MEASURING EFFICIENCY OF BRAZILIAN COURTS: ONE DECADE LATER

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1. Introduction

It is not uncommon for developing countries to present weak political institutions. These institutions usually lack credibility, independence, transparency and/or, especially, efficiency. As a matter of fact, the prevalence of such institutions is, according to institutional economists (e.g., North & Weingast, 1989; North, 1991; Acemoglu and Robinson, 2012), one of the main reason why countries remain underdeveloped.

Among the most scrutinized institutions with regards to these deficiencies is the Judiciary. A lengthy literature shows empirical evidence of the manner by which judicial inefficiency impact economic and social outcomes. This paper aims to measure (in)efficiency of the Brazilian Judiciary and its dynamism in recent years (2009-2015), one decade after the National Council of Justice (CNJ) first made available the data necessary for this kind of investigation. We will use DEA (Data Envelopment Analysis), and more specifically, the Malmquist index approach, to analyze the efficiency and productivity change in Brazilian courts during the recent period. The results of this current article will help to evaluate whether these recent efforts were useful (somehow) to improve judicial productivity in Brazil. The discussion may be fruitful for scholars, magistrates, lawyers, or anyone interested in better understanding the Brazilian Judiciary. It is an attempt to conclude the investigations made in this last decade.

This paper is divided into five sections, including this introduction. Section 2 briefly reviews the literature on the impacts of judicial efficiency in the economy, and also DEA methodology applied to courts in Brazil. Section 3 is our section on methodology and data. We carefully describe the methodology chosen, the data source employed, and the construction of the variables. In Section 4 we present the DEA results, both the efficiency scores and the Malmquist Productivity Index. Besides discussing the scores and the evolution of productivity change, we also digress on peer units and target outputs and inputs. We close this section with a brief but important discussion relating judicial efficiency and judicial quality. Finally, in section 5 we conclude the paper with some final remarks.

2. Literature Review: Judicial Efficiency and DEA applied to Brazilian Courts

A lengthy literature shows empirical evidence of the manner by which judicial inefficiency impact economic and social outcomes.

Focusing on Latin America, and based on data collected in interviews with entrepreneurs in Latin America, Weder (1995) shows that 23% of the variation in per capita growth could be explained by the functioning of the Judiciary. It is clear that courts that are efficient and make decisions in a secure manner do bring higher level of economic growth. Sherwood (2004) also surveyed seven countries (Argentina, Brazil, Canada, Peru, Philippines, Portugal and Spain), between 1996 and 2002. The author shows that the malfunctioning of the Judiciary was responsible for 20% of the lack of growth and for 10% of the reduction in credit in these countries.

In a very comprehensive study on the literature of the determinants of judicial efficiency, Voigt (2016) made a summary of the empirical results found by several studies, from all over the world. First, average efficiency varies significantly within countries; interestingly, if efficiency is measured by court delay, it does not increase with the number of judges employed. Also, there seems to be some sort of outside pressure leading to higher judicial productivity. Moreover, the quality of procedural law is correlated with judicial efficiency: the more complex the procedures,

the longer are court delays, and the less efficient are courts. Finally, there does not seem to be significant correlation between judicial efficiency and quality, as measured by reversal rates in higher courts.

In Brazil, there were some attempts to quantitatively measuring judicial efficiency since the beginning of year 2000. For instances, Souza and Schwengber (2005) use the methodology of Nonparametric FDH (Free Disposal Hull) to estimate efficiency of local courts in the state of Rio Grande do Sul. Yet, to our knowledge, the first attempt applying DEA to courts in Brazil were Yeung and Azevedo (2011) and Fochezatto (2010). Since then, several papers – published either nationally or abroad – employed the same approach, for instances: Nogueira et al (2012), Yeung and Azevedo (2012), Yeung (2014), Botelho (2016). The exponential growth in the DEA literature in Brazil reflects the same international trend, as shown by Emrouznejad and Yang (2018).

Have all these works in the literature helped improve, somehow, judicial efficiency in the real life?

3. Methodology, Data and Variables

3.1 Methodology

We choose the model originally formulated by Charnes, Cooper and Rhodes (CCR, 1978), which is of constant returns of scale (CRS). Although there is no definitive consensus in the literature about this choice for judicial courts (Voigt, 2016), the assumption of CRS is not unfounded. Both Dalton & Singer (2009), in the United States, and Kittelsen & Forsund (1992), in Norway, found that increasing returns to scale only appears in very small courts, those which handle less complex cases. In Spain (a civil law country, similarly to Brazil) Pedraja-Chaparro & Salinas-Jiménez (1996) regressed efficiency scores on size, and found no significant results in the coefficients. Our base paper for Brazil, Yeung and Azevedo (2011), did the same exercise and also found no significant coefficients of the impact of size of courts to efficiency scores.

Also, due to the legal impossibility of Brazilian courts to freely adjust the level of inputs employed (judges, staff, etc.), we use the output oriented DEA model. This is also in accordance with the majority of this literature.

As for the dynamic analysis, of the evolution of productivity throughout the time, we use the methodology of Malmquist Productivity Index (MPI), which enables us to analyze, separately, changes in the components of technical efficiency – i.e., pure efficiency and scale efficiency – and changes in technology. As shown by Behera et al (2011), MPI may be derived as:

$$MPI = \frac{}{} \quad \frac{}{} \quad \frac{}{}$$

"The ration outside the brackets is the ratio of Technical Efficiency between two periods of time, denoted as EFFCH, and indicates if the DMU is getting closer o or moving away from the efficiency frontier over time. The ratio inside the brackets measures the technology change over the period, denoted as TECHCH, and indicates if the efficiency frontier is shifting out or shrinking in. While the value of the ratios greater than one indicates progress in the front, values less than and equal to one indicates regress and no change, respectively" (Behera et al, 2011, p.391).

3.2 Data and Variables

Data comes from "Justiça em Números" (Justice in Numbers), the report annually published by the National Council of Justice (CNJ). This council was created in 2003, as part of a larger institutional reform of the Brazilian Judiciary, which aimed at improving efficiency. One of the tasks CNJ was to collect, monitor and publish statistics by all branches of the judicial system.

Since the publication of the first "Justiça em Números", in 2004, several improvements have been made, mostly to make it more accessible to common citizens (not only scholars or law practitioners), and to present, in a more explicit manner, information related to efficiency, such the duration of an average lawsuit, percentage of appeals and amendments by superior courts, etc.

We use data on State Courts, both of first and second instances. According to "Justiça em Números 2016", these courts concentrated 69.4% of all new lawsuits in the country; they also hold 79.9% of all pending cases in the Brazilian Judiciary. There are 27 Federal Units in the country, and therefore, 27 State Courts, which are the Decision Making Units (DMUs) in our study.

Two inputs were used: the number of judges and the number of judicial staff in each State Court. Output analyzed is the sum of the numbers of decisions held in the first- and second-degree courts. Following Yeung and Azevedo (2011), we also weighted the inputs and output of each State Court by its workload, i.e., the sum of new cases of the current year, and pending cases from the previous year. The main reason to do so is the high concentration of population, economic activity, and litigation in Brazil. As explained by those authors, not taking into account the striking differences between the Federal Units could lead to bias,

> since courts in which there is a heavier workload could automatically be identified as efficient units simply because they produce more absolute amount of outputs. Furthermore, the simplest concept of efficiency, given by the productivity ratio, also requires some sort of weighting… (p. 347)

After weighting is done, to avoid very small decimal numbers, inputs (number of judges and number of judicial staff) were multiplied by 100,000, and output (number of decisions granted at 1st and 2 nd instances) by 100. In Appendix 2, we present the data effectively used to run the DEA analysis for year 2015.

4. Results and Discussions

4.1 DEA 2009 to 2015, as compared to previous results.

a) Efficiency measures. First, let us look at the results on Table 1, the efficiency scores from year 2009 to 2015:

Table 1: Efficiency Scores (2009-2015)

STATE (DMU)	2009	2010	2011	2012	2013	2014	2015
Acre	0.400	0.451	0.526	0.320	0.381	0.307	0.313
Alagoas	0.527	0.418	0.323	0.502	0.524	0.360	0.622
Amapá	0.198	0.181	0.210	0.236	0.259	0.238	0.349
Amazonas	0.433	0.398	0.624	0.760	0.771	0.493	0.175
Bahia	0.214	0.263	0.295	0.298	0.261	0.255	0.228
Ceará	0.384	0.434	0.252	0.345	0.301	0.408	0.503
Distrito Federal	0.356	0.382	0.454	0.425	0.424	0.431	0.547
Espírito Santo	0.249	0.283	0.426	0.412	0.447	0.401	0.519
Goiás	0.606	0.434	0.564	0.769	0.694	0.663	0.539
Maranhão	0.206	0.164	0.290	0.380	0.277	0.271	0.600
Mato Grosso	0.353	0.274	0.379	0.406	0.417	0.538	0.558
Mato Grosso do Sul	0.956	0.849	0.665	0.670	0.567	0.555	0.643
Minas Gerais	0.491	0.476	0.551	0.625	0.548	0.529	0.689
Pará	1.000	0.991	0.614	0.472	0.734	0.752	0.333
Paraíba	0.319	0.302	0.436	0.315	0.275	0.317	0.302
Paraná	0.992	0.827	0.716	0.639	0.518	0.585	0.932
Pernambuco	0.365	0.378	0.448	0.400	0.589	0.429	0.350
Piauí	0.175	0.178	0.191	0.260	0.270	0.249	0.278

Rio de Janeiro	0.885	1.000	1.000	1.000	1.000	1.000	1.000
Rio Grande do Norte	0.290	0.292	0.276	0.293	0.286	0.317	0.287
Rio Grande do Sul	0.961	1.000	1.000	1.000	1.000	1.000	1.000
Rondônia	0.476	0.306	0.475	0.494	0.524	0.543	0.543
Roraima	0.276	0.224	0.262	0.265	0.299	0.434	0.732
Santa Catarina	0.659	0.697	0.743	0.759	0.671	0.566	0.657
São Paulo	1.000	0.613	0.860	0.776	0.664	0.717	0.873
Sergipe	0.504	0.583	0.458	0.555	0.710	0.685	0.362
Tocantins	0.092	0.257	0.307	0.299	0.343	0.441	0.350

No DMU was on the efficiency frontier during all seven years of the period analyzed; yet, two units were very close to it: the State Court of Rio de Janeiro and of Rio Grande do Sul. Both were away from the efficiency frontier only in the first year of the period analyzed (2009), and their distance was not far from it. Rio de Janeiro scored 0.885, and Rio Grande do Sul was even closer, 0.961. Yeung and Azevedo (2011), analyzing data of 2008, the year immediately before the first observation in our panel, found that the only DMUs lying on the efficiency frontier were exactly these two units, the State Courts of Rio Grande do Sul and of Rio de de Janeiro.

Some DMUs have consistently low scores throughout the period, most of them belonging to the poorer northern regions, such as Acre, Amapá, Bahia, Ceará, Maranhão, Paraíba, Pernambuco, Piauí, Rio Grande do Norte, and Tocantins. Others, such as Espírito Santo (in the richer Southeast region) also have a long way towards the efficiency frontier. On the other hand, most of the richer southern states did perform well throughout the period: Rio de Janeiro, São Paulo, Paraná, Santa Catarina and Rio Grande do Sul. Future research should try to address whether judicial efficiency is correlated with per capita income. Voigt and El-Bialy (2016) did not find this relationship for European countries.

(b) Peer groups and efficient units.

DEA theory shows that, for each inefficient DMU, it is possible to derive an efficient projection onto the production frontier. This projection is not necessarily empirically observed, by is constituted by a convex combination of efficient units effectively observed. Mathematically, for each inefficient DMU, represented by (X_0, Y_0), where X_0 is a vector of inputs and Y_0 a vector of outputs, there exists a projected efficient point $(\hat{X}_0, \hat{Y}_0)$, which lies on the efficiency frontier. This, in turn, is a combination of efficient points, or: $\hat{X}_0 = \Sigma\lambda_k X_k^*$, $\hat{Y}_0 = \Sigma\lambda_k Y_k^*$ where $\lambda_k \geq 0$ for each k, and k's are the efficient points lying on the frontier. λ is a vector of weights empirically derived. Cooper, Seinford and Tone (2007) warns that, if an efficient DMU dos not appear many times as peer for others (as k), the result might not be reliable. Pedraja-Chaparro & Salinas-Jiménez (1996) also affirm that only those efficient DMUs that appear many times in peer groups should be considered "genuinely efficient units". For this reason, we present Table 2, which examines how many times each efficient DMU shows up as peer for others, during this 7 year time period:

Table 2: N. of Times an Efficient DMUs is Peer to Inefficient Ones

	2009	2010	2011	2012	2013	2014	2015
Pará	23	***	***	***	***	***	***
São Paulo	23	***	***	***	***	***	***
Rio de Janeiro	***	20	20	21	21	21	15
Rio Grande do Sul	***	25	25	25	25	25	24

For each year during this time period, there were 25 inefficient DMUs. Except for the first year observed, during which it did not lay on the efficient frontier, the State Court of Rio Grande do Sul presents itself as peer for all inefficient units, but one, in 2015. Rio de Janeiro also did not appear as an efficient unit on 2009, from 2010 on, it always showed up as peer for the vast majority of inefficient units. We may, with strong certitude, be sure about the DEA scores of this time period, especially for the case of these two DMU's.

It is still not sure why São Paulo and Pará appears only once, during this 7-year time period, as efficient units. The State Court of São Paulo is, by far, the largest court in the country. According to the report "Justiça em Números 2016", during year 2015, it encompassed more than 25 million cases, either new or pending ones. It is almost twice the size of the second largest court, the one of Rio de Janeiro, which comprised of 13.6 million cases in that same year. With some degree of internal management, São Paulo could reach the efficient frontier, and the scores on Table 1 show that: except for two years, its efficiency score was over 0.7. On the other hand, Pará seems to be an unexpected and odd case. As for year 2015, it ranked as the 14th largest state court (total of 27). As one can see from Table 1, efficiency scores are not that consistent. Explanations perhaps could be obtained after some more in-depth analysis of the quality of the numbers, and/or of qualitative descriptions about the situation in 2009, the year it appears as efficient. More research is needed to explain this all.

(c) Actual versus target outputs, actual versus target inputs.

One interesting feature of DEA is the possibility to get target outputs and inputs, and compare them to the real values observed.

Let us make an exercise with one DMU, the State Court of São Paulo, the largest in the country, which, in year 2015, had a DEA score of 0.873. DEA results indicate that target output for this DMU is 19.47. Yet, because we have weighted all inputs and outputs before running DEA, we must now multiply target values by the respective weight of each state, i.e., the number of new and pending cases in each year. From Table A2, one can see that, for the State Court of São Paulo, in year 2015, weight equals 24,771,652. Thus, multiplying 19.47 by 24,771,652 and subsequently dividing by 100 (reversing the operation described in section 3.2 above), one gets roughly 4,823,041. Again from Table A2, effective output by this DMU was of 4,223,467. This means that, taking into account inputs effectively employed, the State Court of São Paulo lagged behind in approximately 599,574 decisions, as compared to its DEA target, or 14.2% of the total produced. In fact, this is a relatively positive result. The same exercise may be carried out for all other inefficient DMUs.

One may do similar exercise, now considering target inputs. We may do that for the State Court of Amazonas, the least efficient DMU in year 2015, with a score of only 0.175. Target inputs, calculated by DEA, is 56.77 for judges and 667.00 for judicial staff. Doing the reversal operation as described above (i.e., multiplying by its respective year 2015 weight, and then dividing by 100,000) one gets targets of 129.8 judges and 1,526.58 judicial employees. The effective numbers were, according to Table A2, 178 judges and 1,526 employees. Therefore, taking into account the output produced, the State Court of Amazonas could have employed 48 judges less than it did effectively; judicial staff, on the other hand, was exactly on target. Unfortunately, for judicial courts in Brazil, the exercise of evaluating target inputs is merely theoretical, since as explained before, the definition of the numbers of judges and judicial employees are determined by law.

4.2 Malmquist indexes.

Now, we may turn to a dynamic analysis of judicial efficiency in Brazilian State Courts, i.e., the evolution their productivity, as measured by the Malmquist Productivity Index (MPI). From the 27 units, only two presented all round productivity growth during the period of 2009-2015: the State Court of Amapá, and that of Tocantins. Rio de Janeiro presented growth in all changes, except for PECH, which remained constant throughout the period. Yet, one should remember that we are, in this analysis, employing the CRS perspective, therefore, the PECH indicator is not applicable here. In this sense, Rio de Janeiro can also be considered a unit that presented positive changes in all indicators.

As for the other units that were DEA efficient, Pará and São Paulo, presented decrease in *all* measures of the MPI. This means that, if these two units were efficient somehow and sometime in the past, they are quickly losing their positions, being surpassed by other units (for instances, Rio de Janeiro). Rio Grande do Sul, on the other hand, which was on the efficiency frontier from 2010 to 2015 alongside with Rio de Janeiro, presented growth in technical efficiency (EFFCH) and scale efficiency (SECH), but negative technical change (TECHCH), and more importantly, also negative total factor productivity change (TFPCH). Regress was low (of 1.2%), but if this trend continues, it may, sometime in the future, lose its position on the efficiency frontier, something it has granted throughout the last decade.

Table 3: Average Productivity Change, Selected Units (2009-2015)

STATE (DMU)	EFFCH	TECHCH	PECH	SECH	TFPCH
Amapá	**1.099**	**1.009**	**1.096**	**1.003**	**1.109**
Pará	0.833	0.962	0.858	0.970	0.801
Rio de Janeiro	**1.021**	**1.001**	**1.000**	**1.021**	**1.022**
Rio Grande do Sul	1.007	0.981	1.000	1.007	0.988
São Paulo	0.978	0.999	0.983	0.994	0.977
Tocantins	**1.249**	**1.004**	**1.238**	**1.009**	**1.254**

On Table A3 (appendix), one might see the overall evolution during this 7 year-period. Average TFPCH was of 1.017, or 1.7% growth, with Pará presenting the largest regress (0.801) and Tocantins the largest progress. In fact, 15 units (out of 27) showed positive growth.

However, both TECHCH and SECH, presented average negative growth during this period. TECHCH across the 27 Courts showed small variations in change, ranging from 0.954 in Paraná, to 1.012 in Acre, with an average of 0.993. This aspect should be carefully dealt by court managers in Brazil. In recent years, most attention had been driven to equipping courts with computers, and turning all documents into electronic files; it seems that this effort has not been translated into concrete technical changes, and thus, has not effectively improved judicial efficiency. It is clear that Brazilian courts are still unable to achieve productivity growth by means of technological improvements or by means of management of the work scale. SECH, in its turn, varied from 0.853 in the State Court of Amazonas, to 1.176 in Maranhão.

4.3 A preliminary discussion on the relation between judicial efficiency and quality

In his comprehensive study about the determinants of judicial efficiency, Voigt (2016) poses:

Empirically, faster courts have not been found to produce lower quality decisions (measured by the percentage of cases appealed on the next level). Yet, it is obvious that past a certain threshold, there must be some tradeoff between speed and quality. How should the two be balanced against each other? (p.204)

Indeed, this question seems a true concern for all those studying and practicing in the Judiciary. One attempt in this aspect, specifically for the case of Brazil, was made by Yeung and Azevedo (2015). The authors compiled close to 1,700 decisions made at the Superior Court of Justice (STJ), which analyzed appeals of decisions made by the 27 Brazilian State Courts in the matter of breach of private, commercial contracts. In their *logit* analysis, only one State Court had its decision consistently and significantly amended by the STJ: Rio Grande do Sul. This result interestingly poses the possibility that, despite being one of the most efficient State Courts in Brazil, as shown above, it is also the one with the highest chances of having decisions amended by superior courts.

Unfortunately, up to now, there have been no additional efforts to address the problem posed by Voigt (2016). Certainly, this matter deserves a more careful study by other research in the future.

5. Conclusions

When the CNJ was created in 2003, one of its main goals was to boost efficiency of the Brazilian Judiciary. For this purpose, it mandated the collection and creation of several statistics by local courts, which were compiled in annual reports. More than one decade after the publication of the first report (2004), and several years after the first publications employing DEA to the Judiciary, there does not seem to be much concrete improvement in day-to-day efficiency in courts.

Most of the inefficient State Courts found by Yeung and Azevedo (2011) remain so, several years later. As a matter of concern, there seems to be correlation between per capita income and judicial efficiency across the Brazilian states. Yet, this matter deserves a more careful analysis by future researchers. The same two efficient units found by those authors for remain on the efficiency frontier, except for the first year analyzed in this paper. The structure of high performers and low performers basically remained unchanged throughout the almost ten-year period.

Malmquist Productivity Index (MPI) shows even less exciting evidence: there were very modest changes during this time. Only two units presented all round productivity growth. Average TFPCH for the period was of 1.017, or 1.7% growth; this is a small rate, but 15 units (out of 27) did show some positive change. On the other hand, TECHCH and SECH presented average negative growth. TECHCH across the 27 State Courts showed very small variations in change, and average 0.993, or 0.7% negative growth per annum throughout the period. As a country in which the problem of judicial inefficiency has been increasingly debated, and even chosen by National Council of Justice as priority for public policies, this negative growth at the TECHCH is very worrisome. It seems that most efforts and resources dedicated to the modernization of Information Technology (IT) at judicial courts have not resulted in any concrete results, as measured by the MPI. Productivity changes by means of improving scale efficiency have also been negative: SECH during this period averaged 0.996.

Have any of CNJ's efforts been worthwhile for improving efficiency in Brazilian courts? Perhaps, in qualitative terms, as one may explicitly see by opening the "Justiça em Números" reports year after year is that local courts have "learned" to be disciplined and organized in their data colleting. Undoubtedly, the quality of the data produced is way superior than that of ten years ago, during the first editions of the report (2004 to 2008). However, there is still room for improvements. Even for the latest years of the time period covered in this paper, there were still

State Courts which did not present data on very basic statistics about judicial inputs and outputs. Neither Amazonas nor Paraná did present official data on judicial outputs (decisions made at 2nd degree courts) for year 2015. We had to make estimations in order to "fill the blanks" for the DEA analysis of these two units. Caution in the interpretation of the results for these two courts is advised.

Our final conclusion is that, although the literature on judicial efficiency, and very specifically on DEA measures, has blossomed in the last decade in Brazil, public managers, judges, and even the CNJ itself, do not seem to have grasped the true value of efficiency analysis. Although the agenda of "efficiency boosting" seems to permeate throughout the entire Judiciary in the country, actions and policies have been taken by "trials and errors", without deep analysis of the real roots of the disseminated inefficiency. Efforts to implement IT throughout the courts are examples of such actions. This is a dangerous route since, as practitioners feel policies and initiatives are useless, they will be less and less convinced about the importance of improving efficiency in their daily routines. One positive example stands out in this all, since the first study by Yeung and Azevedo (2011): the State Court of Rio de Janeiro, which, since the beginning of the year 2000's has implemented a certification of ISO 9001, demonstrating its full commitment to efficiency in a very broad and deep manner. It is the only State Court in the country that, besides presenting perfect efficiency scores in six out of seven years of the panel, also showed positive productivity changes in every aspect, except PECH (in which it remained constant): its TFP change in the seven-year period was of 1.022, or +2.2% increase. Certainly this is a case for benchmark among Brazilian courts.

We hope that, in the following 10 years, literature on judicial efficiency keeps rising, as it happened in this last decade. However, even more importantly, it would be to see all this academic research translated into real improvements in the daily functioning of judicial courts in Brazil.

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Appendix 1: Details of the Variables Analyzed

"Justiça em Números" provides a full range of variables and measures, in a very detailed manner. Sometimes it was not straightforward which one was most suited for our efficiency analysis. Keeping our original goal in mind – to have a broad temporal dynamic analysis – we maintained, as closely as possible, those variables analyzed by Yeung and Azevedo (2011). With some minor adjustments (due to changes CNJ itself made in the data collection), the exact data we used from the report were:

Inputs:

- "Servidores da Área Judicial": the number of staff in the judicial área, as defined by CNJ.
- "Magistrados": the number of judges officially allocated to that State Court, both at the first and the second degree.

Outputs:

- "Sentenças do 1º Grau": Decisions granted at first degree courts.
- "Decisões Terminativas do 2º Grau": Ending decisions granted at second degree courts. These are decisions to which no more appeals are possible at the second degree; any appeal, if allowed, is directed to 3rd degree (higher courts).

Weighting:

- "Casos Novos": All new cases entering the State Court in a particular year.
- "Casos Pendentes": The number of pending cases from the previous year, as appeared on December 31st.

Appendix 2: **Table A2 – Inputs and Outputs (raw data) – Year 2015**

UF	Input 1: N. Judges	Input 2: N. Staff	Outputs: Decisions from 1st and 2nd degree	Weights: New and Pending Cases
Acre	72	1,049	44,511	169,339
Alagoas	127	1,419	136,113	646,713
Amapá	69	865	43,729	201,235
Amazonas	178	1,526	40,707	228,873
Bahia	586	6,364	229,285	2,809,253
Ceará	385	3,747	290,934	1,527,443
Distrito Federal	328	5,142	358,935	959,704
Espírito Santo	343	3,419	270,434	1,707,994
Goiás	368	4,674	372,085	2,163,514
Maranhão	149	4,076	179,732	1,473,132
Mato Grosso	233	3,204	245,760	1,379,274
Mato Grosso do Sul	180	2,211	211,035	1,103,861
Minas Gerais	967	13,199	1,273,704	5,943,441
Pará	320	3,321	165,031	1,315,189
Paraíba	253	2,768	128,380	758,549
Paraná	819	6,836	996,306	4,093,071
Pernambuco	473	6,042	315,007	2,365,103
Piauí	158	1,830	80,344	604,601
Rio de Janeiro	782	12,758	1,658,856	13,325,954
Rio Grande do Norte	187	2,264	101,516	890,014
Rio Grande do Sul	729	8,441	1,311,035	4,499,102
Rondônia	139	1,917	140,134	509,427
Roraima	38	479	50,819	135,114
Santa Catarina	465	5,063	506,346	3,421,153
São Paulo	2,415	36,664	4,223,467	24,771,652
Sergipe	161	1,996	106,506	533,868
Tocantins	115	1,401	72,679	405,263

Appendix 3: Table A3 – Average Productivity Change, Brazilian State Courts (2009-2015)

STATE (DMU)	EFFCH	TECHCH	PECH	SECH	TFPCH
Acre	0.960	1.012	0.966	0.994	0.971
Alagoas	1.028	1.002	1.044	0.984	1.029
Amapá	1.099	1.009	1.096	1.003	1.109
Amazonas	0.860	0.957	1.008	0.853	0.823
Bahia	1.011	0.991	0.994	1.017	1.002
Ceará	1.046	0.963	1.068	0.979	1.007
Distrito Federal	1.074	0.999	1.113	0.965	1.073
Espírito Santo	1.130	0.977	1.120	1.009	1.104
Goiás	0.981	1.003	0.989	0.992	0.983
Maranhão	1.195	0.999	1.017	1.176	1.195
Mato Grosso	1.079	1.000	1.094	0.987	1.079
Mato Grosso do Sul	0.936	1.002	0.932	1.005	0.938
Minas Gerais	1.058	0.999	1.057	1.001	1.057
Pará	0.833	0.962	0.858	0.970	0.801
Paraíba	0.991	0.995	1.029	0.964	0.986
Paraná	0.990	0.954	0.992	0.997	0.944
Pernambuco	0.993	1.011	1.015	0.978	1.004
Piauí	1.081	0.983	1.071	1.009	1.063
Rio de Janeiro	1.021	1.001	1.000	1.021	1.022
Rio Grande do Norte	0.998	1.000	0.940	1.062	0.998
Rio Grande do Sul	1.007	0.981	1.000	1.007	0.988
Rondônia	1.022	1.004	1.026	0.996	1.027
Roraima	1.177	1.011	1.188	0.990	1.190
Santa Catarina	1.000	0.997	1.009	0.991	0.996
São Paulo	0.978	0.999	0.983	0.994	0.977
Sergipe	0.946	1.006	0.967	0.979	0.951
Tocantins	1.249	1.004	1.238	1.009	1.254
MEAN	1.024	0.993	1.027	0.996	1.017