Collegio Carlo Alberto

Frictional Matching: Evidence from Law School Admission

Pascal Courty
Mario Pagliero

No. 113
June 2009

Carlo Alberto Notebooks

www.carloalberto.org/working_papers

Frictional Matching: Evidence from Law School Admission

Pascal Courty[1] and Mario Pagliero[2]

June 2009[3]

[1]Department of Economics, European University Institute.
[2]Department of Economics and Finance, University of Turin, and Collegio Carlo Alberto.

Abstract

We measure friction in the matching of students and law schools as the number of unnecessary student applications and school admissions that have to be undertaken per actual matriculation. We show that friction increases with student and school attractiveness, but decreases for top schools and students. We discuss connections with the literature on frictional matching.

JEL: D02, C78.

Keywords: College admission, frictional matching, assortative matching, student portfolio, school standard.

1-Introduction

Undergraduate students and law schools spend substantial resources to match. In 2003, the 184 law schools approved by the American Bar Association (ABA) received 533,000 applications, 398,000 of which were rejected. Of the 136,000 places offered by law schools, 88,000 were turned down. Overall, the admission process therefore generated 486,000 unnecessary procedures. The associated costs mount quickly. Students have to study each school they apply to, pay an application fee, and often spend time writing a school specific statement, among other things. Schools have to finance admissions offices to evaluate and make a selection from the large number of applications they receive.

In a frictionless world, as in Becker's model of assortative matching (1973), each matriculation requires just one application and one admissions procedure. In the presence of friction, however, both students and schools need to invest in the sorting process. The literature on frictional matching has considered several types of market imperfections. For instance, students apply to several schools to secure at least one admission (the student portfolio problem). Because schools receive noisy signals of student types, students may gamble on top schools, exploiting the fact that school screening is imperfect (Chade et al., 2009). Students, themselves, may be imperfectly informed about their own types (Nagypal, 2004).

We measure friction as the number of unnecessary student applications and school admissions that are undertaken during the admission process. We document how frictions depend on the attractiveness of the market participants and discuss the implications for recent models of frictional matching.

2-Law school admission and data

Students apply to law schools through a centralized institution. Applications include transcripts, recommendation letters, academic summary reports, writing samples and LSAT scores. Schools then make admission decisions and, finally, students choose where to matriculate.[2]

The Law School Admission Test (LSAT) is a standardized test which is required by all ABA approved law schools. The LSAT is a crucial part of the application process and carries considerable weight in schools' admission decisions. We use the LSAT score as our measure of student attractiveness.[3] Law Schools are also heterogeneous. Following the literature, we use the U.S. News Score (USNS), which aggregates 12 measures of quality, as a measure of school attractiveness.[4] The USNS is an integer between 20 and 100. More than one school can be assigned the same score. At the lower end of the distribution, schools are clustered in two groups and assigned a score equal to 20 or 30. Although imperfect and controversial, the USNS remains an extremely popular measure of school attractiveness amongst potential candidates, employers, and the general public (Posner, 2006).

Our sample includes the 184 law schools approved by the ABA in 2003.[5] Table 1 reports the total number of applications, admissions and matriculations. For some schools, however, there is no USNS available, so figures disaggregated by school type are based on only 175 schools. Similarly, the Official Guide to ABA approved Law Schools does not report complete

---

[2] Admissions are not necessarily made simultaneously; some schools may start making admissions before all applications have been received.

[3] LSAT scores range between 120 and 180, and are reported in intervals of 5 points. Students with LSAT scores below 140 are included in one category and assigned a value of 137.5. These are students with little chance of being admitted to any school (less than one application in 100 is successful).

[4] The USNS is used to compute the USNS ranking which we do not directly use in this paper.

[5] These schools represent most of the market. In 2003, less than 5 percent of bar exam candidates studied in a non-ABA-approved law school, and less than 2 percent passed the exam.

information by student type for some schools, so figures disaggregated by student type are based on only 119 schools. There is no systematic correlation between USNS and the amount of information reported in the Official Guide.

3-Evidence

Denote student LSAT score by $t \in T=[140,180]$ and school rank by $s \in S=[20,...,100]$. For type $y \in SUT$, a_y denotes the number of applications, A_y the number of admissions, M_y the number of matriculated students, and N_y the number of applicants. The same variables without sub-indexes refer to the total population. Application friction, $F_a=a/M$, measures excess applications per matriculation. Admission friction, $F_A=A/M$, measures excess admissions per matriculation. Table 1, column 2 reports that $F_a=11.17$ and $F_A=2.85$. Due to data limitations, we will sometimes use measures of friction based on the number applicants instead of matriculants, $F_a=a/N$ and $F_A=A/N$.[6] Table 1, column 3 reports that $F_a=5.3$ and $F_A= 1.35$.

$F_{x,y}$ denotes friction $x \in \{a,A\}$ for participant of type $y \in SUT$. Our two measures of friction are related by

$$F_{a,y} = \frac{a_y}{A_y} F_{A,y}$$

where a_y/A_y is a measure of school selectivity (the inverse of the admission probability). In a frictionless world, we have $F_{x,y}=1$ for all x and y. Our aim is to document how these two measures of friction depend on student and school type.

[6] We do not observe matriculation by student type. Therefore, we decompose our measures of friction by student type by normalizing by the number of applicants, as in Table 1, column 3. We compute the total number of applicants by dividing the total number of applications by the average number of applications per applicant. We assume that the distribution of applicants is the same as the distribution of LSAT scores in the 2000-2003 period.

Students---Figure 1 reports $F_{a,t}$ as a function of student type. Better students apply to more schools, with a slight decrease for top students. Students with the top LSAT scores apply to about 3 times more schools than students with the lowest scores. Figure 1 also describes admission friction $F_{A,t}$. Better students secure more admissions per capita. The number of admissions per student triples as one moves from the bottom to the top students. Interestingly, student behavior does not square with advice from preparation intermediaries. For example, the Princeton Review recommends that "your best bet is to apply to a minimum of two reach schools, two strong possibilities and three safety schools. Why seven? Better safe than sorry. Most admissions experts agree with the 2-2-3 or 2-3-2 ratios."[7] Only students in the top quartile follow that advice.

Better students are more likely to be admitted (Figure 2). About one application in 100 is successful for the weakest students. Top students need less than 2 applications to secure an admission. Interestingly, better students do not compensate for this increase in the likelihood of admission by applying to fewer schools. Instead, application friction $F_{a,t}$ increases with t and only starts to slightly decrease for very top students.

Schools---Better schools have higher application friction ($F_{a,s}$ increases with s in Figure 3). Top schools receive about 3 times more applications than bottom ones. Figure 4 shows that admission friction $F_{A,s}$ slightly increases for better schools, and sharply falls for the top schools. Better schools are more selective (higher a_s/A_s), with a pronounced increase for top schools (Figure 5).[8] The small initial increase in admission friction is due to the fact that school

[7] http://www.princetonreview.com/law/application-timing-and-numbers.aspx

[8] School selectivity is one of the twelve variables used to construct the USNS index. This could introduce a bias toward finding a positive relation between USNS score and selectivity (for example, if the USNS index measures school attractiveness with noise). But this is not a concern here because school selectivity receives a small weight (.025) in the construction of the USNS.

selectivity (a_s/A_s) partially compensates for the increase in application friction. For top schools, however, selectivity sharply increases and application friction remains constant, two effects that contribute to the drop in admission friction.

Table 2 shows that the results are robust when we explain friction with dummies for different intervals of school type using OLS regression (instead of the spline regressions presented in Figures 3-4) and also when we control for class size. (A new result from Table 2 is that small schools generate less friction.)

Summary--- Application friction $F_{a,.}$ is increasing and concave in both school and student type, with a slight decrease for very top students. Admission friction $F_{A..}$ increases with student type and slowly increases with school type, but then sharply falls for top schools. The initial increase in friction ($F_{a,.}$or $F_{A,.}$) is more pronounced for students than for schools, and the decrease in admission friction $F_{A,.}$ is more pronounced for top schools than for top students.

4-Discussion

The evidence that $F_{x,y}\neq 1$ is inconsistent with the frictionless view of the world. The frictional matching literature has considered several types of market imperfection. Shimer and Smith (2000) propose a search model with vertically differentiated types, and present equilibria where the matching sets are convex and increasing with type. High types would like to match with equals, but there is a waiting cost, so they end up accepting types inferior to them. Higher types search less; a prediction that is inconsistent with the evidence. In the search framework, however, types have no control over whom they meet; an assumption that is unrealistic here.

Nagypal (2004) and Chade, Lewis and Smith (2008) model the college admission problem. They assume that applications are costly. This is consistent with the observation that students apply only to a small subset of schools. In addition, students and/or schools receive an imperfect

indication of students' type. An interpretation in our application is that the LSAT is an imperfect signal of some underlying true type that could be observed by students and/or by schools. Both papers derive properties of the sorting equilibrium in the two-school case. The worst students apply to no school because it is not worth the cost, better students apply to the bottom school only, even better students apply to both schools, gambling for a top acceptance, the next tier also applies to both schools to ensure acceptance, and top students apply only to the top school to save money. A more realistic model with more than 2 schools remains beyond current reach. We conjecture that the predictions of the 2-school model apply to the bottom and top schools in our sample, leaving the threshold between these two tiers undetermined. This is a crude attempt at bridging the theory and the evidence but it is the best that can be done at the moment.

Evidence is consistent with the model. (a) Application friction increases with student type and decreases for top students, which is consistent with the prediction that only mid-range students apply to both schools. (b) Admission friction decreases for top schools, which is consistent with the prediction that top schools are less likely to be rejected. Some questions remain unanswered, however. Why do top students have to secure so many admissions? Why does application and admission friction increase over such a large range of schools and decrease only at the very top?

Our evidence also contributes to the policy debate on the strengths and weaknesses of decentralized matching, a procedure that is used in many academic programs and in some specialized job markets as well. We show that search intensity, and therefore the cost of the search, varies greatly with the participants' type. Imposing a cap on the number of applications per student would mainly affect good students, without reducing the number of applications by the worse students, who are the least likely to be successful.

References

Becker, G. (1973). “A Theory of Marriage: Part I.” Journal of Political Economy, 81, 813–846.

Chade, Hector, Gregory Lewis, and Lones Smith. (2009). “A Supply and Demand Model of the College Admissions Problem.” Mimeo, Michigan University.

Nagypal, E. (2004). “Optimal Application Behavior with Incomplete Information,” mimeo, Northwestern University.

Posner, Richard. (2006). “Law School Rankings.” 81 Indiana Law Journal 13.

Shimer, R., and L. Smith (2000). “Assortative Matching and Search,” Econometrica, 68(2), 343–369.

Table 1. Summary statistics (184 schools)

	(1) Number of procedures (/1,000)	(2) Friction (Number of procedures per matriculation)	(3) Friction (Number of procedures per applicant;)
Applications (a)	533	11.17	5.30
Admissions (A)	136	2.85	1.35
Matriculations (M)	47	1	0.47

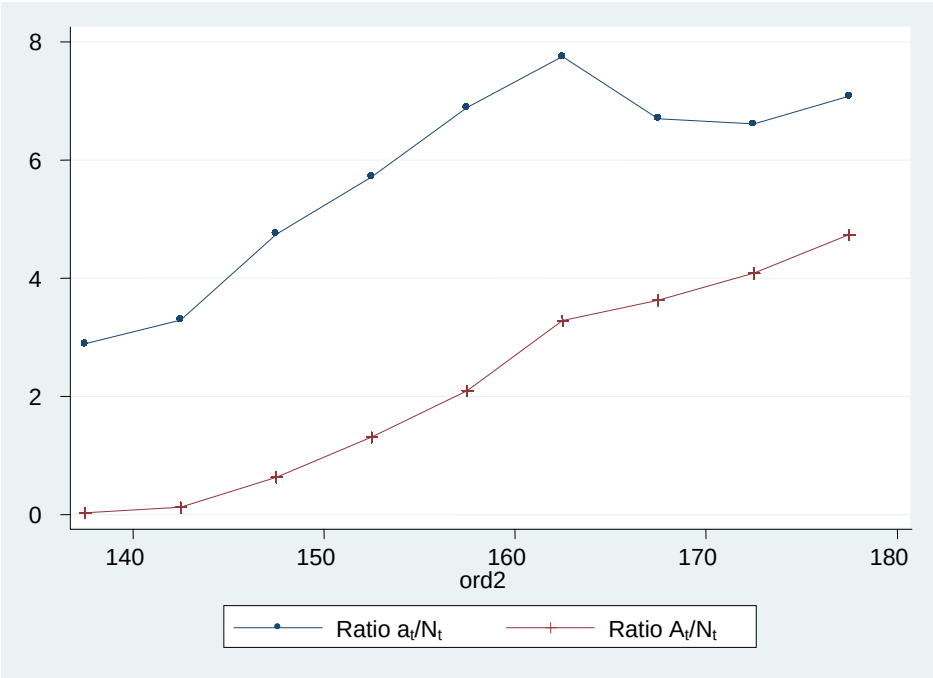
Note: column 3 is based on 100,000 applicants.

Table 2. The impact of school type and class size on friction (OLS)

	(1) a_s/M_s	(2) a_s/M_s	(3) A_s/M_s	(4) A_s/M_s
USNS=30	0.999	1.491*	0.055	0.173
	(0.684)	(0.789)	(0.153)	(0.162)
40<USNS <=60	4.340***	4.347***	0.117	0.140
	(0.767)	(0.779)	(0.141)	(0.143)
60<USNS<=80	9.508***	9.571***	0.607***	0.609***
	(1.395)	(1.424)	(0.226)	(0.224)
80<USNS	7.419***	7.704***	0.069	0.152
	(1.846)	(1.848)	(0.195)	(0.198)
100< Class size< 200		2.989*		0.257
		(1.570)		(0.180)
200<Class Size <=300		2.823*		0.464**
		(1.593)		(0.194)
300<Class Size <=400		3.177*		0.582***
		(1.623)		(0.205)
400<Class Size		2.888*		0.433*
		(1.713)		(0.229)
Constant	7.292***	4.334***	2.673***	2.243***
	(0.452)	(1.551)	(0.103)	(0.198)
Observations	184	184	184	184
R-squared	0.31	0.32	0.06	0.09
40<USNS<=80 =60<USNS<=80	0.00	0.00	0.03	0.04
60<USNS<=80 = 80<USNS	0.35	0.40	0.04	0.08

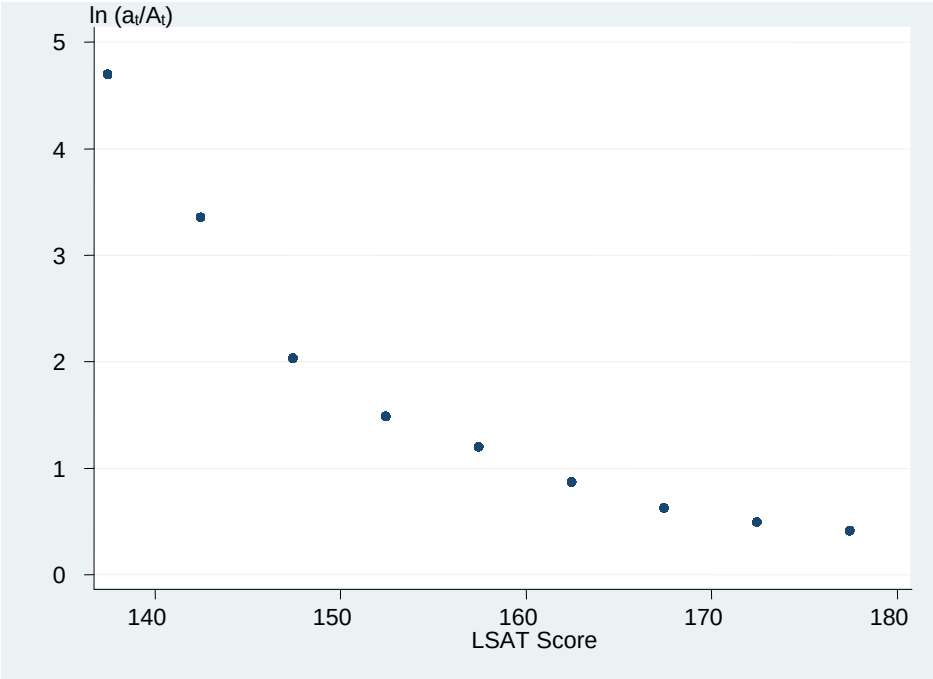
Note: Robust standard errors in parentheses. The table reports the p-values of the F-tests of the equality of coefficients. * significant at 10%; ** significant at 5%; *** significant at 1%

Figure 1: Application friction (a_t/N_t) and admission friction (A_t/N_t) by student type t.



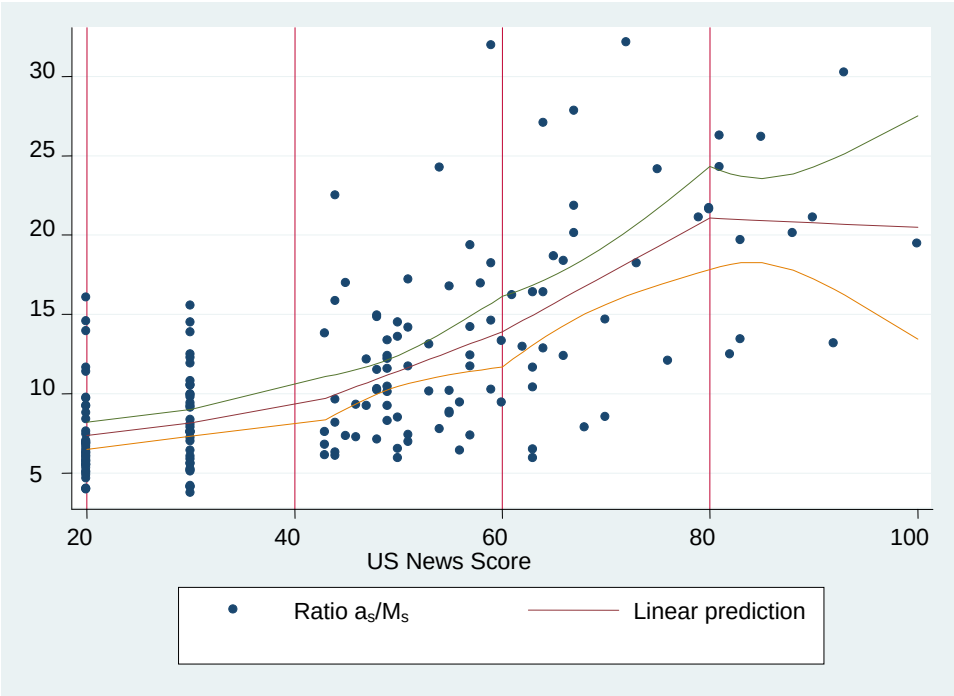
Note: The figure reports the number of applications and admissions per applicant, by applicants' LSAT score. The figure is based on 324,000 applications, 83,000 admissions, and 61,000 applicants in 119 schools.

Figure 2. The number of applications per admission a_t/A_t by student type t (log scale).



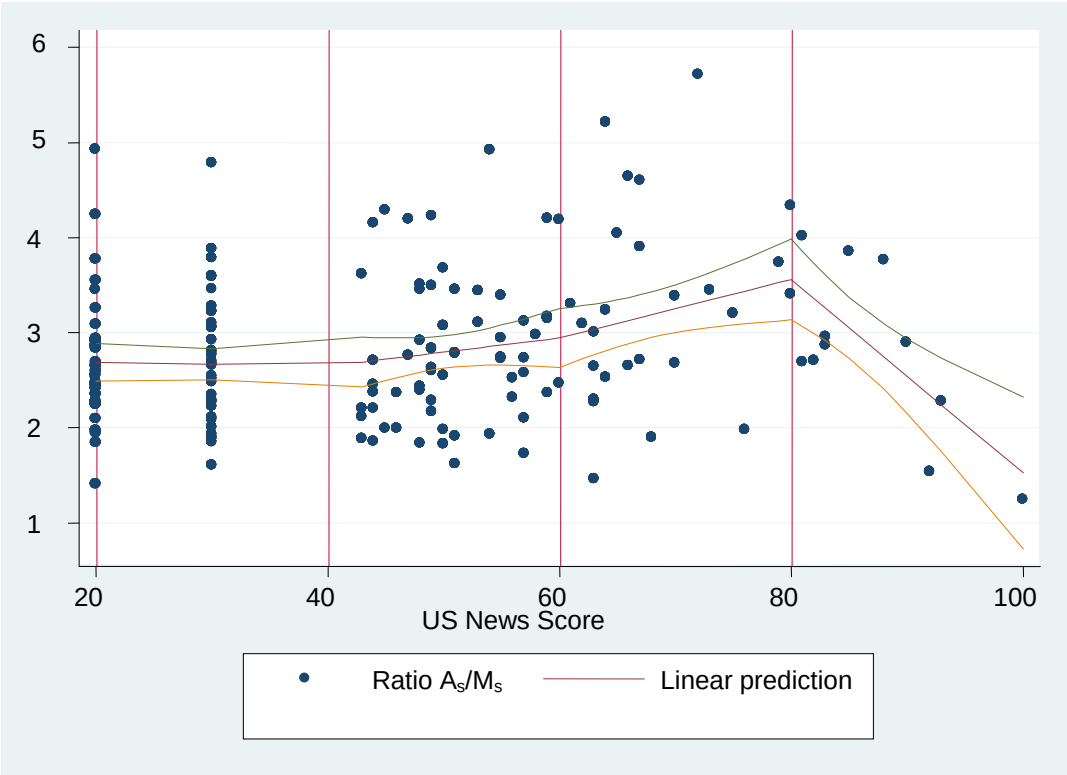
Note: The figure reports the log of the ratio of the number of applications and admissions, by applicants' LSAT score. The figure is based on 119 schools.

Figure 3: Application friction (a_s/M_s) by school type s.



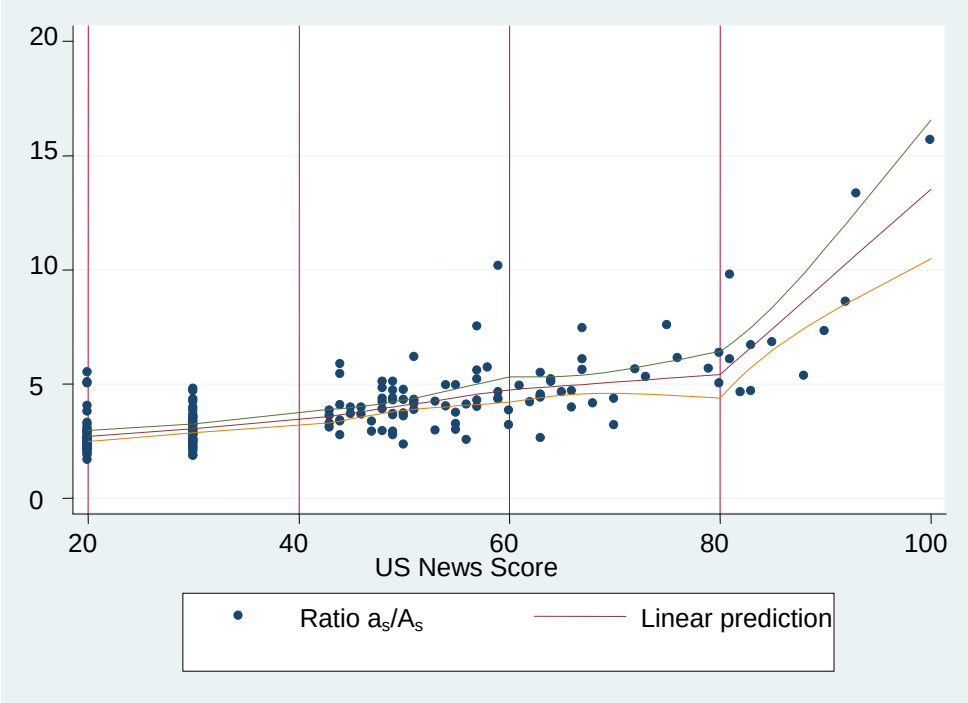
Note: The figure is based on 175 schools. The figure reports the predicted values of a linear spline regression and the 95 percent confidence interval. The slope in the interval [40,60] and [60,80] are significantly different from zero at 1 percent confidence level.

Figure 4. Admission friction (A_s/M_s) by school type s.



Note: The figure is based on 175 schools. The figure reports the predicted values of a linear spline regression and the 95 percent confidence interval. The slope is positive in the interval [60,80], negative in the interval [80,100]. The estimates are significantly different from zero at 2 and 1 percent confidence levels respectively. The difference in slope between the two intervals is significant at 1 percent confidence level.

Figure 5. School selectivity (a_s/A_s) by school type s.



Note: The figure is based on 175 schools. The figure reports the predicted values of a linear spline regression and the 95 percent confidence interval. The slope is significantly different from zero in the interval [80,100] at 1 percent confidence level, not significantly different from zero in the interval [20,80].