Senior Research

The Role of middle class on Democratization

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Abstract

The purpose of this research is to examine the impact of middle class income on democratization by using the mathematical method and applying three class model from Daron Acemoglu's three class model.The middle class income as a median voter affects democratization through (1) revolution, (2) repression, (3) coup. Under mathematical part of this research found out that a relatively richer middle class will lead to less probability of making a revolution, high probability of choosing repression and more consolidated democracy. Hence, the probability of a country to be democratization is lower when the middle class income increase.

Introduction

The middle class income is a group of people who has a share income between the rich and the poor.Middle class not only have to pay tax, but also need some income redistribution from the government. The rich is a group of people who has income greater than an average national income,so they can take care of themselves and they have to pay highest tax rate. For example, they can pay for their health care in private hospital,so they do not need any income transfer from the government. Middle class play an important role for create democratization to political system and bring more income equality to society. Democratization is a changed point of political system from nondemocracy to democracy. In other word, it transfers political power from the rich to middle class and the poor.

The model of democratization, revolution,repression, and coup are taken action by the different level of income. Under three group model,middle class plays an important role to bring democratization to a country because they are median voter who can choose to join either the rich or the poor. When the transfer is not sufficient, middle class can choose to make revolution with the poor. The rich has an option either partial or full democratization. However,under full democratization can be more costly to the rich if the majority voter is the poor,they have power to set their favor tax rate. Since middle class is richer than the poor, middle class require less transfer from the rich, partial democratization is less cost than full democratization. In this case, the rich prefer partial democratization. To prevent revolution from majority people, the rich has to give political power to include middle class in to political system. Partial democratization is a political system that middle class and the rich are enfranchise and the most preferred tax rate is determined by median voter. Even though the political system is changed to par-

tial democracy, there is still the threat of revolution from the poor. In this case, the rich and middle class have to choose either repression or full democratization to stop revolution. Actually, they can promise to set higher tax rate to prevent revolution, but the promise of future tax rate is imperfect. Thus,middle class can reset tax rate to their most preferred tax rate after they can stop revolution. In the case that middle class is relatively poor, they will set tax rate which closed to the poor's most preferred tax rate:as a result;the threat of revolution will not occur.The rich will choose to use repression rather than democratization because high transfer is more costly than cost of repression. Therefore, when an inequality of income in society is higher, the probability of democratization is lower. On the other side, if a country is under democracy, political most preferred tax rates is set by majority voter,so tax rate can be low or high.It is depended on share income of majority voter. Income redistribution under democratic system is not costly to the rich when middle class is wealthy, they need lower transfer from the government. Thus,coup is less attractive for the rich because the cost of income redistribution is sufficient:as a result;an affluent society brings more consolidated democracy.

In summary, the middle class is an important key determination of democratization. An exist of democratization is depended on middle class income. Since they are median voters, they has power to lead political system into either partial or full democracy. An increase of middle class income share will change middle class behavior that they require lower income redistribution from the government.

Literature Review

Under Daron Acemoglu's paper, he explains the two class model $i \in [r, p]$ that the rich and the poor have an impact on democratization.

Democratized function is $f(\mu, \kappa, \varphi, \theta, \tau^i, \delta)$

$\mu=$ the cost of revolution

$\kappa=$ the cost of repression

$\varphi=$ the cost of coup

$\theta^r=$ an income shared of the rich , $\theta^p=$ an income shared of the poor

$\delta^r=$ a proportion of the rich , $\delta^p=$ poor population

$V^i=$ indirect utility of consuming government policy

Under nondemocracy, the rich has de jure power to set their most preferred tax rate τ^r while the poor has de factor power which is collective action to make a revolution against the rich. The revolution occurs when the transfer is not sufficient mean the rich set low tax rate to maximized themselves indirect utilities. Since the revolution is alway successful and the rich get nothing after revolution, the probability of democratization increase because the rich can choose democratize to prevent revolution. The expected payoff for the rich under nondemocracy is higher than the poor because the can set the tax rate that can maximize their consuming utility

$V^r(ND) > V^r(D)$ note that $\tau^r < \tau^p$

$y^r - \tau^r y^r + (C(\tau^r) - \tau^r)\bar{y} > y^r - \tau^p y^r + (C(\tau^p) - \tau^p)\bar{y}$

Nevertheless, the rich still has a choice either repression or democratization when the poor choose to make a revolution. The repression is more attractive under poor society because the rich can realize that the cost of repression is lower than the cost of democratization. Since democratization with higher transfer will

be costly to the rich, the rich prefer repression to democratization. Thus, the probability of democratization decreases.

In two class model, assuming that citizens are the poor and they are majority people which mean that they have collective action power to against the elites. We know that the elites are rich and they do not want to pay high tax rate, the poor can make revolution when they concern that the remainders of post revolution is higher than staying under nondemocracy. De jure power can be transfer from the rich to the poor by revolution or democratization.

$V^p(R, \mu) > V^p(ND)$

$\frac{(1-\mu)\bar{y}}{\delta^m + \delta^p} > y^p - \tau^r y^p + (C(\tau^r) - \tau^r)\bar{y}$

Before passing through democracy, the elites can make repression to stop revolution from the poor. The repression occurs when the poor is very poor and the rich realizes that there is higher cost of paying tax under democratization than cost of repression because the poor can set higher tax rate in democratic system. Hence, the rich prefer to use repression in poor society.

$V^r(O \mid \kappa) > V^r(D)$

$(1 - \kappa)y^r > y^r - \tau^p y^r + (\tau^p - C(\tau^p))\bar{y}$

Under democracy, de jure power belong to the majority voter which is the poor and they can set their most preferred tax τ^p. The coup action is taken by the rich and it occurs only under democracy. When the poor set high tax rate mean that the rich has to give them higher transfer, the cost of staying under democracy is relatively higher than the cost of coup. Higher tax rate create more attractive to coup for the rich.Hence, the probability of staying in democracy declines.The following equation represents when the tax rate is high,the indirect utility of coup for the rich is better off. Since tax burden belongs to the rich,the more tax burden

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the more social conflict.

$$V^r(C, \varphi) > V^r(D)$$

$$(1 - \varphi)y^r > y^r - \tau^p y^r + (\tau^p - C(\tau^p))\bar{y}$$

Further more, The middle class play an important role of a development of democracy. Firstly, middle class has a power to change political system to be democracy,particularly it has more power under partial democracy. Secondly, it can extend political power to the poor and change from partial to full democracy. Thirdly, middle class can be a buffer between the rich and the poor.Finally,middle class as a solftlinear that has more power than hardliners to transition to democracy under smooth way.

In conclusion of Acemoglu's work, the model of democratization is affected by the rich and the poor. The rich prefer nondemocracy to democratization because the future allocation under democracy is more costly and the political power is belong to the poor who is majority voter. whereas the poor prefer democratization because they are majority voter ,so they have de jure power to set higher tax rate. As the gap of income between the rich and the poor increase, the poor need higher transfer from the government while the rich want to pay lower tax rate.

Mathematical Theory

Under my research, I add middle class in to two group model and use mathematical process to explain how middle class affect on democratization.

How people make a decision under political market.

$v^i = y^i - \tau^i y^i + T$ where $i \in [r, m, p]$

$v^i =$ indirect utility of consuming government policy

$y^i =$ income of each group

$\bar{y} =$ average income

$T =$ transfer $= (C(\tau^i) - \tau^i)\bar{y}$

Government revenue = government expenditure

Collecting tax by government = government expenditure

tax rate = government transfer

$\tau^i =$ tax rate that i has to pay

$\tau^m =$ the most preferred tax rate of middle class

$C(\tau^i) =$ cost of collecting tax

Following economic theory, people are rational and self-interest,so they need tax rate that can maximize their indirect consumption utilities.

Since the richer is richer than middle class and middle class is richer than the poor, the rich prefer lowest tax rate in other word, the rich prefer lowest transfer. Because they can take care of themselves, they do not need high transfer from the government whereas the poor need highest transfer under this three group model.

$y^i = \frac{\theta^i}{\delta^i}\bar{y}$

$y^r > y^m > y^p$

$\frac{\theta^r}{\delta^r}\bar{y} > \frac{\theta^m}{\delta^m}\bar{y} > \frac{\theta^p}{\delta^p}\bar{y}$

The most preferred tax rate in political system is depended on who has de jure

power.

y^i =pre-income tax

$\hat{y}^i$ = post-income tax

$\hat{y}^i = y^i - \tau^i y^i + (\tau^i - C(\tau^i))\bar{y}$

First order condition for maximization of consuming utility, $\frac{\partial \hat{y}^i}{\partial \tau^i} = 0 - y^i + (1 - C'(\tau^i))$

$\frac{y^i}{\bar{y}} = 1 - C'(\tau^i)$ and $y^i = \frac{\theta^i}{\delta^i}\bar{y}$

Therefore, $C'(\tau^i) = 1 - \frac{\theta^i}{\delta^i}$

Since, $\frac{\theta^r}{\delta^r} > \frac{\theta^m}{\delta^m} > \frac{\theta^p}{\delta^p}$

$1 - \frac{\theta^r}{\delta^r} < 1 - \frac{\theta^m}{\delta^m} < 1 - \frac{\theta^p}{\delta^p}$

$\tau^r < \tau^m < \tau^p$ meaning that the more richer the less tax rate they want.

Second order condition for examining the relationship between tax rate and shared income; $\frac{\partial \tau^i}{\partial \theta^i} = \frac{-1}{\delta^i C''(\tau^i)} < 0$. In word, when people become relatively richer $\theta^i \uparrow$, they prefer lower tax rate for less income redistribution $\tau^i \downarrow$.

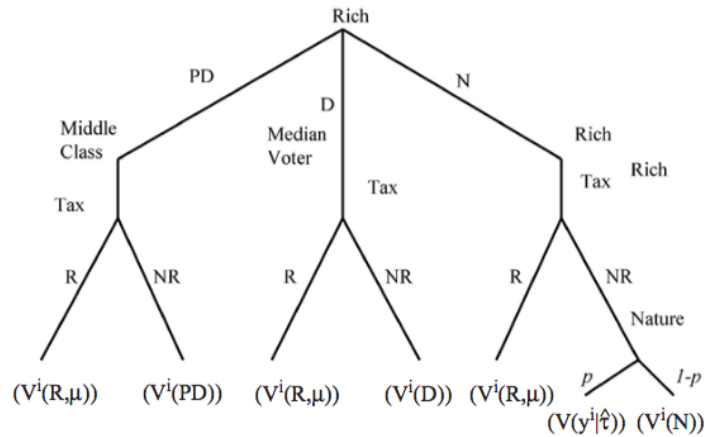**From nondemocracy to partial democracy**

Figure 1: game tree

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The game tree above shows that only the rich has political power as a first player to choose nondemocracy or partial democracy or full democratization. Using backing ward induction to explain how the rich make a decision. There is a revolutionary action from every branch by second player which is middle class. Second player can choose to join the poor as a last player to make a revolution when they do not get enough transfer from the first player. Now the rich know that the middle class is median voter,so they choose to give political power to middle class to exclude middle class from revolutionary process.

Under nondemocracy, the initial power of political institution belong to the rich that exclude middle class and the poor from political system. Therefore, the rich's indirect utility under nondemocracy is higher than democratic system because the rich has de jure power to set their most preferred tax rate τ^r

$V^r(ND) > V^r(D)$ because $\tau^r < \tau^m < \tau^p$

$y^r - \tau^r y^r + T > y^r - \tau^m y^r + T$

Thus, the threat of revolution comes from middle class and the poor and the revolution is always successful. Because the middle class as a median voter when they choose to join the poor to take revolutionary action, the middle class and the poor become majority group. Following this assuming, $\delta^p < \frac{1}{2}$; the middle class is median voter, $\delta^m + \delta^p > \frac{1}{2}$;middle class and the poor are majority population , and $\sum_i \delta^i = 1, i \in [r, m, p]$. Now considering revolution payoff for each group. Middle class and the poor get the same amount because they share benefit together after revolution while the rich get nothing $V^r(R, \mu) = 0$. In this model, I assume that the rich has only two options either partial or full democratization.

$V^i(R, \mu) = [V^r(R, \mu), V^m(R, \mu), V^p(R, \mu)]$

$V^m(R, \mu) = \frac{(1-\mu)\bar{y}}{\delta^m + \delta^p} = V^p(R, \mu)$

$V^r(R, \mu) = 0$

$\mu=$ the destroyed resource after revolution or the cost of revolution

$(1 - \mu)=$the remainder resources of postrevolution

$(1 - \mu)\bar{y}$ the total income after revolution that middle class and poor will get

$\delta^m + \delta^p$ is the number of middle class and the poor population

To prevent revolution, the rich has to extend de jure power to middle class to exclude them from revolutionary process. When the middle class and the rich are joining the political system together, nondemocracy is changed to partial democratization to stop revolution. Since the middle class is median voter, they have a power to set their most preferred tax rate τ^m. Hence, the revolution does not occur when tax rate is sufficient for middle class. Following this equation

$V^m(R, \mu) \leqslant V^m(PD)$

$\frac{(1-\mu)\bar{y}}{\delta^m + \delta^p} = y^m + p[-\tau^m y^m + (\tau^m - C(\tau^m))\bar{y}]$

$\mu^* = 1 - \frac{\delta^p + \delta^m}{\delta^m}(\theta^m + p(\tau^m(\delta^m - \theta^m) - \delta^m C(\tau^m)))$

μ^* is the indifferent of middle class between revolution and partial democracy.

p= the promise of government where $p \in [0, 1]$

There are a several factors that can effect μ^* which are $\delta^m, \delta^p, p, \theta^m$.

$\frac{d\mu^*}{d\theta^m} = -\frac{\delta^p + \delta^m}{\delta^m}(1 - \tau^m + (\tau^m(\delta^m - \theta^m) - \delta^m C'(\tau^m))\frac{d\tau^m}{d\theta^m}) < 0.$

In word, if the gap between middle class and average income increase, then θ^m decline which reduce the probability of revolution.

$\frac{d\mu^*}{dp} = -\frac{\delta^p + \delta^m}{\delta^m}(\tau^m(\delta^m - \theta^m) - \delta^m C(\tau^m)) < 0.$

When the trust of government increases, μ^* declines , $\mu < \mu^* \downarrow$ that lead to lower incentive to make a revolution. Hence,lower joining probability of revolution lead to lower probability of a country to be full democratization.

$\frac{d\mu^*}{d\delta^p} = [\theta^m + p(\tau^m(\delta^m - \theta^m) - \delta^m C(\tau^m)]\frac{-1}{\delta^m} < 0.$

<u>Case</u> $\theta^m > \delta^m$ gives $\frac{d\mu^*}{d\delta^p} < 0$

As the size of the poor population increase, the income redistribution might not be sufficient. Thus, μ^* declines and the probability of revolution increase, $\mu < \mu^* \downarrow$. on the other hand, case $\theta^m < \delta^m$ then, $\frac{d\mu^*}{d\delta^p} > 0$.

$\frac{d\mu^*}{d\delta^m} = [\theta^m + p(\tau^m(\delta^m - \theta^m) - \delta^m C(\tau^m)]\frac{\delta^p}{(\delta^m)^2} - \frac{\delta^p + \delta^m}{\delta^m}[p(\delta^m - \theta^m)d\tau^m + \tau^m - C(\tau^m) - \delta^m C'(\tau^m)d\tau^m]$

<u>Case</u> $\theta^m > \delta^m$ gives $\frac{d\mu^*}{d\delta^m} < 0$

If the middle class population is higher, they will have more de facto power to set up their most preferred tax rate. Then, under τ^m, the redistributive rate is enough for middle class not to make a revolution. In addition, case $\theta^m < \delta^m$; $\frac{d\mu^*}{d\delta^m} > 0$.

Since the rich faces a choice either partial or full democratization, they will choose partial democratization because as a median voter is middle class, partial democratization is less costly to the rich $(\tau^m < \tau^p)$. Also, the middle class can choose to join the rich or the poor and middle class's decision is depended on which one can offer them higher benefit.

transition to full democracy

De jure power can be transitory mean that the rich can transfer power to the middle class and the poor. Under partial democracy, the rich extends political power to middle class. As a result, the middle class has a power to give the right to vote to the poor for counterbalance with the rich. In partial democracy, the poor can make a revolution without middle class joining. In this model, I assume that revolution from the poor is always successful and after revolution middle class and the rich get nothing.

$V^p(R, \mu) = \frac{(1-\mu)\bar{y}}{\delta^p}$

The Role of the Middle Class

Figure 2: game tree

$V^m(R, \mu) = V^r(R, \mu) = 0$

The revolution constraint ; $V^p(R, \mu) \geqslant V^p(PD)$

$\frac{(1-\mu)\bar{y}}{\delta^p} \geqslant y^p - \tau^m y^p + (\tau^m - C(\tau^m))\bar{y}$

$\frac{(1-\mu)\bar{y}}{\delta^p} \geqslant \frac{\theta^p}{\delta^p}\bar{y} - \tau^m \frac{\theta^p}{\delta^p}\bar{y} + (\tau^m - C(\tau^m)\bar{y}$

$1 - \mu \geqslant \theta^p + \tau^m(\delta^p - \theta^p) - \delta^p C(\tau^m))$

$\mu \leqslant 1 - \theta^p - [\tau^m(\delta^p - \theta^p) - \delta^p C(\tau^m)]$

To prevent the threat of revolution under PD, the middle class can promise to provide redistribution τ^{PD} which $\tau^{PD} > \tau^m$. However, the middle class also have a chance to reset tax rate with probability $(1 - p)$ to set $\tau^{PD} = \tau^m$ or they can promise to set $\tau^{PD} = \tau^p$. Therefore, the condition of critical level to make the poor indifferent between PD and revolution is $V^p(PD, \tau^{PD} = \tau^p) = V^p(R, \mu^*)$

$y^p + p[-\tau^p y^p + (\tau^p - C(\tau^p))\bar{y}] + (1 - P)(-y^p\tau^m + (\tau^m - C(\tau^m))\bar{y}] = \frac{(1-\mu^*)\bar{y}}{\delta^p}$

$\mu^* = 1 - \theta^p - [p(\tau^p(\delta^p - \theta^p) - \delta^p C(\tau^p)) + (1 - P)(\tau^m(\delta^p - \theta^p) - \delta^p C(\tau^m)]$

Assuming $\delta^p < \frac{1}{2}$; median voter is middle class.

$$\frac{d\mu^*}{d\tau^m} = -(1-p)[(\delta^p - \theta^p) - \delta^p C'(\tau^p)] > 0$$

$$\frac{d\mu^*}{d\tau^p} = -[p((\delta^p - \theta^p) + \tau^p(\frac{-d\theta^p}{d\tau^p}) - \delta^p C'(\tau^p))] - (1-p)[\tau^m(\frac{-d\delta^p}{d\tau^p})] < 0$$

Since $\frac{d\tau^p}{\theta^p} = \frac{-1}{\delta^p C''(\tau^p)} < 0$, $\frac{d\mu^*}{d\tau^p} < 0$ the promise of higher redistribution cam avoid the threat of revolution from the poor because of $\tau^p > \tau^m$, $\mu < \mu^* \downarrow$, less probability of full democratization.

$$\frac{d\mu^*}{dp} = -[\tau^p(\delta^p - \theta^p) - \delta^p C(\tau^p)) + (\tau^m(\delta^p - \theta^p) - \delta^p C(\tau^m))] < 0$$

$\frac{d\mu^*}{dp} < 0$ When the government trust increase, μ^* declines, the probability of not revolution increase.

In the reality, a majority voter can be either middle class or the poor, so if the poor is majority, the future transfer of democratization will be cost more to the rich. Hence, the democratization will be less attractive to the rich. On the other hand, when the middle class is median voter, the rich feel indifferent between partial and full democracy because of the same tax rate. In addition, when the middle class is relatively richer τ^m is getting closed to τ^r, the middle class prefer partial democracy to democratization because the tax rate under democracy can be more costly to them.

The rich choice either Repression or democratization

A political system is under partial democracy which the rich and middle class have political power. In this model, the rich and middle class can choose either repression or democratization to prevent revolution from the poor.

The game tree above represents that how each class make a decision. Clearly to see that, the rich has many choices repression, nondemocracy, partial democracy or democracy. And their decisions base on the value of expected payoff.

The condition that make the rich indifferent between repression and redistribution $\tau^N = \hat{\tau}$ under nondemocracy is $V^r(O \mid \kappa) = V^r(N, \tau^N)$ where τ^N is sufficient
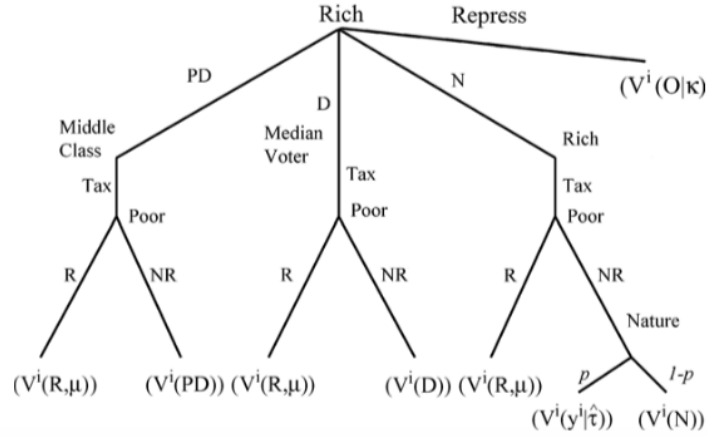
Figure 3: game tree

for the poor not to make revolution.

κ=cost of repression

τ^N= the promise by elites to hold this rate

$V^r(O \mid \kappa) = V^r(N, \tau^N)$

$(1-\kappa)y^r = y^r + p[-\hat{\tau}y^r + (\hat{\tau} - C(\hat{\tau}))\bar{y}]$

$\hat{\kappa} = \frac{p}{\theta^r}(\delta^r C(\hat{\tau}) - \hat{\tau}(\delta^r - \theta^r))$

$\hat{\kappa}$ is the indifferent of the rich between repression and the promise of redistributive rate $\hat{\tau}$ under nondemocracy.

Another option for the rich is to choose repression or partial or full democratization and the tax rate is τ^{PD} and τ^D. If the middle class is median voter, $\tau^{PD} = \tau^D = \tau^m$. Hence, the rich is indifferent between partial and full democratization $V^r(PD) = V^r(D)$. Then,$V^r(O \mid \kappa) = V^r(PD) = V^r(D)$

$(1-\kappa)y^r = y^r - \tau^m y^r + (\tau^m - C(\tau^m))\bar{y}$

$\widetilde{\kappa}^r(\tau^m) = \frac{1}{\theta^r}(\delta^r C(\tau^m) - \tau^m(\delta^r - \theta^r))$

The rich prefer repression when $\kappa < \hat{\kappa}$ or $\kappa < \widetilde{\kappa}^r(\tau^m)$ when the poor choose to

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make revolution $\mu < \mu^*$.

Under partial democracy, the middle class also has political power to make a decision of repression and block full democratization.

$V^m(O \mid \kappa) = V^m(PD)$

$(1 - \kappa)y^m = y^m - \tau^m y^m + (\tau^m - C(\tau^m))\bar{y}$

$\widetilde{\kappa}^m(\tau^m) = \frac{1}{\theta^m}(\delta^m C(\tau^m) - \tau^m(\delta^m - \theta^m))$

$\frac{d\widetilde{\kappa}^m(\tau^m)}{d\delta^m} = \frac{1}{\theta^m}[C(\tau^m) - \tau^m] < 0$ when the size of middle class increase, the probability of repression become lower as $\kappa < \widetilde{\kappa}^m(\tau^m) \downarrow$

$\frac{d\widetilde{\kappa}^m(\tau^m)}{d\theta^m} = [\delta^m C(\tau^m) - \tau^m(\delta^m - \theta^m)]\frac{-1}{\theta^m} + \frac{1}{\theta^m}[\delta^m C'(\tau^m)\frac{d\tau^m}{d\theta^m} - (\delta^m - \theta^m)\frac{d\tau^m}{d\theta^m} + \tau^m]$

<u>case</u> $\theta^m < \delta^m$ ans $\frac{d\tau^m}{d\theta^m} < 0$ give $\frac{d\widetilde{\kappa}^m(\tau^m)}{d\theta^m} < 0$

When the share of middle income increase, $\kappa < \widetilde{\kappa}(\tau^m) \downarrow$,

The cost of repression is relatively higher

<u>case</u> $\theta^m > \delta^m$ then, $\frac{d\widetilde{\kappa}^m(\tau^m)}{d\theta^m}$ can be both positive and negative, it is depended on the size of tax rate.

Now considering under partial democracy, middle class and the rich aggregate their repression preferences meaning they are sharing cost of repression together and this action make the cost declines. In this model,middle class and the rich can choose repression or democratization to stop revolution from the poor.

Let $\widetilde{\kappa}^r(\tau^m)$ and $\widetilde{\kappa}^m(\tau^m)$ are the indifferent of the rich and middle class between repression and redistribution τ^m .Then, their payoff values are combining and $\kappa \in [\widetilde{\kappa}^m, \widetilde{\kappa}^r]$

$V^r(O \mid \kappa) = (1 - \kappa)y^r$

$V^m(O \mid \kappa) = (1 - \kappa)y^m$

$V^r(D) = y^r - \tau^m y^r + (\tau^m - C(\tau^m)\bar{y}$

$V^m(D) = y^m - \tau^m y^m + (\tau^m - C(\tau^m)\bar{y}$

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$$\delta^r V^r(O \mid \kappa) + \delta^m V^m(O \mid \kappa) \leqslant \delta^r V^r(D) + \delta^m V^m(D)$$

$$\delta^r(1-\kappa)y^r + \delta^m(1-\kappa)y^m = \delta^r[y^r - \tau^m y^r + (\tau^m - C(\tau^m)\bar{y})] + \delta^m[y^m - \tau^m y^m + (\tau^m - C(\tau^m)\bar{y})]$$

$$\widetilde{\kappa}^e(\tau^m) = \frac{1}{\theta^m + \theta^r}[C(\tau^m)\delta^m - \tau^m(\delta^m - \theta^m) + C(\tau^m)\delta^r - \tau^m(\delta^r - \theta^r)]$$

$\widetilde{\kappa}^e(\tau^m)$= the indifferent of the rich and middle class between repression and democracy. Given $\widetilde{\kappa}^e(\tau^m) \in [\widetilde{\kappa}^m, \widetilde{\kappa}^r]$ and $\kappa \in [\widetilde{\kappa}^e, \widetilde{\kappa}^r)$

If $\kappa < \widetilde{\kappa}^e$, both middle class and the rich choose repression because the cost of repression is cheaper. However, when the middle class join their repression preference with the rich, the cost of repression becomes cheaper, $\kappa > \widetilde{\kappa}^e$ and $\widetilde{\kappa}^e > \widetilde{\kappa}^m$ which lead to democratization. Even though the rich prefer repression and the middle class choose democratization, democratization occurs anyway because middle class's preference as a median voter has more impact than the rich's.

Then, I use the derivative to show how a change of share middle class income affects on their repression decision.

$$\frac{d\widetilde{\kappa}^e}{d\theta^m} = \frac{1}{\theta^m + \theta^r}[-\frac{1}{\theta^m + \theta^r}[C(\tau^m)\delta^m - \tau^m(\delta^m - \theta^m) + C(\tau^m)\delta^m - \tau^m(\delta^r - \theta^r)] + \frac{d\tau^m}{d\theta^m}[C'(\tau^m)\delta^r - (\delta^r - \theta^r) + \tau^m]] < 0$$

$\frac{d\widetilde{\kappa}^e}{d\theta^m} < 0$ In word, if the middle class is richer, they prefer repress to democracy when the poor choose to make a revolution$\mu < \mu^*$because the democracy is relatively more costly. Thus, When the probability of repression increase$\kappa < \widetilde{\kappa}^e(\tau^m) \uparrow$, the probability of democratization decline.

In brief,under partial democracy which the rich and middle class aggregate their repression preferences,so the cost of repression decline $\kappa \in [\widetilde{\kappa}^m, \widetilde{\kappa}^r]$. It can be $\widetilde{\kappa}^m < \widetilde{\kappa}^e < \kappa < \widetilde{\kappa}^r$ which middle class prefer democratization whereas the rich prefer repression, so this case the middle class bring democratization because their preferences have more influent than the rich. Moreover,as κ increase,repression is

less attractive to both middle class and the rich.
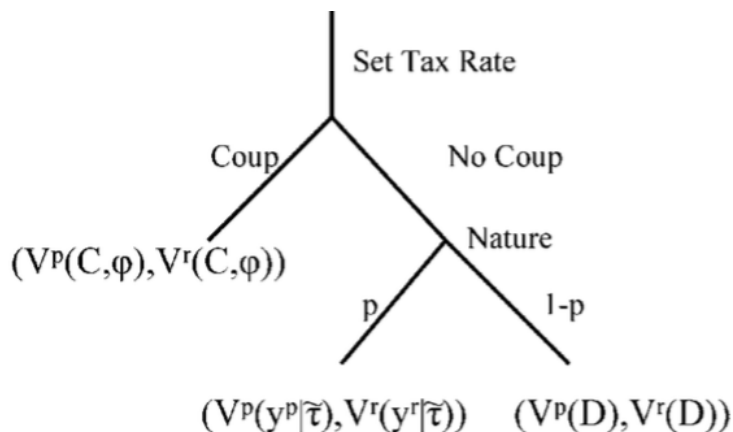
Consolidated democracy

Figure 4: game tree

The game tree starts with a median voter set it most preferred tax rate. In reality median voter can be middle class or the poor. Under my research, I assume middle class is median voter to show how they can impact consolidation of democracy. On second branch, there are the probability of holding tax rate to prevent coup and a chance to reset tax rate after stopping coup. Nature mean that the middle class is a second player when the rich choose not to coup.

Under democracy, a majority voter has political power to set up their most preferred tax rate $\tau^D \in [\tau^m, \tau^p]$. In this model,the rich has an option to make a coup for taking back political power from majority voter. The middle class can help democracy to be consolidated when they are relatively richer. Because the affluent society need lower transfer from the government, low income redistribution is not costly to the rich:as a result;the coup is less attractive for the rich.

The expected payoff value is $V^i(C, \varphi) = (1 - \varphi)y^i$ where $i \in (r, m, p)$ In the

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coup model, the coup from the rich occurs only under democratic system. To stop the mount of coup, middle class and the poor as a majority voter can promise the future tax rate to be lower with a probability p. However, after the coup is stopped, there is a chance that middle class and the poor can reset tax rate with probability $(1 - p)$

The rich choose to coup when $V^r(C, \varphi) > V^r(D)$

$(1 - \varphi)y^r > y^r - \tau^m y^r + (\tau^m - C(\tau^m))\bar{y}$

$\varphi < \frac{1}{\theta^r}[C(\tau^m)\delta^r - \tau^m(\delta^r - \theta^r)]$

$\varphi^* = \frac{1}{\theta^r}[C(\tau^m)\delta^r - \tau^m(\delta^r - \theta^r)]$

φ^*=The indifferent of the rich between coup and democracy with τ^m

$\frac{d\varphi^*}{d\tau^m} = -\frac{1}{\theta^r}[C'(\tau^m)\delta^r - (\delta^r - \theta^r)] > 0$

Therefore,the coup happen when the tax rate is higher,it make the cost of coup relatively cheaper, $\varphi < \varphi^* \uparrow$, the coup is more attractive to the rich.

To prevent the coup from the rich,middle class and the poor can promise to set lower tax rate $\tau^D = \widetilde{\tau}$ which $\widetilde{\tau} < \tau^m$. However, after they can stop the coup, their promise is imperfect because there is a probability that they will rest tax rate to τ^m

The expected return to prevent a coup is $V^r(D, \tau^D = \widetilde{\tau}) \geqslant V^r(C, \varphi)$

$y^r + p[-\widetilde{\tau}y^r + (\widetilde{\tau} - C(\widetilde{\tau}))\bar{y}] + (1 - p)[-\tau^m y^r + (\tau^m - C(\tau^m))\bar{y}] \geqslant (1 - \varphi)y^r$

$\varphi \leqslant \frac{p}{\theta^r}[C(\widetilde{\tau})\delta^r - \widetilde{\tau}(\delta^r - \theta^r)] + \frac{(1-p)}{\theta^r}[C(\tau^m)\delta^r - \tau^m(\delta^r - \theta^r)]$

However, there is a chance that the promise of less redistribution is not sufficient $(\tau^D = \widetilde{\tau})$ to prevent a coup. The middle class can stop redistribution by set $\tau^D = 0$ to make the rich indifferent between coup and democracy. Then, the expected payoff for the rich is as a following:

$V^r(D, \tau^D = 0) = V^r(C, \varphi)$

$$y^r + (1-p)[-\tau^m y^r + (\tau^m - C(\tau^m))\bar{y}] = (1-\varphi)y^r$$

$$\varphi^{**} = \frac{(1-p)}{\theta^r}[C(\tau^m)\delta^r - \tau^m(\delta^r - \theta^r)]$$

φ^{**}=the indifferent indirect utility of the rich between coup and democracy with $\tau^D = 0$.

$$\frac{d\varphi^{**}}{d\tau^m} = \frac{(1-p)}{\theta^r}[C'(\tau^m)\delta^r - (\delta^r - \theta^r)] > 0$$

Since $\theta^r > \delta^r$ and tax rate τ^m depends on level of middle class income, $\frac{d\varphi^{**}}{d\tau^m} > 0$. This proof show that if share income of middle class increase, they will need lower transfer from the rich under democratic system,$\varphi < \varphi^{**} \downarrow$. Thus, the cost of staying under democracy is sufficient for the rich not to make a coup. The democratic system is more consolidated as middle class income increase.

$$\frac{d\varphi^{**}}{dp} = \frac{(-1)}{\theta^r}[C(\tau^m)\delta^r - \tau^m(\delta^r - \theta^r)] < 0$$

As the credit of promise for future redistribution decline, $\varphi < \varphi^{**} \uparrow$, the rich prefer coup to staying under democracy with this redistributive rate τ^m.

Overall, the richer middle class play an important role to consolidate democracy which mean that an income redistribution under democracy is not costly to the rich. Therefore,Coup action is less attractive for the rich.

Mathematical Result

Considering the derivative of an impact of middle class on democratization function $f^D = (\mu^*, \delta^m, \tau^m, \kappa, \varphi, \theta^m, p)$

Assuming:$\theta^m \uparrow$

<u>Case</u> Nondemocracy and partial democracy

1.$\frac{d\mu^*}{d\theta^m} < 0 \rightarrow \mu < \mu* \downarrow \rightarrow P(democratization) \downarrow$

As shared income of middle class is higher under partial democracy, middle class will choose not to make a revolution with the poor because they are already better off. When a revolution does not occur, full democratization will not exist.

2. $\frac{d\mu^*}{dp} < 0 \rightarrow P(democratization) \downarrow or \uparrow$

Meaning that when the trust in promise of setting future tax rate by the government increases under nondemocracy or partial democracy , $\mu < \mu* \downarrow$, the probability of making revolution decline. Hence, a chance of being full democratization decrease.

3. $\frac{d\widetilde{\kappa}^m(\tau^m)}{d\theta^m} > 0 \rightarrow \kappa < \widetilde{\kappa}^m(\tau^m) \uparrow \rightarrow P(democratization) \downarrow$

Considering cost of repression for middle class group, when their income increase, middle class prefer to use repression under partial democracy to prevent full democracy because middle class has to pay higher transfer in democratic system:as a result; this decision from middle class lead to a decline in probability of being full democracy.

4. $\frac{d\widetilde{\kappa}^e(\tau^m)}{d\theta^m} < 0 \rightarrow \kappa < \widetilde{\kappa}^m(\tau^e) \uparrow \rightarrow P(democratization) \downarrow$

Combining of repression preference between the rich and middle class create lower cost of repression. An increase in middle class income share lead to higher probability of using repression. Because the richer middle class's preference is getting closed to the rich, the cost os democracy is relatively higher.

For coup function $\varphi^* = f(\tau^m)$ and $\varphi^{**} = f(\tau^m, p)$ case $\theta^m \uparrow$

1. $\frac{d\varphi^*}{d\tau^m} > 0 \rightarrow \varphi < \varphi^* \downarrow \rightarrow P(democracy) \uparrow$

Since middle class is richer, they need lower transfer from the rich. The price of democracy is lower for the rich. Also the middle class is median voter, the society becomes more wealthy. Consequently, democracy is more attractive to the rich than making a coup.

2. $\frac{d\varphi^{**}}{d\tau^m} > 0 \rightarrow \varphi < \varphi^{**} \downarrow \rightarrow P(democracy) \uparrow$

Middle class can set tax rate to be zero to stop a coup from the rich. When there is no transfer from the rich, the cost of staying under democracy is satisfactory for

the rich not to coup.

3.. $\frac{d\varphi^*}{dp} > 0 \rightarrow P(democracy) \uparrow or \downarrow$

Meaning that if the promise of future redistributive rate by the government is more creditable, the rich will prefer democracy to coup. Therefore, the more creditable promise of government lead to more consolidated democracy.

Conclusion

On one hand, when only the rich group has political power, the middle class is the main key to force a country to be democratization because they are median voter and they can choose to make a revolution with the poor to take down the rich's authority. To prevent revolution, the rich has to include middle class in to political system. The middle class move nondemocracy to become partial democracy.

On the other hand,under partial democracy, middle class and the rich are enfranchised. As a middle class is getting richer, their decision making is more like the rich and when both the middle class and the rich aggregate their repression,the cost of repression decrease.The middle class consider the cost of transfer under full democracy is more costly, so they can choose to block with the rich full democratization by using repression to stop revolution from the poor.Hence, the probability of democratization decline.

Finally, in the case of democracy,an affluent middle class need low income redistribution from the rich. Then, the cost of democracy is not too much for the rich. Comparing between the cost of staying in democracy under affluent society and cost of coup, the coup will less attractive for the rich. Because as the transfer is lower, the cost of coup is relatively higher. In other word, a wealthy middle class help democracy to stay consolidated.

Reference

Bibliography: Acemoglu, D.,Robinson, J. A.2003.Economic origins of dictatorship and democracy.