

**Attention Discrimination:  
Theory and Field Experiments with Monitoring Information Acquisition**

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**SUPPLEMENTARY MATERIAL (FOR ONLINE PUBLICATION ONLY)**

## SUPPLEMENTARY MATERIAL TO SECTION II

**Comment [PU1]:** Filip, please check whether there are all proofs that we promise in the main text. Now, here is proof of corollary 2 which is not in the main text.

### LEMMA 1 (attention choice)

The optimal attention  $\xi$  is weakly decreasing in the distance  $|q_G - R|$  of the mean quality in group  $G$  from the threshold quality  $R$ . Moreover, if  $S = [0,1]$ , and if  $M$  is differentiable, then the monotonicity is strict on  $(0,1)$ .

### Proof of Lemma 1:

$$\max_{\xi \in S} \Pi(\xi) - M(\xi) = \max_{\xi \in S} \left( \frac{1}{\sqrt{2\pi\xi\sigma_G^2}} \int_{-\infty}^{\infty} \max(R, q') e^{-(q'-q_G)^2/(2\xi\sigma_G^2)} dq' - M(\xi) \right). \quad (1)$$

The integral term in equation (2) represents the expected payoff for Gaussian uncertainty. Differentiating  $\Pi(\xi)$  with respect to  $(q_G - R)$  and  $\xi$  in equation (1) we get:

$$\frac{\partial^2 \Pi(\xi)}{\partial(q_G - R) \partial \xi} = - \frac{(q_G - R) \sigma_G^2 e^{-(q_G - R)^2/(2\xi\sigma_G^2)}}{2\sqrt{2\pi}(\xi\sigma_G^2)^{3/2}}.$$

Therefore,

$$\frac{\partial^2 \Pi(\xi)}{\partial|q_G - R| \partial \xi} < 0 \text{ for all } q_G \neq R. \quad (2)$$

This together with the fact that  $M(\xi)$  is independent of  $q_G$  implies that if  $|q_G - R|$  increases, then  $\Pi(\xi) - M(\xi)$  at lower  $\xi$  relatively increases with respect to that at higher  $\xi$ , which means that an increase in  $|q_G - R|$  implies that the optimal  $\xi$  decreases or stays constant.

Now we prove the strict monotonicity.  $M$  is differentiable and the first order condition holds at an interior optimum, i.e.  $\partial(\Pi(\xi) - M(\xi))/\partial\xi = 0$ . If  $\xi_1$  is the original optimum, then the inequality (2) implies that if  $|q_G - R|$  increases, then  $\partial(\Pi(\xi) - M(\xi))/\partial\xi < 0$  at  $\xi_1$ . If  $\xi_1 \in (0,1)$  and  $S = [0,1]$ , then the monotonicity shown above is in fact strict. QED

LEMMA 2 (effect of higher attention)

*If  $q_G < R$ , then a higher attention  $\xi$  increases the probability that an applicant from group  $G$  is accepted, i.e. that  $q' > R$ . If  $q_G > R$ , then the probability decreases with  $\xi$ .*

Proof of Lemma 2:

Upon receiving signals  $G$  and  $y$  the DM's posterior belief about the quality is given by  $N(q', \xi\sigma_G^2)$ , where

$$q' = \xi y + (1 - \xi)q_G, \quad (3)$$

which implies that for group  $G$  the posterior means  $q'$  are drawn from  $N(q_G, \xi\sigma_G^2)$ . Higher attention increases the variance of the posterior means. The statement of Lemma 2 follows immediately. QED

Proof of Proposition 1:

A) Lemma 1 implies that the member of the group  $G$  is paid (weakly) less attention than the applicant from the group  $P$ , which together with Lemma 2 implies that the endogenous difference in attention levels across the two groups increases difference in selection probabilities since more attention increases the probability of selection on this market.

B), C) Follow analogously from Lemmata 1 and 2.

QED

Proof of Corollary 2:

Follows immediately from Lemmata 1 and 2, analogously to the proof of Proposition 1. For instance, on the "cherry-picking" market, revelation of  $G$  decreases attention to the applicant (Lemma 1), which on this market decreases the probability of selection (Lemma 2). QED

## SUPPLEMENTARY MATERIAL TO SECTION III

### **Wording of application email – Czech rental housing market**

1] “Dear Sir/Madam, I am writing because I am very interested in renting the apartment that you have advertised. When would be a good time to come see the apartment? Best regards, Phan Quyet Nguyen”

2] Adding a link to personal website: “Dear Sir/Madam, I am writing because I am very interested in renting the apartment that you have advertised. When would be a good time to come see the apartment? Best regards, Phan Quyet Nguyen, [phan.quiet.nguyen.sweb.cz](http://phan.quiet.nguyen.sweb.cz)”

3] Adding a sentence with applicant’s characteristics: “Dear Sir/Madam, I am writing because I am very interested in renting the apartment that you have advertised. I am a thirty-year-old man, I am single, I have a college [a high-school] degree, and I do not smoke. I have a steady job (with a regular paycheck) at a company. When would be a good time to come see the apartment? Best regards, Phan Quyet Nguyen”

### **Wording of application email – Czech labor market**

“Dear Sir/Madam, I am writing because I am very interested in the Real Estate Agent job position advertised by your company. You can find my resume in this hyperlink: [phanquyetnguyen1982.sweb.cz](http://phanquyetnguyen1982.sweb.cz). Best regards, Phan Quyet Nguyen”

### **Wording of application email – German labor market**

1] “Dear Sir/Madam, I am writing because I am very interested in the Real Estate Agent job position advertised by your company. You can find my resume in this hyperlink:

[fatihyildiz1982.webege.com](mailto:fatihyildiz1982.webege.com) . Best regards, Fatih Yildiz”

2] Adding information about 2 months unemployment: “Dear Sir/Madam, I have been searching for a job for two months and I am writing because I am very interested in the Real Estate Agent job position advertised by your company. You can find my resume in this hyperlink:

[fatihyildiz1982.webege.com](mailto:fatihyildiz1982.webege.com) . Best regards, Fatih Yildiz”

3] Adding information about 18 months unemployment: “Dear Sir/Madam, I have been searching for a job for a year and half and I am writing because I am very interested in the Real Estate Agent job position advertised by your company. You can find my resume in this hyperlink:

[fatihyildiz1982.webege.com](mailto:fatihyildiz1982.webege.com) . Best regards, Fatih Yildiz”

## SUPPLEMENTARY FIGURES

**Figure S1:** Applicant's Personal Website Snapshot (Czech Rental Housing Market)



**Figure S2:** Applicant's Online Resume, Labor Market

Left Part: A Snapshot After Opening the Website (a Shorter Form), Right Part: A Snapshot After Expanding Education and Experience Categories

## PHAN QUYET NGUYEN

*CURRICULUM VITAE*

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**Education** 1997-2001

[more] BUSINESS ACADEMY  
PRAGUE 6, KRUPKOVO NÁMĚSTÍ

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**Experience** 2006-2010

[more] AZPIRO, LTD.  
Administrative support of consultants, work with the PC

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2001-2005

AUTO NELLY LTD.  
International purchases assistant

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1999-2000

MULTIMEDIA MED, LTD.  
Market research; customer surveys

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**Skills** Language skills

[more] English language: excellent level, passed school leaving examination.  
German language: Communicative level.

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Driving licence Type B

## PHAN QUYET NGUYEN

*CURRICULUM VITAE*

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**Education** 1997-2001

[less] BUSINESS ACADEMY  
PRAGUE 6, KRUPKOVO NÁMĚSTÍ

School leaving examination grades:

Accounting - B

Economics - A

Set of vocational courses - A

English language - B

Subjects studied: written and electronic communication, accounting, economics, statistics, tourism management, and English and German language.

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**Experience** 2006-2010

[less] AZPIRO, LTD.  
Administrative support of consultants, work with the PC

Document management; administrative support of consultants; work with the PC; mainly working with Microsoft Excel and Access; Creating client database with information about the projects, project content, costs and price lists.  
For references see [References section](#).

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2001-2005

AUTO NELLY LTD.  
International purchases assistant

Assistance with purchases, communication with international customers, work with the PC, mainly working with Microsoft Word and Excel. Management of client, purchases and price databases.

## SUPPLEMENTARY TABLES

**Table S1:** Survey on Perceptions - Comparison of the Names Used in the Czech Experiments with Other Ethnicity-Signalling Names

Dependent variable	Education level		Quality of housing			
	High school	University	Lodging	Rented flat	Own flat	Own house
	(1)	(2)	(3)	(4)	(5)	(6)
<b>Panel A: Majority-sounding names (omitted Jiri Hajek)</b>						
Jan Novotny	0.13 (0.20)	0.01 (0.23)	0.15 (0.21)	-0.02 (0.21)	0.24 (0.20)	0.25 (0.24)
Tomas Svoboda	0.04 (0.20)	0.29 (0.22)	0.17 (0.21)	0.03 (0.21)	0.11 (0.20)	0.27 (0.24)
Jakub Dvorak	0.01 (0.19)	0.13 (0.22)	-0.17 (0.21)	0.07 (0.20)	0.08 (0.20)	0.16 (0.23)
Constant	5.06*** (0.14)	3.71*** (0.16)	1.63*** (0.15)	4.42*** (0.15)	4.00*** (0.14)	3.14*** (0.17)
Observations	324	324	324	324	324	324
<b>Panel B: Asian-sounding names (omitted Phan Quyet Nguyen)</b>						
Pham Hai Xuan	0.14 (0.24)	-0.09 (0.28)	-0.16 (0.26)	0.51** (0.23)	0.28 (0.23)	-0.22 (0.26)
Le Anh Khoi Nguyen	0.05 (0.23)	-0.06 (0.27)	-0.00 (0.26)	0.10 (0.22)	-0.10 (0.23)	-0.30 (0.26)
Hoang Ca Sinh	0.09 (0.24)	0.38 (0.28)	0.14 (0.26)	-0.01 (0.23)	0.03 (0.23)	-0.29 (0.26)
Constant	4.45*** (0.17)	3.31*** (0.19)	2.34*** (0.18)	4.17*** (0.16)	3.47*** (0.16)	2.98*** (0.18)
Observations	330	330	330	329	330	330
<b>Panel C: Roma-sounding names (omitted Gejza Horvath)</b>						
Tibor Farkas	0.94*** (0.27)	0.84*** (0.26)	-0.95*** (0.30)	-0.15 (0.23)	0.48* (0.25)	0.34 (0.23)
Tibor Demeter	0.51* (0.27)	0.63** (0.26)	-0.67** (0.29)	-0.24 (0.22)	-0.09 (0.24)	0.06 (0.23)
Koloman Lakatos	0.16 (0.27)	0.40 (0.27)	-0.18 (0.30)	-0.38 (0.23)	-0.34 (0.25)	0.07 (0.24)
Constant	3.25*** (0.19)	1.63*** (0.19)	4.09*** (0.21)	4.61*** (0.16)	2.63*** (0.17)	1.83*** (0.16)
Observations	322	322	322	320	322	322

*Notes:* OLS in all Columns of all Panels. Standard errors in parentheses. \*\*\* denotes significance at the 1% level, \*\* at the 5% level and \* at the 10% level. In Panel A, the omitted variable is the name Jiri Hajek, in Panel B it is Phan Quyet Nguyen and in Panel C it is Gejza Horvath. The dependent variables are measured on a scale 0-7. 0 means that a respondent considered it impossible for a person with the given name to have high school (university) education and to live in lodging (in a rented flat, in an own flat, in an own house). 7 means that a respondent considered it certain.

**Table S2:** Czech Rental Housing Market - Randomization Check

Experimental manipulation:	Name of applicant						Access to information		
	<b>White majority name</b>	<b>Ethnic minority name</b>	t-test p-value	<b>Asian minority name</b>	<b>Roma minority name</b>	F-stat p-value	<b>No Information</b>	<b>Monitored Information</b>	t-test p-value
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Female landlord	0.46 (0.50)	0.49 (0.50)	0.26	0.46 (0.50)	0.51 (0.50)	0.15	0.50 (0.50)	0.48 (0.50)	0.49
Size of the apartment (hundreds of m <sup>2</sup> )	0.47 (0.15)	0.47 (0.14)	0.83	0.47 (0.15)	0.47 (0.14)	0.96	0.47 (0.15)	0.47 (0.14)	0.79
Price of the apartment (ths. CZK)	9.03 (2.94)	8.89 (2.86)	0.33	8.79 (2.82)	8.98 (2.89)	0.32	8.87 (2.95)	8.96 (2.98)	0.60
Apartment equipped	0.15 (0.36)	0.16 (0.37)	0.53	0.16 (0.37)	0.17 (0.38)	0.74	0.13 (0.34)	0.17 (0.37)	0.12
N	606	1194		569	625		451	762	

*Notes:* Means. Standard deviations in parentheses. Column 3 reports p-value for a t-test testing the null hypothesis that the means are equal for applicants with a majority-sounding name and a minority-sounding name (Asian and Roma minority pooled together). Column 6 reports p-value for an F-test testing the null hypothesis that the means are equal across all three groups of applicants. Column 9 reports p-value for an F-test testing the null hypothesis that the means are equal in the No Information Treatment and in the Monitored Information Treatment.

**Table S3:** Czech Rental Housing Market - Callback by Ethnicity

	<b>White majority name (W)</b> (1)	<b>Pooled Asian and Roma minority name (E)</b> (2)	p.p. difference: W-E, (p-value) (3)	<b>Asian minority name (A)</b> (4)	p.p. difference: W-A, (p-value) (5)	<b>Roma minority name (R)</b> (6)	p.p. difference: W-R, (p-value) (7)	p.p. difference: R-A, (p- value) (8)
No Information Treatment	0.89	0.58	<b>32 (0.00)</b>	0.54	<b>35 (0.00)</b>	0.61	<b>28 (0.00)</b>	7 (0.19)
Monitored Information Treatment	0.81	0.62	<b>19 (0.00)</b>	0.60	<b>21 (0.00)</b>	0.63	<b>18 (0.00)</b>	3 (0.49)
Monitored Information Treatment <sup>a</sup>	0.89	0.75	<b>15 (0.00)</b>	0.75	<b>14 (0.01)</b>	0.74	<b>15 (0.01)</b>	0 (0.89)

*Notes:* Means. Standard deviations in parentheses. The table reports the likelihood of callback across names and treatments. Columns 3, 5, 7 and 8 report differences in percentage points, in the parentheses we report p-value for a t-test testing the null hypothesis that the difference is zero. <sup>a</sup>The numbers are reported for the sub-sample of landlords who opened applicant's website.

**Table S4:** Czech Rental Housing Market - Responsiveness to Information about Asian and Roma Minority Applicants

Dependent variable:	Invitation rate	
	Asian minority name (1)	Roma minority name (2)
Sample:		
Monitored Information Treatment	0.09* (0.05)	0.07 (0.05)
Additional text in the email - with high school	0.02 (0.07)	0.12** (0.06)
Additional text in the email - with college	0.19*** (0.07)	0.12** (0.06)
Observations	569	625

*Notes:* Probit, marginal effects (dF/dx), robust standard errors in parentheses. \*\*\* denotes significance at 1% level, \*\* at 5% level and \* at 10% level. In both Columns, we control for a dummy variable indicating a landlord being a female, a dummy variable indicating an unknown gender of a landlord (the mean of this variable in the whole sample as well as in the Information with monitoring treatment is 0.02), size of an apartment, price of an apartment rental, and a dummy variable indicating an equipped apartment.

**Table S5:** Czech Rental Housing Market - Opening Applicant's Website and Invitation Rate

Dependent variable:	Invitation rate			
	White majority name (1)	Pooled Asian and Roma minority name (2)	Asian minority name (3)	Roma minority name (4)
Sample:				
Opening applicant's website	0.18*** (0.05)	0.29*** (0.04)	0.37*** (0.06)	0.23*** (0.06)
Observations	255	504	242	262

*Notes:* Probit, marginal effects (dF/dx). Robust standard errors in parentheses. \*\*\* denotes significance at the 1% level, \*\* at the 5% level and \* at the 10% level. The dependent variable is the invitation rate. In all Columns, we control for a dummy variable indicating a landlord being a female, a dummy variable indicating an unknown gender of a landlord (the mean of this variable in the whole sample as well as in the Monitored Information Treatment is 0.02), size of an apartment, price of an apartment rental, and a dummy variable indicating a furnished apartment.

**Table S6:** Czech Labor Market - Randomization Check

	Asian and		t-test p-value	Asian minority name	Roma minority name	F-stat p-value
	White majority name	Roma minority name				
	(1)	(2)				
Required high school education	0.90 (0.30)	0.88 (0.33)	0.57	0.89 (0.32)	0.86 (0.35)	0.69
Required previous experience	0.31 (0.47)	0.23 (0.42)	0.13	0.25 (0.44)	0.21 (0.41)	0.26
Sector of sales and services	0.73 (0.44)	0.72 (0.45)	0.74	0.74 (0.44)	0.69 (0.47)	0.73
Application in holiday period	0.23 (0.43)	0.32 (0.47)	0.12	0.31 (0.47)	0.34 (0.48)	0.28
N	98	176		99	77	

*Notes:* Means. Standard deviations in parentheses. Column 3 reports p-value for a t-test testing the null hypothesis that the means are equal for applicants with a majority-sounding name and a minority-sounding name (Asian and Roma minority name). Column 6 reports p-value for an F-test testing the null hypothesis that the means are equal across all three groups of applicants.

**Table S7:** Czech Labor Market - Invitation Rate across Sectors

Dependent variable:	Invitation for a job interview			
	Sales and services		Manual work and administration	
	(1)	(2)	(3)	(4)
Ethnic minority name	-0.09** (0.05)		-0.14 (0.12)	
Asian minority name		-0.09** (0.04)		-0.12 (0.10)
Roma minority name		-0.05 (0.03)		-0.11 (0.10)
Observations	198	198	51	51

*Notes:* Probit, marginal effects (dF/dx), robust standard errors in parentheses. \*\*\* denotes significance at 1% level, \*\* at 5% level and \* at 10% level. In all Columns, we control for dummy variables indicating required high school education, required previous experience, and application being sent during a holiday period (August). In all Columns, the omitted variable is a White majority name.

**Table S8:** Survey on Perceptions - Comparison of the Names Used in the Czech Experiments

Dependent variable	Education level		Quality of housing			
	High school	University	Lodging	Rented flat	Own flat	Own house
	(1)	(2)	(3)	(4)	(5)	(6)
<b>Panel A: Comparison of all three names (omitted majority-sounding name)</b>						
Roma-sounding name	-1.82*** (0.24)	-2.08*** (0.26)	2.45*** (0.25)	0.19 (0.22)	-1.37*** (0.23)	-1.31*** (0.25)
Asian-sounding name	-0.61** (0.24)	-0.39 (0.25)	0.70*** (0.24)	-0.24 (0.21)	-0.53** (0.23)	-0.16 (0.24)
Constant	5.06*** (0.17)	3.71*** (0.18)	1.63*** (0.18)	4.42*** (0.15)	4.00*** (0.17)	3.14*** (0.17)
Observations	246	246	246	245	246	246
<b>Panel B: Comparison of minority-sounding names (omitted Asian-sounding name)</b>						
Roma-sounding name	-1.21*** (0.25)	-1.68*** (0.26)	1.75*** (0.26)	0.44** (0.22)	-0.84*** (0.24)	-1.15*** (0.24)
Constant	4.45*** (0.17)	3.31*** (0.18)	2.34*** (0.18)	4.17*** (0.15)	3.47*** (0.16)	2.98*** (0.17)
Observations	167	167	167	166	167	167

*Notes:* OLS in all Columns of all Panels. Standard errors in parentheses. \*\*\* denotes significance at the 1% level, \*\* at the 5% level and \* at the 10% level. Majority-sounding name is Jiri Hajek, Roma-sounding name is Gejza Horvath and Asian-sounding name is Phan Quyet Nguyen. The dependent variables are measured on a scale 0-7. 0 means that a respondent considered it impossible for a person with the given name to have high school (university) education and to live in lodging (in a rented flat, in an own flat, in an own house). 7 means that a respondent considered it certain.

**Table S9:** German Labor Market - Randomization Check

Experimental manipulation:	Name of applicant			Information about unemployment			F-stat p-value
	<b>White majority name</b> (1)	<b>Turkish minority name</b> (2)	t-test p-value (3)	<b>No Information</b> (4)	<b>2 months unemployed</b> (5)	<b>18 months unemployed</b> (6)	
Required high school education	0.28 (0.45)	0.30 (0.46)	0.67	0.29 (0.45)	0.25 (0.44)	0.33 (0.47)	0.21
Required previous experience	0.57 (0.50)	0.54 (0.50)	0.45	0.53 (0.50)	0.59 (0.49)	0.55 (0.50)	0.39
City with more than 1 million inhabitants	0.18 (0.38)	0.20 (0.40)	0.37	0.18 (0.38)	0.21 (0.41)	0.19 (0.40)	0.61
Application in holiday period	0.17 (0.38)	0.24 (0.43)	0.02	0.21 (0.41)	0.20 (0.40)	0.22 (0.41)	0.92
Sector: manufacturing and construction	0.11 (0.31)	0.09 (0.29)	0.44	0.09 (0.29)	0.10 (0.30)	0.11 (0.32)	0.65
Sector: information and communication	0.17 (0.38)	0.17 (0.37)	0.91	0.19 (0.39)	0.16 (0.36)	0.15 (0.35)	0.42
Sector: administration	0.19 (0.39)	0.15 (0.36)	0.23	0.16 (0.37)	0.20 (0.40)	0.16 (0.36)	0.36
Sector: professional, scientific and technical activities	0.32 (0.47)	0.36 (0.48)	0.20	0.35 (0.48)	0.29 (0.46)	0.37 (0.48)	0.30
Other sector	0.22 (0.42)	0.23 (0.42)	0.79	0.22 (0.41)	0.25 (0.43)	0.22 (0.42)	0.74
N	366	379		372	187	186	

*Notes:* Means. Standard deviations in parentheses. Column 3 reports p-value for a t-test testing the null hypothesis that the means are equal for applicants with a majority-sounding name and a Turkish minority-sounding name. Column 7 reports p-value for an F-test testing the null hypothesis that the means are equal for applicants who do not provide any information about unemployment, for those who say they have been two months unemployed and for those who say they have been a year and a half unemployed.