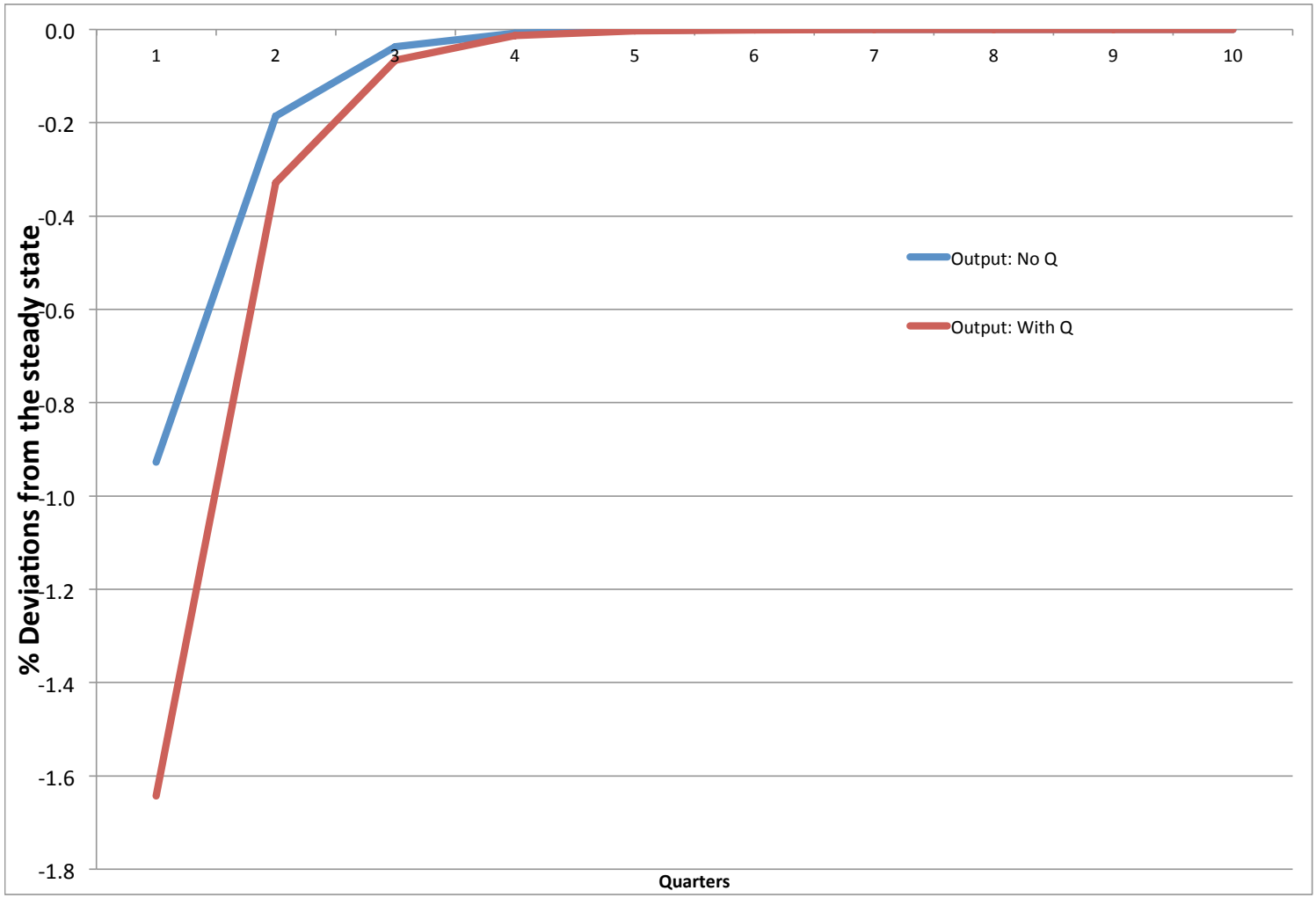
where

- PC usual case: $\kappa = \frac{(1-\beta\psi)(1-\psi)}{\psi} (1 + \nu)$
- PC with quality: $\kappa = \frac{(1-\beta\psi)(1-\psi)}{\psi} (\theta + \nu)$

The Phillips curve is flatter (recall that $\theta < 1$): κ is lower.

With quality, prices adjust less because labor is more flexible. This means mark-ups vary by more following a shock. Thus, labor and output respond more.

Phillips Curve



Conclusion

Empirically, we showed that:

- Consumers react to lower income by reducing quality
- Lower quality products use less labor
- Trading-down within product category reduced labor by 25-35% in the recent recession.

Conclusion

Introducing quality into Business Cycle Models:

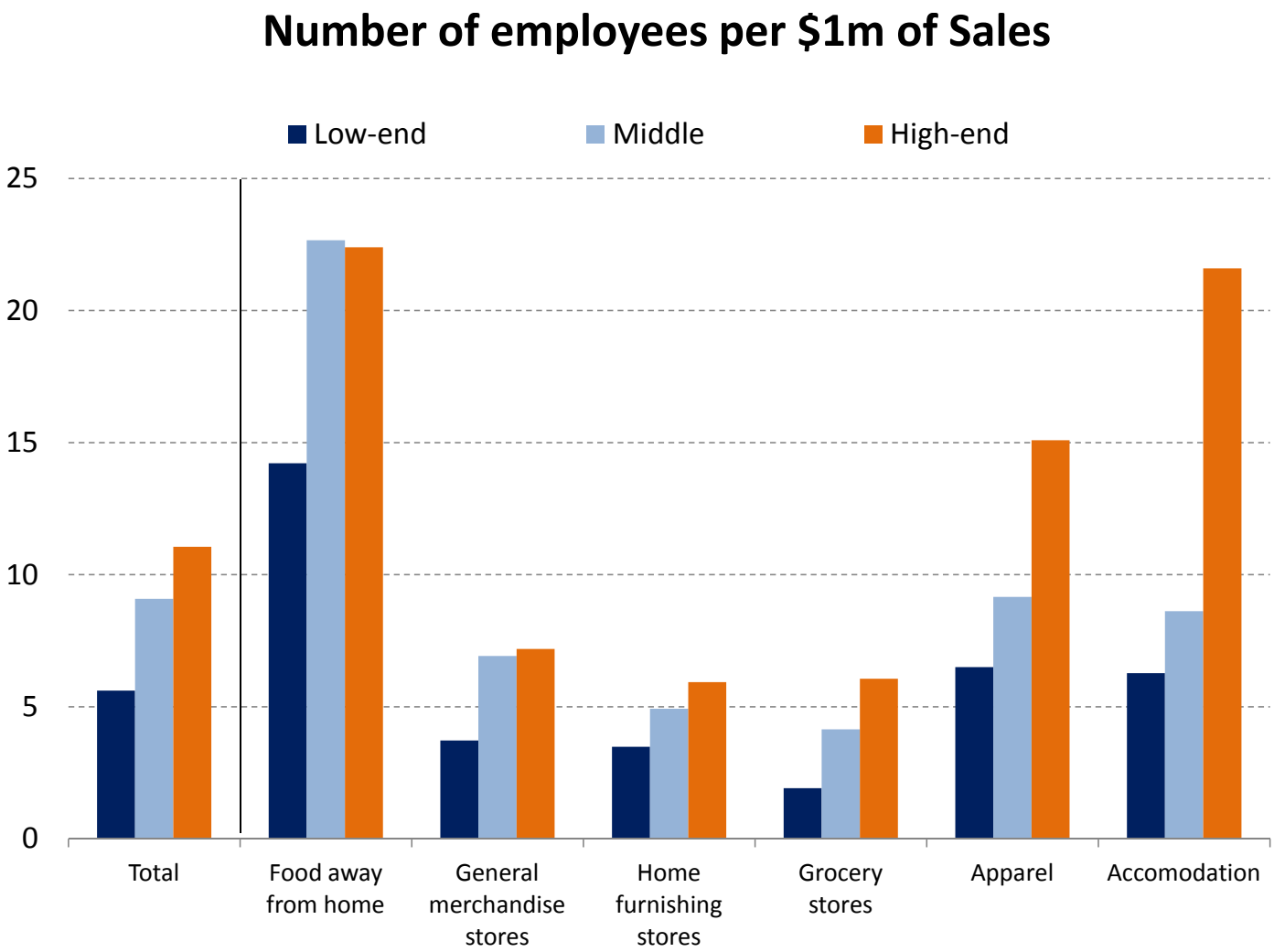
RBC Model:

- Amplified shocks
- Generates comovement in labor in consumption and investment goods sectors
- Provided a new theory of cyclical labor wedge

Calvo Model:

- Flattened the Phillips Curve
- Amplified monetary policy shocks

Differences in Labor Intensity For Various Sectors



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Industries

Employment by Industry Sector	%
Goods-producing, excluding agriculture	
Mining	0.6
Construction	3.9
Manufacturing	8.2
Agriculture, forestry, fishing, and hunting(3)	1.5
Agriculture wage and salary	0.9
Agriculture self-employed and unpaid family workers	0.6
Nonagriculture self-employed and unpaid family	6.1
Federal government	1.9
State and local government	13.1

Employment by Industry Sector	%
Services-providing	65.0
Utilities	0.4
Wholesale trade	3.9
Retail trade	10.2
Motor vehicle and parts dealers	1.2
Furniture and home furnishings stores	0.3
Electronics and appliance stores	0.3
Building material and garden supply stores	0.8
Food and beverage stores	2.0
Health and personal care stores	0.7
Gasoline stations	0.6
Clothing and clothing accessories stores	1.0
Sporting goods, book, and music stores	0.4
General merchandise stores	2.1
Miscellaneous store retailers	0.5
Nonstore retailers	0.3
Transportation and warehousing	3.0
Information	1.8
Financial activities	5.4
Professional and business services	12.3
Educational services	2.3
Health care and social assistance	11.7
Leisure and hospitality	9.5
Accomodation	1.2
Food services and drinking places	6.9
Other services	4.2

The Compustat Firms: Descriptive Statistics

Sectors	Source	Number of Firms	Sales Revenue Average Firm $m	Sales Revenue % of total Industry	Top 5 companies from Compustat
Accomodation	Compustat	11	3,088	15%	Marriot Intl Inc, Hilton Hotels Corp, Wyndham Worldwide Corp, Hyatt Hotels Corp, Accor Hotels
Apparel	Compustat	54	1,648	41%	American Eagle Outfitters Inc, Ascena Retail Group Inc, Foot Locker Inc, Ross Stores Inc, Gap Inc
Grocery stores	Compustat	9	34,348	56%	Supervalu, Kroger, BJ's Club, Sam's Club, Costco
Restaurants	Compustat	74	1,012	19%	McDonald's Corp, Yum Brands Inc, Starbucks Corp, Bloomin' Brands Inc, Chipotle Mexican Grill Inc
Home furnishing	Compustat	41	4,750	39%	Home Depot Inc, Lowe's Companies Inc, Toys R Us Inc, Bed Bath & Beyond Inc, Dicks Sporting Goods Inc.
General Merchandise	U.S. Census	n.a.	n.a.	100%	Sears, Dollar General, Family dollar, Wal-Mart, Dillards

Basic intuition: Why is consumption constant?

$$U = G(q)V(C(q))$$

$$U = G(q)V(\frac{Y}{P(q)})$$

FOC: $\frac{G'(q)q}{G(q)} = \frac{V'(\frac{Y}{P(q)})\frac{Y}{P(q)}}{V(\frac{Y}{P(q)})}\frac{P'(q)q}{P(q)}$

We get constant consumption because of:

(1) Linearity of $P(q)$ in q

(2) $G(q)$ is a power function

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Measuring Budget Share Shifts

Estimate Engel curves: elasticities of budget shares to total expenditure

$$w_{ht}^k = \alpha^k + \beta^k \ln(X_{ht}) + \sum_j \gamma_j \ln(P_{jt}) + \theta_{ht}^k \cdot Z_{ht} + \epsilon_{ht}^k$$

where w_{ht}^k is the budget share allocated to category k, and X_{ht} is total household expenditure.

Thus, $\triangle$ budget share of category $k = \beta^k$ times $\triangle$ total household expenditure. ▸ Back