Blood, Education and Economic Development: How the 19th century Wars in Latin America Foiled its Economic Development[1]

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Abstract. In this paper, we hypothesize that the prolonged wars in Latin America during most of the 19th century hindered human capital development and delayed economic progress well into the 20th century. Collecting novel data for the seven largest Latin American economies over the period 1820-2016, we show that the extraordinarily large share of military expenditure in total spending crowded out investment in education and R&D, which in turn had persistent effects on economic development.

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1 Introduction

A well-known fact is that most Latin American (LA) countries have performed poorly since their independence around 1820 relative to comparable settler economies including Australia, Canada, New Zealand, and the US (ACNU). Since 1820, per capita income in the ACNU countries has grown, on average, approximately 2.5 times more than that of the seven main Latin American countries analyzed in this paper: Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela (henceforth, LA7). What is often overlooked is that most LA countries were in a continual state of war and conflict over most of the 19th century. Following independence from the Spanish and Portuguese empires in the early 19th century, the loosely defined borders, the scramble for precious resources, and population pressure resulted in interstate conflicts and wars (Ross 2014).

The military campaigns were expensive. Of the total government expenditure, the military absorbed, on average, 68% over the period 1820-1870 for the LA7 countries (Figure 1). The military share would have been even higher if the debt-service expenses on government borrowing, accumulated during the war campaigns, were accounted for as military spending. The government debt accumulation was, after all, predominantly driven by wars of independence, and the subsequent interstate wars (Centeno 1997). Despite the marked reduction in the LA7's military spending share over the period 1870-1900, it was still significantly above that of the ACNU countries by 1900

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(Figure 1).[2] The military campaigns not only had immediate budgetary consequences, but also had long-term economic consequences by crowding out investment in human capital.

This research advances a novel hypothesis to explain the delayed economic progress in the overall Latin America (LA) in which it is not institutions but the hitherto neglected phenomenon of military campaigns in most of the 19th century that resulted in low investment in education and innovation that retarded growth. Specifically, we hypothesize that the military campaigns in the post-independence LA7 countries delayed the rise in mass education and investment in public funded R&D well into the 20th century. The large military share of the budget up to 1870, crowded out public spending on education, which in turn had significant adverse long-term consequences for education and knowledge production because of strong intertemporal and intergenerational effects.[3] Our hypothesis relates to the theoretical papers of Besley and Persson (2009, 2010, 2013), in which they show that wars can have differential effects on institutional development through fiscal capacity. Depending on parameter values of their models, a country can end up as a 'common-interest state,' or a 'weak state,' in which there is political instability with little investment in fiscal capacity and, consequently, low investment in human capital.

The contrast between Europe and LA is used as a template for the differentiated effects of wars on institutions, as predicted by the models of Besley and Persson (2009, 2010, 2013). Empirical papers have demonstrated that the Napoleonic Wars, in particular, fostered the rise of mass education in Europe (see, for overviews of the literature and analyses, Aidt and Jensen, 2009, Besley and Persson, 2013). The military campaigns in Europe in the beginning of the 19th century pressured the state to depend less on the administratively simple customs taxes and to rely on the more bureaucratic sophisticated, but potentially more lucrative, domestic sources of revenue, such as direct taxes. The greater bureaucratic complexity that this required is at the heart of the institutional legacy of war. Thus far, the historical focus in the literature has mostly been on Europe after 1800, a period during which Europe had the institutional capacity to develop sophisticated tax systems during wars. In the centuries before then Europe was in an almost constant state of war and, yet, relied almost entirely on lending from the landed class without significantly developing fiscal capacity (Tilly, 1990; Chandler and Beckett, 2003).

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[2] The economic performance of LA is usually contrasted to that of the ACNU countries because they are all European settler economies. Prados de la Escosura (2009) questions whether the United States, for example, is an appropriate comparator for LA. Escosura suggests that former Asian and African colonies may be better comparators. In our context, we cannot use these countries for comparison since they did not have national military budgets and most African countries were first colonized in the late 19th century or after 1900.

[3] Although a potentially important transmission channel, we do not analyze the interest rate crowding out through which debt-induced increases in interest rates reduce the present value of investment in education and R&D. The war-induced debt-escalations are likely to have been responsible for the high interest rate spread of Latin American debt over British consols during the 19th century, as indicated by the estimates of Paolera and Taylor (2013). The interest rates were so high during this period that the private returns to investment in education and R&D were likely miniscule or negative and, therefore, contributed to the low investment in human capital and knowledge production. Using the interest rate spreads of 5% in the lower end of the distribution, for example, would reduce the present value of a $100 skill premium in period t+40 years from $30.70 to $4.60, assuming that the interest rate on British consols was 3%. Related to this, Barro (1987) finds that real and nominal interest rates and government debt were driven up by the wars that Britain was involved in over the past three centuries. Further, the growth in prices and money supply increased in periods in which the gold standard was suspended.

For LA, the military campaigns in the 19th century and beyond did not generate the same results as they did Europe. Instead, LA countries ended up as ‘weak states’ after independence, with political instability, little investment in fiscal capacity, and bad institutions for several reasons (Centeno, 1997; Prados de la Escosura, 2009). First, after independence, adequate administrative mechanisms were not put in place in LA to manage the explosion in both revenues and expenditures. Furthermore, fiscal weakness led to weak government, which, in turn, led in turn to frequent challenges to the elite in power, and as a result, civil strife proliferated. In fact, the Latin American states were in complete disarrays after independence and were neither structurally, politically, nor ideologically ready to exploit the opportunities presented by war (Centeno, 1997; Prados de la Escosura, 2009). Second, ill-defined borders in LA after independence rendered it impossible for the LA countries to establish sovereignty over their territories and, hence, to develop a coherent central state. Third, the ongoing wars in LA prevented the establishment of the fiscal capacity needed to invest adequate resources in human capital. All these factors resulted in political instability and the lack of a common-interest-state with low investments in fiscal capacity that perpetuated inefficient regulatory policies that redistribute income through rent protection rather than taxation (Besley and Persson, 2010, 2013).

Figure 1. Military Budget Share

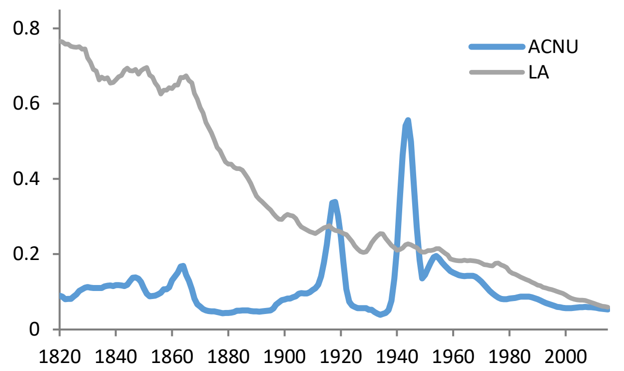
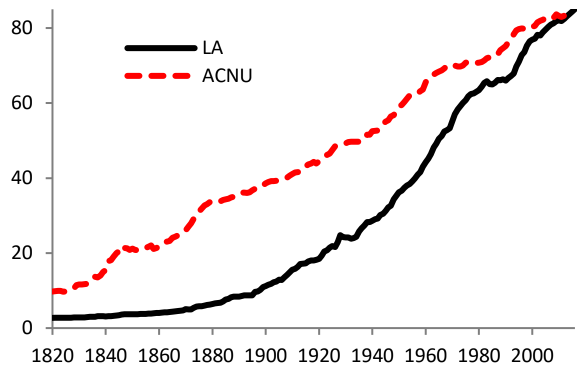


Figure 2. GERs, LA7 and ACNU



Notes: Military expenditure as a proportion of the total budget, 5-year centered moving average. LA7: unweighted average for Argentina, Brazil, Chile, Columbia, Mexico, Peru, and Venezuela. ACNU: Unweighted average for Australia, Canada, New Zealand, and the US. GERs = average gross enrollment rates at primary (7), secondary (5), and tertiary education (5), weighted by years of education at each level in parentheses.

To get a comparative perspective on the educational trajectory in LA7 vis-à-vis the ACNU countries, gross enrollment rates (henceforth GERs), defined as the share of the population of school age that is enrolled in private and public primary, secondary and tertiary education, are displayed in Figure 2. GERs of the LA7 are growing at miniscule rates throughout the 19th century, and by 1900, the GERs of LA7 were a quarter of that of the ACNU countries; thus, barring the LA7 countries from progressing economically. To make matters worse, the bulk of the education was a private affair because public schools were uncommon in Latin America during most of the 19th century when some national governments began to promote the expansion of public education (Engerman et al., 2009). In Columbia over the period 1837-1850, for which data decomposed on private and public schools are available, 71% of primary school enrollment was, on average, in private schools.

Furthermore, in 1864, only 4% of the Columbian general government budget was spent on education (the only years that are listed in the source: Ramírez and Salazar, 2010).

To assess the economic consequences of the military campaigns, we show empirically that the military share of government expenditure was a significant deterrent to education and innovation. To achieve this, we construct a novel annual data set for LA7 over the period 1820-2016 that includes educational attainment of parents, gross enrollment rates, life expectancy, TFP, institutions, the military spending share, and innovations. Specifically, we examine the extent to which the military campaigns deterred the two key drivers of TFP growth, viz school enrollment rates at primary, secondary, and tertiary levels, and innovative activity. Furthermore, we show that the effects of military campaigns are long-lasting because of significant intergenerational effects. Thus, when the military spending share finally started to decline to give room for increasing spending on education at the end of the 19th century, it took a long time to revamp education and R&D. For example, it takes approximately 58 years before the education attainment of the working age population reaches a new steady state in response to an uptake in school enrollment – the time lag between the first year of schooling and retirement. This slow adjustment is perpetrated by intergenerational effects through which parent's education influences the education of their children. It is well-established that parent's education is influential for their children's education, and this is a standard feature of endogenous and unified growth models (Galor, 2011; Prettner and Strulik, 2020).

Empirically, several studies have investigated the economic effects of wars, and almost all studies find that wars significantly reduce growth and welfare spending (see, for an overview of the literature and regression analyses, Russett, 1969; Knight et al., 1996; Gupta et al., 2002; Collier, 2003; Dunne and Perlo-Freeman, 2003, 2005; Emmanouilidis and Karpetis, 2021; de Groot et al., 2022). Using post-1970 data, Besley and Persson (2013) show that, while the West ended up in a 'common-interest state,' most African countries ended up as 'weak states' (they do not consider LA). Only very few studies have examined the effects of military spending on education and innovation. In a pioneering study, using itemized historical budget data for Canada, France, the UK, and the US, Russett (1969) shows that government spending on education is significantly deterred by military outlays. Similarly, using educational data for a large sample of countries over the period 1980-1997, Lai and Thyne (2007) find that education suffers significantly in civil wars. Finally, only a few, if any studies, have examined the effects of defense spending on innovative activity, and quantitative analysis of the economic effects of the military campaigns has not been carried out for LA. Furthermore, these few studies do not consider the effects of persistent wars and the persistent effects on education and innovations.

Our paper is also related to the narrative of Engerman et al. (2009) in which they argue that the willingness to mobilize tax revenue for educational purposes was underwhelming in most LA countries, predominantly because the high wealth and income inequality meant that the cost-benefit ratio would be disproportionally higher for the rich in Latin America compared to Canada and the US. Thus, in LA, where wealth and income inequalities, according to Engerman et al. (2009), were extreme and the wealthier segments of the population had disproportionately high political influence, there were few incentives for the rich to support investment in public goods through taxes.

Our analysis is also complementary to the large literature on the political fragmentation and retarded institutional development in Latin America following independence from Spain and Portugal in the early 19th century. The poor long-run performance of the LA economies has long been attributed poor institutions installed by the Spanish colonizers, which in turn promoted a high concentration of elitist wealth and political power (see, for discussion, Engerman and Sokoloff, 2000; Prados de la Escosura, 2009; Prados de la Escosura and Sanz-Villarroya, 2009). Furthermore, Prados de la Escosura (2009), shows that the monetary and fiscal disintegration of Latin America following independence contributed to the political fragmentation, weak national administrations, and increasing transaction costs.

The next section sets out the analytical framework for education and ideas production that is used to formulate the stochastic models. The empirical analysis is carried out in Section 3, the data are discussed in Section 4, and the empirical results are discussed in Section 5, and Section 6 concludes.

2 Analytical framework

The framework presented in this section demonstrates how military spending influences productivity growth through education and R&D – the two principal channels of growth in endogenous and unified growth theory. As shown below, the growth effects of education and R&D are temporary, persistent, or permanent depending on scale effects in ideas production. To see this, consider the following constant returns to scale Cobb–Douglas production function:

$$Y = AK^{\alpha}H^{1-\alpha} = AK^{\alpha}(hL)^{1-\alpha}, \tag{1}$$

where Y is output; A is total factor productivity; K is capital stock; H is the total quantity of human capital used to produce output; L is raw labor; h is human capital per worker; and α is the income share of capital.

Incorporating (1) into the Solow growth model, yields per capita income in steady state as follows (see, e.g., Mankiw et al., 1992):

$$\ln\left[\frac{Y(t)}{L(t)}\right] = \ln A(t) - \frac{\alpha+\beta}{1-\alpha-\beta}\ln\ (n+g+\delta) + \frac{\alpha}{1-\alpha-\beta}ln s_k + \frac{\beta}{1-\alpha-\beta}ln\ s_h, \tag{2}$$

where n is growth in the labor force; g is technological progress; δ is the depreciation rate of fixed capital stock; s_k is the fraction of income invested in fixed capital; and s_h is the fraction of income invested in education.

Eq. (2) shows the well-known result that the growth effects of education in steady state are zero when education is treated as a factor of production, as in the standard Solow model. However, perpetual income effects of an educated labor force working in the R&D sector arise from scale effects in the ideas production function.

To see this, consider the following ideas production function (Ulku 2007; Peretto and Valente 2011, 2015):

$$\dot{A} = \lambda\left(\frac{X}{Q}\right)^{\sigma} A^{\phi} =>$$
$$g_A = \left(\frac{\dot{A}}{A}\right) = \lambda\left(\frac{X}{Q}\right)^{\sigma} A^{\phi-1}, 0 < \sigma \leq 1, \phi \leq 1, Q \propto L^{\eta} \text{in steady state,} \tag{3}$$

where X is the number of R&D researchers; Q is product variety; L is employment or population, λ is a research productivity parameter; σ is a duplication parameter (0 if all innovations are duplications and 1 if there are no duplicating innovations); ϕ is returns to scale in knowledge; and η is the coefficient of product proliferation. The ratio X/Q is referred to as research intensity.

This ideas production function extends first-generation models of knowledge production to allow for product proliferation and decreasing returns to knowledge stock, as highlighted in second-generation models of economic growth (e.g., Aghion and Howitt, 2006; Peretto 1998). R&D expenditure is divided by product variety, Q, following the second-generation Schumpeterian growth models, in which R&D spreads increasingly thinly across the variety of products as the economy expands. Since, in steady state, product variety is growing at the same rate as the population or the labor force, it follows that the growth rate of knowledge, g_A, cannot increase in response to an increase in the number of researchers that keeps the number of researchers in fixed proportion to the population.

To allow for the effects of military spending on ideas production, we assume that R&D intensity is proportional to the educational attainment at secondary and tertiary levels (indirect effect) and government R&D funding that is inversely related to the military spending share of the budget, *MS*, (direct effects):

$$\dot{A} = \lambda e^{\varphi \cdot h^{ST}} e^{\tau \cdot h^{ST} DTF} MS^{\pi} A^{\phi}, \qquad \varphi > 0, \tau \cdot > \ 0, \pi \ <\cdot 0, \tag{4}$$

where h^{ST} is educational attainment (years of schooling) at the secondary and tertiary levels; *MS* is the share of military spending in total government expenditure; *DST* is the distance to the technology frontier; and π, τ, and φ are constants. The distance to the technology frontier is measured as the ratio of TFP in LA and the maximum TFP of the US and the UK. Eq. (4) shows that technological progress derives from education, the inverse of the military spending share, and international technology transmission through absorptive capacity. From (4) it follows that h^{ST} and *MS* only have permanent growth effects if there are scale effects in ideas production (i.e., $\phi = 1$).

There are various channels through which h^{ST} and *MS* promote technological progress. Almost all R&D today is undertaken by highly educated and specialized researchers employed in tertiary institutions and in modern corporate laboratories (Minniti and Venturini, 2017). Corporate R&D, however, hardly existed before WWII and even in most advanced countries, corporate R&D first gained momentum among high-tech companies during the 1950s and 1960s (Madsen et al., 2021). Instead, we assume that the research intensity is a positive function of the fraction of the population with a relatively long education. Before WWII, most innovations and new technologies were delivered by universities, transmitted from the technological frontier, and provided by self-taught private innovators that, at least in Britain, were educated, learned and resourceful (Mokyr, 2000, 2015). Examining the role of universities for industrial development in Germany around 1800, Dittmar and Meisenzahl (2022) show that the adoption of mechanized technology and the number and share of firms winning international awards for innovation were significantly positively related to the proximity to universities. Finally, based on data for practical inventors among mechanics and engineers in England born over the period from 1660 to 1830, for example, Meisenzahl and Mokyr (2012) show that, of the inventors born before 1800, 25% had a university degree and 37% had higher schooling or university degrees. Furthermore, Meisenzahl and Mokyr (2012) show that skilled workmen often published their work and engaged in debates over contemporary technological issue, which led to positive technology externalities.

Innovations, $\dot{A}$, are assumed to be an exponential function of educational attainment at the secondary and tertiary levels. This means that the effects of an additional year of education on innovation is independent of the years of education. For example, the proportional increase in innovative activity in response to an additional year of secondary and tertiary education is the same regardless of whether educational attainment is increased from 1 to 2 years or from 10 to 11 years. Without the exponential h^{ST} in (4), the proportional innovative response to an increase in education would be 10 times higher when going from 1 to 2 years of education compared to an increase from 10 to 11 years of education. In other words, using $(h^{ST})^{\delta}$ instead of $e^{\varphi \cdot h^{ST}}$ in (4) would imply that the returns to R&D of educated people would be a sharply declining function of the years of secondary and tertiary education – a position that would be difficult to defend.

Following the lead of Nelson and Phelps (1966) and Aghion and Howitt (1998), we assume that international technology spillovers are functions of the interaction between the absorptive capacity and the distance to the technology frontier, where the absorptive capacity is measured by the fraction of the population with secondary and tertiary degrees. In the Nelson–Phelps framework, a higher level of human capital increases the capacity of a nation to imitate and use the technology of the technology frontier and, therefore, facilitates catch-up to the technologically advanced economies.

Turing to the effects of military spending on education, consider the simplified expression of the model of Bils and Klenow (2000), where the optimal years of education, S*, is given by:[4]

$$S^{*} = T - \frac{1}{r-g} ln\left[\frac{r^{Edu}}{r^{Edu} - \mu(r-g)}\right], \tag{5}$$

where T is the retirement age; r is a constant real interest rate, r^{Edu} is the private returns to education, g is productivity growth in steady state; μ is the ratio of schooling tuition fees and the opportunity cost of student time.

Eq. (5) gives important insights. First, the military campaigns resulted in a reduction in the optimal years of education, S*, directly through reduced spending on education that increased the cost of education, μ. Assuming that g is 1 percent, r^{Edu} is 7 percent and r is 3 percent, a reduction in μ from 1 to 0.5 increases the optimal years of schooling by no less than 9.1 years, suggesting that

[4] The model is derived as follows. The present value of expected earnings of the representative individual who finishes school at the age of S, who is active in the labor market until the age of T, and has the earnings, w, is given by:

$$Y^{P} = \int_{S}^{T} (e^{-rt} w_t) dt,$$

where r is the real interest rate on borrowing. Real wages are growing at the rate of technological progress along the balanced growth path:

$$w_t = \Psi e^{Sr^{Edu}} e^{gt},$$

where Ψ is a constant productivity parameter. Solving the model yields life-income:

$$Y^{P} = \frac{\Psi}{r-g}\left[e^{[r^{Edu}-(r-g)]S} - e^{Sr^{Edu}-(r-g)T}\right].$$

Optimizing this model while allowing for the tuition fee relative to the opportunity cost of student time yields (5).

education is highly sensitive to cost of education relative to the opportunity costs of student time, μ. This direct effect is amplified by increasing borrowing costs induced by war, r, and reduced growth through reduced economy-wide spending on education and R&D given that $\partial S^*/\partial\mu > 0$ and $\partial S^*/\partial g > 0$. Second, parent's education reduces the effective cost of education, μ; thus, stimulating their children's education.

Third, an increasing life expectancy increases the years the individual expects to stay in the labor force, which, therefore increases the present value of education. Finally, an important implication of the model is that a higher level of technology, A, and hence a higher level of productivity, does not affect the optimal amount of schooling because it affects the marginal costs and benefits of education equally. This implication is also derived from the seminal paper of Galor and Weil (2000) in which it is technological progress, g, and not its level, A, that matters for fertility and educational transitions.

From the models given by (4) and (5), it follows that military campaigns can have persistent productivity growth effects because: 1) The more-educated fresh graduates will first fully replace the existing labor force with a lag of 50 years or more; 2) the intergenerational effects continue to operate for generations after the first-round effect referred to in 1) has reached a steady state; and 3) the number of innovations increase over time in response to an increase in skilled labor provided that $\phi > 0$; a condition that is satisfied for the LA7 group as shown below. As a result, the positive productivity effects of the decline in the budget share of military spending in the second half of the 19th century took several decades before most of the adverse effects were borne out.

3. Empirics

3.1 Estimation models

Based on the analytical framework in the previous section, we estimate the following two models of education and innovation:

$$\ln GER_{it}^{X} = \beta_0 + \beta_1 \ln MS_{it} + \beta_2 \ln e_{it}^{10} + \beta_3 \ln h_{it}^{Par} + \beta_4 \ln Inst_{it} + \gamma_t + \mu_i + \varepsilon_{1,it}, \quad (6)$$

$$\ln Pat_{it} = \gamma_0 + \gamma_1 lnMS_{it} + \gamma_2 lnPat_{it}^{s} + \gamma_3 h_{it}^{ST} + \gamma_4 DTF_{it} h_{it}^{ST} + \gamma_5 \ln Inst_{it} + \gamma_t + \mu_i + \varepsilon_{2,it}, \quad (7)$$

where GER^X is the gross enrollment rate, where $X = P, S, T$ at the primary, secondary and the tertiary level, and is measured as the fraction of the school-age population enrolled in primary, secondary and tertiary education; e^{10} is life expectancy at age 10; h^{Par} is the educational attainment of parents; *Inst* is an index of the quality of institutions measured as the leading principal component of proxies for contract enforcement, democracy and executive constraints as detailed in the data section; *Pat* is the number of patents granted; Pat^s is the patent stock, which is based on the perpetual inventory method with a 15% depreciation rate; γ_t is time-effects; μ_i is country effects; *DTF* is the distance to the technology frontier (as stated, the ratio of TFP in the individual LA7 countries and the maximum TFP of the US, and the UK); and ε is a disturbance term. Subscripts i and t refer to country i and year t.

Parent's education is measured as the overall educational attainment of the population in the 30–40-year age group. The model is estimated over the period 1826-2015, where the first year (1826) signifies the year at which all the LA7 countries have gained their independence. Life expectancy at the age of ten is used rather than life expectancy at birth because it is closer to the life expectancy at which students enter secondary and tertiary education, noting that the data coverage of life expectancies at later ages is poor.

Institutions are included in the model because they have long been considered to have been the root cause of the poor growth performance of the LA countries. Several economic historians have argued that the institutions established shortly after colonization were dominated by rent-seeking and income and wealth inequality, factors that were detrimental for growth and development (see, for an overview, Engerman and Sokoloff, 2000; Prados de la Escosura, 2009; Bértola et al., 2010). North (1991), for example, attributes the relative success of the United States and Canada to British institutions being more conducive to growth than those of Spain and Portugal. Highlighting environmental factors, Engerman and Sokoloff (2000) suggest that the greater efficiency of the large plantations in LA over North America, where the overwhelming fraction of the populations came to be black slaves, contributed significantly to unequal distributions of wealth and human capital. The inequality, in turn, contributed to the formation of poor institutions. Furthermore, poor contracting institutions deter financial development, which in turn renders it difficult for the poor to gain access to credit-financed education and results in under-investment in education (Checchi and García-Peñalosa, 2010).

While (7) includes all the variables included in the ideas production function derived in the previous section, the $(r - g)$ term in (5) is excluded from the GER model, (6), because the nominal interest rates for the LA7 countries are unavailable over most of the period and because the frequent inflationary spells render it difficult to pin down inflation expectations. Furthermore, the parents of the school-aged children were most likely credit constrained.

3.2 Endogeneity and feedback effects

The coefficients of the military spending share are unlikely to have been biased by feedback effects from school enrollment and patenting to the military budget share. If anything, the feedback effect from enrollment should be positive and, therefore, bias the coefficients of GERs in a positive direction, which, therefore, is against our maintained hypothesis. Since most education was a private affair in the LA7 before the introduction of mass education at the turn of the 20th century, parents would have an interest in lobbying for public subsidies to education that would crowd out the military expenditure share. Endogeneity due to omitted unobservable variables that simultaneously influence military expenditure and the outcome variables, however, cannot a priori be ruled out.

To address potential endogeneity due to omitted variables, we instrument the military spending share, *MS*, using the geographic distance weighted share of military spending in total government expenditure of the LA countries in our sample, excluding the own-country spending. The distance weighted instrument for the home country *i*, is computed as follows:

$$MS_{it}^{IV} = \sum_{j \neq i}^{7} \frac{MS_{jt}}{Dist_{ij}^{2}},$$

where $MS_{j \neq i}$ is the share of military expenditure in total government expenditure and $Dist_{ij}$ is the great circle geographic distance between countries *i* and *j*. Intuitively, an increase in military spending escalations from surrounding countries will boost military spending of country *i*. Various theoretical models suggest that security spending is influenced by the defense burden in neighboring countries (e.g., Richardson 1960; Sandler & Hartley 2001). Besides civil and internal conflicts, the biggest military threat is by governments perceived to come from the behavior of neighbors and their intentions on military spending. In addition, escalations of military spending can also be due to regional behavior or imitation, in which governments may be induced to spend in a similar fashion to their neighbors (Dunne & Perlo-Freeman 2003).

An advantage of the using the distance-weighted military spending as an instrument is that the exclusion restriction is likely to be satisfied. It is hard to imagine that foreign military spending influences human capital through channels other than domestic military spending. It is also doubtful that almost any citizen knows the military budget share of other countries. The downside of our baseline instrument is that domestic military spending escalations will have an effect on the military spending of neighboring countries that is proportional to the weight of the domestic military spending share in the overall sample.

4. Data

4.1 Data

As mentioned, Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela are included in our panel sample. The military spending variable is estimated as the percentage of government expenditure spend on defense. Gross enrollment rates, *GER*, are measured as the number of students enrolled divided by the population in the age groups at three educational levels, GER^P (primary), GER^S (secondary), GER^T (tertiary), and GER^W, where GER^W is the weighted sum of GER^P, GER^S, and GER^T where the weights are the number of years completed at each educational level. Data sources are relegated to the Data Appendix.

Following Madsen (2014), educational attainment at the primary, secondary and tertiary levels are estimated as follows:

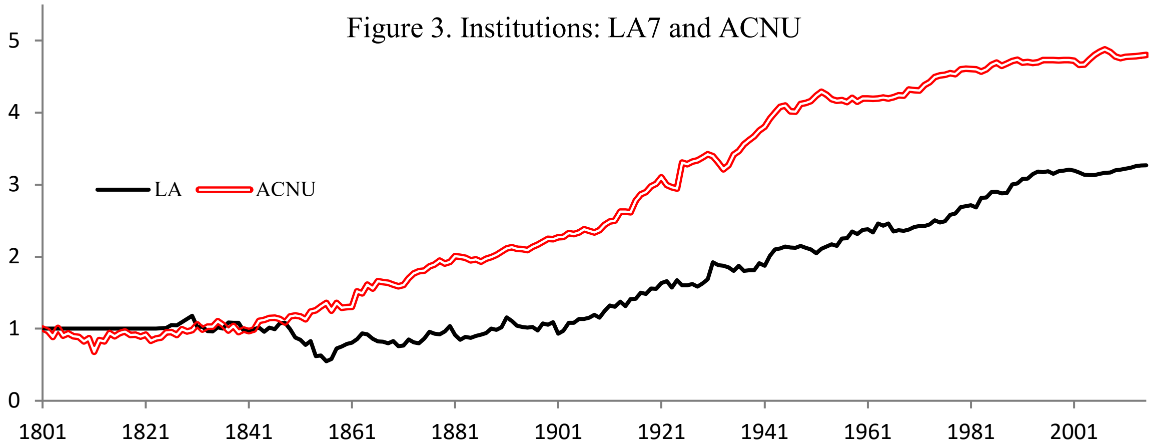
$$h_{t,n}^P = \frac{\sum_{i=0}^{49}\left[Pop_{n,15+i}\sum_{j=3}^{8}GER_{n,t-i-j}^P\right]}{\sum_{i=0}^{49}Pop_{n,15+i}}, \tag{7}$$

$$h_{t,n}^S = \frac{\sum_{i=0}^{46}\left[Pop_{n,18+i}\sum_{j=0}^{4}GER_{n,t-i-j}^S\right]}{\sum_{i=0}^{49}Pop_{n,15+i}}, \tag{8}$$

$$h_{t,n}^T = \frac{\sum_{i=0}^{41}\left[Pop_{n,23+i}\sum_{j=0}^{4}GER_{n,t-i-j}^T\right]}{\sum_{i=0}^{49}Pop_{n,15+i}}, \tag{9}$$

where h^P, h^S and h^T are educational attainment at the primary, secondary and tertiary levels; and Pop_{15+i} is the size of the population aged 15+*i*. For example, the term $Pop_{15+i}\sum_{j=2}^{8}GER_{t-i-j}^P$ in the numerator of the first right-hand-side-term in (7) is the primary educational attainment of the 15+*i* age cohort at time *t*. The computations of (7)-(9) are data intensive because they require data for population distributed on ages and school enrolment 58 years earlier than the year of the first observation. For instance, for a 64-year-old in 1815, the primary educational attainment is the sum of GER^P over the period 1757–1764.

Institutions, *Inst*, are measured as the leading principal component of democracy, constraints on the executive from Polity IV, and contract-intensive money. We use Vanhanen's (2011) indicator of the strength of democracy, which is a combined measure of competition between political parties and the fraction of the population that votes. Contract-intensive money, measured as (*M*2-*H*0)/*M*2, is as an indicator of the public's confidence in contract enforcement (Clague et al., 1999). In economies with sound third-party contract enforcement, credit and monetary deposits will be the preferred store of money and medium of exchange over cash money, because they are considered safe, efficient, and, in most cases, pay interest. Furthermore, a well-developed credit market facilitates the tracking of credit history and, thereby, better enables lenders to screen their borrowers. Conversely, if contracts are not enforced by the government, 1) the safety of money in financial institutions is not guaranteed; 2) that loans will be repaid cannot be taken for granted; and 3) lenders may not have security rights to mortgage assets if the borrower defaults (Clague *et al*., 1999). In these cases, cash will be the preferred medium of exchange over credit.



Notes. The data are the log of the first principal component of *Tax* (one minus the share of trade duties and royalties of commodity production in total government revenue), *Dem* (competition and participation in the democratic process), and *CIM* (contract-intensive-money), *CIM* = (*M*2-*H*0)/*M*2. LA = the unweighted average of the seven LA countries; ACNU = the unweighted average of Australia, Canada, New Zealand and the US.

The leading principal components of institutions for LA7 and ACNU are displayed in Figure 3. While the ACNU group enjoys almost uninterrupted improvements in their institutions throughout the past two centuries, the quality of institutions in LA7 was stagnant and low throughout the 19th century. Despite improvements since 1900, the institutional quality of the LA7 group today is only at the level experienced by the ACNU group in 1926, suggesting a slow modernization process. In terms of the regression analysis, parallel movements in education (Figure 2) and institutions (Figure 3) makes institutions important confounders.

Table 1. Summary statistics.

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Military Expenditure % (MS)	1,330	0.336	0.262	0.0195	1.042
Primary GER (GER^p)	1,330	0.564	0.469	0.00802	1.620
Secondary GER (GER^S)	1,330	0.147	0.244	0.000317	1.039
Tertiary GER (GER^T)	1,330	0.0653	0.123	0	0.865
Life Expectancy at 10 (e^{10})	1,330	47.79	11.05	33.91	71.00

Research Stock	1,330	978.7	2,566	0.0691	19,402
Patents	1,330	151.5	427.8	0.00502	4,600
Skilled education (h^{ST})	1,330	0.587	1.227	0.00205	10.02
Distance to frontier (*DTF*)	1,330	0.522	1.420	-0.88939	3.9636
Institutions	1,330	0.140	1.481	-1.544	3.865
Parent Primary GER	1,330	2.593	2.835	0.00137	9.869
Parent Secondary GER	1,330	0.513	0.936	0.000664	5.015
Parent Tertiary GER	1,330	0.178	0.357	0	2.688
Avg. neighboring country's military expenditure	1,330	0.252	0.152	0.0474	0.686

Notes: All data include the LA7 countries over the period 1826-2015.

5 Regression results

Eqs. (6) and (7) are estimated in levels and in 5-year overlapping first-differences. We maintain the country fixed effects in the difference estimates although they are wiped out in the first difference transformation. The first-difference estimates overcome the potential problems in level estimates in which parameter estimates may partly be driven by common trends in the data. Combining level and first-difference estimates will give insight into the short- and long-run adjustment path of the estimates. The GER regression results are shown in the first part of this section and the patent regressions in the second part.

5.1 Education

5.1.1 OLS and IV regressions in levels

The results of estimating (6) are presented in Table 2 over the full estimation period, 1826-2015, recalling that 1826 signifies the year by which all the LA7 had all gained independence. Consider first the OLS estimates in the first three columns. The coefficients of institutions, parent's education, and life expectancy are all significantly positive at the 1% level. The magnitude of the coefficients of parent's education is highly influential for school enrollment, suggesting that education feeds on itself and that there are strong intergenerational effects in education. The coefficients of the military spending ratio are all statistically and economically significantly negative. The absolute value of the short-run coefficients of the military spending shares are more than twice as high for secondary education than those of primary and tertiary education. However, in steady state, when the effects of parent's education on their children's education is allowed for, the elasticities for primary and secondary education are significantly closer to each other: GER^P = -0.12/(1-0.423) = -0.21, GER^S = -0.276/(1-0.172) = -0.33; and GER^T = -0.118/(1-0.463) = -0.22.

Quantitatively, the military campaigns were influential for the evolution of education in the LA7. Based on the average of the coefficients of military spending of -0.17, a 10% increase in military spending is associated with a 1.7% decrease in GERs in the short run, and a 1.7/(1-0.35) = 2.6% decrease in steady state when the enrollment effects of parent's education are borne out. Conversely, suppose that the military share of the budget increased from 25% to 50% in the LA7 in the early 19th century, noting that there was no military budget before independence: Defense was provided by the Spanish/Portuguese Crown (Prados de la Escosura, 2009). This would have resulted in a 26% lower GER than the alternative of no increase in the steady state, suggesting that the military campaigns in the LA7 were significant deterrents to mass education. Conversely, on average 37 percentage point reduction in the military budget share for our LA7 sample over the period 1866-1900, contributed to a 0.17*37/(1-0.35)*0.77 = 7.5 percentage point increase in the average GERs across the three educational levels, corresponding to 29% of the average GERs at primary, secondary and tertiary educational levels.

Table 2. Parameter estimates of education in levels.

	(1)	(2)	(5)	(4)	(5)	(6)
VARIABLES	$lnGER_{it}^P$	$lnGER_{it}^S$	$lnGER_{it}^T$	$lnGER_{it}^P$	$lnGER_{it}^S$	$lnGER_{it}^T$
	OLS			**2SLS**		
$\ln MS_{it}$	-0.12**	-0.28***	-0.12***	-0.14***	-0.24**	-0.33***
	(2.57)	(7.48)	(3.03)	(3.62)	(2.59)	(3.43)
lne_{it}^{10}	0.54***	0.30***	0.35***	0.44	0.55*	0.51***
lne_{it}^{10}	(2.78)	(3.53)	(4.52)	(1.34)	(1.83)	(5.42)
$\ln h_{it}^{Par}$	0.42***	0.17***	0.46***	0.43***	0.44***	0.43***
	(22.64)	(3.48)	(8.89)	(4.41)	(5.69)	(5.42)
$\ln Inst_{it}$	0.07***	0.20***	0.01*	0.05***	0.17***	0.08**
	(4.93)	(7.16)	(1.79)	(2.72)	(4.75)	(2.24)
				First-stage regressions		
$\ln MS_{it}^{IV}$				0.1528***	0.1293***	0.1326***
				(8.06)	(7.01)	(5.52)
F-stat				30.87	34.15	31.51
Observations	1,330	1,330	1,330	1,330	1,330	1,330
R-squared	0.937	0.922	0.923	0.936	0.937	0.901

Notes. Absolute robust *t*-statistics in parentheses. GER^P, GER^S, and GER^T are the primary, secondary, tertiary GERs; *MS* is the share of military expenditure in total government expenditure; e^{10} is life expectancy at the age of 10; h^{Par} is parent's educational attainment; Inst is institutions measured as the leading principal component of contract-intensive money, democracy and executive constraints; and MS^{IV} is the geographic distance weighted military spending share. Estimation period 1826-2015. ***, ** and * signify statistical significance at the 1%, 5%, and 10% levels.

Consider next the IV regressions in the last three columns in Table 2. Note that the coefficients of MS^{IV} are not well below one because they are weak but because the means of MS and MS^{IV} are different. The *F*-tests for exclusion restrictions range between 31 and 34, suggesting that the instrument relevance criteria are satisfied. The coefficients of the military spending share in the second-stage IV regressions remain statistically significantly negative and the coefficients of the parent's education remain significantly positive. In steady state, the military spending share elasticity of GERs are: GER^P = -0.143/(1-0.431) = -0.25, GER^S = -0.243/(1-0.438) = -0.43; and GER^T = -0.331/(1-0.431) = -0.58. As expected, the absolute value of these long-run coefficients exceeds that their OLS counterparts, suggesting that the OLS estimates are biased toward zero because of positive feedback effects from GERs to the military spending share of the budget.

Turning to institutions, the coefficients of institutions in columns (1)-(6) in Table 2 are, on average, 0.10, suggesting that a one standard increase in institutions is associated with a 0.14%

increase in GERs. Alternatively, had institutions in the LA7 followed the improvement in institutions in the ACNU countries, they would have experienced an improvement of 100% by the year 1900. This would have increased GERs by 10% or 0.27 percentage points. As argued below, these estimates are likely to represent a lower bound. In any event, however, the quantitative results presented here gain support from a large strand of the literature that is skeptical about institutions being the underlying cause of the poor performance of LA countries over the past two centuries.

Williamson (2010), for example, shows that, compared to the rest of the world, inequality was *not* high in the pre-conquest, the immediate post-conquest periods or the mid-19th century, and states that the "historical persistence in Latin American inequality is a myth" (p. 227). A similar finding is made by León (2021) who finds that the Gini Coefficient fluctuated around 30% between 1850 and WWII but increased markedly after WWII. Using data for states in the US, Nunn (2007) also fails to find any supporting evidence for the Engerman and Sokoloff hypothesis that the use of slave labor in plantations concentrated power in the hands of a small elite and, as a result, stunted growth through the development of bad domestic institutions. In addition, the thesis that wealth inequality produces institutional failure has not gained empirical support (Scheve and Stasavage, 2017). Based on 19th century micro data on land ownership by districts within the state of Cundinamarca in Colombia, Acemoglu et al. (2006) find a *positive* relationship between land inequality and current economic development. Generally, Coatsworth (2008); Prados de la Escosura (2009); and Bértola et al. (2010) have been critical of the neo-institutional paradigm applied to LA development.

5.1.2 OLS and IV regressions in 5-year differences

OLS and IV estimates are presented in Table 3. The *F*-tests for exclusion restrictions indicate that the relevant criterium is met. The coefficients of the military spending share are all significantly negative at the 1% level regardless of the estimation method and the level of education. The coefficients of the parent's education and the life expectancy at the age of 10 are statistically significantly positive. While significant in the IV regressions, the coefficients of institutions are insignificant in the OLS estimates. This need not represent evidence against the institutional hypothesis, but, rather it may show that institutional changes take several decades to have real economic effects because of the delayed adjustment of the incentive structure, the culture of bureaucracy, etc.

Based on the IV estimates, we arrive at the following long-run *MS* elasticities: GER^P = -0.13/(1-0.119) = -0.15, GER^S = -0.111/(1-0.303) = -0.16; and GER^T = -0.199/(1-0.216) = -0.25. These elasticities are significant, but smaller than their level counterparts since difference estimates only capture short-run effects. In summary, the first-difference results suggest that the level-regression results are unlikely to have been spurious and driven by common time-trends and low standard errors derived from a low variation in the data.

Table 3. Parameter estimates of education in 5-year differences.

	(1) OLS	(2) OLS	(5) OLS	(4) IV	(5) IV	(6) IV
VARIABLES	$\Delta lnGER_{it}^{P}$	$\Delta lnGER_{it}^{S}$	$\Delta lnGER_{it}^{T}$	$\Delta lnGER_{it}^{P}$	$\Delta lnGER_{it}^{S}$	$\Delta lnGER_{it}^{T}$
$\Delta lnMS_{it}$	-0.07***	-0.10***	-0.08***	-0.13***	-0.11***	-0.20***

	(3.16)	(3.08)	(3.94)	(3.70)	(4.49)	(3.44)
Δlne_{it}^{10}	0.39*	0.17*	0.25***	0.24***	0.26***	0.17***
	(1.65)	(1.68)	(4.02)	(3.60)	(3.45)	(4.64)
$\Delta \ln h_{it}^{Par}$	0.03*	0.09***	0.34***	0.12***	0.30**	0.22*
	(1.70)	(2.89)	(3.47)	(3.32)	(2.14)	(1.71)
$\Delta \ln Inst_{it}$	0.014	0.017	0.019	0.032*	0.057**	0.010***
	(0.12)	(0.10)	(0.87)	(1.69)	(2.19)	(3.52)
First-stage regressions						
$\Delta \ln MS_{it}^{IV}$				0.017***	0.017***	0.021***
				(5.21)	(3.22)	(4.17)
F-stat				40.33	39.13	35.83
Observations	1,302	1,302	1,302	1,302	1,302	1,302
R-squared	0.803	0.907	0.911	0.801	0.891	0.903

Notes. See notes to Table 2. Δ is the 5-year difference operator.

5.2 Innovations

5.2.1 OLS and IV regressions in levels

Table 4 shows the results of estimating ideas production over the periods 1826-2015 and 1870-2015 using the FE-OLS (columns (1)-(3)) and the FE-IV estimators (columns (4)-(6)). Post-1870 estimates are undertaken since patent laws did not exist in the LA7 countries before approximately 1870. The *F*-tests for exclusion restrictions are all highly significant, suggesting that the relevance criterium is satisfied.

The coefficients of skilled education, h^{ST}, are significantly positive in all six cases, confirming our prior that the highly skilled are the most likely innovators of the population. The coefficients of the interaction between advanced education the distance to the technology frontier are significantly positive in all cases, supporting the Nielson-Phelps proposition that educationand has the dual property of affecting economic growth directly and indirectly by increasing the capacity of the home country to absorb the knowledge created at the technology frontier. The coefficients of the knowledge stock are, on average, 0.60, suggesting that the economic growth effects of the regressors are not permanent, but highly persistent. This means that an increase in skilled educational attainment continues to increase total factor productivity at a declining rate after the increase.

Table 4. Parameter estimates of the ideas production function in levels.

	(1) OLS	(2) OLS	(3) OLS	(4) IV	(5) IV	(6) IV
	$\ln Pat_{it}$	$\ln Pat_{it}$	$\ln Pat_{it}$	$\ln Pat_{it}$	$\ln Pat_{it}$	$\ln Pat_{it}$
$lnMS_{it}$	-0.13***	-0.124**	-0.191***	-0.13***	-0.13***	-0.23***
	(5.23)	(2.19)	(4.00)	(2.74)	(3.28)	(3.87)
Pat_{it}^{s}	0.799***	0.540***	0.573***	0.756***	0.553***	0.546***
	(15.90)	(14.70)	(10.28)	(39.59)	(28.09)	(60.26)

h_{it}^{ST}		0.35***	0.38***		0.30*	0.42**
		(3.87)	(4.71)		(1.79)	(2.23)
$DTF_{it}h_{it}^{ST}$		0.340***	0.426***		0.302*	0.442*
		(3.858)	(3.274)		(1.811)	(1.75)
$Inst_{it}$		0.005*	0.005**		0.023*	0.040***
		(1.76)	(2.33)		(1.724)	(3.19)
First Stage Regression						
$\ln MS_{it}^{IV}$				0.16***	0.24***	0.57***
F-stat				150.61	404.71	170.18
Estimation per.	1826-2015	1826-2015	1870-2015	1826-2015	1826-2015	1870-2015
Observations	1,330	1,330	1,022	1,022	1,330	1,022
R-squared	0.938	0.965	0.939	0.950	0.959	0.910

Notes. See notes to Table 2. *Pat* is the number of patents; Pat^S is the patent stock; h_{it}^{ST} is the sum of educational attainment at the secondary and tertiary levels; and *DFT* is the distance to the frontier.

The coefficients of the military spending share are significantly negative with an average of -0.16. The insensitivity of the coefficients of the military spending share to the inclusion of the education variables, however, should not be interpreted as showing that the military expenditure share captures the general equilibrium effects of the military spending share on innovative activity. The key is that educational attainment is a predetermined stock variable that is determined by GERs generations back.[5] Hence, the contemporary correlation between educational attainment ideas production will be minimal because the military spending share has influenced the evolution of educational attainment several generations earlier. Furthermore, the feedback effects from the knowledge stock take time to work through innovations.

To find the total long-run innovation effects of the military campaigns on patenting through the direct and the indirect channels (education at the secondary and the tertiary levels), we substitute (6) into (7) and differentiate:

$$\partial \ln Pat|^{LR} = \left[\frac{\gamma_1}{1-\gamma_2} + \frac{\gamma_3+\gamma_4\overline{DTF}}{1-\gamma_2}\cdot\frac{\beta_1}{1-\beta_3}\cdot\frac{1}{\bar{h}}\right] \partial \ln MS,$$

where $Pat|^{LR}$ is the innovative activity in steady state; and $\overline{DTF}$ is the average distance to the frontier and $\bar{h}$ are is average educational attainment at the secondary and tertiary levels across time and countries. The direct and indirect effects of the military spending share are represented by the first and second terms in the bracket, respectively. Both the direct and, particularly, the indirect effects on patenting are slow and gradual because of the feedback loop from parents' education and

[5] A reduction in the military spending share in 1870, for example, increases the enrollment of the 12-year-olds entering secondary education. This will first affect innovations when they join the labor force after graduation and the pre-invention working population will first be fully replaced by the post-invention labor force when they exit the labor force at retirement. The same principal process applies to the educational attainment of parents that influences the education of their children and delays the time at which the steady state is reached with a generational delay.

knowledge stock and the time it takes fresh graduates to fully replace the existing stock of educated population in the labor force. Thus, it takes generations before a change in GER induced by a change in the military expenditure share converges to a steady state.

Using the coefficients from the full sample period FE-OLS estimates in Table 2 (columns (1-3)) and Table 4 (column (2)) yields the proportional change in patenting in response to a proportional increase in the share of military spending in the overall budget:

$$\ln \frac{\partial \ln Pat}{\partial \ln MS}\bigg|^{LR} = -\left[\frac{0.13}{1-0.54} + \frac{0.35+0.34\cdot 0.522}{1-0.54} \cdot \frac{(0.12+0.27+0.12)/3}{1-(0.42+0.17+0.46)/3} \cdot \frac{1}{(0.51+0.18)}\right] = -0.71.$$

Thus, the average 55% reduction in the military budget share for our LA7 sample over the period 1866-1900 contributed to a 39% increase in the patenting propensity, suggesting that the marked reduction in the military campaigns in the second half of the 19th century had a large positive impact on patent intensity that eventually led to the increasing productivity growth in LA in the first part of the 20th century.

5.2.2 Five-year difference estimates

The results of estimating the patent model in 5-year differences are presented in Table 5. The coefficients of all the variables are statistically significant and have their expected signs. The coefficients of the focus variables, *MS*, h^{ST}, and Pat^{S}, are particularly significant, thus giving credibility to the maintained hypothesis that military spending deterred the innovative activity. The absolute magnitude of the coefficients is approximately 60% of their level counterparts, suggesting a relatively strong short-run impact of military spending and that the level estimates are not driven by spurious correlation between common trends. This is particularly true since patents have incredibly high standard deviations in levels and much more so in first differences.

Table 5. Parameter estimates of the ideas production function in 5-year differences.

	(1) OLS	(2) OLS	(5) OLS	(4) IV	(5) IV	(6) IV
	$\Delta \ln Pat_{it}$	$\Delta \ln Pat_{it}$	$\Delta \ln Pat_{it}$	$\Delta \ln Pat_{it}$	$\Delta \ln Pat_{it}$	$\Delta \ln Pat_{it}$
$\Delta \ln MS_{it}$	-0.08***	-0.08***	-0.09***	-0.08***	-0.06***	-0.09***
	(3.71)	(3.50)	(4.41)	(4.11)	(4.39)	(5.43)
$\Delta \ln Pat_{it}^{s}$	0.33***	0.34***	0.33***	0.33***	0.32***	0.35***
	(24.47)	(24.33)	(24.47)	(22.44)	(20.33)	(14.43)
Δh_{it}^{ST}		0.15***	0.13***		0.209***	0.215***
		(3.04)	(3.89)		(4.40)	(4.51)
$DTF_{it}\Delta h_{it}^{ST}$		0.11*	0.11*		0.048*	0.10**
		(1.82)	(1.86)		(1.81)	(2.22)
$\Delta \ln Inst_{it}$		0.001*	0.001*		0.003***	0.004***
		(1.74)	(1.78)		(4.39)	(3.47)

First Stage Regression						
$\Delta \ln MS_{it}^{IV}$				0.028***	0.014***	0.012***
F-stat				84.73	64.55	63.02
Observations	1,302	1,302	1,022	1,302	1,302	1,022
R-squared	0.688	0.691	0.638	0.691	0.701	0.621

Notes. See notes to Table 2. Pat is the number of patents; Pat^S is the patent stock; h_{it}^{ST} is the sum of educational attainment at the secondary and tertiary levels; and DFT is the distance to the frontier.

6 Concluding remarks

As a mechanism that has delayed economic progress in Latin America (LA), we suggest that the ongoing wars during most of the 19th century crowded out spending on education and innovations. The lack of public funding going to education in LA was so minimal that, on average, only 6% of the population of primary school age received any education between 1820 and 1860 when the military campaigns were at their highest. By 1900, school enrollment rates, GERs, were a ¼ and patents per capita were an 1/8 of the averages of Australia, Canada, New Zealand, and the US.

We find that the adverse effects of the military spending were severely damaging for human capital formation during the 19th century and well into the 20th century. Capturing the direct and indirect effects of these wars through various channels, our regression analyses indicate that the wars took several decades to materialize in per capita income and, therefore, cannot be fully captured in standard growth models with income as the outcome variable. The delayed effects come from the years it takes enrolled students to replace the existing labor force; and is reinforced by intergenerational educational transmission and intertemporal knowledge spillovers.

Quantitively, the results suggest that the reduction in the military budget share for our LA sample over the period 1866-1900 contributed to a 36% increase in patenting and a 7.5 percentage point increase in gross enrollment rates in steady state. These figures are likely to be lower bound estimates since the military campaigns plausibly reduced income growth even further through the following channels not considered here: 1) Private and public fixed investment; 2) labor force participation; 3) immigration; and 4) the war-induced increase in debt-service payments that would have amplified the budgetary constraints on education and contributed to the debt defaults of LA countries during the 19th century. Indirect income effects of the campaigns through factors such as the inequality and democracy may also have affected LA's growth trajectory. A better educated population may have put downward pressure on the skill-premium and reduced the increasing income inequality since 1850 as documented by Prados de la Escosura (2005). Furthermore, the delayed educational advances may have had adverse consequences that contributed to the slow democratic and institutional developments in LA (Glaeser et al., 2007).

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