Does competition for capital discipline governments?

Decentralization, globalization and public policy

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Abstract

Competition among countries—or regions within them—to attract mobile capital is often thought to discipline their governments, motivating them to invest more in infrastructure, reduce waste and corruption, and spend less on non-productive public goods. The result should be convergence on business-friendly policies. We argue that this requires an assumption—units start out very similar—that is often unrealistic. If units are heterogeneous (in natural resources, geographical location, inherited human capital or infrastructure), capital mobility often *weakens* discipline on the poorly-endowed units. This may help explain disappointing results of liberalizing capital flows within Russia and sub-Saharan Africa. (JEL F36, H73, H87)

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Does competition to attract mobile capital discipline governments? Two literatures contend that it does. The first sees such discipline as harmful. Scholars argue that the fear of capital outflows restricts governments from providing welfare services, environmental regulations, and non-productive public goods that citizens value. Capital mobility prompts a "race to the bottom" in social and environmental policy, both among subnational governments within decentralized states and among countries competing in world markets.[1] By contrast, the second literature views such discipline as salutary. The competition for capital motivates governments to reduce their corruption, waste, and inefficiency and to provide more growth-promoting infrastructure.[2]

Although they disagree about whether such discipline is desirable, authors in both schools agree that it exists. For good or ill, competition for capital is thought to shift government priorities away from non-productive public spending toward business-friendly investments. This view—widespread in both academic and policy circles—informs discussions of both political decentralization within countries and

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[1] One of the early statements was in Oates (1972, p.143): "In an attempt to keep taxes low to attract business investment, local officials may hold spending below those levels for which marginal benefits equal marginal costs, particularly for those programs that do not offer direct benefits to local business." Zodrow and Mieszkowski (1986) modeled how this could occur. Keen and Marchand (1996) showed how capital competition might distort governments' spending choices, causing them to invest too much in infrastructure ("business centres and airports") and too little in other public goods ("parks or libraries"). Cumberland (1981) argued that interjurisdictional competition to attract business investment weakens environmental standards. Rom, Peterson and Scheve (1998) discussed the "race-to-the-bottom" in US welfare policies and social services. On globalization, Rodrik (1997) argued that increasing capital mobility has made it harder for national governments to provide social insurance (pp.6, 73). Schulze and Ursprung (1999, p.298) contend that states "competing for foreign investment will … restructure their expenditure towards more privately productive public inputs at the expense of transfers and non-productive government consumption."

[2] Some scholars of federalism argue that interregional competition punishes wasteful or corrupt governments with capital flight (Qian and Roland 1998), inducing them "to provide a hospitable environment for factors," and to guarantee secure property rights and infrastructure (Montinola, Qian, and Weingast 1995, p.58). In China, competition to attract foreign investment is said to have led provinces, cities, and townships to adopt pro-business laws, regulations, and tax systems (Ibid, p.77). Others see beneficial effects of capital competition in the international arena. According to Obstfeld (1998, p.10), a "main potential positive role of international capital markets is to discipline policymakers who might be tempted to exploit a captive domestic capital market. Unsound policies—for example, excessive government borrowing or inadequate bank regulation—would spark speculative capital outflows and higher domestic interest rates." Even one well-known critic of globalization is sympathetic to the argument that "opening the capital account imposes 'discipline.' Countries are 'forced' to have good economic policies, lest capital flow out of the unit" (Stiglitz 2000, p.1080). *The Economist* magazine goes further, contending that: "Integration makes it harder to be a tyrant… people can leave and take their savings with them" (*The Economist* 2001).

the liberalization of capital flows between them. Capital controls are defended by some as vital to preserve national (or regional) policy autonomy, and attacked by others as shelters for inefficient or corrupt governments.[3]

In this paper, we argue that the discipline effect invoked by both schools is not as general as usually thought. The standard model that justifies it relies on a strong assumption that is unlikely to hold for most real world cases. Critically, scholars assume that regions or countries (henceforth, "units") are identical. They then focus only on symmetric equilibria, in which by definition units converge on the same policies or tax rates. We show that given alternative, empirically plausible assumptions, almost exactly *opposite* conclusions follow.

If some units start out better endowed than others with characteristics that make them attractive to investors (e.g., natural resources, geographical advantages, inherited human capital), symmetric equilibria will not exist. If differences in endowments are sufficiently large, the worse-endowed units will actually have less business-friendly policies in equilibrium under capital mobility than if they had effective capital controls. Rather than being disciplined, officials of such units will spend a larger share of the budget on non-productive public goods or on their own consumption than when capital is immobile. By contrast, better-endowed units will invest more in business services and will suck capital out of their poorly-endowed counterparts. The result will be not convergence but polarization of both policies and government quality.

To put it concretely, even if Chad's government were to invest massively in business infrastructure, it would not be able to attract much money out of the capital markets of New York or compete in productivity with the industrial zones of East Asia. Even if the Russian republic of Buryatia were to install high-speed fibre-optic cables, it would not divert much business from Moscow and St Petersburg. Under capital immobility, governments have some incentive to increase the productivity with which local savings are invested—they will be able to tax the profits. Under capital mobility, domestic

[3] We focus in this paper on questions of *capital* mobility and do not consider the effects of increasing trade openness. Even if capital market liberalization does not discipline governments, trade liberalization might.

savings will flee the unit's undeveloped infrastructure and political risk in search of more secure returns. Knowing they cannot compete, governments in poorly-endowed units will give up on pro-business policies and focus instead on either predation or satisfying the demands of local citizens. They will face less, not more, effective discipline.

We demonstrate this point using a simple model of competition for capital among heterogeneous units, assuming a Cobb-Douglas production technology. In Cai and Treisman (2003), we show that the findings hold also in a more general model. The results help make sense of some otherwise surprising empirical cases. Internal capital flows have been liberalized recently in both China and Russia. While competition among the more developed coastal provinces and cities of China is impressive, there is little evidence of any salutary effect of competition on the inland provinces.[4] In Russia since reforms began, capital appears to have flowed out of poorly-endowed regions into a few well-endowed ones, exacerbating interregional inequality. Many developing countries liberalized their capital accounts in the 1980s and 1990s. Some—usually the upper middle-income ones—attracted large inflows of capital, stimulating growth. However, others—in particular, some Sub-Saharan African countries—suffered net capital outflows. During these decades, there was no noticeable, general improvement in the quality of African governance, and the continent continued to fall further behind the rest of the world in infrastructure and output.[5]

Our argument is related to several others. Students of economic growth noticed some time ago that countries' incomes were not converging in the way that simple neoclassical models predicted (Romer 1994, Barro and Sala-i-Martin 1995). Common explanations posit that capital is more productive when combined with high levels of human capital, infrastructure, or property rights protection (Lucas 1990,

[4] For instance, Jian, Sachs and Warner (1996) found the coastal provinces began diverging in output from the less developed inland provinces in the 1990s after international trade and investment flows were liberalized.

[5] Another implication of our analysis is that among the better-endowed countries, those initially most attractive to foreign investors will prioritize infrastructure over non-productive public services the most. Although the parallel to our model is not exact (since we assume that all "well-endowed" units are alike), it is striking that among industrial democracies the most vigorous campaigns to roll back the welfare state came in the two countries already most attractive to investors—the USA (since the 1980s) and the UK (under Thatcher) (see, e.g., Piven 2001).

Mankiw, Romer and Weil 1992). To our knowledge, no one has noted that such differences in endowments also undermine the claim that capital mobility disciplines governments.[6]

In a recent essay, Rogowski (2003) makes an argument similar to ours. He uses a spatial model of policy preferences to explore the extent to which the median voter (worker) will favor policies that accommodate mobile capital. He finds that for some kinds of initial asymmetry, the two countries' policies diverge further under capital mobility than under immobility.[7] Our paper differs in several ways. First, when setting policy, Rogowski's median voter does not explicitly consider the effect his policy choice will have on subsequent capital flows.[8] Such effects are central to our analysis. Second, Rogowski models a tradeoff between voters' exogenous—perhaps ideological—preferences on policy and the impact of policy on their wages, leaving the public sector budget in the background. We model the tradeoff between a policy's fiscal costs and benefits. Thus, Rogowski's analysis lends itself most naturally to topics such as environmental or labor regulations, where policies do not have direct tax costs and where voters' ideological preferences may conflict with their self-interest. It applies less well to questions of public investment, law enforcement, and governance, on which we focus.

Several previous papers analyzed asymmetric tax competition. Bucovetsky (1991) presented a model in which smaller countries have lower equilibrium tax rates because the benefit from capital has a larger per capita impact than in larger countries. Wilson (1991) also examined asymmetric tax competition, in a quite general setting. Kanbur and Keen (1993), in a model with commodity taxes and transportation costs, found that governments of geographically small countries should set the tax rate

[6] The ineffectiveness of such uneven competition to motivate players echoes a result of the literature on tournaments (e.g. Nalebuff and Stiglitz 1983). We thank a referee for pointing out this parallel.

[7] However, for another kind of asymmetry—in the initial capital/labor ratio—he finds policy convergence.

[8] Under capital mobility, in an interior equilibrium the net rate of return to capital must be equalized across the regions. In Rogowski's model, this implies that region 1's equilibrium share of capital is $g^* = x_1^{1/a} / (x_1^{1/a} + x_2^{1/a})$, where x_i is a measure of policy in region i, and a is a constant (Rogowski's equation 2.5). When the median voter maximizes his payoff, however, he does not consider the effect of x_i on g^*.

lower, because the shorter distance for arbitrageurs to travel reduces the rents the government can extract. We do not examine effects of country size. Wilson (1999) and Wilson and Wildasin (forthcoming) review the formal literature on tax competition.

Finally, Besley and Smart (2001) also study the effect of competition for mobile capital on government policies. They introduce asymmetric information about the type of incumbent officials, where "type" denotes the official's relative preference for public goods and rents. In their model, the intensity of capital competition affects how officials allocate funds between public goods and rents. They derive the interesting result that competition for capital is most likely to increase voter welfare not when officials are most predatory but when they are most benevolent. There are two main differences with our approach. First, officials can spend on three things—public goods, their own rents, and productivity-enhancing infrastructure. We combine public goods with rents in a single variable, c_i, and study how capital competition affects the tradeoff between c_i and infrastructure. Besley and Smart disregard infrastructure and examine how capital competition affects the tradeoff between public goods and rents. Thus, the two papers study different parts of a larger problem, and should be viewed as complementary. Second, we focus on how competition for capital interacts with initial asymmetries in endowments, and leave details of the electoral game in the background. Besley and Smart study how capital competition interacts with the electoral game, and so abstract from questions of endowment asymmetry.

I. A simple model

We begin by developing the intuition in the simplest possible setting, and then discuss what happens as complications are introduced. An economy is divided into $N + M$ regions or countries ("units"), indexed by i, each of which has a government, G_i. Investors own a total amount of capital, K, which they invest in the different units. Let k_i be the amount invested in unit i. The units differ in two respects, one exogenous and one endogenous. First, they differ in their exogenous "endowments", by which we mean any inherited features that affect the marginal productivity of capital locally invested. Endowments may

include stocks of natural resources, human capital, or infrastructure. Of the $N+M$ units, N are "well-endowed", and M are "poorly-endowed" Other things equal, capital is more productive in the "well-endowed" than in the "poorly-endowed" units. For simplicity, we assume that units of the same type have identical endowments.

Second, the units differ in the policies that their governments enact during the game. In the simplest version, G_i just chooses a level of investment in infrastructure, I_i. Infrastructure investment should be interpreted broadly as any costly action governments take to increase the productivity of capital in their units. Thus, "infrastructure" includes physical infrastructure (transportation, telecommunications, etc.), education, public health, and a system of well-enforced property rights and legal protections.[9] The productivity of capital in a unit depends on both its exogenous endowments and its government's infrastructure investment.

To fix ideas, suppose that the aggregate production function of unit *i*, $F_i = f(I_i, k_i; A_i)$, takes the standard Cobb-Douglas form:

$$F_i = A_i k_i^a I_i^b \tag{1}$$

where $a > 0$, $b > 0$, $a + b < 1$, and $A_i > 0$. The assumption that $a + b < 1$ captures the notion that there is another fixed factor such as land or labor. The term A_i measures the effect of endowments on output. We assume that $A_i = A_n$ for the well-endowed units, $A_i = A_m$ for the poorly-endowed units, and $A_n > A_m$. The greater is A_n / A_m, the greater is the asymmetry in endowments between the two types. The formulation in (1) assumes endowments, infrastructure, and capital are complementary.

[9] Obviously government policies at time 1 affect endowments at time 2. However, to study the effects of of endowments on policies, we need to assume endowments are fixed at the start of play. Infrastructure investment in one unit may also create externalities for other units—for instance better local roads in unit A reduce costs for firms in other units that trade with A. For simplicity, we ignore such externalities.

To complete the model, we must assume something about the objectives of government. Suppose that governments are *partially self-interested*, caring about private consumption, government spending, or some combination of the two.[10] In the simplest case, let government G_i have the payoff function:

$$U_i = (1 - t_i)F_i + \lambda c_i \tag{2}$$

where t_i is the tax rate on output, c_i is government spending, and $\lambda \geq 0$ measures the government's preference for public spending relative to private consumption (assumed to be the same across units). Government consumption, c_i, can be interpreted in either of two ways: as incumbent officials' consumption of budget funds or as spending on public goods and services demanded by citizens. Equation (2) thus encompasses the extreme cases of pure benevolence (in which case c_i stands for public good provision, and (2) is equivalent to the payoff function for a representative citizen) and of purely predatory government (in which case c_i represents government consumption and λ approaches infinity.) Each government is endowed with initial fiscal revenue $S \geq 0$. To present the main ideas in the most direct way, we first assume tax rates in all units are exogenously fixed at the same level: $t_i = t \geq 0$, for all i, and later discuss how things change when this assumption is relaxed. The budget constraint of government G_i is $I_i + c_i = S + tF_i$.[11]

We study a game in which all governments simultaneously decide how much to invest in infrastructure. Then investors invest their capital. We compare two polar cases: (1) capital is completely immobile and the allocation is fixed at some historically determined level; and (2) capital is perfectly mobile and can cross borders costlessly. Of course, reality lies somewhere in between, but the comparison suggests what is likely to happen as capital becomes more mobile.

[10] For a similar approach, see Edwards and Keen (1996).

[11] Cai and Treisman (2003) work out the argument for a quasilinear payoff function, in which the government's payoff increases concavely in c_i. For a discussion of the utility function, and changes to it, see Section 3.

A. Capital immobility

In this case, the initial levels of capital are trapped in their respective units. Let $\bar{k}_n > 0$ ($\bar{k}_m > 0$) be the fixed capital allocation of each well-endowed (poorly-endowed) unit, where $N\bar{k}_n + M\bar{k}_m = K$. Each government G_i chooses (c_i, I_i) to maximize $U_i = (1-t)F_i + \lambda c_i$ subject to its budget constraint $c_i = S + tF_i - I_i$. Substituting the budget constraint into the objective function, we get

$$\frac{\partial F_i}{\partial I_i} = t \tag{3}$$

where $t \equiv \lambda/[1+(\lambda-1)t]$ can be interpreted as the opportunity cost of infrastructure investment for the governments. Equation (3) simply says that the marginal product of infrastructure should equal its marginal cost. Note that t is increasing in λ: the greater the government's taste for public consumption, the larger the opportunity cost of infrastructure investment.

Substituting in (1), it is easy to solve Equation (3) for the governments' preferred infrastructure investments:

$$\bar{I}_i(\bar{k}_i; A_i) = \left(\frac{1}{t}\,\beta\, A_i \bar{k}_i^{\alpha}\right)^{\frac{1}{1-\beta}} \tag{4}$$

Clearly $\bar{I}_i(\bar{k}_i; A_i)$ is increasing in $\bar{k}_i$ and A_i. Since infrastructure, endowments, and capital are all complementary, units with better endowments and more capital invest more in infrastructure. Note also that infrastructure investments in poorly endowed units, $\bar{I}_m = \left(\frac{1}{t}\,\beta\, A_m \bar{k}_m^{\alpha}\right)^{\frac{1}{1-\beta}}$, depend only on their own capital endowment and are independent of A_n.

B. Capital mobility

Now suppose capital is perfectly mobile across units. Given this, capital will flow from units with lower after-tax marginal rates of return to capital to units with higher rates. In an interior equilibrium in which all units have positive capital, the rates in all units must be equalized. Let r be the economy-wide net return to capital. We suppose for now that each unit is small relative to the whole economy (both N and M are large), so each takes r as given and ignores potential effects of its decisions on r. In Section II, we argue that our results are likely to hold even more strongly if units compete directly and anticipate the effect of their infrastructure investments on r.

If government G_i makes infrastructure investment I_i, the capital inflow to i is given by

$$(1-t)\frac{\partial F_i}{\partial k_i} = r \tag{5}$$

From (5) and (1), we see that:

$$k_i(I_i, r; A_i) = \left(\frac{1}{r}(1-t)a\, A_i I_i^b \right)^{\frac{1}{1-a}} \tag{6}$$

Clearly, capital flows into units that invest more in infrastructure. In addition, capital inflow to i is lower, the higher is the economy-wide net return to capital, r, because higher r means other units are making larger infrastructure investments.

Given r, G_i chooses I_i to maximize its payoff, $U_i = (1-t)F_i(k_i, I_i) + lc_i$, subject to its budget constraint and the capital allocation rule, (6). Substituting its budget constraint into its objective function, we obtain the first order condition:

$$\frac{\partial F_i}{\partial I_i} + \frac{\partial F_i}{\partial k_i}\frac{\partial k_i}{\partial I_i} = t \tag{7}$$

Equation (7) has the usual interpretation for optimality: the marginal benefit of infrastructure investment on the left-hand side must equal its marginal cost on the right-hand side. Comparing this with the first order condition for the case of capital immobility, Equation (3), there is an additional term,

$\partial F_i/\partial k_i \ \partial k_i/\partial I_i$, on the benefit side, which represents the indirect effect of infrastructure investment I_i on unit i's output due to the additional capital it attracts to the unit.

Previous papers have pointed to this infrastructure- and output-increasing effect of capital competition to argue that fiscal decentralization and the liberalization of capital controls can discipline governments and increase welfare (see, e.g., Qian and Roland, 1998). An unnoticed, yet critical, assumption for that conclusion is that the capital allocation under capital mobility is the same as that under capital immobility.[12] Given this, $\partial F_i/\partial I_i$ is unchanged, and so the left-hand side of (7) is unambiguously greater than the left-hand side of (3). However, if a unit's capital allocation under mobility is *lower* than under immobility, there will be a second offsetting effect. Because capital and infrastructure are complements, a lower capital allocation reduces the unit's incentive to invest in infrastructure: $\partial F_i/\partial I_i$ will be lower under mobility. For such units, the total effect will be ambiguous—the left-hand side of (7) might be either greater or smaller than that of (3). Previous papers avoid this by assuming identical units and focusing on symmetric equilibria so that the capital allocation is the same under mobility and immobility. However, as we show below, when units have different endowments, no symmetric equilibrium exists and capital allocation must be different in the two cases. Under mobility, as initial asymmetry increases, the capital allocation becomes more and more uneven.

Given the Cobb-Douglas technology and (5), Equation (7) can be solved for $I_i(k_i;A_i)$:

$$I_i(k_i;A_i)=(1-a)^{-\frac{1}{1-b}}\left(\frac{1}{t}\,b\,A_i k_i^{a}\right)^{\frac{1}{1-b}} \tag{8}$$

Comparing this with Equation (4), we see that if the capital allocation remains fixed at the level under capital immobility ($k_i=\bar{k}_i$), then both types of units build more infrastructure when capital is mobile (since $(1-a)^{-\frac{1}{1-b}}>1$). This is the well-known competition effect. However, since capital allocation is endogenous, this conclusion may be overturned.

[12] We thank a referee for pointing this out and suggesting the intuition below.

Using (6), and (8), we can express G_i's preferred infrastructure investment, and the resulting capital allocation, as functions of the parameters r and A_i:

(9) $$I_i(r;A_i) = \left(r^{-a} A_i B\right)^{\frac{1}{1-a-b}}$$

(10) $$k_i(r;A_i) = \left(r^{b-1} A_i H\right)^{\frac{1}{1-a-b}}$$

where $B = a^{a}(1-a)^{a-1} b^{1-a} t^{a-1}(1-t)^{a}$ and $H = a^{1-b}(1-a)^{-b} b^{b} t^{-b}(1-t)^{1-b}$ are positive constants. Equations (9), (10), along with the market-clearing condition $N k_n(r) + M k_m(r) = K$, determine the equilibrium values of *r*, and therefore also of I_i and k_i.

From Equations (9) and (10), we can write:

(11) $$\frac{I_n}{I_m} = \frac{k_n}{k_m} = \left(\frac{A_n}{A_m}\right)^{\frac{1}{1-a-b}}$$

Therefore, as A_n/A_m increases, k_n/k_m and I_n/I_m become larger. Since in equilibrium all capital is invested, i.e., $N k_n(r) + M k_m(r) = K$, it must be that higher A_n/A_m increases k_n and decreases k_m. And since, by Equation (8), $I_i(k_i;A_i)$ increases in k_i, this means that higher A_n/A_m also increases I_n and decreases I_m.

Thus, under mobility there are two effects. A *competition effect* causes units to invest more in infrastructure in order to attract capital. But a *polarization effect* causes poorly-endowed units to invest less in infrastructure, the greater is their shortfall in endowments. When the endowment gap is sufficiently large (high A_n/A_m), infrastructure investment in the poorly-endowed units becomes very small. Since the poorly-endowed units' capital allocations and infrastructure investments under immobility, $\bar{k}_m$ and $\bar{I}_m$, are independent of A_n, this implies that for high A_n/A_m, poorly-endowed units invest *less* in infrastructure under mobility than under immobility.

In short, when endowment asymmetry is sufficiently large, governments in poorly-endowed units invest less in infrastructure, attract less capital, and thus have lower total output under capital mobility than under immobility. By contrast, governments in well-endowed units invest more in infrastructure, attract more capital, and have higher output when capital can flow freely. When the gap is large, competition for capital does not discipline governments in the poorly-endowed units, forcing them to improve their business environment. On the contrary, since they see little hope of winning, governments give up on competing for capital and focus instead on public consumption.[13] Capital competition exacerbates initial inequalities, hindering economic development in the poorly-endowed units, while stimulating it in their better-endowed rivals.

II. Extensions and robustness

How general is the point sketched above? In a longer version of the paper, we show the conclusion is robust to a number of variations. First, one might wonder whether the result holds for output functions other than the Cobb-Douglas one in (1). In Cai and Treisman (2003), we derive the same qualitative results using a general, increasing and concave output function $F_i = f(k_i, I_i; A_i)$. We make the standard assumption that capital, infrastructure, and endowments are complementary, and a couple of additional regularity assumptions to ensure that units do not become too quickly satiated in capital. In this general case, we show that under capital mobility, the poorly endowed units invest less in infrastructure as the endowment gap widens; for sufficiently high endowment asymmetry, they build less infrastructure than under capital immobility. When the production function does not satisfy Inada conditions and the initial asymmetry is high, the interior equilibrium may disappear, yielding instead an equilibrium of total polarization in which the infrastructure investment and capital of the poorly-endowed units go to zero.[14]

[13] It is the lifting of restrictions on outflows from poorly endowed units that blunts the incentives for their governments, rather than the lifting of restrictions on inflows. However, inflows are likely to be meager if outflows are heavily restricted.

Second, one might wish to complicate the government payoff function. In Cai and Treisman (2003), we replace the linear function $U_i = (1-t)F_i + \lambda c_i$ with a quasilinear one

$$U_i = (1-t)F_i + \lambda v(c_i) \tag{12}$$

where $v_c > 0, v_{cc} < 0$. The opportunity cost of infrastructure investment then becomes a function of government consumption: $t = \lambda v'(c_i)/[1+(\lambda v'(c_i)-1)t]$. Although the algebra becomes somewhat more complicated, this does not change anything fundamental in the results.

Quasilinear government payoff functions of this kind are very common in political economy analyses (see for example Persson and Tabellini 2000), and are consistent with various models of voting. Both Downsian spatial models and "citizen-candidate" models (Osborne and Slivinski 1996, Besley and Coate 1997) assume that the policy chosen is that most preferred by one of the voters. In the Downsian setup, the median voter dictates policy, assuming a Condorcet winner exists.[15] In "citizen-candidate" models, the winning candidate chooses his favorite policy. If we assume citizen preferences are linear in after-tax income and concave in public spending, we arrive in either case at a version of (12). Retrospective voting models (Barro 1973, Ferejohn 1986) are also consistent with payoff functions like (12). Here, one can reinterpret c_i as current period rents of office. Suppose the incumbent derives concave utility from current rents, $v(c_i)$, and his probability of reelection increases linearly with the after-tax

[14] In the total polarization equilibrium, the return to capital is higher in the well-endowed than in the poorly endowed units. For this to occur, the exogenous difference in productivity across the units must be large relative to the total amount of capital worldwide, so that the better-endowed units do not become satiated in capital.

[15] Persson and Tabellini (2000, pp.24-5) show that a Condorcet winner is likely to exist if voter preferences are linear in private consumption and concave in the preference for public spending.

income of voters.[16] If reelected, he gets the expected value of future rents. We are then just a simple transformation away from (12).[17]

A third extension is to consider what would happen if instead of assuming a large number of units, we assumed a small number of units interacting strategically. Each unit would then anticipate that *r* would depend on its own and other units' infrastructure investments. Intuitively, we can express this most simply by rewriting (5) as:

$$(5') \qquad (1-t)\frac{\partial F_i}{\partial k_i} = r(I_i, I_{-i})$$

where I_{-i} represents total infrastructure investments in other units. This introduces two new effects. First, if governments anticipate that their infrastructure investments increase the economy-wide rate of return to capital ($\partial r / \partial I_i > 0$), this will reduce the effectiveness of their infrastructure investments in attracting capital into their unit. Second, higher infrastructure investments by other units will now also increase the economy-wide rate of return to capital, again reducing the effectiveness of I_i for attracting capital. Intuitively, these two effects make the conclusions of this paper even more likely to hold, because the first reduces the "competition effect" while the second strengthens the "polarization effect". In a model with

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[16] Suppose voters coordinate to vote the incumbent out of office if after-tax income falls below a threshold, *k*, but there is some stochastic element, e, so that the incumbent is reelected only if $(1-t)F \geq k + e$. Suppose, in addition, that e is uniformly distributed, with density f. Then the incumbent's probability of reelection, $p = \Pr[e \leq (1-t)F - k] = \frac{1}{2} + f[(1-t)F - k]$, increases linearly in $(1-t)F$.

[17] The formulations in both (2) and (12) ignore the complication that under capital mobility owners of investments may live outside the unit. Thus after-tax output in *i* may not correspond exactly to consumption of citizens of *i*. An alternative simplification would be to replace F_i in (2) or (12) with L_i, where $L_i \equiv f(k_i, I_i) - f_k(k_i, I_i)k_i$ is labor income in *i*, and to assume L_i is concave. (For instance, in the Cobb-Douglas formulation, we get $L_i \equiv (1-a) f(k_i, I_i)$. The tax would then be a tax on just labor income, with labor assumed immobile. Qian and Roland (1998, p.1148) take this approach. It seems reasonable to assume L_i would increase concavely in both I_i and k_i. In any case, if government *i*'s payoff function is *not* concave in I_i and k_i there will be no competition for capital: the only equilibria under mobility will be corner solutions in which all capital flows to one unit. Our argument will hold even more strongly.

only one well-endowed and one poorly-endowed unit and with quadratic production functions, we fully characterize the strategic equilibrium and show that our main results of this paper still hold.[18]

Finally, incorporating endogenous tax rate competition is also likely to strengthen the results. In this case, governments have two instruments to compete for mobile capital. Investing in infrastructure becomes more costly than before because the higher tax rates necessary to finance it discourage investors. It is easy to see the logic in a model in which governments set both the local tax rate and infrastructure investment to maximize Equation (12).[19] The first order conditions for capital immobility are:

$$\frac{\partial F_i}{\partial I_i} = l\, v'(c_i) = 1 \tag{3'}$$

while those for mobility simplify to:

$$\frac{\partial F_i}{\partial I_i} + \frac{\partial F_i}{\partial k_i}\frac{\partial k_i}{\partial I_i} = 1 - \frac{(1-t_i)\,\partial F_i/\partial k_i\,\partial k_i/\partial t_i}{F_i} \tag{7'}$$

We see the familiar "competition effect" in the second term on the left-hand side of (7'). This, as before, increases the marginal benefit of building infrastructure under mobility. But the marginal cost of infrastructure is also increased by the second term on the right-hand side, $-(1-t_i)(\partial F_i/\partial k_i)(\partial k_i/\partial t_i)/F_i$, which is always positive since $\partial k_i/\partial t_i$ will be negative. This term measures the loss in after-tax income caused by the higher tax rates that are needed to finance additional infrastructure and by the outflow of capital such tax increases induce. Thus, equilibrium infrastructure investments will be lower than if the tax rate were exogenously fixed. The disciplining effect of capital mobility will be weaker. In the longer version of our paper, we prove that our main results extend to the case with endogenous tax competition.

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[18] In a fully strategic model, technical complications arise in characterizing the best response functions that involve higher order derivatives of the production functions. Assuming quadratic production functions circumvents those complications and hence allows clean results. The main insights, however, should be valid in general. See our longer version of the paper for details.

[19] Maximizing $U_i = (1-t)F_i + l\,c_i$ subject to $c_i = S + tF_i - I_i$ yields only corner solutions if $l \neq 1$.

III. Illustrations

The logic we outline may help to explain several stylized facts about capital flows and government policies that are hard to reconcile with the standard thinking. There are certainly other explanations for these, so we mean the following discussion to be no more than suggestive.

A. Interregional capital flows in post-communist Russia

In Russia, the transition from communism after 1991 liberated private capital to flow relatively freely among the federation's 89 regions. A network of investment banks sprang up to channel such flows. Informed by the conventional view, one might have expected all regions to speed up economic reforms, build infrastructure, and cut back on corruption and waste to compete for this mobile capital. In fact, the evidence suggests more a polarization into well- and poorly-endowed groups, with the former competing actively while the latter largely gave up on attracting investors.

Russia's regions differed greatly as of the early 1990s. We constructed an index of their initial endowments, incorporating indicators of natural resources (raw materials production); geographical advantages (the negative distance from Berlin or Tokyo, whichever was closest); inherited human capital (average education level, number of R&D organization), and physical infrastructure (share of roads paved, number of public buses per capita).[20] We found that a region's initial endowments, as measured by this index, correlated positively with various indicators of regional government effort to build infrastructure or enact business-friendly policies in subsequent years.

For instance, in almost all regions the pace of construction of roads and water mains fell during the decade. However, construction tended to fall less in regions with better initial endowments.[21] That might reflect greater financial constraints on the poorly-endowed regions. But,

[20] Most data were from the Russian official statistical agency, Goskomstat. For more details on the analysis, see Cai and Treisman (2003).

better-endowed regions seem also to have allocated a larger share of their budgets to growth-promoting infrastructure. The average share of regional spending on "development of markets", transport, roads, communications, and information technology correlated positively with initial endowments ($r = .48$, $p < .01$).[22] Better endowed regions also moved faster to replace communist institutions with a market system. The business magazine *Ekspert* publishes annual regional ratings of the "degree of development of the leading institutions of a market economy". Since no regions had market institutions at the start of transition, this, by definition, measures change since 1990. Regions with better initial endowments tended to rank higher on the *Ekspert* institutional rating as of 2001 ($r = .41$, $p < .01$; see Figure 1).

More business-friendly policies and institutions were associated with higher inflows of investment. Data to judge this are imperfect, but still permit some tentative conclusions. We calculated two measures of net capital inflows for 1998, the latest year for which we had data: (1) total investment in non-financial assets in the region minus total savings of its population, and (2) total bank credits issued in the region minus total savings. An excess of local investment or credit emission over local savings would suggest net capital inflows. We also examined rates of foreign investment. As shown in Table 1, regions with more business-friendly policies tended to have higher rates of capital inflows by any of these measures. The correlation between business-friendly policies and capital inflows was positive and significant even controlling for our measure of initial endowments, consistent with the argument that the business-friendly policies themselves attracted capital, not just the endowments.[23]

In sum, patterns of regional policy and capital flows in Russia since market liberalization seem to fit the model of this paper better than they do the conventional wisdom. In regions with better initial endowments, governments tended to spend proportionally more on infrastructure, to cut back less on

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[21] The correlations were $r = .23$, $p < .06$ for paved roads, and $r = .41$, $p < .01$ for water mains. The latter correlation excludes one extreme outlier, the Republic of Sakha, which had very low water mains construction in the 1990 base year; this turned a subsequent moderate increase into a giant percentage leap.

[22] This correlation is for the average spending level in 1996-8. Detailed data were only available from 1996, so we could not analyze the change in spending patterns. But since "spending on market development" did not occur before the early 1990s, this part at least already measures reallocation of resources toward market infrastructure. The correlation is weaker, but still significantly positive, if Moscow and St Petersburg, are excluded ($r = .27$, $p < .03$).

[23] One of the correlations for foreign investment was only marginally significant controlling for initial endowments.

construction of roads and water mains, and to develop more effective market institutions. More business-friendly policies correlated, in turn, with larger net inflows of both domestic and foreign capital. Major urban or industrial centers such as Moscow, St Petersburg, and Samara competed vigorously for capital, and got it. More remote, resource-poor, underdeveloped regions such as the Altai, Tyva, or Kalmyk Republics did not bother to compete. They let their physical infrastructure run down, spent almost nothing on market development, and had among the lowest-rated market institutions. Each suffered net outflows of local savings.

[Table 1 and Figure 1 about here]

B. Capital account liberalization in the developing world

The 1980s and 1990s witnessed a worldwide trend toward capital account liberalization, during which many developing countries reduced capital controls. Did such countries invest in infrastructure and improve their business environments sufficiently to compete with better endowed rivals for mobile capital? In fact, the developing world's share in global private capital flows fell from 11.8 percent in 1991 to 7.6 percent in 2000, even as its share in global output grew from 19.8 to 22.5 percent (World Bank 2001, Tables 2.1, 2.2, 2.3). Net private inflows to developing countries were very low in most years, and after the Asian financial crisis of 1997-9 even turned negative. At the end of a decade of capital market integration, private capital appeared on balance to be flowing out of, rather than into, the developing world.[24]

Even this paints too rosy a picture of the capital accounts of the least competitive economies. Capital inflows to the developing world were highly concentrated on a dozen or so success stories, including China, Mexico, and Brazil. Despite significant capital market liberalization in many countries and low capital saturation, Africa saw almost none of the increase. Private capital inflows to

[24] Another way of gauging total capital flows is to look at the current account, which measures the difference between domestic savings and investment. A current account surplus indicates net outflows. Developing countries' aggregate current account was in surplus of $60.3 billion in 2000 (World Bank 2001, Ch.2).

Sub-Saharan Africa fell from 3.9 percent of the region's GNP in 1975-82 to 1.8 percent in 1990-98 (UNCTAD 2000). Inflows to North Africa fell from 7.2 to 0.8 percent of GNP in the same period. In both regions outbound profit remittances and interest payments were larger in the 1990s than private capital inflows. Capital flight often increased after capital market opening. In various countries that liberalized—Egypt, Mauritius, Uganda—outflows by residents rose substantially in relative terms in the 1990s (UNCTAD 2000, p.37). By the end of the 1990s, Africans held a larger proportion of their wealth overseas than residents of any other continent.

Except for a few mineral-rich countries such as Nigeria, Sub-Saharan Africa is poorly endowed with the human capital, infrastructure, and resources that would attract investors. African countries have only 55 kms of rural highways per thousand square kilometers, compared to more than 800 kms in India, and 10 times fewer telephones per capita than in Asia (Collier and Gunning 1999, pp.71-2). There is little sign these countries increased investment in infrastructure after reducing capital controls. The percentage of paved roads in Sub-Saharan Africa actually fell in the 1990s (World Bank 2001, p.309). Between 1980 and 1995, electricity generating capacity and the number of telephone mainlines both grew more slowly in the average African country than in the rest of the world.[25] In short, capital account liberalization has not prompted a significant inflow of capital into the most underdeveloped countries. And there is little evidence competition for capital has led their governments to enact more business-friendly policies.

IV. Conclusions

The free flow of capital is viewed by many as a powerful disciplining force, pressuring governments to improve their business climate, reduce welfare programs, and cut waste and corruption. Although scholars differ over whether the benefits of such discipline outweigh the costs, few question that it exists. This view informs policy debates on the desirability of both political decentralization and the liberalization of international capital flows.

[25] Calculated from database for Canning (1998).

However, when regions or countries differ markedly in natural resources, human capital, or infrastructure, we showed that the disciplining effect is likely to be one-sided. Better-endowed units compete aggressively and drain capital from their poorly-endowed counterparts. Poorly-endowed units, knowing they will lose, simply give up. As a result, such units may be even less business-friendly when capital is mobile than when it is not.

Our argument does not necessarily imply endorsement of capital controls. There are well-known efficiency reasons for favoring free capital flows. However, it suggests more thinking may be in order about how to organize capital competition. Although we hesitate to draw policy conclusions from such a simple model, three ideas might be worth at least exploring. First, when endowment differences are not too large, external aid to finance market infrastructure, improve human capital, or insure against exogenous risks might reduce the initial productivity gap to the point at which the disciplining effect of competition kicks in. In decentralized states, centrally funded infrastructure investments might help poorly-endowed regions compete, motivating their governments to reform themselves.[26] Second, if the discipline of capital competition is considered desirable, it may make sense to liberalize capital flows first within clubs of countries (or regions) with similar endowments. Freeing up capital flows within the European Union or within a group of African states may benefit disadvantaged countries more than if all were to integrate directly into world capital markets. Third, there are many reasons why political decentralization might be favored. But if the goal is to impose discipline on local governments, our analysis suggests an important qualification. Decentralization may achieve this in homogeneous countries. However, within geographically diverse ones, decentralization may sometimes have the opposite effect.

[26] The challenge, of course, is how to ensure that such central investments or international aid are spent on infrastructure rather than being diverted to other uses. To this, we do not have any simple answers.

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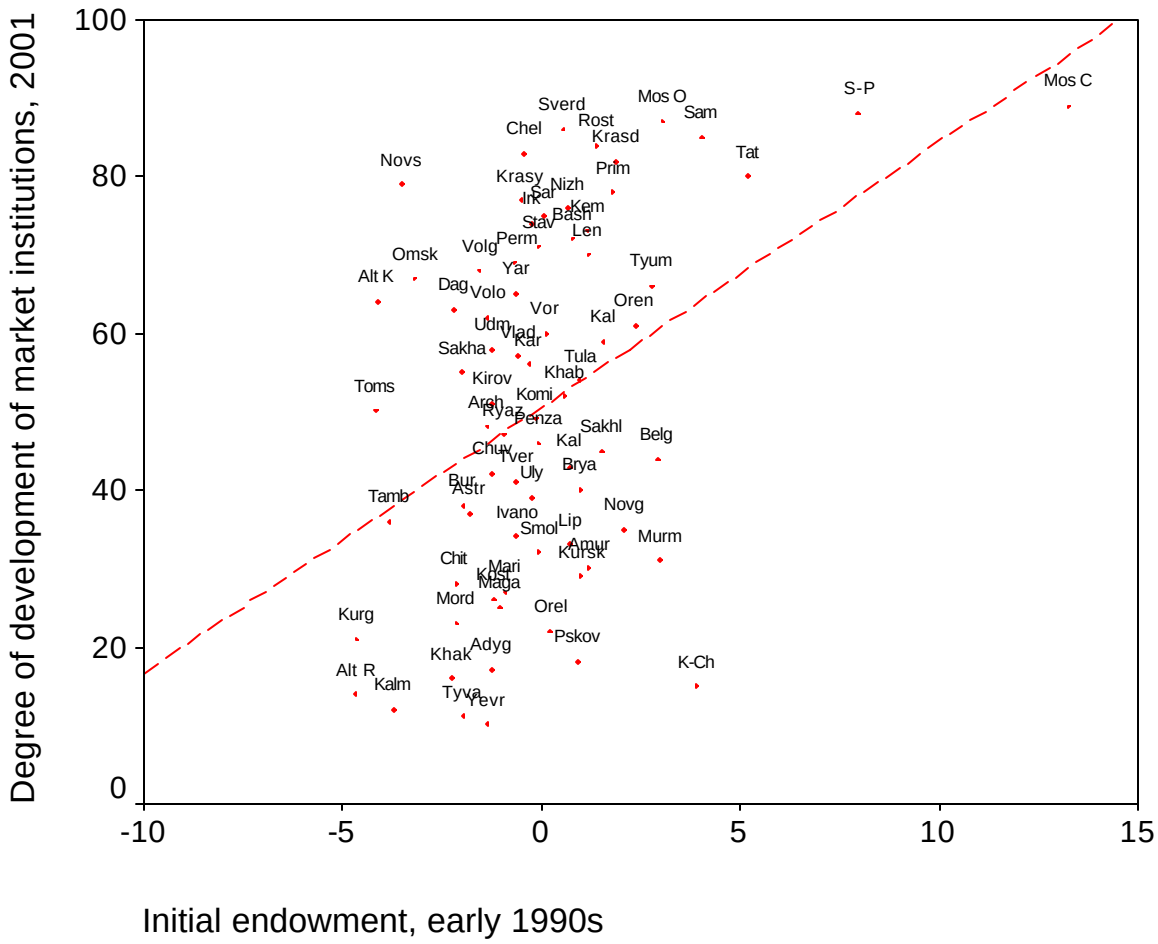
Table 1: Business-friendly policies and capital inflows, Russia late 1990s, correlation coefficients

	Investment minus saving in region, 1998	Credits issued minus saving in region, 1998	Log foreign investment 1998-2000
Share of regional budget spent on market institutions, transport, roads, communications, and information technology, 1996-8	0.49	0.55	0.40
-controlling for initial endowment	0.35	0.33	0.20[a]
Ekspert rating of "development of market institutions" 1996	0.49	0.51	0.66
-controlling for initial endowment	0.32	0.30	0.61

Sources: Goskomstat (1999, 2000), Ministry of Finance reports on regional budget execution, *Ekspert* magazine (www.ekspert.ru).

[a] $p < .10$; all other correlations significant at $p < .01$.

Figure 1: Degree of development of leading institutions of a market economy in Russia's regions, 2001; rating compiled by staff of *Ekspert* magazine.



Note: Correlation: 0.41 ($p < .01$)); without Moscow and St Petersburg, 0.32 ($p < .01$).
Sources: Goskomstat, *Ekspert*. "Initial endowment" is sum of standardized values of (1) ln of share of region in RF raw materials output 1993, (2) percentage of population with higher education 1989, (3) percentage of roads that were paved as of 1990, (4) number of research and development organizations as of 1992, and (5) number of public buses per 1,000 inhabitants as of 1992, minus the standardized value of the distance from the nearer of Berlin and Tokyo. Natural log of (1) taken because distribution highly skewed. Index of development of market institutions from *Ekspert* (www.ekspert.ru), adjusted so that "most developed" is 89, "least developed" is 1.