5
Two-step estimation

5.1 Framework for estimation

Let i index a country and t index an year. Let the model for X_{it} be given by $Z_{it}\beta_X$, the model for d_{it} be given by $Z_{it}\beta_d$ and the model for c_{2it} be $Z_{it}\beta_C + \delta_{it}$, where $\delta_{it} \sim i.i.d.F(\delta)$. For simplicity, I suppose there is no error term in the expression for X_{it} and for d_{it}, in order to avoid dealing with heteroskedasticity based on q^W_{it} and q^P_{it}. I also adopt linear functional forms for X_{it}, c_{2it} and d_{it} for simplicity.

Call t^P_{it} the dummy that indicates whether there was a peaceful transition of power between different political parties, and t^W_{it} a dummy that indicates a transition of power for a coup or war. I look at peaceful transitions of parties instead of peaceful transitions of governments because I believe this is a more realistic counterfactual for the q^P the rebel movements might have access to. Putting it in other words, there are peaceful transitions of government in countries like Saudi Arabia and the Soviet Union, however, these peaceful transitions occur between members of the royal family/communist party. Probably, a movement fighting against the government to depose it does not have access to these means of getting to the government.

We would like to observe the potential outcomes of t^P_{it} and t^W_{it} independent of the occurrence of wars or not and estimate $q^P_{it} = E[t^P_{it}|\mathcal{F}_{it}]$ and $q^W_{it} = E[t^W_{it}|\mathcal{F}_{it}]$, where $\mathcal{F}_{it}$ is the informational set of the players in the real world. However, I can only hope to observe $\tilde{q}^P_{it} = Y^P_{it}\beta_P = E[t^P_{it}|\mathcal{F}_{it}] - \omega^P_{it}$ and $\tilde{q}^W_{it} = Y^W_{it}\beta_W = E[t^W_{it}|\mathcal{F}_{it}] - \omega^W_{it}$, where Y^P_{it} and Y^W_{it} are observable variables, $\omega^P_{it}, \omega^W_{it}$ are two residuals orthogonal to Y^P_{it} and Y^W_{it}. For simplicity, I am assuming a linear probability model for q^P and q^W.

If I could estimate the probabilities $\tilde{q}^W_{it}$ and $\tilde{q}^P_{it}$ above, and assuming $\delta_{it}, \omega^W_{it}, \omega^P_{it} \perp Z_{it}, Y^P_{it}, Y^W_{it}$, one could replace the models for c_2, d, X, q^W and q^P in inequality (2) from proposition 1, to estimate:

$$\Pr(W_{it}=1)=F\left(\frac{-Z_{it}\beta_C+(Y_{it}^W\beta_W-Y_{it}^P\beta_P)Z_{it}\beta_X-(1-Y_{it}^P\beta_P)Z_{it}\beta_d}{h}\right) \tag{1}$$

where h would be the expression for the standard error of $\delta_{it}+(\omega_{it}^W-\omega_{it}^P)X_{it}+\omega_{it}^P d_{it}$, which is orthogonal to $Z_{it}, Y_{it}^P, Y_{it}^W$ for the assumption that $\delta_{it}, \omega_{it}^W, \omega_{it}^P \perp Z_{it}, Y_{it}^P, Y_{it}^W$. The terms ω_{it}^W and ω_{it}^P would only add heteroskedasticity to the model, as long as they were independent of the full set of observables Z_{it}, Y_{it}^W and Y_{it}^P. In this paper, I am going to assume out this heteroskedasticity term, supposing that $h=1$.

In this section, I ignore the fact that I only observe t_{it}^P in times of peace, and t_{it}^W in times of war, and I estimate equation (1) using a first stage estimate of $\tilde{q}_{it}^W$ and $\tilde{q}_{it}^P$ in the selected sample. Moreover, for simplicity, I do not correct the standard errors for the fact that q^W and q^P are estimated. I also assume, in this section, a linear probability model, so that the heteroskedasticity terms do not affect too much my estimates. In the next section, I deal with these problems of selection and of uncertainty in the estimation process of q^W and q^P. Despite all the caveats raised for the estimation framework in this section, I do not need to use non-linear models for the probability of war here, which are necessary when dealing with the sample selection issue described before. This allows me to control for country fixed effects.

5.2 Estimating q^P and q^W

To estimate q^P, I use the sample of country-years at peace, and I look at how the measures of political competition in the year t predict the occurrence of a peaceful transition of party in power in year $t+1$. I use a simple linear model to predict q^P.

The results are shown in table 10.2. As would be expected, a higher POLITY IV score is a statistically significant predictor of a higher probability of peaceful transitions. Column 1 predicts that going from the democracy level of Saudi Arabia to the democracy level of the United Kingdom increases $\hat{q}^P$ from -1.8% to 14.4% (the negative probability comes from the linear model employed). This result is robust to the control for country fixed effects, year dummies and per capita income.

Competitive participation in the political system (in the sense of allowing for participation of different ideologies and preferences for leadership) also predicts a higher probability of transitions and, as expected, countries that do not regulate the political participation[1] have a high probability of peaceful

[1]In general, these are not the most democratic countries in my sample, since democratic

transitions. Going from the level of competitive participation in Saudi Arabia to the level in United Kingdom increase $\hat{q}^P$ from 0.3% to 13.9%. However, countries like Nigeria between 1999 and 2004 or Papua New Guinea through the whole period analyzed, had estimated $\hat{q}^P$ of 29.1%, since participation is unregulated in these countries. It is noteworthy that these two countries have a POLITY score of only 4 on a scale from -10 to 10. This result does not change by much once I control for per capita income, year dummies and country fixed effects.

Finally, competitive executive recruitment also predicts significantly variation in peaceful transitions. Changing the competitiveness of executive recruitment from Saudi Arabia to the competitiveness in the United Kingdom increases $\hat{q}^P$ from -2.7% to 13.6%. Again the results are robust to the control for country fixed effects, year dummies and per capita income.

To estimate $\hat{q}^W$, I look at the country-years at war, and at how the national army's support for the rebels in year t predicts that the rebels will have taken the government in year $t+1$. Again, I employ a linear model to predict $\hat{q}^W$.

As documented in the descriptive statistics, the probability that rebels take over the government through wars is, on average, smaller than the probability of a peaceful transition between parties. However, there is considerable variation in these probabilities: table 10.3 indicates that when the army supports the rebels, the probability of taking over the government increases by 17.1% to 25.8%, depending on the specification considered. Moreover, one can still use as source of variation whether the army is going against a military government or against a civil government: once I control for country fixed effects, year dummies and income per capita, the military government cancels the effect of the army being against the government. However, it should be noted that the results here are less robust than the results for q^P: when controlling for country fixed effects, year dummies and income per capita, the joint significance of the variable indicating an anti-government army disappears.

Table 10.4 presents summary statistics on these estimated $\hat{q}^P$ and $\hat{q}^W$. Here, I use the estimates from table 10.2, column (5) to project $\hat{q}^P$ both for country-years in conflict and in peace, and I use the estimates from table 10.3, column (1) to project $\hat{q}^W$ for both country-years in peace and in conflict. The results indicate that the average $\hat{q}^P$ for the whole sample is slightly lower that the average number of peaceful transitions in countries in peace. Despite the fact that this difference is small, this should indicate that self-selection into war

countries in general have regulations stating that participation occurs through political parties, for instance.

and peace might be relevant for estimating $\hat{q}^P$. In the same way, the average $\hat{q}^W$ for the whole sample is slightly lower that the average number of transitions through war in countries in conflict. Again, despite the small difference, this also indicates that selection bias might be an issue in estimating $\hat{q}^W$.

Additionally, table 10.4 presents the correlation between the estimated $\hat{q}^P$ and $\hat{q}^W$ of -0.153. This indicates that $\hat{q}^P$ and $\hat{q}^W$ are not perfectly collinear, something necessary for the argument of identification that I made.

5.3 Equation of wars

Table 10.5 shows sample averages of coups and wars according to levels of competitive executive recruitment and depending on whether the army is against the government. When the army is against the government, there is always an attempted coup or a war: that happens because of how I observe the military against the government: again, this variable is one whenever the military is plotting a coup against the government, or when it is at war with the government.

Table 10.5 indicates that when the army is not against the government, increasing the degree of competition in executive recruitment always decreases coups and wars. This is consistent with the idea that an increase in competitiveness of the executive recruitment increases q^P and that decreases wars. However, when the army is against the government, there are more wars when competitiveness in executive recruitment increases, though there are less coups. Despite this result may be counter-intuitive, the number of observations with anti-government armies for each degree of competitiveness of executive recruitment is small and this last result should be read with care.

For each level of competitiveness in executive recruitment, table 10.5 indicates that when the army becomes against the government, the number of wars increase. This is not obvious: many armies plot coups without having to make a war. This is consistent with the idea that, when the military becomes a government adversary, q^W increases and there are more wars.

Table 10.6 presents the result of the estimation strategy described in subsection 4.1. First, it is noteworthy that the average cost of war is estimated as negative and is often statistically significant. This raises doubts on a theory supposing that inefficient war happens due to limits to Coasian bargaining between conflicting parties. With a negative estimated cost of war, it might be that war is not inefficient, or that it is impossible to make a transfer $V^i(W) \in [0, X]$ to player 2, as supposed in the model.

Initially, when I estimate the model without considering any source of variation in X, d and c_2, neither $\hat{q}^W - \hat{q}^P$ nor $1 - \hat{q}^P$ show up as significant in the regression. However, as I add heterogeneity based on income per capita and on the lag of the occurrence of war, in columns (2), (3) and (4), both the average X and the average d increase quantitatively and in terms of statistic significance. Moreover, quantitatively, the average d is quite close to the average X, indicating something close to full commitment on average.

On column (5), I add heterogeneity in X, d and c_2 based on 3rd order polynomials in (i) country average log-income and (ii) year trends. I add the third order polynomials in country average log-income for comparability with the results from the next subsection, where I am going to be using a non-linear probability model that will limit my use of country fixed-effects. This polynomial will serve as a imperfect substitute for the country fixed effects. On column (6), I add country fixed effects to the specification of the costs of war. In this column, in order not to face the traditional problems of endogeneity in dynamic panel applications, I omit all terms of lagged conflict. In both these columns, average commitment becomes statistically insignificant. However, this might be due to imprecision of the estimator, since quantitatively, the average commitment is still estimated as close to X.

This raises concerns that the parameters of the may not be well identified, since all parameters are growing together. While the small correlation between $\hat{q}^P$ and $\hat{q}^W$ may help the argument in favor of good identification of the parameters, there might be too many regressors to explain a binary variable that only takes a value of 1 very infrequently (more precisely, in 12.7% of the sample).

Despite the result on average commitment not being too robust here, the main result coming out of this table is that there seems to be considerable heterogeneity in X, c_2 and d. That can be seen by the fact that the $R - 2$ of the regressions increase from 2% to 63% in the specification of columns (4) and (5), and to 53% in the specification of column (6). Even more, much of this increase in $R - 2$ seems to be coming when I add the lagged conflict variable to explain the heterogeneity in X, c_2 and d.

Still the results from this table are weak for a variety of reasons: I do not consider the problem that I am estimating q^P and q^W here, and I have ignored the issue of sample selection when estimating q^P and q^W. Also, the estimators used here are very inefficient. For that, I provide in the next section an estimator of the model that jointly estimates the probability of war, q^W and q^P, and that take into account the sample selection issue when estimating q^P and q^W.