Nation States vs. United Empire: Effects of Political Competition on Economic Growth

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Abstract

Is political fragmentation (i.e. nation states) more favorable to economic growth than political unification (i.e. a united empire)? This paper develops a simple endogenous-growth model to analyze the conditions under which economic growth is higher under political fragmentation than under political unification. Under political unification, the economy is vulnerable to excessive Leviathan taxation and possibly subject to the costs of unifying heterogeneous populations. Under political fragmentation, the competing rulers are constrained in taxation but spend excessively on military defense. If and only if capital is sufficiently mobile, then political fragmentation would favor economic growth. When the political regime is chosen by the rulers, they do not always choose the growth-maximizing regime. In particular, there exists a range of parameter values, in which political fragmentation is more favorable to growth but the rulers prefer political unification.

***Keywords*: economic growth, Leviathan taxation, interstate competition, political fragmentation

***JEL classification*: H20, H56, O41, O43

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1. Introduction

Is political fragmentation (i.e. nation states) more favorable to economic growth than political unification (i.e. a united empire)? A number of economic historians, such as North (1981) and Jones (1981), argue that the unique European nation-state system contributed to its economic takeoff in the late 18th and early 19th century while the united-empire system in China was responsible for its economic stagnation during that period.[1] For example, North (1981) suggests that the interstate competition arising from political fragmentation induces the competing rulers to recognize private property rights in order to prevent labor and capital outflows, and the resulting economic system with secured property rights creates the proper environment for capital accumulation and hence sustained growth. However, Bernolz and Vaubel (2004) note that political fragmentation did not always lead to these predicted effects.

> "Political fragmentation is not a sufficient condition for political competition, innovation and growth… Political fragmentation will not lead to interstate competition unless there is considerable mobility among jurisdictions… Political fragmentation will not favour innovation and growth if it leads to prolonged and highly destructive wars rather than limited warfare or peaceful competition for manpower and capital."
>
> Bernolz and Vaubel (2004, p. 14)

So, under what conditions would fragmentation be more favorable to growth than unification? Also, when the political regime is chosen by the rulers, do they have the incentives to choose the regime that is more favorable to growth?

To analyze the growth effects of fragmentation versus unification, this paper develops a simple endogenous-growth model characterized by three parameters indexing (a) the degree of capital mobility, (b) the extent of competition in military defense and (c) the heterogeneity costs or the benefits of unification under a unified country. We analyze how these three factors affect the households' capital investment rate and the rulers' tax rate, which in turn determine the equilibrium growth rate, under the two political regimes. We follow Karayalcin (2008) to use the tax rate to capture both legal and extra-

[1] See, for example, Bernholz *et al* (1998) and Bernholz and Vaubel (2004) for a comprehensive survey.

legal property expropriations by rulers. This formulation of using taxation as a measure of property rights is also consistent with Drazen's (2000, p. 459) obersvation that "… property rights can be considered in the narrow sense as applying to taxation of property: even in the absence of the threat of outright expropriation, societies can nonetheless legally expropriate the fruits of accumulation via taxation."

Within this framework, we have the following findings. On one hand, political fragmentation can be advantageous to growth because the competition between rulers limits their ability in taxing households. The extent of this limitation is governed by the degree of capital mobility, which in turn is determined by a mobility cost. This mobility cost is meant to capture North's (1981) idea that the monopoly power of a ruler depends on the cost of exit for the citizens. On the other hand, political fragmentation can be damaging to growth if the competing rulers allocate an excessive amount of productive resources to military defense. As for the case of political unification, the unified country may have (a) a higher level of aggregate productivity due to economies of scales and lower trade barrier or (b) lower productivity due to the costs of unifying heterogeneous populations into a single nation. We will consider both possibilities. Allowing for the possibility of these heterogeneity costs enables the model to capture some of the important insights from the country-formation literature. For example, Alesina and Spolaore (2003, 2005) argue that there are additional costs in ruling heterogeneous populations under a single nation. Potential sources of these costs include conflicting preferences over public policies, coordination costs, monitoring costs, and the expected losses associated with civil wars.

In summary, under political unification, the economy is vulnerable to excessive Leviathan taxation and subject to the heterogeneity costs or unification benefits. Under political fragmentation, the competing rulers are constrained in taxation but spend excessively on military defense. The theoretical analysis suggests that whether fragmentation or unification is more favorable to growth depends on the degree of capital mobility. If and only if the degree of capital mobility is higher (lower) than a critical threshold, then fragmentation (unification) would favor economic growth, and this critical threshold is increasing in the degree of defense competition and decreasing in the heterogeneity costs (or increasing in the unification benefits).

When the political regime is chosen by the rulers, they do not necessarily choose the growth-maximizing regime. In particular, there exists a range of values for the heterogeneity costs (or the unification benefits), in which fragmentation is more favorable to growth but the rulers prefer unification. On one hand, when the heterogeneity costs are sufficiently high (or the unification benefits are sufficiently low), economic growth is higher under fragmentation that exhibits tax competition. On the other hand, the rulers suffer from consuming a lower level of tax revenue under fragmentation due to competition in both taxation and defense. When the heterogeneity costs are not excessively high (or the unification benefits are not excessively low), this negative level effect dominates the positive growth effect under fragmentation, and the rulers enjoy a higher level of utility under unification. In this case, although fragmentation favors growth, the rulers prefer unification. In contrast, the households always prefer the regime that favors growth. Therefore, there is a range of values for the heterogeneity costs (or the unification benefits) in which the households and the rulers have conflicting preferences, and this range of parameter values is expanding in the degree of (a) defense competition, (b) capital mobility and (c) Leviathan (i.e. the weight that the rulers place on taxation relative to households' welfare).

Related Literatures

This paper relates to a number of literatures (a) institutional economics and economic history, (b) endogenous-growth theory, (c) Leviathan and tax competition, (d) country formation and (e) the political economy of growth. This paper formalizes some important insights from a number of economic historians on the effects of political fragmentation on growth using an AK endogenous-growth model. In particular, it embeds a framework of Leviathan taxation into the growth model to analyze the conditions under which capital mobility would constrain the tax rate chosen by self-interested rulers and enhance growth under fragmentation.[2] Furthermore, it borrows some of the insights from the literature on country formation to analyze the different growth effects of fragmentation and unification. Alesina and Spolaore (2005)

[2] The literature on Leviathan and tax competition was initiated by Brennan and Buchanan (1977, 1980). See, for example, Edwards and Keen (1996) and Rauscher (1998) for a theoretical formulation.

analyze how the heterogeneity costs and the cost of international conflict affect the size and the number of nations.[3] In contrast, the current paper firstly analyzes how these factors affect economic growth for a given size and number of nations. Then, it considers whether the political regime that is more favorable to growth would be chosen by the rulers.

Drazen (2000, ch. 11), Persson and Tabellini (2000, ch. 14) and Acemoglu (2008, ch. 22 and 23) provide excellent surveys on the political economy of growth. Chaudhry and Garner (2006) model another effect of political competition in which the presence of rival states reduces the rulers' incentives to block innovation and enhances growth. Chaudhry and Garner (2007) incorporate a rent-seeking government into a Schumpeterian model to analyze the conditions under which self-interested political elites would adopt growth-reducing policies. The current paper differs from these studies by analyzing different growth effects of political competition through capital mobility and military defense.

Karayalcin (2008) also analyzes the growth effects of fragmentation versus unification. On one hand, the current paper is in line with this study by considering the effects of tax competition on capital-accumulation-driven growth under different political regimes. On the other hand, it differs from this study by (a) also considering interstate competition in military defense and (b) allowing for the possibility of heterogeneity costs under unification. The consideration of defense competition leads to the possibility of a higher tax rate and hence a lower growth rate under fragmentation. The presence of heterogeneity costs leads to the possibility that the rulers may prefer fragmentation over unification.

The rest of this paper is organized as follows. The next section presents the model and results. The final section concludes with a brief discussion on the first unification of China in 221 BC.

2. The Model

There is a continuum of identical households residing in each of the two symmetric regions. In the case of political unification, the unified country is ruled by a group of political elites, who choose the tax rate and consume the tax revenue to maximize their utility that is a weighted average of the tax revenue and

[3] See, also, Bolton and Roland (1997) and Alesina and Spolaore (2003).

households' welfare. Taking the tax rate as given, the households choose consumption and investment to maximize their utility. Due to constant returns to scale in capital in the production function, the output growth rate is determined by the investment rate and the tax rate.

In the case of political fragmentation, each of the two regions is ruled by a group of political elites, who make an additional decision on defense spending for the purpose of capturing a larger share of land. The households also have to make an additional decision on the allocation of capital. When the households allocate a fraction of their capital to the other region, they face a mobility cost. This mobility cost determines capital mobility and affects the equilibrium tax rate chosen by the political elites. As the degree of capital mobility increases, the political elites reduce the tax rate due to tax competition.

Households

There is a unit-continuum of identical households residing in each region $j \in \{\text{home, foreign}\}$, and their lifetime utility is

(1) $$U(j) = \int_0^\infty e^{-\rho t}[\ln C_t(j) + \delta \ln L_t(j)]dt\,,$$ [4]

where $\rho \in (0,1)$ is the households' discount rate . $C_t(j)$ denotes consumption at time *t*, and $L_t(j)$ denotes the amount of land owned by region *j*.[5] $\delta > 0$ is a preference parameter indicating the utility importance of land and determines the degree of competition in military defense under fragmentation. To simplify notation, I will suppress the regional index *j* for the home region and denote variables for the foreign region with a superscript prime.

At each instant of time, the households use their accumulated capital K_t to produce goods, and they decide how much to consume and invest in capital by maximizing utility subject to a sequence of budget constraints given by

[4] The log utility function together with an AK production function ensure that the policies chosen by the elites are time consistent as we will discuss below.
[5] This formulation of treating land as a direct component in the utility function is equivalent to treating land as a factor input for perishable agricultural products that are then consumed.

(2) $$\dot{K}_t = Y_t - C_t - T_t - M_t \,.$$

Y_t is the amount of goods produced. Following the literature on AK growth, the production function is assumed to have constant returns to scale in capital such that $Y_t = A_t K_t$.[6] To incorporate an interesting element from the country-formation literature into the model, aggregate productivity A_t is assumed to be a function of the heterogeneity costs or the unification benefits captured by a parameter $h < 1$. In particular, $A_t = (1 - \gamma_t h)$, where γ_t is an 0-1 indicator that equals 1 for unification and equals 0 for fragmentation. When $h \in (0,1)$, it captures the costs of unifying heterogeneous populations into a single nation as in Alesina and Spolaore (2005). When $h < 0$, it captures the benefits of unification due to economies of scale and lower trade barrier between regions.

$T_t \equiv [\tau_t(1 - s_t) + \tau_t' s_t]K_t$ is the amount of capital tax paid by the households,[7] and $s_t \in [0,1]$ is defined as the share of capital allocated to the foreign region. τ_t (τ_t') is the tax rate in the home (foreign) region. As in Karayalcin (2008), this tax rate should not be viewed as the statutory tax rate; instead, it represents the degree of legal and extra-legal expropriation by the rulers. If the tax rates (i.e. the extent of expropriation by the rulers) differ across regions, then the households have the incentives to allocate some or even all of their capital to the other region. However, when they do so, they face a mobility cost. The last term in (2) represents a mobility cost in s_t incurred by the households if they allocate a share s_t of their capital to the other region. As in Persson and Tabellini (1992), we consider a convex mobility cost to capture varying degree of capital mobility. For analytical tractability, the convex mobility cost M_t is assumed to take the following functional form

(3) $$M_t = s_t^2 K_t / (2m) \,.$$

[6] Capital should be viewed as composite, including physical capital, human capital, and other types of capital.
[7] Due to constant returns to scale in the production function, a tax on capital is equivalent to a tax on capital income.

M_t is increasing and convex in s_t, implying that it is costly for the households to carry out capital outflow and that the associated marginal cost is increasing in the size of capital outflow. We let K_t enter M_t linearly to ensure a balanced-growth path. The parameter $m \in [0,\infty)$ indexes the degree of capital mobility across regions. When m equals zero, the mobility cost goes to infinity and capital is de facto immobile. As m approaches infinity, the mobility cost goes to zero and capital is perfectly mobile. As we will show later, other things being equal, an increase in m reduces the equilibrium τ_t. Therefore, the parameter *m* can also be viewed as an index measuring the degree of tax competition.

Political Elites

There is a group of political elites in each region. Under political unification, the two groups of elites cooperate and rule the two regions as a unified country. Under political fragmentation, each group rules its region as an independent nation. The elites' lifetime utility is

$$V = \int_0^\infty e^{-\beta t}[l(\ln R_t + \delta \ln L_t) + (1-l)(\ln C_t + \delta \ln L_t)]dt \,, \tag{4}$$

where $\beta \in (0,1)$ is the elites' discount rate. R_t is the amount of tax revenue extracted and expended by the elites for their own consumption. The parameter $l \in (0,1)$ indexes the degree of Leviathan. As l approaches zero, the elites become completely benevolent. As l approaches one, the elites become completely self-interested. This degree of Leviathan reflects the extent of the rulers' accountability. The higher the accountability, the lower the l should be. Similar political preferences have been utilized by Edwards and Keen (1996), Rauscher (1998) and Arzaghi and Henderson (2005). Also, (4) assumes that the elites have the same preference as the households on the amount of land captured by their nation.[8]

[8] Relaxing this assumption only adds an extra parameter to the model without changing the results.

Political Unification

In the case of unification, the groups of elites allocate the amount of land equally among the two regions, where the total amount of land is normalized to two such that $L_t = 1$ in each region. The amount of goods produced in each region is $Y_t = (1-h)K_t$. Because the unified country incurs zero defense spending, the amount of tax revenue consumed by each group of elites is $R_t = \tau_t K_t$. Denote c_t as the fraction of capital consumed by the households (i.e. $C_t = c_t K_t$). Taking the path of τ_t as given, the households choose the control path of c_t to maximize (1) subject to (2). Taking the households' best response as given, the elites choose the control path of τ_t to maximize (4) subject to (2).[9] It is well known that this Ramsey approach typically suffers from the so-called "time inconsistent" problem (i.e. after households make their best response, the elites have the incentives to deviate from their chosen policies *ex post*). Time inconsistency does not occur in our model given the pair of utility and production functions.[10]

Since the two regions are identical, we seek a symmetric solution. The two groups of political elites coordinate their policies to enforce $\tau_t = \tau_t'$ for all *t* and hence households will choose $s_t = 0$ for all *t* to avoid the incidence of mobility cost. The equilibrium under unification is denoted with a superscript *u*.

Lemma 1: *Under political unification, the symmetric Markov perfect equilibrium is stationary and*

(5) $$c_t^u = \rho,$$

(6) $$\tau_t^u = l\beta,$$

(7) $$g_t^u = A_t^u - c_t^u - \tau_t^u = 1 - (h + \rho + l\beta).$$

Proof: See Appendix A.□

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[9] Technically, we are solving a Stackelberg differential game, in which the elities (the leader) choose the policy first and then households (followers) choose their control path. Appendix A shows that the equilibrium is time consistent and subgame perfect. See, for example, Dockner et al (2000), Xie (1997) and Karp and Lee (2003) for a discussion.

[10] Xie (1997) shows that time-consistent fiscal policies can be obtained in Stackelberg differential games for the class of utility-production pairs given by $U = (C^{1-\sigma} - 1)/(1-\sigma)$ and $Y = AK^{\sigma}$ for $\sigma \in (0,1]$. Our setup corresponds to the case of $\sigma = 1$.

g_t is the equilibrium growth rate of output, and the time subscript will be suppressed for convenience. Firstly, g^u is decreasing in ρ because an increase in ρ increases consumption and hence reduces capital investment. Secondly, g^u is decreasing in $l\beta$ because an increase in either l or β leads to a higher tax rate that reduces capital investment. Finally, g^u is decreasing in h because a larger h (i.e. larger heterogeneity costs or smaller unification benefits) reduces aggregate productivity.

Political Fragmentation

Under political fragmentation, total output in each region is $Y_t = K_t$ because $h = 0$. The two groups of political elites incur defense spending to fight over the distribution of land. The amount of land claimed by an emperor is assumed to be $L_t = 2D_t/(D_t + D_t')$,[11] where D_t (D_t') is the amount of tax revenue devoted to military spending in the home (foreign) region. The balanced-budget condition requires that $R_t + D_t = \tau_t[(1-s_t)K_t + s_t'K_t']$, where the right-hand side is the amount of tax revenue collected by the elites in the home region.

Denote r_t as the fraction of capital allocated to consumption by the elites and d_t as the fraction capital allocated to defense spending (i.e. $R_t = r_tK_t$ and $D_t = d_tK_t$). Taking the paths of τ_t and L_t as given, the households choose the control paths of c_t and s_t to maximize (1) subject to (2). Then, taking the households' best response and the foreign elites' paths of τ_t' and d_t' as given, the home elites choose the control paths of r_t, τ_t and d_t to maximize (4) subject to (2).[12] The equilibrium under political fragmentation is denoted with a superscript *f*.

[11] We follow Alesina and Spolaore (2005) to use this tractable functional form, which originates from the literature on conflict resolution; see, for example, Hirshleifer (1991).

[12] Technically, we are solving a simultaneous-move differential game between the two groups of elites, and we focus on strongly symmetric strategies, in which the groups of elites take the same action both on and off the equilibrium path. This assumption is only for the purpose of ensuring that the equilibrium is subgame perfect among the set of off-equilibrium (symmetric) trajectories. In other words, the symmetric Markov perfect equilibrium should

Lemma 2: *Under political fragmentation, the symmetric Markov perfect equilibrium is stationary and*

(8) $$c_t^f = \rho,$$

(9) $$\tau_t^f = \frac{\beta(l+\delta/2)}{(1+\delta/2)+2m\beta(l+\delta/2)},$$

(10) $$r_t^f = \frac{l\beta}{(1+\delta/2)+2m\beta(l+\delta/2)},$$

(11) $$d_t^f = \frac{\beta\delta/2}{(1+\delta/2)+2m\beta(l+\delta/2)},$$

(12) $$g_t^f = A_t^f - c_t^f - \tau_t^f = 1-\left(\rho+\frac{\beta(l+\delta/2)}{(1+\delta/2)+2m\beta(l+\delta/2)}\right).$$

Proof: See Appendix A.□

From (9), we see that the higher the m, the lower the τ^f will be. Given the households' capital allocation rule $s_t = m(\tau_t - \tau_t')$,[13] each group of political elites have an incentive to undercut its own capital tax rate to prevent capital outflow and attract capital inflow. Therefore, higher capital mobility generates stronger tax competition and drives down the equilibrium tax rate under fragmentation. From (9) and (11), we see that as δ increases, the elites levy a higher tax rate and allocate more tax revenue to defense spending. Therefore, δ can be viewed as an index measuring the degree of defense competition. Also, note that $D_t = D_t'$ so that $L_t = L_t' = 1$ and hence defense spending is wasted resources.

Growth Effects of Political Fragmentation vs. Political Unification

The condition that determines whether economic growth is higher under fragmentation or unification is

(13) $$g^f > g^u \Leftrightarrow m > \overline{m} \equiv \frac{1}{2}\left(\frac{1}{h+l\beta}-\frac{(1+\delta/2)}{\beta(l+\delta/2)}\right).$$

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be understood as strongly symmetric Markov perfect equilibrium. See Fudenberg and Tirole (1991) for a discussion on strongly symmetric equilibrium.

[13] This rule will be derived in Appendix A.

In other words, fragmentation dominates unification in growth if and only if capital mobility is sufficiently high. The critical threshold $\overline{m}$ is decreasing in h and increasing in δ. As the heterogeneity costs increase (or the unification benefits decrease), the degree of capital mobility can be lower while fragmentation still delivers a higher growth rate than unification. As the degree of defense competition δ increases, the tax rate under fragmentation goes up. Therefore, a larger δ requires a higher degree of capital mobility in order to maintain a higher growth rate than unification.

Proposition 1: *If and only if the degree of capital mobility is above (below) a threshold, fragmentation dominates (is dominated by) unification in growth. This threshold is decreasing in heterogeneity costs (or increasing in unification benefits) and increasing in the degree of defense competition.*

Proof: Compare (7) and (12). Also, see (13).□

The Elites' Preferred Regime

Suppose the political regime is chosen by the political elites. Then, which regime would they prefer? In particular, we want to derive the conditions under which the elites prefer the regime that is *less* favorable to growth. Because the simple growth model does not exhibit transition dynamics, the lifetime utility of the elites can be simplified to

$$V = \frac{l \ln R_0 + (1-l)\ln C_0 + \delta \ln L}{\beta} + \frac{g}{\beta^2}. \tag{14}$$

Because $C_0 = \rho K_0$ and $L = 1$ under both regimes, (14) further simplifies to $\beta V = l \ln R_0 + g / \beta$ after dropping the exogenous terms. The condition that determines whether the elites' utility would be higher under fragmentation or under unification is given by

$$V^f > V^u \Leftrightarrow g^f - g^u > l\beta \ln[(1+\delta/2) + 2m\beta(l+\delta/2)]. \tag{15}$$

The term $l\beta \ln[(1+\delta/2) + 2m\beta(l+\delta/2)]$ reflects the elites' utility loss from consuming a lower level of tax revenue due to competition in capital taxation and defense spending. Capital mobility constrains the tax rate and results into a negative effect on the elites' utility through a reduction in the initial level of tax revenue. Similarly, defense competition causes the elites to divert a fraction of tax revenue to defense spending and hence lowers their tax consumption. As a result of these negative level effects, the emperors may have a lower level of utility under fragmentation even when this political regime is more favorable to growth. Proposition 2 and Figure 2 summarize this finding.

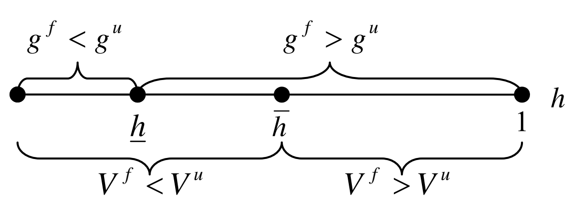
Proposition 2: *There exists a range of parameters, in which* $g^f > g^u$ *but* $V^f < V^u$. *This range of parameters is given by* $h \in (\underline{h}, \overline{h})$, *where*

$$\underline{h} \equiv \frac{\beta(l+\delta/2)}{(1+\delta/2)+2m\beta(l+\delta/2)} - l\beta \,, \tag{16}$$

$$\overline{h} \equiv \underline{h} + l\beta \ln[(1+\delta/2)+2m\beta(l+\delta/2)] \,. \tag{17}$$

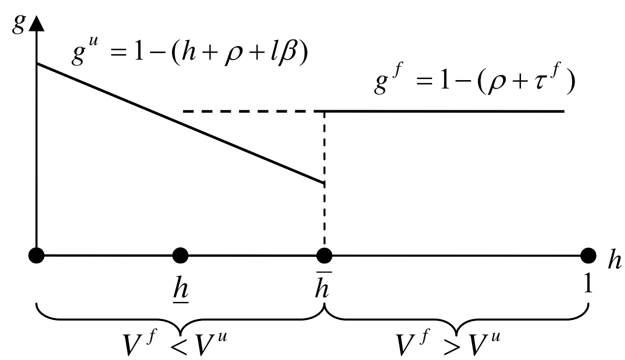
Proof: Comparing (7) and (12) shows that $g^f > g^u \Leftrightarrow h > \underline{h}$. Also, using (6), (10) and (14) shows that $V^f < V^u \Leftrightarrow h < \overline{h}$.□

Figure 1: Results of Proposition 2



Intuitively, when the heterogeneity costs are sufficiently high (or the unification benefits are sufficiently low) such that $h > \underline{h}$, which can be negative, the equilibrium growth rate is higher under fragmentation than under unification. However, due to the competition in taxation and defense spending, the elites suffer from consuming a lower initial level of tax revenue under fragmentation. When the heterogeneity costs are not excessively high (or the unification benefits are not excessively low) such that $h < \overline{h}$, this negative level effect dominates the positive growth effect under fragmentation, and the elites enjoy a higher level of utility under unification. In fact, for $h \le 0$ (i.e. when there are no heterogeneity costs and possibly some unification benefits), the elites always prefer unification (i.e. $\overline{h} > 0$) because either tax competition or defense competition under fragmentation is detrimental to their utility. Figure 2 plots the growth rate when the regime is chosen by the elites to maximize their utility.

Figure 2: Economic Growth



As for the households, they always prefer the political regime that is more favorable to growth. To see this result, their lifetime utility can be re-expressed as

(18)
$$U = \frac{\ln C_0 + \delta \ln L}{\rho} + \frac{g}{\rho^2}.$$

Denote the households' lifetime utility under fragmentation and unification by U^f and U^u respectively.

Proposition 3: $U^f > U^u$ if and only if $g^f > g^u$.

Proof: Recall that $C_0 = \rho K_0$ and $L = 1$ under both regimes.□

Because the households always prefer the growth-maximizing regime, there is a range of parameter values in which the households and the elites prefer different political regimes. Furthermore, this range of parameters defined as $\Delta h \equiv \overline{h} - \underline{h}$ expands as l, β, δ or m increases. As the degree of Leviathan increases, the elites place a larger relative weight on their own consumption of tax revenue, so that they care more about the level of tax revenue than growth. Similarly, as the elites become more impatient, they once again value less the benefit of higher growth. As the degree of defense or tax competition increases, the initial level of the elites' tax consumption decreases; therefore, they would prefer unification unless the heterogeneity costs are excessively high. Corollary 1 summarizes this finding.

Corollary 1: *There exists a range of* $h \in (\underline{h}, \overline{h})$*, in which* $U^f > U^u$ *but* $V^f < V^u$*, and this range of parameter values expands as* l*,* β*,* δ *or* m *increases.*

Proof: Combine Propositions 2 and 3. Also, note that $\Delta h \equiv \overline{h} - \underline{h} = l\beta \ln[(1+\delta/2) + 2m\beta(l+\delta/2)]$.□

3. Conclusion

This paper develops a simple endogenous-growth model to analyze the conditions under which economic growth is higher under political fragmentation than under political unification. In order to formalize the different growth effects of each political regime in a tractable theoretical framework, I have made a number of simplifying assumptions and used specific functional forms. The abstract model certainly does not capture all the important elements of the nation-state and united-empire systems but nonetheless serves its purpose in providing a simple framework that highlights the different growth effects of the heterogeneity costs or unification benefits under unification and the interstate competition in taxation and defense spending under fragmentation.

The main results are as follows. Under political unification, the heterogeneity costs (unification benefits) have a negative (positive) effect on growth. Under political fragmentation, the interstate competition in defense spending has a negative effect on the economy while capital mobility that reduces the tax rate chosen by the elites has a positive effect. Although the abstract model may have neglected other important characteristics of each political regime,[14] whether fragmentation or unification is more favorable to growth should be partly determined by the relative magnitude of the above three factors. Furthermore, when the political regime is chosen by the elites, they do not necessarily choose the growth-maximizing regime.

This finding potentially explains why so many ancient civilizations, except for Europe, adopted the united-empire system while the nation-state system might have been more favorable to growth. Perhaps the heterogeneity costs in Europe due to its cultural and language diversity were higher than, for example, in ancient China such that the European rulers prefer political fragmentation while the Chinese rulers prefer political unification despite the possibility that political fragmentation would have been more favorable to growth and preferred by the citizens.

Finally, let me conclude this paper with a brief discussion on the first unification of China in 221 BC. Upon conquering the other nations and ending the Era of Warring States (from the 5th century BC to 221 BC), Qin Shi Huang (sometimes referred to as the first emperor of a unified China) standardized the Chinese units of measurements, the currency, the length of the axles of carts, the legal system, and most importantly, the Chinese script. These policies reduced heterogeneity across regions and were meant to improve the political elites' ability in ruling the unified China. An implication from the current study is that this reduction in heterogeneity costs led to a tendency of political unification in subsequent Chinese Dynasties. This tendency of political unification resulted into less political competition that could have stimulated China's economic growth.

[14] For example, Jones (1981) argues that through policy diversification and political variety, the nation-state system provided Europe with an insurance mechanism against economic stagnation caused by suboptimal policies.

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Appendix A

Control Paths for the Households: We firstly derive the control paths for the households that will be applicable to both Lemmas 1 and 2. Taking the paths of τ_t and L_t as given, the households choose the control paths for c_t and s_t to maximize (1) subject to (2). The current-value Hamiltonian is

(A1) $$H_t = \ln(c_t K_t) + \mu_t \left(A_t - c_t - \tau_t (1 - s_t) - \tau_t' s_t - \frac{s_t^2}{2m} \right) K_t .$$

The first-order conditions are

(A2) $$\frac{\partial H_t}{\partial c_t} = \frac{1}{c_t} - \mu_t K_t = 0 ,$$

(A3) $$\frac{\partial H_t}{\partial s_t} = \mu_t \left(\tau_t - \tau_t' - \frac{s_t}{m} \right) K_t = 0 ,$$

(A4) $$\frac{\partial H_t}{\partial K_t} = \frac{1}{K_t} + \mu_t \left(A_t - c_t - \tau_t (1 - s_t) - \tau_t' s_t - \frac{s_t^2}{2m} \right) = \mu_t \rho - \dot{\mu}_t ,$$

(A5) $$\frac{\partial H_t}{\partial \mu_t} = \left(A_t - c_t - \tau_t (1 - s_t) - \tau_t' s_t - \frac{s_t^2}{2m} \right) K_t = \dot{K}_t ,$$

and the transversality condition is $\lim_{t \to \infty} e^{-\rho t} \mu_t K_t = 0$. Combining (A4) and (A5) yields

(A6) $$\dot{\mu}_t K_t + \mu_t \dot{K}_t = \rho \mu_t K_t - 1 .$$

Integrating (A6) with respect to time yields $\mu_t K_t = e^{\rho t} \Omega + 1 / \rho$, and the transversality condition implies that the integration constant Ω must equal zero. Therefore, we have

(A7) $$\mu_t K_t = 1 / \rho .$$

From (A7), $\mu_0 = (\rho K_0)^{-1}$ is independent of the elites' actions and has a predetermined value. In other words, the initial value of the households' co-state variable (which may become a state variable in the elites' control problem) is predetermined. As a result, the households' best response does not create any incentive for the elites to deviate along the equilibrium path (i.e. the Stackelberg equilibrium is time consistent); see Xie (1997) and Karp and Lee (2003).

Combining (A2) and (A7) yields (5) and (8). Solving (A3) yields

$$s_t = m(\tau_t - \tau_t'). \tag{A8}$$

Because the equilibrium paths are stationary and independent of the state variable, the equilibrium is subgame perfect (i.e. the households have no incentive to deviate at any time t and for any realization of the state variable); see Dockner et al (2000). Finally, the second-order conditions are satisfied because (a) the control sets are convex, (b) the instantaneous utility function in (1) is strictly concave in K_t, and (c) the law of motion for K_t is linear in K_t; see Seierstad and Sydsaeter (1987).

Proof for Lemma 1: Combining (A2) and (A7) from Lemma 1 yields (5). Taking the households' control paths (5) and (A8) as given, the elites choose their control paths to maximize (4). Solving the symmetric equilibrium that maximizes the joint welfare of the two groups of elites is equivalent to solving the equilibrium in each region. Under unification, $A_t = 1-h$, $L_t = 1$ and $s_t = 0$ because $\tau_t = \tau_t'$. Because the households' co-state variable has a predetermined initial value, we can directly substitute (5) into (A5) (instead of treating μ_t as a state variable) to obtain the elites' current-value Hamiltonian given by

$$\widetilde{H}_t = l\ln(\tau_t K_t) + (1-l)\ln(\rho K_t) + \widetilde{\mu}_t(1-h-\rho-\tau_t)K_t. \tag{A9}$$

The first-order conditions are

$$\frac{\partial \widetilde{H}_t}{\partial \tau_t} = \frac{l}{\tau_t} - \widetilde{\mu}_t K = 0, \tag{A10}$$

$$\frac{\partial \widetilde{H}_t}{\partial K_t} = \frac{1}{K_t} + \widetilde{\mu}_t(1-h-\rho-\tau_t) = \widetilde{\mu}_t\rho - \dot{\widetilde{\mu}}_t, \tag{A11}$$

$$\frac{\partial \widetilde{H}_t}{\partial \widetilde{\mu}_t} = (1-h-\rho-\tau_t)K_t = \dot{K}_t, \tag{A12}$$

and the transversality condition is $\lim_{t\to\infty} e^{-\beta t}\tilde{\mu}_t K_t = 0$. Combining (A11) and (A12) yields

(A13)
$$\dot{\tilde{\mu}}_t K_t + \tilde{\mu}_t \dot{K}_t = \tilde{\mu}_t K_t \beta - 1 .$$

As before, integrating (A13) with respect to time and then using the transversality condition to set the integration constant to zero yield

(A14)
$$\tilde{\mu}_t K_t = 1/\beta .$$

Substituting (A14) into (A10) yields

(A15)
$$\tau_t = l\beta .$$

Because the elites' control path is stationary and independent of the state variable, it is sub-game perfect. Also, the second-order conditions are satisfied as before. Finally, substituting (A15) into (A12) yields

(A16)
$$g_t = 1 - (h + \rho + l\beta) .\square$$

Proof for Lemma 2: Combining (A2) and (A7) yields (8). Taking the households' control paths, τ_t' and d_t' as given, the elites choose r_t, τ_t and d_t to maximize (4). Under political fragmentation, $A_t = 1$, $L_t = 2D_t/(D_t + D_t')$ and $r_t K_t + d_t K_t = \tau_t[(1-s_t)K_t + s_t' K_t']$. The current-value Hamiltonian is

(A17)
$$\begin{aligned}\tilde{H}_t &= l\ln(r_t K_t) + (1-l)\ln(\rho K_t) + \delta \ln\left(\frac{2d_t K_t}{d_t K_t + d_t' K_t'}\right)\\ &+ \tilde{\mu}_t\left(1 - \rho - \tau_t(1-s_t) - \tau_t' s_t - \frac{s_t^2}{2m}\right)K_t + \tilde{\lambda}_t\{\tau_t[(1-s_t)K_t + s_t' K_t'] - r_t K_t - d_t K_t\},\end{aligned}$$

where $s_t = m(\tau_t - \tau_t')$ from (A8). Imposing symmetry (i.e. $\tau_t = \tau_t'$) on the first-order conditions yields

(A18)
$$\frac{\partial \tilde{H}_t}{\partial \tau_t} = -\tilde{\mu}_t K_t + \tilde{\lambda}_t[K_t - \tau_t m(K_t + K_t')] = 0 ,$$

(A19)
$$\frac{\partial \tilde{H}_t}{\partial d_t} = \delta\left(\frac{1}{d_t} - \frac{K_t}{d_t K_t + d_t' K'}\right) - \tilde{\lambda}_t K_t = 0 ,$$

(A20) $$\frac{\partial \widetilde{H}_t}{\partial r_t} = \frac{l}{r_t} - \widetilde{\lambda}_t K_t = 0\,,$$

(A21) $$\frac{\partial \widetilde{H}_t}{\partial K_t} = \frac{1+\delta}{K_t} - \frac{d_t \delta}{d_t K_t + d_t' K'} + \widetilde{\mu}_t (1-\rho-\tau_t) + \widetilde{\lambda}_t (\tau_t - r_t - d_t) = \widetilde{\mu}_t \beta - \dot{\widetilde{\mu}}_t\,,$$

(A22) $$\frac{\partial \widetilde{H}_t}{\partial \widetilde{\mu}_t} = (1-\rho-\tau_t) K_t = \dot{K}_t\,,$$

(A23) $$\frac{\partial \widetilde{H}_t}{\partial \widetilde{\lambda}_t} = \tau_t - r_t - d_t = 0\,,$$

and the transverality condition is $\lim_{t\to\infty} e^{-\beta t} \widetilde{\mu}_t K_t = 0$. Combining (A21), (A22) and (A23) yields

(A24) $$\dot{\widetilde{\mu}}_t K_t + \widetilde{\mu}_t \dot{K}_t = \widetilde{\mu}_t K_t \beta - \left(1 + \delta - \frac{\delta d_t K_t}{d_t K_t + d_t' K'}\right).$$

The symmetry condition ($\tau_t = \tau_t'$ for all t) implies that $K_t = K_t'$ for all t. Integrating (A24) with respect to time and then using the transversality condition to set the integration constant to zero yield

(A25) $$\widetilde{\mu}_t K_t = (1 + \delta/2)/\beta\,.$$

Combining (A18), (A19), (A20) and (A25) yields (9), (10) and (11). Because the elites' control paths are stationary and independent of the state variables, they are sub-game perfect. Also, the second-order conditions are satisfied as before. Finally, substituting (9) into (A22) yields (12).□