Luck or luxury? Possible corruption in the car registration process in the Czech Republic

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Why care about registration plates?

- Car plates were used as a signal in the history since the cars exist...and they might do so also today. (Zelený and Feuereisl: 2011)
- Higher-status cars get less aggressive responses from other drivers (Doob and Gross: 1968, McGarva and Steiner: 2000)
- Personalisation of car is correlated with driver’s behaviour (Choo and Mokhtarian: 2004)
- In certain countries/times special car plates might signal informal connections of the holder.
Why care about registration plates in Czech Republic?

- Czech RP assignment has been an issue for a while, but no published study (known to us)
- Corrupted behaviour should be detected if possible; this small problem might be connected to deeper issues
- New law was about to be prepared, new findings might help

RQ: is there an evidence for non-random assignment of car registration plates?
Links to other research

- sumo-wrestling competitions (Duggan and Levitt: 2002), corruption in basketball tournaments (Wolfers: 2006), check of eBay bids (Giles: 2007); finances used for campaigns reported by political parties (Cho and Gaines: 2007)

- comparison of physical quantities of infrastructure versus the prices paid by the government (Golden and Picci: 2005) or investigation of input costs changes in hospitals (Tella and Schargrodsky: 2003)
Empirical strategy and issues

If car registration plates were truly randomly assigned, the cars’ observable characteristics should be **orthogonal** to the randomized section of their registration plate numbers.

- How to get the data?
- How to code the variables?
- Which registration plates are „suspicious“?
Data

- In an Ideal world: we get data from Department for Car Registrations
- Czech reality: collect our own sample
- Two workdays from certain week and two times from time intervals 8,00-12,00 and 13,00-18,00
- Start: random, end exogenous (memory of camera)
- Result: 4,200 photos with ??? cars
Types of plates under question

Table 1. Theoretical and observed frequencies of selected types of registration plates

<table>
<thead>
<tr>
<th>Category</th>
<th>AAAA</th>
<th>ABCD</th>
<th>A000</th>
<th>000A</th>
<th>ABAB</th>
<th>AABB</th>
<th>ABBA</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example</td>
<td>1A2</td>
<td>1A2</td>
<td>1A2</td>
<td>1A2</td>
<td>1A2</td>
<td>1A2</td>
<td>1A2</td>
<td>1A2</td>
</tr>
<tr>
<td>Count</td>
<td>4444</td>
<td>2345</td>
<td>5000</td>
<td>0007</td>
<td>3434</td>
<td>8833</td>
<td>2332</td>
<td></td>
</tr>
<tr>
<td>% in our full sample</td>
<td>0.26</td>
<td>0</td>
<td>0.16</td>
<td>0.28</td>
<td>0.96</td>
<td>0.98</td>
<td>0.9</td>
<td>3.54</td>
</tr>
<tr>
<td>Theoretical (%)</td>
<td>0.1</td>
<td>0.08</td>
<td>0.1</td>
<td>0.1</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>3.08</td>
</tr>
</tbody>
</table>

Source: Data collected in the field, our own calculations.

- Altogether we call them „distinct“ plates
Statistical Test

\[ Car \_ price_i = \beta_0 + \beta_1 \text{Distinct}_i + \beta_{2-4} \text{Measurement1-3}_i + \beta_{5-6} \text{LaneX}_i + e_i \]

- Coefficients (standard errors)
- Cars with "distinct" plates (all types) are on average 12.965 EUR more expensive (59% more)
„Distinct“ vs. rest
Price Differences (EUR)
Sensitivity tests

- Sensitivity test 1: another random sample
- Sensitivity test 2: exclusion of outliers (deleted EUR 78,000+ cars)
- Sensitivity test 3: 10% most expensive cars (80% distinct there instead of 46%)

<table>
<thead>
<tr>
<th>Or.</th>
<th>CRN</th>
<th>Price (min, CZK)</th>
<th>Or.</th>
<th>CRN</th>
<th>Price (min, CZK)</th>
<th>Or.</th>
<th>CRN</th>
<th>Price (min, CZK)</th>
<th>Or.</th>
<th>CRN</th>
<th>Price (min, CZK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>590008</td>
<td>7 120 000</td>
<td>11</td>
<td>1110006</td>
<td>2 137 200</td>
<td>21</td>
<td>16969</td>
<td>1 923 700</td>
<td>31</td>
<td>28888</td>
<td>1 545 000</td>
</tr>
<tr>
<td>2</td>
<td>17777</td>
<td>4 500 000</td>
<td>12</td>
<td>2 2386</td>
<td>2 106 000</td>
<td>22</td>
<td>10 8000</td>
<td>1 901 250</td>
<td>32</td>
<td>91 3737</td>
<td>1 544 000</td>
</tr>
<tr>
<td>3</td>
<td>420000</td>
<td>3 655 000</td>
<td>13</td>
<td>48 5003</td>
<td>2 099 000</td>
<td>23</td>
<td>73 5544</td>
<td>1 860 000</td>
<td>33</td>
<td>79 9933</td>
<td>1 542 500</td>
</tr>
<tr>
<td>4</td>
<td>10007</td>
<td>3 036 000</td>
<td>14</td>
<td>73 5577</td>
<td>2 064 000</td>
<td>24</td>
<td>1 8000</td>
<td>1 851 600</td>
<td>34</td>
<td>72 9696</td>
<td>1 539 500</td>
</tr>
<tr>
<td>5</td>
<td>686000</td>
<td>2 916 166</td>
<td>15</td>
<td>2 3788</td>
<td>2 047 030</td>
<td>25</td>
<td>48 0040</td>
<td>1 799 000</td>
<td>35</td>
<td>82 8998</td>
<td>1 530 000</td>
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<tr>
<td>6</td>
<td>369779</td>
<td>2 354 000</td>
<td>16</td>
<td>52 5462</td>
<td>1 998 000</td>
<td>26</td>
<td>10 7337</td>
<td>1 777 971</td>
<td>36</td>
<td>1 6633</td>
<td>1 500 000</td>
</tr>
<tr>
<td>7</td>
<td>389696</td>
<td>2 336 000</td>
<td>17</td>
<td>74 0707</td>
<td>1 998 000</td>
<td>27</td>
<td>94 3333</td>
<td>1 710 000</td>
<td>37</td>
<td>96 0005</td>
<td>1 498 570</td>
</tr>
<tr>
<td>8</td>
<td>890000</td>
<td>2 259 000</td>
<td>18</td>
<td>91 7000</td>
<td>1 985 550</td>
<td>28</td>
<td>80 0022</td>
<td>1 710 000</td>
<td>38</td>
<td>92 8060</td>
<td>1 498 570</td>
</tr>
<tr>
<td>9</td>
<td>420000</td>
<td>2 227 000</td>
<td>19</td>
<td>51 3431</td>
<td>1 957 700</td>
<td>29</td>
<td>46 7117</td>
<td>1 702 400</td>
<td>39</td>
<td>81 5775</td>
<td>1 497 900</td>
</tr>
<tr>
<td>10</td>
<td>327711</td>
<td>2 199 000</td>
<td>20</td>
<td>84 2233</td>
<td>1 928 500</td>
<td>30</td>
<td>71 7337</td>
<td>1 629 000</td>
<td>40</td>
<td>1 6254</td>
<td>1 495 000</td>
</tr>
</tbody>
</table>
Media review and interviews with distinct CRN users

Table 4. Reported reasons for the demand and supply of “distinct” registration plates

<table>
<thead>
<tr>
<th>Reasons for obtaining a “distinct” registration plate number</th>
<th>Printed and Online Resources (31 Articles)</th>
<th>Personal Interviews (Eight Respondents)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetic appeal or lucky numbers</td>
<td>Design (3), easy to remember (3)</td>
<td>Aesthetic (1), lucky numbers (1)</td>
</tr>
<tr>
<td>Signal to other drivers</td>
<td>VIP status (14), image (8)</td>
<td>Show status, get respect (6)</td>
</tr>
<tr>
<td>Signal to police</td>
<td>VIP status (15)</td>
<td>Get respect (6), easier way to bribe (2)</td>
</tr>
<tr>
<td>Reason for issuing a “distinct” registration plate number</td>
<td>Cash (13)</td>
<td>Cash via intermediary (4)</td>
</tr>
<tr>
<td>Money</td>
<td>Intermediary (20) (car dealers, person from the office)</td>
<td>Via intermediary (6) (car dealers, person from the office)</td>
</tr>
</tbody>
</table>

Source: Data collected online and in personal interviews.
Conclusions

- We conclude that the RPs in Prague in given period were (nearly certainly) not assigned randomly (the probability we got from the models is much smaller than 1/1000).

- The difference in prices between cars with “distinct” and the rest of the population corresponds to relative scarcity of given group of “distinct plates“.

- The new law with paid RPs will not hamper down the potential for corruption (Law N. 239 / 2013, law that changes several traffic laws).
Future

- the data from Ministry of Transportation would greatly help to identify the relation of prices and CRNs better on real random sample with more details about cars
- corruption and traffic experts would gain from investigation of relationship between nice CRNs and traffic accidents
- auctions might both mitigate corruption and increase the government revenues
Take home

- This paper shows minimalistic way how to identify deviation from a proclaimed rule
- If variable is truly RANDOM, all characteristics should be orthogonal to it
- Check: lotteries in public policy (housing, public grants)
- FRAUD detection: check the distribution the variable is suppose to follow – uniform distribution or for example Benford’s Law (if applicable)
THANK YOU FOR YOUR ATTENTION!!!