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Punctual Arrival, Commuter Behavior, and Willingness to Pay

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PUNCTUAL ARRIVAL, COMMUTER BEHAVIOR,

AND WILLINGNESS TO PAY

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Abstract: We know a lot about how commuters value average travel time, but surprisingly little about how they value certainty of travel time. This study defines unreliability and punctuality of travel time, and concentrates on punctuality. People in different occupational groups have different requirements for punctual arrival. They reserve different amounts of slack time before work start, and will pay different amounts to avoid a delay. One aspect of personality -- locus of control -- is shown to vary between occupational groups. Locus of control can be used to explain the seemingly paradoxical finding that those who state the highest need for punctuality are least likely to pay to circumvent traffic delays: the high need for punctuality is not the commuter's need, but the employer's.

Occupational differences are often amplified by gender segregation. The commuting differences between men and women have been explained previously by the greater family responsibilities of women. This study shows that the presence of young or school-age children does not affect women's decision to reserve slack time, but it does increase her willingness to pay to circumvent unexpected delays.

1. Introduction

We know a lot about how commuters value average travel time, but surprisingly little about how they value certainty of travel time. Models of commuting behavior generally assume that travel times do not vary. When travel time variation is recognized, it usually is collapsed into two attributes of the trip, mean travel time and the standard deviation or another second-moment term (e.g. Senna 1994). Analogous to the value of time calculation, the value of reliability is calculated as the ratio of coefficients for standard deviation and monetary terms. The approach has drawbacks: the approach assumes away the effects of higher order moments of the travel time distribution and more importantly, the approach also assumes that preferences over money and different aspects of travel time are unambiguous, consistent, and constant over the relevant range of values. This might not be the case.

According to the theory of allocation of time (Becker 1965), value of time is calculated assuming that the commuter can freely choose the amount of time she is going to work, and that she has a clearly defined opportunity cost for lost work time[1]. The theory does not assume that the value of each minute is constant, as opportunities may vary during the day, but the empirical applications often make this assumption. On the other hand, the theory does assume that the value of time is independent of trip purpose, because it is only the lost earnings that count -- an assumption inconsistent with empirical results. Even in the most favorable instance for the theory -- commute to work -- the lost time in traffic delays only indirectly transfers into lost earnings, because only a part of the work force actually loses earnings or professional reputation when they arrive late to work.

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[1]See Pollack and Wachter 1975; Winston 1982 pp.157-158, 162-164 for critique of the approach.

For these reasons the construct 'value of time' is misleading. Nobody has *a* value of time. Rather the value is situation-specific. This warns us that when modeling 'value of reliability', we must use a specification capable of detecting both individual and situational variation. Indeed the literature has some evidence of such variation.

Black and Towris (1993) measured unreliability by a coefficient of variation for travel time. As the standard theory would predict, the value of reliability was greater in higher income classes. However, the reliability ratio was highest in the bottom income class while the two other income classes had similar values[2], indicating that lower income class valued reliability of travel time with respect to mean travel time relatively more than high income class. The authors also found that the value of the reliability ratio displayed a weak *decreasing* trend with the importance of prompt arrival, while the value of mean travel time increased with promptness.

Mahmassani et al. (1989) warn that travel time preferences estimated for a system that is in equilibrium do not hold for a system in disequilibrium. Bates et al. (1990) find that the trade-off between ease of commuting and departure time depends on one's current departure-time habits. Bates et al. say that it is misguided to trust the estimated average elasticities when forecasting how a commuter will respond to changes in the transportation system.

The traditional demand modeling approach *averages* situational constraints arising from the need to coordinate travel with other activities. Because these constraints can be severe, elasticities based on the whole population do not capture the full effect of unusual decision

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[2] Reliability ratio ($\beta = \beta_\sigma / \beta_T$) is the ratio of the coefficient for the standard deviation of travel time and the coefficient for mean travel time.

makers, whose change of habits may change the equilibrium dramatically. A logical step is to study the responses of *different* population groups to changing traffic conditions. This paper takes that step.

Uncertainty can reduce the commuter's utility in two ways (Benwell and Black 1984). When the commuter has to be present at work by a set arrival time, she suffers disutility from late arrival. Arriving on time or earlier is called *punctuality*. The commuter also suffers disutility from the amount of lateness or earliness, and from the distortion of her planned activities. This second aspect is referred to as *unreliability*. I consider the need for punctuality in this paper. Unreliability is discussed in Koskenoja (1996).

Punctuality implies a reference point after which the value of arrival sharply changes. The value of punctuality could be explained by habituality, by how a person's activity affects the timing of her other activities, or by how other people's activities are affected by the person's activities.

The timing aspect shows up in activity analysis, where the value of one activity is affected by its timing with respect to the person's other activities (e.g. Bates et al. 1990; Polak et al. 1993; Kitamura 1983). Need for punctuality that is derived from interaction with other people has been explained by teamwork intensiveness of the occupation (Hansen 1990; Lee and Young 1978), or by how the family responsibilities of the commuter influence her opportunity costs (Hanson and Hanson (1980); Pas and Koppelman (1987); Rosenbloom (1989); Rosenbloom and Burns (1994)). For instance the commuter may need to coordinate with family members on her way to work. Advancing or postponing the commute would cause the commuter a loss of utility which is not directly linked to her work.

To estimate trade-offs between time, money and other resources, transportation demand models implicitly assume, somewhat unrealistically, that people have unambiguous trade-offs between resources. I do not make this assumption. Instead, I look at willingness to spend time and money separately. The demand for punctuality is manifested in two behaviors: by reserving slack time between expected arrival at work and work start, and by the willingness to pay when unexpected travel delay occurs. This paper analyzes both behaviors.

I develop two interpretations of the results. The first uses a construct from psychology -- locus of control -- to explain the differing tastes. Consider two employees:

1) This person has internalized the goals of her work activities and is committed to achieving them. They become personal goals. Since work time is personally engaging, carrying out the planned activities of the day is personally important.

2) This person is disengaged from her work, the activities are seen as "somebody else's" priorities, and are performed as a duty.

I expect to find that a person who feels that she has a high degree of control over her work activities will be interested in controlling her commute time as much as her private time. But a person who feels little control over her work activities will have less interest in controlling her commute time than her private time. It's an extension of work, it's somebody else's time.

Psychological variables are often hard to measure and difficult to collect, so I use "hard" variables as proxies for the locus of control. I operationalize it by using a well known theory of how occupation reflects personality.

1.1 Locus of control

Locus of control draws a boundary between what an individual believes is caused by her own actions and what is caused by factors external to her (Rotter 1966). I expect that a commuter's value of punctuality will depend upon her locus of control at work. Though I cannot measure it directly for each individual, I can measure it indirectly through the expected variation in occupational characteristics.

Spector (1986) conducted an analysis of 88 studies of perceived control of employees in work environments. His summary of the findings is as follows:

> Employees who perceive comparatively high levels of [internal] control at work are more satisfied, committed, involved, and motivated. They perform better and hold greater expectancies. They experience fewer physical and emotional symptoms, less role ambiguity and conflict, are absent less, have fewer intentions of quitting, and are less likely to quit.

Different occupational groups can be expected to have a different degree of self-determination. In their literature review Hurrel and Murphy (1991) mention a finding that workers in leadership jobs have higher internal locus of control than those in nonsupervisory jobs. They also conclude that those who have an internal locus of control appear to have higher expectancies about the relationship between effort and job performance, and between performance and rewards. McGraw (1978) has shown that self-determination leads to better performance on complex heuristic tasks, but control in the form of extrinsic rewards can facilitate performance at certain algorithmic tasks. This leads me to assume that the typical locus of control in an occupation can be inferred from the incentives used. Specifically, if the locus of control is external, I expect the employer to control arrival time closely.

I expect that valuation of punctuality will depend on whether travel time is viewed as "own" time or "employer's" time. We tend to value more the resources we consider our own. Thus if an unforseen traffic delay occurs, an employee with an internal locus of control is more willing to pay a fee to retain her intended arrival time than an employee with an external locus of control.

A person's locus of control is subjective. People differ in their inherent propensity to feel alienated or engaged. Individuals can feel disengaged from their jobs despite high control over their work situation, while others feel highly involved despite relatively little control over their work situation. I cannot directly measure these personality differences, but again I can use occupation as a proxy for them. There is considerable literature that says: people's personalities cause them to self-select into compatible occupations.

Before discussing the self-selection process, note that I am discussing two distinct implications of occupational characteristics. First, I discussed the tendency for certain occupations to engender feeling of engagement or alienation, hence affecting the employee's valuation of punctuality. Second, I will discuss the tendency for certain personality types to select occupations compatible with their inherent feelings of engagement or alienation. I use occupation as a proxy for locus of control. It does not matter whether the relationship occurs by different occupations allowing different degrees of control, or through a process where employees select occupations that are in accord with their existing feeling of control. Occupation will be a good proxy variable either way.

1.2 Occupation as Reflection of Personality

John Holland (1973, 1985) posits a connection between occupation and personality. According to Holland each personality type is a product of an interaction among a variety of cultural and personal forces. Out of this experience a person learns to prefer some activities. The activities become interests and lead to special competencies, which create a particular personal disposition that in turn leads a person to think, perceive, and act in special ways. The theory is interactive in that it assumes that many career and social behaviors are the outcome of people and environments acting on one another: on the one hand, people gravitate towards their optimal vocation, and on the other hand, the work environment molds them towards the typical in the vocation.

Holland's theory of personality types fits well into the study about punctual arrival to work. First, as the theory is about occupational personalities, we can assume it extrapolates to differentiate personality effects concerning commuting. Second, as the theory has been empirically found[3] to actually separate different personality types[4], we do not have to test it, but only to operationalize it for this application. And third, since the occupational classification is based on the work activities, there is a reason to believe that they can separate the types of work where internal and external locus of control is dominant. The occupation provides a double

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[3] See a theme issue in Journal of Vocational Behavior 1992, No.2. E.g. Hyland and Muchinsky (1991) write: "Over the past two decades, approximately 700 studies have been directed toward various aspects of Holland's (1973,1985) theory. Those studies in which the structural validity of the theory has been addressed have been concerned with the correctness of the hexagon for modeling the structure of interests. Findings supportive of the proposed structure were reported in a large percentage of these studies." (p.75).

[4] Since the personality types in this theory are defined on an aggregate level, the critique of personality trait theories from the situationalist school loses its validity. See Epstein and O'Brien (1985) for discussion of the situationalist vs. personality trait theory explanations of behavior.

explanation for behavior: through the personality of the employees and through the work rules the employer sets at the work place. For the purposes of this study, it doesn't matter which causes the other. What matters is that certain work rules and employee behaviors are likely to pair together, and indicate each others existence.

And finally, the occupational personality variable is an objectively observable, hard variable. It is relatively straightforward to code and doesn't suffer from the ambiguity of traditional attitudinal variables[5]. Thus it is likely to maintain its explanatory power outside the current sample.

Holland (1985) gives brief descriptions of the six main personality types.

> **The realistic** type prefers activities that entail the explicit, ordered, or systematic manipulation of objects, tools, machines, and animals and has an aversion to educational and therapeutic activities. These tendencies lead to the acquisition of manual, mechanical, agricultural, electrical, and technical competencies and to a deficit in social and educational competencies. The realistic person values concrete things or tangible personal characteristics - money, power, and status. Examples of realistic occupations include: airline radio operator, bookbinder, dental technician, fire fighter, fish and game warden, hardness inspector, instrument mechanic, miller supervisor, and tree surgeon.

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[5]See Eisner (1987) about difficulties with attitudinal variables.

The investigative type prefers observational, symbolic, systematic, and creative investigation of physical, biological, and cultural phenomena in order to understand and control such phenomena, and has an aversion to persuasive, social, and repetitive activities. These tendencies lead to the acquisition of scientific and mathematical competencies and to a deficit in persuasive competencies. The investigative type values science. Examples of investigative occupations are: actuary, computer programmer, dairy technologist, economist, EKG technician, medical technologist, medical-laboratory assistant, optometrist, and pathologist.

The artistic type prefers ambiguous, free, unsystematized activities that entail the manipulation of physical, verbal, or human materials to create art forms or products, and has an aversion to explicit, systematic, and ordered activities. These tendencies lead to the acquisition of competencies in language, art, music, drama, and writing, and to a deficit in clerical or business competencies. Artistic type values esthetic qualities. Examples of artistic occupations include: actress, advertising manager, architect, decorator, editor, fashion model, and literature teacher.

The social type prefers manipulation of others to inform, train, develop, cure, or enlighten, and has an aversion to explicit, ordered, systematic activities involving materials, tools, and machines. These tendencies lead to the acquisition of interpersonal and educational competencies and to a deficit in manual and technical competencies. The social type values social end ethical activities and problems. Social occupations include: athletic coach, barber, counselor, hotel manager, claim adjuster, cosmetologist, minister/priest/rabbi, public health service officer, recreation superintendent, and school superintendent.

The enterprising type prefers the manipulation of others to attain organizational goals or economic gain, and has an aversion to observational, symbolic, and systematic activities. These tendencies lead to the acquisition of leadership, interpersonal, and persuasive competencies, and to a deficit in scientific competencies. The enterprising type values political and economic achievement. Examples of enterprising occupations include: administrative assistant, bank president, farm manager, gift shop manager, lawyer, politician, real estate sales agent, and salesperson.

The conventional type prefers explicit, ordered, systematic manipulation of data, such as keeping records, filing materials, reproducing materials, organizing written and numerical data according to a predescribed plan, operating business machines and data processing machines to attain organizational or economic goals, and has an aversion to ambiguous, free, exploratory, or unsystematized activities. These tendencies lead to the acquisition of clerical, computational, and business system competencies and to a deficit in artistic competencies. Conventional type values business and economic achievement. Examples of conventional occupations are: certified public accountant, cashier, court reporter, file clerk, proofreader, secretary, and travel clerk.

Besides the psychological theme, another theme emerges from my findings. It is about gender. Initially, I expected to explain the punctuality differences by occupational differences, but gender has an effect beyond the occupational effects. Giuliano (1993) found that commuters who are male, in professional or managerial occupations, or who have higher incomes are likely to have the flexibility to make changes in the work trip than commuters who are female, in clerical occupations, or who have lower incomes. Similar differences have been identified in the studies that were mentioned in the discussion of interactive activities.

First I analyze the occupation-specific time constraints to determine which occupations are likely to have high proportions of people with external locus of control. Then I study how often punctuality is needed, and who needs it often, who seldom. I examine this by a multinomial logit model. After that, I examine the two mechanisms for handling delays: reserving slack time prior to arrival and a willingness to pay to circumvent a traffic jam. The possibility to pay for circumventing traffic delays is not unrealistic in Southern California: a privately-run toll road opened recently, offering less congested toll lanes in the median of a

public freeway with driver able to choose in real time knowing approximately the delay in the free lanes.

The data for this study is from a mail-in survey that was conducted in August - September 1994 in Southern California. The sample consists of participants of a panel transportation study recently conducted by the Institute of Transportation Studies. Using the participants of the panel study enabled me to utilize a wealth of background variables and to individualize some of the questions in the survey without multiple individual contacts. The questionnaire is divided into three parts. The first part concentrates on the respondent's occupation and the terms of employment contract. The second measures the daily work and individual timetable constraints. The third concentrates on the current commuting experience and the commuter's willingness to change her behavior when the commuting environment changes. Of the 677 questionnaires that were sent out 542 commuting respondents formed the final estimation sample.

The questions used in this study have various degrees of subjectivity. On one extreme, I have questions that are rather objective and correspond to regular revealed preference data: official work start time, the average length of time between arriving and starting to work in last two weeks, occupation and title in the organization, number of employees in the work site, whether the person works at various work sites or not, age, gender, and household size.

The next category includes statements about work rules, like "My employer does not allow me to arrive at work before the official work start time and start working" or "It is important that I arrive at work at a precise pre-determined time every day".

The third category is more speculative: it contains statements about consequences from violating the work rules, for instance expectations to lose pay or professional reputation if one arrives late. This category contains also traditional contingency questions: given a hypothetical situation, what would the respondent do. In this paper I analyze one such question: "Suppose during your regular morning commute you find yourself in a traffic jam where you expected to stand in immobile traffic for 30 minutes or more. If you could bypass the traffic jam and continue uninterrupted by paying a fee, would you be willing to pay a fee of : a) $ 0.50, b) $1.00, c) $2.00, d) $3.00, e) $5.00?". The respondent could answer "yes" or "no" to each value, and the highest positive response was recorded.

Responses to contingency questions are known to yield biased answers. Bradley and Kroes (1990) cite Bonsall (1985) on four specific types of biases: affirmation bias, rationalization bias, policy response bias, and unconstrained response bias.

Affirmation bias happens when the respondent wishes to please the interviewer. Anonymity provided by mail-in survey might alleviate this bias. Rationalization bias should not be a problem, because I'm not asking for reasons for choices. Policy response bias is probably present. Toll roads were a highly politicized topic when this survey was conducted. The pilot survey indicated that people who oppose toll roads are likely to state that they are not willing to pay anything at all. This bias can be tackled by analyzing the response in two parts: decision to pay or not pay, and a conditional decision about the amount of payment.

Unconstrained response bias would mean that respondent does not fully incorporate the consequences of her decision to her other activities. In this question it means that the respondent discounts the importance of at least half an hour delay or $ 5.00. Since a delay of

this magnitude is rare, the bias would most likely discount the time loss more than the money

loss, biasing the money values of saved time downwards[6].

In addition to these biases respondents have a tendency to give flippant answers if the

hypothetical situation does not feel relevant (Eisner 1987). Respondents also have a resistance

to accept negative situations, and the answers to such questions are more ambiguous than in

positive situations (Lopes 1990). Based on these considerations I expect the *pay/don't pay*

decision to have some political bias and the money values to be downward biased.

I coded the occupations based on two questions: "What is your title in your work

organization?" and "What is your occupation?". I compared the answer to the Dictionary of

Holland occupations, which has also the codes of U.S. Department of Labor Occupational

Codes Dictionary. If the occupation was not listed in the Dictionary of Holland occupations, I

searched for a fitting description of the occupation from the U.S. Department of Labor

Occupational Codes Dictionary, and translated the code into a Holland code. Despite the rather

straightforward principle, the coding process has a random element: if the occupation title is

not directly found from the Holland Dictionary of Occupational Titles, the search for the most

fitting title imports randomness to the results. However, since my analysis uses only the six

major occupational categories and the classification errors are most likely to happen between

subcategories, randomness is limited. It is possible to reduce the randomness by coding the

occupations twice and comparing discrepancies, but that was not done here. Another element

bringing randomness to occupational coding is that the U.S. Occupational classification

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[6] See e.g. Kemp and Maxwell (1992) for a demonstration of how biases affect answers to contingent valuation questions.

changes over time (Clogg, Rubin, Schenker, Schultz, and Weidman 1991). To counteract that change, I used the edition of U.S. Department of Labor occupational codes what the Holland Dictionary refers to.

To see which of the occupations would have strictest time control, I ran a series of cross tabulations on various descriptive variables by the occupational categories. Table 1 shows these cross tabulations in percentage form. The most time-constrained occupations are Realistic and Conventional: they tend to have the most defined work hours, and they are allowed to deviate from these hours less than employees in other occupations. This leads me to conclude that the behavior implied by external locus of control would be more prevalent in Realistic and Conventional occupations.

Table 1. Time constraints associated with Holland occupational categories

| Correlated variable | Artistic | | Investigative | | Realistic | | chi^2 |
| | Social | | Enterprising | | | | |
	Conventional						p-value
Can arrive and start earlier	76%	80%	83%	87%	65%	69%	0.000
Can stay after hours	82%	91%	88%	94%	73%	75%	0.000
Can work outside office	71%	51%	59%	62%	35%	31%	0.000
Sometimes works at home	29%	16%	16%	13%	7%	3%	0.023
Lateness causes loss of pay	12%	14%	7%	4%	18%	22%	0.000
Lateness causes loss of reputation	18%	44%	52%	49%	59%	52%	0.048
Part time worker	18%	6%	5%	2%	7%	2%	0.018
Working in rotating shift	12%	9%	0%	3%	5%	2%	0.012
Able to choose work schedule	24%	37%	42%	41%	30%	29%	0.231
Day-to-day changes in work schedule	35%	43%	27%	37%	25%	16%	0.004
Can not arrive 15 minutes late	35%	49%	24%	28%	49%	41%	0.000
Can arrive 15 minutes late	59%	35%	64%	56%	44%	52%	0.002
No specific arrival time	6%	16%	12%	15%	9%	5%	0.099

Table 1. Time constraints associated with Holland occupational categories (cont.).

Correlated variable	Artistic		Investigative		Realistic		chi^2
		Social		Enterprising		Conventional	p-value
Less than 25 employees in the work site	6%	15%	12%	17%	9%	9%	0.319
100 or more employees in the work site	71%	63%	72%	63%	80%	74%	0.056
Multiple work sites	29%	30%	23%	32%	16%	14%	0.022
Work starts 6.30 am or earlier	0%	5%	12%	11%	27%	5%	0.000
Work starts 6.30 - 7.30 am	12%	12%	22%	20%	24%	22%	0.499
Work starts 7.30 - 8.30 am	47%	35%	42%	41%	28%	55%	0.033
Work starts 8.30 am or later	24%	33%	17%	19%	15%	14%	0.029
Job change during previous 6 months	12%	6%	12%	13%	6%	7%	0.302
At least one employer change 1- 4 years ago	12%	14%	9%	9%	7%	2%	0.265
At least one work site location change 1 - 4 years ago	18%	16%	12%	11%	8%	2%	0.101
Wage-earner	29%	27%	19%	13%	42%	41%	0.000
Independent contractor or entrepreneur	12%	10%	6%	6%	1%	0%	0.048
Male	41%	37%	67%	56%	63%	14%	0.000
Average age, years	43	43	44	44	45	45	--
Average personal income, $ 1000 (approximated from categorical data)	41	53	56	60	42	35	--

2. How Often Do Commuters Need to Arrive Punctually?

Respondents to the transportation survey were asked "How often is it important that you arrive at work at a precise pre-determined time?" The distribution of answers was:

Practically never	29.6%
Once a month or less frequently	3.4%
Two to four times a month	11.9%
Two to four times a week	15.3%
Every day	39.9%

The answers are further grouped by combining the intermediate values into one group. This leads to a distribution:

Practically never	29.6%
Some days	30.5%
Every day	39.9%

I search for explanations of these differences based on occupational characteristics and personal characteristics of the commuter. I am looking for relatively objective explanatory variables to explain the need for punctuality. Later I will use the predicted values for different punctuality need categories to estimate the decision to reserve slack time and willingness to pay. If the link from the more objectively measured variables to more vaguely measured variable to decision making can be established, the objectively measured variables can be used directly with understanding as to why they should have the hypothesized effect.

In my preliminary analysis of the data many background variables were correlated with the need for punctuality, but it was also clear that the background variables are correlated with

each other. To control for 'double counting', I estimated a multinomial logit model[7] for the three punctuality need categories (Practically never, Some days, Every day).

Those who "Practically never" need to be punctual form the base category of the model and their coefficients are normalized to zero. The coefficients on the "Some days" and the "Every day" categories are therefore relative measures to the base category.

From Table 2 we can conclude that a person who needs to arrive punctually every day can neither start working before the official work start time nor later. The person can not choose her own schedule. People in this category are typically female who work in Realistic, Conventional, and Social occupations. People in Investigative occupation are least likely to face strict punctuality requirements. A significant portion of those needing to be punctual every day have to arrive at work by 6.30 am.[8]

People, who face high punctuality needs, have on the average lower incomes. However, the other variables in the model are more significant and income is rendered statistically insignificant and was left out of the estimated model.[9]

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[7] I considered estimating an ordered logit model instead of multinomial logit, but the dependent classes, even though ordered by the frequency of punctuality needs, are not monotonically influenced by the explaining variables. Therefore I proceeded to not assume any ordering between the punctuality categories.

[8] Other variables, not included in the table, that seem to measure the same strictness on time use as the included variables are: losing pay if arriving late, not being able to make the time up after official hours, and not being able to take work home. All these variables were highly correlated with the included variables and were therefore not included in the model.

[9] Education was another plausible but insignificant variable. Higher education measured by a dummy variable indicating a four year college degree was not significant alone or for only women or men. Of the occupational categories the highest educational level is in Investigative and Social occupations. Conventional and to a lesser degree Social and Artistic occupations are female dominated, while the clearest male dominance is in the Investigative occupations. Earlier studies have found that the length of commute and commuting time are positively related to income. This finding holds true also in this sample. To see if commuting time had an additional effect on punctuality requirements, it was entered in the earlier version of the model. However, commuting time had no additional effect and was left out of the reported model.

Those who need to be punctual on some days differ from the other two groups by their later work start time, smaller work site size, and the occupational composition. They also tend not to work in Investigative occupations.

To see whether the presence of children has an effect on the perceived need of punctual arrival, I added variables indicating gender and presence of younger and older children interacted with gender. To control for the effect of age on the household composition, I also added age and age squared as explanatory variables. All these variables were clearly insignificant for the need to be punctual on some days. For those who need to be punctual every day age seems to have a non-linear effect. Women with older children tend to report a higher need for punctual arrival.

Table 2. Need for punctuality, a multinomial logit model

	Need to be punctual on some days		Need to be punctual on every day	
Explanatory variables	Coef.	t-value	Coef.	t-value
Possibility to arrive to work earlier than official start time	-	-	-3.196	-7.672
Not acceptable to arrive 15 minutes late	-	-	1.509	5.254
Can choose own work schedule	-	-	-.669	-2.263
Less than 25 employees at work site	.499	1.704	-	-
Multiple work sites	-	-	-.778	-2.046
Work starts at or before 6.30 am	-	-	1.013	2 351
Work starts at or after 8.30 am	0.866	3.351	-	-
Working in an Investigative occupation	-.484	-1.733	-.779	-2.046
Woman working in a Social occupation	-	-	1.113	2.316
Woman working in a Conventional occupation	-	-	1.475	3.082
Woman working in a Realistic occupation	-	-	1.032	1.710
Woman, children 15 years or younger	.356	0.790	-.163	-0.313
Man, children 15 years or younger	-.369	-0.976	-.040	-0.078
Woman , children 16-21 years old	-.314	-0.621	.728	1.302
Man, children 16-21 years old	.151	0.370	-.108	-0.193
Age (years)	-.049	-0.561	-.127	-1.394
Age squared	.000323	0.336	.00151	1.534
Male	-.091	-0.294	-.273	-0.679
Constant	1.473	1.946	4.372	2.064

The base category = Needs to be punctual "Practically never"

Number of obs   = 503
Log Likelihood, constrained   = -547.9751
Log Likelihood, with current constraints   = -397.1604
Likelihood-ratio test   chi2(13)   =   301.63
                      Prob > chi2   =   0.0000

3. Reserving Slack Time to Ensure Punctuality

A commuter can leave home earlier to insure punctual arrival, a practice I call here reserving slack time[10]. I had expected that the same variables that explain high need for punctuality would also explain reserving slack time before work start. To count for the effect these variables have through the need for punctuality, I entered the predicted values for need for punctuality "every day" and "some days". Of these, only the predicted need "every day" was significant. The sign is negative, as would be expected: those who need punctuality are more likely to reserve slack time to insure it. However, the possibility of arriving earlier and benefiting form the early arrival is important: even though the lack of possibility to start working earlier is associated with need for punctuality, flexible start time towards early start increases the attraction of slack time. The only added variable that increased the likelihood for slack time was, as one would expect, an expected monetary penalty from lateness.[11] To test the 'family responsibilities' explanation for women with young children, I interacted dummy variables indicating a presence of a pre-school and school-age (0-15 years), and older children (16-21 years) with gender of the respondent. Of these, only the oldest children had a statistically significant effect, decreasing the probability to reserve slack time. This finding is

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[10] The time between required arrival time and intended arrival time has many names: it has been called safety margin, schedule delay early, and slack time.

[11] The variables that do not explain slack time were: gender interacted with education, female interacted with presence of 0-5 years old children, female interacted with 6-15 years old children, presence of 0-5 years old children, presence of 6-15 years old children, respondent's age, education, personal income, wage vs. salary income, being an entrepreneur or an independent contractor, occupational groups, work start time, perceived damage to reputation due to lateness, being able to continue working after the official hours, being able to take work outside office during or after work hours, being able to work sometimes at home instead of in the office, working part time, working in rotating shift, being able to choose the work schedule, working under changing schedule vs. fixed, number of employees in the worksite, multiple work sites, and commuting distance and time.

against the family responsibility hypothesis, which indicates that the presence of young children

would influence women's time use. The older children can often drive themselves, and their

effect here is stronger on men's time use, not women's.[12] In general, men tend to not reserve

slack time, and the tendency is not dependent on their age. Women's tendency to reserve slack

time is dependent on their age, irrespective of the presence of children. Income has a

statistically insignificant effect on the decision to reserve slack time.

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[12] This effect could be a confounded effect of the decreased tendency to make side trips when the children are older.

Table 3. Choice to reserve slack time before work starts, a binary logit model

Dependent variable: slack	Coef.	t-value
Predicted "every day" importance of prompt arrival	2.224	2.507
Predicted "some days" importance of prompt arrival	-.514	-0.396
Possibility to arrive to work earlier than official start time	.960	2.399
Monetary penalty for lateness	.782	2.206
Man, youngest children in the household are 0-15 years old	-.366	-1.037
Woman, youngest child in the household are 0- 15 years old	.377	0.969
Man, youngest children in the household are 16-21 years old	-1.113	-2.739
Woman,youngest children in the household are 16-21 years old	-1.075	-2.327
Age of a woman	-.338	-2.550
Age of a woman squared	.00359	2.346
Age of a man	.0276	0.358
Age of a man squared	-.000386	-0.491
Personal income, in thousand dollars	.00266	0.592
Man	-7.446	-2.289
Constant	5.477	1.843

Base category: no slack

Number of obs   =   485
Log Likelihood, constrained   = - 332.0730
Log Likelihood, with current constraints   = - 296.9579
Likelihood-ratio test   chi2(14)   =   70.23
                               Prob > chi2   =   0.0000

4. Willingness to Pay to Escape a Sudden Schedule Delay

Willingness to pay a fee to avoid an unexpected 30 minute delay during the commute to work was analyzed in two stages: first the decision to pay anything at all, and secondly the highest amount to be paid once the decision to pay has been made. The reason to split the analysis is to account for the likely political bias present in the answers. The respondents who were opposed to toll roads indicated in the pilot study that they would not pay anything to circumvent the traffic jam in the hypothetical situation.

The political bias of a specific group is detected as follows: If a particular group of people will be identified as more likely than others to not be willing to pay at all to circumvent the jam, and if the same group is identified from the ones that do pay as likely to pay more than average, a plausible explanation for this finding is political bias. The lower the true value of the option, the more likely the political bias is to push the response towards "no value". In the analysis the group splits into two: those from the upper regions of the value scale , and those who indicate "no value" [13]. The first stage of analysis is presented in Table 4.

The predicted importances of "every day" and "some days" prompt arrivals have relatively large coefficients to reduce the willingness to pay, but the effects are not statistically significant. However, the negative sign indicates that those who practically never need to arrive punctually are the ones most willing to pay. The predicted slack time affects willingness to pay. The sign is also negative: those who are going to reserve slack time are not likely to pay. Also

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[13] Tobit models are often used to analyze censored data. While Tobit model accounts for censored data from one extreme of the response distribution, it assumes that the observed data is non-biased, i.e. that the missing data is from the not observed region. It does not count for situations where the explanatory variable has non-monotonic effects.

working in Realistic or Conventional occupations decreases the willingness to pay. Because the effect of these occupations is already included through the need for "every day" promptness, this result means that these two occupations have additional factors besides the need for promptness that further decrease the willingness to pay. Locus of control provides an explanation that fits this seemingly paradoxical behavior: employees in Realistic and Conventional occupations see it as beyond their duty or interest to pay their own money for something that happens during employer's time. Those who face the strictest external time control are the ones least likely to internalize the goal of arriving punctually.

Table 4. Willingness to pay a fee to avoid a 30 minute delay in traffic, a binary logit model

Dependent variable: Willingness to pay a fee	Coef.	t-value
Predicted "every day" importance of prompt arrival	-2.269	-1.708
Predicted "some days" importance of prompt arrival	-2.161	-0.960
Predicted probability to reserve slack time	-2.479	-1.015
Loss of pay for lateness	1.224	2.057
Personal income, in thousand dollars	.0184	2.096
Working in Conventional occupation	-.985	-2.010
Working in Realistic occupation	-.592	-1.482
Working in Investigative occupation	-1.042	-2.470
Woman, youngest child in the household is 0 - 15 years old	1.635	1.367
Man, youngest child in the household is 0 - 15 years old	.577	1.109
Woman, youngest child in the household is 16-21 years old	-.106	-0.083
Man, youngest child in the household is 16-21 years old	-1.860	-2.550
Age of a woman	.175	0.699
Age of a woman squared	-.00200	-0.729
Age of a man	-.0185	-0.189
Age of a man squared	.000232	0.229
Man	2.780	0.493
Constant	1.200	0.189

```
Number of obs                              =     479
Log Likelihood, constrained                =  -199.2404
Log Likelihood, with current constraints   =  -162.4421
Likelihood-ratio test         chi2(6)      =     73.60
                         Prob > chi2        =      0.0000
```

Investigative occupations do not support the hypothesized external locus of control. On the contrary, people in Investigative occupations report more often than anybody else that they need to arrive promptly "practically never", and they have a highest proportion of respondents who state that they can arrive 15 minutes late at work. Since the effect of working in Investigative occupation is negative on predicted need for "every day" promptness, the results indicate that there may be something else in this occupational group to make the respondents feel more detached to the timing of work activities. Another explanation is that people in Investigative occupations understand to the uses and abuses of survey data, and would be most likely to include political bias in their answers. The results of table 5 support the latter explanation.

As the theory predicts, personal income increases one's willingness to pay, as did the expected loss of pay from late arrival. Also, living with young children increases the willingness to pay. This finding supports the explanation that family responsibilities increase the importance of timing of activities for women, but the effect is statistically insignificant and seems to be true also for men. Again the older children in the household have an unexpected effect on behavior: their presence decreases men's willingness to pay. Age does not have any influence on the willingness to pay for men or women, but in general men are more willing to pay.

Insignificant variables for this model included education, commuting time, and a host of variables measuring time use flexibility at the work place.

In the second stage, when the amount of fee is analyzed, the predicted need for punctuality and slack time fully lose their significance. This is presented in Table 5. Personal

income increases the fee. Working in Investigative occupation increases the amount the commuter is willing to pay, as does a degree from a four year college. College education changes especially the amount women are willing to pay. These effects can be explained through an internal locus of control: educated people and people in Investigative occupations treat the time at work more as their "own" time. Thus they are willing to pay more of their own money to spend the time as they please. On the other hand, being a wage-earner is an indication of stricter external control on the respondent's time use, and therefore doesn't motivate the respondent to pay.

The presence of children in the household does not affect the amount men or women are willing to pay, neither does the age or gender of the respondent. This result is not consistent with the "family responsibility" explanation.

Because willingness-to-pay questions are subject to well known biases, numerical values of the fee derived from this model should not be treated as unbiased estimators of the fee people would pay in real choice situations. There is more reason to believe in the relative importance of the explaining variables this model indicates.

Table 5. The highest fee one is willing to pay in order to avoid a 30 minute delay during a commute to work, given that the person is willing to pay something, an OLS regression.

Dependent variable: The highest amount one is willing to pay to avoid a 30 minute delay during a commute to work	Coef.	t-value
Predicted "every day" need for prompt arrival	.188	0.299
Predicted "some days" need for prompt arrival	.473	0.515
Predicted probability to reserve slack time	-.858	-0.696
Personal income, in thousand dollars	.00421	1.404
Loss of pay due to lateness	.760	2.475
Wage-earner	-.348	-1.850
Working in an Investigative occupation	.286	1.458
4 year college degree, if the respondent is a man	.313	1.513
4 year college degree, if the respondent is a woman	.571	2.944
Woman , youngest child in the household is younger than 16 years	-.218	-0.875
Man , youngest child in the household is younger than 16 years	-.0374	-0.152
Woman, youngest child in the household is 16 - 21 years old	-0.842	-0.241
Man, youngest child in the household is 16 - 21 years old	.168	0.457
Age of a woman	-.0749	-0.611
Age of a woman squared	.000735	0.541
Age of a man	-.0185	-0.371
Age of a man squared	.0000962	0.192
Man	-1.109	-0.391
Constant	2.976	0.967

Number of obs   = 404
$F(18, 385)$ =   2.95
Prob > F   =   0.0000
R-square   =   0.1212
Adj R-square   =   0.0801
Root MSE   =   1.2576

A surprise result was the negative correlation between the amount of reserved slack time and the amount the respondent was willing to pay to avoid an unexpected delay (-.17). Instead of being overall averse to the risk of late arrival, those who are willing to plan ahead and reserve slack time are not willing to pay a fee if they get stuck in a traffic jam that would make them arrive late at work, and those not willing to spend time to insure punctuality are willing to pay in case of larger unexpected delays.

This surprise may be explained in terms of locus of control. The individuals that perceive an external control for their arrival and take precautions by reserving slack time, have a clearer image of the limits of their duty and influence. Landing in an unexpected traffic delay is clearly "not their fault", and they are not willing to pay their own money to get out of it. Individuals with internal locus of control, on the other hand, are more likely to internalize the unwelcome occurrence and are willing to pay to change it.

What I have demonstrated here is that commuters have a value for punctuality which depends on their perception of control or ownership of their time. I have gone beyond the description of 'tastes' of different socio-economic groups, and provided an explanation to a seemingly contradictory behavioral pattern. This interpretation differs from the standard "value of time" , or here "value of punctuality" interpretation, where the commuter is supposed to have unknown, but unambiguous, values for different aspects of time, commonly assumed as functions of earning power.

5. Summary

The need for punctual arrival can be explained by occupational requirements. The attraction of occupations can be explained by personality. One aspect of personality -- locus of control -- can be used to explain the seemingly puzzling finding that those who state the highest need for punctuality are least willing to pay to circumvent traffic delays: the high need for punctuality is not the commuter's need, but the employer's. When the employee has done his duty to reserve enough time for the commute, it is not in his interest to pay for delays that he sees beyond his responsibility. This finding persists when I control for income, the regular economic explanation.

Conventional and Realistic occupations have the strictest time requirements and are therefore concluded to indicate highest proportions of employees with external locus of control. Women face much stricter punctuality requirements than men even within occupational categories. In Conventional, Realistic and Social occupations the differences in requirements are strongest.

There are clear differences in commuting behavior between men and women. 'Family responsibilities' could explain only some of the differing commuting behavior, while the 'locus-of-control' provided another explanation.

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