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15 **Abstract** 15

16 Normally, economists take the size of countries as an exogenous variable. Nevertheless, 16  
17 the borders of countries and their size change, partially in response to economic factors 17  
18 such as the pattern of international trade. Conversely, the size of countries influences 18  
19 their economic performance and their preferences for international economic policies – 19  
20 for instance smaller countries have a greater stake in maintaining free trade. In this 20  
21 paper, we review the theory and evidence concerning a growing body of research that 21  
22 considers both the impact of market size on growth and the endogenous determination 22  
23 of country size. We argue that our understanding of economic performance and of the 23  
24 history of international economic integration can be greatly improved by bringing the 24  
25 issue of country size at the forefront of the analysis of growth. 25  
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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.<sup>1</sup> 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.<sup>2</sup> 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 chapter, 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.<sup>3</sup> 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 by those researchers who have paid attention to the effect of geography on growth. Borders are not exogenous geographical features: they are a human-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 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 about the political costs of large states. 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".

<sup>1</sup> 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.

<sup>2</sup> Based on all measures of growth in per capita PPP income in constant prices constructed from the Penn World Tables, version 6.1.

<sup>3</sup> 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.

1 Influenced by Montesquieu, the founding fathers of the United States were preoccu- 1  
2 pied with the potentially excessive size of the new Federal State. On the other hand, 2  
3 liberal thinkers who in the nineteenth century contributed to defining modern nation- 3  
4 states were concerned that in order to be economically, and therefore politically viable, 4  
5 countries should not be too small. Historians have studied the formation of states and 5  
6 their size and emphasized the role of wars and military technology as an important de- 6  
7 terminant. In fact, rulers, especially nondemocratic ones, have always seen size as a 7  
8 measure of power and tried to expand the size of the territory under their rule. So, while 8  
9 throughout history country size seemed to be a constant preoccupation of philosophers, 9  
10 political scientists and policymakers, economists have largely ignored this subject. 10

11 In recent decades the question of borders has risen to the center of attention in in- 11  
12 ternational politics. The collapse of the Soviet Union, decolonization, and the break-up 12  
13 of several countries have rapidly increased the number of independent polities. In 1946 13  
14 there were 76 independent countries, in 2002 there were 193.<sup>4</sup> East Timor was the latest 14  
15 new independent country at the time of this writing. 15

16 In this chapter, we explore the relatively small recent economics literature dealing 16  
17 with the size of countries and its effect on economic growth. In particular we ask sev- 17  
18 eral questions: Does size matter for economic success, and if so why and through which 18  
19 channels? What forces lead to changes in the organization of borders, or to put it dif- 19  
20 ferently what determines the evolution of the size of countries? Obviously the second 20  
21 question is very broad. Here we focus specifically a narrower version of this question, 21  
22 namely how economic factors, especially the trade regime, influence size.<sup>5</sup> 22

23 This chapter is organized as follows. Section 2 discusses a general framework for 23  
24 thinking in economic terms about the optimal and the equilibrium size of countries, 24  
25 providing a formal model that focuses on the effect of size on income levels and growth, 25  
26 with special emphasis on the role of trade. Section 3 reviews the empirical evidence 26  
27 on these issues and provides updated and new results. Section 4 briefly explores how 27  
28 the relationship between country size, international trade and growth have played out 28  
29 historically. The last section highlights questions for future research. 29  
30

## 31 32 **2. Size, openness and growth: Theory** 32

### 33 34 *2.1. The costs and benefits of size* 34

35 36 We think of the equilibrium size of countries as emerging from the trade-off between the 36  
37 benefit of size and the costs of preference heterogeneity in the population, an approach 37  
38 followed by Alesina and Spolaore (1997, 2003) and Alesina, Spolaore and Wacziarg 38  
39 (2000). 39  
40

41 42 <sup>4</sup> These include the 191 member states of the United Nations, plus the Vatican and Taiwan. 42

43 <sup>5</sup> For a broader discussion see Alesina and Spolaore (2003) and Spolaore (2005). 43

1 2.1.1. *The benefits of size* 1

2  
3 The main benefits from size in terms of population are the following: 3

- 4 (1) There are economies of scale in the production of public goods. The per capita 4  
5 cost of many public goods is lower in larger countries, where more taxpayers pay 5  
6 for them. Think, for instance, of defense, a monetary and financial system, a ju- 6  
7 dicial system, infrastructure for communications, police and crime prevention, 7  
8 public health, embassies, national parks, etc. In many cases, part of the cost of 8  
9 public goods is independent of the number of users or taxpayers, or grows less 9  
10 than proportionally, so that the per capita costs of many public goods is declin- 10  
11 ing with the number of taxpayers. Alesina and Wacziarg (1998) documented that 11  
12 the share of government spending over GDP is decreasing in population; that is, 12  
13 smaller countries have larger governments. 13
- 14 (2) A larger country (both in terms of population and national product) is less subject 14  
15 to foreign aggression. Thus, safety is a public good that increases with country 15  
16 size. Also, and related to the size of government argument above, smaller coun- 16  
17 tries may have to spend proportionally more for defense than larger countries 17  
18 given economies of scale in defense spending. Empirically, the relationship be- 18  
19 tween country size and share of spending of defense is affected by the fact that 19  
20 small countries can enter into military alliances, but in general, size brings about 20  
21 more safety. Note that if a small country enters into a military alliance with a 21  
22 larger one, the latter may provide defense, but it may extract some form of com- 22  
23 pensation, direct or indirect, from the smaller partner. In this sense, even allowing 23  
24 for military alliances, being large is an advantage. 24
- 25 (3) Larger countries can better internalize cross-regional externalities by centralizing 25  
26 the provision of those public goods that involve strong externalities.<sup>6</sup> 26
- 27 (4) Larger countries are better able to provide insurance to regions affected by im- 27  
28 perfectly correlated shocks. Consider Catalonia, for instance. If this region expe- 28  
29 riences a recession worse than the Spanish average, it receives fiscal and other 29  
30 transfers, on net, from the rest of the country. Obviously, the reverse holds as 30  
31 well. When Catalonia does better than average, it becomes a net provider of trans- 31  
32 fers to other Spanish regions. If Catalonia, instead, were independent, it would 32  
33 have a more pronounced business cycle because it would not receive help during 33  
34 especially bad recessions, and would not have to provide for others in case of 34  
35 exceptional booms.<sup>7</sup> 35  
36 36

37  
38  
39 <sup>6</sup> See Alesina and Wacziarg (1999) for a discussion of this point in the context of Europe. For example, 39  
40 fisheries policy has been centralized in Europe because if each country decided on its own fishing policy, 40  
41 the result would be overfishing and resource depletion. For some policies, such as policies to limit global 41  
42 warming, centralization at the world level might be justified. 42

43 <sup>7</sup> Obviously, this argument relies on an assumption that international capital markets are imperfect, so that 42  
43 independent countries cannot fully self-insure. 43

- 1 (5) Larger countries can build redistributive schemes from richer to poorer regions, 1  
2 therefore achieving distributions of after tax income which would not be avail- 2  
3 able to individual regions acting independently. This is why poorer than average 3  
4 regions would want to form larger countries inclusive of richer regions, while the 4  
5 latter may prefer independence.<sup>8</sup> 5
- 6 (6) Finally, the role of market size is the issue on which we focus most in this arti- 6  
7 cle. Adam Smith (1776) already had the intuition that the extent of the market 7  
8 creates a limit on specialization. More recently, a well established literature from 8  
9 Romer (1986), Lucas (1988) to Grossman and Helpman (1991) has emphasized 9  
10 the benefits of scale in light of positive externalities in the accumulation of hu- 10  
11 man capital and the transmission of knowledge, or in light of increasing returns 11  
12 to scale embedded in technology or knowledge creation.<sup>9</sup> Murphy, Shleifer and 12  
13 Vishny (1989) focused instead on the benefits of size in models of “take-off” or 13  
14 “big push” of industrialization, where the take-off phase is characterized by a 14  
15 transition from a slow growth, constant returns to scale technology to an endoge- 15  
16 nous growth, increasing returns to scale technology. Finally, several papers have 16  
17 stressed the pro-competitive effects of a larger market size: size enhances growth 17  
18 by raising the intensity of product market competition.<sup>10</sup> In these various mod- 18  
19 els, size represents the stock of individuals, purchasing power and income that 19  
20 interact in the market. This market may or may not coincide with the political 20  
21 size of a country as defined by its borders. It does coincide with it if a country is 21  
22 completely autarkic, i.e. does not engage in exchanges of goods or factors of pro- 22  
23 duction with the rest of the world. On the contrary, market size and country size 23  
24 are uncorrelated in a world of complete free trade. So in models with increasing 24  
25 returns to scale, market size depends both on country size and on trade openness. 25

26 In theory, with no obstacle to the cross-border circulation of factors of productions, 26  
27 goods and ideas, country size should be, at least through the channel of market size, 27  
28 irrelevant for economic success. Thus, in a world of free trade, redrawing borders should 28  
29 have no effect on economic efficiency and productivity. However, a vast literature has 29  
30 convincingly shown that even in the absence of explicit trade policy barriers, crossing 30  
31 borders is indeed costly, so that economic interactions within a country are much easier 31  
32 and denser than across borders. This is true both for trade in goods and financial assets.<sup>11</sup> 32  
33 What explains this border effect, even in the absence of explicit policy barriers, is not 33

34  
35  
36 <sup>8</sup> See Bolton and Roland (1997) for a theoretical treatment of this point. 36

37 <sup>9</sup> A recent critique of some this class of models is due to Jones (1995b). Specifically, Jones pointed out that 37  
38 endogenous growth models generally imply that growth rates should increase with the stock of knowledge. 38  
39 Yet growth rates have been relatively stable or declining in advanced industrial economies, while the stock of 39  
40 knowledge has increased rapidly. In Section 3, we review and discuss this critique in much detail. 40

41 <sup>10</sup> See Aghion and Howitt (1998) and Aghion et al. (2002). 41

42 <sup>11</sup> On trade see McCallum (1995), Helliwell (1998). For the role of geographical factors in financial flows, 42  
43 see Portes and Rey (2000). For a theoretical discussion of transportation costs across borders and their effects 43  
44 on market integration, see Obstfeld and Rogoff (2000).

1 completely clear.<sup>12</sup> Whatever the source of the border effect, however, the correlation 1  
2 between the “political size” of a country and its market size does not totally disappear 2  
3 even in the absence of policy-induced trade barriers. Still, one would expect that the 3  
4 correlation between size and economic success is mediated by the trade regime. In a 4  
5 regime of free trade, small countries can prosper, while in a world of trade barriers, 5  
6 being large is much more important for economic prosperity, measured for instance by 6  
7 income per capita. 7

### 8 9 2.1.2. *The costs of size* 9

10  
11 If size only had benefits, then the world should be organized as a single political entity. 11  
12 This is not the case. Why? As countries become larger and larger, administrative and 12  
13 congestion costs may overcome the benefits of size pointed out above. However, these 13  
14 types of costs become binding only for very large countries and they are not likely to be 14  
15 relevant determinants of the existing countries, many of which are quite small. As we 15  
16 noted above, the median country size is less than six million inhabitants. 16

17 A much more important constraint on the feasible size of countries lies in the het- 17  
18 erogeneity of individuals’ preferences. Being part of the same country implies sharing 18  
19 public goods and policies in ways that cannot satisfy everybody’s preferences. It is true 19  
20 that certain policy prerogatives can be delegated to subnational levels of government 20  
21 through decentralization, but some policies have to be national.<sup>13</sup> Think for instance of 21  
22 defense and foreign policy, monetary policy, redistribution between regions, the legal 22  
23 system, etc. 23

24 The costs of heterogeneity in the population have been well documented, especially 24  
25 for the case in which ethnolinguistic fragmentation is used as a proxy for heterogene- 25  
26 ity in preferences. Easterly and Levine (1997), La Porta et al. (1999) and Alesina et 26  
27 al. (2003) showed that ethnolinguistic fractionalization is inversely related to economic 27  
28 success and various measure of quality of government, economic freedom and democ- 28  
29 racy.<sup>14</sup> Easterly and Levine (1997), in particular, argued that ethnic fractionalization in 29  
30 Africa, partly induced by absurd borders left by colonizers, is largely responsible for the 30  
31 economic failures of this continent. There is indeed a sense in which African borders 31  
32 32

33  
34 <sup>12</sup> A recent literature prompted by Rose (2000) argues that not having the same currency creates large trade 34  
35 barriers. For a review of the evidence see Alesina, Barro and Tenreyro (2002). Other explanatory factors in- 35  
36 clude different languages, different legal standards, difficulties in enforcing contracts across political borders, 36  
37 etc. 37

38 <sup>13</sup> In fact, the recent move towards regional decentralization in many countries can be partly viewed as a re- 38  
39 sponse of the political system to increasing pressures towards separatism. See Bardhan (2002) for an excellent 39  
40 discussion of this point, and De Figueiredo and Weingast (2002) for a formal treatment. Also, for an excellent 40  
41 review of the literature on federalism, see Oates (1999). 41

42 <sup>14</sup> A large literature provides results along the same lines for localities within the United States. For example, 42  
43 see Alesina, Baqir and Easterly (1999). Related to this, Alesina and La Ferrara (2000, 2002) show that measure 43  
44 related to social capital are lower in more heterogeneous communities in the US. Alesina, Baqir and Hoxby 44  
45 (2004) show how local political jurisdictions in the US are smaller in more radially heterogeneous areas. 45

1 are “wrong”, not so much because there are too many or too few countries in Africa, 1  
2 but because borders cut across ethnic lines in often inefficient ways.<sup>15</sup> 2

3 We can think of trade openness as shifting the trade-off between the costs and benefits 3  
4 of size. As international markets become more open, the benefits of size decline relative 4  
5 to the costs of heterogeneity, thus the optimal size of a country declines with trade 5  
6 openness. Or, to put it differently, small and relatively more homogeneous countries 6  
7 can prosper in a world of free trade. With trade restrictions, instead, heterogeneous 7  
8 individuals have to share a larger polity to be economically viable. Incidentally, above 8  
9 and beyond the income effect, this may reduce their utility if preference homogeneity 9  
10 is valued in a polity. While in this paper we focus on preference heterogeneity rather 10  
11 than income heterogeneity, the latter plays a key role as well, a point raised by Bolton 11  
12 and Roland (1997). Poor regions would like to join rich regions in order to maintain 12  
13 redistributive flows, while richer regions may prefer to be alone. There is a limit to how 13  
14 much poor regions can extract due to a nonsecession constraint, which is binding for the 14  
15 richer regions. Empirically, often more racially fragmented countries also have a more 15  
16 unequal distribution of income. That is, certain ethnic group are often much poorer 16  
17 than others and economic success and opportunities are associated with belonging to 17  
18 certain groups and not others. These are situations with the highest potential for political 18  
19 instability and violence. 19

## 20 2.2. A model of size, trade and growth 20

21 In this section we will present a simple model linking country size, international trade 21  
22 and economic growth. The model builds upon Alesina and Spolaore (1997, 2003), 22  
23 Alesina, Spolaore and Wacziarg (2000) and Spolaore and Wacziarg (2002). 23

### 24 2.2.1. Production and trade 24

25 Consider a world in which individuals are located on a segment  $[0, 1]$ . The world popu- 25  
26 lation is normalized to 1. Each individual living at location  $i \in [0, 1]$  has the following 26  
27 utility function 27

$$28 \int_0^\infty \frac{C_{it}^{1-\sigma} - 1}{1-\sigma} e^{-\rho t} dt, \quad (1) \quad 28$$

29 where  $C_i(t)$  denotes consumption at time  $t$ , with  $\sigma > 0$  and  $\rho > 0$ . Let  $K_i(t)$  and 29  
30  $L_i(t)$  denote aggregate capital and labor at location  $i$  at time  $t$ . Both inputs are supplied 30  
31 inelastically and are not mobile. At each location  $i$  a specific intermediate input  $X_i(t)$  is 31  
32 produced using the location-specific capital according to the linear production function 32

$$33 X_i(t) = K_i(t). \quad (2) \quad 33$$

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43 <sup>15</sup> On this point see in particular Herbst (2000). 43



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

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

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  $S_1 + S_2, \dots$ , 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  $S_2, \dots$ , 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,

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

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

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

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:

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

1 and

$$2 \quad F_{in''}(t) = \frac{(1 - \beta_{n'n''})^{\alpha/(1-\alpha)} K_{in'}}{3 \quad S_{n'} + \sum_{n \neq n'} S_n (1 - \beta_{n'n})^{\alpha/(1-\alpha)}}. \quad (7)$$

4 As one would expect, barriers to trade tend to increase the domestic use of an interme-  
5 diate output and to discourage international trade.

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

8 (A3)  $\beta_{i'i''} = \beta$  for all  $i'$  and  $i''$  belonging to different countries.<sup>16</sup>

9 We define

$$10 \quad \omega \equiv (1 - \beta)^{\alpha/(1-\alpha)}. \quad (8)$$

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

16 Thus, Equations (6) and (7) simplify as follows:

$$17 \quad D_{in'}(t) = \frac{K_{in'}(t)}{18 \quad S_{n'} + (1 - S_{n'})\omega} \quad (9)$$

19 and

$$20 \quad F_{in''}(t) = \frac{\omega K_{in'}(t)}{21 \quad S_{n'} + (1 - S_{n'})\omega}. \quad (10)$$

### 22 2.2.2. Capital accumulation and growth

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

$$28 \quad \frac{dC_{it}}{dt} \frac{1}{C_{it}} = \frac{1}{\sigma} [P_i(t) - \rho] = \frac{1}{\sigma} \{ \alpha A [\omega + (1 - \omega) S_{n'}]^{1-\alpha} K_{in'}^{\alpha-1}(t) - \rho \}. \quad (11)$$

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

$$30 \quad K_{in'}^{ss} = \left( \frac{\alpha A}{\rho} \right)^{\alpha/(1-\alpha)} [\omega + (1 - \omega) S_{n'}]. \quad (12)$$

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

32 <sup>16</sup> For an analysis in which barriers are different across countries and are an endogenous function of size, see  
33 Spolaore and Wacziarg (2002).  
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43

1 PROPOSITION 1. *The steady-state level of output per capita in each location  $i$  of a*  
2 *country of size  $S_{n'}$  is*

$$3 \quad Y_i^{ss} = A^{1/(1-\alpha)} \left( \frac{\alpha}{\rho} \right)^{\alpha/(1-\alpha)} [\omega + (1-\omega)S_{n'}]. \quad (13)$$

6 Hence, it follows that:

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

$$8 \quad \frac{\partial Y_i^{ss}}{\partial \omega} > 0. \quad (14)$$

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

$$12 \quad \frac{\partial Y_i^{ss}}{\partial S_{n'}} > 0. \quad (15)$$

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

$$17 \quad \frac{\partial^2 Y_i^{ss}}{\partial S_{n'} \partial \omega} < 0. \quad (16)$$

20 The above results show that openness and size have positive effects on economic per-  
21 formance, but (i) openness is less important for larger countries and (ii) size matters less  
22 in a more open world.<sup>17</sup> In fact, there were no barriers to trade ( $\omega = 1$ ), output would  
23 be independent of country size.

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

$$25 \quad \frac{dY}{dt} \frac{1}{Y} = \xi e^{-\xi} (\ln Y^{ss} - \ln Y(0)), \quad (17)$$

28 where  $\xi \equiv \frac{\rho}{2} [(1 + 4(1 - \alpha)/\alpha)^{1/2} - 1]$  and  $Y(0)$  is initial income.<sup>18</sup> Hence, we will  
29 also have the proposition.

31 PROPOSITION 2. *The growth rate of income per capita around the steady-state is in-*  
32 *creasing in size, increasing in openness, and decreasing in size times openness.*

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

39 <sup>17</sup> The result does not depend on the assumption that barriers to trade are uniform across countries. In partic-  
40 ular, one can derive analogous results for the case of non uniform barriers. Moreover, analogous results can be  
41 obtained when “openness” is defined as trade over output rather than in terms of trade barriers. See Spolaore  
42 and Wacziarg (2002).

43 <sup>18</sup> For a derivation of this result, see Barro and Sala-i-Martin (1995, Chapter 2).

1 2.3. *The equilibrium size of countries* 1

2  
3 So far we have taken the number and size of countries as given. However, in the long- 3  
4 run borders do change, and our model suggests that international openness may play 4  
5 a role in this process. As we have seen, country size affects output and growth when 5  
6 barriers to trade are high, while country size is less important in a world of international 6  
7 integration. Hence, the reduction of trade barriers should reduce the incentives to form 7  
8 larger countries. In what follows we will formalize this insight using the framework of 8  
9 country formation developed by Alesina and Spolaore (1997, 2003).<sup>19</sup> 9

10 If there were no costs associated with size, world welfare would be maximized by 10  
11 having only one country, which seems rather unrealistic. Following our previous dis- 11  
12 cussion we model the costs of size as the result of heterogeneity of preferences over 12  
13 public policies and public goods, the collection of which we label “government”. We 13  
14 assume that, for each location, there exists an “ideal” type of government. If individuals 14  
15 in location  $i$  belong to a country whose government is different from their ideal type 15  
16 (say  $j \neq i$ ), their utility will be reduced by  $h\Delta_{ij}$ , where  $\Delta_{ij}$  is the distance between 16  
17  $j$  and  $i$ , and  $h$  is a parameter that measures “heterogeneity” costs – that is, the costs 17  
18 of being far from the median position in one’s country. The distance from the govern- 18  
19 ment that give raise to these costs should be interpreted both as a distance in terms of 19  
20 preferences and in terms of location.<sup>20</sup> 20

21 On the other hand, in a country of size  $S_n$  the fixed costs of government can be spread 21  
22 through a larger population.<sup>21</sup> For example, if the fixed cost of government is  $G$  and it 22  
23 is shared equally by all citizens, each individual in a country of size  $S_n$  will have to pay 23  
24  $G/S_n$  – which is obviously decreasing in  $S_n$ . 24

25 We consider the case in which borders are determined to maximize net income minus 25  
26 heterogeneity costs in steady-state.<sup>22</sup> That is, we assume that each individual at loca- 26  
27 tion  $i$  in a country  $n$  of size  $S_n$  is interested in maximizing the following steady-state 27  
28 welfare 28

$$29 \quad W_{in} = Y_{in}^{ss} - t_{in} - h\Delta_{in}, \quad (18) \quad 29$$

30 where  $Y_{in}^{ss}$  is steady-state income, given by  $A^{1/(1-\alpha)}(\frac{\alpha}{\rho})^{\alpha/(1-\alpha)}[\omega + (1-\omega)S_n']$ ,  $t_{in}$  de- 30  
31 notes taxes of individual  $i$  in country  $n$ ,  $\Delta_{in}$  is individual  $i$ ’s “distance from the govern- 31  
32 ment”. 32  
33 33

34  
35 <sup>19</sup> The economics literature on the endogenous formation of political borders, while still in its infancy, has 35  
36 been growing substantially in the past few years. An incomplete list of contributions, besides those cited in the 36  
37 text, includes Friedman (1977), Casella and Feinstein (2002), Findlay (1996) and Bolton and Roland (1997). 37

38 <sup>20</sup> This assumption is extreme but allows to have only one dimension. For more discussion see Alesina and 38  
39 Spolaore (2003). 39

40 <sup>21</sup> Obviously, not all the costs of government are fixed. Some depend positively on size, such as infrastructure 40  
41 spending or transfers. See Alesina and Wacziarg (1998) for an empirical examination of this point using cross- 41  
42 country data. 42

43 <sup>22</sup> The analysis could be extended in order to consider the more complex issue of border changes along the 43  
44 transitional dynamics, in which adjustment costs from changing borders would be explicitly modeled. Here 44  
45 we abstract from such issues and focus on borders in steady-state. 45

Country  $n$ 's budget constraint is

$$\int_{S_{n-1}}^{S_n} t_{in} di = G. \quad (19)$$

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  $[0, 1]$ .<sup>23</sup> 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

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

which is maximized by the following "efficient size",<sup>24</sup>

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

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 (b) 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

<sup>23</sup> For a formal proof, see Alesina and Spolaore (1997, 2003).

<sup>24</sup> Equation (20) abstracts from the fact that the number of countries  $N = 1/S$  must be an integer.

country of size  $S$ . Then, a Leviathan's total rents in a country of size  $N$  is given by

$$tS - G, \quad (22)$$

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

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

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

$$t = Y_i^{ss} - \frac{h\delta S}{2} - W_0. \quad (24)$$

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

$$S^e = \sqrt{\frac{2G}{h\delta - 2(1-\omega)A^{1/(1-\alpha)}(\frac{g}{\rho})^{\alpha/(1-\alpha)}}}. \quad (25)$$

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.<sup>25</sup> 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,

$$\frac{\partial^2 S^e}{\partial \omega \partial A} < 0. \quad (26)$$

<sup>25</sup> Another element of ambiguity would be introduced if one were to assume that the costs of government  $G$  are decreasing in  $A$ .

1 Of course, these comparative statics results are based on the highly simplifying assumption  
2 that technological progress is exogenous. An interesting extension of the model  
3 would be to consider endogenous links between political borders, the degree of interna-  
4 tional openness, and technological progress.<sup>26</sup>

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

#### 16 17 2.4. Summing up

18  
19 In this section we have provided a model in which the benefits of country size go down  
20 as international economic integration increases. Conversely, the benefits of trade open-  
21 ness and economic integration are larger, the smaller the size of a country. Secondly,  
22 we have argued that economic integration and political disintegration should go hand  
23 in hand. As the world economy becomes more integrated, one of the benefits of large  
24 countries (the size of markets) vanishes. As a result, the trade-off between size and  
25 heterogeneity shifts in favor of smaller and more homogeneous countries. This effect  
26 tends to be larger in more developed economies. By contrast, technological progress  
27 in a world of *high* barriers to trade should be associated with the formation of *larger*  
28 countries.

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

39  
40  
41 <sup>26</sup> For example, some authors have suggested that technological progress may be higher in a world with more  
42 Leviathans who compete with each other (such as Europe before and after the Industrial Revolution) than in  
43 a more centralized environment (such as China in the same period). For a recent formalization of these ideas,  
see Garner (2001).

1 Smaller countries do adopt more open trade policies (and are consequently more open 1  
2 when openness is measured using trade volumes), so that a world of small countries will 2  
3 tend to be more open to trade.<sup>27</sup> Conversely, changes in the average degree of openness 3  
4 in the world (brought forth for example by a reduction in trading costs) should be ex- 4  
5 pected to lead to more secessions and smaller countries, as we will argue extensively 5  
6 below. 6

### 7 8 9 **3. Size, openness and growth: Empirical evidence** 9

10  
11 In this section, we review the empirical evidence on trade openness and growth, as 11  
12 well as the empirical evidence on country size and growth. We then argue that the two 12  
13 are fundamentally linked, because both openness and country size determine the extent 13  
14 of the market. Thus, their impact on growth cannot be evaluated separately. Then we 14  
15 estimate a specification for the determination of growth as a function of market size 15  
16 (itself a function of both country size and trade openness), derived directly from the 16  
17 model presented in Section 2. Our estimates, which are consistent with a growing body 17  
18 of evidence on the role of scale for growth, also provide strong support for our specific 18  
19 model. In particular, we show that the costs of smallness can be avoided by being open. 19  
20 In other words, the impact of size on growth is decreasing in openness, or, conversely, 20  
21 the impact of openness on growth falls as the size of countries increases. This evidence 21  
22 suggests that the extent of the market is an important channel for the realization of the 22  
23 growth gains from trade. 23

#### 24 25 *3.1. Trade and growth: a review of the evidence* 25

26  
27 The literature on the empirical evidence of trade and growth is vast and a comprehensive 27  
28 survey is beyond the scope of this article. In this subsection, we simply summarize some 28  
29 of the salient results from recent studies in this literature, in order to set the stage for a 29  
30 discussion of the more specific issue of market size and growth. 30

31 The fact that openness to trade is associated with higher growth in post-1950 cross- 31  
32 country data was until recently subject to little disagreement.<sup>28</sup> Whether openness is 32  
33 measured by indicators of trade policy openness (tariffs, nontariff barriers, etc.) or by 33  
34 the volume of trade (the ratio of imports plus exports to GDP), numerous studies docu- 34  
35 ment this correlation. For example, Edwards (1998) showed that, out of nine indicators 35  
36 of trade policy openness, eight were positively and significantly related to TFP growth 36  
37 in a sample of 93 countries. Dollar (1992) argued that an indicator of openness based on 37  
38 price deviations was positively associated with growth. Ben-David (1993) demonstrated 38

39  
40  
41 <sup>27</sup> See Alesina and Wacziarg (1998) and Spolaore and Wacziarg (2002) for cross-country empirical evidence 40  
41 on this point. 41

42 <sup>28</sup> The pre-1990 literature was usefully surveyed in Edwards (1993). We will focus instead on salient papers 42  
43 in this literature since 1990. 43



1 that a sample of countries with open trade regimes displays absolute convergence in per  
2 capita income, while a sample of closed countries did not. Finally, in one of the most  
3 cited studies in this literature, Sachs and Warner (1995) classified countries using a sim-  
4 ple dichotomous indicator of openness, and argued that “closed” countries experienced  
5 annual growth rates a full 2 percentage points below “open” countries in the period  
6 1970–1989. They also confirmed Ben-David’s result: open countries tend to converge,  
7 not closed ones.

8 These studies focused mostly on the correlation between openness and growth, con-  
9 ditional on other growth determinants. In other words, little attention was typically paid  
10 to issues of reverse causation. In contrast, a more recent study by Frankel and Romer  
11 (1999) focused on trade as a causal determinant of income levels. Using geographic  
12 variables as an instrument for openness, they estimated that a 1 percentage point in-  
13 crease in the trade to GDP ratio causes almost a 2 percent increase in the level of per  
14 capita income.<sup>29</sup> Wacziarg (2001) also addressed issues of endogeneity by estimating  
15 a simultaneous equations system where openness affects a series of channel variables  
16 which in turn affect growth. Results from this study suggest that a one standard devia-  
17 tion increase in the portion of the trade to GDP ratio attributable to formal trade policy  
18 barriers (tariffs, nontariff barriers, etc.) is associated with a 1 percentage point increase  
19 in annual growth across countries.

20 These six studies were recently scrutinized by Rodrik and Rodríguez (2000), who  
21 argued that their basic results were sensitive to small changes in specification, or that the  
22 measurement of trade policy openness captured other bad policies rather than trade im-  
23 pediments.<sup>30</sup> While it is true that cross-country empirical analysis is fraught with data  
24 pitfalls, specification problems and issues of endogeneity, these authors do recognize  
25 that it is difficult to find a specification where indicators of openness actually have a  
26 negative impact on growth.<sup>31</sup> In other words, they essentially conclude that the range of  
27 possible effects is bounded below by zero. One could argue that by the standards of the  
28 cross-country growth literature, this is already a huge achievement: it constitutes an im-  
29 portant restriction on the range of possible estimates. Moreover, Rodrik and Rodríguez  
30 (2000) argue that one of the problems associated with estimating the impact of trade on  
31 growth is that protectionism is highly correlated with other growth-reducing policies,  
32 such as policies that perpetuate macroeconomic imbalances. This suggests that trade  
33 restrictions are one among a “basket” of growth-reducing policies. Since Rodrik and  
34

35  
36  
37 <sup>29</sup> A crucial assumption is that the instrument (constructed as the sum of predicted bilateral trade shares,  
38 where only gravity/geographical variables are used as predictors of bilateral trade) be excludable from the  
39 growth regression, i.e. that it affects growth only through its impact on trade volumes.

40 <sup>30</sup> For another critical view of this literature, in particular of the Sachs and Warner (1995) study, see Harrison  
41 and Hanson (1999). Pritchett (1996) showed that various measures of policy openness were not highly corre-  
42 lated among themselves, suggesting that relying on any single measure was unlikely to capture the essence of  
43 trade policy.

44 <sup>31</sup> They state that “we know of no credible evidence – at least for the post-1945 period – that suggests that  
45 trade restrictions are systematically associated with higher growth rates” (p. 317).

Rodríguez (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 and Rodríguez (2000). 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 1–1.5 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.<sup>32</sup> 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 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 microeconomic 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 microeconomic 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.

<sup>32</sup> An exception is Wacziarg (2001). Alcalá and Ciccone (2004) also examine whether the effect of openness works through labor productivity or capital accumulation (in its various forms).

1 In a time-series context, Jones (1995a, 1995b) made a simple point. Several endoge- 1  
2 nous growth models predict that the rate of long-run growth of an economy is directly 2  
3 proportional to the number of researchers, itself a function of population size.<sup>33</sup> Hence, 3  
4 as the population of the United States increased (and in particular the number of sci- 4  
5 entists and researchers), so should have growth. Yet while the number of researchers 5  
6 exploded, rates of growth in industrial countries have been roughly constant since the 6  
7 1870s. This simple empirical fact created difficulties for first-generation endogenous 7  
8 growth models. In particular, it was taken as indicative of the absence of scale effects in 8  
9 long-run growth. However, while it contributed to the conventional wisdom that scale 9  
10 is unrelated to aggregate growth, this finding in no way precludes the existence of scale 10  
11 effects when it comes to income levels, which is the focus both of the theory presented 11  
12 in Section 2 and of our empirical estimates presented below.<sup>34</sup> Hence, Jones' objection 12  
13 applies neither to our theory nor to our evidence. Several recent theoretical papers have 13  
14 sought to extend and preserve the endogenous growth paradigm while eliminating scale 14  
15 effects on growth. See for instance Young (1998), Howitt (1999) and Ha and Howitt 15  
16 (2004). 16

17 In a cross-country context, some of the most systematic empirical tests of the scale 17  
18 implications of endogenous growth models appeared in Backus, Kehoe and Kehoe 18  
19 (1992). They showed empirically, in a specification where scale was defined as the size 19  
20 of total GDP, that scale and aggregate growth were largely unrelated. In their baseline 20  
21 regression of growth on the log of total GDP, the slope coefficient was positive but 21  
22 statistically insignificant.<sup>35</sup> Moreover, the number of scientists per countries was not 22  
23 found to be a significant predictor of growth, and the scale of inputs into the human ac- 23  
24 cumulation process (meant to capture the extent of human capital spillovers) similarly 24  
25 did not help predict aggregate growth. The authors also showed that scale effects were 25  
26 present in the data when confining attention to the manufacturing sector (i.e. regressing 26  
27 manufacturing growth on total manufacturing output), and suggest that this is consistent 27  
28 with microeconomic studies, which typically focus on manufacturing. But the set of 28  
29 regressions relating to the aggregate economy is often cited as evidence that there are 29  
30 no effects of scale on growth at the country level. 30  
31  
32

33 <sup>33</sup> As suggested by Jones (1999), such models include Romer (1990), Grossman and Helpman (1991) and 33  
34 Aghion and Howitt (1992). 34

35 <sup>34</sup> Scale effects in our theory come purely from the border effect – namely the fact that it is more costly (in the 35  
36 iceberg cost sense) to conduct trade across borders than within. This allows us to combine scale effects with a 36  
37 neoclassical model of growth. Our theory has standard neoclassical implications as far as transitional growth 37  
38 is concerned. Thus, scale may affect growth in the transition to the steady-state, since it is a determinant of 38  
39 steady-state income *levels*. But scale has no impact on long-run growth, which is exogenous in our model. 38

39 <sup>35</sup> According to the authors, this univariate regression implies that “a hundredfold increase in total GDP is 39  
40 associated with an increase in per capita growth of 0.85”. One could argue that this is a sizable effect, but 40  
41 the *t*-statistic on the slope coefficient is only 1.64 and the regression contains no other control variables. 41  
42 In a multivariate setting, the authors show that when “standard” growth regressors (but *not* trade openness) 42  
43 are controlled for, the coefficient estimate on total GDP remains essentially identical, but the *t*-statistic falls 43  
considerably.

1 A major problem with this approach is that variables defined at the national level may 1  
2 be poor proxies for the total scale of the economy, the extent of R&D activities or the 2  
3 importance of human capital externalities. Scale effects do not stop at the borders of 3  
4 countries. Since small countries adopt more open trade policies, and likely also import 4  
5 more technologies, a coefficient on size in a regression of growth on size that omits 5  
6 openness is going to be biased towards zero.<sup>36</sup> The authors do recognize (and show 6  
7 empirically) that imports of specialized inputs to production can lead to faster growth. 7  
8 They also mention that “by importing specialized inputs, a small country can grow as 8  
9 fast as a larger one”. But they do not empirically examine variations in the degree of 9  
10 openness of an economy and how it might impact the effect of size on growth.<sup>37</sup> In other 10  
11 words, they examine separately whether country size on the one hand, and imports of 11  
12 specialized inputs on the other, affect growth. We propose instead to examine openness 12  
13 and country size jointly as determinants of market size and thus growth. 13  
14

### 15 3.3. *Summing up* 15

16  
17 The literature on trade and growth indicates that trade openness has favorable effects on 17  
18 growth and income levels, but for the most part does not inform us as to whether these 18  
19 effects are attributable to the extent of the market, or to other channels. The literature 19  
20 on scale and growth typically considers measures of scale that have to do with domestic 20  
21 market size (i.e. the size of a country or a national economy), and generally fails to 21  
22 consider that openness can substitute for a large domestic market. In what follows, we 22  
23 bring these literatures together to focus on the impact of market size on growth. 23  
24

### 25 3.4. *Trade, size and growth in a cross-section of countries* 25

26  
27 In this subsection, we bring Propositions 1 and 2 of Section 2 to the data. If small coun- 27  
28 tries tend to be more open to trade, and if trade openness is positively related to growth, 28  
29 then a regression of growth on country size that excludes openness will understate the 29  
30 effect of scale. Moreover, our theory suggests that the effects of size become less im- 30  
31 portant as an economy becomes more open, i.e. the coefficient on an interaction term 31  
32 between openness and country size is predicted to be negative. Ales and Glaeser (1999), 32  
33

34  
35 <sup>36</sup> See Alesina and Wacziarg (1998) and Spolaore and Wacziarg (2002) for empirical evidence that small 35  
36 countries tend to be more open to trade, when trade openness is measured by the trade to GDP ratio. Perhaps 36  
37 more surprisingly, such a relationship also holds when openness is measured by average weighted tariffs, i.e. 37  
38 by a direct measure of trade policy restrictiveness. 38

39 <sup>37</sup> Another shortcoming of the literature linking economic growth to country size is its failure to examine 39  
40 whether size might have different effects on growth at different levels of development. Growth may have 40  
41 different sources at different stages of development, and country size may affect these sources differently. 41  
42 For instance, scale effects may be more present in the increasing returns, endogenous growth phase that 42  
43 characterizes advanced industrialized countries, and have a smaller effect in the capital deepening phase that 43

1 Alesina, Spolaore and Wacziarg (2000) and Spolaore and Wacziarg (2002) have exam- 1  
2 ined how country size and openness interact in growth regressions, and have confirmed 2  
3 the pattern of coefficients on openness, country size and their interaction predicted by 3  
4 our theory. In this section, we update and expand upon these results. We focus on growth 4  
5 specifications of the form 5  
6

$$\log \frac{y_{it}}{y_{it-\tau}} = \beta_0 + \beta_1 \log y_{it-\tau} + \beta_2 \log S_{it} + \beta_3 O_{it} + \beta_4 O_{it} \log S_{it} + \beta_5' Z_{it} + \varepsilon_{it}, \quad (27)$$

7  
8  
9  
10 where  $y_{it}$  denotes per capita income in country  $i$  at time  $t$ ,  $S_{it}$  is a measure of country 10  
11 size,  $O_{it}$  is a measure of openness, and  $Z_{it}$  is a vector of control variables. In this speci- 11  
12 fication, the parameter estimates on openness, country size and their interaction will be 12  
13 our main focus. In the context of the theory presented in Section 2, these variables as 13  
14 well as the  $Z_{it}$  variables are to be interpreted as determinants of the steady-state *level* 14  
15 of per capita income.<sup>38</sup> 15  
16

### 17 3.4.1. Descriptive statistics 17

18  
19 Tables 1–3 display summary statistics for our main variables of interest, averaged 19  
20 over the period 1960–2000. The data on openness, investment rates, growth and in- 20  
21 come levels, government consumption, and population come from release 6.1 of the 21  
22 Penn World Tables [Heston, Summers and Aten (2002)], which updates their panel of 22  
23 PPP-comparable data to the year 2000. The rest of the data we use in this paper comes 23  
24 from Barro and Lee (1994, subsequently updated to 2000) or from the Central Intel- 24  
25 ligence Agency (2002). Country size is measured by the log of total GDP or by the 25  
26 log of total population, in order to capture both economic size and demographic size. 26  
27 Throughout, we define trade openness in two ways: as the ratio of imports plus exports 27  
28 in current prices to GDP in current prices, and as the ratio of imports plus exports in 28  
29 exchange rate \$US to GDP in PPP \$US. We label the first variable “nominal openness” 29  
30 and the second one “real openness”. 30  
31

32 Recently, Alcalá and Ciccone (2003, 2004) have criticized the widespread use of 32  
33 the first measure, have advocated the use of the second, finding that the latter leads to 33  
34 more robust effects of openness on growth. The key difference between the two mea- 34  
35 sure stems from the treatment of non tradable goods. Suppose that trade openness raises 35  
36 productivity, but does so more in the tradable than in the nontradable sector (a plausible 36  
37 assumption). This will lead to a rise in the relative price of nontradables, and a fall in 37  
38 conventionally measured openness under the assumptions that the demand for nontrad- 38  
39

40  
41 <sup>38</sup> Alesina, Spolaore and Wacziarg (2000) present direct evidence on the effects of market size based on levels 41  
42 regressions where initial income does not appear on the right hand side. These regressions were consistent 42  
43 with the predictions of the theory presented in Section 2. We have repeated these levels regressions using the 43  
44 new cross-country data that extends to 1999, with little changes in the results.

Table 1  
Descriptive statistics (1960–2000 averages)

	Number of observations	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 of per capita GDP 1960	110	7.730	0.889	5.944	9.614
Log of total GDP	113	23.905	1.943	19.723	29.165
Log of 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 of total GDP	Log of per capita GDP 1960	Log of population	Openness ratio (current)
Average annual growth	1.000				
Log of total GDP	0.338	1.000			
Log of per capita GDP 1960	0.172	0.436	1.000		
Log of 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

ables 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

Table 3  
Conditional correlations (1960–2000)

Variable	Conditioning statement	Correlation with growth	Number of observations
Openness (current)	Log of population > median = 8.807	0.104	54
Openness (current)	Log of population ≤ median = 8.807	0.511	50
Openness (current)	Log of GDP > median = 16.700	0.301	52
Openness (current)	Log of GDP ≤ median = 16.700	0.462	52
Openness (real)	Log of population > median = 15.715	0.131	54
Openness (real)	Log of population ≤ median = 15.715	0.579	50
Openness (real)	Log of GDP > median = 23.607	0.223	52
Openness (real)	Log of GDP ≤ median = 23.607	0.474	52
Log of population	Openness (current) > median = 53.897	0.107	50
Log of population	Openness (current) ≤ median = 53.897	0.426	54
Log of GDP	Openness (current) > median = 53.897	0.324	50
Log of GDP	Openness (current) ≤ median = 53.897	0.563	54
Log of population	Openness (real) > median = 26.025	−0.089	51
Log of population	Openness (real) ≤ median = 26.025	0.587	53
Log of GDP	Openness (real) > median = 26.025	0.137	51
Log of GDP	Openness (real) ≤ median = 26.025	0.625	53

Notes. Medians computed from individual samples, while correlations are common sample correlations. Growth: average annual growth, 1960–2000.

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 1 and 2 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 4–6 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.<sup>39</sup> Its use

Table 4  
Constrained SUR estimates (size = log of population, openness = current openness)

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

Notes. Standard errors in parentheses.

\*significant at 5% level;

\*\*significant at 1% level.

<sup>39</sup> 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  $t + 2$ .



Table 5  
Constrained SUR estimates (size = log of GDP, openness = current openness)

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

Notes. Standard errors in parentheses.

<sup>†</sup>significant at 10% level;

\*significant at 5% level;

\*\*significant at 1% level.

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 (1960–1969, 1970–1979, 1980–1989 and 1990–1999), 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.<sup>40</sup>

<sup>40</sup> We use the term constrained SUR to refer to the fact that slope coefficients are constrained to equality across periods.

Table 6  
Constrained SUR estimates (using real openness)

	Size = log of population		Size = log of GDP	
	(1)	(2)	(3)	(4)
Size * Real openness	-0.004*	-0.006 <sup>†</sup>	-0.008**	-0.007*
	(0.002)	(0.003)	(0.002)	(0.003)
Size	0.250**	0.229 <sup>†</sup>	0.496**	0.424**
	(0.093)	(0.129)	(0.096)	(0.126)
Real openness	0.075*	0.094 <sup>†</sup>	0.198**	0.185**
	(0.031)	(0.052)	(0.050)	(0.068)
Log of 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)	
Number 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

Notes. Standard errors in parentheses.

<sup>†</sup>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 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

1 variables. Finally, Table 6 shows that using “real openness” does not modify the over- 1  
2 all pattern of coefficients. In fact our results are generally stronger (in the sense of the 2  
3 estimated coefficients being larger in magnitude) when using this measure of openness. 3  
4 Similar estimates in Alcalá and Ciccone (2003, written after first draft of this paper) 4  
5 lend further support to our results. They show how controlling for a host of additional 5  
6 variables including institutional quality does not change the nature of these results and 6  
7 that the use of “real openness” leads to coefficients that are larger and more robust than 7  
8 when using “nominal openness”. 8  
9

### 10 3.5. Endogeneity of openness: 3SLS estimates 10 11

12 Openness, especially when defined as the volume of trade divided by GDP (however 12  
13 deflated), may be an endogenous variable in growth regressions. As described above, 13  
14 in an important paper Frankel and Romer (1999) have developed a innovative instru- 14  
15 ment to deal with potential endogeneity bias in growth and income level regressions. 15  
16 We use our own set of geographic variables as well as Frankel and Romer’s instru- 16  
17 ment to address potential endogeneity. Our panel data IV estimator relies on a three 17  
18 stage least squares (3SLS) procedure. This estimator achieves consistency through in- 18  
19 strumentation, and efficiency through the estimation of cross-period error covariance 19  
20 terms. Table 7 presents parameter estimates of our basic specification when the list of 20  
21 instruments includes geographic variables, namely dummy variables for small coun- 21  
22 tries, islands, small islands, landlocked countries and the interaction term between each 22  
23 of these measures and country size.<sup>41</sup> Again, the results are consistent with previous 23  
24 observations, namely the pattern of coefficients suggested by theory is maintained. In 24  
25 the specification with all the controls, the statistical significance of the coefficients of 25  
26 interest is reduced slightly when real openness is used instead of current openness (Ta- 26  
27 ble 8), though all remain significant at the 10% level. The signs of the main coefficients 27  
28 of interest are maintained and the magnitude of the openness coefficient is raised in all 28  
29 specifications, confirming the results of Alcalá and Ciccone (2003, 2004).<sup>42</sup> 29

30 Finally, Table 11 shows the same results using the geography-based instrument from 30  
31 Frankel and Romer (1999), as well as the interaction term between this variable and 31  
32 country size. In all specifications, the signs and basic magnitudes of the coefficients 32  
33 of interest are unchanged (although when openness is entered in “real” terms, the esti- 33  
34 mates cease to be statistically significant at the 5% level). Spolaore and Wacziarg (2002) 34  
35

36  
37 <sup>41</sup> This is the same list of instruments as was used in Alesina, Spolaore and Wacziarg (2000). Using Hausman 37  
38 tests, this paper showed that this set of instruments was statistically excludable from the growth regression, 38  
39 and first stage  $F$ -tests suggested that they were closely related to openness and the interaction term. 39

40 <sup>42</sup> Tables 9 and 10 present  $F$ -tests for the first stage of the 3SLS procedure. They test the joint significant 40  
41 of the instruments in regressions of the endogenous variables (openness and its interaction with country size) 41  
42 on all the exogenous variables in the system. These  $F$ -tests show that our instruments are closely related 42  
43 to the variables they are instrumenting for, limiting the potential for weak instruments, especially in the 43  
specifications with many controls.

Table 7  
Constrained 3SLS estimates (current openness)

	Size = log of population			Size = log of GDP		
	(1)	(2)	(3)	(4)	(5)	(6)
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 <sup>†</sup> (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 <sup>†</sup> (0.036)
Log of 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)
Government 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)
Number of 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

Notes. Standard errors in parentheses.

<sup>†</sup> significant at 10% level;

\* significant at 5% level;

\*\* significant at 1% level.

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.

present more evidence on this type of regression, by treating estimating a simultaneous equations system for the endogenous determination of openness and growth 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.

Table 8  
Constrained 3SLS estimates (real openness)

	Size = log of population			Size = log of GDP		
	(1)	(2)	(3)	(4)	(5)	(6)
Size * Real openness	-0.006*	-0.006*	-0.007 <sup>†</sup>	-0.014**	-0.014**	-0.007*
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)
Size	0.280**	0.317**	0.248 <sup>†</sup>	0.630**	0.768**	0.440**
	(0.107)	(0.103)	(0.146)	(0.111)	(0.124)	(0.141)
Real openness	0.100*	0.098*	0.111 <sup>†</sup>	0.350**	0.361**	0.195*
	(0.040)	(0.038)	(0.062)	(0.073)	(0.071)	(0.079)
Log of per capita income, 1960	-	0.017	-1.277**	-	-0.526**	-1.493**
		(0.157)	(0.237)		(0.187)	(0.239)
Fertility	-	-	-0.543**	-	-	-0.536**
			(0.112)			(0.110)
Male human capital	-	-	0.269	-	-	0.206
			(0.260)			(0.255)
Female human capital	-	-	-0.167	-	-	-0.13
			(0.299)			(0.292)
Government consumption (% GDP)	-	-	-0.033**	-	-	-0.033**
			(0.012)			(0.012)
Investment (% GDP)	-	-	0.092**	-	-	0.075**
			(0.017)			(0.017)
Intercept	-2.941	-3.922*	-	-13.883**	-13.503**	-
	(1.706)	(1.919)		(2.721)	(2.679)	
Number of countries (periods)	104 (4)	104 (4)	80 (4)	104 (4)	104 (4)	80 (4)
Adjusted R-squared	-0.17 -0.01	-0.20 -0.01	0.33 0.22	-0.10 0.02	-0.21 -0.01	0.35 0.19
	-0.09 0.01	-0.06 0.00	0.46 0.22	-0.15 -0.01	-0.08 -0.02	0.50 0.24

Notes. Standard errors in parentheses.

<sup>†</sup> significant at 10% level;

\* significant at 5% level;

\*\* significant at 1% level.

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.

### 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

Table 9  
First-stage  $F$ -tests for the instruments (current openness)

Specification	Endogenous variable	Openness (current)	Openness * Size
Size = log of population			
1	$F$ -statistics $p$ value	4.83 0.00	3.92 0.00
2	$F$ -statistics $p$ value	5.63 0.00	6.28 0.00
3	$F$ -statistics $p$ value	4.22 0.00	4.49 0.00
Size = log of GDP			
4	$F$ -statistics $p$ value	5.61 0.00	6.25 0.00
5	$F$ -statistics $p$ value	10.38 0.00	11.23 0.00
6	$F$ -statistics $p$ value	7.52 0.00	7.34 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 10  
First-stage  $F$ -tests for the instruments (real openness)

Specification	Endogenous variable	Openness (constant)	Openness * Size
Size = log of GDP			
1	$F$ -statistics $p$ value	4.45 0.00	4.95 0.00
2	$F$ -statistics $p$ value	9.09 0.00	9.92 0.00
3	$F$ -statistics $p$ value	10.75 0.00	10.80 0.00
Size = log of population			
4	$F$ -statistics $p$ value	4.55 0.00	3.52 0.00
5	$F$ -statistics $p$ value	6.25 0.00	7.18 0.00
6	$F$ -statistics $p$ value	5.67 0.00	7.20 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.

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

Table 11  
Constrained 3SLS estimates (using Frankel and Romer's instrument)

	Size = log of population		Size = log of GDP	
	Current openness (1)	Real openness (2)	Current openness (3)	Real openness (4)
Size * Openness	-0.008** (0.003)	-0.010 <sup>†</sup> (0.006)	-0.003 <sup>†</sup> (0.002)	-0.009* (0.004)
Size	0.435* (0.180)	0.273 (0.197)	0.399* (0.166)	0.452** (0.173)
Openness	0.128** (0.041)	0.163 <sup>†</sup> (0.088)	0.089 <sup>†</sup> (0.049)	0.242* (0.099)
Log of initial per capita income	-1.114** (0.251)	-1.254** (0.252)	-1.282** (0.245)	-1.433** (0.255)
Fertility	-0.307* (0.122)	-0.354** (0.120)	-0.290* (0.125)	-0.348** (0.118)
Male human capital	0.105 (0.280)	-0.011 (0.291)	-0.036 (0.283)	-0.086 (0.284)
Female human capital	-0.164 (0.321)	-0.023 (0.327)	-0.043 (0.325)	0.031 (0.320)
Government consumption (% GDP)	-0.053** (0.013)	-0.052** (0.013)	-0.051** (0.013)	-0.052** (0.013)
Investment rate (% GDP)	0.131** (0.017)	0.130** (0.017)	0.122** (0.017)	0.112** (0.019)
Intercept	3.959 (4.408)	7.991 (4.296)	2.219 (4.948)	2.694 (4.547)
Number of 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

Notes. Standard errors in parentheses.

<sup>†</sup> significant at 1% level;

\* significant at 5% level;

\*\* significant at 1% level.

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

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).

1 Conversely, the effect of size at the median level of openness, which is attained by 1  
2 South Korea (with a trade to GDP ratio of 54% on average between 1960 and 1999), 2  
3 the effect of multiplying the country's size by 10 would be to raise annual growth by 3  
4 0.33 percentage points. In contrast, a relatively closed country such as Argentina (with 4  
5 a trade to GDP ratio of 15% on average between 1960 and 1998) would experience 5  
6 an increase in growth of 0.78 percentage points from decoupling its population. The 6  
7 effect of size on growth attains zero when openness reaches 82.4% (in our sample, 26 7  
8 countries had a higher level of average openness over the 1960–1999 period). Using the 8  
9 results obtained with “real” measures of openness the magnitude of our results would 9  
10 typically be even larger. 10

11 Whether one “believes” these actual magnitudes or not, the signs and statistical 11  
12 significance of our variables of interest are very robust features of the data and inde- 12  
13 pendently confirmed and reinforced by Alcalá and Ciccone (2003). When evaluating 13  
14 the effects of scale on growth, it is essential to view scale as attainable either through 14  
15 a large domestic market, or through trade openness. Ignoring either would lead to 15  
16 underestimating scale effects in income. This section and the literature from which it is 16  
17 inspired has sought to bring together the research on the impact of trade on growth and 17  
18 the research on the impact of economic scale on growth, and in doing so has empirically 18  
19 established a substitutability between openness and country size. 19

20

#### 21 **4. Country size and trade in history** 21

22

23 To what extent the size of countries respond to the economic “incentives” that we 23  
24 discussed above? Is there a sense that in the long-run the size of countries responds to 24  
25 economic forces? Our answer is yes, even though, of course, the determination of bor- 25  
26 ders is driven by a highly complex web of politico-economic forces. The point of this 26  
27 section is simply to highlight the relationship between country size and trade in a brief 27  
28 historical excursion. We certainly we do not aim to discuss the entire history of state 28  
29 formation and their size. For a more extensive discussion we refer the reader to Alesina 29  
30 and Spolaore (2003), and to the voluminous literature cited therein. 30

31

##### 32 *4.1. The city-states* 32

33

34 The city-states of Italy and the Low Countries of the Renaissance in Europe represent 34  
35 a clear example of a political entity that could prosper even if very small because they 35  
36 were taking advantage of world markets. Free trade was the key to prosperity of these 36  
37 small states. A contemporary observer described Amsterdam as a place where “com- 37  
38 merce is absolutely free, absolutely nothing is forbidden to merchants, they have no rule 38  
39 to follow but their own interest. So when an individual seems to do in his own commer- 39  
40 cial interest something contrary to the state the state turns a blind eye and pretends not 40  
41 to notice”.<sup>43</sup> The other reason why city-states could afford to be small is that the state 41  
42 42

43 <sup>43</sup> From Braudel (1992, p. 206). Also cited in Alesina and Spolaore (1997). 43



1 did not provide many public goods, so that not much was lost in terms of tax burden 1  
2 from being small. Thus, the combination of a small states who provided very few public 2  
3 goods and complete freedom of trade allowed for the city state to reach unprecedented 3  
4 level of wealth based on trade. 4

#### 5 6 4.2. *The absolutist period* 6 7

8 The emergence of centralized states from the consolidation of feudal manors was driven 8  
9 by three main forces. One is technological innovations in military technology that in- 9  
10 creased the benefits of scale in warfare. Secondly, there was a need to enforce property 10  
11 rights and to create markets above and beyond the maritime commerce of the city-states. 11  
12 Finally bellicose rulers needed vast populations in order to extract levies to finance wars 12  
13 and luxurious courts. Territorial expansion and fiscal pressure went hand in hand and 13  
14 city-states could not survive in this changed world. Italian city-states lost predominance. 14  
15 The Low Countries survived longer because of their role as Atlantic traders. While the 15  
16 small city-states blossomed on trade, as Wilson (1967) writes regarding France “by 16  
17 the second half of the sixteenth century primitive ideas about trade had already given 17  
18 rise to a corpus of legislation ... aimed at national self-sufficiency”. Similarly, Eng- 18  
19 lish policy turned quite protectionist in the early seventeenth century. From the small 19  
20 and open city-states with low taxation, the western world became organized in large 20  
21 countries, pursuing inward looking policies. So economic predominance switched from 21  
22 small open economies with cheap governments to large relatively closed economies 22  
23 with a heavier burden of taxation to service war. 23

24 Outside the core of Europe, absolutist regimes were based on heavy taxation raised 24  
25 without the parenthesis of city-states. This is the case, for instance of the Ottoman Em- 25  
26 pire, but also of India and China. The Ottoman Empire for instance, was largely based 26  
27 on extracting rents from its population. In India the level of taxation was extraordinarily 27  
28 high for that period. In the sixteenth century the estimated tax revenue of the central 28  
29 government was about 20% of GNP. 29  
30

#### 31 4.3. *The birth of the modern nation-state* 31 32

33 The nineteenth century marks the birth of the nation-state in modern forms, both in Eu- 33  
34 rope and North America. It also marks the beginning of industrialization and the growth 34  
35 take-off, which likely transformed the relationship between country size and economic 35  
36 performance, raising the importance of scale effects. The liberal philosophers of these 36  
37 times viewed the “optimal size” of a nation-state as emerging from the trade-off be- 37  
38 tween homogeneity of language and culture and the benefit of economic size. In fact, 38  
39 following the work of Adam Smith, they were well aware that with free trade a market 39  
40 economy can easily prosper even without a heavy central government. Nevertheless, 40  
41 the view was that there existed an minimum size that made an economy viable. For in- 41  
42 stance, certain regions, like Belgium, Ireland and Portugal were considered too small to 42  
43 prosper, but free trade was regarded as a way of allowing even relatively small countries 43

1 to prosper. Giuseppe Mazzini, an architect of the Italian unification, suggested that the 1  
2 optimal number of states in Europe was 12. His argument was precisely based on the 2  
3 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 3  
4 argues that it was “ridiculous” that Belgium and Portugal should be independent because 4  
5 there economies were too small to be economically viable.<sup>44</sup> 5  
6

7 The unification of Germany can in fact be viewed along similar lines. The German 7  
8 nation-state started as a customs union (the Zollverein) which was viewed as necessary 8  
9 to create a sufficiently large market. As Merriman (1996, p. 629) notes, before the cus- 9  
10 toms union “German merchants and manufacturers began to object to the discouraging 10  
11 complexity of custom tariffs that created a series of costly hurdles . . . many business- 11  
12 men demanded an end to these unnatural impediments faced by neither of their French 12  
13 or British rivals”. Clearly market size was a critical determinant of the birth of Ger- 13  
14 many. The external threat of a war with France was a second one, as emphasized by 14  
15 Riker (1964). The establishment of a common market free of trade barriers was also 15  
16 one of the motivating factor behind the creation of the United States. 16

#### 17 4.4. *The colonial empires* 17

18 In the period between 1848 and early 1870’s the share of international trade in 18  
19 GDP quadrupled in Europe.<sup>45</sup> From 1870 to the First World War trade grew much 19  
20 more slowly despite a drastic reduction of transportation costs, as documented in 20  
21 Estevadeordal, Frantz and Taylor (2003). In fact the extent of the reduction of trade 21  
22 amongst European powers in the half century between 1870 and 1915 is a matter of 22  
23 dispute amongst historians. Bairoch (1989) has probably the most sanguine view on 23  
24 one side of the argument when he writes that the introduction of new large tariff by Ger- 24  
25 many in 1879 marks the “death” of free trade. While many historians may find this view 25  
26 a bit extreme, it is fairly non controversial that without the sharp reduction in trading 26  
27 costs international trade would have probably greatly suffered in this period, which was 27  
28 certainly associated with an increase in protectionism. 28  
29

30 The last two decades of the nineteenth century witnessed the expansion of European 30  
31 (and North American) powers over much of the “less developed” world. One motivation 31  
32 of this expansionary policy was certainly the opening of new markets. As reported by 32  
33 Hobsbawn (1987, p. 67), in 1897 the British Prime Minister told the French ambassador 33  
34 to Britain that “if you [the French] were not such persistent protectionists, you would 34  
35 not find us so keen to annex new territories”. Needless to say, the British were just as 35  
36 protectionist as the French and the British navy was heavily used to protect trade routes. 36  
37 Similar considerations apply to the expansionary acquisitions of the United States in the 37  
38 late nineteenth and early twentieth centuries, namely Alaska, Hawaii, Samoa, Cuba and 38  
39 the Philippines. At the same time, in response to European protectionism, the United 39  
40 States also turned protectionist in this period. 40  
41

42 <sup>44</sup> See Hobsbawn (1987). 42

43 <sup>45</sup> See Estevadeordal, Frantz and Taylor (2003) for a more detailed discussion. 43

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.<sup>46</sup> 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

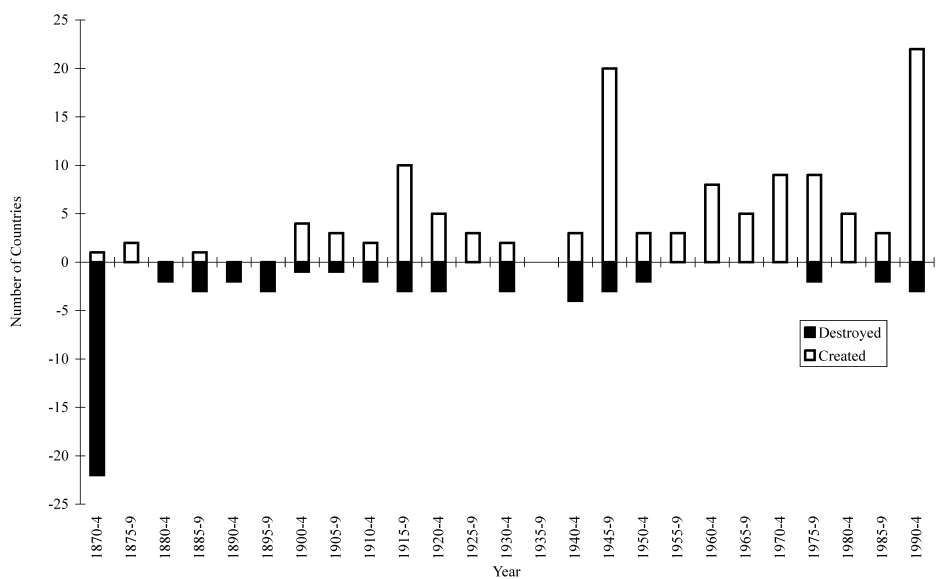


Figure 1. Countries created and destroyed (5-year periods, excludes Sub-Saharan Africa).

<sup>46</sup> This figure exclude Sub-Saharan Africa, given the difficulty of identifying borders before the colonization period.

1 Vatican City, the only other countries created between 1920 and the Second World War  
2 were Ireland (1921), Mongolia (1921), Iraq (1932), and Saudi Arabia (1932).

3 The interwar period was characterized by a collapse of free trade, the emergence of  
4 dictatorships, and by a belligerent state of international relationships. The Great De-  
5 pression completed the gloomy picture and precipitated the rise of protectionism. These  
6 are all factors that, according to our analysis, should *not* be associated with the creation  
7 of new countries, in fulfillment of nationalistic aspirations. In addition, these elements  
8 (lack of democracy, international conflicts, protectionism) would make colonial powers  
9 hold on to their empires and repress independent movements. In fact, all the colonial  
10 powers were adamant in refusing self-determination of colonies during this period. This  
11 combinations of events, protectionism and maintenance of large countries and empire,  
12 stands in sharp contrast with what happened in the aftermath of the Second World War.  
13

14 *4.6. Borders in the post-Second World War period*

15  
16 In the fifty years that followed the Second World War, the number of independent countries  
17 increased dramatically. There were 74 countries in 1948, 89 in 1950, and 193  
18 in 2001. The world now comprises a large number of relatively small countries: in 1995,  
19 87 of the countries in the world had a population of less than 5 million, 58 had a popu-  
20 lation of less than 2.5 million, and 35 less than 500 thousands. In the same 50 years,  
21 the share of international trade in world GDP increased dramatically. The volume of  
22 imports and exports in a sample of about 60 countries has risen by about 40 percent.

23 We should stress that the increase in international trade in the last half-century, as  
24 documented in Figure 2, is not the simple result of an accounting illusion. In fact, if

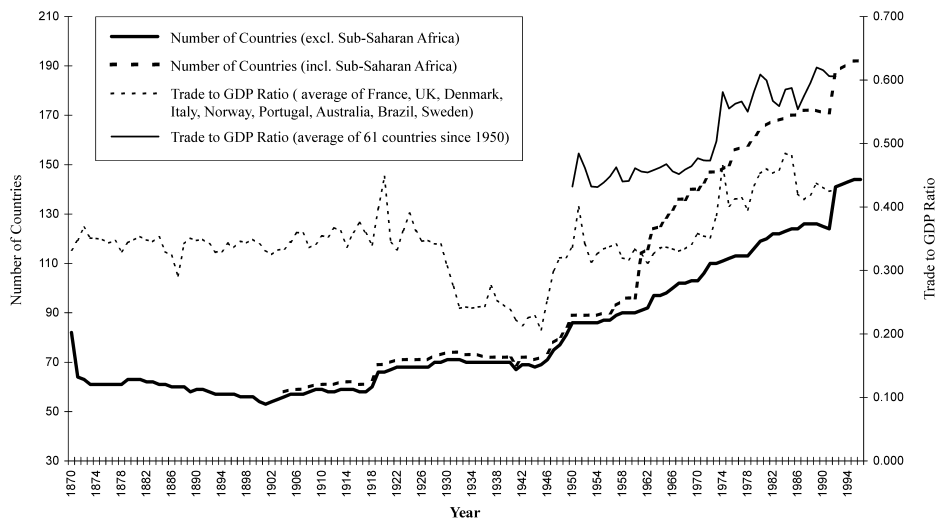


Figure 2. Trade openness and the number of countries.

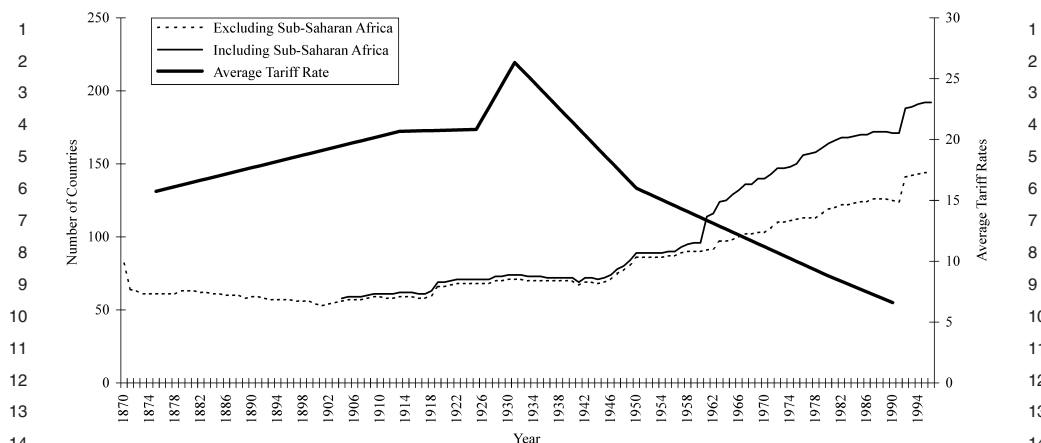


Figure 3. Average tariff rate and the number of countries (unweighted country average of average tariff rate for Austria, Belgium, France, Germany, Sweden, USA).

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 Figures 4 and 5 which plot the detrended number of independent countries against the detrended trade to GDP ratio, including Sub-Saharan Africa from 1903 onward, and without it from 1870 to 1905.<sup>47</sup> 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

<sup>47</sup> All these figures are taken from Alesina, Spolaore and Wacziarg (2000).

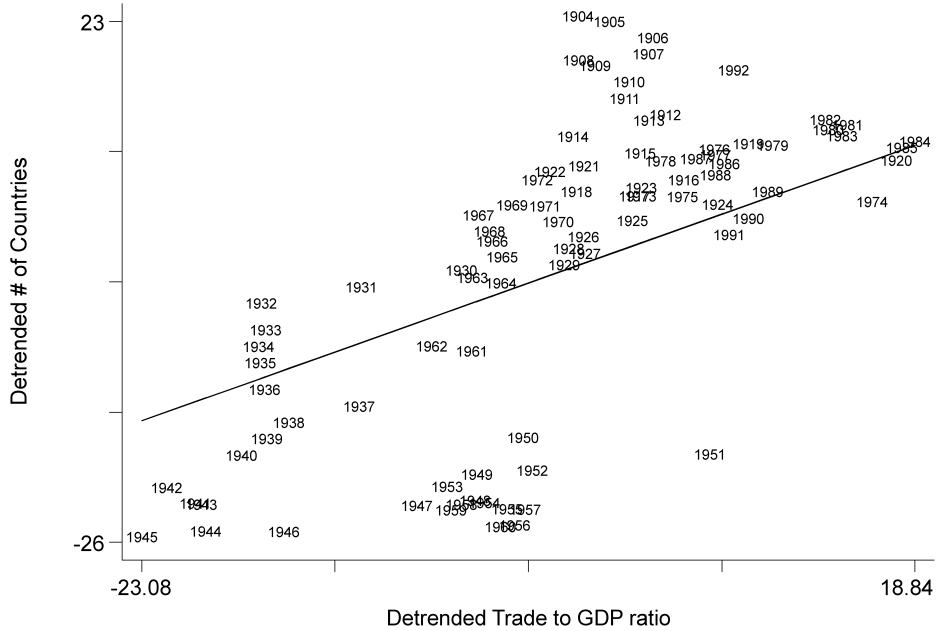


Figure 4. Scatterplot of the detrended number of countries plotted against the detrended trade to GDP ratio (with Sub-Saharan Africa – 1903–1992).

matter, so that trade among Canadian provinces is much easier than trade between Canadian provinces and US states. As shown by McCallum (1992), 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 towards political separatism. How does the European Union “fit” into this picture?



Figure 5. Scatterplot of the detrended number of countries plotted against the detrended trade to GDP ratio (with Sub-Saharan Africa – 1870–1992).

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”.

1 One way of thinking about the EU is as a supranational union of countries that have 1  
2 merged certain functions needed to guarantee the functioning of a common market and 2  
3 take advantage of economies of scale. Whether or not the attribution of responsibilities 3  
4 and policy prerogatives between the EU and the national government is appropriate or 4  
5 not is an intricate subject which is beyond the scope of this paper.<sup>48</sup> 5  
6 6  
7 7

## 8 **5. Conclusion** 8

9 9

10 This paper has argued that size matters for economic performance and that country size 10  
11 is endogenous and depends on economic factors such as free trade, public goods pro- 11  
12 vision and preference heterogeneity. We have reviewed and extended a recent literature 12  
13 that has discussed country formation and secession in the context of the theory of eco- 13  
14 nomic growth. The econometric and historical evidence is broadly consistent with the 14  
15 implications of these models 15

16 Much remains to be done. On the theoretical side, we have shown how scale effects 16  
17 could be derived in a simple neoclassical growth model, without appealing to increasing 17  
18 returns technologies, endogenous R&D or human capital spillovers, but simply by ap- 18  
19 pealing to the existence of a border effect driven by trading frictions. However, whether 19  
20 the scale effects that we observe in the data come from the border effect, technology or 20  
21 spillovers remains to be investigated. 21

22 The models that we discussed are based on the assumption that heterogeneity within 22  
23 a country has negative effects on average utility. However, heterogeneity may also bring 23  
24 about some benefits. In fact, the gains from trade in our model do stem from a kind of 24  
25 heterogeneity – the production of different intermediate goods by different regions – 25  
26 and this is why a larger country, for given barriers to trade, brings net economic gains 26  
27 through the trade channel. By “heterogeneity” costs here we mean the specific costs 27  
28 associated with disagreements over the basic characteristics of a government (including 28  
29 policies about official languages, religion, etc.). A richer discussion of the pros and cons 29  
30 of heterogeneity is certainly called for. 30

31 On the empirical side, debates are still raging. Even the literature on the effect of 31  
32 trade on economic performance is now subject to debates on the nature and extent of 32  
33 this effect. The literature on the effect of country size is even more contentious. Yet the 33  
34 existence of both of these effects is important to the argument that we proposed about 34  
35 the role of trade openness in the endogenous determination of country size. We have 35  
36 shown that a simultaneous consideration of an economy’s openness and of its size led 36  
37 to estimating strong effects of both size and openness on growth in a sample of countries 37  
38 since 1960. 38

39 Finally, in a broad historical sweep, we have suggested that the types of trade-offs 39  
40 identified by our framework have been at play at various stages in modern history. 40  
41 41  
42 42

43 <sup>48</sup> For a discussion of this point, see Alesina and Wacziarg (1999). 43



1 In a way, current developments provide an ideal setting for observers of country cre- 1  
2 ation. Since the Second World War, increasing globalization has threatened nation-states 2  
3 “from above”, while rising regionalism and decentralizing forces have threatened them 3  
4 “from below”. The construction of the European Union epitomizes this tension, as a 4  
5 fundamental redrawing of the distribution of political prerogatives is being orchestrated. 5  
6 Powers are being transferred down through decentralization, and up through the Euro- 6  
7 pean construction. It is likely that if globalization proceeds apace, so will regionalism. 7  
8 If the backlash against globalization succeeds, however, large centralized nation-states 8  
9 could initiate a comeback. 9

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20

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