Robin Hood vs. King John Redistribution: How Do Local Judges Decide Cases In Brazil?

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This article discusses two opposed hypotheses to predict the behavior of judges when they have to decide a claim between parties with asymmetrical economic and political power. The first, which has broad acceptance among policy makers in Brazil, is the *jurisdictional uncertainty hypothesis* (Arida *et al*, 2005) that suggests that Brazilian judges tend to favor the weak party in the claim as a form of social justice and redistribution of income in favor of the poor. Glaeser *et al.* (2003) stated the second hypothesis. They suggest that the operation of legal, political and regulatory institutions is subverted by the wealthy and politically powerful for their own benefit, a situation they call *King John redistribution*. An empirical test was conducted analyzing judicial decisions from 16 Brazilian states, showing that a) judges favor the strongest party, b) a local powerful party has more chance to be favored than a national or foreign big company, a effect we named *parochial subversion of justice* and c) in Brazilian states where we have more social inequality there is higher probability that a discussed contract clause will not be maintained.

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1. INTRODUCTION

The ongoing discussion about the judiciary reform in Brazil brings up two opposite hypotheses concerning the behavior of judges when deciding a claim between opposing parties with different economic and political power. The first hypothesis formulated by Arida, Bacha and Lara-Resende (2005) suggests the concept of *jurisdictional uncertainty* to refer to the uncertainties associated with the settlement of contracts in the Brazilian jurisdiction. This uncertainty manifests itself predominantly as an antisaver and anti-creditor bias. According to Arida et al. (2005), Brazilian judges tend to favor the weaker party in the claim as a form of social justice and redistribution of income in favor of the poor, in a kind of *Robin Hood* redistribution. The second hypothesis was stated by Glaeser, Scheinkman and Shleifer (2003), suggesting that the operation of legal, political and regulatory institutions is subverted by the wealthy and politically powerful for their own benefit, in a situation that the authors call King John redistribution. In this case they argue that inequality is detrimental to the security of property rights, and therefore to growth, because it enables the rich to engage in such subversion, as it is showed in the next section.

1.1. The 'Jurisdictional Uncertainty' Hypothesis

Some opinion surveys have attempted to confirm the alleged anti-saver and anti-creditor bias pointed by Arida *et al.* (2005). The depth of this bias, they say, may be inferred in Brazil from the answers to an elite opinion survey conducted by two Brazilian political scientists (Lamounier and Souza, 2002). Confronted with the dilemma between the enforcement of contracts and the practice of social justice, only 48% of the 500-plus respondents considered that contracts must always prevail over social considerations. Only 7% of the members of the judiciary said that they were prepared to judge contracts regardless of social considerations, and a full 61% acknowledged that the achievement of social justice would justify decisions in breach of contracts. It should be stressed, however, that these surveys ask what these judges are supposed to do, not what they actually do. This and other pieces of research would be more trustworthy if they were grounded on real cases instead of relying on opinion surveys.

To corroborate the same point, a former IPEA (a large governmental research institute in Brazil) researcher, Armando Castelar Pinheiro (2002b), conducted a survey among judges asking a similar question: If the judges, in deciding a case, should maintain the tenor of the contract clauses or ignore these clauses in order to reach social justice. The results are similar to those of Lamounier and Souza (2002).

However, several studies are devoted to the analysis of the gap between declared intentions and the real actions (Glaeser *et al*, 2000, Lazzarini et al, 2005). This could mean that these opinion surveys are measuring something else instead of the way that judges actually decide cases. It could be argued that judges tend to overstate their social role and importance for social change in order to alleviate the image that goes of not being politically engagé.

1.2. The 'King John' Hypothesis

The sovereign has an interest in how the dispute is resolved, to punish undesirable conduct, to establish precedents, or to promote deterrence, but also to help his friends and hurt his enemies. In this case justice can favor not only people close to the sovereign, but the wealthy and the politically powerful (Djankov *et al*, 2003). The rich can redistribute from the have-nots by subverting institutions. They can do so through political contributions or bribes or just deployments of legal and political resources to get their way. This is likely to be true, according Glaeser *et al* (2003), in more unequal societies, due the role that inequality has in their model. The ability to punish the judge, when he decides against the interests of the strongest party, will be larger the larger is the income difference among population of a given country. At end, the justice will be more likely to be subverted in these societies.

Following the reasoning of North (1990), it can be said that inequality is harmful to the security of property rights, and therefore to growth, due this possibility of subversion. If one is rich enough, compared to another party and the judicial system is corruptible, then the legal system will favor the rich, not the just. At the end, those who are likely to be expropriated will refrain from contracting with more powerful people. The break down in property rights will deter investments, at least by these potential victims, with adverse consequences for economic growth.²

1.3. The Parochial Subversion of Justice Hypothesis

The theoretical proposition of Glaeser *et al* (2003) takes into account not just the economic power, but also a variable they define as political power, that means, the capacity to punish the judge if he does not decide in the favor of the strong party. This ability to punish could be exerted with more efficiency by a local party, who is more likely to have social attachments with the judge of the case, or with people in position to punish this judge when necessary. The modeling of Glaeser *et al* (2003) also sug-

²It should be stressed that neither Glaeser et al nor this article elaborates too much over the methods used by these powerful parties to subvert justice. It could be done for sure by the recourse to corruption (bribes and other forms), but could also be done by some kind of influence, e.g. the use of newspapers, TV or other mass media to widespread a feeling against people outside the community, or even resorting to threatening and intimidation.

gests that more unequal societies will increase the ability that the political powerful party has to punish .

This theoretical construction to explain the influence exerted by powerful parties resembles the description made about a situation observed in the Northwestern part of Brazil, the 'coronelismo'³. This phenomenon, described for the first time by Leal (1948), could be understood as the domination of local people by local farmers⁴. These leaders received the status of colonel from Brazilian Central Government, and had their own armies, used to subvert local political systems and justice. Lima Sobrinho (1997) argues that this phenomenon persists with company owners, local politicians and others in the place of the original colonels⁵. The intention is to investigate the possible influence of these local powerful parties over judicial decisions, a hypothesis which will be named here *parochial subversion of justice*. This was tested against the current alternative hypothesis formulated by Arida *et al* (2005), and should be understood as a refinement of the *King John's redistribution* hypothesis.

2. THE EMPIRICAL TEST

To oppose these two hypotheses, this article in the first part discusses the concept of *jurisdictional uncertainty*, showing that there are no reasons for the judge to decide against the law and favor the poor if one takes into account the advantages he could gain from this behavior. After this discussion the article goes deep in the analysis of judicial decisions to verify the existence of an anti-creditor bias, instead of relying on opinion surveys. In the first phase of the research an empirical test was conducted analyzing 1,019 judicial decisions in São Paulo, the largest GDP among the Brazilian states. The results were published in a previous article (Ferrão, Ribeiro, 2006).

But these results do not prove that the hypothesis of institutional subversion applies. If the judges are neutral, one perspective claims that the result will favor the strongest party (Cappelletti, Garth, 1976, Galanter, 1974), because they are in a better position to conduct a case, as they have easier access to the legal system and lawyers as well as more financial resources to face the costs of the case and to support themselves while waiting for a decision.

³In Portuguese without equivalent word for English.

 $^{^4}$ This phenomenum could be found in similar forms in other regions of the country, manly in nineteen and the beginning of twenty century, with other names like 'caudil-hismo' and others.

⁵See also Ribeiro (2006).

2.1. The Behavior of Judges

The behavior of judges, as well as other economic agents aims at maximizing their utility. Some studies have tried to connect the decisions of judges with the favoring of the class or social group to which they belong. The result would be that a judge who is a landowner would favor landowners; judges who walk to work would favor pedestrians and so on (Posner, 1995, p. 581). But in that case the gain the judge could have will be minimal and must be outweighed against possible penalties for deciding disregarding the sound tenor of legislation. These penalties include professional criticism, reversal of decisions in court appeals and damages to the reputation of judges. So far, all these attempts do not seem to show any positive results.

The recruitment of judges, which also influences this behavior, prioritize technical knowledge as any selection of civil servants, and it seems more likely that this criterium yield in the selection of judges concerned with the quality and accuracy of their decisions. As a consequence, this system for hiring judges will favor those that just follow the legislation, avoiding any innovation in its interpretation. Specifically for Brazil, one must take into account the criteria for career evolution in appeal and low-level courts. In half of the promotions the oldest is designated, but in the other half the promotion is done on the grounds of merit, with the number of decisions maintained in higher courts being a decisive aspect.

2.2. The Description of Empirical Test

To separate the hypothesis that the judges are neutral (or that there is a self-selection of cases, an possible argument that will be developed further in this section) a methodology was developed, based on selected judicial cases in several Brazilian states. This article looks at cases in which parties with recognized local power are in legal battle against:

a) A local citizen with no power, understood as a natural person or a small business. To assure this absence of power, it was ascertained from the documents of the case and public documents that the person is not a politician, government official or belonging to a local oligarchy. The same procedure was adopted concerning small companies.

b) A national company, listed among the 300 largest national groups, or a foreign company.

c) The central government or a state-owned company.

The selection of a local powerful party was made according to the following criteria: if the party were a company, it would be a family owned one, listed among the largest local companies according to the local and national ranks of 'Balanço Anual' from 'Gazeta Mercantil', a well reputed financial newspaper in Brazil. Also included in the sample were family owned companies with local politicians or high public officials among its owners, as well as some cases in which these politicians or high public officials litigate as a natural person. In all cases, the national or foreign company has at least the same size in terms of revenues or assets that the local party, and in most of the cases this party is several times larger than this local one.⁶

The selected cases are concerned with contractual clauses⁷, but in very few of them the discussion is about a title (for a land or a patent) and in two cases it could be argued that the case would be more concerned with torts than with contracts. However, if we disregard these two cases from the sample the results do not change. In short, it could be said that the cases relate to judicial enforcement of a private arrangement.

As expected from the test reported in Ferrão and Ribeiro (2006), a decision favoring the local strong party is likely to prevail over one favoring a local weak party. But in the case of a national or foreign company it is expected that the local party be favored only if the *Parochial Subversion of Justice* hypothesis applies. It is argued here that a local and powerful party should be in better condition to influence the judge than a party outside the community, even if the latter has more financial resources. If the decision in favor of a national or foreign party prevails, then the judges are acting in a neutral way, and the financial resources play a central role in determining the result of the trial.

It is therefore necessary to consider what the effect of self-selection bias in our hypothesis would be. Strong parties have better lawyers, opportunity to improve the contracts through the time and more experience in judicial cases. This party may only file a case when they have some confidence that courts will enforce the contract, and that could lead to a high rate of success for this party⁸. However, in this case the expected result would be

⁶In spite of having these objective criteria for the selection of parties, it is not to be denied that a bias could emerge from the selection done by field researchers. We do think that all procedures assure the minimal possibility of this bias, and that this is the best result given the conditions we had. The stricter criterion yielded in a lower number of observations, but the result still being significant. We are grateful to Edinaldo Tebaldi, from CAEN/UFC, for his comment in this sense during the XI ANPEC Regional Conference in Economics and BNB Forum on Economic Development in Fortaleza (July, 19-21th) and also to Sérgio Lazzarini (Ibmec/SP) for his comment during the 2006 ESNIE Conference in Cárgese, France (May, 15-20th).

⁷The discussion about a single contract clause allows more objectivity in the analysis. If it were chosen judicial cases in which the validity of the whole contract was under judicial appreciation, it would be hard to determine if the contract was maintained or not. In that case, the field researchers could bias the sample by their judgment if the contract was maintained or not, and the selection in which we have just one contact clause under discussion seems to be the best strategy for the research. However, the selection of cases with this restriction decreased substantially the size of the sample. We are grateful to Edinaldo Tebaldi and Sérgio Lazzarini for this point too.

⁸We are grateful to Francesco Parisi and Sérgio Lazzarini for comments about this point. As one can see from the development of this argument, this possibility just reinforces the results of the empirical test in favor of the *parochial subversion of justice* hypothesis. However the self-selection bias does not invalidate the results of Ferrão and Ribeiro (2006). If the weak party brings the case to the court with a wrong idea of

that the national or foreign company often wins the case, because in all of them this party has more economic resources than the local powerful party. If we find significant coefficients for the likelihood of a powerful local party winning, in spite of having this selection bias, it means that the final effect of the *parochial subversion of justice* hypothesis is even stronger.

The cases chosen here also include some in which a local party with no power faces a national or foreign company. These cases were included to control for the hypothesis that judges protect all kind of local parties, and not just the powerful ones. It could be argued too that local parties have better conditions to litigate because they know the local judicial system and good lawyers in the neighborhood among other aspects. It is expected, if the *parochial subversion of justice* prevails, that these parties have less chance of winning a case than the powerful parties.

As a corollary of this rationale, one is expected to find a correlation between inequality indexes and subversion of justice. In this case, more unequal Brazilian states will have higher probability of having the strongest party winning the case. Here, one could argue that it is possible to have a reverse causation: if justice decides consistently in favor of the richer, this will carry more financial resources to these parties, increasing inequality.

2.3. The Econometric Model and Variables

An econometric model, departing from Amemiya's Generalized Last Squares method, is used to circumvent the problems with endogenous variables. The structural parameters estimators are calculated from the reduced form parameters estimators. Following the proposition of Newey (1987), the parameters are obtained by the resource to GLS method to estimate the coefficients of the reduced form, using the residues of this regression as additional explanatory variables. This article describes in details the method in Appendix 1. The two-equation model used in the regression analysis regarding the influence of inequality over probability of a contract clause being maintained is:

$$P(Contract = 1|Gini, X_1) = G(\gamma_1 Gini + X_1\beta_1 + u_1)$$
(1)

$$Gini = \gamma_2 P(Contract = 1) + X_2\beta_2 + u_2 \tag{2}$$

Where Gini can be any social inequality indicator, X_1 is a vector of exogenous variables, β_1 is a vector of regressor parameters and u_1 is a vector of disturbances in equation (1). In equation (2), X_2 is a vector of instrumental variables excluded from equation (1). The function G is a

his likelihood of winning, he will do so with grounds in a contractual clause that was supposed to be maintained, that means, the contract was also subverted in this case.

standard normal cumulative function, giving us a Probit model with an endogenous explanatory variable.

The instrumental variable used in the regressions is the cohort size (as proposed by Higgins and Williamson, 1999), expressed as the ratio of the population 40 to 59 years old to the population 15 to 69 years old. When we have a 'fat cohort' in the middle of the age-earnings curve where lifecycle income is highest, this labor market glut lowers income in the middle, thus tending to flatten the age-earnings curve (Higgins, Williamson, 1999) and for this reason cohort size is a predictor of the inequality. On the other hand, there is no reason to relate this 'fat cohort' to the favoring of a local powerful party in judicial cases.

Bound, Jaeger and Baker (1995) raised the problem with instrumental variables estimation when the correlation between the instruments and the endogenous explanatory variables is weak, and Hahn and Hausman (2003) suggest that the cause of *weak instruments* is often stated to be a low R^2 or F statistic of the reduced-form equation, in the most commonly occurring situation of one right-hand-side endogenous variable. As it can be seem from Table 2, the correlation between cohort size and GINI index is high $(0.67)^9$. It was added among the results for the two-stages regressions the R^2 and F statistics for the first stage (see Table 6, regressions 16 and 17), showing that cohort size is an acceptable instrumental variable.

In all cases one explanatory variable, expressing if we have a strong local party in the lawsuit, was added to the model as an exogenous regressor. This variable tests the hypothesis of *parochial subversion of justice*, showing that the local power plays a major role in determining the result of the case. One could argue that it is necessary to observe whether the clause of the contract or the facts of the case do not favor this local party or not. If that were the case, it would be natural that the local party stand a better chance of winning the case.

In order to assure that the econometric model will not be influenced by the fact that the contract clause is in favor of the local party, it was added an explanatory dichotomous variable. This variable assumes the value of '1' if the contract clause being discussed in the case favors the strong local party and '0' otherwise. To verify whom the clause benefits, an analysis of the documents of the case was conducted. It is expected that the coefficient for this variable reflects the effect of having a contract clause in favor of the local party, so the coefficient for the second dichotomous variable, the existence of a local powerful party, will show the net effect of the *parochial* subversion of justice hypothesis.

The control for the facts of the case needs some considerations. Suppose that higher courts reached a standardized understanding about one type of case or that there is a new legislation imposing this understanding. It

⁹The correlation between cohort size and others inequality indexes is also high, e.g. for Theil inequality index (0.56) and for 20+/40- index (0.68).

could be an understanding in favor of the creditors, like the recent decision of the Brazilian Supreme Court (the Supremo Tribunal Federal), followed by a constitutional amendment, stating that the 12% constitutional ceiling for interest rates is not applicable to contracts. On the other hand, it could be an understanding in favor of the debtors, e.g. the prohibition of clauses allowing the creditor to fulfill and sign, in the name of the debtor, credit titles in order to recover alleged losses in the contract between them. These standardizations are more related to legislative initiatives or political understanding than to the behavior of judges. If we include in the sample several cases of the former decision, the result shows that judges will favor the creditors. If we include several cases of the latter, the result shows the opposite. To circumvent this problem the repeated cases are excluded from the sample, remaining just a few of them chosen with a random criteria¹⁰.

The facts of the case, if it is included in the sample just some of the repeated cases, are not supposed to be related to the economic or political power of the party. One could argue that in the situation previously described, in which there is a standardized understanding about one type of case, if the judge decides against this understanding in, as an example, 30% of the cases, he would introduce a certain level of *uncertainty* in the judiciary system. Unless these departs from the imposed interpretation of the case are always in favor of the weak party, we do not have the *jurisdictional uncertainty* as described by Arida *et al* $(2005)^{11}$.

The GINI coefficient, the Theil coefficient and the ratio between the income of the 20% richest and the 40% poorest part of the population for each Brazilian state were chosen as the measures for social inequality, all them calculated from data of Brazilian Census of 2000 (PNUD, 2003). Finally, the regressions were controlled for years of schooling, GDP per capita and the percentage of urban population in each state, all data from IPEA (2006). In all regressions the results hold with all inequality indexes, with similar p-values – in most of the cases, 1%, and there is no situation in which the change of the inequality measure modifies the results. For this reason, we present the results just for GINI index.

2.4. The Results of Ferrão and Ribeiro (2006)

The first test we mentioned, regarding the test of 1,019 judicial decisions in São Paulo, resulted in 171 decisions included in the regressions. The decisions dropped were concerned more with procedural code discussions or were decisions in repeated cases.

¹⁰This criterion was followed also in Ferrão and Ribeiro (2006). We are grateful to people that raised this point, specially to Maria Alessandra Rossi, during the 2006 ESNIE Conference at Cárgese, Robert Sherwood, Matthew Taylor and also to one anonymous referee during the X Conference of Latin American and Caribbean Law and Economics Association (ALACDE) in Buenos Aires.

¹¹We are grateful to one anonymous referee to raise this point.

In the research published in Ferrão and Ribeiro (2006) it was considered cases in eight law areas, with different regulation levels in each of them. The cases were separated into this areas, and a measure of the degree of regulation was provided with basis on the methodology developed by Ribeiro $(2005)^{12}$. Table 1 (reproduced from Ferrão and Ribeiro, 2006) shows the values of this degree of regulation measure.

The regressions from Table 2, also from Ferrão and Ribeiro (2006) show that the strongest party stands between 38% and 45% more chances of having the contract clause maintained than the poorest party when it is beneficial for him¹³. That is to say, when we have a case brought to the court discussing the validity of a contract clause, the decision of the judge will be for the maintenance of that clause with around 40% more chance if this clause is beneficial to the strongest party.

The number of observations varies in each equation depending on the explanatory variables included in the test. In the cases in which it was tested only the influence of the degree of regulation, the number of observations reached to the full size of the sample (181 observations in equation 3), but when comes the time to measure the influence of having a strong party in the cases analyzed, it was possible to identify a strongest party just for 129 cases (results from equations 1, 4 and 5). An additional test was conducted, including just cases that bring discussions about commercial or financial contracts, and in that case we have just 32 observations. This test was conducted because the proposition made by Arida *et al* (2005) stated that the worst consequence of the *jurisdictional uncertainty* would be in commercial and credit cases.

The heavy regulation of some areas interferes in a lower degree and is not significant when one takes into account the interaction between the level of regulation and the presence of a contract in favor of the strongest party. When we consider the interaction, it is possible to say that the initial advantage that the strongest party has (45%) is greater than the advantage that regulation gives to the weak party¹⁴.

 $^{^{12}}$ A greater degree of regulation in one area increase the probability of having an illegal clause in the contract, and in that case the judge would ignore this clause not because he whishes to do so, but because he must.

¹³Huber/White/sandwich estimator of variance was used in place of the traditional calculation, and the values for standard errors founded were not so different from those calculated disregarding the likelihood of the presence of heteroskedasticity. See Appendix 2 for a discussion about small departures from homoskedasticity in Probit models.

¹⁴One can say that is not possible the direct comparison between the coefficients, since the first is a dummy variable and the second is a continuous variable. However, if we take into account that the maximum difference in the level of regulation among legal areas is around 3, it would be possible to say that the regulation could, in the worst hypothesis, reestablish the balance between parties in the case, since the coefficient is about 15% around the mean and certainly lower for the rest of the curve.

	Table 1 – Degree of Regulation.											
	Labor Cases	Commercial Cases	Consumers Rights Cases	Environmen t Cases	Landlord- Tenant Relations	Social Security Cases	Credit Marke	t Regulation t Cases				
Mean	5,94	1,68	5,43	6,53	2,94	6,03	2,32	5,23				
Standard Deviation	0,76	0,88	0,59	0,76	0,80	0,76	0,84	0,95				
			Sou	rce: Ferrão, Ribeiro	(2006).							
	Table 2: Probability of a contract being maintained in a lawsuit.											
				1	2^{3}	3	4	5				
Deg	ree of Regulation					-0,2228*** (0,0264)	-0,1899*** (0,0293)	-0,0764 (0,0508)				
Con	tract favors the stro	ngest party		-0,0842	0,3885**	,	-0,0682	0,4541**				
				(0,1102)	(0,1941)		(0,1425)	(0,1166)				
Deg	ree of regulation x t	the presence of a	strongest party					-0,1587*** (0,0613)				
Nun	ber of Observation	S		129	32	181	129	128				
Log	Likelihood			-84,8465	-8,9789	-83,4932	-61,0164	-57.8860				
Pseu	$do R^2$			0,26	0,26	0,33	0,28	0,31				

Table Notes: 1 – Instead the coefficients, the table shows the alteration in dependent variable due to a slight change around the mean in the explanatory variable (dF/dx), when if is a continuous variable, or due the change from 0 to 1 with dichotomous variables. 2 – Standard errors calculated using Huber/White matrix. 3 – Just for commercial and credit cases. *** Significant at 1% ** significant at 5% * significant at 10%. Source: Ferrão, Ribeiro (2006).

3. THE RESULTS FROM THE 'PAROCHIAL SUBVERSION OF JUSTICE' HYPOTHESIS

It was discussed in previous parts of this work that the results from Ferrão and Ribeiro (2006) are not conclusive regarding the hypothesis of the favoring of the richer and politically influential party. If the judges are neutral, the party with more financial resources could still winning the case, since he is in better conditions to conduct the case. This point shows the need for the empirical test described in section 2.2, capable of separating the hypothesis of a neutral judge from the hypothesis of a judge favoring the strong party. Tables 5^{15} and 6 show the results of the empirical test conducted analyzing 86 judicial decisions from 16 Brazilian states to answer this question, and Table 3 and 4 show descriptive statistics of the series of data used in this research.

Table 5 shows ordinary Probit regressions to test the *parochial sub*version of justice hypothesis. Equation 1 shows that the contract clause stands almost 41% more chance of being maintained if it is beneficial to a strong local party, a result that holds if it is added as explanatory variables the degree of inequality (equations 3 to 6), GDP per capita (equation 4), average years of schooling (equation 5) and percentage of urban population $(equation 6)^{16}$. All these variables decrease the likelihood of the contract clause being maintained. However, if the contract clause favors the weak local party (equations 7 and 8) the result is the opposite, and this party stands around 26% less chances of having the contract clause maintained. The conclusion here could be that the strongest party is more capable of conducting the case, or that we have a selection of case bias. But how could we explain the results in equations 9 and 10, showing that if the contract clause favors a national or foreign company, we do not have any impact over this probability? These national or foreign companies have more financial resources, larger legal departments and more experience in conducting cases than the local powerful parties, and yet this does not interfere in their possibility of having the contractual rights recognized by the court.

Finally, we can see that the fact that the contract clause favors the local strong party explains 14% of the result (R^2 of equation 1), but if the clause favors a weak party or a national or foreign company that explains too little of the result (R^2 of equations 7 and 9, respectively 4% and 1%)¹⁷. These

¹⁵Again, Huber/White/sandwich estimator of variance was used in these regressions. See Appendix 2 for some considerations about the effects of homoskedasticity in twostage Probit models.

¹⁶Specifications including inequality and more than one of the other explanatory variables (GDP *per capita*, years of schooling and urban population) do not alter the results either for inequality or for the presence of a contract favoring the local strong party. In these specifications the coefficients for urban population and GDP per capita are not significant, but the coefficients for years of schooling are.

 $^{^{17}}$ The values reported are those of the pseudo R-squared measures. McFadden (1974)

results confirm the results of Ferrão and Ribeiro (2006), showing that there is no favoring to the weak party, that means, no evidence of the *jurisdictional uncertainty hypothesis*, even if the test were extended to the whole country¹⁸. It also shows some evidence of the opposing hypothesis, the *parochial subversion of justice* hypothesis. The results in table 5 also show the importance of social inequality to the phenomenum. In Brazilian states with a greater degree of social inequality there is a lower probability of the contract clause being maintained. This result holds if another inequality index is used, like Theil index or the ratio between the mean income of the 20% richest part of the state population and the mean income of the 40% poorest part. This result seems to confirm the proposal of Glaeser *et al* (2003), that in more unequal societies there is a greater probability of subversion of justice.

Table 6 shows the results for equations that have the favoring of a local party in the decision of the case as a dependent variable. The favoring of a local party is a dichotomous variable that assumes the value of 1, either the judge of the case maintains a contract clause that is in favor of a local party or he ignores a contract clause that is unfavorable to a local party, and 0 otherwise. For sure that this probability is greater in the first case, in which the contract clause is in favor of a local party, and to isolate this effect we added an explanatory dummy variable that assumes the value of 1 if the contract clause favors the local party and 0 otherwise. In equation 11 it can be seem that the power of a local party is more important that the fact that the contract clause favors a local party, and if we add the GINI index as an explanatory variable (equation 12) the result holds for the power of a local party, but the favoring of a contract clause gains some importance. This result shows that, if we control for the level of inequality, the judge tend to take into account the contract clause when deciding the case, which means that in more unequal states the judges tend to ignore the contract clause. Table 6 also shows that the results when we add inequality as an explanatory variable are consistent and significant (equations 12 and 14). Higher levels of inequality decrease the likelihood of the contract clause being maintained. The magnitude of the coefficient can be explained by the nature of GINI coefficient, which varies from 0 to 1 maximum. It can be said, to better understand the result, that an increase in the GINI coefficient of 1% (departing from the mean value) will result in a decrease in the chances of the contract clause being maintained from 4% to 11%.

suggested the measure $1 - \mathcal{L}_{ur}/\mathcal{L}_0$, where \mathcal{L}_{ur} is the log-likelihood function for the estimated model, and \mathcal{L}_0 is the log-likelihood function in the model with only an intercept. Percent correctly predicted for all observations, as well as separated percentages of correctly predicted 1's and 0's were added, with the number of observations correctly predicted and the number of observations between parentheses.

¹⁸Some people have argued that the results from Ferrão and Ribeiro (2006) could not hold if we extend the analysis to the Brazilian states from the South, where a tendency called 'alternative use of justice' appears to have some influence. We are grateful to two anonymous referee from University of São Paulo Law School for these comments.

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Estate		Giiii	Inen	Conort	1 10	207/40-	Pop.	School	ned ¹	Maint. ²
Acre		0.648	0.718	0.15	1.04	21 707	66	5.6		
Alagoas	AU	0,048	0,716	0,13	0.85	27,063	68	13		
Anagoas	AL	0,691	0,810	0,10	2.20	27,903	75	4,5		
Amaná		0,085	0,780	0,13	1.41	29,429	80	67		
Anapa Dahia		0,657	0,708	0,14	1,41	20,770	67	0,7	4	0
Dallia	DA CE	0,009	0,775	0,20	0.06	23,736	72	4,7	4	3
Distrito Federal	DE	0,670	0,810	0,19	4.03	24,090	06	4,7	2	2
Espírito Sento	ES	0,040	0,701	0,21	7.29	16.005	90	6.2	2	2
Espírito Santo	GO	0,008	0,031	0,23	2,38	15 283	88	6.0	4	2
Moranhão	MA	0,650	0,048	0,22	0.56	22 207	60	0,0	1	2
Minas Corois	MG	0,039	0,738	0,17	2.02	16 504	82	4,5	1	2
Mata C. da Sul	MG	0,013	0,071	0,24	2,05	16.940	02	5,9	4	2
Mato G. do Sul	MT	0,627	0,092	0,22	1,95	10,849	70	0,1	5	2
Malo Grosso Dorá		0,030	0,085	0,20	1,65	20,800	67	6,0	3	Z
r ala Daraíba		0,033	0,744	0,17	1,04	20,899	71	0,0		
Paraiba Damambara	PD	0,040	0,754	0,20	1.26	20,550	71	4,0	1	2
Pernanibuco	PE DI	0,075	0,795	0,21	1,20	24,510	62	3,2	1	Z
Plaul Danan é		0,001	0,790	0,19	0,04	15 620	05	4,1	4	0
Parana Dia da Janaina		0,007	0,052	0,24	2,30	15,030	81	0,0	4	0
Rio de Janeiro	KJ DN	0,014	0,004	0,28	3,28	10,955	90	7,5	4	2
Rio G. do Norte	KN DO	0,057	0,731	0,20	1,15	17,000	/3	5,2	Z	0
Rondonia	RU	0,614	0,639	0,18	1,39	17,022	64	6,0		
Roraima		0,622	0,043	0,10	1,18	19,901	/0	0,5	2	1
Rio Gde. do Sul	KS CC	0,586	0,617	0,29	2,86	14,294	82	6,/	2	1
Santa Catarina	SC	0,560	0,551	0,25	2,71	12,011	79	6,8	12	1
Sergipe	SE	0,658	0,763	0,19	1,14	21,943	/1	5,6	3	4
Sao Paulo	SP	0,592	0,607	0,26	3,42	14,646	93	1,3	8	2
Tocantins	10	0,662	0,738	0,18	0,72	22,377	/4	5,3	1	2
Average		0,637	0,710	0,20	1,74	19,978	77	5,9	3,6	1,8
Total								Ļ	58	28

Table 3: Data Description.

 Total
 58
 28

 1 – Number of cases in which the contract clause was maintained, per Brazilian Estate and whole country. 2 – Number of cases in which the contract clause was not maintained.
 28

	Cohort	Gini	Theil	20+/40-	PIB	Urban	Schooling
Cohort	1,00						
Gini	-0,67	1,00					
Theil	-0,56	0,96	1,00				
20+/40-	-0,68	0,96	0,92	1,00			
PIB	0,61	-0,55	-0,41	-0,41	1,00		
Urban	0,56	-0,52	-0,43	-0,46	0,79	1,00	
Schooling	0,36	-0,56	-0,50	-0,41	0,88	0,79	1,00

	1	2	3	4	5	6	7	8	9	10
Contract favors a	0.4066***		0.3421**	0.4047***	0.4083***	0.3906***				
strong local party	(0.1175)		(0.1271)	(0.1199)	(0.1214)	(0.1220)				
Contract favors a							-0.2494	-0.2708*		
weak local party							(0.1651)	(0.1802)		
Contract favors a									-0.1372	-0.0581
national/foreign									(0.1625)	(0.1884)
company										
Inequality (GINI)		-5.2776***	-4.1643**	-7.2292***	-9.1266***	-6.4324***		-3.4229*		-6.0955***
		(1.5250)	(1.6768)	(2.3168)	(2.6211)	(2.1921)		(1.9625)		(2.3422)
Average years of					-0.2638**					
schooling					(0.1178)					
Percentage of						-0.0177*				
urban population						(0.0096)				
GDP per capita				-0.1874*						
(In US\$ 1,000)				(0.1042)						
Number of	55	86	55	55	55	55	50	50	46	46
Observations										
Log Likelihood	-31.5187	-49.1733	-28.8639	-27.5054	-26.5194	-27.2436	-27.3688	-25.6171	-31.1463	-27.8606
Pseudo R ²	0.14	0.12	0.21	0.25	0.27	0.26	0.04	0.10	0.01	12
Total predicted ⁴	69% (38/55)	71% (61/86)	76% (42/55)	75% (41/55)	73% (40/55)	75% (41/55)	74% (37/50)	68% (34/50)	57% (26/46)	70% (32/46)
0's predicted	81% (17/21)	53% (16/30)	67% (14/21)	71% (15/21)	57% (12/21)	71% (15/21)	0% (0/13)	0% (0/13)	0% (0/20)	65% (13/20)
1's predicted	62% (21/34)	80% (45/56)	82% (28/34)	76% (26/34)	82% (28/34)	76% (26/34)	100% (37/37)	92% (34/37)	100% (26/26)	73% (19/26)

Table 5: Probability of contract being maintained¹.

1 – Instead the coefficients, the table shows the alteration in dependent variable due to a slight change around the mean in the explanatory variable (dF/dx), when if is a continuous variable, or for the change from 0 to 1 with dichotomous variables. 2 – Standard errors calculated using Huber/White matrix. 3 – Controlled for endogeneity using AGLS with cohort size as an instrument. 4 – The result is predicted to be 1 when the probability is higher than 0.50, and 0 otherwise. The values between parentheses are the ratio between the values correctly predicted and the total of observations. *** Significant at 1% ** significant at 5% * significant at 10%.

Table 0. I robability of a local party being favored .										
	11	12	13	14	15	16³	17 ³			
Contract favors a local party	0.1710	0.2859*				0.2859*				
	(0.1526)	(0.1586)				(0.1567)				
Contract favors a			-0.1404	-0.3127*	-0.3192*		-0.3187			
national/foreign company			(0.1753)	(0.1598)	(0.1702)		(0.1725)			
Local party has political or	0.2869**	0.2656*	0.3813**	0.3459**	0.2478	0.2579*	0.3379**			
economic power	(0.1233)	(0.1371)	(0.1408)	(0.1597)	(0.1809)	(0.1410)	(0.1615)			
Inequality (GINI)		10.0570***		9.2181***	3.9374	10.7881***	9.6840***			
		(2.5432)		(2.8299)	(4.6766)	(2.8166)	(3.2896)			
Average years of schooling										
Percentage of urban										
population										
GDP per capita					-0.2263					
(In US\$ 1,000)					(0.1768)					
Number of Observations	63	63	46	46	46	63	46			
Log Likelihood	-40.1183	-30.5409	-27.9287	-21.8985	-20.9304	-32.3850	-23.5627			
Pseudo R ²	0.08	0.30	0.12	0.31	0.34	0.26	0.26			
F statistic for the first stage						49.10	29.02			
R^2 for the first stage						0.64	0.67			

Table 6: Probability of a local party being favored¹.

1 – Instead the coefficients, the table shows the alteration in dependent variable due to a slight change around the mean in the explanatory variable (dF/dx), when if is a continuous variable, or for the change from 0 to 1 with dichotomous variables. 2 – Standard errors calculated using Huber/White matrix. 3 – Controlled for endogeneity using AGLS with cohort size as an instrument. *** Significant at 1% ** significant at 5% * significant at 10%.

The results are consistent not only for the specifications in Table 6, but for all specifications including other explanatory variables, like the average years of schooling, the percentage of urban population, GDP per capita, and another social inequality index, in all possible combinations. In the specifications that were omitted here, the added variables are not significant, except for average years of schooling, and the results concerning the main hypothesis hold.

Equation 13 shows that the fact that the contract clause favors a national of foreign company is not significant, although if we add the GINI coefficient (equation 14) the coefficient became significant, but a slight lower than the coefficient for the power of a local party. It was expected that cases where the contract clause favors a national or foreign party would have limited room for judges' discretionarily, reducing the likelihood of the favoring of a local party. However, what we see is that this is true just in less unequal states, and this reinforces the *parochial subversion of justice hypothesis.* The influence of inequality also holds with the exception of equation 15 in which the presence of more explanatory variables and the use of AGLS could result in such a reduction of the degree of freedom that could justify the non significant result.

The favoring of the local strong party holds, with higher coefficients ranging from 26% to 36%, even when controlled for endogeneity (equations 16 and 17).

4. CONCLUSIONS

The results of this research emphasizes that impartiality of justice is essential to economic development. The likelihood of being expropriated will discourage investors outside the community from investing. The potential gains and the development that could result from long distance trade will not be achieved and these states will not benefit from specialization and inter-region trade. The situation here seems the opposite of what was observed in Europe from the 11th to the 14th centuries, when the creation of institutions that could assure the property rights favored the reemergence of commerce. At that time, the most important aspect was that these institutions promoted confidence among investors, in order to make feasible investments between parties that never met before and that had little probability of facing each other again in another negotiation.

However, it is not enough to have contracts in favor of powerful parties outside the community enforced, but it is also necessary to assure to everyone who decides to engage in a contract that this contract will be respected. The Brazilian Supreme Court conducted research in Rio de Janeiro in 2004 and discovered that 49.5% of torts claims in Small Claims Court in the city were filed against only 16 companies. These companies were ordered to pay damages worth US \$2.3 billions, and they still operate with the same harmful practices. In this context, the person who is likely to have his property rights violated and his contracts not maintained will refrain from contracting with powerful parties, depressing the credit market, lowering the value of trademarks (since the quality guarantee is not enforceable) and increasing the informal market.

The Parochial Subversion of Justice acts over the two sides of the market transactions. It lowers the offer of credit, goods and investments by not assuring to parties outside the community that their contracts will be respected, and it also lowers the demand by not assuring to local consumers, small investors and other not so influential local parties that their contracts will also be respected and that they will not be expropriated by a local powerful party. The result would be a decrease in economic activity and an increase in social inequality. The article as a consequence would be undestrood as an innovative demand overview from benefits of a well-functioning market.

However, the results of this study do not mean that the poor performance of judicial system is harmless neither that the creditor will be not expropriated. The long time for a decision to be reached is beneficial to debtors, and as a consequence is prejudicial to creditors and savers, since the opportunity cost is high. The effects of inflation rates are not negligible, and in countries that adopt the American system, where each party pays her own legal expenses regardless of the outcome, the judicial discussion adds an extra burden to creditors. What the study shows is that there is no bias from the judge in favor of the debtor and that there is a bias in favor of a local and powerful party. The policy makers in this case must consider reforms that avoid this local subversion, and not measures that will reduce judicial remedies available to debtors. The reformers must consider the effect of the heavy caseload in courts and its effect in duration of cases, which seems to be the incentive to debtors to get resource to judicial cases in order to postpone payments.

For the policy-makers and researchers the article also shows that the opinion surveys are not enough for a proper investigation of the problems of a given judicial system, and must be followed by deeper analyses, in order to reach to a refined diagnose that should precede reforms. The obstacle posed by the difficulty of measuring legal variables must be circumvented by the resource to more refined techniques (Ribeiro, 2005) and empirical research is mandatory if the problems are to be appropriately understood.

APPENDIX A: THE AGLS MODEL

The regressions of the research were made with a Probit model with endogenous explanatory variables, developed as a user command for Stata statistical software by Joe Harkness, from Johns Hopkins University. The program implements Amemiya Generalized Least Squares (AGLS) estimator for Probit and Tobit with endogenous regressors.

This estimator is obtained by applying Probit to the reduced form for the equation of interest and then solving back via a generalized least squares approach to obtain the structural parameters. To see how it is done, consider the two-equation model¹⁹:

$$y_{1i} = \gamma_1 y_{2i} + \beta' x_{1i} + u_{1i}$$

$$y_{2i} = \gamma_2 y_{1i} + \beta' x_{2i} + u_{2i}$$

Which can be expressed in matrix notation as:

$$y_1 = \gamma_1 y_2 + X_1 \beta_1 + u_1 \tag{1a}$$

$$y_2 = \gamma_2 y_1 + X_2 \beta_2 + u_2 \tag{2a}$$

And having the following reduced forms:

$$y_1 = X\Pi_1 + v_1 \tag{3a}$$

$$y_2 = X\Pi_2 + v_2 \tag{4a}$$

It is possible to define two matrices J_1 and J_2 in a way that $XJ_1 = X_1$ and $XJ_2 = X_2$. Substituting (4a) into (1a), it will be found that:

$$y_1 = \gamma_1 X \Pi_2 + X J_1 \beta_1 + \gamma_1 v_2 + u_1 \tag{5a}$$

If one equals (5a) to (3a), after some calculus one will get:

$$\Pi_1 = \gamma_1 \Pi_2 + J_1 \beta_1 \tag{6a}$$

Similarly, if one substitutes (3a) into (2a) and equals the result to (4a), the result will be:

$$\Pi_2 = \gamma_2 \Pi_1 + J_2 \beta_2 \tag{7a}$$

Amemyia suggests estimating equations (6a) and (7a) directly by regression methods, writing $\hat{\Pi}_1$ for Π_1 and $\hat{\Pi}_2$ for Π_2 . In this case, the equation (6a) would be:

¹⁹This section comes from the detailed description that Maddala (1983) made about Amemyia (1979) classical article. In this article, Amemiya suggested a estimators as an alternative to the two-stage estimator used by Nelson and Olsen (1978).

$$\hat{\Pi}_1 = \gamma_1 \hat{\Pi}_2 + J_1 \beta_1 + \eta_1 \tag{8a}$$

where

$$\eta_1 = \hat{\Pi}_1 - \Pi_1 - \gamma_1 (\hat{\Pi}_2 - \Pi_2) \tag{9a}$$

Newey (1986) proposed that this estimator would be calculated by applying GLS to estimates of the reduced form coefficients that is obtained by using reduced form residuals as additional explanatory variables. He derives these estimators from general results on asymptotic efficiency of two-stage and Amemyia GLS estimators²⁰. He proposes a general model that can subsume several different limited dependent variable models.

To begin with, lets consider the following endogenous explanatory variables model:

$$y_t^* = Y_t \beta_0 + X_{1t} \gamma_0 + u_t = Z_t \delta_0 + u_t, \qquad t = 1, ..., n,$$
(10a)

where $Z_t = [Y_t, X_{1t}]$, $\delta'_0 = [\beta'_0, \gamma'_0]$, Y_t is the *t* th observation of a $1 \times r$ vector of endogenous explanatory variables, X_1 is a $1 \times s$ vector of exogenous explanatory variables, and δ_0 is the $q \times 1$ vector of regression parameters for this equation, with $q \equiv r + s$. The real value of y_t^* is not observable, but rather a value of y that results from $\tau(y_t^*, \psi_0)$, where the second parameter is a vector of parameters with $m \times 1$ size. If this function were the maximum value of y^* between y^* and zero, we would have a censored regression model. It is also possible to have as a result just two values, either zero or one, expressing a binary choice model.

The equation below relates the endogenous variables of the model to a $1 \times K$ vector of instrumental variables, and also is the reduced form equation for the endogenous explanatory variables in equation (10a):

$$Y_t = X_1 \Pi_0 + V_t = X_{1t} \Pi_{10} + X_{2t} \Pi_{20} + V_t$$
(11a)

where Π_{10} is a $s \times r$ matrix of coefficients for the instrumental variables that are included in equation (10a), Π_{20} is a $(K-s) \times r$ matrix of coefficients for the instrumental variables that are *excluded* from equation (10a), $\Pi_0 \equiv [\Pi'_{10}, \Pi'_{20}]'$ and V is a $1 \times r$ vector of disturbances.

It is possible to have the reduced form equation for y_t^* by substituting equation (11a) in equation (10a), as follows:

$$y_t^* = (X_1 \Pi_0 + V_t)\beta_0 + X_{1t}\gamma_0 + u_t$$
(12a)

$$y_t^* = X_{1t} \Pi_{10} \beta_0 + X_{2t} \Pi_{20} \beta_0 + V_t \beta_0 + X_{1t} \gamma_0 + u_t$$
(13a)

 $^{^{20}}$ See Newey (1987), specially section 5 for the background of Harkness' implementation of the 'divprob' Stata user command. Some passages of this article are reproduced here, with some details added.

Rearranjing similar terms and taking $\alpha_{10} \equiv \Pi_{10}\beta_0 + \gamma_0$, $\alpha_{20} \equiv \Pi_{10}\beta_0 + \gamma_0$, $\alpha_0 \equiv (\alpha'_{10}, \alpha'_{20})'$ and $v_t \equiv u_t + V_t\beta_0$, one gets:

$$y_t^* = X_t \alpha_0 + v_t \tag{14a}$$

The parameters are related by the equation:

$$\alpha_0 = D(\Pi_0)\delta_0 \tag{15a}$$

Where $D(\Pi_0) \equiv [\Pi, I_1]$ and I_1 is the $K \times s$ selection matrix such that $X_{1t} = X_t I_1$. The identification assumption rank $(\Pi_{20}) \equiv r$ is satisfied and δ_0 is the unique solution to equation (15a).

Rivers and Vuong (1984) suggested an estimator to δ for Probit model, substituting the least squares estimator $\hat{\Pi}$ in the conditional log-likelihood for y_t , under the assumption that the disturbances of equations (10a) and (11a) are multivariate normal, conditional on X_t . From the derivation of a general relationship between two-stage and AGLS estimators, Newey (1986) concludes that AGLS estimator of δ is a member of the class of minimum distance estimators $\hat{\delta}_W$ that solves:

$$\min_{\delta} (\hat{\alpha} - \hat{D}\delta)' \hat{W} (\hat{\alpha} - \hat{D}\delta)$$
(16a)

Where \hat{W} is a positive semi-definite matrix with $p \lim(\hat{W}) = W$, and $\hat{\delta}_W$ is obtained by minimizing the distance between two estimates $\hat{\alpha}$ and $\hat{D}\delta$ of the reduced form coefficients, with \hat{W} measuring the distance. The AGLS estimator $\hat{\delta}_A$ is obtained by choosing $\hat{W} = \hat{\Omega}^{-1}$, where $\hat{\Omega}$ is a consistent estimator of the asymptotic covariance matrix Ω of $\sqrt{n}(\hat{\alpha} - \hat{D}\delta_0)$, assumed as non singular. The construction of a consistent estimator of Ω requires use of a consistent estimator of β as well as a consistent estimator of the join asymptotic covariance of $\hat{\alpha}$ and $\hat{\Pi}$. The two stages instrumental variables (2SIV) estimator can be used in the construction of $\hat{\Omega}$, or it can be used $\hat{\delta}_W$ for some choice of non-random \hat{W} , that means, \hat{W} equal to an identity matrix.

Amemyia (1978) showed that the AGLS estimator is asymptotically efficient relative to any other estimator $\hat{\delta}_W$ obtained from (16a).

Newey (1986) uses this previous result and the result of the comparison of efficiency of the AGLS estimator related to the minumum chi-square (MCS) estimator to propose a simple to compute AGLS estimator. He reaches to a relative simple form of Ω , which allows one to have a consistent estimator of Ω , departing from the residuals of a 2SIV of Y_t . The calculus of Ω also drawn from the use of any of the standard estimators of the covariance matrix of the minimum likelihood estimator in specific models where the conditional log-likelihood has a standard form, which is the case of the Probit model used in this article. For a more detailed approach of these procedures, see Newey, especially section 5.

5. APPENDIX B: THE EFFECTS OF HETEROSKEDASTICITY OVER PROBIT AND TWO-STAGE PROBIT MODELS

Suppose that we have two vectors \underline{x}_1 and \underline{x}_2 and that if one is sampling conditional on elements of \underline{x}_1 the variance of the residual is σ_1^2 but if one is sampling conditional on the elements of \underline{x}_2 the variance is σ_2^2 . Let X and X^* be defined as²¹:

$$X = \begin{bmatrix} \frac{1}{\sigma}(\underline{1} \ \underline{\mathbf{x}}_1) \\ \frac{1}{\sigma}(\underline{1} \ \underline{\mathbf{x}}_2) \end{bmatrix} \qquad X^* = \begin{bmatrix} \frac{1}{\sigma_1}(\underline{1} \ \underline{\mathbf{x}}_1) \\ \frac{1}{\sigma_2}(\underline{1} \ \underline{\mathbf{x}}_2) \end{bmatrix}$$

Then the correct underlying model is given by:

$$\left[\begin{array}{c}\underline{\mathbf{y}}_1^*/\sigma_1\\\underline{\mathbf{y}}_2^*/\sigma_2\end{array}\right] = X^* \left[\begin{array}{c}\alpha\\\beta\end{array}\right] + \left[\begin{array}{c}\epsilon_1\\\epsilon_2\end{array}\right]$$

Where the residuals have unit variances.

If we omit to model the heteroskedasticity and incorrectly assume a common variance σ^2 , then then the exact MC biases may be obtained directly by taking probability limits of the explicit MC estimators. Approximate ML biases may be obtained by taking a linear Taylor series expansion of the 'plimmed' first order conditions²². These are of the form:

$$\begin{bmatrix} p \lim a_{ML} \\ p \lim b_{ML} \end{bmatrix} \cong (X'\Omega^{-1}X)^{-1}X'\Omega^{-1}X^* \begin{bmatrix} \alpha \\ \beta \end{bmatrix}$$

Where Ω^{-1} is a diagonal weighting matrix with entries f(.)/F(.)(1 - F(.)) and the arguments of the normal density and c.d.f. are $(\alpha + \beta x)/\sigma$, where x is the corresponding element from \underline{x}_1 or \underline{x}_2 .

Now suppose $\underline{x}_1 = \underline{x}_2$; then the above approximating formula reduces to a scalar times the parameter vector. This case is of interest since it corresponds to zero correlation between the residual and the explanatory variable. Thus, for small departures from homoskedasticity, there is only a rescaling effect on the parameter vector when the variance of the residual is uncorrelated with the explanatory variable.

Regarding to two-stage Probit models, Lee, Maddala and Trost (1980) suggest that the correct covariance matrix is underestimated when the heteroskedasticity introduced in the first step is ignored. The demonstration of this point is beyond the scope of this paper, and we recommend the reading of Lee *et al* (1980) to those interested in this point.

 $^{^{21}\}mathrm{See}$ Yatchew and Griliches (1985). Some passages of this article are reproduced here, with some details added.

²²Details in Yatchew, Griliches, 1984.

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