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The Wealth and Size of Nations

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This article provides a general theory explaining the geographic and population size and wealth of nations. Successful countries create conditions for high productivity in the economic sphere by enforcing property rights and providing social overhead capital and at the same time minimize political costs by creating a system of rules that reduce influence costs and allow for diverse preferences. Countries also need an effective military apparatus to protect their wealth from predation by other countries. Success in these endeavors may lead to immigration and geographical expansion, but an inability to meet these goals may lead to extensive emigration or breakup of the country. The argument is done within the context of a formal model that integrates spatial political costs with the benefits of spatially determined economic production and the effect of coercive transfers. The analysis is used to provide insight into secessions and mergers of nation-states.

The study of history is predominantly the study of nations: their rise and decline, consolidation and breakup, and their wars of expansion and independence. From Alexander the Great, through the decline and fall of the Roman Empire, to the present events in Hong Kong, Quebec, Kosovo, and Palestine, the issues of sovereignty, merger, and dissolution are paramount.

This article develops an analytic framework for understanding these historical events. The first section presents a broad discussion of the factors that affect the geographic and population size of nations. The next section develops a formal model integrating spatial political models with spatially determined Cobb-Douglas production functions and military coercion functions to explain the wealth of nations. Propositions regarding the size of nations are derived in the third section. The fourth section briefly considers previous research. The last section presents concluding remarks.

THE GENERAL THEORY

Individuals acting alone and in groups try to maximize their welfare. Depending on the group’s ability to resolve certain public goods problems, the group may be more or

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less successful in promoting these ends. In turn, these groups interact either cooperatively or coercively with other groups to achieve the goals of their members. An important collection of groups is the nation-state. Typically, those in power in one nation have very limited power in another nation-state. This is what is known as sovereignty. Different nations are more or less successful in resolving political conflict and promoting economic welfare. Nations also interact with other nations to maximize the wealth of their ruling groups. Sometimes, this involves cooperation, and sometimes this involves coercion. In this article, we show how this competition, cooperation, and conflict affect the equilibrium geographic and population size of nations. In particular, we show that the size and wealth of nations depend on the following three elements: (1) the production technology, (2) political transaction costs, and (3) the military coercion technology.

Nations are a nexus of public goods. A wise public policy choice may significantly increase the overall wealth of the citizenry. Successful countries create conditions for high productivity in the economic sphere by enforcing property rights and providing social overhead capital and at the same time minimize political costs by creating a system of rules that reduce influence costs and allow for diverse preferences. Countries also need an effective military apparatus to protect their wealth from predation by other countries. As we will show, success in these endeavors may lead to immigration and geographical expansion, but an inability to meet these goals may lead to extensive emigration or a breakup of the country.

Countries will have an incentive to merge (or break up) when the value is greater (or less) for a unified country than as separate sovereign states. In theory, economic value is unequivocal if those who want union can bribe those who do not want union, but those who do not want union cannot bribe those who want union to change their minds.

Economies of scale are an important explanation for size. The costs of administration and policy coordination are unlikely to be proportional to the size of the nation. Different political systems have different economies of scale. Participatory democracy puts severe constraints on the size of the polity. The central command and control apparatus of the communist system enabled the Soviet economy to deal effectively with large-scale physical capital accumulation and the demands of warfare, but less so in an economy based on human capital. Administrative technology also plays a role. Preliterate societies tend to be less extensive than those that can keep records.

At some point, diseconomies of nation scale arise. The main reason for this appears to be the political costs of integrating people with diverse preferences and skills. Nevertheless, some countries’ legal and political systems are better suited for dealing with diverse preferences and hence are more likely to experience significant levels of immigration.

The merger of states reduces interstate transaction costs but increases intrastate transaction costs. The impetus to economize on transaction costs affects the number and size of nations. The appropriate forum, within a merged nation or across two sov-

1. The analysis does not require nations to be at the efficiency frontier—only that very large gains to consolidation (being separate) are over time likely to lead to unification (devolution).
2. For related discussions of transaction cost trade-offs, see Ellingsen (1998) and Yarbrough and Yarbrough (1994).
ereign nations, for resolving conflict depends on the political institutions available in each sphere and the nature of the potential conflict.

Different national and transnational political institutions have different transaction costs, and thus the comparative advantage of size depends on which political institutions are in place.\(^3\) The existence of the World Court, the willingness of nations to forgo war as a means of settling disputes, and other methods of reducing interstate transac-
tion costs reduce the optimal nation size. Similarly, an international regime of free trade among nations allows for smaller scale political units because economic production is not limited by the demand and supply of domestic markets.

The circumstances surrounding merger and devolution of countries need not be peaceful or voluntary. The history of nations has in large measure been a history of exploi-
tation by one country of another interrupted by attempts to resist such exploitation.\(^4\)

When the technology of coercion has greater economies of scale, we are likely to see mergers of states to exploit others more or to be less exploited. When there are lower military economies of scale or there are great military economies of scale but military might becomes less important for gaining wealth, then there will be more nations, and their average size will be smaller. Because the scale effects of military power have been so well studied, we will, for the most part, put aside a detailed discus-
sion of economies of scale in coercive power.

Exploitation need not result in a loss of sovereignty because there are other means of transferring wealth from one country to another such as tribute, reparations, theft, and bribes. That is, given exploitation, the most efficient (i.e., wealth maximizing) methods will generally be invoked. When a robber says your wallet or your life, you hand over the wallet because both of you are likely to be better off by that exchange. By analogy, both countries may be better off if the exploited country provides tribute rather than the exploiting country taking over the reigns of government and extracting wealth directly.

Because, in general, there are no third-party enforcers of international agreements, merger and dissolution agreements may not be credible. In turn, this means that wealth-maximizing changes in the size of countries may not occur. For example, sup-
pose that a merger between Iraq and Kuwait were wealth maximizing, then Saddam Hussein might promise to make the rulers of Kuwait better off if they merged with Iraq. But such promises are not credible; once Saddam Hussein was in control of Kuwait, he could renege on his promises with impunity. On the other side, suppose that maintain-
ing Kuwait's independence is wealth maximizing. A promise by the leaders of Kuwait to indefinitely bribe Iraq so that it will not invade is not credible either because Kuwait might eventually achieve the means to resist such exploitation.

Thus, a complete analysis would require first a determination of the wealth-
maximizing solution and then an investigation whether there were credible methods of enforcing such a solution. Because the wealth maximization solution is logically prior, the issue of credible commitments is left to the companion paper (Wittman 1999).

\(^3\) To make the analysis more manageable, I will not consider the endogeneity of political structure.

\(^4\) Although each country tends to maximize its own wealth, wealth is not maximized for the system as a whole. Scarce resources are used in coercing and resisting coercion.
A FORMAL MODEL: ASSUMPTIONS

The formal model mels together three separate theoretical considerations—spatial voting models, economic production functions, and anachic systems—into a multination analysis. In so doing, the model builds on important papers by Alesina and Spolaore (1996, 1997) on the number of countries and by Skaperdas (1992), Grossman and Kim (1995), and Hirshleifer (1995) on anachic and predatory systems.\(^5\)

We first consider political costs, then economic production, and finally the role of cross-country coercion on the collective welfare of a country’s citizens.

POLITICAL COSTS

We assume that individuals have single-peaked political preferences along a \([0, 1]\) continuum, with quadratic loss functions. The distribution of most preferred positions, \(x_i\), is characterized by \(F(x)\). \(F(1) = X\) is the total population in the world. The population of country \(i\) is represented by

\[
\int_{x_{i-1}}^{x_i} f(x)dx = F(x_i) - F(x_{i-1}).
\]

That is, country \(i\) is composed of individuals with preferences between \(x_{i-1}\) and \(x_i\). Because equilibrium conditions impose contiguous preferences, this assumption could be seen as an implication of the model.

\(\mu_n\), a point along the continuum, represents the political position implemented by country \(i\). A person in country \(i\) whose most preferred position is at \(x\) faces a quadratic political loss of \((\mu_i - x)^2\). The total political loss to all the people in the country is represented by the following expression:

\[
-A_i \int_{x_{i-1}}^{x_i} [\mu_i - x]^2 f(x)dx.
\]

\(A_i \geq 1\) represents the political inefficiency of the government—the larger the \(A_i\), the greater the political cost. Some countries’ legal and political systems are better suited for dealing with diverse preferences and resolving conflict at low cost. These countries have smaller \(A_i\). For any given level of \(A_i\), the more diverse the preferences, the greater the political costs.

Thus, equation (1) represents the political loss from creating one set of rules (public good) for people with diverse preferences.

PRODUCTION FUNCTION

Land, denoted by \(y\), exists on a \([0, Y]\) continuum. Country \(i\) encompasses \([y_{i-1}, y_i]\), where \(i = 1, 2, \ldots, n\); \(y_{i-1} \leq y_i; y_0 = 0;\) and \(y_n = Y\).

\(^5\) In turn, these authors built on earlier works. See Blum and Dudley (1991) for a spatial model of the state and Bush (1972) for a model of the predatory state.
Economic output in country $i$ is characterized as a Cobb-Douglas production function, with land $(y_i - y_{i-1})$ and population

$$\left( \int_{x_{i-1}}^{x_i} f(x) \, dx \right)^{\frac{1}{\gamma-1}}$$

as inputs and scale parameter, $S$:

$$B_i [y_i - y_{i-1}]^\gamma \left( \int_{x_{i-1}}^{x_i} f(x) \, dx \right)^{\frac{\gamma}{\gamma-1}}.$$

(2)

$1 > B_i > 0$ represents the economic efficiency of country $i$. A country with poorly defined property rights will have a lower $B_i$ and a lower output than otherwise.

We assume that there are economies of scale in production ($1 < S < C + 1$; $C < 1$). In a regime of perfect free trade and perfect enforcement of property rights across countries, economies of nation scale would be 1. Because there is neither perfect free trade nor perfect cross-country enforcement of property rights, intercountry transaction costs are greater than intracountry transaction costs; therefore, within-country economies of scale are greater than 1. Thus, other things being equal, a larger country will be economically more productive. From the opposite perspective, an international regime of free trade among nations would reduce $S$ toward 1 and allow countries to be smaller (here, we treat $S$ as a parameter).

For country $i$ to be viable, per capita output,

$$B_i [y_i - y_{i-1}]^\gamma \left( \int_{x_{i-1}}^{x_i} f(x) \, dx \right)^{\frac{\gamma}{\gamma-1}} / \left( \int_{x_{i-1}}^{x_i} f(x) \, dx \right),$$

must be sufficiently large to sustain life (i.e., greater than some value, $L$).

**COERCION**

Coercion is an important method for one nation to increase its wealth (at the expense of another nation). Military expenditures enhance a nation’s ability either to exploit the weak or to be less exploited by the strong. But more guns also means less butter—there is a trade-off between the direct cost of military expenditure and its indirect benefit.

We will now try to capture these ideas in terms of a coercion or threat function. The concept of a coercion function is far less developed than the notion of an economic production function. There is no canonical form that is generally acceptable. Because

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6. The model has only one output and, consequently, no international trade in goods (of course, there is “trade” in factors of production when people emigrate and boundaries are redrawn). However, one can conceive of there being international trade, with output being the posttrade result. We would still see movement of the factors of production from one country to another just as we see the movement of factors of production from one firm to another within a country.
coercion plays a relatively minor role in our analysis, we will provide a simple model that captures the main issues without unduly complicating the analysis.

Let $m_i$ be country $i$’s military expenditures.

$e_i (0 < e_i \leq 1)$ is a military efficiency parameter (playing the same role as $A_i$ and $B_i$ did earlier); the larger $e_i$ is, the greater bang (both literally and figuratively) the country gets for a dollar of military expenditure. $g (0 < g \leq 1)$ is a general technology parameter, which we will discuss at greater length later.

We assume that each country interacts militarily only with its neighbors, $i - 1$ and $i + 1$. It is useful to think of the countries being arcs on the circle (with the 0 point being defined as the right boundary of country 1). Then country $n$ is geographically but not politically next to country 1. That is, country 1’s neighbor on the left, $1 - 1 = 0$, is country $n$. Thus, $m_0$ and $m_n$ are alternative ways of representing military expenditures by country $n$; $m_{n+1}$ and $m_1$ are alternative ways of representing military expenditures by country 1.

The amount of income transferred from $i - 1$ to $i$ and from $i + 1$ to $i$ is the extortion transfer function, or $gT(e_i m_i, e_{i-1} m_{i-1}) + gT(e_i m_i, e_{i+1} m_{i+1})$.

We assume that $T_1 > 0$, $T_2 < 0$, $T_{11} < 0$, $T_{22} > 0$, $T_{12} > 0$, and $T_{11} T_{22} > T_{12} T_{21}$. That is, the greater $i$’s military effectiveness, $e_i m_i$, the more that country $i$ extorts from its neighboring countries $i - 1$ and $i + 1$ (or the less that its neighbors extort from $i$). This effect is subject to decreasing returns from expenditures. $T_{12} > 0$ implies that the marginal benefit of $i$ increasing its military expenditures is greater when $i + 1$’s military expenditure is larger than when $i + 1$’s military expenditure is smaller. In turn, these assumptions imply that $T_i(v, z) \leq T_i(z, v)$ for $v > z$ because $T_{11} < 0$ implies $T_i(v, z) < T_i(z, z)$, and $T_{12} > 0$ implies $T_i(z, z) < T_i(z, v)$. A certain amount of symmetry is also assumed. In particular, $T(z, z) = 0$; that is, there are no transfers when both countries are balanced in military power.

Essentially, military power is used to coerce wealth transfers from neighboring countries. The expected return from warfare is the credible demand by the extorting country—wars need not be fought.

The benefits and costs of extortion to country $i$ are then captured by the following equation:

$$gT(e_i m_i, e_{i-1} m_{i-1}) + gT(e_i m_i, e_{i+1} m_{i+1}) - m_i.$$  

(3)

**WELFARE MAXIMIZATION**

Combining equations (1), (2), and (3), the total wealth of country $i$ is the sum of economic production minus political costs plus coerced transfers from other countries (which may be negative) minus military expenditures. This is represented by the following equation:

7. Skaperdas (1992) assumes an S-shaped curve, whereas we have a concave function. Further elaboration of the extortion model is possible. For example, land size and population might be inputs into the extortion function.

8. This last assumption is not necessary for analyzing the effect of coercion. I make this assumption so that I can focus this article on the other two equations.
\[ w^i = B_i [y_i - y_{i-1}]^r \left( \int_{x_{i-1}}^{x_i} f(x) \, dx \right)^{1-c} - A_i \int_{x_{i-1}}^{x_i} \left[ \mu_i - x \right]^2 f(x) \, dx + gT(e, m_i, e_{i+1} | m_{i-1}) \\
+ gT(e, m_i, e_{i+1} | m_{i+1}) - m_i. \]  

(4)

Our analysis is in terms of a social planner who wants to maximize total welfare, \( \bar{W} \), over all countries, where

\[ \bar{W} = \sum_{i=1}^{N} w^i + VX. \]  

(5)

The \( V \) term stands for the utility to each of the \( X \) individuals in the world from being alive. We assume that \( V \) is always greater than any political loss, \( (x - \mu)^2 \), that any individual with preference \( x \) might face (there are few martyrs in the world).

We assume that the social planner has control over the assignment of land and population and \( \mu \), but has no control over military expenditures, which will always be in total greater than 0. The reason for this assumption is twofold. First, there is no such thing as a neutral third-party enforcer. Any third-party enforcer could use its might to extort other countries. Thus, countries must rely on their own military power; it is their ultimate credible threat. Second, there are great returns to military expenditures when the other side has very low military expenditures. For example, if country \( A \) has zero nuclear weapons and country \( B \) has 5 nuclear weapons, the balance of power is greatly weighted toward country \( B \). If country \( A \) has 100 nuclear weapons and country \( B \) has 105, then there is only a slight imbalance in favor of \( B \). This relationship can also be derived from our assumptions as \( T_i(v, v) < T_i(v, z) < T_i(z, z) \) for \( v > z \). Because detection is never perfect, the dangers from the other side cheating on an arms control agreement are less if both have a reasonable level of defensive capability. Therefore, disarmament agreements will not result in zero military expenditures.

We will initially confine our analysis to interior solutions. Later we will consider how corner solutions alter the results.

**PROPOSITIONS**

**THE RELATIVE SIZE OF TWO COUNTRIES**

In this section, I show how an exogenous change in one country’s economic and political efficiency parameters affects its size and the size of its neighbors (the number of countries remains constant). The social welfare maximizer chooses that population and land configuration and level of \( \mu \) that maximizes

\[ \bar{W} = \sum_{i=1}^{N} w^i + VX = -\sum_{i=1}^{N} A_i \int_{x_{i-1}}^{x_i} \left[ \mu_i - x \right]^2 f(x) \, dx + \sum_{i=1}^{N} B_i [y_i - y_{i-1}]^r \left( \int_{x_{i-1}}^{x_i} f(x) \, dx \right)^{1-c} \\
+ \sum_{i=1}^{N} gT(e, m_i, e_{i+1} | m_{i-1}) + \sum_{i=1}^{N} gT(e, m_i, e_{i+1} | m_{i+1}) - \sum_{i=1}^{N} m_i. \]  

(6)
We note that the coercive transfer terms (those with $T$) will sum to 0; transfers do not involve a net social cost. We will concentrate on the border between $i$ and $i+1$. A complete analysis would consider all of the partial derivatives.

The first-order conditions for an interior maximum are

$$\frac{\partial \overline{W}}{\partial \mu_i} = \overline{W}_{\mu_i} = -A_i \int_{x_{i-1}}^{x_i} 2(\mu_i - x)f(x)dx = -2A_i \int_{x_{i-1}}^{x_i} f(x)dx - \int_{x_{i-1}}^{x_i} xf(x)dx = 0$$

$$\frac{\partial \overline{W}}{\partial x_i} = \overline{W}_{x_i} = A_i [\mu_i - x_i]^2 \int_{x_{i-1}}^{x_i} f(x)dx + A_{i+1} [\mu_{i+1} - x_i]^2 \int_{x_{i-1}}^{x_i} f(x)dx$$

$$+ B_i [S - C] (y_i - y_{i-1}) \int_{x_{i-1}}^{x_i} [F(x_{i-1}) - F(x_i)]^{S-C-1} f(x_{i-1})dx$$

$$- B_{i+1} [S - C] (y_{i+1} - y_i) \int_{x_{i-1}}^{x_i} [F(x_{i+1}) - F(x_i)]^{S-C-1} f(x_i)dx = 0$$

$$\frac{\partial \overline{W}}{\partial y_i} = \overline{W}_{y_i} = B_i C (y_i - y_{i-1}) \int_{x_{i-1}}^{x_i} [F(x_i) - F(x_{i-1})]^{S-C} - B_{i+1} C (y_{i+1} - y_i) \int_{x_{i-1}}^{x_i} [F(x_{i+1}) - F(x_i)]^{S-C} = 0.$$
necessary to reach such a wealth-maximizing solution. Or there may be a corner solution in which a subset of the polity has insufficient tradable assets to encourage a policy move in their direction toward the mean (see the section on corner solutions). Either way, there is a loss of welfare. For reasons of analytic tractability, we have chosen to characterize this loss of welfare in terms of a greater $A_i$, rather than as a movement from the mean.

So far, we have viewed the migration of people and the redrawing of borders as being under the control of a social planner. But in the real world, there is no social planner; instead, countries are to a great extent in a state of anarchy. Nevertheless, the comparative statics should be in the same direction. That is, other things being equal, if there is an increase in the marginal productivity of labor in country $i$, net immigration to country $i$ tends to increase; equivalently, net emigration from country $i$ tends to decrease. This is what might be called the comparative statics version of the Coase conjecture—even when there are positive transaction costs, factors are more likely to go where they are most highly valued the greater the differential in value. For example, Eastern bloc countries captured the surplus from emigration by charging either the emigrant (as the Soviet Union did) or the immigrating country (as East Germany charged West Germany). If there were free migration, the individual or the country of immigration would have captured most of the surplus, and there would have been more migration. However, the direction of migration is the same, whoever receives the surplus.

To evaluate changes in political satisfaction and efficiency, we need to know the second-order conditions.\(^9\)

First, looking at terms involving $\mu_i$: $\bar{W}_{\mu_i} < 0; \bar{W}_{\mu_i,x_i} = 0; \bar{W}_{\mu_i,y_i} = 0$. In addition, $\bar{W}_{\mu_i,\theta_i}$ and $\bar{W}_{\mu_i,\theta_i}$ also equal zero. Hence, we will be able to ignore second partials involving $\mu_i$ and instead concentrate on the remaining second-order conditions. That is, we will be able to analyze relations as if there were only two variables—$x_i$ and $y_i$.

$$
\bar{W}_{x_i,x_i} < 0; \bar{W}_{y_i,y_i} < 0; \bar{W}_{x_i,y_i} > 0; H = \bar{W}_{x_i,x_i} \bar{W}_{y_i,y_i} - \bar{W}_{x_i,y_i}^2 > 0.
$$

Thus, the hessian of second-order conditions is negative definite.

**Proposition 1.** Given wealth maximization, if country $i$ experiences an exogenous decrease in political or economic efficiency (i.e., $A_i$ increases or $B_i$ decreases), then $i$ will experience a decrease in both land size and population size.

**Proof.** First, we consider the effect of an increase in $A_i$. Making use of the implicit function theorem, we take the total derivative of the first-order conditions:

$$
d\bar{W}_{x_i} = \bar{W}_{x_i,x_i} \Delta x_i + \bar{W}_{x_i,y_i} \Delta y_i + \bar{W}_{x_i,\theta_i} \Delta \theta_i = 0,
$$

$$
d\bar{W}_{y_i} = \bar{W}_{y_i,x_i} \Delta x_i + \bar{W}_{y_i,y_i} \Delta y_i + \bar{W}_{y_i,\theta_i} \Delta \theta_i = 0.
$$

Solving the above equations, we get

9. The derivation of the second-order conditions, detailed proofs of the propositions, and a discussion of historical examples are found in Wittman (2000).
\[
\frac{\Delta x_i}{\Delta A_i} = \frac{[\mu_i - x_i]^2 f(x_i) \bar{W}_{y,y_i}}{H} < 0,
\]
\[
\frac{\Delta y_i}{\Delta A_i} = \frac{[\mu_i - x_i]^2 f(x_i) \bar{W}_{x,y_i}}{H} < 0.
\]

It makes more sense to consider an increase in \( B_i \) (i.e., an increase in economic efficiency). Again, going through a similar process as above, we get

\[
\frac{\Delta x_i}{\Delta B_i} = \frac{[S - C][y_i - y_{i-1}]^C [ F(x_i) - F(x_{i-1}) ]^{S-C-1} f(x_i) \bar{W}_{y,y_i} + C[y_i - y_{i-1}]^{C-1} [ F(x_i) - F(x_{i-1}) ]^{S-C} \bar{W}_{x,y_i}}{H},
\]
\[
\frac{\Delta y_i}{\Delta B_i} = \frac{[S - C][y_i - y_{i-1}]^C [ F(x_i) - F(x_{i-1}) ]^{S-C-1} f(x_i) \bar{W}_{x,y_i} - C[y_i - y_{i-1}]^{C-1} [ F(x_i) - F(x_{i-1}) ]^{S-C} \bar{W}_{y,y_i}}{H}.
\]

These latter two equations are both greater than zero because \( H > 0 \), \( \bar{W}_{x,y_i}^i < 0 \), \( \bar{W}_{y,y_i}^i < 0 \) and \( \bar{W}_{y,y_i}^i > 0 \).

These results are not surprising. A decrease in political satisfaction will result in emigration to another country. In turn, this reduces the marginal productivity of the other input—in this case, land (the same would hold for capital if we considered it explicitly). Similarly, a decrease in economic efficiency reduces the marginal product of both land and labor, which in turn results in a decrease in the geographic and population size of the country.

**ENDOGENOUS NUMBER OF COUNTRIES**

Suppose that all countries are identical and that \( f \) has a uniform distribution. We first find the equilibrium number of countries and then find the effect of a global exogenous change in economic and political efficiency on the number and size of countries.

Given the assumption of a uniform distribution and identical nations, the social planner maximizes the following expression:

\[
\bar{W} = \sum_{i=1}^{N} W^i + VX = -N A \int_{0}^{1/N} \left[ \frac{1}{2N} - x \right]^2 Xdx + NB \left[ \frac{Y}{N} \right]^c \left[ \frac{X}{N} \right]^{S-C} - Nm^* + VX,
\]

where \( m^* \) is the equilibrium level of military expenditures in a state of anarchy. Because people are uniformly distributed on \([0, 1]\) and there are \( X \) people in the world, \( f(x) = X \). Each country is identical. Thus, the amount of land and population in each of the \( N \) countries is \( Y/N \) and \( X/N \), respectively. Looking at the first country, the population is uniformly distributed between 0 and 1/N; so, the mean is 1/2N. Again, net transfers over all countries are 0. Because
the summation can be simplified to the following expression:

$$\overline{W} = -\frac{AX}{12N^2} + B \left[ \frac{1}{N} \right]^{S-1} Y^C X^{s-c} - Nm * + VX = -\frac{AX}{12N^2} + BN^{1-S} Y^C X^{s-c} - Nm * + VX.$$ 

Maximizing the above expression with respect to $N$, the first-order conditions for an interior maximum are\(^{10}\)

$$\frac{\partial \overline{W}}{\partial N} = \frac{AX}{6} N^{-3} + B[1-S]N^{-S}Y^C X^{s-c} - m * = 0.$$ 

Second-order conditions are

$$\frac{\partial^2 \overline{W}}{\partial N^2} = \frac{S}{N} N^{-3} + B[1-S]N^{-S}Y^C X^{s-c} = \frac{S}{N} N^{-3} + \frac{AX}{6N^3} \frac{Sm *}{N} < 0.$$ 

The last equality makes use of the first-order conditions. The inequality holds because $S < 3$.

**Proposition 2.** A decrease in political efficiency (increase in $A$) or a decrease in economic efficiency (decrease in $B$) will lead to more countries (larger $N$) of smaller size.

**Proof.** Taking the total derivative of the first-order conditions with respect to a change in $A$, we get

$$d\overline{W}_N = \overline{W}_{NN} \Delta N + \overline{W}_{NA} \Delta A = \overline{W}_{NN} \Delta N + \frac{x}{6N^3} \Delta A = 0.$$ 

Equivalently,

$$\frac{\Delta N}{\Delta A} = -\frac{\overline{W}_{NA}}{\overline{W}_{NN}} = -\frac{x}{6N^3} > 0.$$ 

That is, the greater the political inefficiency, the greater the number of countries.

We next consider the effect on $N$ of a decrease in $B$ (i.e., a decrease in economic efficiency). Again taking total derivatives, we get

$$\frac{\Delta N}{\Delta B} = \frac{\overline{W}_{NB}}{\overline{W}_{NN}} = \frac{[1-S]N^{-S}Y^C X^{s-c}}{\overline{W}_{NN}} > 0.$$ 

The last inequality holds because $S > 1$.

Thus, a global decrease in economic efficiency leads to a greater number of countries. \[q.e.d.\]

\(^{10}\) We ignore the problem that $N$ may not be an integer.
Looking at proposition 2 from the opposite point of view, the greater the overall political or economic efficiency, the fewer the number of countries. These results reinforce the conclusions of the previous section.

We next consider the role of military expenditures on the optimal size of countries.

**Proposition 3.** If \( m^* \) increases, the number of countries decreases and the average size increases.

**Proof.** Again making use of the first-order conditions,

\[
\frac{\Delta N}{\Delta m^*} = -\frac{\bar{W}_{NN^*}}{\bar{W}_{NN}} = -\frac{1}{\bar{W}_{NN}} < 0.
\]

[q.e.d.]

Countries can save on military costs by merging because they no longer have to defend against each other. Of course, they face increased internal political costs from unification.

This proposition suggests that the potential for extortion will result in the average size of countries being above the wealth-maximizing size, even if the relative size of one country vis-à-vis another is not affected by the potential for extortion, even if the transfer between any two countries is 0. Thus, as military might becomes relatively less important, the size of nations will decrease (this will be considered in greater detail in the following section).

**MILITARY EXPENDITURES**

We now consider the equilibrium military expenditures. For heuristic reasons, we will only consider three countries. If country \( i \) maximizes \( W^i \) with respect to its military expenditures, \( m_i \), then the first-order interior conditions for each country are

\[
W_{m_i}^1 = e_1 g T_1(e_1 m_1, e_3 m_3) + e_1 g T_1(e_1 m_1, e_2 m_2) - 1 = 0, \quad (8)
\]

\[
W_{m_2}^2 = e_2 g T_1(e_2 m_2, e_3 m_3) + e_2 g T_1(e_2 m_2, e_1 m_1) - 1 = 0, \quad (9)
\]

\[
W_{m_3}^3 = e_3 g T_1(e_3 m_3, e_1 m_1) + e_3 g T_1(e_3 m_3, e_2 m_2) - 1 = 0. \quad (10)
\]

**Proposition 4.** Assume that there are no coalitions. If \( e_i = e \) for \( i = 1, 2, 3 \), then \( m_1 = m_2 = m_3 \) and there are no transfers. That is, the only equilibrium that exists is one in which all military expenditures are equal.

**Proposition 5.** If \( e_1 > e_2 > e_3 \), then \( e_1 m_1 > e_2 m_2 > e_3 m_3 \).

Propositions 4 and 5 are intuitively obvious. Thus, militarily more efficient countries will extort more from other countries. It can also be shown that militarily more efficient countries have greater military expenditures.
We next consider the effect of an increase in $g$ on the equilibrium amount of military expenditures and, in turn, the effect on the number of countries.

**Proposition 6.** If all countries are identical, an increase in $g$ will result in a decrease in $N$.

**Proof.** We first show that an increase in $g$ will result in an increase in $m_i$ for all $i$. From (8), (9), and (10), we make use of the implicit function theorem to derive the following:

\[
dW_{m_1} = W_{m_1}^1 \Delta m_1 + W_{m_1 m_2}^1 \Delta m_2 + W_{m_1 m_3}^1 \Delta m_3 + W_{m_1 g}^1 \Delta g = 0, \tag{11}
\]
\[
dW_{m_2} = W_{m_2 m_1}^2 \Delta m_1 + W_{m_2 m_2}^2 \Delta m_2 + W_{m_2 m_3}^2 \Delta m_3 + W_{m_2 g}^2 \Delta g = 0, \tag{12}
\]
\[
dW_{m_3} = W_{m_3 m_1}^3 \Delta m_1 + W_{m_3 m_2}^3 \Delta m_2 + W_{m_3 m_3}^3 \Delta m_3 + W_{m_3 g}^3 \Delta g = 0. \tag{13}
\]

Because $e_i = e$ and $m_i = m^*$ for all $i$, $W_{m_1 g}^1 = e_1 T_1(e_1 m_1, e_2 m_2) + e_2 T_i(e_1 m_1, e_2 m_2) = 1$, $g = W_{m_2 g}^2 = W_{m_3 g}^3$, and $e_1 T_i(e_1 e_2 m_i) = e T_i(e_1 m^* e_2 m^*)$ for all $i$ and $j$.

Thus, (11) through (13) can be rewritten as

\[
e^6 g^3 \begin{bmatrix} 2T_{11} & T_{12} & T_{12} \\ T_{12} & 2T_{11} & T_{12} \\ T_{12} & T_{12} & 2T_{11} \end{bmatrix} \begin{bmatrix} \Delta m_1 \\ \Delta m_2 \\ \Delta m_3 \end{bmatrix} = \begin{bmatrix} -g^{-1} \\ -g^{-1} \\ -g^{-1} \end{bmatrix}.
\]

Denoting the terms in the bracket on the left side of the equality by $H$, $H$ is negative definite by assumption. Solving for the effect of a change in $gm_i$, we get

\[
\frac{\Delta m_i}{\Delta g} = \frac{e^6 g^2 \left[ 4(T_{11})^2 - (T_{12})^2 - 2T_{12} T_{11} + (T_{12})^2 + (T_{12})^2 - 2T_{11} T_{12} \right]}{H} = \frac{-e^6 g^2 \left[ 4(T_{11})^2 - 4T_{12} T_{11} + (T_{12})^2 \right]}{H}.
\]

The expression is greater than 0 because $H$ is negative, and the bracketed term is positive $T_{12} > 0$ and $T_{11} < 0$ by assumption. Thus, an increase in $g$ results in an increase in $m_i$. Combining these results with proposition 3, we get the result that an increase in $g$ results in a decrease in $N$.  

$g$ is a general military effectiveness variable that depends on both military technology and the spoils of war. Warfare may result in destruction of the object desired by the invading country. Under such circumstances, the threat of war is less credible, and therefore the ability to extort wealth is also reduced. In general, mineral deposits and agricultural land are more likely to survive a war than physical capital, and it is still harder to expropriate human capital than physical capital. So, countries whose wealth is in the ground tend to be more vulnerable to extortion. The more important this wealth is, the larger $g$ is and the larger the average size of countries.
CORNER SOLUTIONS

Our analysis has focused on interior solutions, but corner solutions are always possible. In such cases, the anarchic solution is likely to greatly diverge from the social welfare solution. Consider the case in which the political cost of integration of a people into any existing country is greater than their marginal productivity minus their minimal daily requirement for existence (which is \( L \) per person). This set of people have nothing of value (except their humanity) to offer to others. A social welfare maximizer would either create a new country with sufficient land to produce at least \( L \) per person or add these people to an existing country. Because some country is always viable and there are economies of scale, the latter is always an option. Because we have assumed that the value of life, \( V \), is greater than any political costs, a social welfare maximizer would always prefer that these people exist. But in the absence of a social planner, individual countries are unlikely to value these people, qua people, and would prefer to exterminate them rather than have them part of the polity.

This situation is most likely to occur when one country is technologically very far behind other countries. The backward country is then likely to be subject to extortion. Without the productive wherewithal, indigenous people of the backward country will not be able to pay tribute as a substitute for giving up the land. And when the marginal product net of minimum daily requirements is less than the cost of political integration, the extorting country may prefer extermination of the native population. \( V \) is not a tradable good.

Alternatively, the imperial leaders may allow the indigenous people to live but not respond to their political wishes. That is, \( \mu \) would be at the mean preference of the colonial power rather than at the mean preference over the entire population. If the indigenous people had sufficient tradable assets, they would be able to move the policy toward their own interests and the mean overall, but they do not have such tradable assets either because they are not sufficiently productive or because their assets were taken away.

This seems to characterize European policy toward their colonial subjects in the 19th century and China’s policy toward Tibet today. The imperial country’s need for labor determines its strategy toward the colonial subjects. If its need for labor is small, it will either engage in a policy of genocide or encourage migration. If it needs labor, it will keep payments to the indigenous people to a minimum and extract all tradable surplus. As a consequence, there will be little integration.

COMPARISON TO OTHER MODELS

Now that we have specified the model, it is useful to compare this work to others. In his seminal article, Friedman (1977) viewed the state as being embodied in a ruler who maximizes tax revenues (net of administrative costs).\(^{11}\) He showed how different sizes and shapes of countries allow for differing levels of tax collection. For example, as

\(^{11}\) Tilly (1990) has a more nuanced theory of the state in which the sovereign maximizes the collection of receipts via war and capital.
labor becomes more productive, the state will want to increase its tax on labor, but this
is limited by the possibility of migration. Therefore, the state will want to enlarge its
size and erect linguistic and/or physical barriers (such as the Iron Curtain) to increase
the cost of migration and reduce the competition from other countries. Because trade
increases the productivity of labor, Friedman also argued (contrary to my results) that
increased trade leads to larger nations in order for their rulers to capture greater
monopoly rents.

There are significant differences between Friedman’s (1977) approach and mine. In
Friedman’s analysis, net tax receipts are maximized, but in my model wealth is maxi-
mized. Thus, in his model, the outcome depends on net tax revenues to the rulers and
not on the costs that might fall on the subjects. Consequently, there is no resistance by
the subjects to costly attempts at monopolization by the ruler. However, if Friedman
were correct about the exploitation, then people in both countries should resist the
merger of two otherwise similar countries because merger would just result in their
greater exploitation.

Alesina and Spolaore (1996, 1997) have a political cost function but neither a pro-
duction function nor an extortion function. Their political cost function differs from
mine in a number of ways. They assume that voters have linear and not quadratic loss
functions, that preferences are uniformly distributed, and that μ is the most preferred
position of the median voter, not the most preferred position of the mean voter. In their
model, all countries are identical and have the same size. In their model, behavior is
based on averages—citizens are treated equally. In my model, welfare maximization
tends to take place so that payments are more likely to depend on marginal contribu-
tions. More important, in their model, individuals are tied to the land—there is no
migration. In my model, independent migration is possible.

Schmidtchen (1994) considers the optimal size of nations in the context of
Buchanan’s constitutional theory and the theory of clubs. He does not have a spatial
model of political cost or an explicit production function. 12

We have considered scale economies throughout the article. Scale economies are
also an important part of the new economic geography (see, e.g., Fujita, Krugman, and
Venables 1999). However, these models do not explain nation size. For example, eco-
nomic geography might be able to explain why Seattle is a locus in the software indus-
try but not why Seattle is part of the United States and not Canada.

CONCLUDING REMARKS

It is hard to condense the history and theory of the size and wealth of nations into a
short paper. Even restricting the analysis to a formal model provides many disparate
components. Therefore, I will merely mention some of the important comparative
static results.

12. For earlier work along these lines, see Buchanan and Faith (1987). Josselin and Marciano (1998)
consider the boundary between one state and the periphery. Cost increases with the size of the country, but
otherwise they have an entirely different approach.
Nations that can better integrate people with diverse preferences and promote property rights will tend to be wealthier with immigration, capital inflows, and a larger geographic area.

The number of small states increases as free trade across countries increases. For similar reasons, when the threat of war decreases, the size of nations also decreases. This has already occurred in the former Soviet Union, and it may be the future for other countries as well.

As land per se becomes less important relative to capital and labor in producing wealth, adjustments will tend to be through changes in capital and migration rather than in land. The value of the military in increasing the nation’s wealth will also be reduced as theft and extortion become more difficult. Because mineral wealth is relatively impermeable to war, it will continue to be the major source of conflict over territory.

The analysis need not be restricted to the nation-state. Many of the insights provided here can be applied to cities, religions, tribes, and clans. For example, Sahlins (1968) reports on a set of African tribes that limit their membership to 50 people. When a tribe gets larger than that, new tribes are created even though there may be tribal warfare. The reported reason for this division is that the political structure is incapable of handling larger entities.

Finally, the theoretical synthesis of the spatial political model with an economic production function can serve as the foundation of future research in numerous other areas, including the theory of the firm, federalism, and the nature of economic development.

REFERENCES


13. The ideas of this article are complementary to Tiebout models that explain city size.


