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Hlavní specializace: Ekonomická analýza

THE EFFECT OF THE NUMBER OF JUDGES ON THE OUTPUT OF THE JUDICIAL SYSTEM

diplomová práce

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Prohlašuji na svou čest, že jsem diplomovou práci vypracoval samostatně a s použitím uvedené literatury.

Václav Jonáš

V Praze, dne 15.5.2015

Poděkování:

Tímto bych rád poděkoval vedoucímu mé diplomové práce doc. Mgr. Liboru Duškovi, Ph.D. za poskytnutí potřebných dat, jeho vstřícný přístup, mnohé cenné rady a přínosné konzultace. Dále bych rád poděkoval Ministerstvu spravedlnosti ČR za dodání dat na počty soudních zaměstnanců. V neposlední řadě děkuji svým rodičům za jejich neustávající podporu během mého studia.

Thesis assignment:

Topic: **The effect of the number of judges on the effectiveness of the judicial system**

Length of thesis: 65 pages

General content:

1. This diploma thesis examines the effect of the number of serving judges on the effectiveness of the judicial system. The main goal of this thesis is to estimate the effect of increasing the number of serving judges on the effectiveness of the judicial system.
2. The appointment of new judges is costly; therefore, it should be carefully considered. The contribution of this work will be to find out whether the appointment of new judges really fulfils its goal (an increment in the number of resolved cases) or has no positive effect and the costs are pointless.
3. In the theoretical part of the thesis, I will summarize literature which deals with this topic. Previously, it was assumed that increasing the number of judges leads to a similar increase in the number of resolved cases. In recent years, the hypothesis that increasing number of judges would lead to an insignificant change in the number of resolved cases, has been popular. It is based on the assumption that the appointment of new judges will decrease the caseload of incumbent judges and they will expend less effort afterwards. In this part, I will also describe the Czech judicial system.
4. In the analytical part, I will run a regression analysis to test this hypothesis on data from the Czech Republic. I will use the number of resolved cases as the dependent variable. As the explanatory variables, I will use the number of serving judges, courts' caseload and control variables. I use data that cover district and regional courts in the Czech Republic.

Selected bibliography:

1. BEENSTOCK Michael - HAITOVSKY Yoel - Does the appointment of judges increase the output of the judiciary?, International Review of Law and Economics 24, 2004, p. 351–369

2. MURELL Peter - Demand and supply in Romanian commercial courts: Generating information for institutional reform. SSRN Working Paper No. 280428, 2001

3. POSNER, Richard - What do judges and justices maximize? (The same as everybody else does), Supreme Court Review 3, 1993, p. 1 - 41

4. ROSALES-LÓPEZ Virginia - Economics of court performance: an empirical analysis, European Journal of Law and Economics 25, 2008, p. 231 – 251

5. ZAJC Katarina et al. - Court output, judicial staffing, and the demand for court services: Evidence from Slovenian courts of first instance, International Review of Law and Economics 32, 2012, p. 19 – 29

Abstract

This thesis examines the effect of the number of judges on court output in the Czech Republic. It is based on the theory of a rational judge and the hypothesis that after the appointment of new judges, the incumbent judges face lower caseload pressure and they can decrease their effort. It follows that the change in the court output is very small or non-existent. I develop a model that specifies court output as a function of judicial staffing, caseload and other variables. I employ OLS, FE and 2SLS estimation methods. The estimation results suggest that the number of judges does not affect court output in the case of district courts. In the case of regional courts, a 10% growth in the number of judges leads approximately to a 5% growth in the number of resolved cases. Furthermore, estimates suggest that all courts strongly react on changes in the caseload. I also show that the quantity-quality trade-off is not present at courts in the Czech Republic. The thesis contributes to thin empirical literature on the effect of judicial staffing on court output mainly by controlling for the case difficulty and by using panel data from the Czech Republic.

Keywords: rational judge, number of judges, court output, caseload, Czech Republic, case difficulty, appointment

Abstrakt:

Práce zkoumá vliv počtu soudců na výstup soudů v České Republice. Je založena na teorii racionálního soudce a na hypotéze, která tvrdí, že po jmenování nových soudců, začnou současní soudci vynakládat menší snahu. Z toho pak plyne velmi malá nebo žádná změna ve výstupu soudů. Vytvářím model, který specifikuje výstup soudu jako funkci počtu soudců, celkového počtu případů a dalších proměnných. K odhadu model využívám následující metody: OLS, FE a 2SLS. Výsledky ukazují, že v případě okresních soudů nemá počet soudců vliv na výstup soudu. V případě krajských soudů, výsledky ukazují, že 10% nárůst v počtu soudců vyústí asi v 5% růst v počtu vyřešených případů. Výsledky také naznačují, že všechny soudy silně reagují na změny v celkovém počtu případů. Také dokazuji, že v České Republice neexistuje vztah mezi počtem a kvalitou vyřízených případů. Příspěvek práce k nepříliš rozsáhlé empirické literatuře podobného zaměření spočívá především v zahrnutí náročnosti případu do modelu a ve využití dat z České Republiky.

Klíčová slova: racionální soudce, počet soudců, výstup soudů, celkový počet případů, Česká Republika, náročnost případů, jmenování

Klasifikace podle JEL/JEL Classification: D02, K40, K41

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Introduction

Judicial system is one of the main factors in modern states that ensure the enforcement of the law. Among other things, the court system is supposed to be fair, independent, accessible and also efficient. In the last decades, judicial efficiency has been a widely discussed topic in many countries. The topic was discussed in empirical literature as well as in daily press. Naturally, courts are supposed to handle cases as fast and as effectively as possible since court proceedings are stressful and costly for all parties involved. In the Czech Republic, one can hear many voices (daily press, some politicians etc.) which claim that the judicial system in the Czech Republic is not very efficient and that the reason for the inefficiency is straightforward – an insufficient number of judges. In public, it is generally accepted that the solution is simple as well – to increase the number of judges. It is believed that an increase in judicial staffing leads to a proportional growth in court output. However, increasing the number of judges is costly and it should be carefully considered. Recent empirical literature shows that the relation between the number of judges and court output is not as straightforward as it is generally believed and that the appointment of new judges often has a very small effect on court output and efficiency. Thus the appointment does not fulfil its goal, which is a growth in court output and the improvement of court efficiency. The contribution of this thesis is therefore to contribute to scarce empirical literature on economic analysis of court activity and to analyse the effect of judicial staffing on court output in the Czech Republic. Furthermore, the thesis introduces controlling for the case difficulty into the analysis, which is not used very often in recent empirical literature.

The theoretical part of my thesis starts by introducing the reader to a theory that is the very basis of the analysis of court efficiency and the behaviour of judges – the theory of the rational judge. I also summarize the empirical literature which has inspired the thesis and deals with the same topic. The literature on the closely related research is briefly discussed as well. Furthermore, the most important acts and laws regarding the Czech judicial system are presented and briefly discussed. Moreover, I pinpoint some features of the Czech judicial system, which may prove to be important from an analytical point of view. I also present the international comparison of judicial systems.

As for the practical part, I firstly generate descriptive statistics to get basic information on the dataset. I also generate time series to track changes in the number of judges and other key variables over the time. I also examine relationships between the number of

judges and other key variables. However, no final conclusions can be made only on the basis of descriptive statistics. There is only one method used in recent empirical literature to inspect the relationship between the number of judges and court output and that is the regression analysis. It follows that I create a model with the number of resolved cases as my primary dependant variable. Secondary dependant variables are average and median times needed to resolve a case. The explanatory variables are the number of judges, caseload and other control variables. Firstly, I use Ordinary Least Squares to estimate the model. However, the results suffer from two sources of endogeneity: unobserved court heterogeneity and reversed causality. Therefore I use fixed effect estimation to deal with the unobserved court heterogeneity problem and Two-Stage Least Squares to address the problem of reversed causality. District courts and regional courts are examined separately since they represent different tiers of the Czech judicial system. The thesis also deals with two questions that are closely related to my research. Firstly, do courts which exhibit higher performance in terms of the case resolution produce lower quality verdicts? Secondly, does sudden growth in court's caseload at time *t* affect court performance at time *t+1*?

It follows that I examine the effect of the number of judges on court output, which is represented by the number of resolved cases and a case resolution time. On the basis of the theory of the utility-maximizing judge and recent empirical literature, I hypothesize that appointment of new judges decreases caseload pressure on incumbent judges and allows them to decrease their effort. It implies that appointment of new judges has a very small effect on court output. The aim of the thesis is to test this hypothesis using panel data from Czech courts. Furthermore, the thesis examines the effect of caseload and other variables on court output and also addresses a few questions closely related to the examined topic. The thesis also provides an insight into the Czech judicial system.

The thesis is organized as follows: Chapter 1 presents the literature that established the theory of a rational judge and empirical literature on the efficiency of the judicial system and the effect of various factors (especially number of judges) on court efficiency. Chapter 2 present acts regarding the Czech judicial system, some important features of the Czech judicial system and international comparison of judicial systems. Chapter 3 presents the data. Chapter 4 is focused on the descriptive statistics, time series and relationships between key variables. Chapter 5 presents the methodology. Results are displayed and discussed in Chapter 6. Chapter 7 is dedicated to extensions and provides answers on additional questions.

1 Literature review

In this chapter of my thesis, I summarize literature which deals with topics that are related to my research. The first part of this chapter is focused on the behaviour of judges. Most importantly, it deals with the literature on rational behaviour of judges. It also summarizes literature on judges' reaction to a change in their caseload, their publication decisions (i.e. decision whether they publish their opinion on the case or not) or the influence of their background and demographics. The second part examines literature that deals with various factors affecting the efficiency of the judicial system and literature that quantifies and measures the efficiency of the judicial system. Naturally, I pay special attention to the effect of the number of judges. The last part summarizes the most important findings discussed in parts 1.1 and 1.2, which includes estimation methods or results prevailing in the empirical literature and formulates the hypothesis. Due to a large length of this thesis, the literature in this review is often discussed in greater detail rather than a simple mention about the most important contribution of a particular paper.

1.1 Judicial behaviour

Even though this thesis does not directly approach judicial behaviour, I devote several pages to this topic. The reason is simple: theories about the behaviour of judges serve as a basis for theories and papers that examine the effect of the judicial staffing on judicial efficiency. It is not possible to study changes in the number of judges and their impact without any knowledge about judges, their behaviour, utility function and reactions to incentives. Most of these theories were developed and tested in the USA. Fortunately, these theories are quite universal and can be applied to the behaviour of judges in other countries. Firstly, I present the reader with a few papers that deal with the effect of judges' background and demographics on their decision-making. Secondly, I introduce the reader to papers that develop theories of judges' behaviour based on utility maximization. These theories serve as a basis for further research on the efficiency of the judicial system. Afterwards, I present an example of developing a mathematical model of such a theory. In the next part, I describe techniques used by judges to cope with their increasing caseload. In the last subchapter, a few more elements of judicial decision-making are discussed.

1.1.1 Effect of background, political preference and demographics

It is widely believed that judges' demographics, background, political preferences or their worldview somehow affects their decision-making during the process. However, the results on the direction and the scale of the effect are mixed. For example Goldman (1966) or Ulmer (1983) conclude that judges' background and demographics do not affect their decisions, but their political preferences do. On the other hand, some papers do find that judges' demographics and background affect their decision-making. For example, Songer and Tabrizi (1999) find out that judges are strongly affected by religion in their decisions. Ashenfelter, Eisenberg and Schwab (1995) examine how a judge affects case outcomes (victory of plaintiff, settlement etc.) while they control for the judge's demographics. The authors conclude that "*judges influence the procedures within civil right cases, but have relatively little effect on whether cases settle or win.*"[1] These theories lost a lot on their popularity in last decades.

1.1.2 Theories based on utility maximization

In this section, I present the reader with the most popular theories of rational judicial behaviour. Since these theories are highly respected and used as a basis for the research on the effect of judicial staffing on the efficiency of the judicial system, I describe them in greater detail.

The first proper economic theory of judicial behaviour based on utility maximization (i.e. theory of a rational judge) was proposed in 1983 by Robert Cooter in his paper "The objectives of private and public judges". Cooter (1983) analyses the behaviour of private judges[2] and then expands his analysis to public judges. He starts the analysis by looking into decision-making of people in a dispute, because the behaviour of judges is based on the behaviour of their potential clients. Cooter claims that legal disputes are close to bargaining games. It is because the defendant and the plaintiff want to avoid a trial (which is costly) and they negotiate about dividing stakes - the compensation from the defendant to the plaintiff. In a simple model situation, the litigants choose their strategy: they decide how hard they want to bargain. Harder negotiations increase a possible share of stakes, but also increase the probability of a trial. If they cooperate and reach an agreement, the stakes are divided. If they do not cooperate, the case will be

[1] Ashenfelter, Eisenberg and Schwab (1995), p. 281

[2] "*Private judges are typically experienced, knowledgeable retired judicial officers who are selected by counsel to hear and determine family law and/or civil matters and are compensated by one or both litigants*." (Robbins, 2009, p.2). If both litigants do not want their dispute to be resolved at public court, they may hire private judge to resolve their dispute. This concept is typical for several states in USA, especially California. More information about private courts could be found in Robbins (2009), for example.

resolved at court. If disputants do not reach an agreement, they either decide to seek services of a private judge or submit their case to the public court. Cooter assumes that all decisions made by potential litigants depend on the reputation of judges (e.g. reputation for being generous to the victims of accidents and thus plaintiffs). Both sides are familiar with judges' reputation. It implies that their preferences for the choice of a judge are opposite and it leads to negotiations about the choice. Negotiations about the choice of a private judge can be modelled in a similar way as negotiations about dividing stakes. Both sides choose their bargaining strategy. In case of a cooperative solution, a private judge is chosen. In case of a non-cooperative solution, the dispute will be resolved by a public judge. Private judges are aware of this process and want to maximize their utility, as everyone else. Based on these assumptions Cooter reaches the following conclusion: "*competitive equilibrium among private judges is reached when they adjust their reputation until each one earns same income. Consequently, there must be a correspondence between the distribution of demands by disputants and the distribution of judges by the reputation*."[3] From our point of view, very important is last idea in Cooter's paper. He argues that private judges maximize the income, while public judges rather maximize the probability of promotion and their reputation. Even though their ultimate goal is different, private and public judges maximize their reputation and thus behave in a similar way. Thus the model of private judicial behaviour can be applied to public judges.

There were a few critics of this work. In his comment, Chester (1983) criticized Cooter for ignoring information asymmetry. Rubin (1983) pointed out that there are private judges that are not paid on a case-by-case basis and the model cannot be applied to them. However, both authors acknowledged the contribution of Cooter's paper.

Another respected paper was published by Richard Posner (1993). He discusses the behaviour of judges at appellate courts in the USA, but his conclusions can be applied to judges in other countries as well. Posner starts his paper by making a few assumptions about judges to make them fit for economic analysis. He assumes that judges are rational, maximize their own utility, and react to incentives. A quite trivial, but important statement is that "*a federal judge can be lazy, lack judicial temperament, mistreat his staff, berate without reason the lawyers who appear before him, be reprimanded for ethical lapses, verge on or even slide into senility."*[4] In other words,

[3] Cooter (1983), p. 126
[4] Posner (1993), p. 4

judges are not genial saints. Last but not least, Posner states that judges "*can fruitfully be viewed as composites of three types of rational maximizer: the manager of a non-profit enterprise, the voter, and the theatrical spectator.*"[5]

Posner compares judges to the managers of a non-profit organization whose behaviour was described by Hansmann (1980). Among other things, Hansmann (1980) concludes that it is quite difficult to measure and quantify exact results of a non-profit organization. And here is the similarity with the judicial system: it is quite difficult to exactly measure the output of a full-service public judicial system. It implies that the judicial system has also a non-profit character in a sense. Posner also compares judges to voters. Federal appellate judges vote very often and with a very small probability of their vote being decisive. He believes that judges enjoy voting, because it is connected with a sense of power and deference. Posner also compares judges to theatrical spectators or gamesters, because the judge has some degree of power and can bring his own personal preferences (sympathy etc.) into the case.

From my point of view, the most important contribution of this paper is a definition of elements of judicial utility function. The list of elements follows:

- **Popularity**: Posner assumes that judges like to be popular among their close colleagues and lawyers.
- **Prestige** is manifested mainly in the opposition to things like the appointment of new judges or the extension of the meaning of the word "judge" to lower-level judicial personnel. However, there is little a judge can do in order to increase the prestige of judges.
- **Avoiding reversal**: judges dislike reversal, because reversal implies that a judge is not very skilled, leads to embarrassment, increased workload and a lower chance of promotion.
- **Reputation**: Posner distinguishes between reputation, popularity and prestige. Reputation represents relations with other judges and with legal profession at large. Importantly, it is a function of effort. Higher levels of effort can help a judge in her career, however it can made him unpopular among other judges. Exerted effort also affects judges' backlog. Higher effort itself is considered to negatively affect judges' utility.

[5] Posner (1993), p. 3

- **Workload and time spent on work** are assumed to decrease judges' utility. As (almost) all other people, judges find, ceteris paribus, work to be unpleasant.

Cohen (1991) works with a slightly different utility function than Cooter (1983) or Posner (1993). In his paper, judges' utility function involves job satisfaction (which positively depends on discretion in sentencing), workload, a possibility to create precedents and a chance of promotion.

1.1.3 Example of the mathematical model

It is necessary to somehow formalize the analysis performed by Cooter (1983) or Posner (1993). Such an approach was used by Beenstock and Haitovsky (2004). Following Posner (1993) and Cooter (1983), the authors assume that judges dislike working (exerting effort) and want to be promoted, which requires some effort. Thus judges are optimizing. Authors start with defining the change in the stock of pending cases as:

$\dot{K} = S - C - \delta K$

where K is the number of pending cases, δ is the pre-court termination rate of cases, S is the number of newly allocated cases to the judge and C is the number of completed cases. Beenstock and Haitovsky assume that judges' utility negatively depends on K and on E (effort). Judges maximize the following utility (U) function:

$$U = \int_0^T U(t)e^{-rt}dt + f(K(T))$$

After transforming the equations and solving the maximization problem, authors derive a system of equations to capture the relations in the system:

$$\frac{dE}{dK} = -\frac{\delta}{C_E} < 0$$

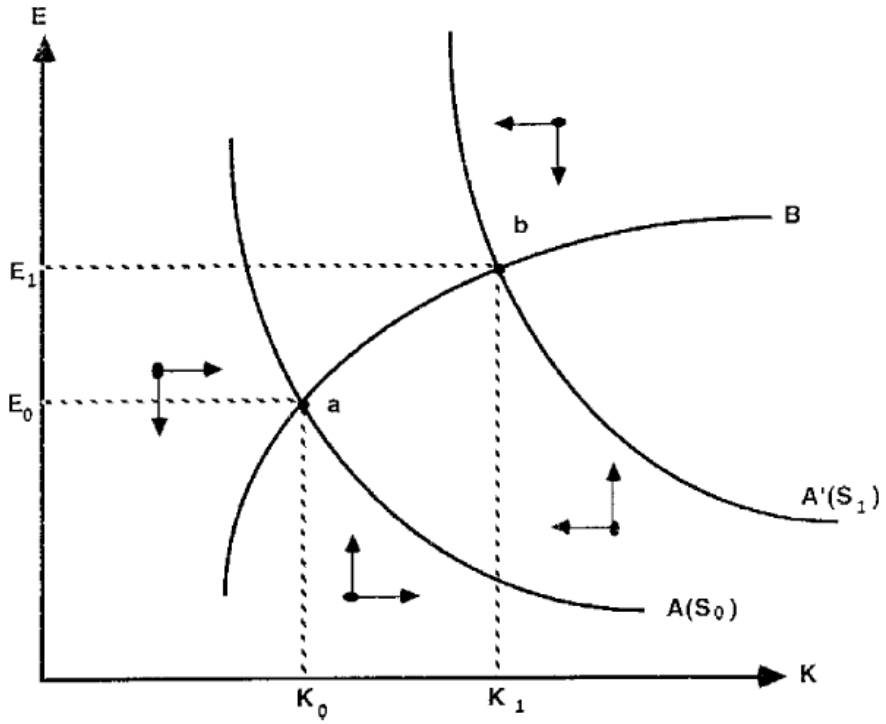
$$\frac{d^2E}{dK^2} = -\frac{\delta C_{EE}}{C_E^2} < 0$$

which are represented by schedule A in a phase diagram.

$$\frac{dE}{dK} = \frac{\left(\frac{C_E}{\delta}\right)U_{KK} - U_{KE}}{U_{EE} - \left(\frac{C_E}{\delta}\right)U_{KE} - \left(\frac{U_K}{\delta}\right)C_{EE}}$$

which is represented by schedule B in the phase diagram.

Figure 1: The phase diagram in E and K space



Source: Beenstock and Haitovsky (2004), p. 356

As we can see, effort is depicted on the vertical axis and the number of pending cases is depicted on the horizontal axis. In the example in Figure 1, in an initial equilibrium (point a) the judge is allocated with S_0 new cases. She exerts effort E_0 and thus achieves case completion K_0. Suddenly, the judge receives a higher number of new cases S_1. To cope with this change, the judge reacts by increasing his effort to E_1 and that implies backlog of K_1. The extent of the judge's reaction to the change in S depends on the slope of schedules. The model can be used to examine changes on the macro level as well. For example: "*suppose that the number of judges is raised to J_1 and the number of cases lodged is unchanged, so that each judge is allocated $S_1 < S_0$ new cases. The number of cases completed per time period will be $c_1 = J_1 * C(E_1)$. Judges respond to the new appointments by extending lesser effort; their productivity is endogenous. Hence, if the number of judges is raised by 1%, the number of completions by the court can be expected to increase by less than one percent.*"[6]

1.1.4 Judicial response to increase in caseload

Robel (1990) based his research on a survey among judges. Many judges expressed dissatisfaction with their work and the state of the judicial system. A few figures from the research are as follows: forty six percent of federal judges responded that a high

[6] Beenstock and Haitovsky (2004), p. 356

caseload negatively affected their work "often". Eighty one percent of appeal court judges responded that they found their workload to be "overwhelming" or "heavy". According to Robel (1990), high workload leads to creating so-called "case-management techniques" which are supposed to help judges to deal with their increased caseload. These techniques[7] include methods to increase case terminations without a trial (i.e. judges encourage a settlement between litigants), to narrow the disputed issues for the trial (i.e. judges force attorneys to establish priorities, and not to use all possible arguments) or to limit the scope of discovery (i.e. judges increase knowledge of litigants by providing relevant information and data). The most used technique is probably delegation of judges' work to others (law clerks, federal magistrates etc.). However, all these techniques are often criticised, because they supposedly decrease the quality of courts decisions. See McCree (1981), for example.

1.1.5 Other elements of judicial decision-making

An interesting hypothesis was proposed by Choi, Gulati and Posner (2010). They work with typical judicial utility function and thus assume that judges want to minimize their workload and maximize their reputation by avoiding reversal. The authors hypothesize that in order to avoid reversal, district judges base their decisions not on their own political preferences, but rather on political preferences of appellate judges. This applies especially to decisions that are published, because published decisions tend to have a higher impact. They use a dataset that includes observations on decision-making of 629 district judges, their demographics and political preferences. They found out that in regions with higher heterogeneity of appellate judges' political preferences, reversal is higher and district judges are less likely to publish their decision. These findings support their hypothesis, because higher political preference heterogeneity may prevent district judges from estimating preferences of appellate judges and adjusting their verdicts. There are several publications which deal with decision-making of judges about publishing their opinions. For instance, Taha (2004) examines the relation of judicial, institutional and other characteristics with the probability of publishing judicial opinions. Most notable results of this paper are: older judges are less likely to publish (which could be attributed to declining health and energy), judges who held political positions or former professors are more likely to publish and judges serving in courts with heavier caseload are less likely to publish.

[7] I think it is suitable to mention these techniques since judges in Czech Republic are likely to adopt something similar

1.2 Performance of judicial system and factors affecting it

This subchapter is divided into three parts. The first part deals with various measures of judicial performance. The second part is the most important and the most extensive one. It summarizes literature on the effect of various factors on the efficiency of judicial system. Special attention is paid to literature that deals with the very topic of this thesis: the effect of the number of judges. Finally, the last part lists a few papers on related topics, which may prove to be useful for the purposes of the thesis.

1.2.1 Measuring judicial performance

The discussion about measuring judicial performance can be found in Bowler, Staats and Hiskey (2005) or Rosales-López (2008) for example. Measuring judicial performance or quality is usually quite problematic for several reasons.

Rosales-Lopéz (2008) lists the following causes:

- "*The complexity of the organizational and institutional structure of the judicial system*
- *The scarcity and sometimes lack of data of the basic judicial activity.*
- *The existence of prejudices on the part of key actors of the system in almost all matters concerning the evaluation and quantification of supposedly nonquantifiable aspects, such as dispensing justice or the quality of a sentence.*
- *The judicial performance is also affected by external factors, such as incentives for the parties involved in the dispute and their lawyers*."[8]

Bowler, Staats and Hiskey (2005) list the following attributes of the judicial system as the most important measures of judicial quality: independence, efficiency and accessibility. The authors also describe what particular measures represent: "*Judicial independence means two things: independence of the judicial system as an institution from unwarranted external political influence, and the ability of individual judges to make independent decisions in particular cases. Efficiency is the ability of a judicial system to process cases without unreasonable delays and backlogs. Finally, we understand accessibility to mean how much the judicial system is equally available to citizens regardless of socioeconomic status or geographic location.*"[9] The authors work with two more measures: accountability and effectiveness. Accountability "*concerns the*

[8] Rosales-Lopéz (2008), p. 234
[9] Bowler, Staats and Hiskey (2005), p. 79

issue of whether the judicial branch is itself subject to the rule of law"[10]; effectiveness represents how functional an enforcement of the law in the system is. The summary of various measures of the quality of the judicial system is in Table 1. The authors quantify and evaluate the listed items in the region of South America. They collected data from 17 countries in Latin America between 2001 and 2005. An important finding of this paper is that the results are consistent between countries and categories. To put it simply, a country that shows a good performance in one measure shows a good performance in other measures, and a country that shows a bad performance in one measure shows a bad performance in other measures.

Table 1: Measures of judicial performance

Independence	Accountability	Efficiency	Effectiveness	Accessibility
Independence of Supreme Court	Honesty of judicial system	Efficiency of judicial system	Promotion of civil liberties and protection of human rights	Access to courts across all socio-economic classes
Independence of courts of first instance	Competence of supreme court justices		Protection of rights of accused in criminal cases	Access to courts in both urban and rural areas
	Competence of judges of courts of first instance		Justice to parties in civil cases	

Source: Bowler, Staats and Hiskey (2005), p. 83

1.2.2 Effect of various factors on efficiency[11]

In this thesis, I examine the efficiency of the judicial system (column 3 in Table 1). To determine the effect of various factors on efficiency, it is necessary to find out how changes in variables representing such factors affect the output of the courts. The most widely used variable to quantify output is the number of resolved cases per unit of time or time needed to dispose an average case. A very useful summary of factors that affect judicial output can be found in Rosales-López (2008), who defines output as:

$Y = f (K, L, S, T, O, H, N, M, A, J, C)$

[10] Bowler, Staats and Hiskey (2005), p. 80

[11] In this part of my thesis, I summarize literature on the topic and simply write what estimation methods individual authors use. Estimation methods and reasoning behind them are discussed in greater detail in part 5 (Methodology) of this work

Table 2: Summary of factors that affect judicial output

Where:	It might expect
K = capital	$\delta Y/\delta K = +$
L = judicial staff	? Depending on the effect that "S" have on litigation incentives
S= public spending in justice	
T = available technology	$\delta Y/\delta T = +$
O = organizational aspects	?? It depends on the organizational aspects that are considering. For example it might expect the more flexible is the organizational structure higher level of output.
H = judges' human capital: years of experience, education	$\delta Y/\delta H = +$
N = Judges' incentives	? It depends on the kind of incentives
S = Judicial staff's incentives	? It depends on the kind of incentives
M = Case management	$\delta Y/\delta M = +$ effective management would tent to increase judicial output
A = the time the judges allocate to administrative tasks	$\delta Y/\delta A = -$
J = the time judges allocate to jurisdictional tasks	$\delta Y/\delta J = +$
C = complexity of cases filed	$\delta Y/\delta C = -$
I = litigation incentives	? It depends on the kind of incentives

Source: Rosales-López (2008), p. 236

Afterwards, the author uses data on 61 civil first instance courts from Andalusia and runs an OLS regression where the number of courts' resolutions is used as the explained variable. The number of judges, caseload and some control variables are the explanatory variables. Rosales-López concludes that "*a 10% increase in caseload produces a 3% increase in judicial output and a 10% increase in court size produces a 6.2% increase in judicial output*."[12] So an increase in the number of judges leads to an increase in output, but the growth in the output is not proportional to the growth in staffing.

One of the first papers empirically addressing case processing time and efficiency of courts was published by Luskin and Luskin (1986). The authors examine factors that affect case processing time of criminal cases. They mainly focus on factors on the case level. This paper is quite useful for purposes of this thesis, because it provides us with a great summary of case-related factors that affect processing time. Authors name several categories of case-related factors:

[12] Rosales-López (2008), p. 241

- **Case specific incentives:** this category includes items such as attorney type or seriousness of the crime. All interested parties (defendant, judge, attorneys) want longer processing time in case of more serious crime. Pretrial release or prior record of defendant tend to lengthen the processing time.
- **Case complexity:** the authors argue that it is rather difficult to somehow measure the complexity of a case. They believe that one possible measure is the number of defendants.
- **Case events:** the last category is focused on events that may happen during the process. This includes events such as defendant absence, psychiatric hiatus of the defendant or a mistrial. All these events lead to delay.

The authors use data on 2,026 cases resolved in Detroit between 1976 and 1978. They set up a model with processing time as the dependant variable and case-related variables, caseload and structural variables as the explanatory variables. The model is estimated by OLS and GLS. Among other things, the authors conclude that judges' caseload lowers the processing time. To be more specific, they found out that an increase in caseload of one judge by fifty cases leads to a four-day decrease in processing time. However, this paper was later criticized for not dealing with endogeneity.

Buscaglia and Dakolias (1999) determine the key factors of judicial efficiency based on a comparison of judicial systems in different countries. Their research is based on data on salaries, caseload, budget, personnel and time allocation of judges. The examined output variables are case duration, clearance rate and the cost elasticity of the supply of court services. They also performed survey among judges in chosen countries. The authors find out that the quality of information technology, infrastructure, capital budget, judges' managerial skills and cost per case affect case resolution time. Naturally, the administrative burden of judges plays a very important role too. The number of judges, training level of personnel and salaries seem to have no or a very small effect.

Murell (2001) approaches the analysis in a different manner. He models not only the supply side of the judicial system but the demand side as well. He claims that litigants can sometimes choose a court that will examine the case or prefer alternative dispute resolution. It follows that there is a certain degree of competition among courts and the demand side must be incorporated into the model as well. He sets up a two-equation model. The first equation represents supply, where he uses the so-called Cappaleti-Clark

index (Clark and Merryman, 1976) as the dependant variable. The Cappaleti-Clark index is calculated as:

$$CCI = \frac{(stock\ of\ cases\ at\ beginning) + (new\ cases\ filed)}{number\ of\ cases\ disposed} - 1$$

The explaining variables consist of the number of cases filed (i.e. demand), variables for local legal structure and socioeconomic environment. The second equation represents demand. This equation models how caseload depends on the congestion of the court, the appeal rate and the level and the character of socioeconomic activity. Murell estimates his model on a dataset from Romania in 1999. As estimation methods, OLS and 3SLS are used. From our point of view, there are several interesting conclusions: an increase in demand and thus the caseload leads to slower case resolution, an increase in resources devoted to the judicial system and thus (according to the author) the number of judges leads to slightly faster case resolution.

Beenstock and Haitovsky (2004) apply their microeconomic model[13] to data from Israel. They use data from 1975 to 1995 on Magistrate, District and Supreme courts. They also distinguish between civil and criminal cases. The authors use a model where the number of completed cases is the dependant variable and the number of cases lodged, the number of cases pending and the number of judges are the explanatory variables. They found out that only in case of small magistrate courts the number of judges affects case disposition. It follows that productivity of judges is endogenous and judges adjust their effort. Thus appointing new judges does not solve the problem.

Mitsopoulos and Pelagidis (2007) examine the efficiency of Greek courts. In their first paper, they use the ratio of remaining cases at the end of the year to total cases introduced as an indirect measure of time to resolve the case, and thus as the dependant variable. They conclude that staffing has a positive effect on the number of cases resolved at appeal courts, but not at courts of the first instance. Therefore their policy recommendation is as follows: the first instance courts should increase the quality of judges, while appeal courts should increase the number of judges.

A similar research is performed by Dimitrova-Grajzl et al. (2012) on Slovenian courts. They use data on 44 local courts and 11 district courts in the years 2000 – 2008. Again, they use resolved cases as the explained variable and caseload, the number of judges and dummy variables for years as the explanatory variables. As a basic estimation

[13] See section 1.1.3

method they use the simple OLS. However, the simple OLS method does not deal with possible endogenity and may lead to biased results[14]. To solve this issue, the authors use more sophisticated estimation methods as well. To be more precise, they use fixed effects estimation and the instrumental variable approach to deal with various sources of endogenity. The usage of the instrumental variables approach is the biggest contribution of the paper since it was not used before in this field of research. As instruments, differences in caseload and the number of judges between time t-1 and time t-2 are used. The results from their estimation are as follows: a 10% increase in the number of judges leads to a 1.3%, 2.2% or an insignificant increase in case resolution, depending on the estimation method. A 10% increase in the caseload leads to a 6.4 – 17.6% growth in case resolution. So again, an increase in the number of judges leads to a small or even null growth in case resolution. Three years later, Dimitrova-Grajzl et al. (2015) perform very similar research on data from Bulgaria. They find out that the judicial staffing has no effect on the number of resolved cases. In case of Bulgaria, the number of resolved cases changes proportionally with the caseload.

1.2.3 Examples of useful related research

Yet a different estimation method is chosen by Kittelsen and Forsund (1992) or Schneider (2005). They utilize the so-called data envelopment analysis (DEA). In short, DEA "*is a linear programming technique that computes productivity scores from observed input-output combinations by calculating the weights ("prices") of inputs and outputs in a way that maximizes a productivity score or index.*"[15] "*DEA produces performance scores ranging from 0 to 1 (or 0 to 100 percent). All observations with a score of 100 percent are efficient; observations with a score below 100 percent are inefficient, and the extent of inefficiency can be quantified.*"[16]

Kittelsen and Forsund (1992) examine the productivity of district courts in Norway. They conclude that Norwergian courts suffer from technical inefficiency but mainly from a suboptimal scale of courts. They estimate the efficiency loss to be 8 – 10 % on aggregate.

Schneider takes a closer look at German labour courts. He assumes that effort and ex ante probability of promotion (which depends on the number of contestants, the number of vacancies and a judge's quality) determine career success of a judge. The author

[14] See chapter 5 (Methodology) of this work for more detailed discussion of this issue
[15] Schneider (2005), p. 133
[16] Schneider (2005), p. 134

hypothesises that judges with higher ex ante probability of promotion will exert lesser effort. It paradoxically implies that ex ante probability of promotion has a negative impact on the court productivity and the confirmation rate. He tests his hypothesis on a dataset consisting of 9 Labour Courts of Appeal and 230 judges in the years 1980 to 1998. In the DEA model presented by the author, caseload and the number of judges are used as inputs, resolved cases and published decisions are used as outputs. Another dependant variable is the ratio of (confirmed decision by appeal court)/ (published decisions). The results of the regression confirm his hypothesis. Interesting finding is that a higher share of Ph.D. judges increases court efficiency, but also leads to a higher reversal rate.

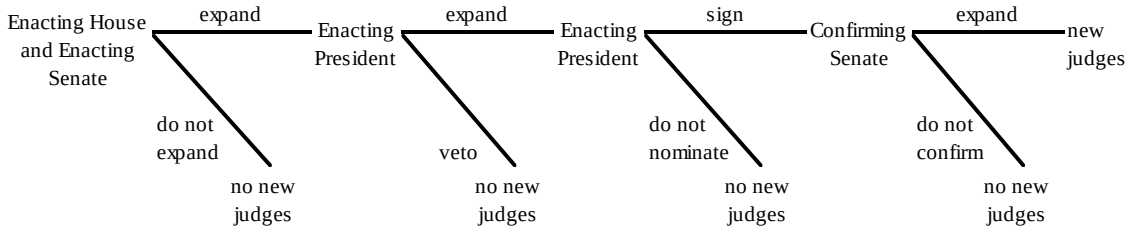
There are many papers that do not deal with the effect of the number of judges, but examine related topics and may prove useful for the purposes of this thesis. For example, Posner (2000) deals with the effect of the court's size in terms of population and a judgeship. Posner believes that some courts are too big and perform worse than small ones, because observing judges' individual behaviour and thus punishing underperformance is much easier in small courts. Posner claims that the ninth circuit[17] in USA is too large and thus performs poorly. He supports his criticism by data and shows that an increase in judgeship by 1 leads to an increase in reversal rate by 0.00168 percent.

Some papers examine reasons behind judicial expansion, because judicial expansion is not always a reaction to the increasing caseload and theoretical insufficient amount of judges. De Figueiredo and Tiller (1996) claim that judicial expansion is often politically motivated. Authors believe that there are apolitical reasons for judicial expansion (a growing caseload or a request from the judiciary itself), but there are political reasons as well. There is a great difference between an expansion based on political reasons and an expansion based on apolitical reasons, because an apolitically motivated expansion is institutionally effective[18] while a politically motivated expansion is not. The authors utilize the fact that in the USA, judicial expansion must be approved by several policymakers (see Figure 2).

[17] There are 13 courts of appeal in the USA. Twelve of them have territorial jurisdiction. Each court of appeal with its territorial jurisdiction is called circuit. The Ninth Circuit is by far the largest one.

[18] It implies that unlike me, the authors believe that the judicial staffing positively affects the case resolution

Figure 2: Judicial expansion process in the USA



Source: De Figgueiredo and Tiller (1996), p.444

The basic assumption is that "*each actor prefers new judges from its own party over no new judges and no new judges over judges of an opposing political party.*"[19] This implies that new judges are appointed only if all policymakers involved in the appointment process have the same political alignment. This assumption seems to be too strong but it is possible to say that a higher number of policymakers from the same political party leads to a higher probability of the approval of new judges' appointment.

On basis of these facts the authors hypothesize that judicial expansion is more likely to occur while policymakers have the same political alignment. To verify this hypothesis, they run two regressions: one to determine factors affecting the size of the expansion, the other to determine factors affecting timing of the expansion. They conclude that the size of the expansion depends on both political and apolitical reasons. On the other hand, the timing of the expansion is affected by only political reasons.

Yet another example of related research is article by Dakolias (1999) that compares court performance in chosen countries around the world or Chappe (2012) who sets up quite a complicated mathematical model for evaluation of the demand for courts' services and the congestion effect. OECD (2013) not only compares judicial systems but also lists factors that affect the efficiency of judicial systems.

1.3 Summary and hypothesis

To sum up, to examine the effect of the number of judges on the efficiency of the judicial system, it is necessary to find out how the changes in judicial staffing affect the output of the court. Most of the models put cases resolved or the resolution time as the dependent variables and the caseload, the number of judges and control variables as the explanatory variables. Numerous estimation methods are employed: OLS, instrumental variable approach, fixed effects estimation, DEA etc. Most of the results suggest that an increase in judicial staffing leads only to small or zero growth in cases resolved. Researchers (Dimitrova-Grajzl et al. (2012), Beenstock and Haitovsky (2004) etc.)

[19] Figueiredo and Tiller (1996), p. 444

utilize theories of rational judicial behaviour (e.g. Posner (1993)) and explain this phenomenon as follows: an increase in the number of judges leads to lesser workload of incumbent judges. It allows them to decrease their effort and thus leads to a lower number of cases resolved by an average judge. Thus the increase in the output is very small or non-existent. And this is the hypothesis of my thesis. The results (even though if similar to other countries) are useful for Czech policy making. A similar detailed quantitative analysis of Czech courts has been lacking. The evidence on the effect of caseload is mixed, because there are two opposing effects. When facing higher caseload, judges want to avoid backlogs and thus accelerate the case resolution (so-called incentives effect), which possibly decreases the quality of their decisions. On the other hand, an increased caseload leads to a stronger congestion effect and slows down the case resolution.

2 Czech judicial system

This part of the thesis is focused on the Czech judicial system. In the first subchapter, a modern development of the judicial system is summarized. This includes some basic facts and important changes in the law that concern the judicial system. The second subchapter points out a few features of the judicial system which may be relevant to my research. Finally, in the last section, I compare the Czech judicial system with judicial systems of other countries.

2.1 Acts on judicial system

In 2002, the Czech government adopted the Act No. 6/2002 Coll. "Zákon o soudech, soudcích, přísedících a státní správě soudů a o změně dalších zákonů". From our point of view, Chapter 1 and Chapter 2 are important. Chapter 1 adjusts basic principles of courts and the structure of the judicial system. It establishes districts, residences of all types of courts etc. The act determines competence and personnel structure of all courts. Inner organization and the character of spread-overs of courts are established as well. Spread-overs[20] are published by the court's chairman once a year and determine working schedules of personnel at the court. Chapter 2 is focused on judges. It determines prerequisites for becoming a judge, the tenure of judges, the process of appointment of judges, the process of allocation of judges and the process of termination of function as a judge. Chapter 2 also establishes rights and obligations of judges. It also establishes disciplinary proceedings related to judges. The judicial system was reformed in 2008 by Act No. 314/2008 Coll. In Chapter 1 called "Změna zákona o soudech a soudcích" several articles of the law were changed. The biggest amendment concerns disciplinary proceedings. Now, judges could be dismissed by the Disciplinary Senate and not by anyone else. Also, the penalty for infringement was increased. The change in disciplinary proceedings may possibly be reflected in the behaviour of judges.

2.2 Important features

Czech law is based on late Roman law. In other words, Czech law is Continental European law (or Civil law). To be more precise, it belongs to the Germanic subgroup of law. The most important implication is the fact that judges must always follow written collection of laws. Unlike judges in the common law system who are granted precedential power.[21] Similar to other countries, the Czech Republic has three basic

[20] In Czech: rozvrh práce

[21] For more information on this topic see Večeřa et al. (2012), for example

types of procedure: criminal procedure, civil procedure and administrative procedure. This thesis is focused on civil procedure.

The structure of the Czech judicial system is established in the Constitution of the Czech Republic and adjusted in Act No. 6/2002 Coll. In the Czech Republic, there is a four-tier system of courts and two-instance proceedings[22]. The structure of the judicial system is as follows:

- Supreme Court and Supreme Administrative Court: these courts are courts of the last instance
- High courts: these courts deal with the most serious crimes.
- Regional courts: these courts act as courts of the first or second instance (as appeal courts to district courts). They examine more serious crimes than district courts.
- District courts: These courts act as courts of the first instance and a majority of disputes is resolved here.

The procedure of the allocation of judges is another important feature of the judicial system. Again, the procedure is established in Act No. 6/2002 Coll. Judges are allocated to district courts by the Minister of Justice. The allocation is theoretically based on a wish of the judge. It is generally known that judges are reluctant to work in Northern Bohemia.

In case of good performance, the judge could be promoted, i.e. transferred to a court of a higher tier. The decision about transferring the judge is made by the Minister of Justice. In case of breach of duty or underperformance, the judge is sent before the Disciplinary Senate and she is punished somehow: she receives a reprimand, her salary is lowered by 30 % or the particular judge could be even dismissed from her post. It implies that the judge while deciding about the effort she exerts takes into account not only the possibility of promotion (e.g. Cooter (1983)), but also the possibility of being punished.

Another aspect of the judicial system is the jurisdiction of courts. Jurisdiction is established in Act No. 99/1963 Coll.: "Občanský soudní řád". The description of the jurisdiction system can be found in Winterová (2012), for instance. There are several types of jurisdiction[23]. Firstly, there is subject-matter jurisdiction. The subject-matter

[22] It means that after a decision of the first instance court, the losing party can appeal to a court of the higher tier. The decision of the appeal court is definitive (with few exceptions)

[23] Jurisdiction defines in which court will be given case filed. Such a court is obligated to deal with a case and deliver verdict

jurisdiction determines which tier of courts will be deciding about a given case as the court of the first instance. Most cases are filed in district courts. If the law does not state otherwise, a case is filed in a district court. The exceptions are listed in Act No. 99/1963 Coll. and in Act No. 292/2013 Coll. More complicated cases are filed in courts of higher tiers. Secondly, there is territorial jurisdiction. The territorial jurisdiction determines the competence of courts within the same tier. Usually, a case is filed in the court where the defendant has permanent residence in the central register of citizens or where she lives. In case of legal entity, territorial jurisdiction is based on the official residence. However, there are some exceptions to this rule. It is possible that a case can be under territorial jurisdiction of more than one court.

It is possible to utilize Alternative Dispute Resolution (ADR) methods in the Czech Republic, which enables disputants to settle the dispute outside the court. There are two types of ADR in the Czech Republic. Firstly, it is a mediation, which was established by Act No. 257/2000 Coll.: "Zákon o Probační a mediační službě", and novelized by Act No. 202/2012 Sb.: "Zákon o mediaci a o změně některých zákonů." The method is based on appointing a third party (mediator) to enable and encourage negotiations between disputants. The mediation is utilized only while dealing with criminal cases. Secondly, there is an arbitration, which was established by Act No. 216/1994 Coll.:"Zákon o rozhodčím řízení a o výkonu rozhodčích nálezů". The arbitration is mostly utilized while dealing with property disputes. The third party (arbitrator) is established to resolve the dispute. It follows that there can actually be some kind of a competition on the field of courts.

2.3 International comparison

It may be useful to compare the Czech judicial system with judicial systems of other countries to get a grasp of relative quality of the Czech judicial system. A quick survey of judicial systems in developed countries could be found in an OECD report (2013). A very extensive and detailed comparison of European judicial systems is in a CEPEJ[24] report (2014). There is a huge number of statistical indicators in the report and thus I have chosen the most important ones and discuss them.

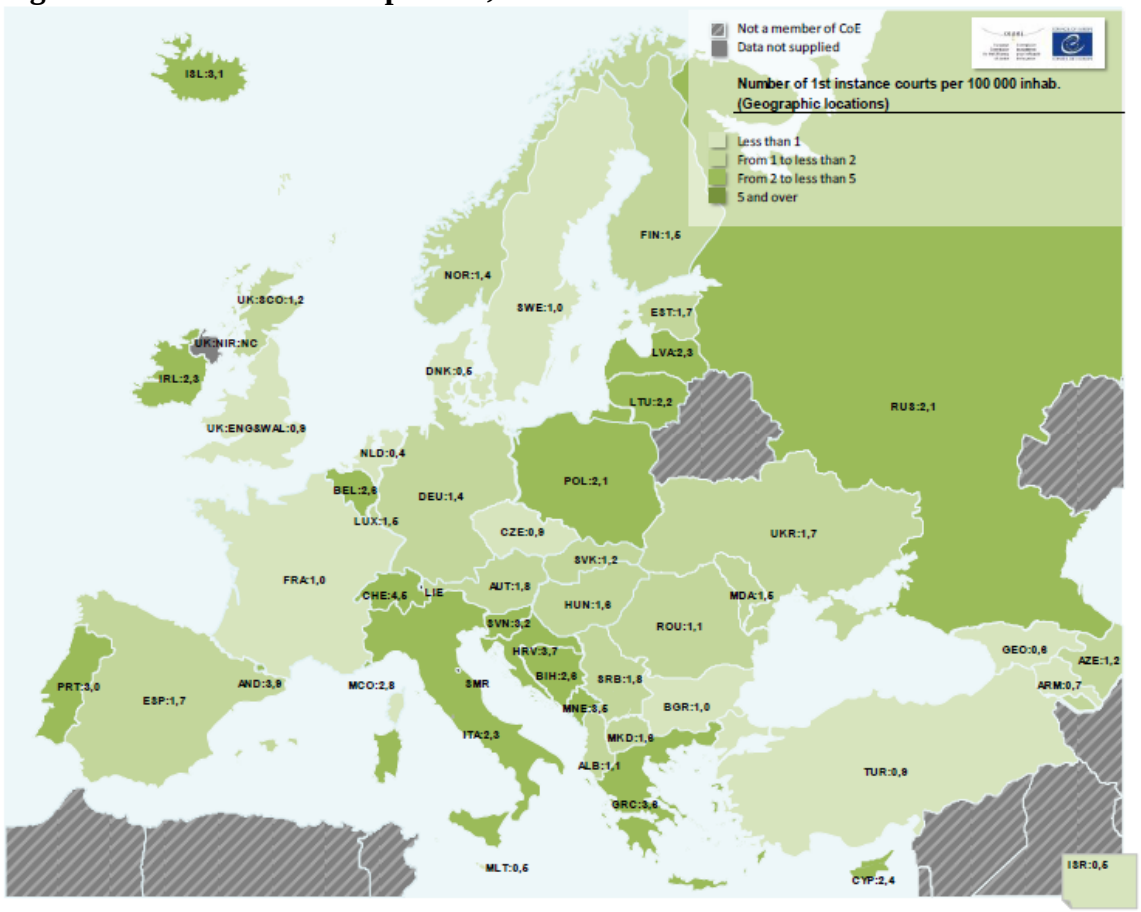
The budget allocated to the judicial system and courts reflects in numerous ways and thus is definitely one of the factors that may affect the quality and the quantity of case resolutions. Unfortunately, the Czech Republic is one of a few countries that do not

[24] The European Commission for the Efficiency of Justice

include the budget of the prison system into the budget allocated to the whole justice system. It follows that the Czech Republic exhibits 0.7 % of the annual public budget allocated to the justice system, which is strongly below the average of 2.2 %. However, due to differences in methodology, this information is not very useful. The measure of the budget allocated to courts does not suffer from the previously discussed bias and the Czech Republic seems to be slightly above average with 0.24 % annual public budget as the percentage of GDP per capita allocated directly to courts while the average is 0.21 % in Europe.

The Czech Republic is one of the European countries which have less than one court of the first instance per 100,000 inhabitants (see Figure 3). The Czech Republic exhibits a relatively high number of judges. It is highly above median (17.7) and average (21.0) with its 29.1 judge per 100,000 inhabitants. It is not possible to draw any conclusions without the knowledge of further information (caseload, institutional arrangement etc.) but this information may indicate that the number of judges is sufficient for the Czech Republic.

Figure 3: Number of courts per 100,000 inhabitants



Source: CEPEJ (2014), p. 118

Judges are not the only ones who contribute to correct functioning of courts. There is a non-judge personnel as well. Again, the Czech Republic exhibits a result highly above average. The average is 65.8 non-judge staff per 100,000 inhabitants and the number of non-judge staff per 100,000 inhabitants in the Czech Republic is 86.9. This number includes the so-called Rechtsplfleger[25] (21.3 %), staff to assist the judge such as registrars (48.9 %), staff in charge of administrative tasks and the management of courts (22.3 %), technical staff (7.0 %) and other staff (0.5 %).

An extensive chapter of the report is devoted to the efficiency of judicial systems. It does not set up an econometric model as the most of the recent empirical literature, but compares judicial systems based on several indicators such as clearance rate and disposition time. Clearance rate (CR) is computed as:

$$CR\ (\%) = \frac{Resolved\ cases\ in\ a\ peroid}{Incoming\ cases\ in\ a\ period} * 100$$

It follows that clearance rate higher than 100 % indicates that backlog is decreasing and clearance rate below 100 % means that backlog is rising. Disposition time (DT) is calculated as:

$$DT = \frac{number\ of\ unresolved\ cases\ at\ the\ end\ of\ a\ period}{number\ of\ cases\ resolved\ in\ a\ period} * 365$$

According to CEPEJ, the clearance rate in the Czech Republic is 113.7 % for other than non-criminal cases (i.e. civil and administrative law cases). Median is 100.4 %. Average disposition time is 116 days for non-criminal cases. Median in European countries is 149 days. Again, this data suggest that the Czech judicial system is above European average. This information is related to the courts of the first instance. Unfortunately, data on clearance rate and disposition time for criminal cases in the Czech Republic have not been published.

To sum up, the Czech Republic exhibits at least average results in almost all important statistical indicators. It follows that the Czech judicial system is in a relatively good shape in comparison with other European countries.

There are several statistical indicators which do not directly measure the efficiency of a judicial system, but can provide us with clues on the quality of a legal system and

[25] „*Function, which is inspired by the German and Austrian systems. The European Union of Rechtspfleger (EUR) defines the Rechtspfleger as an independent judicial body, anchored in the constitution and performing the tasks assigned to it by law…. The Rechtspfleger does not assist the judge, but works alongside the latter and may carry out various legal tasks, for example in the areas of family and guardianship law, the law of succession, the law of land registry and commercial registers*." (CEPEJ, 2014, p. 175). In the Czech Republic, it is Senior Judicial Officer defined by Act No. 189/1994 Coll.

inhabitants' behaviour in a particular country. Such information is the number of cases per 100,000 inhabitants, for example. Results may suggest how accessible justice is or whether inhabitants tend to resolve their disputes with the assistance of a court or not. CEPEJ published data on the first instance incoming and resolved civil (and commercial) litigious cases per 100,000 inhabitants. The Czech Republic exhibits 3,415 civil litigious cases per 100,000 inhabitants. This number can be considered high, since the European average is 2,492.

3 Data

My dataset covers district and regional courts in the Czech Republic between 1995 and 2014. The data was obtained from several different sources.

Firstly, case-related data was obtained from statistical lists for civil agenda and statistical lists for custodianship agenda of the Ministry of Justice of the Czech Republic. Each court fills up the statistical list formula immediately after a verdict becomes legally effective and sends it to the Ministry of Justice. There are some exceptions to this rule and courts do not fill the statistical list formula every time. However, this exception includes only a very small fraction of cases. My dataset is compiled from database files that contain data from the statistical lists. After deleting some flawed data (e.g. data suggest that the case ended before it has actually started), my dataset consists of 7,451,015 cases resolved by district courts and 595,947 cases resolved by regional courts. It is 8,046,962 cases resolved in total. Data for each case consist of important case-related dates, matter in dispute, information on defendant and plaintiff, the result of the dispute etc. Not only statistical lists provide me with relevant case-related information, they also enable me to determine the caseload, the number of resolved cases and the number of started cases for each year and court. Since 1995 the Ministry of Justice has several times slightly changed its methodology concerning statistical lists. It follows that older data slightly differ from newer ones in their formatting. Also newer statistical lists contain more information. Since the data from statistical lists are on the case level, I aggregate the data, so they are on the court-year level. I.e. each observation contains data on a particular court in a particular year. This format is more useful for the purposes of my thesis.

Secondly, data on judicial personnel were obtained directly from the Ministry of Justice as the annual observations. To exactly match the personnel data and the case-related data, the data that covers the number of judges and other personnel between the years 1995 and 2014 would be ideal. Unfortunately, not all personnel data are obtainable. I managed to obtain all personnel data only for years 2010, 2011 and 2014. These data include information on the number of judges, the number of Rechtspflegers[26], the number of judicial assistants[27], the number of judicial secretaries[28], the number of

[26] In Czech: vyšší soudní úředník
[27] In Czech: asistent soudce
[28] In Czech: soudní tajemník

judicial executors[29], the number of chiefs of the office[30], the number of recording clerks[31] and other personnel working at district or regional courts. For the years 2006 – 2009, 2012 and 2013, I have data on the number of judges at regional and district courts. For the years 1995 – 2005, I only have data on the number of judges at regional courts. The summary of the available data is listed in Table 3.

Table 3: Summary of the available data

	Data available			
	Regional courts		District courts	
Year	judges	other personnel	judges	other personnel
1995	Yes	No	No	No
1996	Yes	No	No	No
1997	Yes	No	No	No
1998	Yes	No	No	No
1999	Yes	No	No	No
2000	Yes	No	No	No
2001	Yes	No	No	No
2002	Yes	No	No	No
2003	Yes	No	No	No
2004	Yes	No	No	No
2005	Yes	No	No	No
2006	Yes	No	Yes	No
2007	Yes	No	Yes	No
2008	Yes	No	Yes	No
2009	Yes	No	Yes	No
2010	Yes	Yes	Yes	Yes
2011	Yes	Yes	Yes	Yes
2012	Yes	No	Yes	No
2013	Yes	No	Yes	No
2014	Yes	Yes	Yes	Yes

Source: Ministry of justice of the Czech Republic, 2014, own work

Finally, the data on the mean wages in the Czech Republic and on the wages of the lawyers in particular regions were obtained from the Czech Statistical Office[32] and from the website of Average Earnings Information System[33] (ISPV).

[29] In Czech: soudní vykonavatel
[30] In Czech: vedoucí kanceláře
[31] In Czech: protokolující úředník
[32] www.czso.cz
[33] In Czech: Informační Systém o Průměrném Výdělku, www.ispv.cz

4 Descriptive statistics

In this chapter, I take a closer look at the dataset and the descriptive statistics. It must be emphasised that this section gives an insight into the dataset and provides some information about key variables, but no final conclusion about the effect of the number of judges on the output of the judicial system could be made on the basis of this chapter. This chapter is divided into two parts. In the first part, I take a closer look at the descriptive statistics for the key variables in individual years and how the key variables have changed over the years. I also briefly discuss the performance of the individual courts. In the second part, I examine relationships between the key variables.

4.1 Descriptive statistics and time series[34]

The goal of this thesis is not an evaluation of individual courts' performance; that is a question for another time. Thus I only mention which courts seem to be performing well and which courts seem to be performing poorly on the basis of the descriptive statistics. In Tables 4 to 9, there are the descriptive statistics for the number of judges, the caseload, the case resolution time, the number of resolved cases, the number of cases per judge and the number of resolved cases per judge between the years 2006 and 2014 for district courts.

Table 4: District courts, caseload

Year	N	Mean	Std. Dev.	Min	Max
2006	578811	6730.36	5813.08	1417	34719
2007	639814	7439.70	6692.41	1478	36810
2008	656581	7634.66	6975.94	1448	43374
2009	986482	11470.72	10534.64	2994	66357
2010	1219334	14178.30	13620.95	3574	82225
2011	1399370	16271.74	16775.78	4041	111763
2012	1088043	12651.66	13313.76	2980	86580
2013	839779	9764.87	9384.59	2544	60820
2014	431818	5021.14	4086.49	1187	25700

Source: Ministry of Justice of the Czech Republic, 2014, own calculations

It is rather difficult to explain the huge growth of caseload between 2008 and 2011, followed by a drop in 2012 and 2013. A closer examination of the data reveals that the number of relatively routine and easy cases (unpaid fines from public transport, disputes regarding payments for insurance, water or electricity supply) has been changing. I have no proof for the hypothesis, but it is possible that the change in the number of cases was

[34] The case is filled in the statistical list when a verdict becomes legally effective. Thus started and not finished cases are not in the list. This leads to significantly lower caseload in 2014.

caused by the introduction of the electronic payment order[35]on the 1st July 2008 (Act No. 99/1963 Coll., § 174a). The electronic payment order is a very useful tool in the case of an undisputable claim, when there is no doubt about the claim and its extent. All the claimant has to do is just to fill in a pdf formula, put his/her electronic signature and send it to the Ministry of Justice of the Czech Republic. I.e. the electronic payment order greatly reduces the transaction costs of making a claim and getting the dispute before a court. Naturally, greatly reduced costs of making a claim leads to a great growth in the number of claims. Courts with the highest number of cases per year are (not surprisingly) courts in cities (Prague, Brno, Pilsen, Ostrava) and courts in Northern Bohemia (Most, Ústí nad Labem, Karviná, Chomutov). On the other hand, the least busy courts are located in Jeseník, Pelhřimov and Rokycany.

Table 5: District courts, the number of judges

Year	Mean	Std. Dev.	Min	Max
2006	20.83	13.55	5	80
2007	21.41	14.30	4	86
2008	21.69	14.42	5	85
2009	21.86	14.67	6	86
2010	21.50	14.18	6	84
2011	21.66	14.36	7	85
2012	21.51	14.00	7	82
2013	21.59	13.89	7	82
2014	21.76	13.95	6	81

Source: Ministry of Justice of the Czech Republic, 2014, own calculations

It can be seen that the number of judges in the Czech Republic is relatively stable. Generally, the biggest courts are in cities and the smallest courts are located in the Southern Bohemia.

[35] Elektronický platební rozkaz in Czech

Table 6: District courts, case resolution time

year	Mean	Std. Dev.	Min	Max
2006	339.48	150.94	165.14	1192.86
2007	269.92	121.42	124.00	877.35
2008	277.86	132.80	128.89	1023.99
2009	192.50	102.04	75.68	649.13
2010	193.43	89.36	79.27	483.52
2011	196.59	93.12	76.96	531.17
2012	246.32	116.11	98.41	665.34
2013	251.37	144.11	82.09	860.59
2014	249.80	133.62	104.83	865.02

Source: Ministry of Justice of the Czech Republic, 2014, own calculations

The average case resolution[36] time exhibits a downward trend between 2006 and 2009, which is followed by an increase in 2012. Afterwards the case resolution time remains stable. A closer look at the data reveals that the courts in Český Krumlov, Prachatice and Domažlice seem to be the most efficient ones in terms of case resolution time. On the other hand, courts in Northern Bohemia (Most, Ústí nad Labem and especially Chomutov) seem to have the worst performance.

Table 7: District courts, resolved cases

year	N	Mean	Std. Dev.	Min	Max
2006	316512	3680.37	2866.57	1000	16575
2007	337789	3927.78	3065.83	1054	15865
2008	361404	4202.37	3162.84	955	15848
2009	559267	6503.11	4325.57	1907	25915
2010	689034	8012.02	5494.20	2213	33868
2011	792691	9217.34	6721.64	3203	42090
2012	685682	7973.05	6487.28	2252	40658
2013	591070	6872.91	6246.84	1889	43202
2014	431902	5022.12	4087.71	1188	25702

Source: Ministry of Justice of the Czech Republic, 2014, own calculations

Trends in the number of resolved cases follow the trends in caseload. It follows that the courts with the highest caseload exhibits the highest number of resolved cases.

[36] In this thesis, the resolution time is the number of days from the start of the judicial process to the day when the verdict becomes legally effective

Table 8: District courts, caseload per judge

year	Mean	Std. Dev.	Min	Max
2006	304.20	101.36	94.08	641.58
2007	322.48	107.04	104.21	677.24
2008	324.66	95.90	196.10	682.57
2009	494.25	109.15	321.80	930.16
2010	623.87	211.07	233.62	1638.91
2011	695.45	192.38	434.40	1712.78
2012	537.78	158.33	285.43	1339.59
2013	425.83	101.98	235.31	937.13
2014	226.70	40.44	107.91	318.24

Source: Ministry of Justice of the Czech Republic, 2014, own calculations

Table 9: District courts, resolved cases per judge

year	Mean	Std. Dev.	Min	Max
2006	175.37	46.24	48.46	346.10
2007	178.08	43.23	62.29	366.91
2008	187.76	41.68	110.91	395.18
2009	305.19	57.88	132.74	521.90
2010	382.59	107.96	178.05	1095.57
2011	430.60	80.28	224.11	596.64
2012	361.11	67.29	229.50	549.30
2013	305.97	67.74	182.94	627.42
2014	226.73	40.45	108.00	318.40

Source: Ministry of Justice of the Czech Republic, 2014, own calculations

Since the number of judges is relatively stable, the trends in the caseload per judge and the number of resolved cases per judge are very similar to the trends in the caseload and in the number of resolved cases. The most loaded courts in terms of cases per judge are again in cities and Northern Bohemia. These courts also resolve the most cases per judge and per year.

As for regional courts, there are only 8 observations per year and the time series is much longer. It follows that publishing the descriptive statistics for each year separately is pointless and thus only descriptive statistics for all years aggregated are presented in table 10.

Table 10: Regional courts, descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
Caseload	9174.62	9220.80	601.00	47640.00
Case resolution time	448.64	278.01	116.13	1808.96
Number of judges	102.49	49.97	37.00	241.00
Resolved cases	3724.67	4091.09	356.00	20418.00
Caseload per judge	78.22	43.21	14.62	207.13
Resolved cases per judge	31.26	18.98	6.24	89.95

Source: Ministry of Justice of the Czech Republic, 2014, own calculations

The surprisingly huge variance between observations can be explained by the fact that all court-years between 1995 and 2014 are included in the statistics. And of course, the caseload changes greatly in two decades. The case resolution time of regional courts is on average higher than the average case resolution time of district courts. Also the number of resolved cases per judge is smaller. Since regional courts deal with more complicated cases than district courts, this result is absolutely logical. Due to a low number of regional courts, it may be useful to examine each court separately. The key variables for individual regional courts are stated in table 11.

Table 11: Regional court, key variables by courts[37]

Court	average case resolution time	number of judges	number of resolved cases per year	number of cases per year and judge	number of resolved cases per year and judge
Č. Budějovice	234.52	48.45	1366.05	46.56	28.20
Praha (RC)	284.84	81.90	1945.60	41.27	23.76
H. Králové	388.14	78.70	2450.15	66.00	31.13
Plzeň	396.50	75.95	1686.80	48.58	22.21
Ostrava	456.11	128.25	4710.60	86.89	36.73
Praha (CC)	463.20	191.40	10580.55	130.56	55.28
Brno	633.54	128.30	4531.00	107.25	35.32
Ustí n. L.	732.26	87.00	2526.60	103.28	29.04

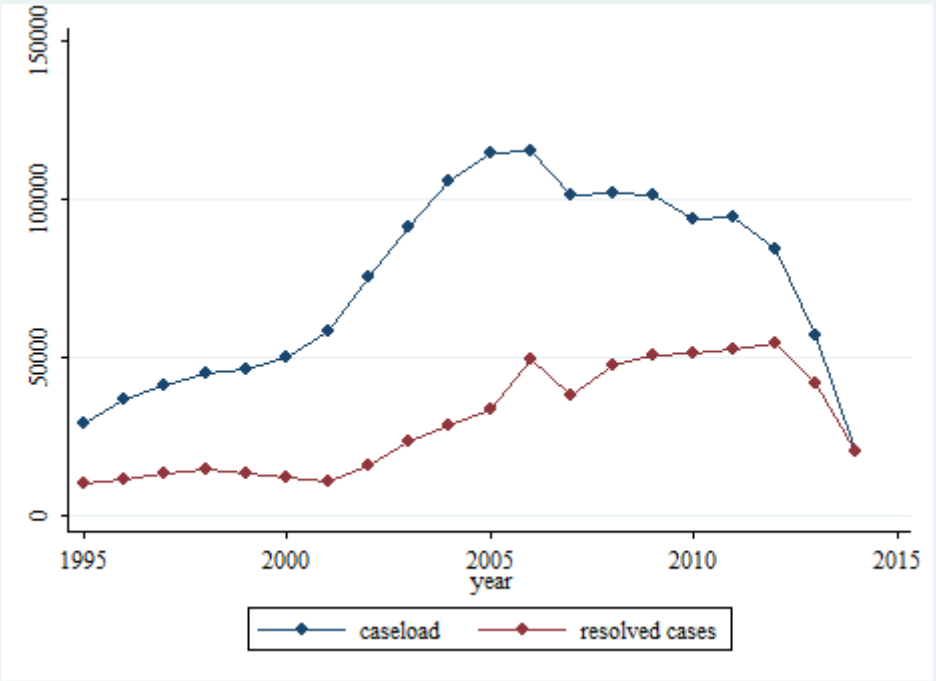
Source: Ministry of Justice of the Czech Republic, 2014, own calculations

The best performing court in terms of case resolution time is the court in České Budějovice and again the slowest court is the regional court in Ústí nad Labem. The best performing court in terms of the resolved cases per judge is city court in Prague, and the smallest number of resolved cases per judge exhibits the court in Pilsen. A closer look at the table also reveals that courts with higher caseload tend to have slower case resolution time. This may indicate that some courts are congested by a huge

[37] RC stays for Regional court and CC stays for City Court

amount of cases to resolve. In case of the regional courts, I present the changes in the key variables graphically in Figures 4, 5 and 6.

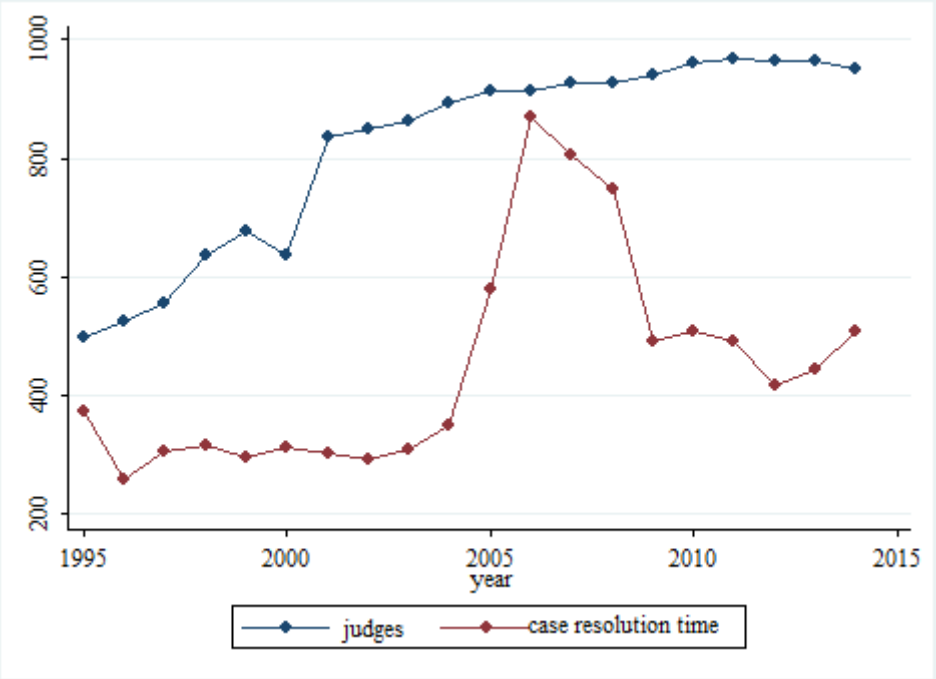
Figure 4: Regional courts, caseload and the resolved cases



Source: Ministry of Justice of the Czech Republic, 2014, own calculations

There is a strong upward trend which peaks at 2006, followed by the opposite trend from 2006. The courts exhibit a disturbing difference between the caseload and the number of resolved cases between the years 2005 and 2010.

Figure 5: Regional courts, case resolution time and the number of judges



Source: Ministry of Justice of the Czech Republic, 2014, own calculations

We can see that the case resolution time skyrockets between the years 2004 and 2006, followed by a fall in the following years. This trend was experienced by all regional courts and it is very difficult to explain this change. It seems that courts focused on finishing old unresolved cases rather than on dealing with the new ones. Also increasing caseload could be partially responsible. Another explanation may also be some changes in the methodology of statistical lists. Neither of these explanations is unfortunately satisfactory. Between 1995 and 2010, there is a positive trend in the number of judges. In the last years, the number of judges was stable.

Figure 6: Regional courts, caseload per judge and resolved cases per judge

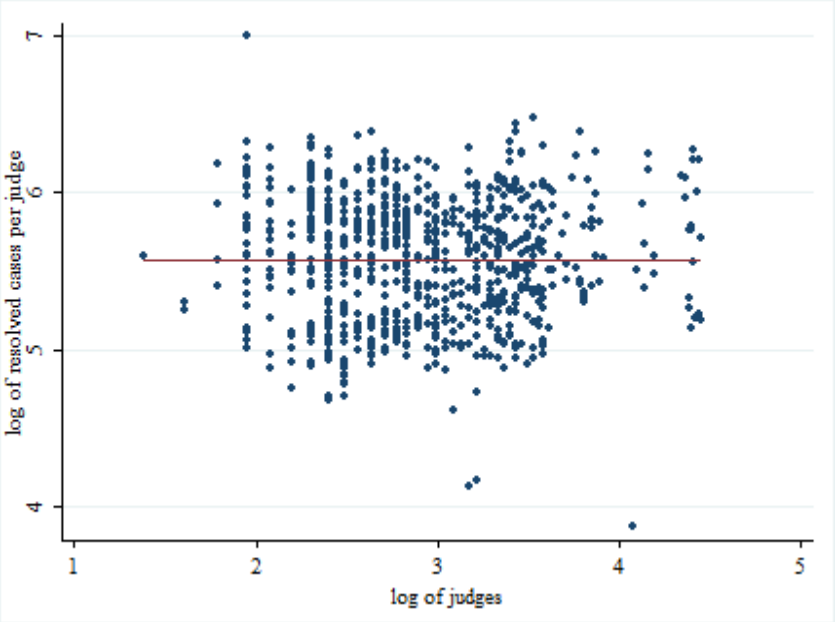
Source: Ministry of Justice of the Czech Republic, 2014, own calculations

The trends in the number of cases per judge and the number of resolved cases per judge are very similar to the trends in the caseload and the number of judges.

4.2 Relationships between key variables

In this section, I focus on relationships between the key variables. I use scatterplots to examine and demonstrate the relationships. All variables are in logs in order to smoothen the differences between observations. The district and the regional courts are examined separately.

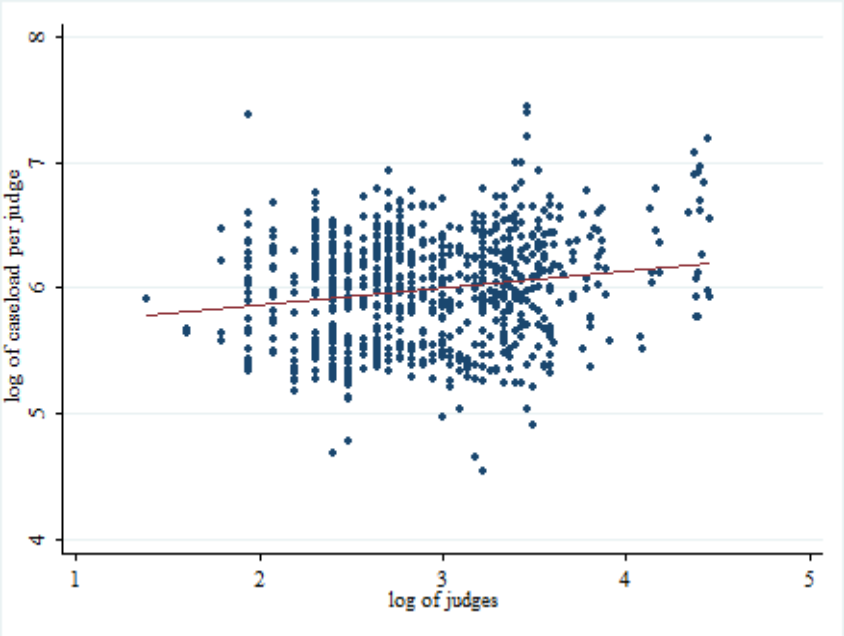
Figure 7: District courts, resolved cases per judge vs. the number of judges



Source: Ministry of Justice of the Czech Republic, 2014, own calculations

There seems to be none or a very small negative correlation between the number of judges and the number of cases resolved by a judge (Figure 7). This result suggests pretty much nothing and it is necessary to control for other factors to get reliable results.

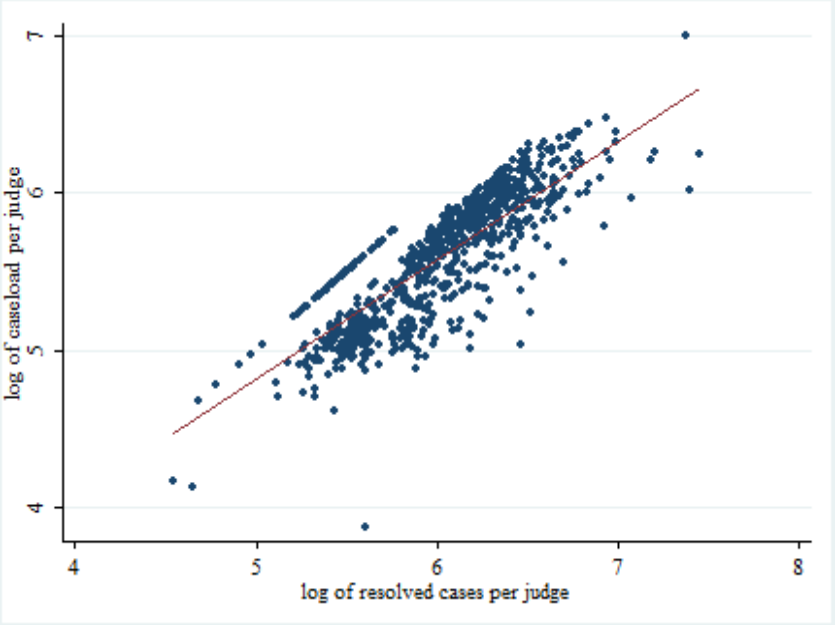
Figure 8: District courts, caseload per judge vs. the number of judges



Source: Ministry of Justice of the Czech Republic, 2014, own calculations

There appears to be a positive relation between the caseload per judge and the number of judges (Figure 8). This may imply that the bigger courts may have insufficient number of judges. However, there is no control for the difficulty of the cases and other factors.

Figure 9: District courts, caseload per judge vs. resolved cases per judge

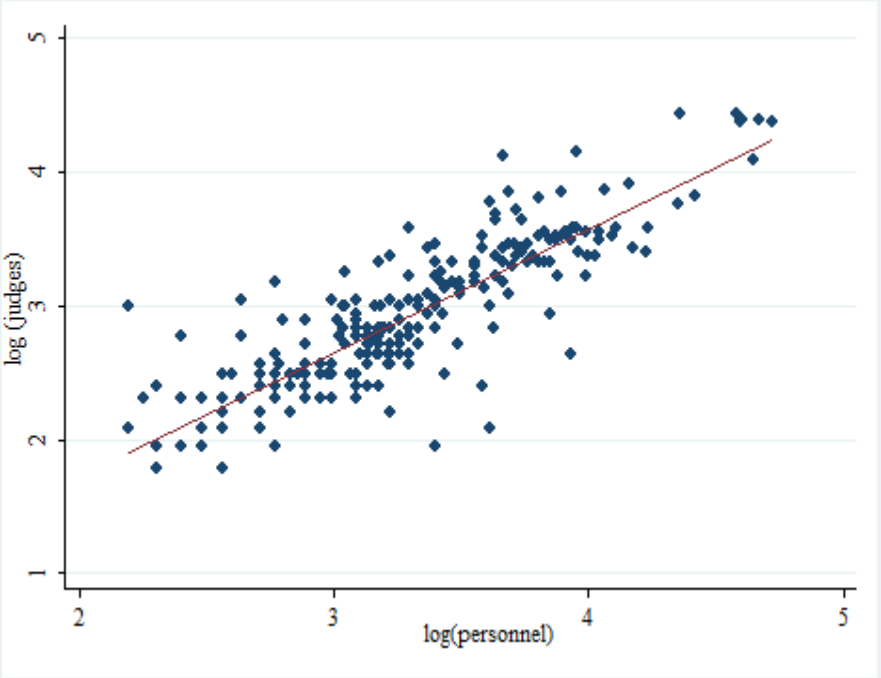


Source: Ministry of Justice of the Czech Republic, 2014, own calculations

Naturally, there is a very strong positive relationship between the resolved cases per judge and caseload per judge (figure 9). Such a relationship is absolutely logical and basically mandatory. Otherwise, the judge would be unable to fulfil her duty and this would lead to a permanent growth in backlogs. The question is how strong the relationship is.

One more interesting piece of information is how the number of judges and other personnel is correlated. They should grow proportionally to make courts as efficient as possible. The relation is displayed in Figure 10. The figure shows that the growth is really almost proportional. The correlation coefficient is 0.89, which may imply that bigger courts may be slightly underequipped with non-judge personnel.

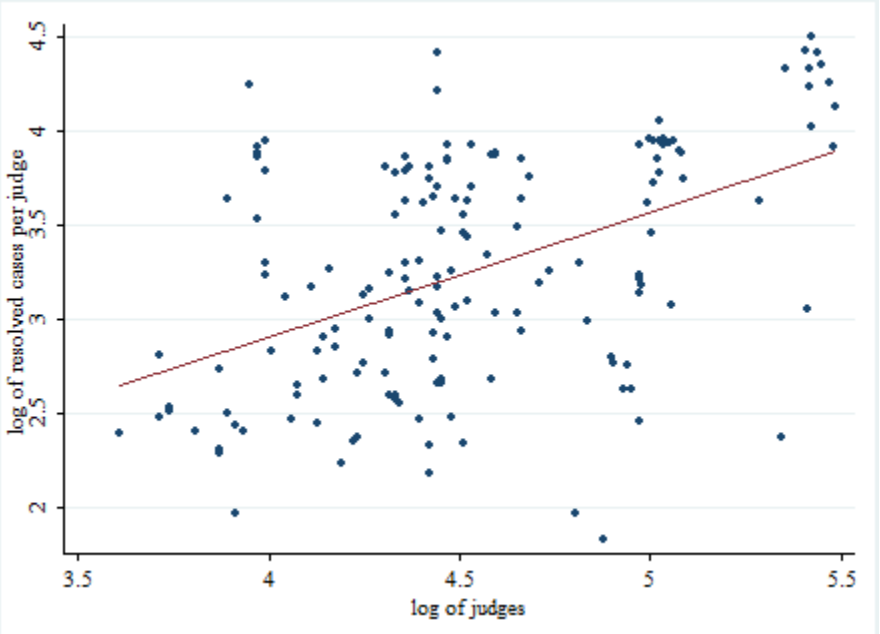
Figure 10: District courts, the number of judges vs. other personnel



Source: Ministry of Justice of the Czech Republic, 2014, own calculations

As for the regional courts, there is a small number of courts – observations, thus each individual court greatly affects the relationship. Figure 13 depicts the correlation of the number of resolved cases per judge and the number of judges.

Figure 11: Regional courts, the resolved cases per judge vs. the number of judges

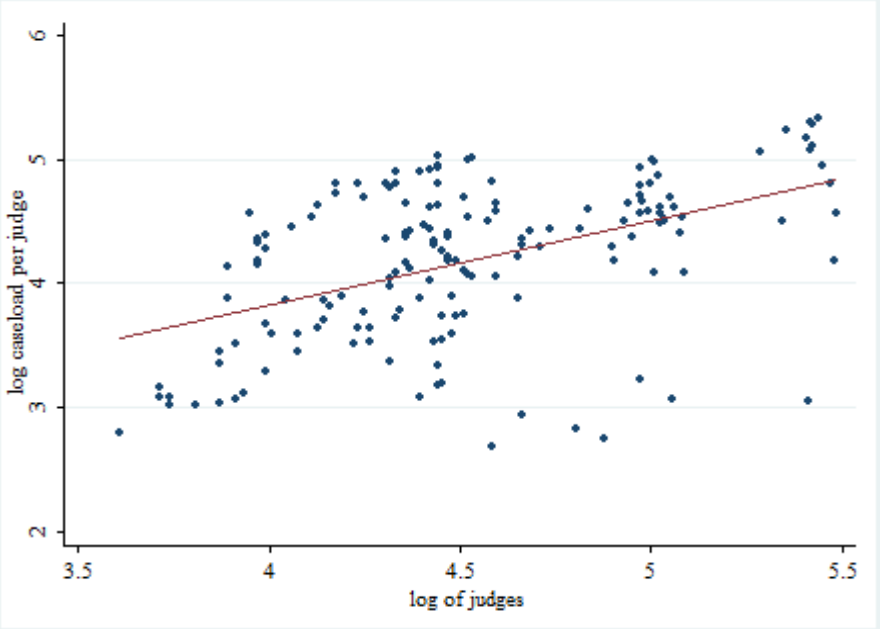


Source: Ministry of Justice of the Czech Republic, 2014, own calculations

Unlike on the level of district courts, there is a clear positive correlation. It is caused by big regional courts in Prague and Ústí nad Labem which deal with very high caseload.

Also the graph suggests that there may be a problem with big variance among observations.

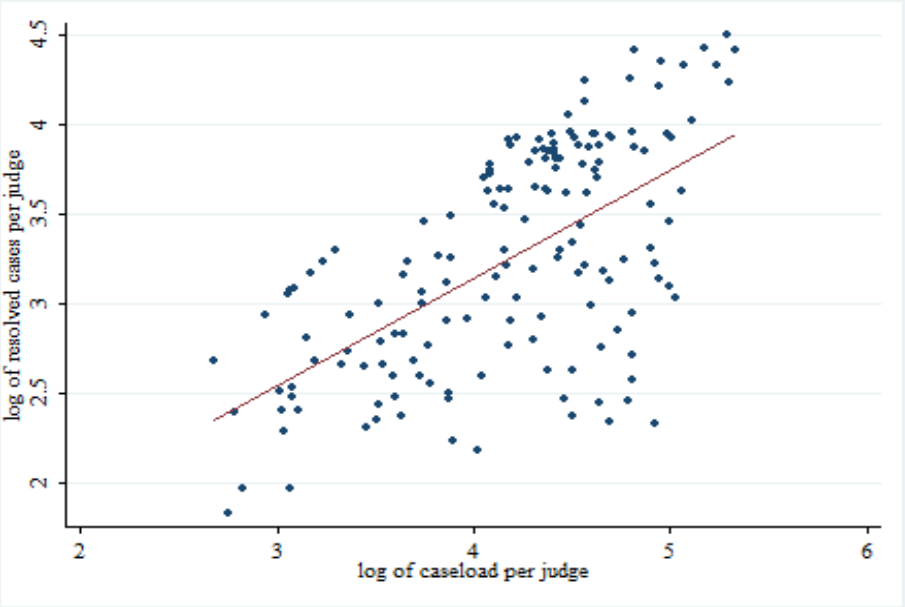
Figure 12: Regional courts, caseload per judge vs. the number of judges



Source: Ministry of Justice of the Czech Republic, 2014, own calculations

Figure 12 depicts the relationship between the number of judges and the caseload per judge. The correlation is much stronger than at the district-courts level. It may imply that particular courts are overwhelmed and may be congested. Yet again, there is a very strong correlation between the number of resolved cases per judge and the caseload per judge (Figure 13).

Figure 13: Regional courts, caseload per judge vs. resolved cases per judge



Source: Ministry of Justice of the Czech Republic, 2014, own calculations

5 Methodology

In this chapter, I describe the methodology of my work. Due to data availability I use more datasets. Each of them has its own pros and cons. I go deeper into this issue in the first part of this chapter. In the second part of the chapter, I discuss variables used in the regressions. And finally, in the third part, I introduce and briefly discuss the employed estimation methods.

5.1 Datasets

I use three different datasets. All datasets contain case-related data, but differs in the data on judicial personnel, in the examined period and whether the court is district or regional. Each dataset has its own pros and cons.

- **Dataset 1** contains data on the district courts between the years 2006[38] and 2014. However, there are only data on the number of judges. On the plus side, the dataset contains the data from a relatively long time period and all 86 district courts, which results in a high number of observations and a panel data structure. On the minus side, the dataset does not contain data on the other judicial personnel. I considered this dataset to be the best one.
- In **Dataset 2**, there are data on judges and other personnel at district courts, but only in the years 2010, 2011 and 2014. The downside of this dataset is that it contains data only from 3 years and there is a two-year gap. It leads to the loss of the advantage that panel data provides. The upside is a higher amount of the information on court personnel.
- **Dataset 3** is focused on regional courts between the years 1995 and 2014. The advantage is very long time period, which enables me to examine courts in the last two decades. Since there are only eight regional courts in the Czech Republic, a big disadvantage of this dataset is a small number of groups. However, there is no way how to avoid this problem at the regional courts level.

[38] Not all data are available for 2006. In the end, year 2006 is not included in the regressions.

5.2 Variables

The primary goal of this section is to discuss the explained and the explanatory variables which are used or could be used in the regressions. Also, the case composition is briefly presented and discussed.

5.2.1 Dependent variables – court outputs

The number of resolved cases

Court output and thus efficiency is usually measured by the court ability to resolve cases. It follows that my primary dependent variable is the number of resolved cases. The more cases a court is able to resolve, the better. Thus the most obvious and used variable is the number of resolved cases per unit of time, usually per year. This variable was used by Beenstock and Haitovsky (2004), Dimitrova-Grajzl et al. (2012), Rosales-López (2008) etc. Even though the number of resolved cases is generally considered to be the best measure of court output, it still has some drawbacks. Firstly, it reflects only cases that were finished in a particular year, but it does not reflect the work which was put into other, not finished, cases. Secondly, it does not reflect the quality of decisions (Dimitrova-Grajzl et al. (2012)). But pretty much no efficiency measure does reflect the quality of judging. So my first dependant variable is the number of resolved cases (*resolved).* In this thesis, I also use an "adjusted" number of resolved cases. In the variable "adjusted" resolved cases *(adj_resolved*) the difficulty of the cases, which are resolved at a particular court and in particular year is included in the regression. More about "adjusting" variables is written in part 5.2.2. The number of resolved cases and the adjusted number of resolved cases are my primary and the most important dependant variables. If the appeal was lodged, the case is included into *resolved* and *adj_resolved* variables in the year when the case was resolved by an appeal court.[39]

The case resolution time

Another possible proxy variable for measuring the output of the judicial system is a case resolution time. It is used by Luskin and Luskin (1986) for example. In my thesis I express the case resolution time as the number of days from the start of the judicial process to the day when the verdict becomes legally effective. The question remains how to aggregate the case resolution time from case-level data to court-level data. Which statistical indicator is the best? The most commonly used are the median and the

[39] It means that the performance of an appeal may be also reflected. It follows that the inclusion of cases on the basis of first-instance court decision may be more appropriate. Unfortunately, the older data includes information only on the date of the final verdict (i.e. only on the decision made by an appeal court). Still, this issue concerns very small fraction of cases and I argue that it will not affect the regression results.

mean. Including the mean is almost mandatory. However, the median has one big advantage in comparison to the mean. It is not affected by the extreme values. In the cases of the case resolution time, there may be a subset of the cases which takes several years or even decades due to various reasons. This subset of cases may lead to an unpleasantly long mean of the case resolution time. I have decided to use both – the mean (*av_time)* and the median (*med_time*).

All dependant variables are used in a logarithmic form in the regressions for two reasons. Firstly, this form is more suitable for the interpretation. In this case, it is better to examine relative changes than the absolute ones. Secondly, a logarithmic form smoothens the differences in size between courts. See Woolridge (2003a) for more details.

5.2.2 Independent variables – court inputs

The number of judges

This is the variable I am interested in and it is vital for testing the hypothesis of this thesis. As already discussed in the theoretical part, appointment of new judges leads to lower caseload pressure on the incumbent judges and that may cause them exert smaller effort. It follows that an increase in the number of judges leads to a very small or a non-existent change in court output. So I expect that a growth in the number of judges leads to no or a very small increase in the number of resolved cases and in the case resolution time.

The caseload

I calculate the caseload for year *t* as the number of cases pending at the beginning of the year *t* plus cases started in year *t*. In other words, cases started and in a particular year are included into the year's caseload. The variable representing caseload is a must in models dealing with the efficiency of courts. The effect of caseload on the number of resolved cases is straightforward. Higher caseload logically leads to a higher number of resolved cases. If a court would not be able to do this it may lead to serious trouble, enormous backlogs and very long case resolution times. The question is whether the court is able to cope with the increased caseload completely and increase the number of resolved cases proportionally or not.

There are mixed findings on the effect of caseload on case resolution time. Luskin and Luskin (1986) find that an increase in caseload leads to a decrease in the case resolution

time. But for example Murell (2001) opposes this conclusion.[40] On the one hand, higher caseload forces judges to exert higher effort, use shortcuts and accelerate the process in order to avoid an increase in backlog. On the other hand, judges may not be able to cope with the increased caseload. In the regressions, I use the "adjusted" caseload (*adj_caseload*) to control for the difficulty of cases.

Case-related variables

Some cases are more difficult and time-consuming than others. And naturally different courts deal with a different set of cases. For example, the composition of cases filed at a small court such as Rokycany is different from the composition of cases filed at courts in Prague.

There are two ways of including the composition of the case-related variables into the model. The most obvious and common way is simple including the variable as an independent variable into the regression. In this case, it means including variables representing relative frequencies of a particular type of case-related factor. Let me present an example for clarification. At the court *a*, the caseload is composed of 100 cases with matter in dispute *x*, 400 cases with matter in dispute *y* and 500 cases with matter in dispute *z*. Thus there are 10 % of cases with matter in dispute *x*, 40 % of cases with matter in dispute *y* and 50 % of cases with matter in dispute *z*. Thus the values of the three variables representing matters of disputes *x*, *y* and *z* in the model for court *a* would be 10, 40 and 50. Naturally, there are many more types of matters in dispute. This fact poses a problem while using the method described earlier. The problem is that it is not possible to work with ceteris paribus assumption. A decrease in a relative frequency of a particular matter in dispute leads to an increase in a relative frequency of an unknown type and number of other matters in dispute. And the effect of differences in the case-composition of courts may be lost due an excessively large number of categories (variables). It follows that I choose different way of including the matter in dispute in the regression, which relies on creating difficulty coefficients for the matter in dispute.

I start with matter of dispute *i* and calculate its relative difficulty coefficient as a ratio of the mean case resolution time of *i* and the overall mean case resolution time. Observations from all years are included in the calculation, thus the relative difficulty coefficient of *i* is constant over time. Afterwards, I compute the difficulty coefficient for court *j* in year *t* as the weighted arithmetic mean of all difficulty coefficients of matters

[40] See chapter 1.2

in disputes while using the numbers of cases with particular matter in dispute as weights. Thus I obtain a difficulty coefficient for each court-year. Of course, the case resolution time is not a perfect approximation of the difficulty of a case. However, it exactly quantifies how long the courts deal with a particular type of case, it is the best tool available and thanks to the huge number of observations, it should sufficient as a proxy for difficulty. Finally I, multiply the caseload and the number of resolved cases by the court-year difficulty coefficients to obtain the adjusted caseload and the adjusted number of resolved cases. By this process, I include the matter in dispute into the regression. To illustrate the effect of difficulty controlling, I display time series of caseload and adjusted caseload in Figure 14.

Figure 14: Comparison of caseload and adjusted caseload

Source: Ministry of Justice of the Czech Republic, 2014, own calculations

Adjusting the caseload actually does not affect the overall caseload in particular years very much. The adjusted caseload in years 1995-2004 is higher which implies that courts were dealing with relatively more difficult cases. The growth in caseload between years 2008 and 2011 is slightly smaller. But it is still enormous. However, changes in the caseload after the adjustment are more apparent on the court-year observations. The best way to examine the effect of adjustment on the caseload is to examine calculated difficulty coefficients. Table 12 displays chosen percentiles of average difficulty coefficients calculated for court-year observations. 1 % of difficulty coefficient values are smaller than 0.793. On the other hand, 1 % of difficulty coefficient values are higher than 1.510. It follows that the difference in the caseload

difficulty is definitely not negligible. The difficulty coefficient for the court-years facing the most difficult caseload is almost two times bigger than the coefficient for court-years facing the least difficult caseload.

Table 12: Chosen percentiles of the difficulty coefficient

Percentile	Dif. Coef.
1%	0.793
5%	0.827
10%	0.848
25%	0.896
50%	0.966
75%	1.119
90%	1.321
95%	1.398
99%	1.510

Source: Ministry of Justice of the Czech Republic, 2014, own calculations

The matter in dispute is a very important indicator of expected case difficulty. It follows that I examine it in greater detail. There are just too many matters in dispute to be discussed, but it is possible to divide them into categories with respect to statistical lists. Frequencies of particular categories are stated in table 13.

Table 13: Frequency of matter in dispute categories

Category of matter in dispute	Frequency	Percentage	Cumulative
Trade disputes	1,158,582	14.40	14.40
Employment disputes	132,436	1.65	16.04
Disputes according to the law about family and civil union	188,392	2.34	18.38
Compensation for damage according to civil code	1,404,445	17.45	35.84
Civil code - lease contracts	588,682	7.32	43.15
Civil code - other contracts of hire	149,974	1.86	45.02
Civil code - property relations	191,867	2.38	47.40
Other rights established by civil law	2 314,399	28.76	76.16
Other civil disputes established by special legislation	163,303	2.03	78.19
Restitution law	25,708	0.32	78.51
Nullity pleas	6,600	0.08	78.59
Recovery of intangible rights	22,105	0.27	78.87
Administration tribunals	173,469	2.16	81.02
Custodianship agenda	1,527,000	18.98	100.00

Source: Ministry of Justice of the Czech Republic, 2014, own calculations

There are four categories which involves most of the litigations. The most represented category is “other rights established by civil law”. An absolute majority of this category

creates trivial agenda. More precisely – 764,400 cases are disputes that concerns unpaid insurance fees, 518,735 cases involve disputes about loans and 372,769 cases are disputes about unpaid fees for gas and electricity supply. In 2009, there was a huge growth in frequency of this type of cases due to the establishment of the electronic payment order. The second most represented category is custodianship agenda. This category is naturally dominated by disputes about paying alimony (469,429 cases) and disputes that concern parenting and raising the children (391,946 cases). The third most common disputes are disputes from the category "compensation for damage according to civil code". With its 1,148,240 cases this category is absolutely dominated by disputes involving paying fines from the public transportation. Logically, a majority of these disputes is filed in cities Pilsen, Ostrava, Brno and especially Prague. This type of disputes experienced a great boom with the introduction of the electronic payment order as well. The second most common in this category is dispute about unjustified enrichment with 122,834 resolved cases. The last major category is trade disputes. The majority of disputes in this category were resolved at courts in Prague. On the basis of previous discussion, it is possible to conclude that a very high share of disputes are disputes that concerns routine and simple agenda - unpaid fees for various things or unpaid fines.

There are also some quantitative variables which may be used as a proxy for the case complexity. It could be argued that cases that ceteris paribus involve more matters in dispute are more difficult, because courts have more issues to deal with at once. Thus the average number of matters in dispute is also included in the regression.

Other case-related variables which could be used

I also have other case-related data at my disposal. Other case-related variables which could be included into the regression are variables representing the type of the plaintiff and the type of the defendant. It is possible that the type of the defendant and plaintiff may ceteris paribus slightly affect the difficulty and the case resolution time of a case. The duration of the process may be affected because a natural person is absent at the court etc. The way the case was started also may affect the output of a court. For example, the electronic payment order may accelerate the resolution. However, these variables are strongly correlated with the matter in dispute and thus including them into the equation in form of adjusting the caseload and the number of resolved cases would lead to bias. Thus these variables are not included in the regressions. Theoretically, a higher number of defendants may complicate the case resolution. Also average

plaintiff's claim may serve as a proxy for case difficulty. However, these proxies for difficulty seem to be non-related to output. After some testing, I decided not to include them in the regression. See Appendix A for robustness check.

Difference between evidence and plan

The Ministry of justice calculates the need for appointment of judges. The ministry of justice distinguish 29 (30 in case of regional courts) categories of cases. Each category is assigned the coefficient which determines number of cases that should be resolved by an average judge per year if he deals only with cases in that category. The need for judges is than calculated as (weighted mean of filings from previous years)/(coefficient) for each category. Calculated needs are than summed to obtain the need for judges at a particular court. Finally, the need is proportionally lowered at all courts when the budget is taken into account. However, the actual number of judges slightly differs from the calculated need due to various reasons. There are fewer judges due to long-term illnesses, retirements, maternity leaves etc. On the other hand, there are more judges at some courts thanks to appointment of new judges, transfers etc. This may lead to a suboptimal number of judges and thus lower court performance. Thus I include the variable which represents the difference between the actual and the planned number of judges (*judges_dif*). The descriptive statistics for *judges_dif* are presented in table 14. Interestingly enough, the mean of *judges_dif* is higher than 0. It implies that the empirical number of judges is on average higher than the planned number of judges.

Table 14: *Judges_dif*, descriptive statistics

Mean	Std. Dev.	Min	Max
1.016	2.598	-15	13

Source: Ministry of Justice of the Czech Republic, 2014, own calculations

Wage ratio

Another included variable is a ratio of the judges' and average lawyers' wages. Judges' wages were calculated on the basis of data from the Czech Statistical Office about average salaries and on the basis of Act No. 236/1995 Coll. which determines the wages of judges. The data on the average lawyers' wages were obtained from annual reports on the website Average Earnings Information System (ISPV). The ratio of the wages (*wage_ratio*) may affect the quality of the judges. Higher values of ratio of (judge wage)/(lawyer wage) may attract more capable lawyers into the judicial system and thus later increase the quality and a pace of the case resolution. It is very difficult to find the most corresponding lag between the change in the ratio and the actual impact of this

change. The training on the post of a judge (the judicial traineeship post) takes three years, thus the ratio may affect the case resolution four years later (possible bureaucratic and other delays included).

Years

I follow Dimitrova-Grajzl et al. (2012) and also include dummy variables for years to control for possible year-specific events that affected all courts in the same way.

Non-judge personnel

Finally, the last category of dependant variables includes variables that represent the number of non-judge personnel at a court. In the regression I can use variables representing the numbers of following courts' personnel: rechtspflegers, judicial assistants, judicial secretaries, chiefs of an office and the recording clerks. A rechtspfleger is entitled to perform individual tasks in the process and even make partial decisions in judicial agenda. A judicial assistant performs tasks assigned to him by a judge, also makes simple decisions and works on the drafts of verdicts. A judicial secretary sometimes conducts a hearing of a litigants and works on the court's documentation and files. A chief of an office runs and organizes the courts' office and performs administrative tasks. A recoding clerk writes a court record in a court hall and transcribes audio records. I put two variables that represent the numbers of non-judge personnel in the model. Variable *legalpers* represents personnel who actually assists the judge in deciding cases, i.e. provides the judge legal assistance. It includes rechtspflegers and judicial assistants. Variable *adminpers* stands for three remaining personnel categories. Naturally, I expect that non-judge court personnel affect the output of a court positively. However, a similar problem as with the judges may appear – with an increasing number of judicial personnel, the incumbent personnel may decrease their effort and thus not increase the court's output.

So, I specify the following model:

$$\text{Court output}_{it} = f(\text{Judges}_{it}, \text{Caseload}_{it}, \mathbf{a}_{it)} + u_{it}$$

In the equation, *i* identifies the court and *t* identifies the year. $\mathbf{a}_{it}$ denotes the vector of other variables that are discussed above and are included in the model. u_{it} is the error term. The court output stands for the number of resolved cases, the adjusted number of resolved cases, the average case resolution time and the median case resolution time.

5.3 Estimation methods

In this subchapter of the thesis, I discuss employed estimation methods and the reasoning behind their application. For more elaborate and detailed explanation of these methods see Woolridge (2002a) or Woolridge (2002b), for example. As for the estimation methods, this thesis is greatly inspired by Dimitrova-Grajzl et al. (2012).

5.3.1 Pooled Ordinary Least Squares

I follow the majority of the recent literature that deals with the effect of the number of judges on the efficiency of the judicial system and use Ordinary Least Squares (OLS) as a starter. It is a simple linear regression model, which is defined as follows:

$y = \beta_0 + \beta_1 x + u$

These models are based on the assumption that there is a linear relationship between explained variable y and explanatory variable x. In our case, between court output (resolved cases, case resolution time) and court input (the number of judges). "*The variable u, called the error term or disturbance in the relationship, represents factors other than x that affect y*."[41] In other words, u represents unobserved factors that are not included in the model. OLS is an estimation method and one possible way to determine β_1. To put it simple, all observations from the dataset could be put into the graph as points. OLS creates a line in such a way that squared distance between actual observations (points) and the estimation points on the line is minimized. Naturally, x (the number of judges) is not the only factor that affects y (court output). All other effects are still in the error term. It is possible to add more variables to the equation. In our case, it is caseload, the number of other personnel etc. For example, by including the number of other personnel into the equation, we take it out of the error term. In other words, we control for it. The more relevant variables are put into the equation, the more factors are controlled for and thus the more precise and realistic the estimations are. It follows that I estimate the following equation:

$$log(output)_{it}{}^{42} = \beta_0 + \beta_1 log(judges)_{it} + \beta_2 log(adj\_caseload)_{it} + \sum_{k=1}^{n} \beta_k x_{kit} + u_{it}$$

X_k always represent k-th independent variable in a particular model, apart from the number of judges and caseload.

[41] Woolridge (2002a), p. 23

[42] The number of resolved cases, adjusted number of resolved cases, average and median case resolution time

The Woolridge (2002b)-Drukker (2003) test for autocorrelation suggests that autocorrelation[43] is present in the data. It follows that I base the interference on the cluster-robust standard errors by courts to allow for the arbitrary correlation within courts and to control for heteroscedasticity[44]. See Cameron and Miller (2013) for a detailed discussion about clustering standard errors.

Unfortunately, OLS does not deal with the endogeneity problem. One source of the endogeneity is caused by the fact that the estimation suffers from the omitted variable problem. In other words, there is an unobserved heterogeneity on the court level and therefore the courts differ in the aspects that are not captured in the model. The second source of endogenity is connected with reversed causality. If the court exhibits signs of need for more judges (high backlogs, slow case resolution, sudden growth in the case filings, etc.) the new judges may be appointed to deal with this problem. So the number of judges is a response to the case resolution and not its cause. The same logic can be applied on the caseload. Courts with more efficient case resolution may attract more filings. In the Czech Republic, judges are allocated on the basis of fillings per year. The disputants may also utilize ADR if they find courts to be slow and ineffective. It follows that the problem of reversed causality may be present in the data. For dealing with endogeneity more sophisticated estimation methods must be employed.

5.3.2 Fixed effects estimation

Estimation based on fixed effects (FE) is a logical follow-up on the OLS method while using the panel data. The method aims to deal with the unobserved heterogeneity problem. There are two types of unobserved effects: the ones that vary over time and the constant ones. A simple model with two periods and one explanatory variable can be written as follows:

$$y_{it} = \beta_0 + \beta_1 x_{it} + a_i + u_{it}$$

where term a_i captures the time-constant unobserved heterogeneity between courts. The method is based on differencing a_i away. Firstly, it is required to average the equation over time for each *i* and thus obtain:

$$\bar{y}_i = \beta_1 \bar{x}_{it} + a_i + \bar{u}_i$$

[43] It means that error terms are somehow correlated across the time. Such a thing is usually undesirable in the regression since it may lead to incorrect standard errors. Again, see Woolridge (2002a).

[44] Heteroscedasticity is present when the error does not have a constant variance. Heteroscedasticity may lead to biased estimates of the standard errors

Since a_i is constant over the time and thus same in both equations, differencing between the first and the second equation makes it disappear and we can dispose of unobserved heterogeneity. Thus the obtained equation is following:

$$\ddot{y}_{it} = \beta_1 \ddot{x}_{it} + \ddot{u}_{it}$$

The final step is just using the OLS. In my model, I work with more explanatory variables, but the principle remains the same – calculate the average over time and subtract the equations. In the case of the Czech Republic, the number of judges is relatively stable but the caseload is not. I believe that using FE is still justified.[45] Again, the interference is based on the cluster-robust standard errors by courts. I estimate the two-way fixed effects (to control for both – court and year fixed effects) model in the following form:

$$log(output)_{it}{}^{46} = a_i + \lambda_t + \beta_1 log(judges)_{it} + \beta_2 log(adj\_caseload)_{it} + \sum_{k=1}^{n} \beta_k x_{kit} + u_{it}$$

5.3.3 Instrumental variable approach

The instrumental variable (IV) approach can deal with the reversed causality problem. As the name of the method suggests, it is necessary to find a suitable instrument and used it in the regression. Let us assume that we want to estimate the following equation:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + u$$

However, x_1 and u are correlated. Such a correlation must be controlled for. To do this, we have to find the so-called instrumental variable z, which is related to the endogenous explanatory variable x_1 and not correlated with u. It is possible to use more instruments (more "zeds") and "*with multiple instruments, the IV estimator is also called the two stage least squares (2SLS) estimator*[47]", because this estimation is performed in two stages. In the first stage, we are searching for the best linear combination of the instruments. In other words, we are searching for the combination of exogenous variables (z_i) which exhibits the highest correlation with x_1 and leads to obtaining the best $\hat{x}_1$. In the second stage we use $\hat{x}_1$ instead of x_1 in the original equation.

The utilization of 2SLS was introduced in the court efficiency analysis relatively recently by Dimitrova-Grajzl et al. (2012) and I will follow their work. They base their

[45] And the Hausman test confirmed my belief while I was deciding between fixed and random effects
[46] Again, the number of resolved cases, adjusted number of resolved cases, average and median case resolution time
[47] Woolridge (2002a), p. 477

analysis on the assumption that caseload and judicial staffing are not strictly but sequentially exogenous. Under this assumption, the error term u_{it} is not correlated with past and current values of the caseload and the number of judges. But it may be correlated with their future values. This assumption holds if the changes in the caseload and the judicial staffing are responses to court performance in the previous year. The whole 2SLS analysis is performed in the differences to control for court fixed effects. Still, differences in the caseload and in the number of judges are correlated with an error term and must be instrumented. And under the assumption of the sequential exogeneity the lagged differences of caseload and the number of judges could be used as instruments. Yet again, the interference is based on the cluster-robust standard errors. So I use $\Delta\log(judges)_{it-1}$ and $\Delta\log(adj\_caseload)_{it-1}$ as instruments and estimate the model in the following form:

$$\Delta\log(output)_{it}{}^{48} = \beta_1 \Delta log(judges)_{it} + \beta_2 \Delta log(adj\_caseload)_{it} + \sum_{k=1}^{n} \beta_k \Delta x_{kit} + \Delta u_{it}$$

[48] Again, the number of resolved cases, adjusted number of resolved cases, average and median case resolution time

6 Results

In this section, the results of the regressions are presented and discussed. The chapter is divided into parts on the basis of the used dataset. I do not include a constant and estimates for year dummies in the result tables. For all datasets, I report the results for 4 dependant variables – the number of resolved cases, the adjusted number of resolved cases, average and median case resolution times. Resolved cases are far more utilized than case resolution time in the recent literature and I also consider resolved cases and adjusted resolved cases as my primary and most relevant dependant variable. The adjusted resolved cases variable reflects the difficulty of the caseload also in the resolved cases while the resolved cases variable does not reflect the difficulty coefficient. It must be also noted that the number of resolved cases and the case resolution time are different proxy measures of the efficiency and the estimation results may not necessarily lead to the very same conclusion. If this happens, I consider the number of resolved cases to be more reliable.

6.1 Dataset 1, district courts in 2006 - 2014

Firstly, I examine the results based on the first dataset. I.e., the dataset that contains data on district courts between 2006 and 2014. I start with the number of resolved cases and the adjusted number of resolved cases as the dependent variable. The results are displayed in tables 15 and 16.

The results confirm my hypothesis. The OLS estimates suggest that a 10% increase in the number of judges leads to a 3.7% increase in the number of resolved cases (a 3% increase in case of adjusted resolved cases). Furthermore, the OLS suggest that a 10% increase in the caseload leads to 5.3% (6.4%) growth in the number of resolved cases. Also the average number of matters in dispute seems to affect the case resolution. The one unit growth in the average number of matters in dispute leads to a 2.8% (4.9%) drop in the case resolution. Naturally, such a growth is purely theoretical. The majority of cases have only one matter in dispute. The difference between the planned and actual number of judges seems to have an almost non-existent effect.

Table 15: Results - Dataset 1, number of resolved cases

log(resolved)	OLS	FE	2SLS
log(adj_caseload)	0.534***	0.561***	1.412***
	(0.0555)	(0.0493)	(0.410)
log(judges)	0.374***	0.0257	-0.0683
	(0.0621)	(0.0437)	(0.136)
n_matters	-0.275*	-0.779***	-0.126
	(0.154)	(0.138)	(0.415)
judges_dif	-0.0195***	-9.51e-05	0.00169
	(0.00421)	(0.00367)	(0.00362)
L4wage_ratio	0.177***	0.116***	-0.0230
	(0.0582)	(0.0328)	(0.0804)
Observations	688	688	602
R-squared	0.963	0.946	0.842

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: Ministry of Justice of the Czech Republic, 2014, own calculations

Table 16: Results - Dataset 1, adjusted number of resolved cases

log(adj_resolved)	OLS	FE	2SLS
log(adj_caseload)	0.640***	0.655***	1.428***
	(0.0436)	(0.0494)	(0.364)
log(judges)	0.302***	0.0189	-0.0402
	(0.0521)	(0.0436)	(0.119)
n_matters	-0.494***	-0.841***	-0.285
	(0.113)	(0.140)	(0.364)
judges_dif	-0.0121***	-0.000106	0.00135
	(0.00341)	(0.00431)	(0.00336)
L4wage_ratio	0.172***	0.110***	-0.00960
	(0.0516)	(0.0335)	(0.0756)
Observations	688	688	602
R-squared	0.973	0.944	0.875

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: Ministry of Justice of the Czech Republic, 2014, own calculations

The wage ratio affects the case resolution positively. A growth of the ratio by one unit (the judicial wage may increase or the lawyers' wage may drop) leads to a growth in the case resolution by approximately 1.7%. It implies that increasing judicial wages may actually affect the court performance. The FE estimations suggest that a 10% increase in the caseload leads to a 5.6% (6.5%) increase in the cases resolved. The effect of the number of judges changed drastically – it is now statistically insignificant and very close to zero. Such results suggest that the OLS estimates were indeed biased. The FE

estimates also show negative effect of the number of matters in dispute. There is a problem with the 2SLS estimation – a majority of its estimates are statistically insignificant. This fact must be kept in mind while interpreting the results. The estimates suggest that a 10% increase in caseload leads to a 14% growth in the number of resolved cases. It implies that number of resolved cases changes more than proportionally with the change in caseload. Even though the result may seem surprising, it is in full compliance with the results of Dimitrova-Grajzl et al. (2012). The effect of the growth in judicial staffing is again non-existent. The wage ratio has no effect in 2SLS estimation. The difference between the planned and actual number of judges seem to have no effect at all. The result for the first stage of the 2SLS estimations are reported in Table 17.

Table 17: First stage results for 2SLS

	Δlog(judges)		Δlog(adj_caseload)	
	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
$\Delta\log(judges)_{t-1}$	-0.289	0.090	-0.014	0.031
$\Delta\log(adj\_caseload)_{t-1}$	0.035	0.050	0.088	0.050
Δn_matters	-0.098	0.095	-0.934	0.106
Δjudges_dif	0.014	0.003	-0.003	0.002
Δwage_ratio	0.060	0.049	0.099	0.083
Observations	602		602	
F-test of overall significance	3.67		459.05	

Source: Ministry of Justice of the Czech Republic, 2014, own calculations

While using average and median case resolution time as the dependent variable, I do not utilize the IV approach since this method is developed only for models with the number of resolved cases as the dependant variable. The results for OLS and FE estimations are displayed in tables 18 and 19.

Table 18: Results - Dataset 1, average case resolution time

log(av_time)	OLS	FE
log(adj_caseload)	0.800***	0.214**
	(0.0989)	(0.0826)
log(judges)	-0.580***	-0.0156
	(0.131)	(0.0757)
n_matters	0.864***	0.687***
	(0.303)	(0.212)
judges_dif	0.0349***	-0.00214
	(0.0113)	(0.00569)
L4wage_ratio	-0.422**	-0.149**
	(0.165)	(0.0711)
Observations	688	688
R-squared	0.537	0.542

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: Ministry of Justice of the Czech Republic, 2014, own calculations

As for the case resolution time, the OLS estimates suggest that a 10% growth in the caseload leads to an 8 % growth in the average case resolution time and a 9.5% growth in the median case resolution time. The result suggests that courts may struggle to deal with growth in the caseload. The estimation results furthermore suggest that a 10% increment in the number of judges accelerate the case resolution – it reduces the average and median times by 5.8 % or 6.2 % respectively.

Table 19: Results - Dataset 1, median case resolution time

log(med_time)	OLS	FE
log(adj_caseload)	0.946***	0.433***
	(0.108)	(0.0978)
log(judges)	-0.618***	0.0297
	(0.132)	(0.0960)
n_matters	0.910***	0.810**
	(0.340)	(0.319)
judges_dif	0.0331***	-0.00921
	(0.0120)	(0.00731)
L4wage_ratio	-0.411**	-0.132***
	(0.166)	(0.0945)
Observations	688	688
R-squared	0.609	0.577

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: Ministry of Justice of the Czech Republic, 2014, own calculations

However, the fixed effects estimation almost turns these results upside down. The increment in the number of judges has basically no effect on the average and median case resolution times. Furthermore, the estimates suggest that courts are able to deal with growth in caseload relatively well. A 10% growth in caseload leads to a 2.1% growth in the average case resolution time and a 4.3% growth in median. So either the judges are not exerting much effort while dealing with lower caseload or they are forced to accelerate the case resolution by decreasing the quality of the process and the verdict. This result resonates with previous FE estimation results. Yet again the difference between the actual and the planned number of judges seems to have no effect. A higher number of matters in dispute seems to slow down the case resolution, even though this effect is mildly exaggerated by the OLS estimates. A growth in judges'/lawyers' wages by 1 unit accelerates the case resolution by approximately 1.5%.

6.2 Dataset 2, district courts in 2010, 2011, 2014

In this section, I present the results based on the dataset containing data on all judicial personnel to get an insight into the effect of non-judge personnel on court efficiency. I use OLS and FE estimations. 2SLS estimation is not suitable due to the size and the structure of the dataset. I start with dependant variables *resolved* and *adj_resolved*.

Table 20: Results - Dataset 2, number of resolved cases

log(resolved)	OLS	FE
log(adj_caseload)	0.535***	0.430***
	(0.0768)	(0.0777)
log(judges)	0.308***	0.0225
	(0.0864)	(0.0576)
n_matters	-0.248	-0.946***
	(0.225)	(0.310)
judges_dif	-0.0205***	0.00410
	(0.00447)	(0.00662)
L4wage_ratio	0.156*	-0.0276
	(0.0796)	(0.0861)
log(legalpers)	0.0122	0.00626
	(0.0246)	(0.0299)
log(adminpers)	0.0436*	-0.00882
	(0.0231)	(0.0185)
Observations	254	254
R-squared	0.959	0.943

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: Ministry of Justice of the Czech Republic, 2014, own calculations

Table 21: Results - Dataset 2, adjusted number of resolved cases

log(adj_resolved)	OLS	FE
log(adj_caseload)	0.646***	0.533***
	(0.0645)	(0.0840)
log(judges)	0.238***	0.0149
	(0.0731)	(0.0554)
n_matters	-0.583***	-1.161***
	(0.170)	(0.338)
judges_dif	-0.0107***	0.00600
	(0.00395)	(0.00728)
L4wage_ratio	0.148**	-0.0691
	(0.0695)	(0.0919)
log(legalpers)	0.0170	-0.000891
	(0.0234)	(0.0309)
log(adminpers)	0.0358*	-0.000703
	(0.0205)	(0.0198)
Observations	254	254
R-squared	0.971	0.944

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: Ministry of Justice of the Czech Republic, 2014, own calculations

In case of Dataset 2, the panel is too short and most of the variation comes from the difference between courts. Therefore the OLS estimation is relatively more believable than the FE estimation. The effect of both categories of judicial employees seems to be non-existent. There are a few possible explanations for a non-existing effect of judicial staffing, which were already mentioned in section 5.2.2. Firstly, a similar problem as with the judges appears – when increasing number of judicial personnel, the incumbent personnel decrease their effort and thus the court output. Secondly, even though the Ministry of Justice determines the maximum number of personnel for each court, the final decision is up to individual courts. It follows that some courts employ a lesser number of more skilled clerks and reward them financially for their effort. Thirdly, the data are insufficient for closer examination of the effect of judicial staffing. Thus more data are needed to obtain panel dataset and enable employment of more advanced estimation methods and further research. Naturally, the rest of the estimates are very similar to the results obtained from the first dataset.

Tables 22 and 23 display the results of estimations with average and median case resolution time used as a dependant variable.

Table 22: Results - Dataset 2, average case resolution time

log(av_time)	OLS	FE
log(adj_caseload)	0.671***	0.100
	(0.103)	(0.0922)
log(judges)	-0.351**	0.0819
	(0.140)	(0.0848)
n_matters	0.439	-0.520
	(0.487)	(0.397)
judges_dif	0.0388***	-0.00877
	(0.0114)	(0.00930)
L4wage_ratio	-0.392*	-0.0972
	(0.235)	(0.113)
log(legalpers)	0.0356	-0.0159
	(0.0680)	(0.0523)
log(adminpers)	-0.106**	-0.0180
	(0.0529)	(0.0240)
Observations	254	254
R-squared	0.506	0.545

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: Ministry of Justice of the Czech Republic, 2014, own calculations

Again the effect of judicial staffing is non-existent and statistically insignificant in regressions. Only the OLS estimation suggests that a 10% growth in administrative support staff leads to a 1% drop in case resolution time. And again the rest of the results are rather similar to the results obtained from the estimation based on the dataset 1. There is only one big difference. The FE estimations suggest that an increase in the average number of matters in dispute accelerate the case resolution. This result is not logical and contradicts the results from all other regressions. I attribute this result to insufficient data.

Table 23: Results - Dataset 2, median case resolution time

log(med_time)	OLS	FE
log(adj_caseload)	0.827***	0.381***
	(0.121)	(0.128)
log(judges)	-0.401**	0.197
	(0.155)	(0.127)
n_matters	0.283	-1.283**
	(0.585)	(0.603)
judges_dif	0.0313**	-0.0390**
	(0.0130)	(0.0167)
L4wage_ratio	-0.386	-0.141
	(0.261)	(0.187)
log(legalpers)	0.0333	0.0286
	(0.0863)	(0.0813)
log(adminpers)	-0.108	-0.0478
	(0.0696)	(0.0346)
Observations	254	254
R-squared	0.570	0.629

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: Ministry of Justice of the Czech Republic, 2014, own calculations

In sum, the results suggest that appointment of new judges to district courts does not increase court output and thus it does not fulfil its goal and can be considered as a pointless increase in costs. Thus, the policy recommendation is not to increase the number of judges.

6.3 Dataset 3, regional courts in 1995-2014

In case of regional courts, only the number of judges, adjusted caseload, the difference between the actual and the planned number of judges and dummies for years are included as explanatory variables. The rest of the variables seem to have no effect and no statistical significance. There is no logical reason for the inclusion of the wage ratio, because newly appointed judges are allocated to district courts. The best performing judges can be promoted to the regional courts after many years of service. Also the data on the wage ratio are not available for the years 1995-2000. Thus including lagged wage ratio would greatly reduce the number of observations in the regression. Including such a small number of independent variables may seem to be insufficient but since the most important case-related variable, which is a type of matter in dispute, is implicitly

included I argue that all important factors are controlled for[49]. Also the 2SLS estimation is not employed since it is not suitable for regional courts due to a low number of observations. The problem with the Dataset 3 regression is a very small number of courts - only eight regional courts. Again, I start with the resolved cases and the adjusted resolved cases as the dependant variable.

Table 24: Results - Dataset 3, number of resolved cases

log(resolved)	OLS	FE
log(adj_caseload)	0.404**	0.632***
	(0.157)	(0.148)
log(judges)	0.768**	0.575*
	(0.292)	(0.293)
judges_dif	-0.00174	-0.00119
	(0.00310)	(0.00242)
Observations	160	160
R-squared	0.915	0.902

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: Ministry of Justice of the Czech Republic, 2014, own calculations

Table 25: Results - Dataset 3, adjusted number of resolved cases

log(adj_resolved)	OLS	FE
log(adj_caseload)	0.509**	0.748***
	(0.175)	(0.191)
log(judges)	0.627*	0.494*
	(0.298)	(0.227)
judges_dif	-0.00158	-0.00167
	(0.00295)	(0.00243)
Observations	160	160
R-squared	0.944	0.947

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: Ministry of Justice of the Czech Republic, 2014, own calculations

The effect of caseload and the number of judges on case resolution is again positive in the OLS estimation. OLS suggests that a 10% growth in the caseload leads to a 4% (5%) increment in the number of resolved cases. The effect of the number of judges seems to be relatively strong - increasing the number of judges by 10 % leads to a growth in of 7.7% (6.3%) in the number of resolved cases. Unlike on the district court level, the fixed effects estimation confirms the direction of OLS estimates. FE estimates suggest that caseload affects the number of resolved cases very strongly. A 10% growth

[49] Moreover, in recent empirical literature, very few control variables are being included in the regressions. Caseload and the number of judges are by far the most important variables.

in caseload results in a 6.3% (or even 7.5%) increment in the number resolved cases and a similar growth in the number of judges leads to a 5.8% (5%) increase in the number of resolved cases. All estimations show that the difference between the planned and the actual number of judges has no effect.

Table 26: Results - Dataset 3, average case resolution time

log(av_time)	OLS	FE
log(adj_caseload)	0.303**	-0.0433
	(0.108)	(0.0857)
log(judges)	-0.0220	0.00930
	(0.281)	(0.164)
judges_dif	0.00111	0.00169
	(0.00406)	(0.00360)
Observations	160	160
R-squared	0.671	0.735

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: Ministry of Justice of the Czech Republic, 2014, own calculations

Table 27: Results - Dataset 3, median case resolution time

log(med_time)	OLS	FE
log(adj_caseload)	0.390***	0.172**
	(0.106)	(0.0665)
log(judges)	-0.140	-0.0372
	(0.224)	(0.109)
judges_dif	0.00182	-0.000788
	(0.00440)	(0.00343)
Observations	160	160
R-squared	0.695	0.653

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: Ministry of Justice of the Czech Republic, 2014, own calculations

The OLS estimates suggest that a growth in number of judges does not affect the average case resolution time and leads to a slightly lower median case resolution time. The FE estimates suggest that the number of judges does not affect the output of a court. This result does not correspond to the previous results. As already discussed, I find the results with the number of resolved cases to be more reliable. As for the caseload, the OLS estimates suggest that a 10% growth in the caseload leads to a 3.3 % increment in the average resolution time and a 3.9 % growth in the median resolution time. The FE estimation suggests that the median case resolution time grows by 1.7% if the caseload grows by 10%.

To sum up, the results suggest that there is some merit in appointment of new judges to regional courts, but the expected improvement in output is not proportional and it should be considered whether the improvement is sufficient or not. However, due to various issues, the results should be treated carefully.

6.4 Statistical verification

There is actually not much of a statistical verification to be done. Since I base my interference on the cluster robust standard errors, there is no need to check for heteroscedasticity and autocorrelation. The problem of endogeneity was discussed earlier and more sophisticated estimation methods were employed to deal with it. The two variables that must be included in the model (caseload and the number of judges) are strongly correlated. It follows that the multicolinearity present in the model may be relatively strong. A test based on the VIF (variance inflation factor) was performed. The highest VIF value was 11.83 for adjusted caseload. A rule of thumb suggests that variables with VIF of 10 and higher should be more closely examined. In this case, I conclude that the multicolinearity in the model is still bearable and acceptable, because the high value of VIF is caused by arbitrary strong correlation between caseload and judicial staffing.

The only thing that remains is to test the strength of my instruments used in 2SLS regressions in Dataset 1. I follow Bound et al. (1995) and Staiger and Stock (1997) and use F-statistic of excluded instruments in the first stage regression to examine the strength of the instrument. Staiger and Stock (1997) came out with a rule of thumb which states that an F-statistic lower than 10 indicates a weak instrument. The F-statistic of excluded instrument is 5.60 in case of $\Delta\log(\text{adj\_caseload})_{it-1}$ and 1.77 in case of $\Delta\log(\text{judges})_{it-1}$. It follows that the instruments are unfortunately weak. Therefore, the 2SLS results should be treated with caution. The FE estimation seems to be more reliable.

7 Extensions

In the previous chapters, I analyzed the effect of the number of judges on court output. However, there are a few additional questions which remain unanswered. In this part, I tackle two additional questions related to court performance. Firstly, do courts which exhibit higher performance in terms of case resolution produce lower quality verdicts? In other words, is there a quantity-quality tradeoff? Secondly, does a sudden increase in court's caseload affect performance in following time periods?

7.1 Quantity-quality trade-off

This part is dedicated to the examination of quantity-quality trade-off. It examines whether courts with high output in terms of resolved cases exhibit a lower quality of judging or not. In other words, it examines whether the high court output is produced at the expense of the quality of a judging. Firstly, I briefly discuss theoretical background. The second part is dedicated to the descriptive statistics of quality measures. The third part presents the methodology and the results.

7.1.1 Theoretical background

It is not possible to measure the quality of case resolution directly, but there are variables which can be used as a proxy for the quality of the case resolution. There are several measures of the quality of courts decision-making (Djankov et al. (2003) or Choi (2011)). With respect to the data available, I use the appeal rate and the rate at which verdicts are reversed by courts of higher instance[50]. Lower appeal and reversal rates suggest that the verdicts are of a higher quality. Naturally, neither of these proxies is perfect. The appeal rate depends not only on the quality of the verdict, but also on other factors. Whether the appeal is lodged depends on litigants' subjective evaluation of the costs of appealing and the probability of the appeal being successful (Priest and Klein (1984)). And the differences in subjective evaluations may lead to different appeal rates at courts with the same quality of verdicts. The reversal rate suffers from the fact that judges may adjust their decisions with respect to preferences of judges at appeal courts. The reversal rate than may be affected by the degree at which the judges adjust their verdicts and their ability to predict the preferences of judges at appeal courts (Choi et al. (2010) or Choi et al. (2011)).

[50] It is reversal rate. I define reversal rate as a ratio of reversed verdicts by courts of higher instance to all cases resolved by an appeal court. Sometimes, the reversal rate is defined as a ratio of reversed verdicts by an appeal court to all cases resolved by court of lower instance

The quantity-quality trade-off is tackled by López (2008). Firstly she runs the regression concerning judicial output in Spain and then she divides courts into two groups (higher and lower performance courts) on the basis of regression residuals. Afterwards she runs ANOVA (Analysis of Variance) to compare the means of the reversal rate of both groups. She concludes that there is no difference between the reversal rate of higher and lower performance courts. Dimitrova-Grajzl et al. (2015) perform very similar research on data from Bulgaria. Again, they divide courts into two groups on the basis of case resolution and compare the means of the number of cases appealed. They use a two-sided two-sample t-test and find no "*persuasive evidence of the existence of a quality-quantity tradeoff in Bulgarian district courts*."[51]

7.1.2 Descriptive statistics of quality measures

As already discussed, the proxy variables for the quality of judging are appeal rate and reversal rate. The descriptive statistics for these measures in years 2006 – 2014 are presented in tables 28 and 29.

Table 28: District courts, appeal rate

Year	Mean	Std. Dev.	Min	Max
2006	9.99	2.25	4.33	16.41
2007	7.22	2.04	3.04	13.03
2008	6.86	1.81	2.80	14.05
2009	3.56	1.30	1.38	11.84
2010	3.95	1.27	1.37	11.30
2011	3.30	1.31	1.34	13.03
2012	4.57	1.94	1.57	14.98
2013	5.16	1.88	2.52	12.88
2014	3.56	1.46	0.73	11.60

Source: Ministry of Justice of the Czech Republic, 2014, own calculations

The appeal rate is not very stable and there are substantial differences between the appeal rates in particular years. It is possible to see a big drop in the appeal rate between the years 2006 and 2009. Afterwards the appeal rate remains stable with exceptions in the years 2012 and 2013. Furthermore, there is a great variance among courts in appeal rate.

[51] Dimitrova-Grajzl et al. (2015)

Table 29: District courts, reversal rate

Year	Mean	Std. Dev.	Min	Max
2006	45.62	8.17	27.82	67.83
2007	41.74	9.01	20.78	59.40
2008	43.19	9.16	22.89	68.56
2009	41.19	9.11	24.68	62.06
2010	44.06	7.63	23.79	66.75
2011	45.41	7.78	23.53	67.42
2012	44.67	10.58	10.72	90.07
2013	38.09	10.64	7.54	72.92
2014	43.60	9.40	15.56	71.92

Source: Ministry of Justice of the Czech Republic, 2014, own calculations

The reversal rate is relatively far more stable. But again, there is a great variance in the reversal rate among courts. Year 2013 is particularly interesting. A relatively high appeal rate and a low reversal rate suggest that people were more likely to make an appeal even in cases with a relatively low chance of their appeal being successful.

As for individual courts, the lowest mean reversal rate is in Ústí nad Labem, Vyškov and Uherské Hradiště. On the other hand, the highest reversal rate is in Prague. The appeal rate is the lowest in Most and the highest in Prague 2.

Table 30: Regional courts, reversal rate and appeal rate

Court	reversal rate	appeal rate
Brno	49.79	8.40
Praha (CC)	50.42	9.94
Ustí n. L.	51.80	8.57
Plzeň	52.86	8.13
H. Králové	54.07	7.75
Praha (RC)	54.21	10.30
Ostrava	56.32	8.24
Č. Budějovice	56.63	8.03

Source: Ministry of Justice of the Czech Republic, 2014, own calculations

As for regional courts, I report on aggregated reversal and appeal rates for each court in Table 30. It can be seen that Brno exhibits the lowest reversal rate and Ostrava exhibits the highest reversal rate. The appeal rate is lowest in Hradec Králové and highest at regional court in Prague.

7.1.3 Methodology and results

Basically, I follow López (2008) and Dimitrova-Grajzl et al. (2015). Firstly, I multiply the reversal and the appeal rate to get a ratio of reversed verdicts by an appeal court to all cases resolved by a court of first instance (I call it the rate of reverse to distinguish

between this rate and the reversal rate discussed earlier). Afterwards, I draw on the FE regression using Dataset 1 and employ *adj_resolved* as a dependant variable. I find this regression to be the most robust and reliable. I divide courts into two groups on the basis of residuals from the regression. The first group is compiled of court-year observations with positive residuals (*the higher performance group*) and the second group includes court-year observations with negative residuals (*the lower performance group).* Yet again, some courts deal with more "difficult" cases than others. I.e. in certain types of cases, litigants are more likely to make an appeal. It follows that I adjust the rate of reverse in a similar way as I have adjusted the caseload and the number of resolved cases[52]. Afterwards, I use a t-test[53] to find out whether there is a statistically significant difference between mean rates of reverse of *the lower performance group* and the *higher performance group.* It follows that I test the following null hypothesis (H_0): (mean adjusted rate of reverse of *lower performance group*) = (mean adjusted rate of reverse of *higher performance group*). Of course, an alternative hypothesis (H_a) is that means are not equal.

Before running the t-test, I have to check if the tested groups are normally distributed and if they have the same variance. Levene's test rejects the null hypothesis of equal variances. To address the difference in variances between the groups I use t-test with unequal variances. Shapiro–Wilk normality test rejects the assumption of a normally distributed adjusted rate of reverse. To address the non-normal distribution I transform the rate into a logarithmic form. It follows that I use a two-sample, two-sided with t-test unequal variances to compare the means of the rate of reverse of the lower performance group and the higher performance group. Descriptive statistics and the p-value[54] are reported in Table 31.

Table 31: Higher and lower performance groups

	Obs.	Mean	Std. Dev.	p-value
Higher performance	356	2.2776	1.2190	0.7268
Lower performance	332	2.2890	0.9892	

Source: Ministry of Justice of the Czech Republic, 2014, own calculations

The p-value is 0.7268 and thus I cannot reject the null hypothesis of means equality. It follows that there is no statistically significant difference in the means of the adjusted rate of reverse between the higher performance group and the lower performance group.

[52] See chapter 5.2.2. This time, the proxy for the „difficulty" of a matter in dispute is reversal
[53] Basically, t-test is a statistical test used to compare two sets of data. See any textbook of statistics.
[54] The descriptive statistics are for non-logarithmic form, but the p-value is based on t-test with logarithmic form of variables

This result suggests that there is no quantity-quality trade-off at Czech courts. In other words, more productive courts are more productive without a negative impact on the quality of verdicts.

I also utilize the alternative approach which is very simple regression analysis, more precisely OLS. I use adjusted rate of reverse (*adj_ror*) as the dependant variable. As independent variables I use the logarithm of adjusted number of resolved cases per judge (*respjudge*), wage ratio to control for potential skill differences between judges and dummy variables for years to control for year-specific events. The results are presented in Table 32.

Table 32: Results - quantity-quality trade-off

adj_ror	Coef.	Robust Std. Err.	t	P>t	[95% Conf.	Interval]
log(respjudge)	0.0736	0.1856	0.40	0.6920	-0.2908	0.4380
L4wage_ratio	-1.8857	0.2533	-7.44	0.0000	-2.3831	-1.3882
Observations	688					
R-squared	0.2078					

Source: Ministry of Justice of the Czech Republic, 2014, own calculations

The estimation results suggest that a 1% growth in the number of resolved cases by a judge leads to growth of adjusted rate of reverse by 0.07 unit. The result is statistically insignificant. Again, I found no evidence of statistically significant quantity-quality trade-off. Furthermore, the estimation result suggests that there is a strong negative relationship between wage ratio and adjusted rate of reverse. It implies that increasing relative wage of judges may lead to lower rate of reverse and higher quality of judging.

7.2 Effect of growth in caseload on output in following period

Another question related to my research is following: how does a growth in caseload affect the court performance in the following period? The tested hypothesis is that a growth in caseload in year *t* leads to a drop in case resolution in year *t+1*. The logic is as follows: There is a sudden growth in the caseload in year *t*. Judges react to a growth in caseload by extending higher effort which is connected with higher court output (i.e. with a higher number of resolved cases). However, dealing with increased caseload, extending bigger effort and resolving more cases is more tiresome for judges. It is possible that the bigger extended effort takes its toll on judges and negatively affects their performance in the following period. Thus it leads to a drop in court output in the following period. On the other hand, if the judges are able to extend bigger effort without any following negative consequences, the number of resolved cases in time *t*

and the number of resolved cases in time *t+1* are unrelated. To test this hypothesis I simply include a variable representing lagged adjusted number of resolved cases (*adj_resolved*$_{it-1}$) into my model. The most suitable for this extension are OLS and FE estimations using data from Dataset 1 and the dependent variable *adj_resolved*. The results of the regressions are presented in table 33.

Table 33: Results - regression with *adj_resolved*$_{it-1}$

log(adj_resolved)	OLS	FE
log(adj_resolved)$_{t-1}$	0.279***	0.144***
	(0.0684)	(0.0487)
log(judges)	0.146***	-0.00514
	(0.0478)	(0.0371)
log(adj_caseload)	0.521***	0.647***
	(0.0534)	(0.0476)
n_matters	-0.368***	-0.725***
	(0.0977)	(0.116)
L4wage_ratio	0.151***	0.113***
	(0.0407)	(0.0311)
judges_dif	-0.00797***	0.000836
	(0.00253)	(0.00402)
Observations	688	688
R-squared	0.978	0.948

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: Ministry of Justice of the Czech Republic, 2014, own calculations

The estimates are naturally close to estimates obtained in part 6.1. Apparently, the variable *adj_resolved*$_{it-1}$ is positively related to *adj_resolved*$_{it}$. A 10% growth in the case resolution in year *t-1* is connected with 2.8% (1.4%) growth in the number of cases resolved in year *t*. It implies that judges are able to react to higher caseload pressure and increase their effort without a follow up in form of some kind of "burnout" and thus with no negative consequence for the court performance in the following period. On the contrary – there actually is persistence in the case resolution. To test whether "burnout" does not occur later I also run the regression with *adj_resolved*$_{it-2}$ included. The coefficient for log (*adj_resolved*$_{it-2}$) is statistically insignificant and very close to zero (0.03). It follows that the persistence in the case resolution disappears and the "burnout" still does not occur.

Conclusions

In my thesis, I deal with the effect of the number of judges on the court efficiency. The issue is topical and widely discussed. This fact is reflected in a world-wide growth of empirical literature focused on the very topic. In the Czech Republic, it has been argued recently that the court system is inefficient, the number of judges is insufficient and that the only solution to the problem is an appointment of new judges. In my thesis I show that this opinion is incorrect and thus may lead to wrong policy decisions, pointless appointment of new judges and pointless burden for the state budget.

In the theoretical part of my work I present and accept the theory of a rational judge, which is based on papers by Cooter (1983) and Posner (1993). The theory states that judges maximize their utility as everyone else. They want to maximize their reputation, income etc. and minimize their effort and workload. In other words, judges are optimizing and they want to find an optimum in which they exert the smallest effort possible without being punished for it and thus without their career being jeopardized. This theory is a starting point for recent empirical research dealing with the effect of the number of judges on court output. Beenstock and Haitovsky (2004) and other authors hypothesize that after the appointment of new judges, the incumbent judges suddenly face lower caseload pressure and they decrease their effort in pursue of their own maximum utility. Due to a drop in the effort of the incumbent judges the expected growth in output is not happening. It follows that an increase in the number of judges leads only to very small or no growth in the number of resolved cases. I accept the hypothesis and test it on the data from the Czech Republic. Furthermore, I introduce the Czech judicial system and the most important acts and laws that established or changed the Czech judicial system. Last but not least, I briefly introduce and discuss international comparison of judicial systems performed by CEPEJ (2014). The CEPEJ (2014) report suggests that Czech courts are performing relatively well in comparison with other European counties.

In the practical part of the thesis, I start with descriptive statistics, time series and relationships between key variables. It provides me with some interesting facts. The number of judges is relatively stable in the Czech Republic; on the other hand, caseload, number of resolved cases and the case resolution time are much more volatile. In case of the regional courts, the case resolution time is volatile beyond any reasonable explanation. Fortunately, this peculiarity does not affect the results of the regressions.

The regression results confirm my hypothesis. At the district court level, an increase in the number of judges leads to a very small or a non-existent growth in the number of resolved cases. Thus it is safe to conclude that incumbent judges indeed lower their effort when new judges are appointed. It is impossible that the number of judges would have no effect on the number of resolved cases or their quality. If a court had only one judge instead of twenty, the court would produce less output. The regressions are only able to capture the local effects - the effects of changing the number of judges by one or two. But that is exactly the relevant policy margin. No one proposes to double the number of judges or to cut it by half. But adding or subtracting one judge or other personnel is a relevant policy agenda. And I show that such a change in the number of judges does not affect the court output. Much bigger growth in the number of judges would most likely lead to some (small) growth in the court output. But the costs of such a change are too big and the change is politically indefensible. It follows that increasing the number of judges in general is not recommended to policy-makers and they should rather focus on improving the incentives for judges to complete cases efficiently.

Secondary findings suggest that a fairly strong incentive effect is present and district courts react on the change in the caseload. As a reaction to an increase in caseload they accelerate the case resolution and significantly increase the output - a 10% increase in caseload results in a 5.6-6.6% growth in the number of resolved cases. This result again shows that judges adjust their effort relatively easily. Still, they are not able to respond on change in caseload proportionally. Therefore, it is recommended to policy-makers to react on change in caseload (i.e. to react on change in case filings). The non-judge personnel have no effect in most of the regressions, which does not correspond to my assumption. I believe that the reasons as follows: Firstly, the theory of utility maximization can be applied on all court personnel. It implies that with increasing the number of judicial personnel, the incumbent personnel decrease their effort. Secondly, even though the Ministry of justice determines the maximum number of employees for each court, the final decision is up to individual courts. It follows that some courts employ a smaller number of more skilled clerks and reward them financially for higher workload. In the majority of regressions the wage ratio is positively related to court output. Thus the lawyers indeed react to financial incentives. The difference between the actual and the planned number of judges has no effect on court's performance. It corresponds with my primary finding, because it shows that the small differences in judicial staffing do not affect the court performance. Finally, almost all regressions

suggest that cases involving more matters in dispute are more complicated and therefore the number of matters in dispute is a good proxy for case difficulty and it is negatively related to court output.

As for the regional courts, the estimates suggest that a 10% growth in the number of judges results in approximately 5% growth in the number of resolved cases. The question is if the 5% growth in cases resolved is enough to justify the costs. Again, we are talking about the local effects. The costs of appointment of a few new judges are not that big, but still leads to an increase in court performance. It follows that appointment of small number of new judges to each regional court can be recommended to policy-makers. Regional courts seem to react to the change in caseload very strongly as well. A growth in caseload results in an almost proportional growth in the number of resolved cases.

In the last section, I deal with questions that are closely related to my research. I show that more productive courts do not produce verdict of lesser quality. Thus there is no quantity-quality trade-off. Therefore it is possible for a court to achieve both – low reversal and fast case resolution. It again implies that the policy recommendation is to focus on improving the incentives for judges to complete cases efficiently. Moreover, I show that increased caseload and consequential growth in judges' workload and court output do not negatively affect court output in the following year. On the contrary – there actually is persistence in the case resolution.

I believe that I have completely fulfilled the goal of the thesis in the case of analysing of the district courts. The results are mostly consistent, statistically significant and in full compliance with the theory and recent empirical literature. The matters are slightly more complicated at the regional courts level. The main cause of the issues is low number of groups (i.e. courts) and great variance among years and courts. It results in statistical insignificance of some results, slight inconsistence of results and inability to use the very same methodology as at the district courts level. Furthermore, only one court may strongly affect the results. It follows that the results should be treated with extreme caution. Also, the time series of the case resolution time is rather disturbing even though it does not affect the results. Still, there is nothing to be done about the issues and I believe that I have fulfilled the goal of the thesis at the regional-courts level as well.

There are at least two possible directions of the extension of this thesis. The first one is connected with acquiring a larger amount of data. Data on the non-judge personnel for

all years would enable me to combine the advantages of Dataset 1 (more observations, possibility to use FE and 2SLS) and Dataset 2 (data on other court personnel). Court budgets, characteristics of judges, region specifics etc. can also affect the court efficiency. Thus obtaining more data would enable the researcher to control for more factors and also examine their effect. Secondly, the thesis aims to examine the effect of the number of judges on court efficiency on the data from the Czech Republic. A possible extension is to utilize the data available and analyse the efficiency of the Czech judicial system and the performance of individual courts. I.e. generate a large amount of descriptive statistics and employ the Data Envelopment Analysis.

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Act No. 189/1994 Coll., Zákon o vyšších soudních úřednících, 1994

Act No. 236/1995 Coll., Zákon o platu a dalších náležitostech spojených s výkonem funkce představitelů státní moci a některých státních orgánů a soudců a poslanců Evropského parlamentu, 1995

Act No. 257/2000 Coll., Zákon o Probační a mediační službě, 2000

Act No. 6/2002 Coll., Zákon o soudech, soudcích, přísedících a státní správě soudů a o změně dalších zákonů, 2002

Act No. 314/2008 Coll., Zákon, kterým se mění zákon č. 6/2002 Sb., o soudech, soudcích, přísedících a státní správě soudů a o změně některých dalších zákonů, 2008

Act No. 89/2012 Coll., Občanský zákoník, 2012

Act No. 202/2012 Coll., Zákon o mediaci a o změně některých zákonů, 2012

Act. No. 292/2013 Coll., Zákon o zvláštních řízeních soudních, 2013

Návod k vyplňování statistického listu pro civilní agendu, Ministerstvo spravedlnosti ČR, 2012

Návod k vyplňování statistického listu O, Ministerstvo spravedlnosti ČR, 2012

Appendix A – Robustness check

In section 5.2.2, I discuss a possibility of including more case-related variables (let me now call them testing variables) in the regressions. In the end, I decide not to include them. To check the robustness, I run the regressions again and gradually include and exclude testing variables. The variables I use in regression in the thesis (let me now call them core variables) are always included. The results of regressions are reported in Table 34. For simplicity, I report only OLS estimations using data from Dataset 1 and the dependent variable *adj_resolved*.

Table 34: Robustness check

log(adj_resolved)	OLS 1	OLS 2	OLS 3	OLS 4	OLS 5
log(adj_caseload)	0.640***	0.641***	0.635***	0.611***	0.624***
	(0.0436)	(0.0438)	(0.0478)	(0.0478)	(0.0444)
log(judges)	0.302***	0.301***	0.306***	0.324***	0.327***
	(0.0521)	(0.0521)	(0.0554)	(0.0538)	(0.0541)
n_matters	-0.494***	-0.488***	-0.502***	-0.424***	-0.624***
	(0.113)	(0.114)	(0.118)	(0.103)	(0.115)
judges_dif	-0.0121***	-0.0121***	-0.0121***	-0.0106***	-0.0103***
	(0.00341)	(0.00340)	(0.00343)	(0.00370)	(0.00333)
L4wage_ratio	0.172***	0.169***	0.170***	0.163***	0.155***
	(0.0516)	(0.0510)	(0.0535)	(0.0531)	(0.0498)
n_defnd		-1.002			
		(1.742)			
log(av_claim)			-0.00973		
			(0.0260)		
plain_AP				0.00520*	
				(0.00298)	
plain_state				0.00294	
				(0.00324)	
plain_else				0.000845	
				(0.00486)	
defnd_AP					-0.00586**
					(0.00291)
defnd_state					-0.00475
					(0.00317)
defnd_else					-0.0288
					(0.0442)
Observations	688	688	688	688	688
R-squared	0.973	0.973	0.973	0.974	0.974

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

OLS 1 is the regression I use in the thesis. In OLS 2 the average number of defendants (*n_defnd*) is included. In OLS 3 the average claim of the plaintiff (*av_claim*) is included. In OLS 4 and OLS 5 I include relative frequencies of plaintiff and defendant types into regression. The types of plaintiff and defendant types are as follows: artificial person (*plain_AP* and *defnd_AP*), natural person (*plain_NP* and *defnd_NP*), state (*plain_state* and *defnd_state*) and else (*plain_else* and *defnd_else*). Variables *plain_NP* and *defnd_NP* are omitted in the regressions because of collinearity. With the exception of *n_defnd* all testing variables are not related to court output. Variable *n_defnd* negatively affects *adj_resolved*, but the effect is highly statistically insignificant. Also scale and direction of its effect on the court output differs greatly between regressions It follows that *n_defnd* is not appropriate proxy for case difficulty and it should not be included in the regressions. Including testing variables have very small or no effect on the estimates of the effect of core variables and no effect on R-squared. It follows that the regressions used in the thesis are robust and there is no reason to include the testing variables.

Appendix B – Statistical lists

Statistical list for civil agenda by Ministry of Justice of the Czech Republic

Statistický list pro civilní agendu

1. Číslo soudu | **2. Spisová značka** | **3. Číslo senátu** | **4. Pořadové číslo** | **5. Měsíc odeslání** | **6. Rok**

7. Datum zahájení řízení

8. Způsob zahájení řízení

- 01 - návrhem/žalobou
- 02 - po zrušení rozhodnutí pro zmatečnost
- 03 - povolení obnovy
- 04 - po zrušení rozhodnutí nálezem ústavního soudu
- 05 - po vyhovění dovolání
- 06 - po zrušení rozhodnutí po kasační stížnosti
- 07 - návrhem na vydání platebního rozkazu
- 08 - návrhem na vydání elektronického platebního rozkazu
- 09 - návrhem na vydání směnečného platebního rozkazu
- 10 - návrhem na vydání šekového platebního rozkazu
- 12 - návrhem na vydání evropského platebního rozkazu
- 13 - návrhem na zahájení evropského řízení o drobných nárocích
- 11 - bez návrhu

9. Vrácen stav na vyřízená, jeho datum a důvody

nebyl vrácen - 1 byl vrácen - 2

datum vrácení stavu věci na vyřízená

důvody vrácení
- 1 - nové řízení u odvolacího soudu
- 2 - zrušena původní PM rozhodnutí
- 9 - jiné důvody

10. Údaje o předchozím řízení a vyřízení MOP

datum zahájení předchozího řízení

datum jeho vyřízení

právní moc konečného rozhodnutí

datum podání mimořádného opravného prostředku

datum právní moci konečného rozhodnutí o tomto MOP

11. Datum prvního úkonu

12. Počet jednání

13. Datum posledního rozh. soudu I. st.

14. Odvolání (podáno, výsledek a počet zrušení a vrácení)

odvolání podal
- 1 - navrhovatel/žalobce
- 3 - žalovaný
- 5 - oba
- 6 - jiná osoba
- 9 - odvolání podáno nebylo

datum podání odvolání

napadlo u odvolacího soudu

datum rozhodnutí odvolacího soudu

výsledek odvolání
- 1 - rozhodnutí bylo potvrzeno
- 3 - rozhodnutí bylo změněno
- 9 - jiný výsledek

15. Datum konečné právní moci rozhodnutí

16. Výše přiznaného nároku v Kč

16a. Nařízení setkání s mediátorem

1 - ano

2 - ne

počet zrušení a vrácení odvolacím soudem

17. TABULKA INDIKACÍ (charakteristika účastníků a předmět sporu)

OPAKUJ			IN	kód navrhovatele /žalobce			kód žalovaného			PŘEDMĚT SPORU			výsledek řízení	
			1			x			-					
			2			x			-					
			3			x			-					
			4			x			-					
			5			x			-					
			6			x			-					
			7			x			-					
			8			x			-					
			9			x			-					
			10			x			-					

source: Návod k vyplňování statistického listu pro civilní agendu , Ministerstvo spravedlnosti ČR,2012, p. 15

Statistical list for custodianship agenda by Ministry of Justice of the Czech Republic

STATISTICKÝ LIST O

1. Číslo soudu | **2. Spisová značka** | **3. Číslo senátu** | **4. Pořadové číslo** | **5. Měsíc odeslání** | **6. Rok**

7. Datum zahájení řízení

8. Způsob zahájení řízení
- 01 - návrhem
- 02 - po zrušení rozhodnutí pro zmatečnost
- 03 - povolení obnovy
- 04 - po zrušení rozhodnutí nálezem Ústavního soudu
- 05 - po vyhovění dovolání
- 11 - bez návrhu

9. Vrácen stav na vyřízená, jeho datum a důvody
nebyl vrácen - 1 byl vrácen - 2

datum vrácení stavu věci na vyřízená

důvody vrácení
- 1 - nové řízení u odvolacího soudu
- 2 - zrušena původní PM rozhodnutí
- 9 - jiné důvody

10. Údaje o předchozím řízení a vyřízení MOP

datum zahájení předchozího řízení

datum jeho vyřízení

právní moc konečného rozhodnutí

datum podání mimořádného opravného prostředku

datum právní moci konečného rozhodnutí o tomto MOP

11. Počet jednání soudu I. stupně

12. Datum posledního rozhodnutí soudu I. stupně

13. Odvolání (podáno, výsledek a počet zrušení a vrácení)

podáno odvolání 1 - ano 2 - ne

datum podání odvolání

napadlo u odvolacího soudu

datum rozhodnutí odvolacího soudu

výsledek odvolání
- 1 - rozhodnutí bylo potvrzeno
- 3 - rozhodnutí bylo změněno
- 9 - jiný výsledek

počet zrušení a vrácení odvolacím soudem

14. Datum konečné právní moci rozhodnutí

15. Čistý měsíční příjem v Kč a další vyživovací povinnost

	otec (osvojitel)	matka (osvojitelka)
čistý měsíční příjem v Kč		
další vyživovací povinnost		

15a. Mediace
nařízeno setkání s mediátorem
1 - ano
2 - ne

schválená mediační dohoda
1 - ano
2 - ne

16. TABULKA INDIKACÍ (přehled předmětů a výsledků řízení)

INDIKACE		ROK NAROZENÍ				PŘEDMĚT A VÝSLEDEK ŘÍZENÍ					VÝŽIVNÉ v Kč						
	X					X				X							
	X					X				X							
	X					X				X							
	X					X				X							
	X					X				X							
	X					X				X							
	X					X				X							
	X					X				X							
	X					X				X							
	X					X				X							

source: Návod k vyplňování statistického listu O, Ministerstvo spravedlnosti ČR,2012, p. 12