Determinants of service quality in bureaucracy: Parkinson's theory at work *

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Abstract

Parkinson described the time comsumption and the development of size that occurs in a bureaucracy. Using data on vehicle registration offices in Germany we found empirical support for Parkinson's law: First, service quality is no better in offices that have more staff per case. Second, service quality is worse if the service procedure is disaggregated into multiple smaller sub-services. Third, the staff size is a convex function of the number of customers. These results are robust when alternative models are used.

Keywords: Bureaucracy, Parkinson's law, Waiting time, Service Quality, Queueing Theory, OLS, Duration Model.

JEL classification numbers: H83 (Public Administration), D02 (Institutions: Design, Formation, and Operations), C21 (Cross-Section Models), C41 (Duration Analysis).

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The bureaucracy is expanding to meet the needs of an expanding bureaucracy.

[Anonymous]

1 Introduction

The general public often mistrusts the public services, and a bureaucracy is often seen as a particular kind of joke, rather like 'celebrity' and 'dirty' jokes. While some social scientists have pointed to the beneficial effects of bureaucracy, among them Max Weber who argued that a bureaucracy has a positive effect on the rule of law, the focus of many economists has been on its disadvantages. In their theorizing about such organizations they have discussed the reasons for their malfunctioning and slack (e.g. Niskanen 1971). Most notably, it is argued that the pressure of competition eliminates or reduces inefficiency, and even where market competition is not particularly strong, such as in a monopoly, the profit motive of firms stimulates cost minimizing behavior. The behavior of for-profit firms is, at least partly, aligned with welfare objectives. The public service sector by contrast is subject to different rules. The pressure of competition and a profit motive are often completely absent.

Parkinson (1957) observed that, after the First World War, the number of officers in the British Navy administration did not remain constant, it rose, despite the fact that the number of ships and sailors had declined sharply. He concluded that work expands to fill the time available for its completion, and derived growth dynamics from the bureaucrats' incentives to expand by creating a hierarchy whose maintenance and control dissipates further work effort.

The early economic theory of internal organization is based on similar insights (Leibenstein 1966, 1978). Modern contract theory starts from the perspective that the public administration is established and controlled by a principal – a politician, or, ultimately, the voter. A rigorous and monolithic framework for studying these aspects was developed by Laffont and Tirole in a series of papers, and in their monograph (1993). Their work also triggered a great deal of further research. Their analysis showed the theoretical limits to the optimal governance of a bureaucracy and it came up with a wealth of results for the limits to efficiency imposed by the incompleteness of contracts, information asymmetries etc. in controlling bureaucrats.

It would perhaps be best to downsize an office that has become too large. However, this may not be feasible, partly because it is difficult to judge from the outside whether or not it is too large. It could be, for instance, that the only clear evidence the governing principal can observe is that the administrators are hard working, while, for a variety of possible reasons, these administrators themselves do not want the office to be downsized. In this case, the latter will naturally define the tasks and procedures of the office in such a way that the time available is filled. Administrators could use up the time with internal procedures, such as writing and circulating memos and approving them. The excess staff may also be used for interaction with the clients. This may, but need not, be to the benefit of clients. Service for the clients may be improved, for instance, by increasing the number of counters where they are served and this could reduce waiting time. In addition, the administrator could become more diligent and this could turn out to be to the customer's disadvantage. Furthermore, administrators could divide up the task of servicing a particular client into several sub-tasks, thus ensuring that clients deal with a number of administrators instead of one. Each of these would have to become familiar with the particular case in order to contribute something to completing it. This procedure also creates the need for more supervision within the office. A headquarters or a hierarchical structure may be needed to coordinate this process and it will require some effort to evaluate and optimize it.

This paper follows Parkinson's idea: we consider whether more staff will improve the quality of the public service or make it deteriorate. We consider and compare about 400 German motor vehicle registration offices. These local offices have a simple one-dimensional task that allows service quality to be measured, this is the time it takes for a client to register a car. We collected the relevant data in a survey and the following are the key findings of a multivariate analysis. First, there is considerable variance with respect to both the ratio between the number of staff available and the number of clients served and also with respect to the average time needed to complete cases. However, the service time is no shorter in offices where there was more staff per case (i.e. a higher manning). Second, if processing the cases of single clients is more disaggregated, there is a tendency for average duration to increase. Third, the manning in the registration offices increases more than proportionally as the number of clients increases.

Our work is very much in line with Parkinson's law, and is also related to a number of other empirical studies on time use. Behavioral scientists have studied extensively the relationship between time available and the time needed to complete a task.[1] Brannon, Hershberger and Brock (1999) provide a literature survey suggesting that Parkinson's law is widely, but not unanimously, accepted among sociologists and in the organizational behavior and management literature. They also provide new experimental evidence that is in line with the law. Moss (1978) used data from the Natural Environment Research Council's (NERC) report. His data suggest that the number of administrative staff within NERC bodies is a function of total staff and the number of locations/addresses of the respective body. His result triggered further correspondence in Nature (Flux 1980, Gray 1980). In management science Gutierrez and Kouvelis (1991) took up Parkinson's time dimension aspect. They formalized and extended Parkinson's theory for project management with special regard to project completion time. Other aspects of Parkinson's law were analyzed by Breton and Wintrobe (1979, 1982). According to them administrators maximize power by accumulating the loyalty of theirs subordinates. In times of declining budgets, these subordinates have to be promoted to reward them for their loyalty and to prevent them being dismissed. Budget cuts may then lower the output but lead to an increase in the administrator - subordinate proportion. This theory explains some of Parkinson's observations and McKee and Wintrobe (1993) test it. They find empirical support in the Canadian public school system and in the US steel industry. O'Toole, Jr., and Meier (2004) find evidence that contracting in education implies more administration there and vice versa. The analysis by Boyne (2003) concludes that the most likely ways of improving the service are to provide extra resources and better management. This

[1] The first experiments were done by Aronson and Gerard (1966), Aronson and Landy (1967), and Bryan and Locke (1967). They all succeed in replicating Parkinson's observation. Later, Orpen and Riese (1973) failed to replicate Parkinson's results, whereas both Latham and Locke (1975) and Peters, O'Connor, Pooyan and Quick (1984) in their field studies again succeeded.

finding is in contrast with our findings, where more resources seem to have no influence on service quality.

The paper is organized as follows. In section 2 we provide information on the institutional background of our setting. In Section 3 we review Parkinson's ideas and turn them into three empirical hypotheses which we test in section 4. In Subsection 4.1 we describe the data set. The empirical model and estimation methods are presented in Subsection 4.2. Results are given and explained in Subsection 4.3. Section 5 offers some concluding remarks.

2 Institutional Framework

Input and output of bureaucracies is generally multi-dimensional. On the one hand, different wage structures, varying regional or local legislation, and differing technological endowment can result in heterogenous input. On the other hand, most offices, especially in the Anglo Saxon world, offer more than one service to their customers and thus their output is not one-dimensional. In addition, measuring the output or the success of an office is very difficult.

Where both input and output differ in more than one aspect, it is hardly possible to measure their efficiency. However, we were able to identify a bureaucracy that provides a service whose efficiency is easy to measure because, although there are several input dimensions, there is only one output dimension. This is the processing of motor vehicle registrations in Germany.

There is a uniform pattern for car registration. All departments carry out the same task under comparable technological constraints and under very similar administrative wage regimes. All cars and all car owners must be registered. Federal law is applied in all local administrative districts. So the offices produce only one product that is fully standardized countrywide: car registration. The quality differs among offices along one output dimension only. This is the time required for a car to be registered or, put differently, the time it takes a customer from entering the office to leaving it can differ widely. This is the one and only, output dimension that creates the quality differences between offices.

Within the common legal and wage structure framework the local administrative districts themselves organize the registration process and structure the offices. There is, therefore, considerable variation with several important input dimensions. These are the number of full-time employee-equivalents per car registration, the overall size of the local office, the way the office is organized in terms of one-stop versus several-stop agencies. There is, also, considerable variation in the average time it takes a client to register a car, which is, as mentioned above, the measure of output quality for this public service.[2]

Thus, the bureaucratic setting of the vehicle registration process in Germany offers a rare opportunity to measure efficiency in a bureaucracy and, hence to test Parkinson's ideas.

3 Distilling Parkinson's ideas

50 years ago, C. Northcote Parkinson published his book "Parkinson's Law and Other Studies in Administration". It describes the time consumption and development of size in a bureaucracy. Parkinson noted that work expands to fill the time available for its completion and stated this as follows (1957, 2).

> Granted that work (and especially paperwork) is thus elastic in its demand on time, it is manifest that there need be little or no relationship between the work to be done and the size of the staff to which it might be assigned.

He illustrated his findings by comparing the amount of time an old lady might need to write and send a postcard with the amount a busy manager might need. The lady can spent a whole day getting nicely dressed, looking in various shops for a suitable card, writing it in a pleasant café, and taking it to the post office, but the manager only needs a few minutes to write and send off his card. According to Parkinson (1957, 2) the reason is that "[t]he thing to be done swells in importance and complexity in a direct ratio with the time to be spent".

[2] We use service quality, service time, waiting time, and duration as synonyms. We always mean the time from entering the office building to leaving it, i.e. the sum of pure waiting and service times.

All other things equal, additional staff adds time to the overall time budget of the bureau. Consequently, all employees have more time to complete the work to be done. So if, in our context, additional staff is employed, all staff members have more time for a given number of car registrations in a certain period of time. However, we do not know how more staff will affect service quality. This depends on what tasks the new staff are given. Following a theory based on efficiency, a rise in service quality could be expected to follow the increase in staff. Remember, that service quality is measured by the time a client needs to register a new car. So, the shorter the time required, the higher product or service quality.

However, employees can also be kept busy inefficiently or they can keep themselves busy inefficiently. The administrators may, for instance, think up additional procedures for dealing with theirs clients, ask clients to provide additional paperwork, formal documents, or to fill in excessively long forms. This may also serve the purpose of using up administrators' time, as these forms must be read and processed, documentation needs to be inspected and photocopied etc. This can result in no change in service quality or, in the worst case, in a decline in service quality. Parkinson observed that the work to be done increases in a direct ratio with the available time (Parkinson, 1957, 2). As a consequence, staff per registration (i.e. manning) should have no influence at all on service time, because the additional time each employee gains from an increase of staff is simply used to extend the time needed for one car registration. Therefore, the first hypothesis can be derived.

Hypothesis 1 *Manning has no influence on the average duration of each single registration service.*

Still, from a Parkinson point of view, it is not only the manning that is relevant. How many administrators are involved in one registration is also important, because "officials make work for each other" (Parkinson, 1957, 4). A question, for example, may well come to two administrators and they might argue about who is to be in charge of it. Possibly one of them may draft an answer and the other read, amend and correct it carefully - using more time than he would have needed to answer it on his own. Even if tasks are clearly allocated - as, is probable, in car registration offices - each clerk has to be familiarized with each case. The more disaggregated the organization of the car registration process, the more clerks must become acquainted with each single case. Furthermore, each (additional) clerk adds administrative work, because he or she makes the lines of communication longer and also needs to be supervised. So bureaucracy keeps itself busy. Consequently, the overall waiting time for the customer will be longer the more employees that are involved, i.e. the more disaggregated the organization of the process.

Hypothesis 2 *The larger the number of clerks involved in each single registration process, the longer the waiting time.*

Standard queueing theory suggests that waiting time, which can - as in our setting - include real waiting time plus service time, depends on the mean service rate, the mean arrival rate of the customers and the number of service points[3]. Waiting time, therefore, should, ceteris paribus, decrease with the number of service points. If, during a day, 100 arbitrarily distributed customers appear and are served at one service point, average waiting time (and average idle time) will be longer than if 1,000 arbitrarily distributed customers appear and are served at 10 service points. This can be derived ultimately from the law of large numbers. We also consider these theoretical aspects in our estimations.

Parkinson also noted that administrators are bound to multiply because "an official wants to multiply subordinates, not rivals." (Parkinson, 1957, 4). An administrator who considers herself overworked will probably insist on having two assistants to help her. If she divides the work between them, she will benefit from being the only one who comprehends them both because each of them only knows one aspect of the task to be carried out. It is important to notice that there have to be at least two subordinates. If there was only one assistant he would try to divide the work between himself and the administrator. Then, the assistant would almost assume an equal status to the administrator which is not in the interest of the former because she does not want to have a rival. The

[3] For a detailed description of the relationship of these three aspects in a multi-server case see for example Hiller and Lieberman (1980, 400-424).

administrator does not want to risk loosing her job to the assistant if it turns out that he is doing a better job than she is doing herself. However, if the administrator has at least two assistants, there clearly is a hierarchical order between the administrator and the assistants and a direct comparison between the work of the administrator and that of the assistants becomes far more difficult. Then, the position of the administrator is not at risk. Thus, subordinates must number two or more. A bureaucracy tries to keep itself busy so, at one point, the new assistant, will complain that he is overworked and ask for assistance himself. So, to be fair, all new employees will have to have assistants and so on (Parkinson, 1957,4-5). Hence, over time, organizations increase their administrative staff relative to other employees regardless of whether or not the administration carries out additional tasks. A hierarchy emerges. In a strong version, the administrative staff can multiply even when output and the number of other employees both decline, as can be seen from the way the British Navy developed after the First World War (Parkinson, 1957, 7-13).

It should be expected that the overall staff of a vehicle registration office will increase with the number of cases to be handled. However, if Parkinson's law holds, each increase in the number of cases handled should be followed by a disproportionately large increase in overall staff numbers because, over time, an administrative hierarchy builds up.

Hypothesis 3 *The larger the registration office, the disproportionately larger is the number of employees.*

4 Empirical Evidence

4.1 Data

In order to assess the role of office and staff size, and of the internal structure of the office for the service quality, we sent a questionnaire to all 447 main vehicle registration offices in Germany in May 2004. 235 questionnaires were returned and could be used for the analysis. This is a share of 53 per cent. There is no indication of a sample selection bias.

The questionnaire included questions about the tasks of the admission office, its staff (number of people and in full-time employee-equivalents), the number of counters and waiting room seats, the internal structure of the registration process for a new car and the average length of time taken for a new vehicle registration from entering the building until leaving it. We asked for annual data for the year 2003.

Our data have both strengths and weaknesses. Certainly, the high feedback rate for our questionnaires (53 per cent) is very positive. Moreover, the questionnaires were completed carefully and we have very few missing answers to specific questions. Admittedly there is one main shortcoming in the data, it is that they are based on self-assessments and with such assessments it is always possible for the data to be manipulated strategically. Each of the offices may have an incentive to claim that the waiting times are shorter than they really are and thus appear to be providing better service. In Germany there are private firms, for example car dealers, which, for a fee, will register the new car for the owner. Therefore, we tried to eliminate this weakness in our data set by sending a similar questionnaire to some of these private firms as to control the information provided by the government offices. Unfortunately we had hardly any feedback from them and, therefore, had to be content with the data we obtained from the registration offices.

Overall annual registrations, address and ownership changes, and deletions of registrations at the local level (*Kreise*) were obtained from the Federal Vehicle Office (*Kraftfahrzeugbundesamt*). This also provided information about the branches of registration offices. The Federal Statistical Office (*Statistisches Bundesamt*) provided us with annual data for local GDP and population.

4.2 Empirical model

Whereas hypotheses 1 and 2 offer explanations for waiting time, hypothesis 3 attempts to explain the size of offices' staff. So, we have two different dependent variables and, therefore, carried out two separate regression analyses. Let us begin with the first two hypotheses.

In the empirical literature, there are two ways of estimating waiting time. Lindsay and Feigenbaum (1984) and Midttun and Martinussen (2005) both use ordinary least squares (OLS), while Joling/Groot/Janssen (2003), for example, estimate waiting time for doctors using a proportional hazard model. The latter method especially fits well with our findings from the queueing theory, which imply a non-linear explanation for the waiting time. Therefore, we estimate our hypotheses using OLS and control the results with a proportional hazard model. We use the following empirical model for both estimation methods

$$d_i = \beta_0 + \beta_1' x_i + \beta_2' z_i + \beta_3' s_i + \epsilon_i. \tag{1}$$

The explained variable d_i denotes the average time needed to register a new vehicle from entering the office until leaving it in minutes (DURATION), i.e. the waiting time plus the service time. Our unit of observation is the local jurisdiction $i = 1, ..., N$.

The bureaucracy variables, that simulate the mean service rate of the queueing theory, are summarized in x_i. These include the manning (MANNING), i.e. the ratio of new vehicle registrations to full time employee-equivalents, and the officers involved in each registration process (CLERKS). These two variables are the most important explanatory variables for hypotheses 1 and 2. However, further variables simulate the mean service rate and are, therefore, included in x_i. These are the annual cases handled in one office (CASES), additional duties the office has to carry out (TASK), and the hierarchical position of the office (INDEPEND) within the German administration. The variable CASES consists of new vehicle registrations, changes in address or ownership and deletions of registrations. Additional duties are those that go beyond the ones given in the federal legislation for registration offices. The variable INDEPEND measures whether the local office can act relatively independently of supervising authorities or not. We also include the relation between employees and their full time equivalents (FTQ) and the convenience of waiting by using the relative number of waiting room seats (SEATS_CASES). Finally, we control for the number of branches the office might have (BRANCH). A detailed description of all the variables can be seen in Table 1 of the appendix.

An approximation of the mean arrival rate can be seen in the variables that refer to different characteristics of the local jurisdictions, such as variations in GDP or case density. The number of cases per capita (CASES_PERS) or local GDP per capita (GDP_PERS) in each local jurisdiction are denoted in z_i. We also control for whether large car companies are located in the local jurisdiction (CarProd) and a dummy for each state is included to control for state effects. This is also denoted in z_i.

Following the queueing theory, we further include the number of service points (COUNTER) and an interaction variable (INTERACTION) where the number of counters interacts with the new-registration-to-counter ratio in s_i. This nonlinear variable is well in line with the nonlinear relation between office size and the number of counters derived from queueing theory.

Random disturbance is $\epsilon_i \sim N(0, \sigma_\epsilon^2)$. Let $w_i = (x_i|z_i|s_i)$, then the assumptions of the model can be summarized as follows

$$\begin{aligned} &E(\epsilon_i \epsilon_j) = 0 && \text{for } i \neq j \\ &E(w_i \epsilon_j) = 0 && \text{for all } i, j \end{aligned} \tag{2}$$

We use OLS and control for heteroskedasticity using Withe-corrected standard errors. To complement to the use of state dummies, we cluster states where the assumption of independence of observations within states is relaxed. So, clustering produces "correct" standard errors (in the measurement sense) as, even if the observations within the cluster are correlated, they only have to be independent across clusters. Finally, we control for outliers.[4]

As it is most likely that all explanatory variables enter in a nonlinear way to determine waiting time, we check our results obtained by the linear regression with a non-linear regression using a duration model, the fit proportional hazards model. However, there is no reason why OLS results should be biased or inconsistent. Equation 1 changes only with regard to the constant term and that vanishes because duration models do not have a constant. The hazard function describes the probability that the waiting time will be over in T, given the fact that the person has waited until then. In our setting the hazard function is constant which means that the process driving T is memoryless, i.e., the probability of exit in the next interval does not depend on how much time has been spent in the initial state (Wooldridge, 2002, 688). We also control for heteroskedasticity

[4] We use the stata commend *rreg*, that calculates Cooks'D and eliminates outliers with Cooks'd larger than 1 before estimating robust standard errors. In this case, however, no clustering is possible.

with Withe-corrected standard errors.

All modern regression packages keep track of missing data and simply ignore observations when computing a regression. If the data are missing at random, then the size of the random sample is simply reduced. While this makes the estimator less precise, it does not introduce any bias and the random sampling assumption still holds. In most cases the observations that have missing information are just ignored. Nevertheless, we control for this by adding a dummy for the missing observations (MISS).

The general setting changes slightly when hypothesis 3 is estimated, because, instead of the waiting time, the bureaucratic structure of vehicle registration offices is analyzed. Then, the empirical model looks as follows:

$$m_i = \beta_0 + \beta_1' x_i + \beta_2' z_i + \beta_3' s_i + \beta_4' d_i + \epsilon_i. \quad (3)$$

Now, the dependent variable m_i is the manning (CASES_FTE), i.e. the ratio of annual cases to full time employee-equivalents. The bureaucratic variables in x_i remain unchanged with one exception. The variable MANNING is no longer included as it is almost identical with the dependent variable m_i. As in equation 1, z_i denotes local control variables like CarProd and local GDP per capita. The case density (CASES_PERS) is not included because it would - in the end - only measure the relationship between local inhabitants and full-time equivalents and this does not play a role in our setting. s_i is defined slightly differently. Instead of the interaction variable and the total number of counters, we include the number of counters relative to cases (CASES_COUNTER) as we have no reason to believe that counters should enter the regression in a nonlinear way. Finally, the variable d_i denotes, again, service time.

As before, random disturbance is $\epsilon_i \sim N(0, \sigma_\epsilon^2)$, all other assumptions are analogous. We estimate equation 3 with OLS and control in exactly the same ways as described above.

4.3 Empirical Results

Before we estimate the hypotheses let us first take a brief look at the descriptives.

[Table 2 about here]

The average registration time for a new car is half an hour. However, the actual time given differs widely, between 5 and 165 minutes. The sizes of the registration offices are very different as can be seen from the number of yearly car registrations (between 1,558 and 104,646) and the annual cases they handle ranging from 6,868 to 421,690 with an average of 32,658 cases. The variation in size can also be seen from the number of full-time equivalents working there. These vary between 2 and 296 (average 16.3).

On average, one full-time employee-equivalent registered 520 cars per year (MANNING). This falls to 489 if the seven local jurisdictions where large car production sites are located (CarProd) are excluded (MANNINGD). Again, there is a wide interval, ranging from 172 car registrations per full time equivalent to 3,066 (or 2,021 without jurisdictions with large car production sites). 2.1 officers were, on average, involved in each registration process, with a minimum of one, and a maximum of 20, officers (CLERKS).

Whereas 70 per cent of offices had no branches, 21 per cent had one and the rest had two or more (BRANCH). 80 percent of offices did not carry out more tasks than required in the Federal Law for registration offices. 9 per cent carried out one additional task, 7 percent two, and the remainder carried out more of them (TASK). While two third of offices are subordinate to another administrative body and are, therefore, relatively dependent, one third is not (INDEPEND). The employees worked, on average, 84 per cent of the full time work load.

Looking at GDP per capita and case density in each local jurisdiction, we find that average GDP per capita is 24.561 €, and 18 per cent of inhabitants had a registration, a deletion or a change of address or ownership of a car during the year. This result remains unchanged when the seven local jurisdictions with large car production sites are excluded.

Finally, the number of available counters (COUNTER) varies between 1 and 5, with the absolute majority of offices (52 per cent) having 2 counters. The ratio of registrations to counters (REGISTR_COUNTER) varies between 622 and 48.006 per year with an average of 4.724.

In section 3 we developed two hypotheses to explain the waiting time for a car registration in Germany. According to the first, *manning has no influence on the duration of the registration process.*

[Table 3 about here]

In column 2 we report the results from the OLS-estimation with robust standard errors and clustered states (estimation 1), and in column 3 the results from the OLS-regression with robust standard errors corrected for outliers (estimation 2). In the last column we show the estimation results from a proportional hazard model (estimation 3). In estimation 1 and 2, the coefficient of the variable MANNING is slightly positive. So if the number of full-time-equivalents (i.e. the denominator in the variable) raises the value of the variable MANNING decreases and waiting time declines. Therefore, the positive sign of the coefficient points to a negative correlation between staff per registration and waiting time. The corresponding coefficient in the last column is negative. In a proportional hazard model, this negative coefficient shows that the probability that, at a given point of time, someone is no longer waiting is higher, the better the manning; i.e. - again - the better the manning, the shorter the waiting time. However, all three coefficients are extremely small, and - even more important - well beyond any acceptable significance level (significance lies between 36 per cent and 68 per cent, respectively). So, we do not find any significant correlation between manning and waiting time. Thus, we find support for hypothesis 1.

The second hypothesis derived in section 3 predicts that *the more clerks involved in the registration process, the longer the waiting time.* The results are also reported in table 3. We find a very strong positive relationship between the number of employees involved in one registration process (CLERKS) and the duration of the process in all three estimations. The OLS-estimations produce a coefficient of 1.8 and 2.0, respectively. That means that one additional employee who is involved in the registration process adds around two minutes waiting time for the customer. These results are significant at a 1-per cent-level, whereas the coefficient in the proportional hazard model is still significant at 2.4 per cent. As described above, the coefficient in the proportional hazard model has a sign opposite to that of the OLS-results, i.e. it is negative. The interpretation is the same as mentioned above: the more employees involved in one registration process, the lower the probability that, at a given point of time, someone has already been served, i.e., the longer the waiting time. Thus, we find support for hypothesis 2, too.[5]

With one exception, none of the control variables turns out to be significant in any estimation. Office size seems to have no influence on waiting time, since the coefficient of the number of cases (CASES) is 0. The coefficient of branches (BRANCH) shows the expected negative sign. So is seems to be that, if the number of branches increases, waiting time decreases.[6] Carrying out additional tasks might lead to a shorter waiting time. This result seems to be surprising and - apart from being insignificant - is also not in line with the results of estimation 1 and 3. Therefore, we should neglect it. The positive coefficient of the variable INDEPEND shows that waiting time is longer if the admission office is subordinate to another administrative body. From a more general point of view, this could be seen as evidence for promoting a more decentralized organization. Comfort, i.e., the ratio between waiting room seats and cases (SEATS_CASES), is positively correlated with waiting time. The positive coefficient of the ratio of full-time equivalents to the absolute number of employees implies that part time employees are more productive than full time ones because waiting time decreases if the number of employees - but not the number of full time equivalents - increases.

The coefficient for offices located in jurisdictions with large car productions sites shows the expected negative sign. Overall waiting time in these jurisdictions appears to decrease. This is probably due to the fact that the registration process is highly automated in cooperation with these large car production companies. Local wealth appears to have no influence on the waiting time as the coefficient of GDP per capita (GDP_PERS) is 0. We find that case density in the local jurisdiction does seem to have a negative influence on the waiting time. But, again, this result is not confirmed in estimations 1 and 3.

Finally, the variables COUNTER and INTERACTION, the latter combining the number of counters and the ratio of new car registrations to counters, test whether waiting time decreases, ceteris paribus, with the number of counters. Although we have also estimated this idea using several other nonlinear methods, no empirical evidence for this

[5]If we run regression 1, 2, and 3 without the highly significant variable CLERKS, the other main results do not change.

[6]We mainly concentrate our interpretation on estimation 2, as results are similar in all three regressions.

aspect of the queueing theory was ever found.

Summing up, most of the coefficients of the control variables show the expected sign but none of them is even close to being significant.

We did not report the coefficients for state dummies.[7] In the OLS-regressions no single state dummy is ever significant. However, this changes if they are tested jointly. Therefore, we have left them in the regression as we cannot reject the hypothesis that states do not matter. In estimation 3, the proportional hazard model, four state dummies are significant and if tested jointly all are significant. As the coefficients have negative signs, the waiting time in Bavaria, Baden-Württemberg, Saarland, and Lower Saxonia appears to be longer than elsewhere. The first three coefficients are significant at a 1% level and the last one is still significant at a 10%-level.

We are aware that we cannot completely rule out an inverse causality in our estimations. Hence, we were unable to think of any plausible instruments for either the manning or for clerks handling a single registration. In any case, inverse causality is not very plausible for hypothesis 1. If, for example, a longer waiting times had resulted in better manning with the aim of improving the situation for the clients, we should find a significant positive correlation. Thus, we do not find any significant correlation between waiting time and manning. With hypothesis 2, inverse causality also does not make much sense, because it is hard to imagine how waiting time could influence the number of clerks handling one registration. Therefore, we stick to our conclusion that hypotheses 1 and 2 can be confirmed.

In section 3 we also derived a hypothesis for Parkinson's idea that organizations are bound to multiply the number of subordinates. Hypothesis 3 says that *the larger the registration office, the disproportionately larger the number of employees.*

[Table 4 about here]

In table 4 we show the results of a robust OLS-estimation that controls for outliers. The coefficient of cases (CASES) shows a negative sign, meaning that, if the number of cases increases, the ratio of cases to full-time equivalents decreases, i.e. the number of

[7] We also do not report the coefficients of the control variable for missing observations (MISS). This variable drops out of every single estimation due to collinearity.

full time equivalents must increase disproportionately to the number of cases. The result is significant at 1 per cent. This disproportional increase in the staff size is exactly what our hypothesis 3 predicts.

Five coefficients of control variables are significant and will be discussed briefly. Not surprisingly, the coefficient of the variable, accounting for additional tasks a registration office carries out (TASK), has a negative sign. The more additional tasks a registration office carries out, the fewer registration cases per full-time equivalent occur because employees also have other duties. This result is significant at 1.8 per cent. We control for comfort by looking at the ratio between waiting room seats and cases (SEATS_CASES). The coefficient of this variable shows the expected negative sign and the variable is highly significant. So, if the number of waiting room seats increases, so too does the number of full-time equivalent employees. As waiting room seats are highly correlated with office size, this correlation simply means that there are more full-time equivalents in large offices. The next significant control variable is the ratio of full-time equivalents to employees in absolute numbers (FTQ). It has a negative sign, meaning that there is a positive relation between the absolute number of employees and number of cases. As expected, the coefficient of the variable controlling for large production sites (CarProd) has a positive sign and significance is at the 1 percent level. In local jurisdictions where there is a large car production site, the number of annual car registrations is much higher than elsewhere. However, the number of full-time equivalents dealing with these registrations does not have to be increased proportionately as the registration process in this context is probably highly automated. Finally, the ratio of cases to counters (CASES_COUNTER) shows a significant positive correlation with manning. This means that the number of full-time equivalents increases with the number of counters. It is most probable that this is simply an indication for office size. The number of clerks handling a registration (CLERKS), the number of branches (BRANCH), local wealth (GDP_PERS) and waiting time (DURATION) have insignificant coefficients. All results are unchanged if waiting time is not used as an explanatory variable in the estimations.[8]

In estimation 4, state dummies are not included because none of them is significant

[8] However, the CASES_COUNTER coefficent is no longer sifnificant.

and they are also not significant if tested jointly. So, states do not seem to play a role in this question.[9]

Summing up, we also find support for the hypothesis that the staff size increases disproportionately with the size of the registration office.

5 Conclusion

Our results are in line with the hypotheses derived from the theory. We do find evidence for Parkinson's law in three aspects. First, following Parkinson's observation that paperwork is elastic in its demand for time and expands with the time available, we do not find any correlation between manning and waiting time. So the bureaucrat's extra time is not used to the benefit of the customer, and this means that service quality is no better in offices that have more staff per registration. Second, waiting time increases with the number of employees involved in the registration process. Thus, service quality is worse if the service procedure is disaggregated into multiple smaller sub-services. This confirms Parkinson's findings that the bureaucracy keeps itself busy because each additional employee adds to administrative work. Finally, an increase in the number of clients who are served is followed by a more than proportionate increase in staff size. This supports Parkinson's law that the number of administrators is sure to multiply since they want to increase the number of their assistants, with the result that an administrative hierarchy emerges.

6 References

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[9] By the way, if we include state dummies the result does not change, but significance of our main explanatory variable, CASES, changes to 6.5%.

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7 Appendix

Variable	**Explanation**
DURATION	waiting and service time for a new vehicle registration in minutes
REGISTR	annual registrations of new vehicles per office
FTE	full-time employee eqivalents
MANNING	ratio new vehicle registrations (REGISTR) to full-time equivalents (FTE)
CLERKS	clerks involved in each registration process
CASES	annual cases = registrations, adress and ownership changes and deletions
BRANCH	number of branches of a registration office
TASK	additional administrative tasks the office carries out
INDEPEND	= 1 if registration office is subordinated to another administrative body
FTQ	ratio of full-time employee equivalents to absolute number of employees
SEATS_CASES	ratio of waiting room seats to cases
CarProd	= 1 if a large car production site is located in the local jurisdiction
GDP_PERS	GDP per capita in each local jurisdiction
CASES_PERS	cases per capita in each local jurisdiction
CASES_FTE	cases per full-time equivalent
COUNTER	service points or counters
REGISTR_COUNTER	ratio of new registrations to counters
INTERACTION	COUNTER* REGISTR_COUNTER
MISS	=1 for missings
MANNINGD	manning without CarProd = 1

Table 1: Explanation of variables.

Variable	N	mean	s.d.	min	max
DURATION	233	30.3	18.7	5	165
REGISTR	235	8295.6	11500.5	1558	104646
FTE	232	16.3	22.9	2	296
MANNING	232	519.6	302.6	172.3	3065.9
MANNINGD	225	488.8	213.6	172.3	2021.0
CLERKS	234	2.1	1.35	1	20
CASES	235	32657.9	36685.6	6868	421690
CASES_FTE	232	2171.7	900.4	747.3	9899
BRANCH	235	.4298	.7668	0	4
TASK	235	.4085	.9355	0	6
INDEPEND	228	.6579	.4755	0	1
FTQ	232	.8406	.1234	.25	1
CarProd	235	.0298	.1704	0	1
GDP_PERS	235	24561.1	11418.6	6290.4	78018.2
CASES_PERS	235	.1849	.0339	.0428	.4418
COUNTER	235	1.8809	.7586	1	5
REGISTR_COUNTER	235	4724.1	5608.9	621.7	48005.5
MISS	235	.0596	.2372	0	1

Table 2: Descriptive statistics.

Variable	estimation 1		estimation 2		estimation 3	
MANNING	.0016	(.0038)	.0049	(.0054)	−.0002	(.0002)
CLERKS	1.8333***	(.5616)	1.9719***	(.6937)	−.0768**	(.0364)
CASES	.0000	(.0002)	−.0000	(.0002)	−.0000	(.0000)
BRANCH	−.5436	(1.4933)	−1.5431	(1.3909)	.02	(.0662)
TASK	.7626	(1.5135)	−.7994	(1.029)	−.0656	(.0963)
INDEPEND	2.5975	(2.0557)	.8541	(2.026)	−.1942*	(.1087)
SEATS_CASES	−106.6207	(2347.904)	−689.0284	(1598.14)	−32.3941	(105.9645)
FTQ	3.7478	(12.3207)	2.9055	(9.5194)	−.0546	(.7248)
CarProd	-12.1807	(10.2533)	-9.5716	(10.4005)	.4852	(.5027)
GDP_PERS	.0002	(.0001)	.0001	(.0001)	−.0000	(.0000)
CASES_PERS	11.7014	(52.9191)	-26.4803	(46.9778)	-.8814	(2.8270)
COUNTER	-1.4402	(1.2122)	-1.3734	(1.438)	.0856	(.0673)
INTERACTION	.0001	(.0005)	.0002	(.0005)	.0000	(.0000)
R^2	.2187					

Dependent variable DURATION, $N = 219$, robust standard errors in brackets.
Significance levels: *** = 0.01, ** = 0.05, * = 0.10

Table 3: Regression results for registration duration.

Variable	estimation 4	
CASES	-.0043***	(.0016)
CLERKS	-12.0415	(20.0822)
BRANCH	-24.0495	(40.0568)
TASK	-73.4569**	(30.7992)
INDEPEND	4.3267	(60.0235)
SEATS_CASES	-145768.7***	(45213.83)
FTQ	-2552.379***	(233.4117)
CarProd	698.3915***	(179.0319)
GDP_PERS	-.0005	(.0026)
CASES_COUNTER	.007**	(.0029)
DURATION	-2.0776	(1.8032)

Dependent variable CASES_FTE, $N = 219$,
robust standard errors in brackets.
Significance levels: *** = 0.01, ** = 0.05, * =0,10

Table 4: Regression results for office size.