# Trade, Growth and the Size of Countries*

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March 2004

**Abstract**

Normally, economists take the size of countries as an exogenous variable which does not need to be explained. Nevertheless, the borders of countries and therefore their size change, partially in response to economic factors such as the pattern of international trade. Conversely, the size of countries influences their economic performance and their preferences for international economic policies - for instance smaller countries have a greater stake in maintaining free trade. In this paper we review the theory and the evidence concerning a growing body of research that has considered both the impact of market size on growth and the endogenous determination of country size. We show that our understanding of economic performance and of the history of international economic integration can be greatly improved by bringing the issue of country size at the forefront of the analysis of growth.

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# 1 Introduction

Does size matter for economic success? Of the five largest countries in the world in terms of population, China, India, the United States, Indonesia and Brazil, only the United States is a rich country.[1] In fact the richest country in the world in 2000, in terms of income per capita, was Luxembourg, with less than 500,000 inhabitants. Among the richest countries in the world, many have populations well below the world median, which was about 6 million people in 2000. And when we consider growth of income per capita rather than income levels, again we find small countries among the top performers. For example Singapore, with 3 million inhabitants, experienced the highest growth rate of per capita income of any country between 1960 and 1990.[2] These examples show that a country can be small and prosper, or, at the very least, that size alone is not enough to guarantee economic success.

In this paper, we discuss the relationship between the scale of an economy and economic growth from two points of view. We first discuss the effects of an economy's size on its growth rate and we then examine how the size of countries evolves in response to economic factors.

The "new growth literature", with its emphasis on increasing returns to scale, has devoted much attention to the question of size of an economy.[3] It is therefore somewhat surprising that the question of the effect of border design and size of the polity as a determinant of economic growth has received limited attention. One reason is that, as we will see below, measures of country size (population or land area) used alone in growth regressions, generally do not have much explanatory power. Even less attention has been devoted to the endogenous determination of borders even from those researchers who have paid attention to the effect of geography on growth. Borders are not exogenous geographical features: they are a man-made institution. In fact, even the geographical characteristics of a country are in some sense endogenous: for instance whether a country is landlocked or not

[1] Throughout this paper we use the word "country", "nation" and "state" interchangeably, meaning a polity defined by borders and a national government and citizens. We are not dealing with the concept of a nation as a people not necessarily identified by borders and a government.

[2] Based on all measures of growth in per capita PPP income in constant prices constructed from the Penn World Tables version 6.1.

[3] However, it is well known that increasing returns are not *necessary* for a positive relationship between market size and economic performance. As we will see in our analytical section, larger markets may entail larger gains from trade and higher income per capita even when the technology exhibits constant returns to scale.

is the result of the design of its borders, which in turn depend upon domestic and international factors.

While economists have remain on the sidelines on this topic, philosophers devoted much energy thinking about country size. Plato, Aristotle and Montesquieu worried that a large polity cannot be run as a democracy. Aristotle wrote in Politics that "experience has shown that it is difficult, if not impossible, for a populous state to be run by good laws". Influenced by Montesquieu, the founding fathers of the United States were preoccupied with the potentially excessive size of the new Federal State. On the other hand, liberal thinkers who in the nineteenth century contributed to defining modern nation-states were concerned that in order to be economically, and therefore politically viable, countries should not be too small. Historians have studied the formation of states and their size and emphasized the role of wars and military technology as an important determinant. In fact, rulers, especially non-democratic ones, have always seen size as a measure of power and tried to expand the size of the territory under their rule. So, while throughout history country size seemed to be a constant preoccupation of philosophers, political scientists and policymakers, economists have largely ignored this subject.

In recent decades the question of borders has risen to the center of attention in international politics. The collapse of the Soviet Union, decolonization, and the break-up of several countries have rapidly increased the number of independent polities. In 1946 there were 76 independent countries, in 2002 there were 193.[4] East Timor was the latest new independent country at the time of this writing.

In this paper, we explore the relatively small recent economics literature dealing with the size of countries and its effect on economic growth. In particular we ask several questions: does size matter for economic success, and if so why and through which channels? What forces lead to changes in the organization of borders, or to put it differently what determines the evolution of the size of countries? Obviously the second question is very broad. Here we focus specifically a narrower version of this question, namely how economic factors, especially the trade regime, influence size.[5]

This paper is organized as follows. Section 2 discusses a general framework for thinking in economic terms about the optimal and the equilibrium

[4] These include the 191 member states of the United Nations, plus the Vatican and Taiwan.

[5] For a broader discussion see Alesina and Spolaore (2003).

size of countries, providing a formal model that focuses on the effect of size on income levels and growth, with special emphasis on the role of trade. Sections 3 reviews the empirical evidence on these issues and provides updated and new results. Section 4 briefly explores how the relationship between country size, international trade and growth have played out historically. The last section highlights questions for future research.

# 2 Size, Openness and Growth: Theory

## 2.1 The costs and benefits of size

We think of the equilibrium size of countries as emerging from the trade-off between the benefit of size and the costs of preference heterogeneity in the population, an approach followed by Alesina and Spolaore (1997, 2003) and Alesina, Spolaore and Wacziarg (2000).

### 2.1.1 The Benefits of Size

The main benefits from size in terms of population are the following:

1) There are economies of scale in the production of public goods. The per capita cost of many public goods is lower in larger countries, where more taxpayers pay for them. Think, for instance, of defense, a monetary and financial system, a judicial system, infrastructure for communications, police and crime prevention, public health, embassies, national parks, etc. In many cases, part of the cost of public goods is independent of the number of users or taxpayers, or grows less than proportionally, so that the per capita costs of many public goods is declining with the number of taxpayers. Alesina and Wacziarg (1998) documented that the share of government spending over GDP is decreasing in population; that is, smaller countries have larger governments.

2) A larger country (both in terms of population and national product) is less subject to foreign aggression. Thus, safety is a public good that increases with country size. Also, and related to the size of government argument above, smaller countries may have to spend proportionally more for defense than larger countries given economies of scale in defense spending. Empirically, the relationship between country size and share of spending of defense is affected by the fact that small countries can enter into military alliances, but in general, size brings about more safety. Note that if a small country enters into a military alliance with a larger one, the latter may

provide defense, but it may extract some form of compensation, direct or indirect, from the smaller partner. In this sense, even allowing for military alliances, being large is an advantage.

3) Larger countries can better internalize cross-regional externalities by centralizing the provision of those public goods that involve strong externalities.[6]

4) Larger countries are better able to provide insurance to regions affected by imperfectly correlated shocks. Consider Catalonia, for instance. If this region experiences a recession worse than the Spanish average, it receives fiscal and other transfers, on net, from the rest of the country. Obviously, the reverse holds as well. When Catalonia does better than average, it becomes a net provider of transfers to other Spanish regions. If Catalonia, instead, were independent, it would have a more pronounced business cycle because it would not receive help during especially bad recessions, and would not have to provide for others in case of exceptional booms.[7]

5) Larger countries can build redistributive schemes from richer to poorer regions, therefore achieving distributions of after tax income which would not be available to individual regions acting independently. This is why poorer than average regions would want to form larger countries inclusive of richer regions, while the latter may prefer independence.[8]

6). Finally, the role of market size is the issue on which we focus most in this article. Adam Smith (1776) already had the intuition that the extent of the market creates a limit on specialization. More recently, a well established literature from Romer (1986), Lucas (1988) to Grossman and Helpman (1991) has emphasized the benefits of scale in light of positive externalities in the accumulation of human capital and the transmission of knowledge, or in light of increasing returns to scale embedded in technology or knowledge creation. Murphy, Shleifer and Vishny (1987) focused instead on the benefits of size in models of "take-off" or "big push" of industrialization, where the take-off phase is characterized by a transition from a slow

[6] See Alesina and Wacziarg (1999) for a discussion of this point in the context of Europe. For example, fisheries policy has been centralized in Europe because if each country decided on its own fishing policy, the result would be overfishing and resource depletion. For some policies, such as policies to limit global warming, centralization at the world level might be justified.

[7] Obviously, this argument relies on an assumption that international capital markets are imperfect, so that independenct countries cannot fully self-insure..

[8] See Bolton and Roland (1997) for a theoretical treatment of this point.

growth, constant returns to scale technology to an endogenous growth, increasing returns to scale technology. In these various models, size represents the stock of individuals, of purchasing power and income that interact in the market\. This market may or may not coincide with the political size of a country as defined by its borders. It does coincide with it if a country is completely autarkic, i.e. does not engage in exchanges of goods or factors of production with the rest of the world. On the contrary, market size and country size are uncorrelated in a world of complete free trade. So, in models with increasing returns to scale, market size depends both on country size and on the trade policy regime.

In theory, with no obstacle to the cross-border circulation of factors of productions, goods and ideas, country size should be, at least through the channel of market size, irrelevant for economic success. Thus, in a world of free trade, redrawing borders should have no effect on economic efficiency and productivity. However, a vast literature has convincingly shown that even in the absence of explicit trade policy barriers, crossing borders is indeed costly, so that economic interactions within a country are much easier and denser than across borders. This is true both for trade in goods and financial assets.[9] What explains this border effect, even in the absence of explicit policy barriers, is not completely clear.[10] Whatever the source of the border effect, however, the correlation between the "political size" of a country and its market size does not totally disappear even in the absence of policy-induced trade barriers. Still, one would expect that the correlation between size and economic success is mediated by the trade regime. In a regime of free trade, small countries can prosper, while in a world of trade barriers, being large is much more important for economic prosperity, measured, say, by income per capita.

### 2.1.2 The Costs of Size

If size only had benefits, then the world should be organized as a single political entity. This is not the case. Why? As countries become larger and larger, administrative and congestion costs may overcome the benefits of

[9] On trade see McCallum (1985), Helliwell (1998). For the role of geographical factors in financial flows, see Portes and Rey (1999). For a theoretical discussion of transportation costs across borders and their effects on market integration, see Obstfeld and Rogoff (2000).

[10] A recent literature prompted by Rose (2000) argues that not having the same currency creates large trade barriers. For a review of the evidence see Alesina, Barro and Tenreyro (2002). Other explanatory factors include different languages, different legal standards, difficulties in enforcing contracts across political borders, etc.

size pointed out above. However, these types of costs become binding only for very large countries and they are not likely to be relevant determinants of the existing countries, many of which are quite small. As we noted above, the median country size is less than six million inhabitants.

A much more important constraint on the feasible size of countries lies in the heterogeneity of preferences of different individuals. Being part of the same country implies sharing public goods and policies in ways that cannot satisfy everybody's preferences. It is true that certain policy prerogatives can be delegated to subnational level of government through decentralization, but some policies have to be national.[11] Think for instance of defense and foreign policy, monetary policy, redistribution between regions, the legal system, etc.

The costs of heterogeneity in the population have been well documented, especially for the case in which ethnolinguistic fragmentation is used a as proxy for heterogeneity in preferences. Easterly and Levine (1997), La Porta Lopez de Silanes, Shleifer and Vishny (1999) and Alesina et al. (2003) showed that ethnolinguistic fractionalization is inversely related to economic success and various measure of quality of government, economic freedom and democracy.[12] Easterly and Levine (1997), in particular, argued that ethnic fractionalization in Africa, partly induced by absurd borders left by colonizers, is largely responsible for the economic failures of this continent. There is indeed a sense in which African borders are "wrong", not so much because there are too many or too few countries in Africa, but because borders cut across ethnic lines in often inefficient ways.[13]

We can think of trade openness as shifting the trade-off between the costs and benefits of size. As international markets become more open, the benefits of size decline relative to the costs of heterogeneity, thus the optimal size of a country declines with trade openness. Or, to put it differently, small and relatively more homogeneous countries can prosper in a world

[11] In fact, the recent move towards regional decentralization in many countries can be partly viewed as a response of the political system to increasing pressures towards separatism. See Bardhan (2002) for an excellent discussion of this point, and De Figueiredo and Weingast (2002) for a formal treatment. Also, for an excellent review of the literature on federalism, see Oates (1999).

[12] A large literature provides results along the same lines for localities within the United States. For example, see Alesina, Baqir and Easterly (1999). Related to this, Alesina and La Ferrara (2000, 2002) show that measure related to social capital are lower in more heterogeneous communities in the US. Alesina Baqir and Hoxby (2004) show how local political jurisdictions in the US are smaller in more radially heterogeneous areas.

[13] On this point see in particular Herbst (2000).

of free trade. With trade restrictions, instead, heterogeneous individuals have to share a larger polity to be economically viable. Incidentally, above and beyond the income effect, this may reduce their utility if preference homogeneity is valued in a polity. While in this paper we focus on preference heterogeneity rather than income heterogeneity, the latter plays a key role as well, a point raised by Bolton and Roland (1997). Poor regions would like to join rich regions in order to maintain redistributive flows, while richer regions may prefer to be alone. There is a limit to how much poor regions can extract due to a non-secession constraint, which is binding for the richer regions. Empirically, often more racially fragmented countries also have a more unequal distribution of income. That is, certain ethnic group are often much poorer than others and economic success and opportunities are associated with belonging to certain groups and not others. These are the situations with the highest potential for political instability and violence.

## 2.2 A Model of Size, Trade and Growth

In this section we will present a simple model linking country size, international trade and economic growth. The model builds upon Alesina and Spolaore (1997, 2003), Alesina, Spolaore and Wacziarg (2000) and Spolaore and Wacziarg (2002).

### 2.2.1 Production and Trade

Consider a world in which individuals are located on a segment $[0, 1]$. The world population is normalized to 1. Each individual living at location $i \in [0, 1]$ has the following utility function:

$$\int_0^\infty \frac{C_{it}^{1-\sigma} - 1}{1-\sigma} \, e^{-\rho t} dt \tag{1}$$

where $C_i(t)$ denotes consumption at time $t$, with $\sigma > 0$ and $\rho > 0$. Let $K_i(t)$ and $L_i(t)$ denote aggregate capital and labor at location $i$ at time $t$. Both inputs are supplied inelastically and are not mobile. At each location $i$ a specific intermediate input $X_i(t)$ is produced using the location-specific capital according to the linear production function:

$$X_i(t) = K_i(t) \tag{2}$$

Each location $i$ produces $Y_i(t)$ units of the same final good $Y(t)$, according to the production function:

$$Y_i(t) = A \left( \int_0^1 X_{ij}^\alpha(t) dj \right) L_i^{1-\alpha}(t) \tag{3}$$

with $0 < \alpha < 1$. $X_{ij}(t)$ denotes the amount of intermediate input $j$ used in location $i$ at time $t$, and $A$ captures total factor productivity. Intermediate inputs can be traded across different locations in perfectly competitive markets by profit-maximizing firms. Locations belong to $N$ different countries. Country 1 includes all locations between 0 and $S_1$, country 2 includes all locations between $S_1$ and $S_1 + S_2$, .., country $N$ includes all locations between $\sum_{n=1}^{N-1} S_n$ and 1. Hence, we will say that country 1 has size $S_1$, country 2 has size $S_2, ...$, country $N-1$ has size $S_{N-1}$, and country $N$ has size $S_N = 1 - \sum_{n=1}^{N-1} S_n$.

Political borders impose trading costs. In particular, we make the following two assumptions:

A1). There are *no internal barriers* to trade: Intermediate inputs can be traded across locations that belong to the same country at no cost.

A2). There are barriers to international trade: If one unit of an intermediate good produced at a location within country $n'$ is shipped to a location $i''$ within a different country $n''$, only $(1 - \beta_{n'n''})$ units of the intermediate good will arrive, where $0 \leq \beta_{n'n''} \leq 1$.

Consider an intermediate good $i$ produced in country $n'$. Let $D_{in'}(t)$ denote the units of intermediate input $i$ used domestically (i.e., either at location $i$ or at another location within country $n'$). Let $F_{in''}(t)$ denote the units of input $i$ shipped to a location within a different country $n'' \neq n'$. By assumption, only $(1 - \beta_{n'n''})F_{in''}(t)$ units will be used for production. In equilibrium, as intermediate goods markets are assumed to be perfectly competitive, each unit of input $i$ will be sold at a price equal to its marginal product both domestically and internationally. Therefore,

$$P_i(t) = \alpha A D_{in'}^{\alpha-1}(t) = \alpha A (1 - \beta_{n'n''})^{\alpha} F_{in''}^{\alpha-1}(t) \tag{4}$$

where $P_i(t)$ is the market price of input $i$ at time $t$. From equation (2) it follows that the resource constraint for each input $i$ is:

$$S_{n'} D_{in'}(t) + \sum_{n \neq n'} S_n F_{in}(t) = K_{in'}(t) \tag{5}$$

where $S_{n'}$ is the size of country $n'$, while $K_{in'}(t)$ is the stock of capital in location $i$ (belonging to country $n'$) at time $t$.

By substituting (4) into (5) we obtain:

$$D_{in'}(t) = \frac{K_{in'}}{S_{n'} + \sum\limits_{n \neq n'} S_n (1 - \beta_{n'n})^{\frac{\alpha}{1-\alpha}}} \tag{6}$$

and:

$$F_{in''}(t) = \frac{(1-\beta_{n'n''})^{\frac{\alpha}{1-\alpha}} K_{in'}}{S_{n'} + \sum_{n \neq n'} S_n (1-\beta_{n'n})^{\frac{\alpha}{1-\alpha}}} \tag{7}$$

As one would expect, barriers to trade tend to increase the domestic use of an intermediate output and to discourage international trade.

In the rest of this analysis, for simplicity, we will assume that the barriers to trade are uniform across countries, that is:

A3). $\beta_{i'i''} = \beta$ for all $i'$ and $i''$ belonging to different countries.[14]

We define:

$$\omega \equiv (1-\beta)^{\frac{\alpha}{1-\alpha}} \tag{8}$$

This means that the lower the barriers to international trade are, the higher is $\omega$. Hence $\omega$ can be interpreted as a measure of "international openness". $\omega$ takes on values between 0 and 1. When barriers are prohibitive ($\beta = 1$), $\omega = 0$, which means complete autarchy. By contrast, when there are no barriers to international trade ($\beta = 0$), we have $\omega = 1$, that is, complete openness.

Thus, equations (6) and (7) simplify as follows:

$$D_{in'}(t) = \frac{K_{in'}(t)}{S_{n'} + (1-S_{n'})\omega} \tag{9}$$

and:

$$F_{in''}(t) = \frac{\omega K_{in'}(t)}{S_{n'} + (1-S_{n'})\omega} \tag{10}$$

### 2.2.2 Capital accumulation and growth

In each location $i$ consumers' net household assets are identical to the stock of capital $K_{in'}(t)$. Since each unit of capital yields one unit of intermediate input $i$, the net return to capital is equal to the market price of intermediate input $P_{it}$ (for simplicity, we assume no depreciation). From intertemporal optimization we have the following standard Euler equation:

$$\frac{dC_{it}}{dt}\frac{1}{C_{it}} = \frac{1}{\sigma}[P_i(t) - \rho] = \frac{1}{\sigma}\{\alpha A[\omega + (1-\omega)S_{n'}]^{1-\alpha} K_{in'}^{\alpha-1}(t) - \rho\} \tag{11}$$

[14] For an analysis in which barriers are different across countries and are an endogenous function of size, see Spolaore and Wacziarg (2002).

Hence, the steady-state level of capital at each location $i$ of a country of size $S_{n'}$ will be

$$K_{in'}^{ss} = \left(\frac{\alpha A}{\rho}\right)^{\frac{\alpha}{1-\alpha}} [\omega + (1-\omega)S_{n'}] \tag{12}$$

By substituting (12) into (9) and (10), and using (3), we have the following:

**Proposition 1**

*The steady-state level of output per capita in each location $i$ of a country of size $S_{n'}$ is*

$$Y_i^{ss} = A^{\frac{1}{1-\alpha}} \left(\frac{\alpha}{\rho}\right)^{\frac{\alpha}{1-\alpha}} [\omega + (1-\omega)S_{n'}] \tag{13}$$

Hence, it follows that:

1) Output per capita in the steady-state is increasing in openness $\omega$. That is:

$$\frac{\partial Y_i^{ss}}{\partial \omega} > 0 \tag{14}$$

2) Output per capita is increasing in country size $S_{n'}$:

$$\frac{\partial Y_i^{ss}}{\partial S_{n'}} > 0 \tag{15}$$

3) The effect of country size $S_{n'}$ is smaller the larger is $\omega$, and the effect of openness is smaller the larger is country size $S_{n'}$. That is:

$$\frac{\partial^2 Y_i^{ss}}{\partial S_{n'} \partial \omega} < 0 \tag{16}$$

The above results show that openness and size have positive effects on economic performance, but i) openness is less important for larger countries and ii) size matters less in a more open world.[15] In fact, were there no barriers to trade ($\omega = 1$), output would be independent of country size.

Around the steady-state, the growth rate of output can be approximated by:

$$\frac{dY}{dt}\frac{1}{Y} = \xi e^{-\xi}(\ln Y^{ss} - \ln Y(0)) \tag{17}$$

where $\xi \equiv \frac{\rho}{2}\left[(1 + \frac{4(1-\alpha)}{\alpha})^{\frac{1}{2}} - 1\right]$ and $Y(0)$ is initial income.[16] Hence, we will also have:

[15] The result does not depend on the assumption that barriers to trade are uniform across countries. In particular, one can derive analogous results for the case of non uniform barriers. Moreover, analogous results can be obtained when "openness" is defined as trade over output rather than in terms of trade barriers. See Spolaore and Wacziarg (2002).

[16] For a derivation of this result, see Barro and Sala-i-Martin (1995, chapter 2).

**Proposition 2**

*The growth rate of income per capita around the steady-state is increasing in size, increasing in openness, and decreasing in size times openness.*

These results show how the economic benefits of size are decreasing in openness and the economic benefits from openness are decreasing in size. We will test the empirical implications of this model in Section 4.

## 2.3 The Equilibrium Size of Countries

So far we have taken the number and size of countries as given. However, in the long-run borders do change, and our model suggests that international openness may play a role in this process. As we have seen, country size affects output and growth when barriers to trade are high, while country size is less important in a world of international integration. Hence, the reduction of trade barriers should reduce the incentives to form larger countries. In what follows we will formalize this insight using the framework of country formation developed by Alesina and Spolaore (1997, 2003).[17]

If there were no costs associated with size, world welfare would be maximized by having only one country, which seems rather unrealistic. Following our previous discussion we model the costs of size as the result of heterogeneity of preferences over public policies and public goods, the collection of which we label "government". We assume that, for each location, there exists an "ideal" type of government. If individuals in location $i$ belong to a country whose government is different from their ideal type (say $j \neq i$), their utility will be reduced by $h\Delta_{ij}$, where $\Delta_{ij}$ is the distance between $j$ and $i$, and $h$ is a parameter that measures "heterogeneity" costs - that is, the costs of being far from the median position in one's country. The distance from the government that give raise to these costs should be interpreted both as a distance in terms of preferences and in terms of location.[18]

On the other hand, in a country of size $S_n$ the fixed costs of government can be spread through a larger population. For example, if the fixed cost of government is $G$ and it is shared equally by all citizens, each individual in

[17] The economics literature on the endogenous formation of political borders, while still in its infancy, has been growing substantially in the past few years. An incomplete list of contributions, besides those cited in the text, includes Friedman (1977), Casella and Feinstein (2001), Findlay (1996), and Bolton and Roland (1997).

[18] This assumption is extreme but allows to have only one dimension. For more discussion see Alesina and Spolaore (2003).

a country of size $S_n$ will have to pay $G/S_n$ - which is obviously decreasing in $S_n$.

We consider the case in which borders are determined to maximize net income minus heterogeneity costs in steady-state.[19] That is, we assume that each individual at location $i$ in a country $n$ of size $S_n$ is interested in maximizing the following steady-state welfare:

$$W_{in} = Y_{in}^{ss} - t_{in} - h\Delta_{in} \tag{18}$$

where $Y_{in}^{ss}$ is steady-state income, given by $A^{\frac{1}{1-\alpha}} \left(\frac{\alpha}{\rho}\right)^{\frac{\alpha}{1-\alpha}} [\omega + (1-\omega)S_{n'}]$, $t_{in}$ denotes taxes of individual $i$ in country $n$, $\Delta_{in}$ is individual $i$'s "distance from the government".

Country $n$'s budget constraint is:

$$\int_{S_{n-1}}^{S_n} t_{in} di = G \tag{19}$$

How are borders going to be determined in equilibrium? First we consider how borders would be determined *efficiently*, that is, when the sum of everybody's welfare $\int_0^1 W_{in} di$ is maximized. First of all, one can immediately see that the efficient solution implies countries of equal size. This is due to the assumption that people are distributed uniformly in the segment $[0, 1]$.[20] Second, the government should be located "in the middle" of each country, since the median minimizes the sum of distances. When countries are all of equal size (call it $S = 1/N$, where $N$ is the number of countries), and governments are located "in the middle", the average distance from the government is $S/4$. Hence, the sum of everybody's welfare becomes:

$$\int_0^1 W_{in} di = A^{\frac{1}{1-\alpha}} \left(\frac{\alpha}{\rho}\right)^{\frac{\alpha}{1-\alpha}} [\omega + (1-\omega)S] - \frac{G}{S} - h\frac{S}{4} \tag{20}$$

which is maximized by the following "efficient size":[21]

$$S^* = \sqrt{\frac{4G}{h - 4(1-\omega)A^{\frac{1}{1-\alpha}} \left(\frac{\alpha}{\rho}\right)^{\frac{\alpha}{1-\alpha}}}} \tag{21}$$

[19] The analysis could be extended in order to consider the more complex issue of border changes along the transitional dynamics, in which adjustment costs from changing borders would be explicitly modeled. Here we abstract from such issues and focus on borders in steady-state.

[20] For a formal proof, see Alesina and Spolaore (1997; 2003).

[21] Equation (20) abstracts from the fact that the number of countries $N = 1/S$ must be an integer.

Hence,we have that the "efficient size" of countries is:

1) Increasing in the fixed cost of public goods provision ($G$),

2) Decreasing in heterogeneity costs ($h$),

3) Decreasing in the degree of international openness ($\omega$),

4) Increasing in total factor productivity ($A$).

Therefore, in our model, if borders are set efficiently, increasing economic integration and globalization should be associated with a breakup of countries.

Should we expect such a breakup to take place if borders are *not* set optimally? For example, what if, more realistically, borders are set by self-interested governments ("Leviathans") who want to maximize their net rents? We can model the equilibrium of those Leviathans by assuming that a) they want to maximize their rents in steady-state, but ) they are constrained in their rent maximization, since they must provide a minimum level of welfare to at least a fraction $\delta$ of their population (we can interpret this as a "no-insurrection constraint"). Hence, $\delta$ measures the degree to which Leviathans are constrained by their subjects' preferences.

If we assume that each individual in a given country must pay the same taxes (that is, if we rule out inter-regional transfers), we can use $t$ to denote taxes per person in a country of size $S$. Then, a Leviathan's total rents in a country of size $N$ is given by:

$$tS - G \tag{22}$$

where $t$ is chosen in order to satisfy the constraint:

$$W_{in} = Y_i^{ss} - t - h\Delta_i \geq W_0 \tag{23}$$

for a mass of individuals of size $\delta S$.

The Leviathan will locate the government in the middle of his country, as the social planner would do, in order to minimize the costs of satisfying (23). Constraint (23) will be binding for the individual at a distance $\delta S/2$ from the government. Hence, we have:

$$t = Y_i^{ss} - \frac{h\delta S}{2} - W_0 \tag{24}$$

By substituting (24) into (22) and maximizing with respect to $S$ we have the following equilibrium size of countries in a world of Leviathans:

$$S^e = \sqrt{\frac{2G}{h\delta - 2(1-\omega)A^{\frac{1}{1-\alpha}}\left(\frac{\alpha}{\rho}\right)^{\frac{\alpha}{1-\alpha}}}} \tag{25}$$

Again, the size of countries is increasing in the economies of scale in the provision of public goods ($G$) and in the level of total factor productivity($A$), while decreasing in heterogeneity costs ($h$) and openness ($\omega$).

We can note that $S^e = S^*$ when the Leviathans must provide minimum welfare to exactly half of their population, while countries are inefficiently large ($S^e > S^*$) when Leviathans are really dictatorial, that is, they can stay in power without the need to take into account the welfare of a majority of the population. But even in that case, more openness induces smaller countries.

The comparative statics predict that technological progress, in a world of barriers to trade, should be associated with larger countries. This result is intuitively appealing, since technological progress improves the gains from trade, and barriers to international trade increase the importance of domestic trade, and hence a larger domestic market. However, if technological progress is accompanied by a reduction in trade barriers, the result becomes ambiguous.[22] Moreover, a reduction in trade barriers (more openness) has a *bigger* impact (in absolute value) on the size of countries at *higher* levels of development - that is, the effect of globalization and economic integration on the size of countries is expected to be larger for more developed societies. Formally:

$$\frac{\partial^2 S^e}{\partial \omega \partial A} < 0 \tag{26}$$

Of course, these comparative statics results are based on the highly simplifying assumption that technological progress is exogenous. An interesting extension of the model would be to consider endogenous links between political borders, the degree of international openness, and technological progress.[23]

[22] Another element of ambiguity would be introduced if one were to assume that the costs of government $G$ are decreasing in $A$.

[23] For example, some authors have suggested that technological progress may be higher in a world with more Leviathans who compete with each other (such as Europe before and after the Industrial Revolution) than in a more centralized environment (such as China in the same period). For a recent formalization of these ideas, see Garner (2001).

Alesina and Spolaore (2003) also analyze the case in which borders are chosen by democratic rule (majority voting). They show that in this case one may or may not obtain the efficient solution depending on the availability of credible transfer programs. When the latter are not available, in a fully democratic equilibrium in which no one can prevent border changes decided by majority rule or prevent unilateral secessions, there would be more countries than the efficient number. *A fortiori* the democratically decided number of countries would be larger that the one chosen by a Leviathan for any value of $\delta < 1$. An implication of this analysis is that democratization should lead to secessions. For the purpose of this paper, even in the case of majority rule choice of borders, the comparative statics regarding trade, size and growth are the same as in the efficient case and in the Leviathan case.

## 2.4 Summing up

In this section we have provided a model in which the benefits of country size go down as international economic integration increases. Conversely, the benefits of trade openness and economic integration are larger, the smaller the size of a country. Secondly, we have argued that economic integration and political disintegration should go hand in hand. As the world economy becomes more integrated, one of the benefits of large countries (the size of markets) vanishes. As a result, the trade-off between size and heterogeneity shifts in favor of smaller and more homogeneous countries. This effect tends to be larger in more developed economies. By contrast, technological progress in a world of *high* barriers to trade should be associated with the formation of *larger* countries.

One can also think of the reverse source of causality: small countries have a particularly strong interest in maintaining free trade, since so much of their economy depends upon international markets. In fact, if openness were endogenized., one could extend our model to capture two possible worlds as equilibrium border configurations: a world of large and relatively closed economies, and one of many more smaller and more open economies. Spolaore (1995, 2001) provides explicit models with endogenous openness and multiple equilibria in the number of countries. Spolaore and Wacziarg (2002) also treat openness as an explicitly endogenous variable, and show empirically that larger countries tend to be more closed to trade. Empirically, both directions of causality between country size and trade openness, which are not mutually exclusive, likely coexist. Smaller countries do adopt more open trade policies (and are consequently more open when openness is

measures using trade volumes), so that a world of small countries will tend to be more open to trade.[24] Conversely, changes in the average degree of openness in the world (brought forth for example by a reduction in trading costs) should be expected to lead to more secessions and smaller countries, as we will argue extensively below.

# 3 Size, Openness and Growth: Empirical Evidence

In this section, we review the empirical evidence on trade openness and growth, as well as the empirical evidence on country size and growth. We then argue that the two are fundamentally linked, because both openness and country size determine the extent of the market. Thus, their impact on growth cannot be evaluated separately. Then we estimate a specification for the determination of growth as a function of market size (itself a function of both country size and trade openness), derived directly from the model presented in Section 2. Our estimates, which are consistent with a growing body of evidence on the role of scale for growth, also provide strong support for our specific model. In particular, we show that the costs of smallness can be avoided by being open. In other words, the impact of size on growth is decreasing in openness, or, conversely, the impact of openness on growth falls as the size of countries increases. This evidence suggests that the extent of the market is an important channel for the realization of the growth gains from trade.

## 3.1 Trade and Growth: A Review of the Evidence

The literature on the empirical evidence of trade and growth is vast and a comprehensive survey is beyond the scope of this article. In this subsection, we simply summarize some of the salient results from recent studies in this literature, in order to set the stage for a discussion of the more specific issue of market size and growth.

The fact that openness to trade is associated with higher growth in post-1950 cross-country data was until recently subject to little disagreement.[25] Whether openness is measured by indicators of trade policy openness (tariffs, non tariff barriers, etc.) or by the volume of trade (the ratio of imports

[24] See Alesina and Wacziarg (1998) and Spolaore and Wacziarg (2002) for cross-country empirical evidence on this point.

[25] The pre-1990 literature was usefully surveyed in Edwards (1993). We will focus instead on salient papers in this literature since 1990.

plus exports to GDP), numerous studies document this correlation. For example, Edwards (1998) showed that, out of nine indicators of trade policy openness, eight were positively and significantly related to TFP growth in a sample of 93 countries. Dollar (1992) argued that an indicator of openness based on price deviations was positively associated with growth. Ben-David (1993) demonstrated that a sample of countries with open trade regimes displays absolute convergence in per capita income, while a sample of closed countries did not. Finally, in one of the most cited studies in this literature, Sachs and Warner (1995) classified countries using a simple dichotomous indicator of openness, and argued that "closed" countries experienced annual growth rates a full 2 percentage points below "open" countries in the period 1970-1989. They also confirmed Ben David's result: open countries tend to converge, not closed ones.

These studies focused mostly on the correlation between openness and growth, conditional on other growth determinants. In other words, little attention was typically paid to issues of reverse causation. In contrast, a more recent study by Frankel and Romer (1999) focused on trade as a causal determinant of income levels. Using geographic variables as an instrument for openness, they estimated that a 1 percentage point increase in the trade to GDP ratio causes almost a 2 percent increase in the level of per capita income.[26] Wacziarg (2001) also addressed issues of endogeneity by estimating a simultaneous equations system where openness affects a series of channel variables which in turn affect growth. Results from this study suggest that a one standard deviation increase in the portion of the trade to GDP ratio attributable to formal trade policy barriers (tariffs, non tariff barriers, etc.) is associated with a 1 percentage point increase in annual growth across countries.

These six studies were recently scrutinized by Rodríguez and Rodrik (2000), who argued that their basic results were sensitive to small changes in specification, or that the measurement of trade policy openness captured other bad policies rather than trade impediments.[27] While it is true that cross-country empirical analysis is fraught with data pitfalls, specification

[26] A crucial assumption is that the instrument (constructed as the sum of predicted bilateral trade shares, where only gravity/geographical variables are used as predictors of bilateral trade) be excludable from the growth regression, i.e. that it affects growth only through its impact on trade volumes.

[27] For another critical view of this literature, in particular of the Sachs and Warner (1995) study, see Harrison and Hanson (1999). Pritchett (1996) showed that various measures of policy openness were not highly correlated among themselves, suggesting that relying on any single measure was unlikely to capture the essence of trade policy.

problems and issues of endogeneity, these authors do recognize that it is difficult to find a specification where indicators of openness actually have a negative impact on growth.[28] In other words, they essentially conclude that the range of possible effects is bounded below by zero. One could argue that by the standards of the cross-country growth literature, this is already a huge achievement: it constitutes an important restriction on the range of possible estimates. Moreover, Rodríguez and Rodrik (2000) argue that one of the problems associated with estimating the impact of trade on growth is that protectionism is highly correlated with other growth-reducing policies, such as policies that perpetuate macroeconomic imbalances. This suggests that trade restrictions are one among a "basket" of growth-reducing policies. Since Rodriguez and Rodrik (2000), the literature on trade and growth has proceeded apace. Using a new measure of the volume of trade, Alcalá and Ciccone (2004) revisit the issue of trade and growth, and argue that "in contrast to the marginally significant and non-robust effects of trade on productivity found previously, our estimates are highly significant and robust even when we include institutional quality and geographic factors in the empirical analysis". The difference stems for these authors' use of a measure of "real openness" defined as a US dollar value of import plus export relative to GDP in PPP US dollars, as further detailed below. The same authors argue that their results are robust to controlling for institutional quality, a point disputed by Rodrik, Subramanian and Trebbi (2003). In a within-country context, Wacziarg and Welch (2003) show that episodes of trade liberalization are followed by an average increase in growth on the order of 1 to 1.5 percentage points per annum.

An important drawback of the literature on trade and growth is that it does not generally focus on the channels through which trade openness affects economic performance.[29] This makes it difficult to assess whether the dynamic effects of trade openness are mediated by the extent of the market. There are many reasons that could explain a positive estimated coefficient in a regression of trade openness (however measured) on growth or income levels. Such effects could stem from better checks on domestic policies, an improved functioning of institutions, technological transmissions that are facilitated by openness to trade, increased foreign direct investment, scale

[28] They state that "we know of no credible evidence–at least for the post-1945 period– that suggests that trade restrictions are systematically associated with higher growth rates.", p.317.

[29] An exception is Wacziarg (2001). Alcala and Ciccone (2002) also examine whether the effect of openness works through labor productivity or capital accumulation (in its various forms).

effects of the type discussed in Section 2, traditional comparative advantage-induced static gains from trade, or all of the above. Few studies attempt to discriminate between these various hypotheses. Hence, while there is a general sense that trade openness increases growth and income levels, and while this creates a presumption that market size may be important, the accumulated evidence on trade and growth does not directly answer the question of whether it is market size that is good for growth, as opposed to some other aspect of openness.

### 3.2 Country Size and Growth: A Review of the Evidence

We now turn to the empirical evidence on the effects of country size on economic performance. There is a vast microeconometric literature on estimating the returns to scale in economic activities and how they relate to firm or industry productivity. This literature is beyond the scope of this paper, but a general sense is that, at least in some manufacturing sectors or industries, scale effects are present. It may therefore come as a surprise that the conventional wisdom seems to be that scale effects are not easily detected at the aggregate (country) level. The macroeconomic literature on country size and growth is much smaller than the microeconometric literature, but a common claim is that the size of countries does not matter for economic growth, either in a time-series context for individual economies, or in a cross-country context.

In a time-series context, Jones (1995a, 1995b) made a simple point. Several endogenous growth models predict that the rate of long-run growth of an economy is directly proportional to the number of researchers, itself a function of population size.[30] Hence, as the population of the United States increased (and in particular the number of scientists and researchers), so should have growth. Yet while the number of researchers exploded, rates of growth in industrial countries have been roughly constant since the 1870s. This simple empirical fact created difficulties for first-generation endogenous growth models. In particular, it was taken as indicative of the absence of scale effects in long-run growth. However, while it contributed to the conventional wisdom that scale is unrelated to aggregate growth, this finding in no way precludes the existence of scale effects when it comes to income levels, which is the focus both of the theory presented in Section 2 and of

[30] As suggested by Jones (1999), such models include Romer (1990), Grossman and Helpman (1991) and Aghion and Howitt (1992).

our empirical estimates presented below.[31] Hence, Jones's objection applies neither to our theory nor to our evidence.

In a cross-country context, the most systematic empirical tests of the scale implications of endogenous growth models appear in Backus, Kehoe and Kehoe (1992). They showed empirically, in a specification where scale was defined as the size of total GDP, that scale and aggregate growth were largely unrelated. In their baseline regression of growth on the log of total GDP, the slope coefficient is positive but statistically insignificant.[32] Moreover, the number of scientists per countries was not found to be a significant predictor of growth, and the scale of inputs into the human accumulation process (meant to capture the extent of human capital spillovers) similarly did not help predict aggregate growth. The authors also showed that scale effects were present in the data when confining attention to the manufacturing sector (i.e. regressing manufacturing growth on total manufacturing output), and suggest that this is consistent with microeconometric studies, which typically focus on manufacturing. But the set of regressions relating to the aggregate economy is often cited as evidence that there are no effects of scale on growth at the country level.

A major problem with this approach is that variables defined at the national level may be poor proxies for the total scale of the economy, the extent of R&D activities or the importance of human capital externalities. Scale effects do not stop at the borders of countries. Since small countries adopt more open trade policies, and likely also import more technologies, a coefficient in a regression of size on growth that omits openness is going to be biased towards zero.[33] The authors do recognize (and show empirically) that

[31] Scale effects in our theory come purely from the border effect - namely the fact that it is more costly (in the iceberg cost sense) to conduct trade across borders than within. This allows us to combine scale effects with a neoclassical model of growth. Our theory has standard neoclassical implications as far as transitional growth is concerned. Thus, scale may affect growth in the transition to the steady-state, since it is a determinant of steady-state income *levels*. But scale has no impact on long-run growth, which is exogenous in our model.

[32] According to the authors, this univariate regression implies that "a hundredfold increase in total GDP is associated with an increase in per capita growth of 0.85". One could argue that this is a sizeable effect, but the t-statistic on the slope coefficient is only 1.64 and the regression contains no other control variables. In a multivariate setting, the authors show that when "standard" growth regressors (but *not* trade openness) are controlled for, the coefficient estimate on total GDP remains essentially identical, but the t-statistic falls considerably.

[33] See Alesina and Wacziarg (1998) and Spolaore and Wacziarg (2002) for empirical evidence that small countries tend to be more open to trade, when trade openness is

imports of specialized inputs to production can lead to faster growth. They also mention that "by importing specialized inputs, a small country can grow as fast as a larger one". But they do not empirically examine variations in the degree of openness of an economy and how it might impact the effect of size on growth. In other words, they examine separately whether country size on the one hand, and imports of specialized inputs on the other, affect growth. We propose instead to examine openness and country size jointly as determinants of market size and thus growth.

### 3.3 Summing up

The literature on trade and growth indicates that trade openness has favorable effects on growth and income levels, but for the most part does not inform us as to whether these effects are attributable to the extent of the market, or to other channels. The literature on scale and growth typically considers measures of scale that have to do with domestic market size (i.e. the size of a country or a national economy), and generally fails to consider that openness can substitute for a large domestic market. In what follows, we bring these literatures together to focus on the impact of market size on growth.

### 3.4 Trade, Size and Growth in a Cross-Section of Countries

In this subsection, we bring Propositions 1 and 2 of Section 2 to the data. If small countries tend to be more open to trade, and if trade openness is positively related to growth, then a regression of growth on country size that excludes openness will understate the effect of scale. Moreover, our theory suggests that the effects of size become less important as an economy becomes more open, i.e. the coefficient on an interaction term between openness and country size is predicted to be negative. Ades and Glaeser (1999), Alesina, Spolaore and Wacziarg (2000) and Spolaore and Wacziarg (2002) have examined how country size and openness interact in growth regressions, and have confirmed the pattern of coefficients on openness, country size and their interaction predicted by our theory. In this section, we update and expand upon these results. We focus on growth specifications of the

measures by the trade to GDP ratio. Perhaps more surprisingly, such a relationship also holds when openness is measured by average weighted tariffs, i.e. by a direct measure of trade policy restrictiveness.

form:

$$\log \frac{y_{it}}{y_{it-\tau}} = \beta_0 + \beta_1 \log y_{it-\tau} + \beta_2 \log S_{it} + \beta_3 O_{it} + \beta_4 O_{it} \times \log S_{it} + \beta_5' Z_{it} + \varepsilon_{it} \quad (26)$$

where $y_{it}$ denotes per capita income in country $i$ at time $t$, $S_{it}$ is a measure of country size, $O_{it}$ is a measure of openness, and $Z_{it}$ is a vector of control variables. In this specification, the parameter estimates on openness, country size and their interaction will be our main focus. In the context of the theory presented in Section 2, these variables as well as the $Z_{it}$ variables are to be interpreted as determinants of the steady-state *level* of per capita income.[34]

### 3.4.1 Descriptive Statistics

Tables 1 through 3 display summary statistics for our main variables of interest, averaged over the period 1960-2000. The data on openness, investment rates, growth and income levels, government consumption, and population come from release 6.1 of the Penn World Tables (Heston, Summers and Aten, 2002), which updates their panel of PPP-comparable data to the year 2000. The rest of the data we use in this paper comes from Barro and Lee (1994, subsequently updated to 2000) or from the CIA (2002). Country size is measured by the log of total GDP or by the log of total population, in order to capture both economic size and demographic size. Throughout, we define trade openness in two ways: as the ratio of imports plus exports in current prices to GDP in current prices, and as the ratio of imports plus exports in exchange rate US$ to GDP in PPP US$. We label the first variable "nominal openness" and the second one "real openness".

Recently, Alcalá and Ciccone (2003, 2004) have criticized the widespread use of the first measure, have advocated the use of the second, finding that the latter leads to more robust effects of openness on growth. The key difference between the two measure stems from the treatment of non tradable goods. Suppose that trade openness raises productivity, but does so more in the tradable than in the nontradable sector (a plausible assumption). This will lead to a rise in the relative price of nontradables, and a fall in

[34] Alesina, Spolaore and Wacziarg (2000) present direct evidence on the effects of market size based on levels regressions where initial income does not appear on the right hand side. These regressions were consistent with the predictions of the theory presented in Section 2. We have repeated these levels regressions using the new cross-country data that extends to 1999, with little changes in the results.

conventionally measured openness under the assumptions that the demand for nontradables is relatively inelastic, as it may raise the denominator of the conventional measure of openness more than the numerator. So one may observe trade-induced productivity increases going hand in hand with a decline in conventional measures of openness. "Real openness" will address the problem, since the denominator now corrects for international differences in the price of nontradable goods. We show results based on both measures, in order to simultaneously address Alcalá and Ciccone's points and to allow comparability with past results.

Table 2 reveals that both measures of openness are closely related, with a correlation of 0.87. While high, this correlation justifies examining differences in results obtained using each measure. The correlation between our two measures of country size is also high, equal to 0.85. The correlation between openness and country size is negative, whatever the measures of openness and size, and in three out of four cases is of a magnitude between 0.33 and 0.54, confirming past results that small countries are more open, and suggesting that an omission of openness in a regression of growth on country size would understate the effect of size. Finally, while the simple correlation between growth and size is 0.33 when size is measured by the log of total GDP, and the correlation between openness and growth is equal to 0.21 or 0.33 (when openness is measured in current or "real terms" respectively).

Preliminary evidence on Propositions 2 and 3 can be gleaned from conditional correlations displayed in Table 3. This table presents correlations of openness and growth conditional on country size being greater or lower than the sample median, and correlations of country size and growth conditional on openness being greater or lower than the sample median. For the sake of illustration, let us focus on the log of population as a measure of size and on current openness as a measure of openness (the results are qualitatively unchanged when using the other measures). The correlation between openness and growth is 0.51 for small countries (those smaller than 6.7 million inhabitants), and only 0.10 for large countries. Similarly, the correlation between country size and growth is 0.11 for open countries, and 0.43 for closed ones. This provides suggestive evidence that openness and country size are substitutes, and that the correlation between size and growth falls with the level of openness. To fully evaluate this claim, we now turn to panel data growth regressions.

### 3.4.2 Growth, Openness and Size: Panel Regressions

Tables 4 through 6 present Seemingly Unrelated Regression (SUR) estimates of regressions of growth on openness, country size and their interaction, as well as additional controls. The SUR estimator amounts to a flexible form of the random-effects panel estimator, which allows for different covariances of the error term across time periods.[35] Its use in cross-country work is now widespread (see for example Barro and Sala-i-Martin (1995)). The panel consists of four periods of 10 year-averages (1960-69, 1970-79, 1980-89 and 1990-99), and up to 113 countries. The estimation procedure is to formulate one equation per decade, constrain the coefficients to equality across periods, and run SUR on the resulting system of equations.[36]

Table 4 present estimation results when the measure of country size is the log of population and the measure of openness involves variables in current prices. In all specifications, the parameter estimates on our three variables of interest (openness, country size and their interaction) are of the predicted sign and all are significant at the 5% level (and often at the 1% level). This holds whether we enter these variables alone (column 1), whether we control for initial income (column 2), whether we control for a long list of common growth regressors (column 3) and whether we include time specific effects in addition to all the controls (column 4). Moreover, Table 5 shows that the results change little when size is measured by the log of total GDP, although the level of significance is reduced somewhat in the specifications that include many control variables. Finally, Table 6 shows that using "real openness" does not modify the overall pattern of coefficients. In fact our results are generally stronger (in the sense of the estimated coefficients being larger in magnitude) when using this measure of openness. Similar estimates in Alcalá and Ciccone (2003, written after first draft of this paper) lend further support to our results. They show how controlling for a host of additional variables including institutional quality does not change the nature of these results and that the use of "real openness" leads to coefficients that are larger and more robust than when using "nominal openness".

[35] In contrast, the random-effects estimator imposes that the covariance between the error terms at time t and time t+1 be equal to the covariance between the error terms at time t+1 and time t+2.

[36] We use the term constrained SUR to refer to the fact that slope coefficients are constrained to equality across periods.

### 3.5 Endogeneity of Openness: 3SLS estimates

Openness, especially when defined as the volume of trade divided by GDP (however deflated), may be an endogenous variable in growth regressions. As described above, in an important paper Frankel and Romer (1999) have developed a innovative instrument to deal with potential endogeneity bias in growth and income level regressions. We use our own set of geographic variables as well as Frankel and Romer's instrument to address potential endogeneity. Our panel data IV estimator relies on a three stage least squares (3SLS) procedure. This estimator achieves consistency through instrumentation, and efficiency through the estimation of cross-period error covariance terms. Table 7 presents parameter estimates of our basic specification when the list of instruments includes geographic variables, namely dummy variables for small countries, islands, small islands, landlocked countries and the interaction term between each of these measures and country size.[37] Again, the results are consistent with previous observations, namely the pattern of coefficients suggested by theory is maintained. In the specification with all the controls, the statistical significance of the coefficients of interest is reduced slightly when real openness is used instead of current openness (Table 9), though all remain significant at the 10% level. The signs of the main coefficients of interest are maintained and the magnitude of the openness coefficient is raised in all specifications, confirming the results of Alcalá and Ciccone (2003, 2004).[38]

Finally, Table 11 show the same results using the geography-based instrument from Frankel and Romer (1999), as well as the interaction term between this variable and country size. In all specifications, the signs and basic magnitudes of the coefficients of interest are unchanged (although when openness is entered in "real" terms, the estimates cease to be statistically significant at the 5% level). Spolaore and Wacziarg (2003) present more evidence on this type of regression, by treating estimating a simultaneous equations system for the endogenous determination of openness and growth

[37] This is the same list of instruments as was used in Alesina, Spolaore and Wacziarg (2000). Unsing Hausman tests, this paper showed that this set of instruments was statistically excludable from the growth regression, and first stage F-tests suggested that they were closely related to openness and the interaction term.

[38] Tables 8 and 10 present F-tests for the first stage of the 3SLS procedure. They test the joint significant of the instruments in regressions of the endogenous variables (openness and its interaction with country size) on all the exogenous variables in the system. These F-tests show that our instruments are closely related to the variables they are instrumenting for, limiting the potential for weak instruments, especially in the specifications with many controls.

jointly. Their results are similar in spirit to those presented here.

Alcalá and Ciccone (2003) present further results along the same lines, and also explicitly consider institutional quality variables in addition to performing further sensitivity tests. Their empirical results are very consistent with ours, suggesting that predictions on the relationship between trade, country size and growth implied by our model are confirmed when the "real" measure of openness is used instead of nominal openness.

### 3.5.1 Magnitudes and Summary

While the pattern of signs and the statistical significance of the estimates presented above is consistent with our theory, the effects could still be small in magnitude. However, they are not. To illustrate the extent of the substitutability between country size and openness, let us choose a baseline regression. Consider column 4 of Table 4 - this involves using the log of population as a measure of size, current openness as a measure of openness, and a wide range of controls in the growth regression. Consider a country with the median size. In our sample, when the data on log population are averaged over the period 1960-2000, the median country turns out to be Mali (where the log of population is 8.802 - this corresponds to an average population of 6.6 million over the sample period). The effect of a one standard deviation change in openness (a change of 42 percentage points) on Mali's annual growth is estimated to be 0.419 percentage points. In contrast, in the smallest country in our sample (the Seychelles), the same change in openness would translate into an increase in growth of 1.40 percentage points. The effect of a marginal increase in openness on growth becomes zero when the log of population is equal to 10.8, which is the size of France (in our sample, only 13 countries are larger).

Conversely, the effect of size at the median level of openness, which is attained by South Korea (with a trade to GDP ratio of 54% on average between 1960 and 1999), the effect of multiplying the country's size by 10 would be to raise annual growth by 0.33 percentage points. In contrast, a relatively closed country such as Argentina (with a trade to GDP ratio of 15% on average between 1960 and 1998) would experience an increase in growth of 0.78 percentage points from decupling its population. The effect of size on growth attains zero when openness reaches 82.4% (in our sample, 26 countries had a higher level of average openness over the 1960-1999 period). Using the results obtained with "real" measures of openness the magnitude of our results would typically be even larger.

Whether one "believes" these actual magnitudes or not, the signs and statistical significance of our variables of interest are very robust features of the data and independently confirmed and reinforced by Alcalá and Ciccone (2003). When evaluating the effects of scale on growth, it is essential to view scale as attainable either through a large domestic market, or through trade openness. Ignoring either would lead to underestimating scale effects in income. This section and the literature from which it is inspired has sought to bring together the research on the impact of trade on growth and the research on the impact of economic scale on growth, and in doing so has empirically established a substitutability between openness and country size.

# 4 Country Size and Trade in History

To what extent the size of countries respond to the economic "incentives" that we discussed above? Is there a sense that in the long-run the size of countries responds to economic forces? Our answer is yes, even though, of course, the determination of borders is driven by a highly complex web of politico-economic forces. The point of this section is simply to highlight the relationship between country size and trade in a brief historical excursion. We certainly we do not aim to discuss the entire history of state formation and their size. For a more extensive discussion we refer the reader to Alesina and Spolaore (2003), and to the voluminous literature cited therein.

## 4.1 The City-States

The city-states of Italy and the Low Countries of the Renaissance in Europe represent a clear example of a political entity that could prosper even if very small because they were taking advantage of world markets. Free trade was the key to prosperity of these small states. A contemporary observer described Amsterdam as a place were "commerce is absolutely free, absolutely nothing is forbidden to merchants, they have no rule to follow but their own interest. So when an individual seems to do in his own commercial interest something contrary to the state the state turns a blind eye and pretends not to notice".[39] The other reason why city-states could afford to be small is that the state did not provide many public goods, so that not much was lost in terms of tax burden from being small. Thus, the combination of a small states who provided very few public goods and complete freedom of trade

[39] From Braudel (1992, page 206). Also cited in Alesina and Spolaore (2002).

allowed for the city state to reach unprecedented level of wealth based on trade.

## 4.2 The Absolutist Period

The emergence of centralized states from the consolidation of feudal manors was driven by three main forces. One is technological innovations in military technology that increased the benefits of scale in warfare. Secondly, there was a need to enforce property rights and to create markets above and beyond the maritime commerce of the city-states. Finally bellicose rulers needed vast populations in order to extract levies to finance wars and luxurious courts. Territorial expansion and fiscal pressure went hand in hand and city-states could not survive in this changed world. Italian city-states lost predominance. The Low Countries survived longer because of their role as Atlantic traders. While the small-city states blossomed on trade, as Wilson (1967) writes regarding France "by the second half of the sixteenth century primitive ideas about trade had already given rise to a corpus of legislation ... aimed at national self-sufficiency". Similarly, English policy turned quite protectionist in the early seventeenth century. From the small and open city-states with low taxation, the western world became organized in large countries, pursuing inward looking policies. So economic predominance switched from small open economies with cheap governments to large relatively closed economies with a heavier burden of taxation to service war.

Outside the core of Europe, absolutist regimes were based on heavy taxation raised without the parenthesis of city-states. This is the case, for instance of the Ottoman Empire, but also of India and China. The Ottoman empire for instance, was largely based on extracting rents from its population. In India the level of taxation was extraordinarily high for that period. In the sixteenth century the estimated tax revenue of the central government was about 20% of GNP.

## 4.3 The Birth of the Modern Nation-State

The nineteenth century marks the birth of the nation-state in modern forms, both in Europe and North America. The liberal philosophers of the time seemed to think of the "optimal size" of a nation-state as emerging from the trade-off between homogeneity of language and culture and the benefit of economic size. In fact, following the work of Adam Smith, they were well aware that with free trade a market economy can easily prosper even without a heavy central government. Nevertheless, the view was that there

existed an minimum size that made an economy viable. For instance, certain regions, like Belgium, Ireland and Portugal were considered too small to prosper, but free trade was regarded as a way of allowing even relatively small countries to prosper. Giuseppe Mazzini, an architect of the Italian unification, suggested that the optimal number of states in Europe was 12. His argument was precisely based on the consideration of a trade-off between the economically viable size of country and nationalistic aspiration of various groups. A famous political economy treaty of the time argues that it was "ridiculous" that Belgium and Portugal should be independent because there economies were too small to be economically viable.[40]

The unification of Germany can in fact be viewed along similar lines. The German nation-state started as a customs union (the Zollverein) which was viewed as necessary to create a sufficiently large market. As Merriman (1996, page 629) notes, before the customs union "German merchants and manufacturers began to object to the discouraging complexity of custom tariffs that created a series of costly hurdles... many businessmen demanded an end to these unnatural impediments faced by neither of their French or British rivals". Clearly market size was a critical determinant of the birth of Germany. The external threat of a war with France was a second one, as emphasized by Riker (1964). The establishment of a common market free of trade barriers was also one of the motivating factor behind the creation of the United States.

### 4.4 The Colonial Empires

In the period between 1848 and early 1870's the share of international trade in GDP quadrupled in Europe.[41] From 1870 to the First World War trade grew much more slowly despite a drastic reduction of transportation costs, as documented in Estevadeordal, Frantz and Taylor (2003). In fact the extent of the reduction of trade amongst European powers in the half century between 1870 and 1915 is a matter of dispute amongst historians. Bairoch (1989) has probably the most sanguine view on one side of the argument when he writes that the introduction of new large tariff by Germany in 1879 marks the "death" of free trade. While many historians may find this view a bit extreme, it is fairly non controversial that without the sharp reduction in trading costs international trade would have probably greatly suffered in this period, which was certainly associated with an increase in protectionism.

[40] See Hobsbawn (1987).

[41] See Estevadeordal, Frantz and Taylor (2002) for a more detailed discussion.

The last two decades of the nineteenth century witnessed the expansion of European (and North American) powers over much of the "less developed" world. One motivation of this expansionary policy was certainly the opening of new markets. As reported by Hobsbawn (1987, p. 67), in 1897 the British Prime Minister told the French ambassador to Britain that "if you [the French] were not such persistent protectionists, you would not find us so keen to annex new territories". Needless to say, the British were just as protectionist as the French and the British navy was heavily used to protect trade routes. Similar considerations apply to the expansionary acquisitions of the United States in the late nineteenth and early twentieth centuries, namely Alaska, Hawaii, Samoa, Cuba and the Philippines. At the same time, in response to European protectionism, the United States also turned protectionist in this period.

In summary, from the point of view of the colonizers, Empires were a brilliant solution to the trade-off between size and heterogeneity. Large empire guaranteed large markets, especially necessary when protectionism was on the rise, but at the same time, by not granting citizenship to the inhabitants of the colonies, the problem of having a heterogeneous population with full political rights was reduced.

### 4.5 Borders in the Interwar Period

Figure 1 shows all the countries created and eliminated in five years periods from 1870 until today.[42] The dip at the beginning of the figures highlights the unification of Germany. This figure shows that in the interwar period after the Treaty of Versailles, borders remained essentially frozen, despite the fact that many nationalistic aspiration had been left unanswered by the peace treaty. In fact, a common view amongst historians is that the Treaty of Versailles vastly mishandled the border issue. Nevertheless, borders remained virtually unchanged, in a period in which free trade collapsed. No decolonization occurred. Amongst the new country creations, at least one, Egypt (independent in 1922) is merely an issue of classification: it was largely independent from Britain, but its status switched from a protectorate to a semi-independent country. Leaving aside the Vatican City, the only other countries created between 1920 and the Second World War were Ireland (1921), Mongolia (1921), Iraq (1932), and Saudi Arabia (1932).

The interwar period was characterized by a collapse of free trade, the

[42] This figure exclude Sub-Saharan Africa, given the difficulty of identifying borders before the colonization period.

emergence of dictatorships, and by a belligerent state of international relationships. The Great Depression completed the gloomy picture. These are all factors that, according to our analysis, should *not* be associated with the creation of new countries, in fulfillment of nationalistic aspirations. In addition, these elements (lack of democracy, international conflicts, protectionism) would make colonial powers hold on to their empires and repress independent movements. In fact, all the colonial powers were adamant in refusing self-determination of colonies during this period. This combinations of events, protectionism and maintenance of large countries and empire, stands in sharp contrast with what happened in the aftermath of the Second World War.

### 4.6 Borders in the Post-Second World War period

In the fifty years that followed the Second World War, the number of independent countries increased dramatically. There were 74 countries in 1948, 89 in 1950, and 193 in 2001. The world now comprises a large number of relatively small countries: in 1995, 87 of the countries in the world had a population of less than 5 million, 58 had a population of less than 2.5 million, and 35 less than 500 thousands. In the same 50 years, the share of international trade in world GDP increased dramatically. The volume of imports and exports in a sample of about 60 countries has risen by about 40 percent.

We should stress that the increase in international trade in the last half-century, as documented in Figure 2, is not the simple result of an accounting illusion. In fact, if two countries were to split, their resulting trade to GDP ratios would automatically increase, as former domestic trade is now counted as international trade. But Figure 2 only features the average trade to GDP ratio for a set of countries *whose borders did not change since 1870.* Furthermore, Figure 3 uses average tariffs on foreign trade for a selection of countries with available data, a more direct reflection of trade policy, to display a similar historical pattern. Obviously, such policy measures are not subject to the accounting illusion either.

The correlation between the number of countries and trade liberalization is captured by Figure 4 and 5 which plot the detrended number of independent countries against the detrended trade to GDP ratio, including Sub-Saharan Africa from 1905 onward, and without it from 1870 to 1905.[43]

[43] All these figures are take from Alesina, Spolaore and Wacziarg (2000).

In both cases the correlation is very strong. Since both variables are detrended, this positive correlation is not simply due to the fact that both variables increase over time. In Figure 2, note the sharp drop in the number of countries between 1870 and 1871, due to the unification of Germany. While 1871 is on the "regression line", 1870 is well above it, suggesting that there were "too many" countries before the German unification, relative to the average level of openness.

Not only have the recent decades witnessed an increase in the number of countries, but many regions have demanded and often obtained more autonomy from their central governments. In fact, decentralization is very popular around the world. The case of Québec is especially interesting. The push for independence in Québec was revamped by the implementation of the North American Free Trade Agreement (NAFTA). The freer trade in North America, the easier it would be for a relatively small country, like Québec, to prosper. As we discussed above, at least for Canada, national borders still matter, so that trade among Canadian provinces is much easier than trade between Canadian provinces and US states. As shown by McCallum (1988), two distant Canadian provinces trade much more with each other than US states and Canadian provinces bordering each other, even though distance is a strong determinant of trade flows. This implies that there might be a cost for Québec in terms of trade flows if it were to become independent and such arguments were made by the proponents of the "no" in the self-determination referendum of 1996. As the perceived economic costs of secession fall with greater North American economic integration, the likelihood of Québec gaining independence can be expected to increase. In fact, the development of a true free-trade area in North America might reduce these costs and make Québec separatism more attractive.

### 4.7 The European Union

Fifteen European countries have created a union which has several supranational institutions, such as the Parliament, a Court system, a Commission and a Council of Ministers and have delegated to them substantial policy prerogatives. We have argued that more economic integration should have lead toward political separatism. How does the European Union "fit" into this picture?

First of all, the European Union is not a state, not even a federation since it does not have the critical determinant of what a state is: the monopoly of coercion over its citizens. Thus, the European Union does not satisfy

the Weberian notion of what constitutes a "sovereign state". The newly proposed draft Constitution for Europe states clearly in its article 2 that the European Union is indeed a union of independent countries and not a Federal State. Secondly, as economic integration is progressing at the European level, regional separatism is more and more vocal in several member countries of the Union, such as the UK, Spain, Belgium, Italy and even France. So much so, that many have argued that Europe will (and, perhaps should) become a collection of regions (Brittany, the Basque Region, Scotland, Catalonia, Wales, Bavaria, etc.) loosely connected within a European confederation of independent regions. In fact, ethnic and cultural minorities feel that they would be economically "viable" in the context of a truly European common market, thus they could "safely" separate from the home country. This argument is often mentioned in the press. For an example pertaining to Scotland, see the Financial Times, September 16, 1998: "...the existence of the European Union lowers the cost of independence for small countries by providing them with a free trade area... and by creating a common currency which will relieve the Scots of the need to create one for themselves".

One way of thinking about the EU is as a supranational union of countries that have merged certain functions needed to guarantee the functioning of a common market and take advantage of economies of scale. Whether or not the attribution of responsiblities and policy prerogatives between the EU and the national government is appropriate or not is an intricate subject which is beyond the scope of this paper.[44]

# 5 Conclusion

This paper has argued that size matters for economic performance and that country size is endogenous and depends on economic factors such as free trade, public goods provision and preference heterogeneity. We have reviewed and extended a recent literature that has discussed country formation and secession in the context of the theory of economic growth. The econometric and historical evidence is broadly consistent with the implications of these models

Much remains to be done. On the theoretical side, we have shown how scale effects could be derived in a simple neoclassical growth model, without appealing to increasing returns technologies, endogenous R&D or human

[44] For a discussion of this point, see Alesina and Wacziarg (1999).

capital spillovers, but simply by appealing to the existence of a border effect driven by trading frictions. However, whether the scale effects that we observe in the data come from the border effect, technology or spillovers remains to be investigated.

The models that we discussed are based on the assumption that heterogeneity within a country has negative effects on average utility. However, heterogeneity may also bring about some benefits. In fact, the gains from trade in our model do stem from a kind of heterogeneity - the production of different intermediate goods by different regions - and this is why a larger country, for given barriers to trade, brings net economic gains through the trade channel. By "heterogeneity" costs here we mean the specific costs associated with disagreements over the basic characteristics of a government (including policies about official languages, religion, etc.). A richer discussion of the pros and cons of heterogeneity is certainly called for.

On the empirical side, debates are still raging. Even the literature on the effect of trade on economic performance is now subject to debates on the nature and extent of this effect. The literature on the effect of country size is even more contentious. Yet the existence of both of these effects is important to the argument that we proposed about the role of trade openness in the endogenous determination of country size. We have shown that a simultaneous consideration of an economy's openness and of its size led to estimating strong effects of both size and openness on growth in a sample of countries since 1960.

Finally, in a broad historical sweep, we have suggested that the types of trade-offs identified by our framework have been at play at various stages in modern history. In a way, current developments provide an ideal setting for observers of country creation. Since the Second World War, increasing globalization has threatened nation-states "from above", while rising regionalism and decentralizing forces have threatened them "from below". The construction of the European Union epitomizes this tension, as a fundamental redrawing of the distribution of political prerogatives is being orchestrated. Powers are being transferred down through decentralization, and up through the European construction. It is likely that if globalization proceeds apace, so will regionalism. If the backlash against globalization succeeds, however, large centralized nation-states could initiate a comeback.

# References


Ades, Alberto and Edward Glaeser (1999), "Evidence on Growth, Increasing Returns and the Extent of the Market", *Quarterly Journal of Economics*, vol. 114, no. 3, August, pp. 1025-1045.

Aghion, Philippe and Peter Howitt (1992), "A Model of Growth Through Creative Destruction", *Econometrica*, March vol. 60, pp.323-351.

Alcalá, Francisco and Antonio Ciccone (2003), "Trade, the Extent of the Market and Economic Growth 1960-1996", *unpublished*, Universitat Pompeu Fabra.

Alcalá, Francisco and Antonio Ciccone (2004), "Trade and Productivity", *Quartely Journal of Economics*, vol. 119, no. 2, May.

Alesina, Alberto, Ignazio Angeloni and Ludger Schuknecht (2001), "What Does the European Union Do?", *NBER Working Paper* #8647, December

Alesina, Alberto, Robert Barro and Silvana Tenreyro (2002), "Optimal Currency Areas", in Mark Gertler and Kenneth Rogoff, eds., *NBER Macroeconomic Annual*, vol. 17, Cambridge (MA): MIT Press.

Alesina Alberto, Reza Baqir and William Easterly (1999), "Public Goods and Ethnic Divisions", *Quarterly Journal of Economics*, vol. 114, no. 4, November, pp. 1243-1284.

Alesina Alberto, Reza Baqir, and Caroline Hoxby (2004) "Political Jurisdictions in Heterogeneous Communities" *Journal of Political Economy,* forthcoming.

Alesina Alberto and Eliana La Ferrara (2000), "Participation in Heterogeneous Communities", *Quarterly Journal of Economics*, vol. 115, no. 3, August, pp. 847-904.

Alesina Alberto and Eliana La Ferrara (2002), "Who Trusts Others?" *Journal of Public Economics*, vol. 85, August, pp. 207-34.

Alesina, Alberto, Arnaud Devleeschauwer, William Easterly, Sergio Kurlat and Romain Wacziarg (2003), "Fractionalization", *Journal of Economic Growth,* vol. 8, no. 2, June, pp. 155-194.

Alesina, Alberto, and Enrico Spolaore (1997), "On the Number and Size of Nations", *Quarterly Journal of Economics*, November, pp.1027-1056.

Alesina, Alberto, and Enrico Spolaore (2003), *The Size of Nations*, MIT Press, forthcoming.

Alesina, Alberto, Enrico Spolaore and Romain Wacziarg (2000), "Economic Integration and Political Disintegration", *American Economic Review*, vol. 90, no. 5, December, pp. 1276-1296.

Alesina, Alberto and Romain Wacziarg (1998), "Openness, Country Size and the Government", *Journal of Public Economics*, vol. 69, no 3, September, pp.305-321.

Alesina, Alberto and Romain Wacziarg (1999), "Is Europe Going Too Far?", *Carnegie-Rochester Conference Series on Public Policy*, vol. 51, no. 1, December, pp.1-42.

Bairoch, Paul (1989), "European Trade Policy, 1815-1914", in Peter Mathias and Sidney Pollard, eds, *The Cambridge Economic History of Europe*, vol. 8, 1-160. Cambridge: Cambridge University Press, 1989.

Bardhan, Pranab (2002), "Decentralization of Governance and Development", *Journal of Economic Perspectives*, vol. 16, no. 4, pp. 185-205.

Barro, Robert (1991), "Economic Growth in a Cross-Section of Countries", *Quarterly Journal of Economics*, vol. 106, no. 2, May, pp. 407-443.

Barro, Robert J. and Jong-Wha Lee (1994), "Data Set for a Panel of 138 Countries", available at http://www.nber.org/data/.

Barro, Robert J. and Xavier Sala-i-Martin (1995), *Economic Growth*, New York: McGraw Hill.

Ben-David, Dan (1993), "Equalizing Exchange: Trade Liberalization and Income Convergence", *Quarterly Journal of Economics*, vol. 108, August, pp.653-679.

Bolton, Patrick and Gerard Roland (1997), "The Breakups of Nations: A Political Economy Analysis", *Quarterly Journal of Economics*, November, pp. 1057-89

Casella, Alessandra and Jonathan S. Feinstein (2002), "Public Goods in Trade: On the Formation of Markets and Political Jurisdictions", *International Economic Review,* vol. 43, no. 2, pp. 437-462.

Central Intelligence Agency (2002), *CIA World Factbook 2002*, Dulles, VA: Brassey's Inc.

De Figueiredo, Rui and Barry Weingast (2002), "Self-Enforcing Federalism", *working paper*, Stanford University, March.

Dollar, David (1992), "Outward-oriented developing economies really do grow more rapidly: Evidence from 95 LDCs, 1976-85", *Economic Development and Cultural Change*, vol. 40, no. 3, pp.523-544.

Easterly William and Ross Levine (1997), "Africa's Growth Tragedy: Policies and Ethnic Divisions", *Quarterly Journal of Economics,* vol. 111, no. 4, November, pp. 1203-1250.

Edwards, Sebastian (1993), "Openness, Trade Liberalization and Growth in Developing Countries", *Journal of Economic Literature*, vol. 31, September, pp. 1358-1393.

Edwards, Sebastian (1998), "Openness, Productivity and Growth: What Do We Really Know?", *Economic Journal*, Vol. 108, no. 447,March, pp.383-398.

Estevadeordal, Antoni, Brian Frantz and Alan M. Taylor (2003), "The Rise and Fall of World Trade, 1870-1939", *Quarterly Journal of Economics*, vol. 118, no. 2, May.

Findlay, Ronald (1996), "Towards a Model of Territorial Expansion and the Limits of Empires" in Michelle Garfinkel and Sergios Skaperdas, eds, *The Political Economy of Conflict and Appropriation,* Cambridge UK: Cambridge University Press.

Frankel, Jeffrey A. and David Romer (1999), "Does Trade Cause Growth?", *American Economic Review*, vol. 89, no. 3, June, pp. 379-399.

Friedman, David (1977) "A Theory of the Size and Shape of Nations", *Journal of Political Economy,* vol. 85, no. 1, February, pp. 59-77.

Garner, Phillip (2001), "The Role of Rival Nation-States in Long-Run Growth", *working paper*, Brown University.

Grossman, Gene and Elhanan Helpman (1991), *Innovation and Growth in the Global Economy*, Cambridge, MA: MIT Press.

Hall, Robert and Jones, Charles I. (1999), "Why Do Some Countries Produce so Much More Output Per Worker than Others?", *Quarterly Journal of Economics*, vol. 114 no. 1, pp. 83-116, February.

Harrison, Ann and Gordon Hanson (1999), "Who Gains From Trade Reforms? Some Remaining Puzzles", *Journal of Development Economics*, vol. 48, pp.419-447.

Helliwell, John (1998), *How Much Do National Borders Matter?*, Brookings Institution Press, Washington, DC.

Herbst, Jeffrey (2000), *States and Power in Africa*, Princeton: Princeton University Press.

Heston, Alan, Robert Summers and Bettina Aten (2002), "Penn World Table Version 6.1", Center for International Comparisons at the University of Pennsylvania (CICUP), October.

Hobsbawn, Eric (1987), *The Age of Empire*, Vintage Books, New York, NY.

Hobsbawn, Eric (1990), *Nations and Nationalism Since 1870*, Cambridge University Press, Cambridge, UK.

Jones, Charles (1999), "Growth: With or Without Scale Effects?", *American Economic Review Papers and Proceedings*, May, Vol. 89, pp.139-144.

Jones, Charles (1995a), "R&D-Based Models of Economic Growth", *Journal of Political Economy*, August, Vol. 103, pp. 759-784.

Jones, Charles (1995b), "Time Series Tests of Endogenous Growth Models", *Quarterly Journal of Economics*, May, Vol. 110, pp. 495-525.

La Porta Rafael, Florencio, Lopez de Silanes, Andrei Shleifer and Robert Vishny (1999), "The Quality of Government", *Journal of Law, Economics and Organization*, vol. 15, no. 1, March, pp. 222-279.

Lucas, Robert E.(1988), "On the Mechanics of Economic Development", *Journal of Monetary Economics*, vol. 22, pp.3-42.

McCallum, John (1992), "On the Economic Consequences of Quebec's Separation", in A. Riggs and T. Velk (eds.), *Federalism in Peril*, Fraser University Press.

McCallum, John (1995), "National Borders Matter: Canada-US Regional Trade Patterns", *American Economic Review*, June, 615-23.

Merriman, John W. (1996), *A History of Modern Europe: From the Renaissance to the Present*, New York: W.W. Norton & Company.

Murphy, Kevin , Andrei Shleifer and Robert Vishny (1989), "Industrialization and the Big Push", *Journal of Political Economy*, vol. 87, no. 5, pp. 1003-1026.

Oates, Wallace E. (1999), "An Essay on Fiscal Federalism", *Journal of Economic Literature*, vol. 37, September, pp.1120-1149.

Obstfeld, Maurice and Kenneth Rogoff (2000), "The Six Major Puzzles in International Finance: Is There a Common Cause?", in Ben S. Bernanke and Kenneth Rogoff, eds., *NBER Macroeconomics Annual*, vol. 15, Cambridge (MA): MIT Press, pp.339-390.

Portes, Richard and Helene Rey (2000), "The Determinants of Cross-Border Equity Flows", *NBER Working Paper* No. #7336, September.

Pritchett, Lant (1996), "Measuring Outward Orientation: Can It Be Done?", *Journal of Development Economics*, vol. 49, no.2.

Riker, William H., (1964), *Federalism: Origins, Operation, Significance*, Boston: Little, Brown.

Rivera-Batiz, Luis and Paul Romer (1991), "Economic Integration and Economic Growth", *Quarterly Journal of Economics*, vol. 106, pp.531-556.

Rodrik, Dani and Francisco Rodríguez (2000), "Trade Policy and Economic Growth: A Skeptics Guide to the Cross-National Evidence", in Ben Bernanke and Kenneth Rogoff, eds., *NBER Macroeconomics Annual*, vol. 15, Cambridge (MA): MIT Press.

Romer, Paul (1986), "Increasing Returns and Long Run Growth", *Journal of Political Economy,* vol. 94, pp.1002-37.

Romer, Paul (1990), "Endogenous Technological Change", *Journal of Political Economy*, vol. 98, no. 5, October, pp. S71-S102.

Rose, Andrew (2000), "One money, one market: the effect of common currencies on trade", *Economic Policy*, vol. 15. no. 30, April.

Sachs, Jeffrey and Andrew Warner (1995), "Economic Reform and the Process of Global Integration", *Brookings Papers on Economic Activity*, no.1, pp. 1-118.

Smith, Adam (1986), *An Inquiry into the Nature and Causes of the Wealth of Nations*, Harmondsworth, UK : Penguin Books, (first published 1776).

Spolaore, Enrico (1995), "Economic Integration, Political Borders and Productivity", prepared for the CEPR-Sapir conference on "Regional Integration and Economic Growth", Tel Aviv University, December.

Spolaore Enrico (2001), "Conflict, Trade and the Size of Countries", *working paper*, Brown University.

Spolaore, Enrico and Romain Wacziarg (2002), "Borders and Growth", *NBER Working Paper* #9223, September.

Wacziarg, Romain (2001), "Measuring the Dynamic Gains from Trade", *World Bank Economic Review*, vol. 15. no. 3, October.

Wacziarg, Romain and Karen Horn Welch (2003), "Trade Liberalization and Growth: New Evidence", *NBER working paper* #10152*,* December.

Wilson, C. H. (1967), "Trade, Society and the State" in E. E. Rich and C. H. Wilson, eds., *The Cambridge Economic History of Europe from the Decline of the Roman Empire: Volume 4,* Cambridge: Cambridge University Press, pp 487-575.

Wittman, Daniel (1991), "Nations and States: Mergers and Acquisitions; Dissolution and Divorce", *American Economic Review, Papers and Proceedings*, May, pp.126-129.

**Table 1 - Descriptive Statistics (1960-2000 averages)**

| | No. Obs. | Mean | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| Average Annual Growth | 104 | 1.669 | 1.374 | -1.259 | 5.515 |
| Openness Ratio (Current) | 114 | 64.098 | 41.871 | 14.373 | 322.128 |
| Openness Ratio (Real) | 114 | 37.363 | 35.376 | 4.350 | 244.631 |
| Log per capita GDP 1960 | 110 | 7.730 | 0.889 | 5.944 | 9.614 |
| Log total GDP | 113 | 23.905 | 1.943 | 19.723 | 29.165 |
| Log population | 114 | 15.763 | 1.678 | 11.019 | 20.670 |
| Fertility rate | 156 | 4.569 | 1.797 | 1.733 | 7.597 |
| Female human capital | 103 | 1.116 | 1.067 | 0.024 | 4.923 |
| Male human capital | 103 | 1.523 | 1.225 | 0.096 | 5.467 |
| Investment Rate (% GDP) | 114 | 15.653 | 7.880 | 2.023 | 41.252 |
| Government consumption (% GDP) | 114 | 19.869 | 9.439 | 4.297 | 48.635 |

**Table 2 - Pairwise Correlations for the Main Variables of Interest (1960-2000 averages)**

| | Average Annual Growth | Log total GDP | Log per capita GDP 1960 | Log Population | Openness Ratio (current) |
|---|---|---|---|---|---|
| Average Annual Growth | 1.000 | | | | |
| Log total GDP | 0.338 | 1.000 | | | |
| Log per capita GDP 1960 | 0.172 | 0.436 | 1.000 | | |
| Log population | 0.125 | 0.853 | -0.058 | 1.000 | |
| Openness Ratio (Current) | 0.216 | -0.334 | 0.135 | -0.537 | 1.000 |
| Openness Ratio (Real) | 0.331 | -0.042 | 0.382 | -0.348 | 0.870 |

**Table 3 - Conditional Correlations – 1960-2000**

| Variable | Conditioning Statement | Correlation with Growth | Number of Obs. |
|---|---|---|---|
| Openness (current) | Log pop>median=8.807 | 0.104 | 54 |
| Openness (current) | Log pop<=median=8.807 | 0.511 | 50 |
| Openness (current) | Log GDP> median=16.700 | 0.301 | 52 |
| Openness (current) | Log GDP<=median=16.700 | 0.462 | 52 |
| Openness (real) | Log pop>median=15.715 | 0.131 | 54 |
| Openness (real) | Log pop<=median=15.715 | 0.579 | 50 |
| Openness (real) | Log GDP> median=23.607 | 0.223 | 52 |
| Openness (real) | Log GDP<=median=23.607 | 0.474 | 52 |
| Log population | Openness (current)>median=53.897 | 0.107 | 50 |
| Log population | Openness (current)<=median=53.897 | 0.426 | 54 |
| Log GDP | Openness (current)>median=53.897 | 0.324 | 50 |
| Log GDP | Openness (current)<=median=53.897 | 0.563 | 54 |
| Log population | Openness (real)>median=26.025 | -0.089 | 51 |
| Log population | Openness (real)<=median=26.025 | 0.587 | 53 |
| Log GDP | Openness (real)>median=26.025 | 0.137 | 51 |
| Log GDP | Openness (real)<=median=26.025 | 0.625 | 53 |

Medians computed from individual samples, while correlations are common sample correlations.
Growth: Average annual growth, 1960-2000

**Table 4 - Constrained SUR Estimates (size=log of population, openness=current openness)**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| **Size*Openness (current)** | **-0.006**** | **-0.006**** | **-0.007**** | **-0.005*** |
| | **(0.002)** | **(0.002)** | **(0.002)** | **(0.002)** |
| **Size** | **0.493**** | **0.481**** | **0.326*** | **0.412**** |
| | **(0.123)** | **(0.120)** | **(0.153)** | **(0.138)** |
| **Openness (current)** | **0.057**** | **0.055**** | **0.059**** | **0.054**** |
| | **(0.015)** | **(0.014)** | **(0.020)** | **(0.018)** |
| Log initial per capita income | | 0.185 | -1.157** | -1.109** |
| | | (0.112) | (0.248) | (0.230) |
| Fertility | | | -0.332** | -0.479** |
| | | | (0.118) | (0.110) |
| Male human capital | | | 0.090 | 0.337 |
| | | | (0.279) | (0.253) |
| Female human capital | | | -0.139 | -0.260 |
| | | | (0.327) | (0.299) |
| Govt consumption (% GDP) | | | -0.052** | -0.035** |
| | | | (0.013) | (0.012) |
| Investment rate (% GDP) | | | 0.133** | 0.090** |
| | | | (0.016) | (0.016) |
| Intercept | -3.274** | -4.600** | 8.530** | 8.840** |
| | (1.175) | (1.355) | (3.085) | (2.84) |
| Intercept 1970-1979 | | | | 8.170** |
| | | | | (2.87) |
| Intercept 1980-1989 | | | | 7.030* |
| | | | | (2.86) |
| Intercept 1990-2000 | | | | 6.960* |
| | | | | (2.81) |
| # countries (# periods) | 104 (4) | 104 (4) | 80 (4) | 80 (4) |
| Adjusted R-squared | 0.15 0.01 | 0.15 0.02 | 0.12 0.22 | 0.38 0.23 |
| | 0.11 0.03 | 0.10 0.05 | 0.35 0.14 | 0.47 0.23 |

Standard errors in parentheses

† significant at 10% level; * significant at 5% level; ** significant at 1% level

**Table 5 - Constrained SUR Estimates (size=log of GDP, openness=current openness)**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| **Size*Openness (current)** | **-0.005**** | **-0.005**** | **-0.003†** | **-0.003†** |
| | **(0.001)** | **(0.001)** | **(0.002)** | **(0.002)** |
| **Size** | **0.532**** | **0.592**** | **0.325*** | **0.438**** |
| | **(0.099)** | **(0.113)** | **(0.139)** | **(0.125)** |
| **Openness (current)** | **0.089**** | **0.093**** | **0.064*** | **0.063*** |
| | **(0.024)** | **(0.025)** | **(0.030)** | **(0.027)** |
| Log initial per capita income | | -0.171 | -1.252** | -1.342** |
| | | (0.143) | (0.247) | (0.230) |
| Fertility | | | -0.317** | -0.466** |
| | | | (0.119) | (0.109) |
| Male human capital | | | -0.011 | 0.268 |
| | | | (0.282) | (0.254) |
| Female human capital | | | -0.045 | -0.184 |
| | | | (0.331) | (0.300) |
| Govt consumption (% GDP) | | | -0.050** | -0.034** |
| | | | (0.013) | (0.012) |
| Investment rate (% GDP) | | | 0.126** | 0.081** |
| | | | (0.017) | (0.016) |
| Intercept | -8.163** | -7.937** | 6.358 | 6.740* |
| | (1.758) | (1.804) | (3.471) | (3.13) |
| Intercept 1970-1979 | | | | 6.010 |
| | | | | (3.16) |
| Intercept 1980-1989 | | | | 4.820 |
| | | | | (3.16) |
| Intercept 1990-2000 | | | | 4.680 |
| | | | | (3.12) |
| # countries (# periods) | 104 (4) | 104 (4) | 80 (4) | 80 (4) |
| Adjusted R-squared | 0.11 0.01 | 0.12 0.01 | 0.13 0.22 | 0.41 0.24 |
| | 0.09 0.02 | 0.07 0.02 | 0.35 0.06 | 0.47 0.19 |

Standard errors in parentheses

† significant at 10% level; * significant at 5% level; ** significant at 1% level

**Table 6 - Constrained SUR Estimates – Using Real Openness**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | **Size=log of population** | **Size=log of population** | **Size=log of GDP** | **Size=log of GDP** |
| **Size*Real Openness** | **-0.004*** | **-0.006†** | **-0.008**** | **-0.007*** |
| | **(0.002)** | **(0.003)** | **(0.002)** | **(0.003)** |
| **Size** | **0.250**** | **0.229†** | **0.496**** | **0.424**** |
| | **(0.093)** | **(0.129)** | **(0.096)** | **(0.126)** |
| **Real Openness** | **0.075*** | **0.094†** | **0.198**** | **0.185**** |
| | **(0.031)** | **(0.052)** | **(0.050)** | **(0.068)** |
| Log per capita income, 1960 | 0.092 | -1.295** | -0.244 | -1.489** |
| | (0.135) | (0.235) | (0.160) | (0.238) |
| Fertility | - | -0.552** | - | -0.537** |
| | | (0.111) | | (0.110) |
| Male human capital | - | 0.247 | - | 0.205 |
| | | (0.259) | | (0.254) |
| Female human capital | - | -0.162 | - | -0.130 |
| | | (0.298) | | (0.292) |
| Government consumption (% GDP) | - | -0.033** | - | -0.033** |
| | | (0.012) | | (0.012) |
| Investment (% GDP) | - | 0.090** | - | 0.076** |
| | | (0.016) | | (0.017) |
| Intercept | -3.318 | - | -8.823** | - |
| | (1.733) | | (2.091) | |
| # of countries (periods) | 104 (4) | 80 (4) | 104 (4) | 80 (4) |
| Adjusted R-squared | -0.18 -0.01 | 0.33 0.21 | -0.14 0.03 | 0.35 0.19 |
| | -0.07 0.02 | 0.47 0.22 | -0.03 0.06 | 0.50 0.24 |

Standard errors in parentheses

† significant at 10% level; * significant at 5% level; ** significant at 1% level

Columns (2) and (4) estimated with period specific intercepts (time effects not reported). Other specifications available upon request.

**Table 7 - Constrained 3SLS Estimates (Current Openness)**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | **Size=log population** | **Size=log population** | **Size=log population** | **Size=log of GDP** | **Size=log of GDP** | **Size=log of GDP** |
| **Size*Openness (current)** | **-0.008** (0.002)** | **-0.007** (0.002)** | **-0.008** (0.003)** | **-0.007** (0.002)** | **-0.010** (0.002)** | **-0.003† (0.002)** |
| **Size** | **0.507** (0.157)** | **0.634** (0.144)** | **0.375* (0.176)** | **0.677** (0.143)** | **1.070** (0.167)** | **0.314* (0.158)** |
| **Openness (current)** | **0.068** (0.020)** | **0.073** (0.018)** | **0.069** (0.024)** | **0.129** (0.038)** | **0.193** (0.039)** | **0.060† (0.036)** |
| Log initial per capita income | - | 0.147 (0.117) | -1.157** (0.251) | - | -0.525** (0.167) | -1.257** (0.247) |
| Fertility | - | - | -0.330** (0.120) | - | - | -0.319** (0.121) |
| Male human capital | - | - | 0.125 (0.281) | - | - | -0.017 (0.283) |
| Female human capital | - | - | -0.171 (0.329) | - | - | -0.039 (0.332) |
| Govt consumption (% GDP) | - | - | -0.052** (0.013) | - | - | -0.050** (0.013) |
| Investment rate (% GDP) | - | - | 0.134** (0.016) | - | - | 0.126** (0.017) |
| Intercept | -2.701 (1.537) | -5.945** (1.513) | 8.178* (3.299) | -10.843** (2.604) | -14.269** (2.561) | 6.596 (3.813) |
| # countries (# periods) | 104 (4) | 104 (4) | 80 (4) | 104 (4) | 104 (4) | 80 (4) |
| Adjusted R-squared | 0.13 0.05 0.19 0.01 | 0.18 –0.02 0.11 0.03 | 0.13 0.21 0.34 0.15 | 0.12 0.07 0.13 0.01 | 0.25 0.02 0.16 0.24 | 0.28 0.35 0.14 0.18 |

Standard errors in parentheses

† significant at 10% level; * significant at 5% level; ** significant at 1% level

*Notes*: Instruments used: dummies for small country, island, small island, landlocked country, and the interaction of each of these measures with the log of country size.

**Table 8 - First-Stage F-Tests for the Instruments (Current Openness)**

| Endogenous Variable | Openness (Current) | Openness*Size |
|---|---|---|
| **Size = log population** | | |
| Specification 1- F stat | 4.83 | 3.92 |
| p value | 0.00 | 0.00 |
| Specification 2- F stat | 5.63 | 6.28 |
| p value | 0.00 | 0.00 |
| Specification 3-F stat | 4.22 | 4.49 |
| p value | 0.00 | 0.00 |
| **Size= log GDP** | | |
| Specification 4- F stat | 5.61 | 6.25 |
| p value | 0.00 | 0.00 |
| Specification 5- F stat | 10.38 | 11.23 |
| p value | 0.00 | 0.00 |
| Specification 6- F stat | 7.52 | 7.34 |
| p value | 0.00 | 0.00 |

*Note*: F-tests on the instruments from a regression of each endogenous variable on the list of instruments plus the exogenous regressors in each specification.

**Table 9 – Constrained 3SLS Estimates (Real Openness)**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | **Size=log popula-tion** | **Size=log popula-tion** | **Size=log popula-tion** | **Size=log of GDP** | **Size=log of GDP** | **Size=log of GDP** |
| **Size*Real Openness** | **-0.006* (0.003)** | **-0.006* (0.003)** | **-0.007† (0.004)** | **-0.014** (0.003)** | **-0.014** (0.003)** | **-0.007* (0.003)** |
| **Size** | **0.280** (0.107)** | **0.317** (0.103)** | **0.248† (0.146)** | **0.630** (0.111)** | **0.768** (0.124)** | **0.440** (0.141)** |
| **Real Openness** | **0.100* (0.040)** | **0.098* (0.038)** | **0.111† (0.062)** | **0.350** (0.073)** | **0.361** (0.071)** | **0.195* (0.079)** |
| Log per capita income, 1960 | - | 0.017 (0.157) | -1.277** (0.237) | - | -0.526** (0.187) | -1.493** (0.239) |
| Fertility | - | - | -0.543** (0.112) | - | - | -0.536** (0.110) |
| Male human capital | - | - | 0.269 (0.260) | - | - | 0.206 (0.255) |
| Female human capital | - | - | -0.167 (0.299) | - | - | -0.13 (0.292) |
| Government consumption (% GDP) | - | - | -0.033** (0.012) | - | - | -0.033** (0.012) |
| Investment (% GDP) | - | - | 0.092** (0.017) | - | - | 0.075** (0.017) |
| Intercept | -2.941 (1.706) | -3.922* (1.919) | - | -13.883** (2.721) | -13.503** (2.679) | - |
| # Countries (# periods) | 104 (4) | 104 (4) | 80 (4) | 104 (4) | 104 (4) | 80 (4) |
| Adjusted R-squared | -0.17 -0.01 –0.09 0.01 | -0.20 -0.01 -0.06 0.00 | 0.33 0.22 0.46 0.22 | -0.10 0.02 -0.15 -0.01 | -.21 -0.01 - 0.08 -0.02 | 0.35 0.19 0.50 0.24 |

Standard errors in parentheses

† significant at 10% level; * significant at 5% level; ** significant at 1% level

*Notes*: Instruments used: dummies for small country, island, small island, landlocked country, and the interaction of each of these measures with the log of population.

Columns (3) and (6) estimated with period specific intercepts (time effects not reported). Other specifications available upon request.

**Table 10 – First-Stage F-Tests for the Instruments (Real Openness)**

| Endogenous Variable | Openness (Constant) | Openness*Size |
|---|---|---|
| **Size= log GDP** | | |
| Specification 1- F stat | 4.45 | 4.95 |
| p value | 0.00 | 0.00 |
| Specification 2- F stat | 9.09 | 9.92 |
| p value | 0.00 | 0.00 |
| Specification 3- F stat | 10.75 | 10.80 |
| p value | 0.00 | 0.00 |
| **Size = log population** | | |
| Specification 4- F stat | 4.55 | 3.52 |
| p value | 0.00 | 0.00 |
| Specification 5- F stat | 6.25 | 7.18 |
| p value | 0.00 | 0.00 |
| Specification 6- F stat | 5.67 | 7.20 |
| p value | 0.00 | 0.00 |

*Note*: F-tests on the instruments from a regression of each endogenous variable on the list of instruments plus the exogenous regressors in each specification.

**Table 11 – Constrained 3SLS Estimates (using Frankel and Romer's Instrument)**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | **Size=log of population** | **Size=log of population** | **Size=log of GDP** | **Size=log of GDP** |
| | **Current Openness** | **Real Openness** | **Current Openness** | **Real Openness** |
| **Size*Openness** | **-0.008**** | **-0.010†** | **-0.003†** | **-0.009*** |
| | **(0.003)** | **(0.006)** | **(0.002)** | **(0.004)** |
| **Size** | **0.435*** | **0.273** | **0.399*** | **0.452**** |
| | **(0.180)** | **(0.197)** | **(0.166)** | **(0.173)** |
| **Openness** | **0.128**** | **0.163†** | **0.089†** | **0.242*** |
| | **(0.041)** | **(0.088)** | **(0.049)** | **(0.099)** |
| Log initial per capita income | -1.114** | -1.254** | -1.282** | -1.433** |
| | (0.251) | (0.252) | (0.245) | (0.255) |
| Fertility | -0.307* | -0.354** | -0.290* | -0.348** |
| | (0.122) | (0.120) | (0.125) | (0.118) |
| Male human Capital | 0.105 | -0.011 | -0.036 | -0.086 |
| | (0.280) | (0.291) | (0.283) | (0.284) |
| Female human Capital | -0.164 | -0.023 | -0.043 | 0.031 |
| | (0.321) | (0.327) | (0.325) | (0.320) |
| Government consumption (% GDP) | -0.053** | -0.052** | -0.051** | -0.052** |
| | (0.013) | (0.013) | (0.013) | (0.013) |
| Investment rate (% GDP) | 0.131** | 0.130** | 0.122** | 0.112** |
| | (0.017) | (0.017) | (0.017) | (0.019) |
| Intercept | 3.959 | 7.991 | 2.219 | 2.694 |
| | (4.408) | (4.296) | (4.948) | (4.547) |
| # countries (# periods) | 80 (4) | 78 (4) | 80 (4) | 80 (4) |
| Adjusted R-squared | 0.12 0.21 0.36 0.14 | 0.04 0.20 0.37 0.10 | 0.11 0.23 0.37 0.02 | 0.02 0.18 0.40 0.12 |

Standard errors in parentheses

† significant at 1% level; * significant at 5% level; ** significant at 1% level

*Notes*: Instruments used: Frankel-Romer instrument for openness and its interaction with the log of GDP.

**Figure 1. Countries Created and Destroyed**
**(5-year periods, excludes Sub-Saharan Africa)**

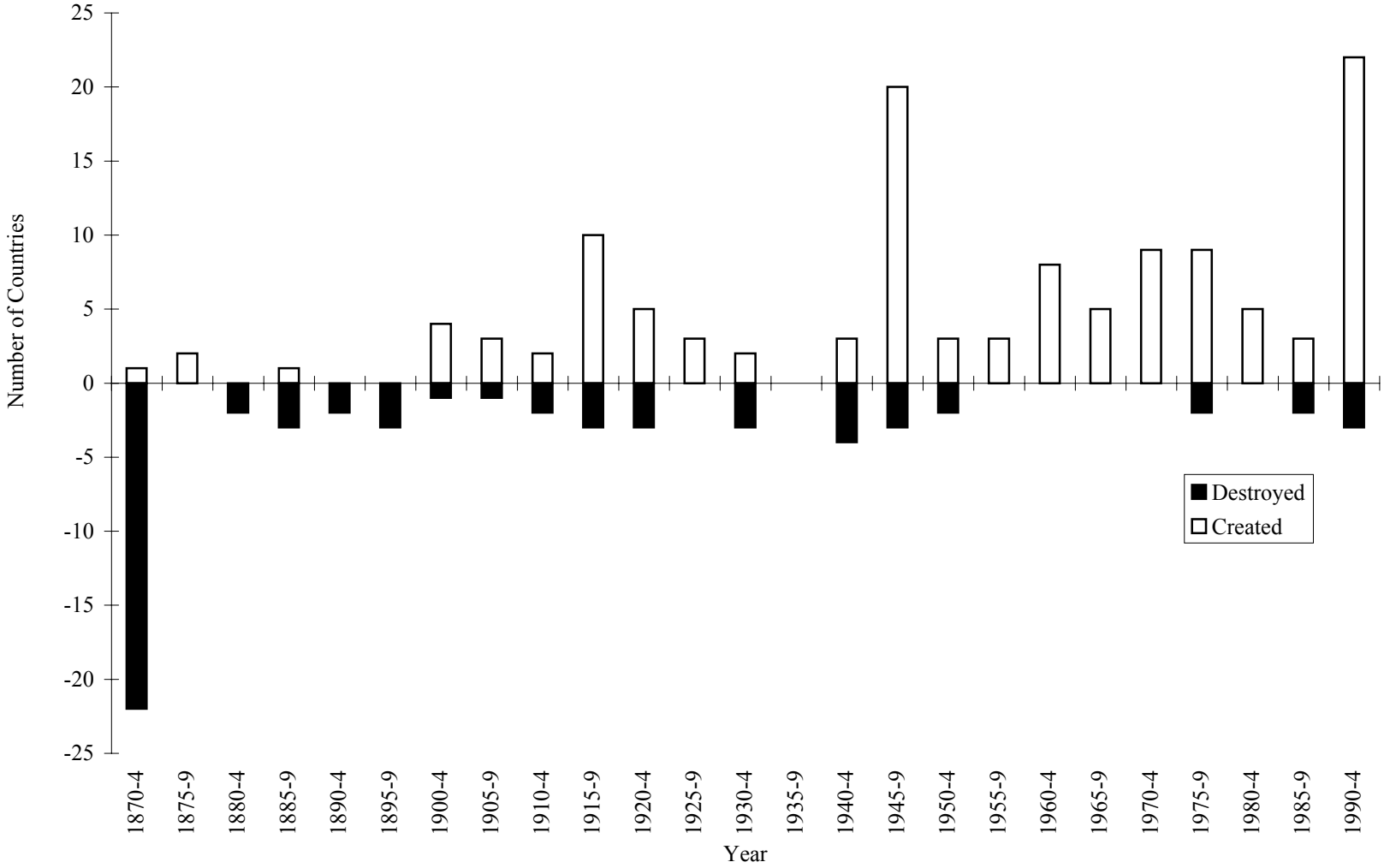

**Figure 2. Trade Openness and the Number of Countries**

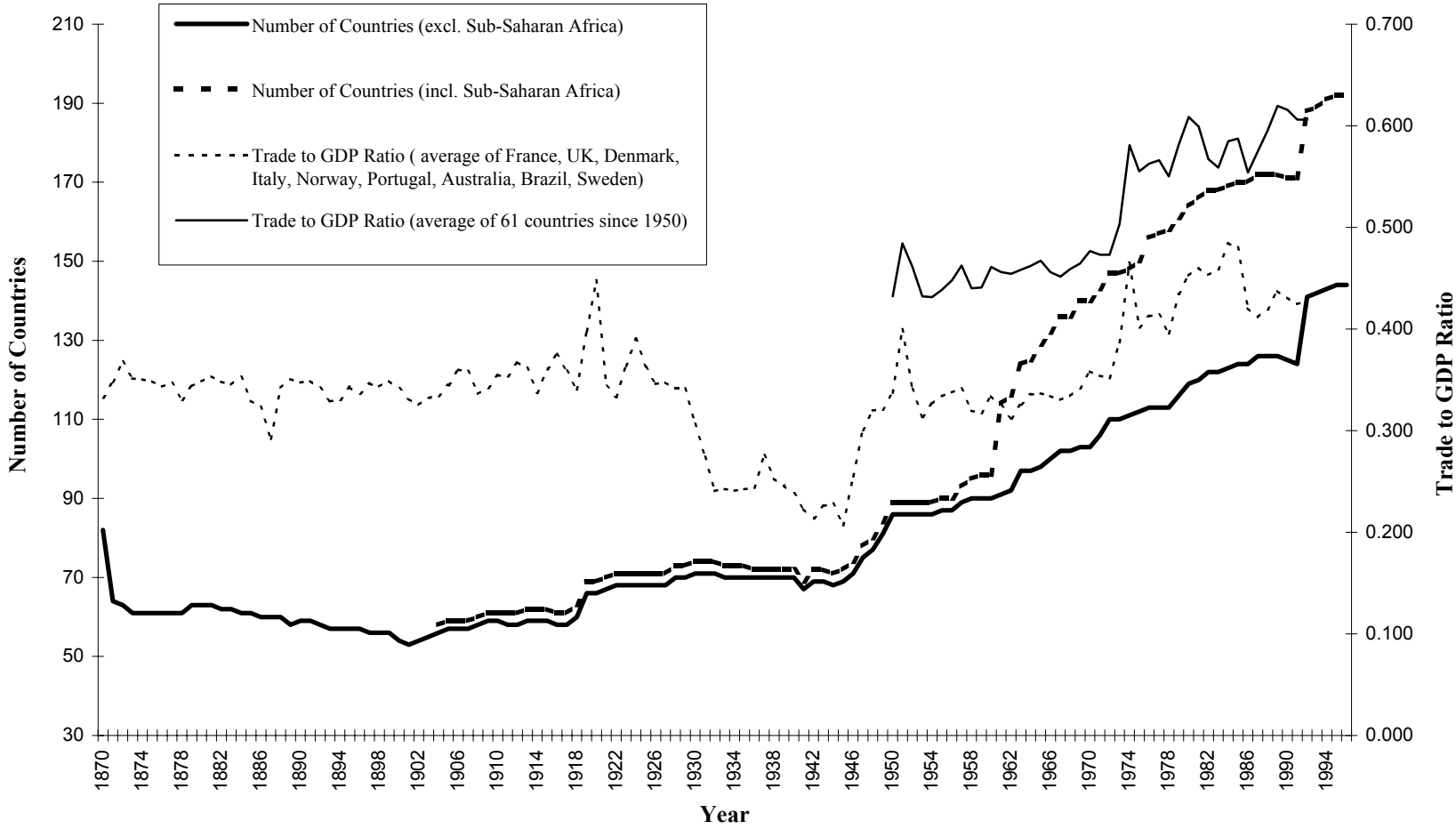

**Figure 3: Average Tariff Rate and the Number of Countries**
**(Unweighted country average of average tariff rate for Austria, Belgium, France, Germany, Sweden, USA)**

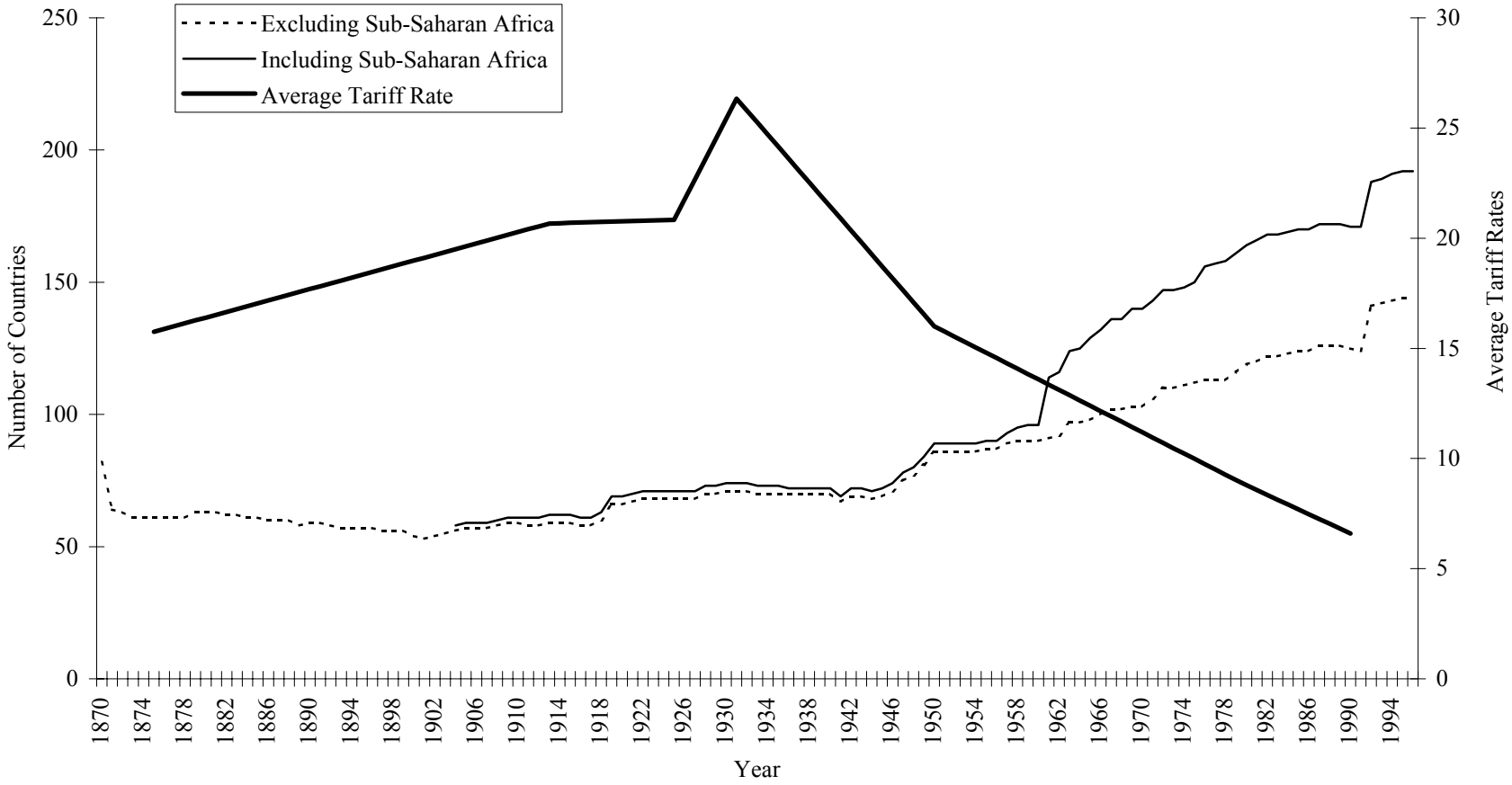

**Figure 4. Scatterplot of the Detrended Number of Countries Plotted Against the Detrended Trade to GDP ratio (Without Sub-Saharan Africa - 1870–1992)**

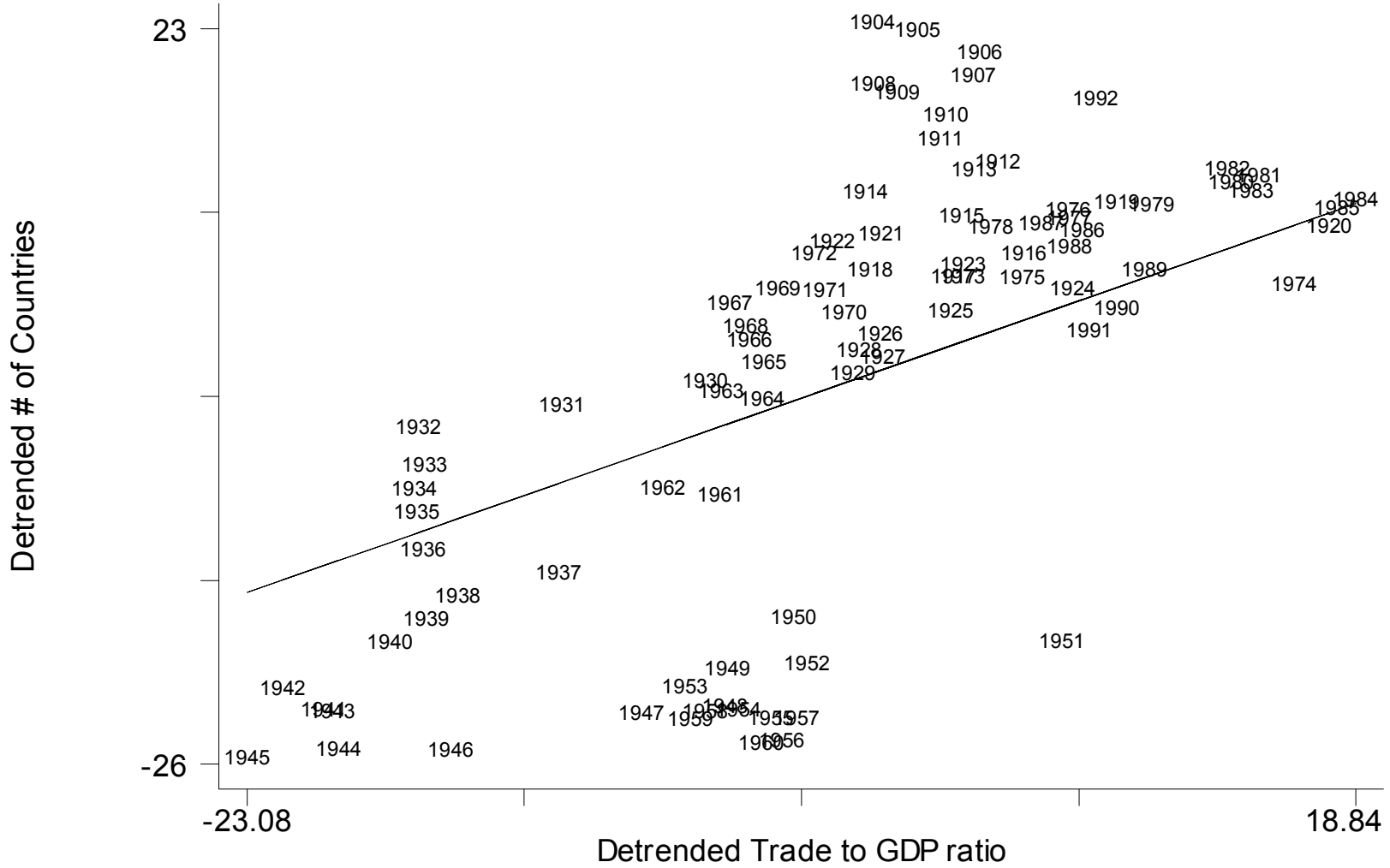

**Figure 5. Scatterplot of the Detrended Number of Countries Plotted Against the Detrended Trade to GDP ratio (With Sub-Saharan Africa - 1903–1992)**