Econ 4850
Final Exam Review

December 12th 2019

Good luck for the exam!

General Aspects of Cognitive Processing

Effects of Reductions in Available Processing Capacity on Decisionmaking

- Subjects under stress exhibit greater tendency to be <u>risk-averse</u> with respect to gains, yet risk-seeking with respect to losses [Kahneman-Tversky "reflection effect"]

- Consistent with view that these biases result from judgments based on imprecise coding of potential payoffs, if precision of coding is reduced when less processing capacity available

- The departure from "risk neutrality" is stronger for small, unusual, non repetitive choices

- Subjects with high demands on their short-term memory, or with lower working memory capacity in general, more likely to make less healthy food choice, or to <u>discount future rewards</u> more: experiment with memory constraint (causality), evidence from development literature (correlation)

- Consistent with view that myopic behavior may represent not a well-considered preference, but rather a consequence of imprecise representation of future benefits (while immediate benefits are more accurately represented), if precision of representation of future benefits is reduced when less short-term memory capacity available

Greater Awareness of "Changes and Differences" than of Absolute Magnitudes

- Greater precision of discriminations is possible when relative values rather than absolute values must be judged [Anne Elk's theory on Brontosauruses]

- Judgments of magnitudes based on imprecise subjective coding that contains more information about changes or differences than about absolute magnitudes results in biases, as illustrated by common sensory illusions: (i) *simultaneous illusions* resulting from greater awareness of differences or contrast; (ii) *after-effects* resulting from greater awareness of changes

- These mechanisms underlie the effects of "salience" on the degree of weight given to particular features of a decision situation, in the Salience Theory of Bordalo-Gennaioli-Shleifer

Models of Economic Decisionmaking

1. Models of Choices Between Risky Prospects

2. Models of Intertemporal Choice

3. Models of Multi-Attribute Consumer Choice

1. Models of Choices Between Risky Prospects

-       Expected Utility Theory

-       Prospect Theory

-       Salience Theory

- Behavioral phenomena to understand: Mosteller-Nogee experiment; Rabin paradox; Allais paradox; "reflection effect"; the "fourfold pattern of risk attitudes"; preference reversals; equity premium puzzle; effects of skewness of returns on the pricing of options

2. Models of Intertemporal Choice

- Exponential discounting

- Naïve hyperbolic discounting

- Sophisticated hyperbolic discounting

- Koszegi-Rabin analysis of inconsistencies in intertemporal choice

- Mullainathan-Shafir analysis of effects of financial stress on decisionmaking (different degree of bias between high and low income subjects)

- Behavioral phenomena to understand: Thaler study of discounting at different horizons; time-inconsistency of choices about exercise, dieting, saving; DellaVigna-Malmendier study of gym membership decisions; borrowing behavior of the poor

3. Models of Multi-Attribute Consumer Choice

- Koszegi-Szeidl "focus-weighted utility" model (concentration)

- Tversky-Kahneman analysis of "jacket-calculator" problem (relative thinking)

- Thaler's theory of "transaction utility"

- Bordalo-Gennaioli-Shleifer Salience Theory

- Behavioral phenomena to understand: Schkade and Kahneman study of location preferences; Dunn *et al.* study of student housing preferences; "asymmetric dominance effect"; "compromise effect"; Tversky-Kahneman "jacket-calculator" problem; Thaler "beer on the beach" problem; Azar evidence for "relative thinking"; Hastings-Shapiro study of gasoline preferences; misleading "sales"

Sample final – Selected questions

Sample final – Question 2 (prospect theory)

- Compare the explanations that Prospect theory and Salience theory would give to the observation that many people buy lottery tickets even when the mathematical expectations is less than the cost. Do these theories agree about which aspect of the terms of the lottery result in this behavior?

Sample final – Question 2 (prospect theory)

- Different models can give the same predictions (in some cases)

- Prospect theory

- Salience

- What other example can we use (other than lotteries) to say that the two models have the same predictions? Any example of different predictions?
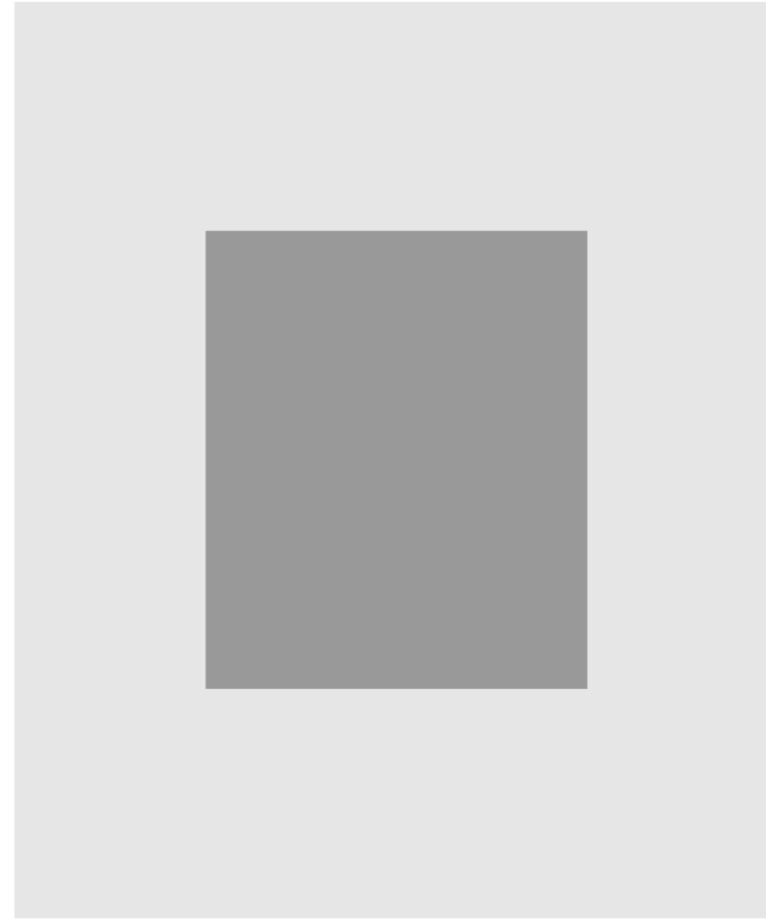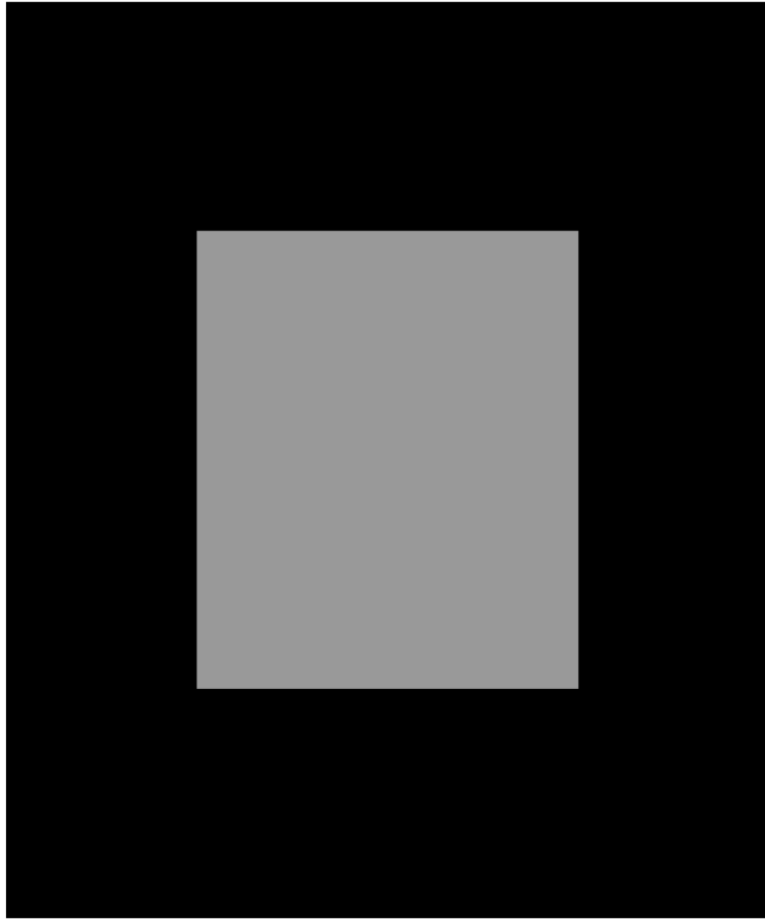
Sample final – Question 3 (Weber's Law)

- Does Weber's Law apply to perceptions of numerosity, in the case of visual arrays (say, fields of dots)? Explain what this means, in terms of something that could be measured experimentally and whether available evidence confirms such a prediction or not.

Sample final – Question 3 (Weber's Law)

- Explain briefly Weber's Law

- Apply the prediction to the perception of visual arrays

- Nieder and Merten (2007) experiment with clouds of dots: stochastic behavior (psychometric function), difference required to spot an increase increases proportionally to the initial number (Weber's law)

Sample final – Question 6 (contrast effect)

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- The central grey region on the right appears darker than the central grey region on the left, even though both regions are actually equally dark, in the sense of reflecting the same fraction of the light that strikes that part of the page. Does this prove that evolution has given us a visual system that is poorly designed to allow us to recognize what the world is really like? Or are there reasons why it could serve some purpose for our visual system to work this way?

Sample final – Question 6 (contrast effect)

- Describe contrast effect (as a specific type of contrast effect)

- Interpretation of repulsion effect as the result of Bayesian estimation: prior over possible colors, noisy mental representation of the color, optimal inference

- General hypothesis about perceptual system (relative vs absolute encoding)

- Other similar cases of repulsion effect (in perceptual and economic decisions)

What should I remember about references?

About references that we have discussed: You will not be expected to memorize the names of the authors of the individual studies, let alone the dates or other details of that kind; nor any precise numerical details of the authors' findings. You **should** know what the main point was of each of the studies that we have discussed in some detail [though not necessarily of studies that were mentioned only very briefly in passing].

For example, you should know that in the study of financial stress on cognitive function [it was by Mani et al. 2013, but you don't need to remember that], subjects answered a financial decision (small or big expense) and then a set of questions intended to tend cognitive functioning, and the high financial stress led to a significant decrease in the performance. You would not be expected to remember that the first question was about fixing a car, that the second set of questions was Raven's matrices, or small details of that kind.

Quick review of old topics

Discrimination between groups as a perceptual bias

- Bertrand and Mullainathan (2004) experiment with fictitious resumes with high quality/low quality profiles and randomly assigned names

- Phelps (1970) theory of statistical discrimination: one characteristic (ethnicity) is irrelevant but observable, and correlated with a relevant characteristic (productivity) that is difficult to observe

- Application of the principle of efficient coding from sensory perception: finer discrimination for stimulus magnitudes in a range that occurs more frequently in the environment (narrower tuning curves)

Attention allocation

- Attention as a scarce resource
- Endogenous allocation of attention across features

- Focusing illusion (concentration bias): allocate more weight towards attributes with higher variance, even if their impact on utility is small
- Reduced-form analysis: effect of concentrated vs dispersed attributes
- Structural-form interpretation: rational inattention model

- Rational inattention (environment) vs Salience theory (item-driven)

Expected utility theory vs Prospect theory

- Definition of EUT, RA and RS are possible (separately)

- Problems with EU: aversion to small gambles (Rabin paradox), Isolation effect, fourfold pattern (RA and RS), Allais paradox (prob.)

- Prospect theory: edit phase, value function, probability weighting function, reference point (framing)

A perceptual approach to prospect theory

- Risk attitudes as perceptual bias

- Concavity in gains / convexity in losses (as in Weber's law)
- More processing capacity allocated to losses (implies kink)
- Overweight small probabilities (conservatism)

- Unified explanation of choice behavior under risk with a simple principle (optimal inference from noisy coding), instead of requiring a set of unrelated assumptions as PT does
- Separate what people "choose" and "prefer"

Intertemporal choice

- Exponential discounting (implies time consistency)

- Quasi-hyperbolic discounting (present bias)
  - Naïve vs sophisticated discounter
  - Data on gym membership – DellaVigna-Malmendier 2006

- Time preference as cognitive bias
  - Noisy perception, maximize focus-weighted utility conditional on subjective representation

- Poverty and present bias, policy implications (incentives vs information)

Asymmetric dominance effect

- **Regularity**: Adding an option to a choice set shouldn't increase purchases of the previous options.

- But adding a **decoy** option can lead to violations of regularity.

- **Asymmetric Dominance Effect**: Suppose there are two options A and B, neither of which dominates the other. C (the decoy) is introduced, and is dominated by A (the target good), but neither dominates nor is dominated by B. This can increase purchases of A.

Contrast Effects

- Many judgments/decisions made on the basis of comparisons.

- Can lead to contrast effects.
  - E.g. rats' willingness to lick sucrose solution influenced by contrast in concentration (Flaherty et al., 1983).
- Also create visual illusions.
  - Simultaneous illusions: caused by other stimuli that are simultaneously present.
  - After-effects: caused by other stimuli that were previously present.

Flaherty et al. (1983) – Contrast effect (rat effort)
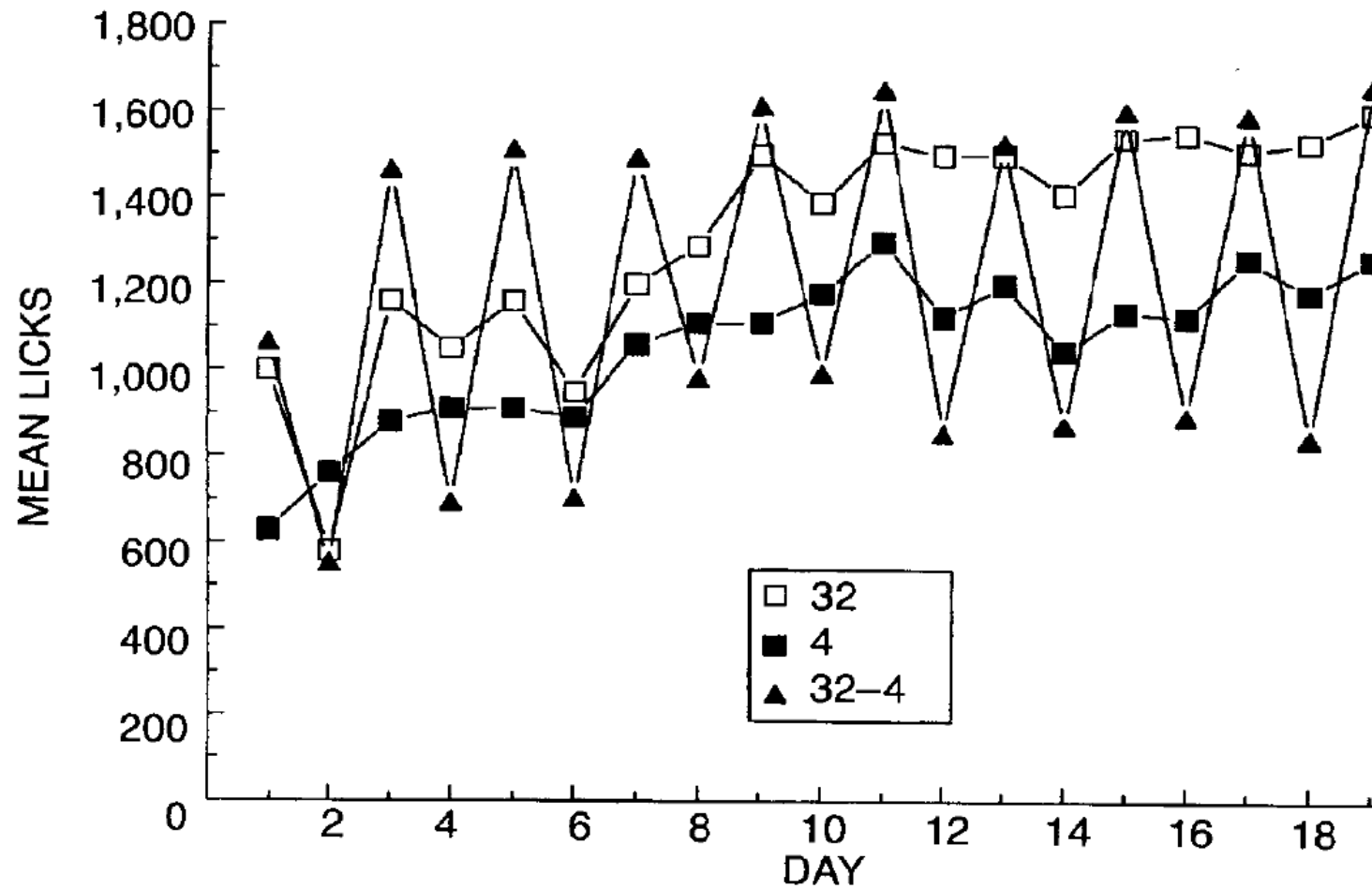
Salience

- Theory of Bordalo, Gennaioli, & Shleifer (2013).
- Salience of an attribute for a good depends on comparison of that attribute with its average.
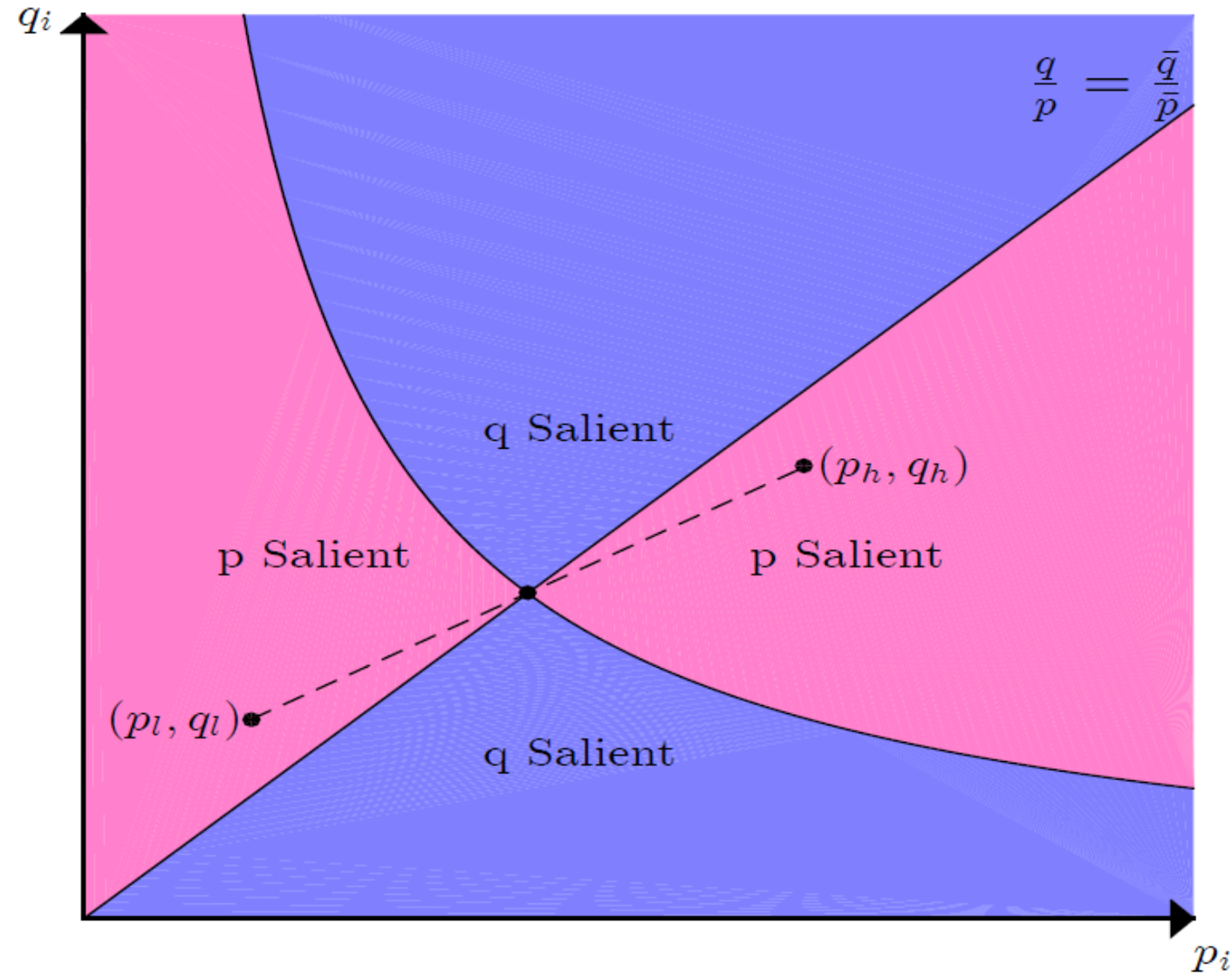- Example of a salience function:

$$\sigma(a_k, \bar{a}) = \frac{|a_k - \bar{a}|}{a_k + \bar{a}}$$

- Quality is salient for good k if $\sigma(q\_k, \bar{q}) > \sigma(p\_k, \bar{p})$
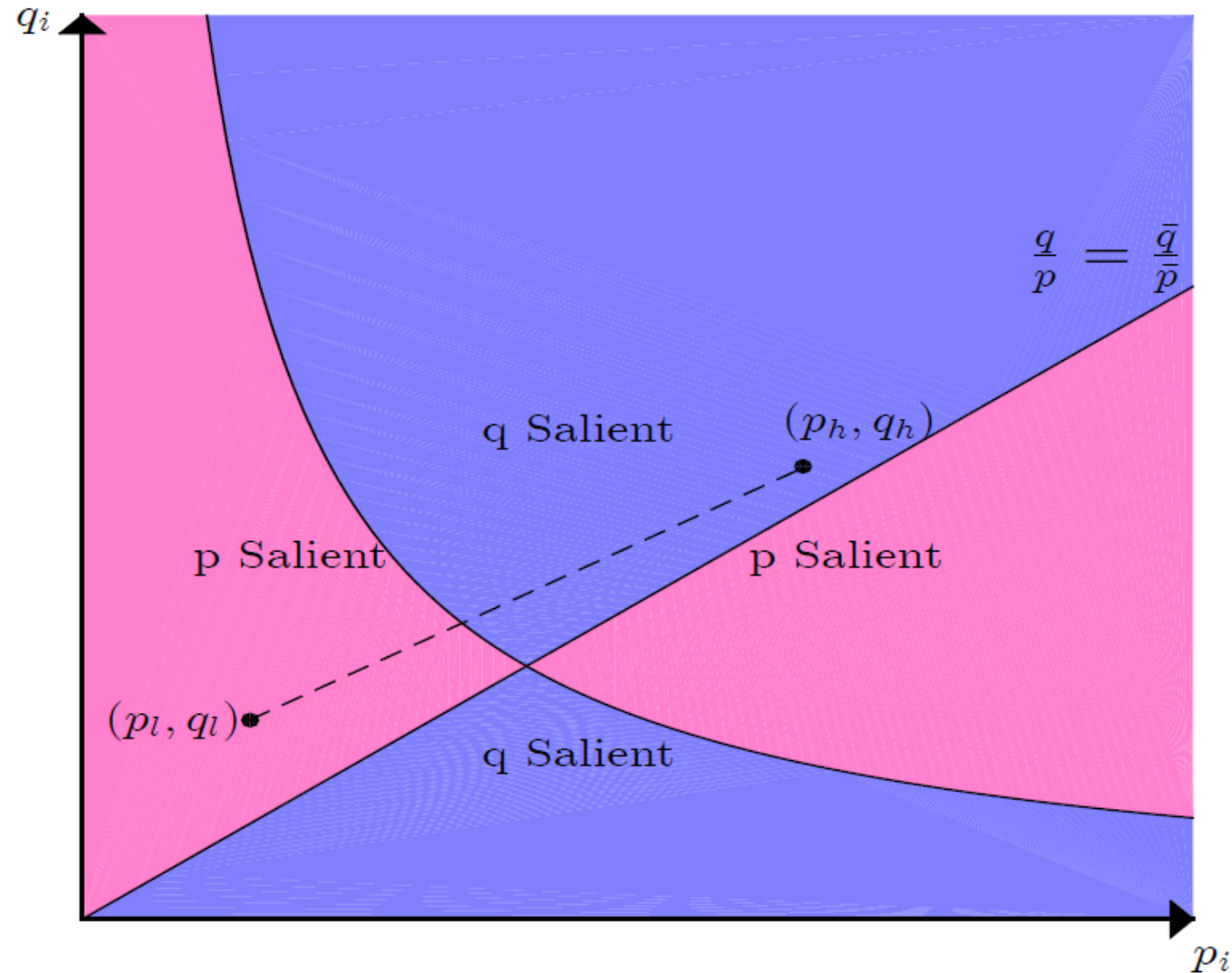- Utility weights: ($\delta \in (0,1]$)

$$g_{\text{sal}} = \frac{2}{1+\delta} \qquad g_{\text{not}} = \frac{2\delta}{1+\delta}$$

Salience and Decoy effect (without decoy)

Salience and Decoy effect (with decoy)

Asset pricing theory and Equity premium puzzle

- According to standard asset pricing theory, asset prices and expected returns should be such that:

$$\mathbb{E}[R_k] = R_{rf} - \frac{\text{cov}(R_k, \Lambda)}{\mathbb{E}[\Lambda]}$$

- So if returns on risky asset higher than risk-free rate of return, it must be because risky returns and the marginal utility of income are negatively correlated.

- Problem: growth in aggregate consumption expenditure exhibits low covariance with stock market returns — equity premium puzzle (Mehra & Prescott, 1985).

Cognitive limitations and public policy

- Standard economic models

- Standard behavioral models (intertemporal inconsistency, self control, risk aversion…)

- Cognitive economics models: randomness, effect of environment, biased choice (not "biased preference")

- Price incentives vs Information manipulation

Cognitive limitations and public policy

- Behavioral policy design and nudge

- (Less) assumptions about individual preference

- Some examples of failed nudges → the model matters! (formal approach, structural estimation, etc.)

Additional exercises: Salience