NBER WORKING PAPER SERIES

INSTITUTIONAL COMPARATIVE STATICS

James A. Robinson
Ragnar Torvik

Working Paper 17106
http://www.nber.org/papers/w17106

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
June 2011

Paper prepared for the 2010 World Congress of the Econometic Society, Shanghai. We are grateful to our discussant Marco Battaglini and to Daron Acemoglu and Stephen Morris for their comments and suggestions. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

NBER working papers are circulated for discussion and comment purposes. They have not been peer-reviewed or been subject to the review by the NBER Board of Directors that accompanies official NBER publications.

© 2011 by James A. Robinson and Ragnar Torvik. All rights reserved. Short sections of text, not to exceed two paragraphs, may be quoted without explicit permission provided that full credit, including © notice, is given to the source.

Institutional Comparative Statics
James A. Robinson and Ragnar Torvik
NBER Working Paper No. 17106
June 2011
JEL No. D7,N50

ABSTRACT

Why was the Black Death followed by the decline of serfdom in Western Europe but its' intensification in Eastern Europe? What explains why involvement in Atlantic trade in the Early Modern period was positively correlated with economic growth in Britain but negatively correlated in Spain? Why did frontier expansion in the 19th Century Americas go along with economic growth in the United States and economic decline in Latin America? Why do natural resource booms seem to stimulate growth in some countries, but lead to a 'curse' in others, and why does foreign aid sometimes seem to encourage, other times impede economic growth? In this paper we argue that the response of economies to shocks or innovations in economic opportunities depends on the nature of institutions. When institutions are strong, new opportunities or windfalls can have positive effects. But when institutions are weak they can have negative effects. We present a simple model to illustrate how comparative statics are conditional on the nature of institutions and show how this perspective helps to unify a large number of historical episodes and empirical studies.

James A. Robinson
Harvard University
Department of Government
N309, 1737 Cambridge Street
Cambridge, MA 02138
and NBER
jrobinson@gov.harvard.edu

Ragnar Torvik
Norwegian University of Science and Technology
Department of Economics
N-7491 Trondheim
Norway
ragnar.torvik@svt.ntnu.no

1 Introduction

What is the impact of productive natural resources on national income? The conventional wisdom in US and British economic history is that natural resources are good for prosperity, even crucial (Wright, 1990, Wrigley, 2004, Allen, 2008). In fact, the greater natural resources available to Britain and Western Europe has been argued to be one of the key reasons for their divergence from China in the early modern period (Pomeranz, 2000).

Though compelling, since natural resources seem to raise income in a mechanical way, this view faces some striking empirical puzzles. The first set concerns the 'Dutch Disease' and the impact of natural gas discoveries on the competitiveness of manufacturing in the Netherlands. The second set suggests a much more general negative correlation between economic growth and the importance of natural resources in the economy (Sachs and Warner, 1995). Since then such findings have expanded into a whole literature on the 'resource curse' replete with detailed case studies as well as econometric results. Indeed, Sachs and Warner (2001, p. 828, 837) argue

> "What the studies based on the post-war experience have argued is that the curse of natural resources is a demonstrable empirical fact, even after controlling for trends in commodity prices. . . . Almost without exception, the resource-abundant countries have stagnated in economic growth since the early 1970s, inspiring the term 'curse of natural resources.' Empirical studies have shown that this curse is a reasonably solid fact."

This view is shared by many, for example (Auty, 2001, p. 840) "Since the 1960s, the resource-poor countries have outperformed the resource-rich countries compared by a considerable margin". How can a resource boom reduce income? How can it be that resources were a boon for economic growth in Britain and the United States, but on average are a curse in the post-War period?

This puzzling situation with respect to natural resources, such as oil, coal or diamonds, is reproduced in many other areas of economics. Take the issue of the impact of the availability of 'frontier lands' on economic and political development in the Americas in the 19th century. Turner (1920)

posited that the availability of frontier land was a key factor in 'American exceptionalism'. Turner, postulating what has become known as the 'Frontier (or Turner) thesis' argued that the availability of the western frontier had led to a particular type of person and had crucially determined the path of US society.

> "The existence of an area of free land, its continuous recession, and the advance of American settlement westward, explain American Development.
>
> Behind institutions, behind constitutional forms and modifications, lie the vital forces that call these organs into life and shape them to meet changing conditions." Turner (1920, pp. 1-2)

Turner emphasized that the frontier created strong individualism and social mobility and his most forthright claim is that it was critical to the development of democracy. He noted

> "the most important effect of the frontier has been to promote democracy" Turner (1920, p. 30)

and

> "These free lands promoted individualism, economic equality, freedom to rise, democracy ... American democracy is fundamentally the outcome of the experiences of the American people in dealing with the West." Turner (1920, pp. 259, 266)

Moreover, the things that went along with democracy and helped to promote it, such as social mobility, most likely also stimulated economic performance.

Since Turner wrote, the 'Frontier Thesis' has become part of the conventional wisdom amongst historians and scholars of the United States. Though the specific mechanisms that Turner favored, such as individualism, have become less prominent, arguments about the frontier have appeared in many places, particularly the literature on the democratization of the United States (Keyssar, 2000, Engerman and Sokoloff, 2005). Keyssar (2000, p. xxi) argues

> "The expansion of suffrage in the United States was generated by a number of key forces and factors ... These include the dynamics of frontier settlement (as Frederick Jackson Turner pointed out a century ago)."

When Turner talked about 'America' in fact he meant the United States. Elsewhere in the Americas, the impact of the frontier was rather different. In fact, the existence of a frontier clearly *did not* distinguish the United States from the other countries of the Americas or indeed other societies such as Russia, South Africa or Australia in the 19th century. Every independent South American and Caribbean country, with the exception of Haiti, had a frontier in the 19th century. As in the United States, these frontiers were usually inhabited by indigenous peoples and they went through the same pattern of expansion into this zone which, as in the United States, coincided with the expropriation and oftentimes annihilation of indigenous communities.

In Latin America, however, frontier expansion is not associated with democracy or economic development. The most important book on this topic concludes that

> "Latin American frontiers have not provided fertile ground for democracy. The concentration of wealth and the absence of capital and of highly motivated pioneers effectively blocked the growth of independent smallholders and a rural middle class" (Hennessy, 1978, p. 129).

How can the frontier be good for democracy and economic growth in the United States and bad for the same two outcome variables in Latin America?

The search for an unconditional impact of natural resources or the availability of new land is at some level quite strange. This is because the standard tools of comparative static analysis rarely make such a clean cut prediction. One of the first things you learn in microeconomics is that it is not even possible to say if people will buy less of a good when its price increases or that workers will work less if their wage falls. Even the most celebrated comparative static results, such as those of international trade theory, the Stolper-Samuelson Theorem (Stolper and Samuelson, 1941) and

the Rybczynski Theorem (Rybczynski, 1955), are conditional in the sense that both results depend on conditions about factor intensities.

In this paper we argue that the temptation to search for simple unconditional relations has marred a great deal of research in economics. In fact, we argue that the natural position would be that the impact of resources or of frontier land on the economy and polity, is that it is conditional. Conditional on what? In the tradition of the Arrow-Debreu model the conditioning factors would include preferences, factor endowments, production possibilities and the structure of markets. Such would be the spirit of the Stolper-Samuelson Theorem.

Yet this traditional approach encounters a large number of empirical problems. Consider the following: after the discovery of diamonds in Kimberly in 1873 and gold in Johannesburg in 1886 the economy of South Africa boomed on the basis of its mineral sector. In the first half of the 20th century the terms of trade improved and the relative price of gold increased. The goldmines were very labor intensive and the government of South Africa created a whole set of labor market institutions which were specifically designed to mobilize labor for the mines (van der Horst, 1942, Feinstein, 2005). The Stolper-Samuelson Theorem applied to a booming relative price of gold in an economic sector which was clearly very labor intensive implies that the real wage rate ought to increase. That it did not is clearly indicated by the data in Wilson (1972) which shows that in fact the real wages of (black) gold miners fell over this period. Indeed, in 1970 they were 20% lower than they had been in 1911. How can booming terms of trade reduce real wages in labor intensive sectors?[1]

[1]Of course it is well known that Theorems such as those of Stolper and Samuelson and Rybczynski are not general. As long ago as 1958 Bhagwati proposed the notion of 'immizerizing growth' where a country could become worse off when it got a positive endowment shock because of severe deterioration in the terms of trade. In addition, it is clear from the Debreu-Mantel-Sonnenschein Theorem (Debreu, 1974, Mantel, 1974, Sonnenschein, 1973, 1974) that such simple comparative static results are not robust and Opp, Sonnenschein and Tombaz (2007) show one can build a non-pathological model where there is a 'Reverse Rybczynski Theorem' (see also Kemp and Shimomura, 2002).

Nevertheless, there is a tendency to regard such demonstrations as theoretically interesting but probably not relevant empirically (Hildenbrand, 1994). In addition, it seems unlikely that the forces that generate the Reverse Rybczynski Theorem are what also cause the types of empirical phenomenon we describe above even though if this theorem holds then factor growth is immizerizing (Opp, Sonnenschein and Tombaz, 2007, Propo-

Modern empirical research has stressed that in order to understand comparative patterns of economic development it is crucial to consider the institutional structures of a society. Fundamental has been the research of Douglass North and his co-authors (North and Thomas, 1973, North, 1982, North and Weingast, 1989, North, Wallis and Weingast, 2009) and Engerman and Sokoloff (1997) which placed institutional change at the heart of explaining the 'Great Divergence' of the last 250 years. This historical work has been largely substantiated by econometric work by Acemoglu, Johnson and Robinson (2001, 2002, 2005a,b) and Acemoglu, Cantoni, Johnson and Robinson (2009, 2011). This econometric work suggests that the preponderance of differences in incomes between poor and rich countries is explained by their institutions with little role being played by natural endowments and resources. Our main point in this paper is that institutions not only determine the level of income or its rate of growth they also determine the comparative statics of the equilibrium.

This is readily seen by returning to the two examples we started the paper with. Once we bring institutions into the picture they will influence the political and economic incentives that a resource boom can have. Though resource rents might have a direct positive impact on national income, they may have all sorts of positive or negative indirect effects. For example, increments of resource income could lead political power to become more valuable inducing politicians to engage in socially wasteful clientelism in order to stay in power (Robinson, Torvik and Verdier, 2006). Another negative channel is isolated in Mehlum, Moene and Torvik (2006) who show that a resource boom can intensify rent seeking. Alternatively, if resource rents flow into the private sector they may boost the return to productive activity drawing people out of rent seeking or bolstering the wealth and political power of productive individuals which could improve political accountability. Which of these effects tends to dominate will depend on institutions. Political institutions will determine the extent to which politicians will be able to use socially undesirable strategies to stay in power following a resource boom. Economic

sition 5). For one thing many of the negative correlations between resource booms and economic growth take place in the context of increases in the prices of the resources and improving terms of trade, which means they cannot be generated by immizerizing growth type effects.

institutions, such as the security of property rights, will determine the extent to which agents would find it optimal to become rent seekers following a resource boom. If one thinks in a simple way of the strength or weakness of institutions (strong political institutions placing more constraints on politicians making them more accountable to citizens, strong economic institutions giving greater property rights security and creating better incentives for productive economic activity) then we could conjecture that in countries with strong institutions the positive indirect effects would dominate, while in countries with weak institutions the opposite might be true.

That this is so in the case of natural resources was first shown by Mehlum, Moene and Torvik (2006). They measured the strength of institutions by constructing an index from five different data series produced by Political Risk Services: the rule of law, bureaucratic quality, government corruption, risk of expropriation and a measure of the likelihood that the government would repudiate contracts. They then examined the impact of nature resource abundance on economic growth conditional on this index of institutions. They found that for countries with weak institutions - low values of the index - resources were a curse, but for countries above a critical value of the index, resources were a boon.[2] Using a measure of mineral abundance, they find that for the top 38% of countries ranked according to institutional quality (including countries such as Chile, Botswana and Malaysia) resource abundance stimulates growth, while for the bottom 62% of countries (including countries such as Cameroon, Venezuela and Mexico) resource abundance retards growth.[3]

We can apply exactly the same set of ideas to thinking about the impact of the frontier. Indeed Hennessy (1978, p. 13) reasoned

> "If the importance of the Turner thesis lies in its ... ability to provide a legitimating and fructifying nationalist ideology, then the absence of a Latin American frontier myth is easy to explain.

[2]Recent work has begun to investigate other types of political institutions. Andersen and Aslaksen (2008) finds that the resource curse is present in countries with presidentialism, but not in countries with parliamentarism. A likely explanation for this result is that except for the US presidential system, in most presidential system there are few checks and balances that constrain the executive (see Robinson and Torvik, 2008, on this issue).

[3]Instrumenting for institutional quality, Boschini, Pettersson and Roine (2007) find similar results.

Without democracy, there was no compulsion to elaborate a supportive ideology based on frontier experiences."

García-Jimeno and Robinson (2011) show that the impact of frontier land is conditional on the strength of institutions. Just as with resource booms, it is clear why this might be so. This is because frontier lands have to be allocated by the political system. In the United States legislation dating back to the Land Ordinance of 1785 right through to the 1862 Homestead Act created a very egalitarian allocation of land. The situation in Latin America outside of Costa Rica and Colombia was very different. There oligarchic or authoritarian political systems created very inegalitarian frontiers thus locking in their power. To capture this García-Jimeno and Robinson (2011) construct estimates of the proportion of land that was frontier for all countries of the Americas in 1850 and show that the long-run impact of this on economic and political development is conditional on initial institutions, specifically constraints on the executive in 1850. With respect to economic development they show that for countries with the lowest level of constraints on the executive in 1850 there is a negative correlation between the extent of frontier and GDP per-capita today, while for countries with greater constraints in 1850 there is a positive correlation. They propose a Conditional Frontier Thesis such that if institutions are strong an open frontier is good for economic development but if they are weak it is bad for economic development.

In this paper we develop the simple idea that the comparative statics of an equilibrium are often conditional on the institutional equilibrium of a society, a phenomenon we call *institutional comparative statics*. We develop a simple model which illustrates these ideas.

Though our model is not the right one to address the South African paradox stated above the right explanation is very much in the spirit of our results because it was the initial institutional equilibrium which determined the outcome. This equilibrium featured the political dominance of the white 20% of the population over the rest and economic institutions designed to extract rents from blacks to enrich the whites. When the price of gold goes up this creates a greater incentive for whites to exploit blacks, thus driving down the wage.

A large literature in political economy and development has of course em-

phasized the importance of the institutional environment for thinking about differences in income levels, development paths and public policy outcomes. There is a now a great deal of theoretical work which suggests that the structure of political institutions, for instance the capacity of the state, nature of the constitution and the electoral system influences public policy. The effects include the extent to which public goods are provided, the amount of rent extraction or corruption by politicians and the ability of politicians (see for instance Persson and Tabellini, 2000, 2003, Besley, 2006, Besley and Persson, 2011). For instance, comparing a situation with and without checks and balances one would expect politicians to extract more rents when checks and balances are absent (Persson, Roland and Tabellini, 1997). Alternatively, considering a situation where politicians have re-election incentives to one where they do not, one would expect politicians to extract less rents when they face re-election (Barro, 1973, Ferejohn, 1986, Ferraz and Finan, 2008). Empirically, research has argued that differences in economic institutions such as the security of property rights are the main determinant of cross-country income differences (Acemoglu, Johnson and Robinson, 2001, 2002). In turn this work sees economic institutions themselves as the outcome of a political process and therefore connected to the nature of political institutions and the distribution of political power in society (Acemoglu, Johnson and Robinson, 2005b, Acemoglu and Robinson, 2011).

Our main contribution to this literature is to emphasize that institutional quality or 'strength' influences the way that the political economy equilibrium will respond to shocks and changes in the economic environment. This point is, we believe, important but not widely understood. For instance, though development problems are often blamed on poor institutions, policy advice is independent of the institutional environment. Consider Africa. Nearly every economist regards the poverty of Africa as being closely related to institutional problems. Yet they continue to make policy prescriptions which ignore this, for instance discussing the benefits of allowing African countries to export more freely to OECD countries without considering how the initially poor institutions determine the consequences of export booms. We think history and a great deal of cross-national evidence shows that the consequences of changes in economic opportunities or the environment

is conditional on the institutions of a country. This implies that there is no necessity that opening markets to exports from Africa would stimulate economic growth in Africa.

The model and this way of thinking about the evidence allows us to make sense of a lot of different empirical and historical research. Though our simple model has no aspiration to generality we believe that the approach we outline is a powerful one. We should stop hoping for unconditional comparative static results and think about how institutions condition the impact of perturbations of an equilibrium.

Our paper builds on many historical and empirical studies but also on a few papers in the literature on the resource curse, particularly Mehlum, Moene and Torvik (2006) and Robinson, Torvik and Verdier (2006). Our model in this paper builds on these papers as well as Torvik (2002). Our approach is also related to models of the allocation of talent by Murphy, Vishny and Shleifer (1991), Acemoglu (1995), Baland and Francois (2000) and Dal Bó and Dal Bó (2006). Our main results are also related to Lane and Tornell (1999) who show how a windfall can reduce growth via the incentives it creates for interests groups to intensify their lobbying. The mechanism in our paper is completely different to the one they study. Our paper shares a similar spirit to Conning (2004) and Acemoglu and Wolitzky (2011). Both papers propose models to throw light on Domer's (1970) analysis of labor coercion and study the conditions under which free labor or slavery can appear. In neither case do the comparative statics hinge on institutions as they do in our paper.

In Section 2 we develop our model to study how new economic opportunities map into aggregate income, and show that this mapping is conditional on the quality of institutions in place. In Section 3 we review other relevant historical evidence on how similar improvements in economic opportunities generated very different outcomes in different countries. Section 4 concludes.

2 A simple model of economic opportunities and economic outcomes

We aim to develop a simple and fairly reduced form approach that can shed light on different historical episodes and empirical results. Still, a common characteristic is that we study how new economic opportunities affect aggregate income. The new economic opportunities may be new possibilities for trade, new available land, new technology, the discovery of valuable timber, oil or minerals. In the model we simply refer to these as natural resources.

The utilization of these new opportunities depends on the strength of institutions in place, and they do so because these affect the incentives of entrepreneurs. We assume throughout that entrepreneurs may engage in one out of two activities. We term these two activities production and 'politics' and to make things very simple we initially abstract from the possibility that politicians can undertake any socially productive action - such as provide public goods. By producers we will understand those entrepreneurs that use their labor and talent in a standard fashion to convert factors into output. By 'political entrepreneurs' we will understand those entrepreneurs that use the political system in various ways so as to redistribute income and property rights towards themselves.[4] A common characteristic of such activities is that the political entrepreneurs earn income partly by decreasing the income of entrepreneurs engaged in production.

When institutions allow 'politicians' and those engaged in political activities to extract rents then increased opportunities are likely to expand the part of the economy that with the help of political power transfers income and property rights to itself. For productive entrepreneurs, and for society, this is costly. On the other hand, when institutions provide secure property rights

[4]The most obvious way is for those that have political power to use this to enrich themselves by taxation and expropriation, but the model may also be interpreted in several other ways. For instance when entrepreneurs benefit by using their talent to lobby for targeted subsidies which is beneficial for themselves but costly for rest of society. Or they lobby for regulations that yield monopoly rents, or when they block technological process so as to keep old privileges, or when they extort productive enterprises, or when they grab other agents' property or output, or when they initiate civil conflict with the motivation of getting access to natural resources, and so on. In general the quality of institutions may be understood as how constrained entrepreneurs are in undertaking such rent extracting activities.

to a broader segment of society increased economic opportunities are likely to strengthen commercial interests outside the political elite and make politics less attractive as a profession. This is favorable to entrepreneurs undertaking production not only because they are able to utilize new economic opportunities, but also because the relative position of the rent extracting political class becomes weaker. In the model when institutions place strong constraints on politicians entrepreneurs are incentivized to choose economically productive activities, while when political institutions place few constraints on politicians then entrepreneurs will be incentivized to use the political system to transfer income and property rights to themselves. We then investigate how the effect of new economic opportunities are conditional on institutions.

Our interpretation of the most important institutions being the ones that constrain politicians comes from our reading of both the literature on the resource curse and frontier expansion. For example, García-Jimeno and Robinson (2011) specifically use constraints on the executive to measure institutional strength, directly analogous to our model and the historical evidence suggests it was precisely the ability of political elites to determine the allocation of frontier lands that determined its impact. Similarly, the index of institutional constraints used by Mehlum, Moene and Torvik (2006) is dominated by public sector outcome variables, such as corruption, which would ultimately be determined by the extent of constraints on politicians.

A traditional approach to investigate the effect of natural resources is to postulate some macro production function that describes how factor endowments map into aggregate income. In such an approach the effect of factor endowments follows from the assumptions captured by the production function. If the mapping from resources to aggregate income is weak, some exogenous parameters in the production function (such as technology) are to blame.

Although the marginal productivity of natural resources is key to understand the link between resource endowments and aggregate income, it does not tell the full story because there is limited scope for investigating how incentives to utilize the resources may be conditional on institutions. The marginal productivity of natural resources may be thought of as the impact effect of an increase in the factor endowments. Then, if there are no

additional effects the final effect coincides with the impact effect. In most instances, however, we would argue that such an understanding of the mapping from factor endowments to aggregate income is rather limited and often incorrect. We illustrate this with our simple model, where the aggregate effect of natural resources depends on the marginal productivity of resources interacted with the type of political institutions in place. We show that when institutions place strong constraints on the political elite the aggregate income effect is stronger than the impact effect. Even with full employment and no price rigidities we get a multiplier effect of resource endowments which resembles the one in the simplest closed economy Keynesian model, although for a very different reason.

When institutions do not place strong constraints on politicians an increase in the natural resource endowment also induces a multiplier effect - but the bad news is that in this case the multiplier has a negative sign. As a result, when institutions allow political entrepreneurs to extract rents the indirect negative effects of resource endowments are stronger than the positive impact effect, and aggregate income falls. Thus in our model the comparative statics of resource endowments in general, and the sign of the effect in particular, are conditional on the strength of institutions.

2.1 Factor endowments and technology

We assume a continuous mass of entrepreneurs normalized to size one, and denote by l the share of entrepreneurs in private production, where the remaining share $1 - l$ of entrepreneurs engage in politics. The endowment of natural resources in the economy is denoted by r. The distribution of these between the private and political entrepreneurs depends on the strength of institutions. In countries with strong constraints on politicians the ability of politicians to use their position so as to transfer property rights to resources to themselves are more limited than in countries with weak constraints. Here we model this in the very simplest way. Let the institutional strength be given by $\theta \in [0, 1]$. The stronger are institutions, the more constraints they place on politicians, the higher is θ. These constraints have the effect of reducing the ability of politicians to transfer property rights to themselves. Thus if institutions make it impossible for the political elite to transfer the property

rights to themselves we have the strongest checks possible, and we denote this by $\theta = 1$. The converse case, where politicians are not constrained at all, we denote by $\theta = 0$. For cases in between $\theta \in (0, 1)$.

Denote by r^p the amount of natural resources available to each entrepreneur in production and r^e the amount available to each politician (e for extraction). We assume

$$r^p = r^p(\theta, l),\ r^p_\theta(\theta, l) > 0,\ r^p(0, l) = 0,$$
$$r^e = r^e(\theta, l),\ r^e_\theta(\theta, l) < 0,\ r^e(1, l) = 0,$$

and where $r^p_\theta(\theta, l)$ denotes the derivative of $r^p(\theta, l)$ with respect to θ and so on. Thus the more constraints on political power, the less of the natural resources are appropriated by each political entrepreneur and the more is available to each producer. To proceed let

$$r^p(\theta, l) = \frac{\theta}{l} r \text{ and } r^e(\theta, l) = \frac{1-\theta}{1-l} r$$

where r is the total amount of resources available.

In the production sector the income or net production of a producer is given by

$$y = f(l, r^p(\theta, l)), \tag{1}$$

where $f_l(l, r^p),\ f_r(l, r^p) > 0$. More entrepreneurs in production means less entrepreneurs engaged in political rent extraction, which is favorable to each entrepreneur in production. More natural resources available to an entrepreneur in production increases his production and income.

The income of an entrepreneur engaged in political rent extraction is given by

$$x = g(l, r^e(\theta, l)), \tag{2}$$

where $g_l(l, r^e),\ g_r(l, r^e) > 0$. More entrepreneurs in the productive sector mean fewer political entrepreneurs to compete with and more productive entrepreneurs to transfer income from, which increases income for each politician. More natural resources available to each political entrepreneur increases the income of political rent extraction.[5]

Aggregate and per capita income in the economy is given by

$$Y = ly + (1 - l)x. \tag{3}$$

[5]Through affecting the property rights to natural resources institutional quality has a

2.2 Equilibrium

An equilibrium in this economy is defined as a situation where no entrepreneur has an incentive to switch activity. We assume the following assumption to be fulfilled:

Assumption 1: $f(0, r^p) > g(0, r^e)$ and $f(1, r^p) < g(1, r^e)$.

This assumption assumes that there is no specialization. The first of these inequalities implies that the income of a political entrepreneur is lower than the income of a producer if there are no producers, as then there are many political entrepreneurs to compete with but no producers to transfer income from. This is immediate from our assumptions about the allocation of natural resources since with θ and r exogenous as l goes to zero the per-capita amount of resources becomes unboundedly large as long as $\theta < 1$. What Assumption 1 thus add is just that also when $\theta = 1$ there is no specialization.

The second inequality implies that the income of a producer is lower than the income of a political entrepreneur if there are no political entrepreneurs, since then there are many producers to transfer income from and no political entrepreneurs to compete with. The second inequality Assumption 1 will always be fulfilled for $\theta > 0$ as again with our particular specification of how resources are allocated $f(1, r^p) < g(1, r^e)$ is implied by the per-capita resource allocations. The second inequality in Assumption 1 just says that the no specialization case also holds for $\theta = 0$.

Thus Assumption 1 implies that in any situation with specialization, some entrepreneurs have an incentive to switch activity, and specialization thus can not constitute an equilibrium.[6]

An implication from Assumption 1 is therefore that any equilibrium has a strictly positive number of political entrepreneurs and producers. The condition for equilibrium is simply:

$$y = x. \tag{4}$$

partial negative influence on income for productive entrepreneurs and a positive effect on income for entrepreneurs in political rent extraction. Obviously, institutions may in addition have negative impact on production and positive impact on rent extraction through additional channels. Adding on such effects would strengthen our qualitative conclusions.

[6]For a model on how natural resources affect income when there is also the possibility of specialization see Mehlum, Moene and Torvik (2006).

Also, note that (4) in combination with (3) implies that aggregate income in any equilibrium is simply given by

$$Y = y = x. \tag{5}$$

We define a locally stable equilibrium as:

$$y = x \text{ and } f_l(l, r^p) - f_r(l, r^p)\frac{\theta}{l^2}r < g_l(l, r^e) + g_r(l, r^e)\frac{(1-\theta)}{(1-l)^2}r. \tag{6}$$

To see why this is locally stable, assume that we start out with $y = x$ and then that for some reason l increases marginally. Then income for each entrepreneur in production increases by $f_l(l, r^p) - f_r(l, r^p)\frac{\theta}{l^2}r$. The first term here is just the direct effect of output while the second (negative) term comes from the fact that when the number of producers goes up the per-capita endowment of resources in the production sector goes down. The income for each political entrepreneur changes by $g_l(l, r^e) + g_r(l, r^e)\frac{(1-\theta)}{(1-l)^2}r$ where the second (positive) term captures the fact that when the number of productive sector agents goes up the per-capita resource endowment of those left in politics goes up making politics even more attractive. When (6) holds the income increases more for political entrepreneurs than for producers, which means that the number of producers falls and the number of political entrepreneurs increases until we are back at the initial situation where $y = x$.

We conversely define an unstable equilibrium as

$$y = x \text{ and } f_l(l, r^p) - f_r(l, r^p)\frac{\theta}{l^2}r > g_l(l, r^e) + g_r(l, r^e)\frac{(1-\theta)}{(1-l)^2}r. \tag{7}$$

When (7) holds a marginal increase in l from a situation with $y = x$ implies that the income of producers have become higher than the income of political entrepreneurs, and thus the initial movement out of equilibrium has a positive feedback on itself, increasing the number of producers even more, lowering the number of political entrepreneurs even more, and so on.

Assumption 1 implies that there always exists at least one stable equilibrium. There may not exist unstable equilibria. If there exists unstable equilibria, the number of stable equilibria always exceeds the number of unstable equilibria by one.

Moreover to study the most interesting case which is in line with our motivation above we assume the following:

Assumption 2: $f_l(l, r^p) - f_r(l, r^p)\frac{\theta}{l^2}r > 0$ (in equilibrium).

This assumption says that other things equal less political entrepreneurs in rent extraction is good for entrepreneurs in production. Less entrepreneurs in rent extraction has two effects on the income of a productive entrepreneur. The direct effect of less entrepreneurs engaged in political rent extraction is favorable for producers and is captured by the term $f_l(l, r^p)$. An indirect effect is also operating, however, since less entrepreneurs in rent extraction means more productive entrepreneurs in production and thus for a given θ less natural resources available to each of them. Assumption 2 thus simply says that (in equilibrium) the direct effect dominates.[7]

In Figure 1 we see the case of a unique stable equilibrium. The number of entrepreneurs engaged in production is measured from left to right on the horizontal axis, while the entrepreneurs in politics is measured from right to left. The income of an entrepreneur is measured on the vertical axis. Aggregate income is simply given by the vertical distance from the horizontal axis to the intersection of the $f(l, r^p)$ and $g(l, r^e)$ curves (due to the number of entrepreneurs being normalized to unity).

Figure 2 shows a case with two locally stable and one locally unstable equilibria. All our comparative statics results will be valid around any stable equilibrium.

2.3 Institutions and aggregate income

It is already clear that improved institutions has the partial effect of increasing income for an entrepreneur in production and decreasing income for a political entrepreneur. To find the general equilibrium effect of improved institutions we substitute from (1) and (2) in (4), and then by differentiating we find the effect on the allocation of entrepreneurs to be

$$dl = \frac{f_r(l, r^p)\frac{r}{l} + g_r(l, r^e)\frac{r}{1-l}}{g_l(l, r^e) + g_r(l, r^e)\frac{(1-\theta)}{(1-l)^2}r - f_l(l, r^p) + f_r(l, r^p)\frac{\theta}{l^2}r}d\theta. \tag{8}$$

Recall that the due to (6) the denominator is positive, and also recall that $r^e_\theta < 0$. Thus, institutions with stronger constraints on politicians increase

[7]Note however that all the analytics of the model to follow is valid also in the case where Assumption 2 does not hold. We discuss the results when Assumption 2 does not hold below.

the number of productive entrepreneurs and decrease the number of political entrepreneurs.

To economize on notation we in the following use f_r instead of $f_r(l, r_p)$ and so on, and moreover we let $c(\theta)$ be defined by

$$c(\theta) \equiv \frac{f_l - f_r \frac{\theta}{l^2} r}{g_l + g_r \frac{(1-\theta)}{(1-l)^2} r}.$$

Note that in light of Assumption 1 and Assumption 2, $c(\theta) \in (0, 1)$.

By (1) and (8) the effect on income for each productive entrepreneur is then given by

$$\begin{aligned} dy &= f_r \frac{r}{l} d\theta + \left(f_l - f_r \frac{\theta}{l^2} r \right) \left(\frac{f_r \frac{r}{l} + g_r \frac{r}{1-l}}{g_l + g_r \frac{(1-\theta)}{(1-l)^2} r - f_l + f_r \frac{\theta}{l^2} r} \right) d\theta \\ &= \frac{1}{1 - c(\theta)} \left[f_r \frac{r}{l} + c(\theta) g_r \frac{r}{1-l} \right] d\theta. \end{aligned}$$

Then by (5) the effect on aggregate income from institutions that place stronger checks on politicians is also given by

$$\frac{dY}{d\theta} = \frac{dy}{d\theta} = \frac{dx}{d\theta} = \underbrace{\frac{1}{1 - c(\theta)}}_{\text{Multiplier effect}} \left(f_r \frac{r}{l} + c(\theta) g_r \frac{r}{1-l} \right) > 0,$$

since all terms on the right hand side are positive. Institutions that place stronger constraints on political entrepreneurs increase aggregate income, and this increase is magnified by a multiplier effect. More constraints on politicians mean that entrepreneurs are incentivized to shift from political rent extraction to production. In turn, the lower number of entrepreneurs in political rent extraction and the higher number of entrepreneurs in production increases the payoff in production further, making even more entrepreneurs shift from rent extraction to production, explaining why the increase in income is higher than the partial effect of institutions on the income of productive entrepreneurs.[8]

[8] Also note that if Assumption 2 does not hold then the effect of institutions is still positive, but since in this case $c(\theta)$ is less than zero we do not have a multiplier effect, and the income inducing effects of strong institutions are thus weaker.

2.4 Institutional Comparative Statics

We have already seen that institutions that place constraints on politicians have a strong effect on aggregate income - thus countries with such institutions are likely to have a much higher income level than countries where institutions do not place constraints on politicians. We now investigate how countries with different institutions respond to a new discovery of natural resources. As we will see, the effect of a discovery of new natural resources is conditional on the institutions in place. With strong constraints on politicians new economic opportunities map into higher aggregate income, with weak constraints on politicians new economic opportunities map into lower aggregate income. Thus initial differences due to institutional quality are magnified with new economic possibilities - the same economic possibilities across countries lead to further divergence in income levels. Moreover, compared to traditional approaches where the effect of natural resources is simply given by the marginal productivity of resources, the present simple setting differs in that with strong institutions we get a more optimistic picture while with weak institutions we get a more pessimistic picture.

To illustrate this in a simple and intuitive way we start out with the cases of $\theta = 1$ and $\theta = 0$, before we turn to a more general case where $\theta \in (0, 1)$.

2.4.1 Institutions with strong political constraints

When an increased amount of natural resources r is channeled into the productive sector of the economy, $\theta = 1$, each productive entrepreneur gets higher factor endowments:

$$dr^p|_{\theta=1} = \frac{1}{l}dr.$$

Inserting from (1) and (2) in (4), by differentiating we find the effect on the allocation of entrepreneurs to be

$$dl|_{\theta=1} = \frac{f_r}{g_l - f_l + f_r \frac{r}{l^2}} \frac{1}{l} dr.$$

By (1) the effect on income for each productive entrepreneur is then given by

$$dy|_{\theta=1} = f_r \frac{1}{l} dr + \left(f_l - f_r \frac{\theta}{l^2} r \right) dl|_{\theta=1} = \frac{1}{1 - c(1)} \frac{f_r}{l} dr,$$

and by (5) we find the effect on aggregate income from more natural resources as

$$\frac{dY|_{\theta=1}}{dr} = \frac{dy|_{\theta=1}}{dr} = \frac{dx|_{\theta=1}}{dr} = \underbrace{\frac{1}{1-c(1)}}_{\text{Multiplier effect}} \frac{f_r}{l} > \frac{f_r}{l}.$$

Thus we see that with strong constraints on politicians the effect of an increased amount of natural resources is stronger than the isolated effect through the marginal productivity. The reason for this is that when institutions are strong an increase in resource endowments initially increases profitability among productive entrepreneurs in the economy, but not for entrepreneurs engaged in political rent extraction. As a result natural resources crowds more entrepreneurs into the productive sector and out of political rent extraction. In turn, the weakening of political entrepreneurs means that income in the productive sector increases not only as a result of more natural resources, but also as a result of less political rent extraction. This attracts even more entrepreneurs into the productive sector, and so on. Thus, although we have full employment, institutions with strong constraints on politicians ensure that resource endowments induce a multiplier effect.[9] We see from the definition of $c(\theta)$ that the multiplier is higher the higher is the income effect of productive entrepreneurs in production f_l relative to the effect on the income of political entrepreneurs g_l. The intuition for this is that in such a case as a large reallocation of entrepreneurs from the political to the productive part of the economy takes place, in turn making the increase in income strong.

This result can also be given a graphical representation. In Figure 3 the income curves for producers and political entrepreneurs are depicted. With $\theta = 1$ an increased amount of natural resources shifts the income curve for producers up with the distance f_r/l which represents the impact effect. We see that the new equilibrium is at a higher level than the increase represented by the impact effect, which is the result of the allocation of entrepreneurs induced multiplier.[10]

[9] The reason this process in not unstable is that the income of production increases less than the income of rent-seeking when l increases, and thus at some point at a higher level of income than the one represented by the impact effect the arbitrage condition $y = x$ is again fulfilled.

[10] Again, note that if Assumption 2 does not hold then the effect on income is still

We have seen that, conditional on institutions placing strong constraints on politicians, the income effect of resources in the present model is stronger than what an analysis based solely on the marginal productivity of resources would suggest. The general equilibrium effect is not captured simply by adding up the microeconomic income effects of more natural resources.

2.4.2 Institutions without political constraints

When $\theta = 0$ a new discovery of natural resources benefits politicians as each political entrepreneur has access to more natural resources than before:

$$dr^e|_{\theta=0} = \frac{1}{1-l}dr.$$

Again, inserting from (1) and (2) in (4), by differentiating we find the effect on the allocation of entrepreneurs as

$$dl|_{\theta=0} = -\frac{g_r}{g_l + g_r \frac{r}{(1-l)^2} - f_l} \frac{1}{1-l} dr.$$

By (2) the effect on income for each political entrepreneur is then given by

$$\begin{aligned} dx|_{\theta=0} &= g_r dr^e|_{\theta=0} + \left(g_l + g_r \frac{r}{(1-l)^2} \right) dl|_{\theta=0} \\ &= \left(1 - \frac{1}{1-c(0)} \right) \frac{g_r}{1-l} dr. \end{aligned}$$

Then by (5) we find the effect on aggregate income from more natural resources as

$$\frac{dY|_{\theta=0}}{dr} = \frac{dy|_{\theta=0}}{dr} = \frac{dx|_{\theta=0}}{dr} = \left(1 - \frac{1}{\underbrace{1-c(0)}_{\text{Multiplier effect}}} \right) \frac{g_r}{1-l} < 0.$$

Thus, maybe surprisingly, when institutions do not place constraints on politicians more natural resources imply not higher but lower aggregate income. The intuition for this result is as follows. When there is more natural resources the impact effect is that the income of political entrepreneurs

positive, but since in this case $c(\theta)$ is less than zero we do not have a multiplier effect, and the effect in income is less than f_r/l. This can also easily be seen graphically since in this case the curve for entrepreneurs in production is downward sloping.

increases. The impact effect pulls in the direction of increased aggregate income. However, there is an additional multiplier effect which has the opposite sign: as a result of political rent extraction becoming relatively more profitable, entrepreneurs shift from production to politics. As a result, after the initial increase in income due to the impact effect, (average) income per political entrepreneur starts falling. Consider the case where the income in political rent extraction has fallen back to its initial value. Would this be sufficient to stop the outflow of entrepreneurs from production? The answer to this question is no, and the reason is that since at this point we have less productive entrepreneurs and more political entrepreneurs, income for productive entrepreneurs is lower than it was initially. Thus at this point the *relative* income in political entrepreneurship is still higher than in productive entrepreneurship, and even more entrepreneurs flow out of production and into politics. It follows that aggregate income must have fallen: each productive entrepreneur has the same amount of natural resources as before, but the political entrepreneurs are stronger than before, and thus income for each productive entrepreneur must be lower than initially. Since the income of each political entrepreneur in the new equilibrium is the same as the income of a productive entrepreneur, also income for each political entrepreneur must have fallen. Thus aggregate income is lower.

Again we have a multiplier effect, but when there are no constraints on political behavior the multiplier effect is negative, and more than outweighs the positive impact effect of the increase in natural resource endowments.

Also this result can be given a graphical representation. In Figure 4 with $\theta = 1$ an increased amount of natural resources shifts the income curve for political entrepreneurs up with the distance g_r/l which represents the impact effect. However as seen from the figure aggregate income in the new equilibrium is not only lower than what is the case after the impact effect, it is also lower than in the initial equilibrium. As seen, the explanation for this is the negative multiplier effect that the change in the allocation of entrepreneurship sparks off.[11]

[11] Note that if Assumption 2 does not hold then total income can not go down with more natural resources, since then c is negative. Again, this can also easily be seen graphically since in this case the curve for entrepreneurs in production is downward sloping and for this reason more resources can not push total income down.

Thus, the country with the weakest institutions and the lowest income initially will find income further reduced with the discovery of new resources, while the country with strongest institutions and highest income will experience increased income. For both reasons, the initial income difference is magnified with the discovery of new resources. Conditional on institutions, similar new economic opportunities in different countries may lead the countries to diverge.

2.4.3 Intermediate institutions

Assume now that we get an increase in natural resources which is distributed according to

$$dr^p = \frac{\theta}{l}dr, \;\; dr^e = \frac{1-\theta}{1-l}dr.$$

Thus the stronger constraints there are on political entrepreneurs the more of the increase in natural resources is allocated to entrepreneurs in production and the less to political entrepreneurs.

The allocation of entrepreneurs is then changed according to

$$dl = \frac{f_r\frac{\theta}{l} - g_r\frac{1-\theta}{1-l}}{g_l + g_r\frac{(1-\theta)}{(1-l)^2}r - f_l + f_r\frac{\theta}{l^2}r}dr, \tag{9}$$

and the effect on aggregate income is given by

$$\frac{dY}{dr} = \frac{dy}{dr} = \frac{dx}{dr} = f_r\frac{\theta}{l} + \left(f_l - f_r\frac{\theta r}{l^2}\right)\frac{f_r\frac{\theta}{l} - g_r\frac{1-\theta}{1-l}}{g_l + g_r\frac{(1-\theta)}{(1-l)^2}r - f_l + f_r\frac{\theta}{l^2}r}. \tag{10}$$

Defining the resource curse as a situation where $dY/dr < 0$, we can then find a critical level of the quality of institutions which we denote by θ^*, where if $\theta < \theta^*$ more resources are a curse while if $\theta > \theta^*$ more resources are a blessing. Inserting $dY/dr = 0$ in (10) we can implicitly define a critical level of θ, denoted θ^*, such that

$$f_r\frac{\theta}{l} + \left(f_l - f_r\frac{\theta r}{l^2}\right)\frac{f_r\frac{\theta}{l} - g_r\frac{1-\theta}{1-l}}{g_l + g_r\frac{(1-\theta)}{(1-l)^2}r - f_l + f_r\frac{\theta}{l^2}r} = 0.$$

After some calculation, and inserting for the definition of c, we find

$$\theta^* = \frac{1}{1 + \frac{1}{c(\theta^*)}\frac{f_r(1-l)}{g_r l}} \tag{11}$$

We see that (10) implicitly defines a $\theta^* \in (0,1)$.[12]

Thus if $\theta > \theta^*$ there is a resource curse while if $\theta < \theta^*$ there is not a resource curse.

2.5 Productive Politicians

In this subsection we extend our basic framework to allow those engaged in politics to also take socially efficient actions. In such a case more politicians also have positive effects on the income of productive entrepreneurs. Thus now let income per entrepreneur in the production sector be given by

$$y = f(l, r^p(\theta, l)) + \delta(1-l), \tag{12}$$

where $\delta > 0$ represents the income gain for a productive entrepreneur from an additional politician. To see how this affects the model assume to save notation that we are in the case where $\theta = 0$ so that all natural resources accrue to the politicians.

Then inserting from (12) and (2) in (4), by differentiating we find the effect on the allocation of entrepreneurs to be

$$dl|_{\theta=0} = -\frac{g_r}{g_l + g_r \frac{r}{(1-l)^2} - f_l + \delta} \frac{1}{1-l} dr.$$

By (2) the effect on income for each political entrepreneur is then given by

$$\begin{aligned} dx|_{\theta=0} &= g_r dr^e|_{\theta=0} + \left(g_l + g_r \frac{r}{(1-l)^2}\right) dl|_{\theta=0} \\ &= \left(1 - \frac{1}{1 - c(0) + \frac{\delta}{g_l + g_r \frac{r}{(1-l)^2}}}\right) \frac{g_r}{1-l} dr. \end{aligned}$$

[12] θ^* is implicitly defined in (11) since the right hand side of the equation is also dependent on θ. However a $\theta^* \in (0,1)$ that solves (11) will always exist. To see this note that if $\theta = 0$ then the left hand side of (11) is smaller than the right hand side of (11), while if $\theta = 1$ the left hand side of (11) is larger than the right hand side. Thus since both the left and right hand sides of (11) are continous in θ, by the Intermediate Value Theorem there must exist a $\theta^* \in (0,1)$ that solves (11). In the continuation we assume that the θ^* that solves (11) is unique.

Then by (5) we also find the effect on aggregate income from more natural resources to be

$$\frac{dY|_{\theta=0}}{dr} = \frac{dy|_{\theta=0}}{dr} = \frac{dx|_{\theta=0}}{dr} = \left(1 - \frac{1}{1 - c(0) + \frac{\delta}{g_l + g_r \frac{r}{(1-l)^2}}}\right) \frac{g_r}{1-l}.$$

Thus when politicians also take socially efficient actions income will increase with more resource abundance when

$$\frac{\delta}{g_l + g_r \frac{r}{(1-l)^2}} > c(0),$$

which can be seen to be equivalent to

$$\delta > f_l.$$

Thus when the socially efficient actions of the politicians are sufficient to outweigh the socially destructive actions through transferring income to the political elite, more resources increases income. If the opposite is the case, we have a resource curse also when politicians provide socially beneficial services.

2.6 Entry Barriers

In our baseline model there is free entry into any profession. In this subsection we investigate the results in our model when there are entry barriers. We investigate this in a simple way by assuming that entrepreneurs who switch profession have to incur a cost, and the stronger are entry barriers the higher is this cost.

Consider first the case with strong political constraints, $\theta = 1$. It is straightforward to see that when it is costly to switch from politics to production the upward shift in the curve for producers in Figure 3 is smaller, resulting in a smaller increase in income from more natural resources. Thus when institutions are strong entry barriers are costly from the point of view of society.

Consider next the case of institutions without political constraints, $\theta = 0$. In this case the upward shift in the curve for politicians in Figure 4 is smaller, resulting in a weaker resource curse than what would otherwise have been

the case. Thus when institutional constraints are weak then entry barriers (into politics) are conducive to prosperity.

Finally consider the case where entry barriers are so strong that entrepreneurs never switch activity. In such a case we can never have a resource curse as the income response to more resources is given by

$$\frac{dY}{dr} = f_r\theta + g_r(1-\theta) > 0,$$

i.e. the income effect of natural resources is simply the aggregate of the marginal productivities. Thus in our model the view that the mapping from factor endowments to aggregate income and development is covered by adding up the income responses found in microeconomic estimates only holds when entry barriers are excessive.

2.7 Endogenous institutions

Admittedly, we have interpreted institutional strength in a very simple manner, where we have just assumed that in countries with strong institutions increased resource endowments are channeled into the productive sector while in countries with weak institutions they are not. Even with this simple assumption, however, we get stark results. Taking mechanisms related to institutions being endogenous to resources, we believe would strengthen our results further. Thus consider the case claimed by some researchers that institutional strength is not exogenous but endogenous to resource endowments.[13] If this is the case, it is reasonable to assume that it is easier to tear down weak institutions than strong institutions. Then the difference in economic outcomes may clearly be stronger than in the simple model above. When institutions are weak in the first place then more natural resources not only push aggregate income down through the effect studied above, but the increased resources weaken institutions further, magnifying the negative effects. Then the difference in aggregate income conditional on institutions is even stronger than our simple model predicts.

Moreover, some researchers, e.g. Acemoglu, Johnson and Robinson (2005a), argue that when initial institutions are strong then new economic opportu-

[13] There is a very large literature on this going back to the notion of the 'rentier state' first proposed by Mahdavy (1970).

nities are likely to politically strengthen the merchant groups relative to the political elite, in turn making the constraints on the political elite, and by implication growth, even stronger. In our model such an effect could easily be incorporated by having $\theta = \theta(l)$ with $\theta_l(l) > 0$. Incorporating this would induce an institutional multiplier, where when initial institutions were strong new economic opportunities would make them stronger, while where initial institutions were weak new economic opportunities would make them weaker.

2.8 Implications for empirical strategy

Although very simple, the above analysis indicates that the mapping from resource endowments, or more generally economic opportunities of many forms, to income should not be studied independently of institutions. Moreover, the *interaction* of institutional quality and resource endowments and opportunities is the crucial thing. Failing to condition the effect of resource abundance on the quality on institutions means that one estimates the average effect of oil in Norway and Nigeria, which may not be very interesting nor relevant. Although obvious, this point often seems to be overlooked in empirical analysis. One example of this is the much celebrated Sachs and Warner (1995) paper, who in a cross section of countries looks at the *average* effect of resource abundance. Moreover, according to these authors since there is no strong effect from resource abundance on bureaucratic efficiency (their measure of institutional quality) they conclude that the negative effect of resource abundance on growth (p. 19) "does **not** appear to work through the bureaucracy effect" (bold in original). However, as clarified by the model above and as discussed by Mehlum, Moene and Torvik (2006), failing to find that institutions is endogenous to resources is something different than claiming that the resource curse does not operate through institutional quality. Indeed, as we have discussed, there is reason to believe that a number of cases where divergence in the mapping from economic opportunities to aggregate income is observed, can be explained by countries having different institutions. This is so even if institutions are not endogenous to factor endowments, as illustrated in the simple model above.

3 Historical episodes and empirical results

In addition to the impact of natural resources and frontier lands, there are a number of other historical examples and empirical results that indicate that the mapping from factor endowments or economic opportunities to aggregate income and development is not simply covered by adding up the income responses found in microeconomic estimates. The general equilibrium effects are likely to be conditional on the nature of institutions.

3.1 The Transition from Feudalism to Capitalism

What caused the transition to capitalist away from the feudal world? This is a question which has attracted the attention of scholars for many generations and much of the historical debate anticipates the notion of conditional comparative statics (see Hatcher and Bailey, 2001, for an overview of the debate). For example, Pirenne (1937) argued that the decline of feudal institutions such as serfdom was due to the spread of market exchange and the money economy. Yet Postan (1937, 1944) quickly pointed out that the most dramatic fall in feudalism occurred after the Black Death when trade and markets contracted. He also noted that expanding trade in the late medieval period also did not necessary lead to declining serfdom. For instance the expansion of the Baltic wheat trade came along with intensified serfdom in the supplying areas of the eastern Baltic. Though Pirenne could point to examples where expanding trade and marketization had led to better institutions and economic growth, Postan could point to other examples with the opposite conclusion.

Postan himself then proposed an alternative explanation for the emergence of capitalism - the demographic collapse of the Black Death. He argued that is was the collapse of the European population in the 1340s, by possibly 40-50%, which led to the end of serfdom by dramatically increasing the bargaining power of labor (an argument picked up by North and Thomas, 1973). Yet as Brenner (1976) observed, while demographic collapse may have led to better institutions in Western Europe, in Eastern Europe it went along with worse institutions and the so-called 'Second Serfdom'. Although

demographic trends were similar all over Europe[14] and

> "it is true that ... in most of Western Europe serfdom was dead by the early sixteenth century. On the other hand, in Eastern Europe, in particular Pomerania, Brandenburg, East Prussia and Poland, decline in population from the late fourteenth century was accompanied by an ultimately successful movement towards imposing extra-economic controls, that is serfdom, over what had been, until then, one of Europe's freest peasantries. By 1500 the same Europe-wide trends had gone a long way towards establishing one of the great divides in European history, the emergence of an almost totally free peasant population in Western Europe, the debasement of the peasantry to unfreedom in Eastern Europe." (Brenner, 1976, p. 41).

What can explain these divergent outcomes? Brenner notes (p. 51): "It was the logic of the peasant to try to use his apparently improved bargaining position to get his freedom. It was the logic of the landlord to protect his position by reducing the peasants' freedom." The outcome "obviously came down to a question of power" (p. 51); whether the peasants or the lords had more political power determined whether serfdom declined or became stronger.

Although we are far from an understanding of the determinants of the relative structure of political power in different parts of Europe, Brenner suggests that an important element was the "patterns of the development of the contending agrarian classes and their relative strength in the different European societies: their relative levels of internal solidarity, their self-consciousness and organization, and their general political resources—especially their relationships to the non-agricultural classes (in particular, potential urban class allies) and to the state" (p. 52). To substantiate this view, Brenner studies how villages tended to be organized differently in Eastern Europe, there was "more of a tendency to individualistic farming; less developed organization of collaborative agricultural practices at the level of

[14]This is the current conventional wisdom amongst historical demographers, see Benedictow (2004).

the village or between villages; and little of the tradition of the 'struggle for commons rights' against the lords which was so characteristic of western development" (p. 57). This differential organization was due to the process of initial occupation of these Eastern lands.

In other words the impact of the Black Death was conditional on the initial institutional equilibrium.

3.2 Economic Growth in Early Modern Europe

Modern economic growth began with the British industrial revolution which started around 1750. But Britain began to grow economically before this. Indeed, both it and the Netherlands began to experience sustained if slow economic growth from at least the mid 17th century onwards. This was closely linked to the new trade and colonial opportunities represented by the Americas and the expansion of demand for new products such as sugarcane and tobacco. These new economic opportunities and the Atlantic economy which developed from them has long been seen as central to the economic success of pre-industrial Europe which itself has been seen as essential for the industrial revolution (Allen, 2008, for the latter argument). Many arguments have been made about the mechanism via which trade may have mattered (Morgan, 2001, for a survey). It could have been though the profits of the slave trade (Williams, 1944), or it could have been that slave plantations were good markets for exports of manufactured goods or that the natural resource endowments of the Americas relaxed constraints in Europe (Pomeranz, 2000).

Yet the Americas represented a new economic opportunity and potential resource boom for all European countries. Indeed, the British and the Dutch were latecomers in the race, the Spanish and Portuguese already having had large American empires for over a century before either country began to expand economically. So the Americas potentially benefitted all European powers, but growth only happened in some. In fact Spain actually declined economically during the early modern Period (Ávarez-Nogal and Prados De La Escosura, 2007).

An interpretation of these facts is proposed in Acemoglu, Johnson and Robinson (2005a). They show that while economic growth in early modern Europe is on average positively correlated with involvement in Atlantic trade

and colonial activities, the effects are heterogeneous. In particular when one examines the conditional relationship between initial institutions, measured by constraints in the executive in 1500, one finds that the positive effect of Atlantic trade comes in countries which initially had strong institutions (relatively high levels of constraints on the executive[15]), such as Britain and the Netherlands. For those with weak initial institutions (low constraints on the executive), such as Spain or France, there is no such effect. This is again an example of institutional comparative statics.

3.3 The First Wave of Globalization

The British industrial revolution and those that followed it created a wave of globalization in the late nineteenth century (O'Rourke and Williamson, 1999). For many commodity exporting countries, such as those in the Americas, this created a huge improvement in their terms of trade. However, the effects of this boom were very different in different contexts. In the United States the traditional historiography sees these movements in relative prices and trade patterns as promoting the development of the country, for instance the expansion of Chicago as the hub for Midwestern farming exports. Yet the Latin American story is quite different. Though in most countries globalization did indeed lead to economic growth the impact of this on inequality, real wages, average living standards and institutions was quite different. In fact in many places a dynamic akin to the Second Serfdom of Eastern Europe emerged (Nugent and Robinson, 2010).

A salient example is what happened in Guatemala. As the world price of coffee rose and international trade expanded, there were huge profits to be made. In 1871, the long-lasting regime of the dictator Rafael Carrera was finally overthrown by a group of people calling themselves 'Liberals,' after the worldwide movement of that name. Led initially by Miguel Garcia Grenados, and after 1873 by Justo Rufino Barrios, the Guatemalan Liberals implemented a huge re-organization of the economy to exploit coffee. Coffee production needed two things, land and labor. To create land for coffee farms, the Liberals pushed through land privatization, a 'land grab' in which they would be able to capture land previously held communally or by the

[15] As constructed by the authors using the definition of the Poliy dataset.

government. Between 1871 and 1883, nearly 1 million acres of land, mostly indigenous communal land and frontier lands, passed into the hands of the elite, and it was only then that coffee developed rapidly. The privatized lands were auctioned off typically to members of the oligarchy or those connected with them. The coercive power of the state was then used to help large landowners gain access to labor. To do this, they adapted and intensified various systems of forced labor. In November 1876, President Barrios wrote to all the governors of Guatemala noting that

> "Because the country has extensive areas of land that it needs to exploit by cultivation using the multitude of workers who today remain outside the movement of development of the nation's productive elements, you are to give all help to export agriculture:
>
> 1. From the Indian towns of your jurisdiction provide to the owners of fincas [farms] of that department who ask for labor the number of workers they need, be it fifty or one hundred" (McCreery, 1994, pp. 187-188).

The repartimiento, the forced labor draft, had never been abolished after independence, but now it was increased in scope and duration. It was institutionalized by Decree 177 in 1877, which specified that employers could request and receive from the government up to 60 workers for fifteen days of work if the property was in the same department, and for thirty days if it was outside it. The request could be renewed if the employer wanted to. These workers could be forcibly recruited unless they could demonstrate from their personal workbook that such service had recently been performed satisfactorily. All rural workers were also forced to carry a workbook, called a 'libreta,' which included details of who they were working for and a record of any debts. Many rural workers were indebted to their employers and an indebted worker could not leave his current employer without permission. Decree 177 further stipulated that the only way to avoid being drafted into the repartimiento was to show you were currently in debt to an employer. Workers were trapped. In addition to these laws, numerous vagrancy laws were passed so that anyone who could not prove he had a job would be immediately recruited for the repartimiento or other types of forced labor on

the roads, or would be forced to accept employment on a farm. As in 19th and 20th century South Africa, land policies after 1871 were also designed to undermine the subsistence economy of the indigenous peoples, to force them to work for low wages. David McCreery (1976, 1994) a historian of rural Guatemala, argues that

> "taking away or reducing the land belonging to Indians was an effective way of creating a low wage labor force ... In the 1870s and 1880s insufficient cheap labor was a ... barrier to the expansion of coffee. The incorporation into the latifundia of Indian village lands ... helped to create rural unemployment by forcing families into marginal areas or leaving them without access to sufficient land. Such conditions were precisely those prerequisites to the laws of vagrancy and debt servitude favored by the Liberals for mobilizing the cheap labor."

The repartimiento lasted until the 1920s; the libreta system and the full gamut of vagrancy laws were in effect until 1945 when Guatemala experienced its first brief flowering of democracy.

The pattern exhibited in Guatemala happened elsewhere, in Bolivia and Peru and Mexico. Indeed, Coatsworth (1974) showed that in Mexico the expansion of the railway system was correlated with uprisings and rebellions caused by the expropriation of the lands made more valuable by improved infrastructure. We have no real evidence on living standards outside of Mexico but the evidence there suggests that during the long economic expansion which took place under the dictator Porfirio Diaz between 1878 and 1910 real wages fell (Gómez-Galvariatto, 1998) as did the stature of military recruits (López-Alonso, 2007).

The impact of globalization on nineteenth century Americas is another example of conditional comparative statics. Where institutions were initially strong, as in the United States, globalization promoted economic growth, improved institutions and living standards. Where institutions were initially weak, as in much of Latin America, although globalization did go along with increased income per-capita it also led to massive inequality, institutional deterioration and falling average wages. It is also worth noting that the economic growth of the 'Profiriato' was followed by the Mexican Revolution.

Perhaps the most devastating example of this phenomenon is the impact on West Africa of the abolition of the slave trade in 1807 (see Acemoglu and Robinson, 2010, 2011, and the essays in Law ed. 1995). In the place of the slave trade came 'legitimate commerce,' a phrase coined for the export from Africa of new commodities not tied to the slave trade. These goods included palm oil and kernels, peanuts, ivory, rubber and gum arabic. The Industrial Revolution in Europe created new commercial opportunities in Africa just as they did in Latin America but they did so in a peculiar context where slavery had become a way of life but the external demand for slaves had suddenly dried up. Instead of selling the slaves to Europeans, many of them were now profitably put to work in Africa producing the new items of legitimate commerce.

One of the best documented examples of this is in Asante in modern Ghana (Austin, 2002, 2005). Prior to 1807, the Asante Empire had been heavily involved in the capturing and export of slaves, bringing them down to the coast to be sold at the great slaving castles of Cape Coast and Elmina. After 1807, with this option closed off, the Asante political elite re-organized their economy. Slaving and slavery did not end. Rather slaves were settled in large plantations, initially around the capital city of Kumase, but later spread throughout the empire (corresponding to most of modern interior Ghana). They were employed in the production of gold and kola nuts for exports, but also grew large quantities of food and were intensively used as porters since Asante did not use wheeled transportation. Further east similar adaptations took place. In Dahomey, for example, the King had large palm oil plantations near the coastal ports of Whydah and Porto Novo, all based on slave labor.

Even if the trade outside of Africa finished, that did not alter many of the political institutions it had wrought in the previous two centuries and did not restore incentives to produce and invest in these societies. As a result of these developments, rather than contracting, the extent of slavery appears to have expanded in Africa throughout the 19th century. Though accurate figures are hard to come by, a number of existing accounts written by travellers and merchants during this time suggest that in the West African kingdoms of Asante or Dahomey and in the Yoruba city states well over half of the

population were slaves (Lovejoy, 2000, p. 174). More accurate data exist from early French colonial records for the Western Sudan, a large swathe of Western Africa stretching from Senegal, via Mali and Burkina Faso, to Niger and Chad. In this region 30 percent of the population were slaves in 1900 (see Lovejoy, 2000, p. 192).

Here we see another example of a potential positive shock, in the form of expanding markets for tropical products and reduced transportation crops ending up with very adverse effects on African societies because of the way they interacted with the initial institutional equilibrium.

3.4 Foreign Aid

Finally, we note that the literature on the impact of foreign aid on economic growth also has very similar findings. Burnside and Dollar (2000), for example, finds that in countries with bad economic policies foreign aid has no impact on economic growth growth. However, when policies are good foreign aid and growth are positively correlated.

4 Concluding remarks

In this paper we have developed the idea that economists have been too ambitious in trying to develop simple models of the comparative static effects of resource endowments and new economic opportunities. Even political scientists are tempted. For example, the debate in economics on the impact of natural resources on economic growth is closely mirrored by one in political science about the impact on democracy. Some claim natural resources cause authoritarianism (Ross, 2001), some that is causes democracy (Karl, 1997), others that it has no impact on either (Haber and Menaldo, 2011). All look for average effects. Yet Luong and Weinthal (2010) present a conditional resource curse where the impact of resources, particularly oil, is conditional on ownership structure. For instance, state ownership is associated with a resource curse. They argue that the form of ownership structure depends on the availability of different fiscal possibilities and the nature of political conflict in society. This is an argument closely related to the one in this

paper.[16]

Though trying to show that natural resources creates booms or democracy, or the opposite, might be sharp and appealing, even basic microeconomic theory suggests that there would be conditional and heterogeneous effects. Such effects might have nothing to do with institutions, in the same way that the standard comparative static results of international trade theory are conditional on factor intensities. However, in this paper we have argued that in many well studied cases it is the nature of institutions which determines the comparative statics of an equilibrium. This emphasis is natural given the existing consensus about the dominant role institutional differences play in determining comparative patterns of economic development.

Of course there are many institutions which might be relevant and which are relevant may itself depend on the context. Following a great deal of research we have emphasized the strength or weakness of institutions which place checks and balances or constraints on political leaders. The argument that these are crucial for a well functioning society was clearly recognized by the formulators of the constitution of the Roman Republic, received articulate modern treatments from Montesquieu and James Madison in the 18th century and has been central to the work of Douglass North and his collaborators. It is also central to many of the empirical studies which inspired this paper. We developed a simple model to illustrate how comparative statics may be conditional on the strength of institutions and emphasized how this can help to reconcile many historical and empirical studies. The model was extremely reduced from and based on the allocation of talent in society and in particular the allocation between productive and non-productive activities, which we associated with 'politics'. Although simple, we believe the theoretical approach brings with it a number of insights which has implications for empirical design, the understanding of economic history, as well as the general question of how resource endowments and new economic opportunities map into aggregate incomes.

[16]Dunning (2008) injected an early piece of nuance into this literature by developing a theoretical model where there are different mechanisms linking oil wealth to democracy the strength of which is conditional on inequality.

5 References

Acemoglu, Daron (1995) "Reward Structures and the Allocation of Talent," *European Economic Review*, 39, 17-33.

Acemoglu Daron, Davide Cantoni, Simon Johnson and James A. Robinson (2009) "From Ancien Régime to Capitalism: The Spread of the French Revolution as a Natural Experiment," in Jared Diamond and James A. Robinson eds. Natural Experiments in History, Cambridge: Harvard University Press.

Acemoglu Daron, Davide Cantoni, Simon Johnson and James A. Robinson (2011) "Consequences of Radical Reform: The French Revolution," forthcoming in the *American Economic Review*.

Acemoglu, Daron, Simon Johnson and James A. Robinson (2001) "The Colonial Origins of Comparative Development: An Empirical Investigation," *American Economic Review*, 91, 1369-1401.

Acemoglu, Daron, Simon Johnson and James A. Robinson (2002) "Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution," *Quarterly Journal of Economics*, 118, 1231-1294.

Acemoglu, Daron, Simon Johnson and James A. Robinson (2003) "An African Success: Botswana," in Dani Rodrik ed. *Analytic Development Narratives*, Princeton; Princeton University Press.

Acemoglu, Daron, Simon Johnson and James A. Robinson (2005a) "The Rise of Europe: Atlantic Trade, Institutional Change and Economic Growth," *American Economic Review*, 95, 546-579.

Acemoglu, Daron, Simon Johnson and James A. Robinson (2005b) "Institutions as a Fundamental Determinant of Growth," in Philippe Aghion and Steven Durlauf eds. *The Handbook of Economic Growth, Volume 1*, Amsterdam: North-Holland.

Acemoglu, Daron and James A. Robinson (2010) "Why is Africa Poor?" *Economic History of Developing Regions*, 25, 21-50.

Acemoglu, Daron and James A. Robinson (2011) *Why Nations Fail: The Origins of Power, Prosperity and Poverty*, New York: Crown.

Acemoglu, Daron and Alexander Wolitzky (2011) "The Economics of Labor Coercion," *Econometrica*, 79, 555-600.

Allen, Robert C. (2008) *The British Industrial Revolution in Global Perspective*, New York: Cambridge University Press.

Ávarez-Nogal, Carlos and Leandro Prados De La Escosura (2007) "The decline of Spain (1500-1850): conjectural estimates," *European Review of Economic History*, 11, 319-366.

Andersen, Jørgen Juel and Silje Aslaksen (2008) "Constitutions and the Resource Curse," *Journal of Development Economics*, 87, 227-246.

Austin, Gareth (2002) "Between abolition and jihad: the Asante response to the ending of the Atlantic slave trade, 1807-1896," in Robin C. Law ed., *From Slave Trade to "Legitimate" Commerce*, New York: Cambridge University Press.

Austin, Gareth (2005) *Labour, Land and Capital in Ghana: From Slavery to Free Labour in Asante, 1807-1956*, Rochester: University of Rochester Press.

Auty, Richard M. (2001) "The Political Economy of Resource-Driven Growth," *European Economic Review*, 45, 839–946.

Barro, Robert J. (1973) "The Control of Politicians: An Economic Model," *Public Choice*, 14, 19-42.

Besley, Timothy (2006) *Principled Agents? The Political Economy of Good Government*, New York: Oxford University Press.

Besley, Timothy and Torsten Persson (2001) *Pillars of Prosperity: The Political Economics of Development Clusters*, Princeton: Princeton University Press.

Bhagwati, Jagdish (1958) "Immiserizing growth: a geometrical note," *Review of Economic Studies*, 25, 201-205.

Baland, Jean-Marie and Patrick Francois (2000) "Rent-seeking and Resource Booms," *Journal of Development Economics*, 61, 527-542.

Benedictow, Ole J. (2004) *The Black Death 1346-1353: The Complete History*, New York: Boydell Press.

Boschini, Anne D., Jan Pettersson and Jesper Roine (2007) "Resource Curse or Not: A Question of Appropriability," *Scandinavian Journal of Economics*, 109, 593-617.

Brenner, Robert (1976) "Agrarian Class Structure and Economic Development in Preindustrial Europe," *Past and Present*, 70, 30-75.

Burnside, Craig and David Dollar (2000) "Aid, Policies and Growth," *American Economic Review*, 90, 847-68.

Coatsworth, John H. (1974) "Railroads, Landholding and Agrarian Protest in the Early Porfiriato," *Hispanic American Historical Review*, 54:1, 48-71.

Conning, Jonathan H. (2004) "On the Causes of Slavery or Serfdom and the Roads to Agrarian Capitalism: Domar's Hypothesis Revisited," Unpublished. Department of Economics, Hunter College.

Dal Bó, Ernesto, and Dal Bó, Pedro (2006) "Workers, Warriors, and Criminals: Social Conflict in General Equilibrium," forthcoming, *Journal of the European Economic Association*.

Debreu, Gerard (1974) "Excess demand functions," *Journal of Mathematical Economics*, 1, 15-21.

Domar, Evsey D. (1970) "The Causes of Slavery and Serfdom: A Hypothesis," *Journal of Economic History*, 30, 18-32.

Dunning, Thad (2008) *Crude Democracy*, New York: Cambridge University Press.

Engerman, Stanley L. and Kenneth L. Sokoloff (1997) "Factor Endowments, Institutions, and Differential Paths of Growth among New World Economies," in Stephen H. Haber ed. *How Latin America Fell Behind*, Stanford; Stanford University Press.

Engerman, Stanley L. and Kenneth L. Sokoloff (2005) "The Evolution of Suffrage Institutions in the New World," *Journal of Economic History*, 65, 891-921.

Feinstein, Charles H. (2005) *An Economic History of South Africa: Conquest, Discrimination and Development*, New York; Cambridge University Press.

Ferejohn, John A. (1986) "Incumbent Performance and Electoral Control," *Public Choice*, 50, 5-26.

Ferraz, Claudio and Frederico Finan (2008) "Exposing Corrupt Politicians: The Effects of Brazil's Publicly Released Audits on Electoral Outcomes," *Quarterly Journal of Economics*, 123, 703–745.

García-Jimeno, Camilo and James A. Robinson (2011) "The Myth of the Frontier," in Dora L. Costa and Naomi R. Lamoreaux eds. *Un-*

derstanding Long-Run Economic Growth, Chacago: University of Chicago Press.

Gómez-Galvarriato, Aurora (1998) "The Evolution of Prices and Wages in Mexico from the Porfiriato to the Revolution", in John H. Coatsworth and Alan Taylor eds., *Latin America and the World Economy Since 1800*, David Rockefeller Center on Latin American Studies, Harvard University.

Haber, Steven H. and Victor Mendaldo (2011) "Do Natural Resources Fuel Authoritarianism? A Reappraisal of the Resource Curse," *American Political Science Review*, 105, 1 -26.

Hatcher, John and Mark Bailey (2001) *Modelling the Middle Ages: The History and Theory of England's Economic Development*, New York: Oxford University Press.

Hildenbrand, Werner (1994) *Market Demand: Theory and Empirical Evidence*, Princeton: Princeton University Press.

Hennessy, C. Alistair M. (1978) *The frontier in Latin American history*, London: Edward Arnold.

Karl, Terry L. (1997) *The Paradox of Plenty: Oil Booms and Petro-States*, Berkeley: University of California Press.

Kemp, Murray C. and Koji Shimomura (2002) "The Sonnenschein–Debreu–Mantel proposition and the theory of international trade," *Review of International Economics*, 10, 671–679.

Keyssar, Alexander (2000) *The right to vote: the contested history of democracy in the United States*, New York: Basic Books.

Lane, Philip R. and Aaron Tornell (1999) "The Voracity Effect," *American Economic Review*, 89, 22-46.

Law, Robin C. ed. (1995) *From slave trade to "legitimate" commerce: the commercial transition in nineteenth-century West Africa*, New York: Cambridge University Press.

López-Alsono, Moramay (2007) "Growth and Inequality: Standards of Living in Mexico, 1850-1950," *Journal of Latin American Studies*, 39, 81-105.

Lovejoy, Paul E. (2000) *Transformations in Slavery: A History of Slavery in Africa*, 2nd Edition, New York: Cambridge University Press.

Luong, Pauline Jones, and Erika Weinthal (2010) *Oil Is Not a*

Curse: Ownership Structure and Institutions in Soviet Successor States, New York: Cambridge University Press.

Mantel, Rolf R. (1974) "On the characterization of aggregate excess demand," *Journal of Economic Theory*, 7, 348-353.

McCreery, David J. (1976) "Coffee and Class: The Structure of Development in Liberal Guatemala," *Hispanic American Historical Review*, 56, 438-460.

McCreery, David J. (1994) *Rural Guatemala, 1760-1940*, Stanford: Stanford University Press.

Mehlum, Halvor, Karl Moene and Ragnar Torvik (2006) "Institutions and the Resource Curse," *Economic Journal*, 116, 1-20.

Morgan, Kenneth (2001) *Slavery, Atlantic Trade and the British Economy, 1660-1800*, New York: Cambridge University Press.

Murphy, Kevin J., Andrei Shleifer and Robert W. Vishny (1991) "The Allocation of Talent: Implications for Growth," *Quarterly Journal of Economics*, 106, 503-530.

North, Douglass C. (1982) *Structure and Change in Economic History*, New York: Norton.

North, Douglass C. and Robert P. Thomas (1973) *The Rise of the Western World: A New Economic History*, New York: Cambridge University Press.

North, Douglass C., John J. Wallis and Barry R. Weingast (1989) *Violence and Social Orders: A Conceptual Framework for Interpreting Recorded Human History*, Princeton: Princeton University Press.

North, Douglass C. and Barry R. Weingast (1989) "Constitutions and Commitment: Evolution of Institutions Governing Public Choice in 17th Century England," *Journal of Economic History*, 49, 803-832.

Nugent, Jeffrey B. and James A. Robinson (2010) "Are Endowments Fate? On the Political Economy of Comparative Institutional Development" *Revista de Historia Económica - Journal of Iberian and Latin American Economic History*, 28, 45-82.

Opp, Marcus M. , Hugo F. Sonnenschein and Christis G. Tombaz (2007) "Rybczynski's Theorem in the Heckscher-Ohlin World – Anything Goes," Unpublished.

O'Rourke, Kevin J. and Jeffery G. Williamson (1999) *Globalization and History: The Evolution of the Nineteenth Century Atlantic Economy*, Cambridge MA: MIT Press.

Persson, Torsten, Gérard Roland and Guido Tabellini (1997) "Separation of Powers and Political Accountability," *Quarterly Journal of Economics*, 112, 1163-1202.

Persson, Torsten and Guido Tabellini (2000) *Political Economics: Explaining Economic Policy*, Cambridge MA: MIT Press.

Persson, Torsten and Guido Tabellini (2003) *The Economic Effects of Constitutions: What do the Data Say?* Cambridge: MIT Press.

Pirenne, Henri (1937) *Economic and Social History of Medieval Europe*, New York; Harcourt, Brace and Company.

Pomeranz, Kenneth (2000) *The Great Divergence: China, Europe, and the making of the modern world economy*, Princeton: Princeton University Press.

Postan, M.M. (1937) "The Chronology of Labour Services," *Transactions of the Royal Historical Society*, 20, 169-193.

Postan, M.M. (1944) "The Rise of a Money Economy," *Economic History Review*, 14, 123-134.

Robinson, James A. and Ragnar Torvik (2008) "Endogenous Presidentialism," NBER Working Paper #14603.

Robinson, James A., Ragnar Torvik and Thierry Verdier (2006) "Political Foundations of the Resource Curse," *Journal of Development Economics*, 79, 447-468.

Ross, Michael L. (2001) "Does Oil Hinder Democracy?" *World Politics*, 53, 325–61.

Rybczynski, T. M. (1955) "Factor Endowment and Relative Commodity Prices," *Economica*, 22, 336–341.

Sachs, Jeffrey D. and Andrew M. Warner (1995) "Natural Resource Abundance and Economic Growth," NBER Working Paper No. 5398.

Sachs, Jeffrey D. and Andrew M. Warner (2001) "The Curse of Natural Resources," *European Economic Review*, 45, 827–38.

Sonnenschein, Hugo (1972) "Market excess demand functions," *Econometrica*, 40, 549-563.

Sonnenschein, Hugo (1973) "Do Walras' identity and continuity characterize the class of community excess demand functions?" *Journal of Economic Theory*, 6, 345-354.

Stolper, Wolfgang F. and Paul A. Samuelson (1941) "Protection and Real Wages," *Review of Economic Studies*, 9, 58–73.

Torvik, Ragnar (2002) "Natural Resources, Rent Seeking and Welfare," *Journal of Development Economics*, 67, 455-470.

Turner, Frederick Jackson (1920) *The frontier in American history*, New York: H. Holt and Co..

van der Horst, Sheila (1942) *Native Labour in South Africa*, London: Oxford University Press.

Williams, Eric E. (1944) *Capitalism and Slavery*, University of North Carolina Press, Chapel Hill.

Wilson, Francis (1972) *Labour in the South African gold mines, 1911-1969*, Cambridge: Cambridge University Press.

Wright, Gavin (1990) "The Origins of American Industrial Success, 1879–1940," *American Economic Review*, 80, 651–668.

Wrigley, Anthony (2004) "The Divergence of England: the growth of the English Economy in the Seventeenth and Eighteenth Centuries," in his book *Poverty, Progress and Population*, New York: Cambridge University Press.

Figure 1

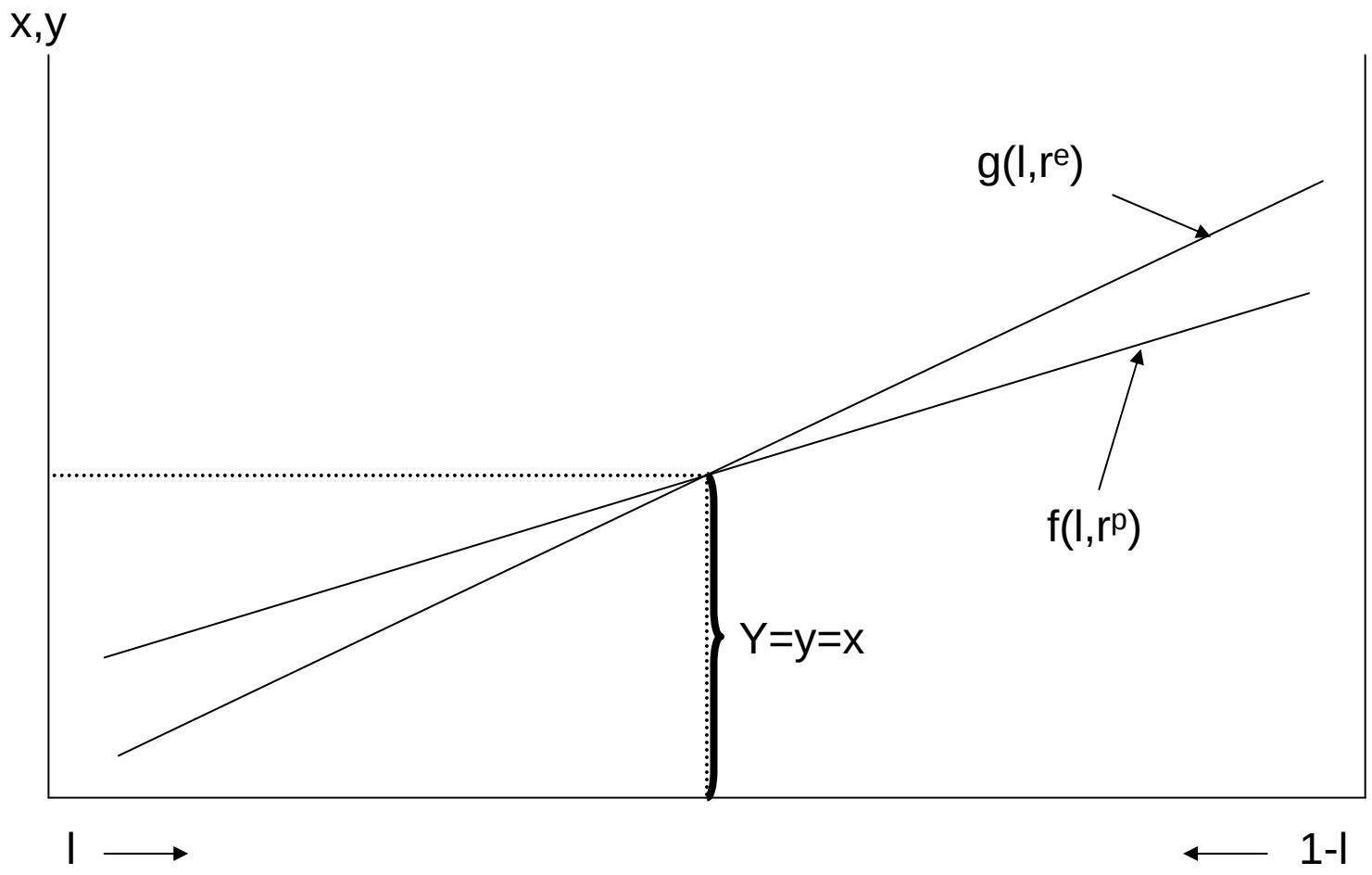


Figure 2

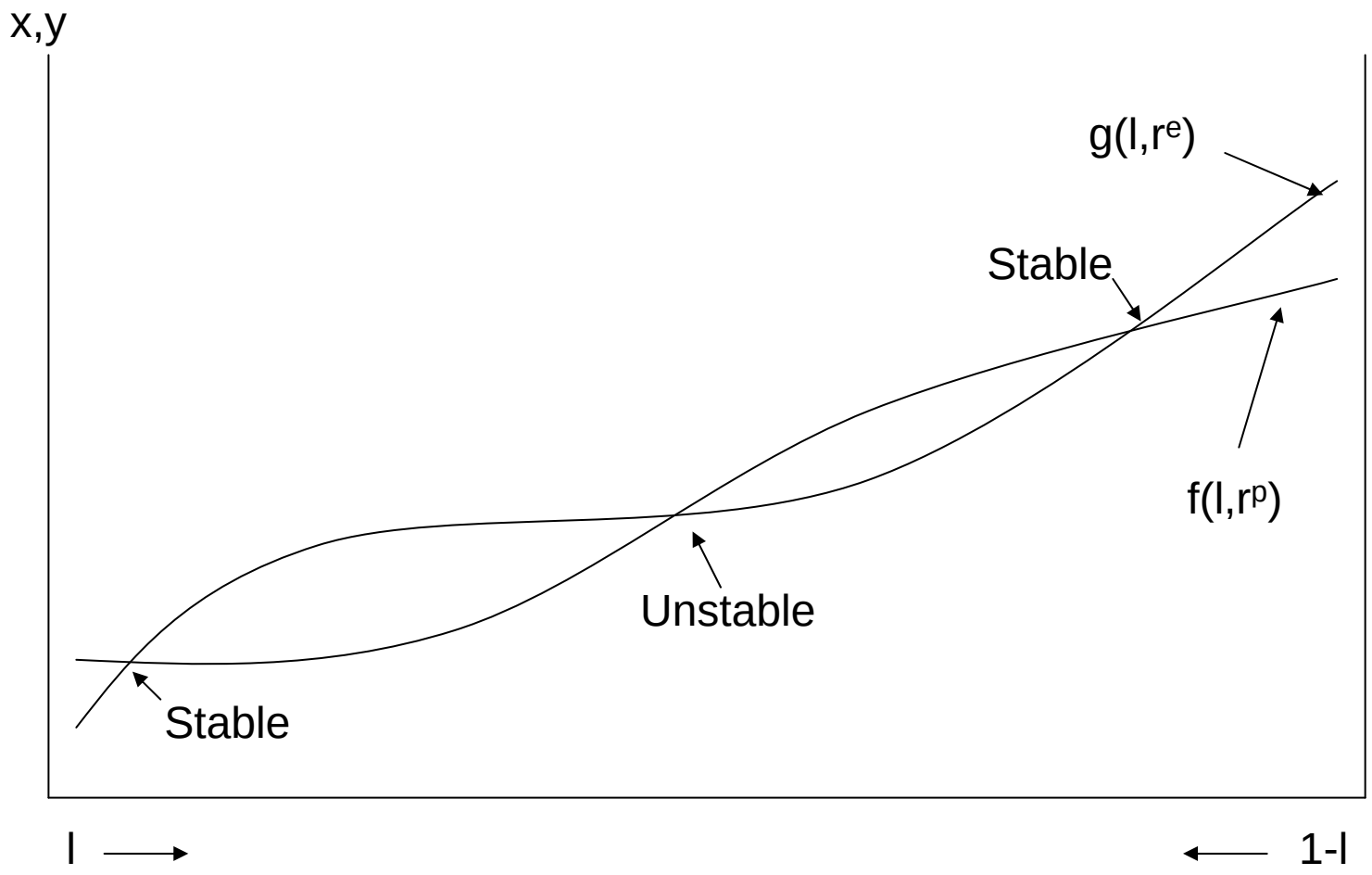


Figure 3

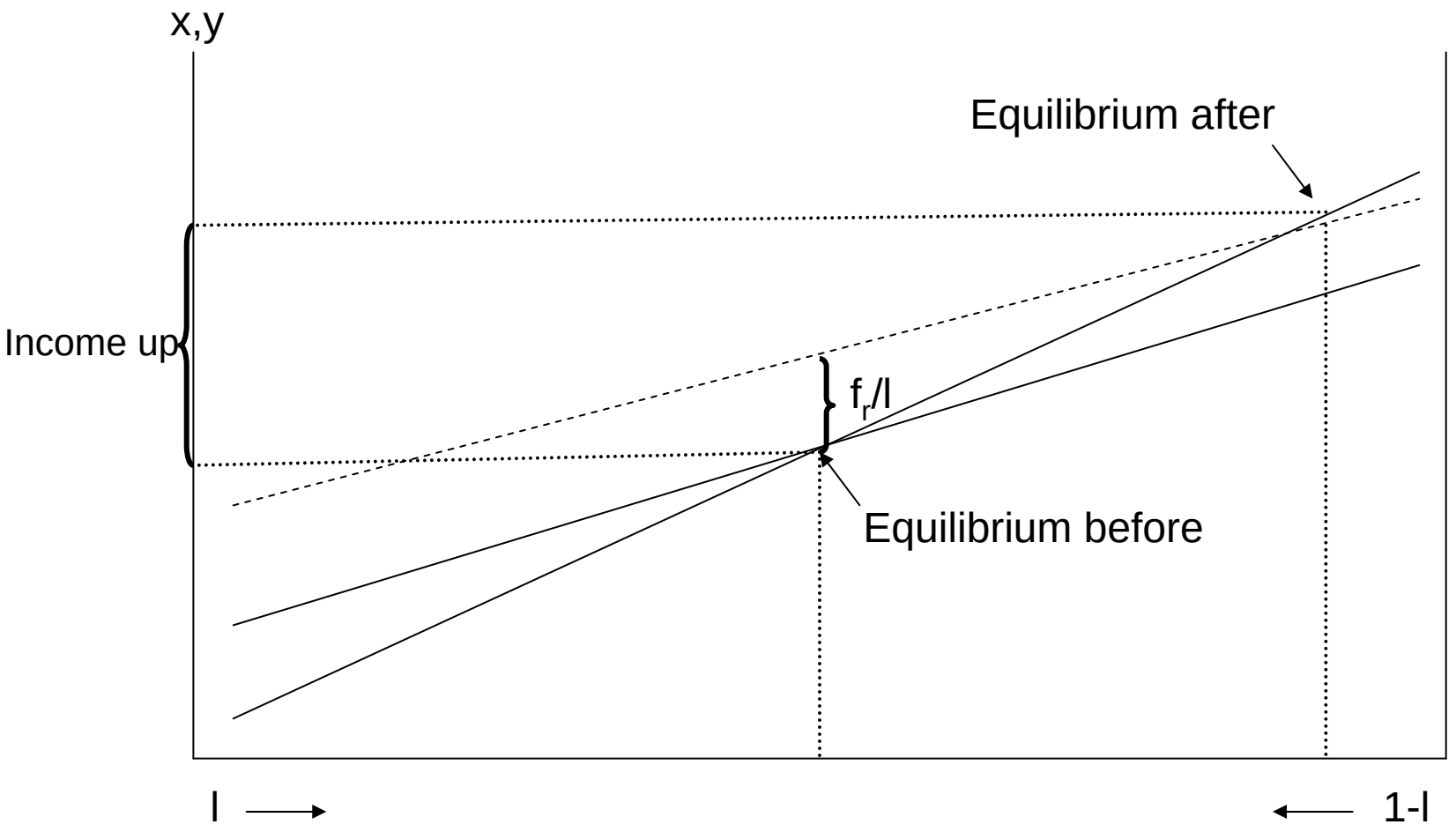
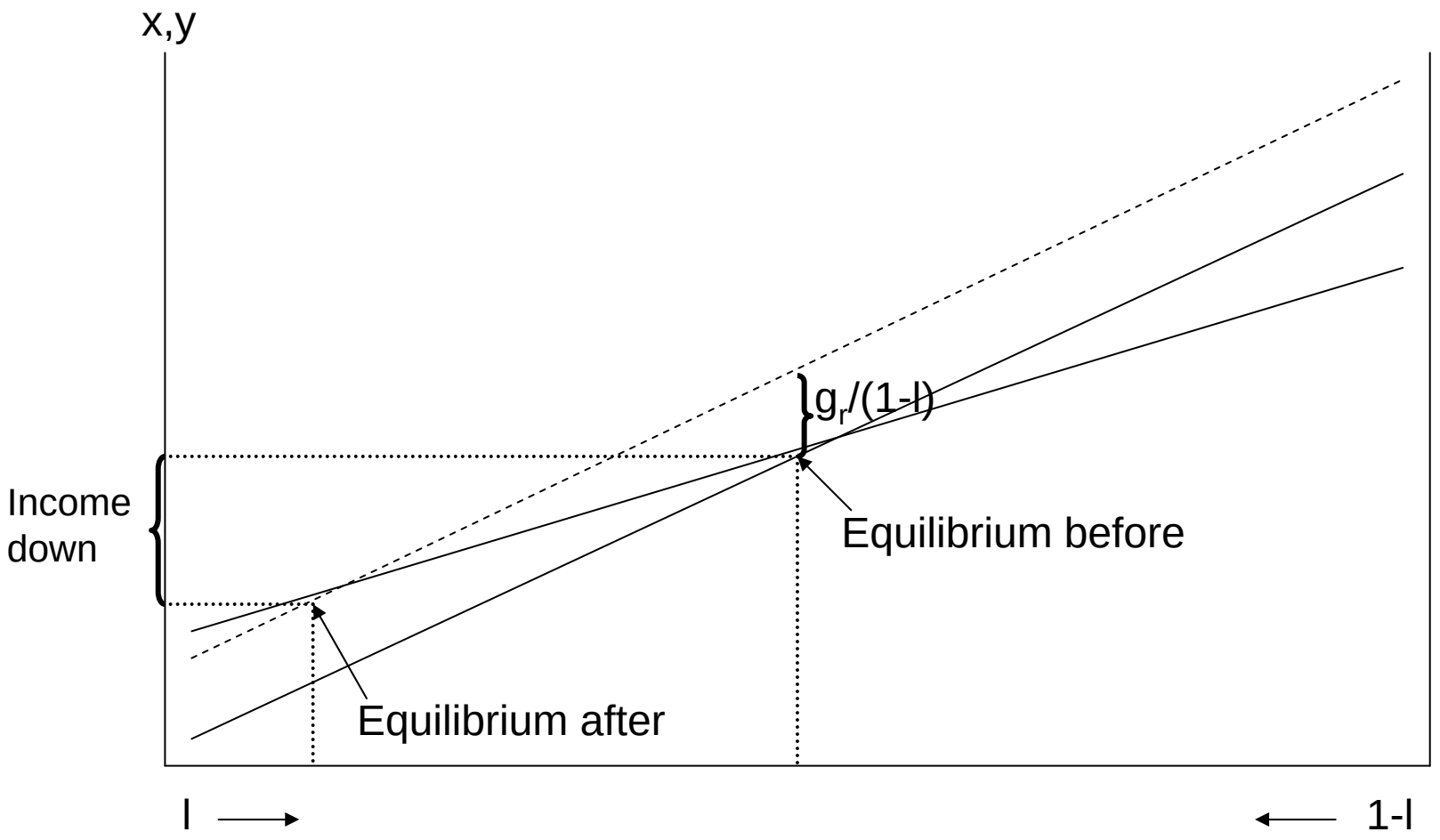


Figure 4


x,y
$g_r/(1-l)$
Income
down
Equilibrium before
Equilibrium after
l
1-l