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Germán H. González
Valentina Viego

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Germán H. González (CONICET and UNS)¹
Valentina Viego (UNS)²

Abstract

Argentina and Canada showed until beginning of World War II similar per-capita GDPs. Both economies had started their industrialization processes while exporting natural resource intensive products and importing capital goods. Both were also barely populated but received significant inflows of European immigrants since the second half of the XIXth century. However after the mid-1930s, the gap between both per-capita GDPs began to grow, accelerating later in the century. This experience was studied by a literature that, on one hand, tries to determine the precise moment in which the divergence began while on the other tries to explain why Argentina could not to break that trend and catch up with Canada. In this sense, we carry out an empirical study of the deep determinants (Rodrik, 2003) of the divergence process between both economies. Although similar exercises have been run in the past, our proposal relies upon a different methodology. More precisely, we test econometrically both new and old hypotheses, while specific points in time we use to assess consistency of those results.

Resumen

Argentina y Canadá mostraron hasta la Segunda Guerra Mundial similares PIB per capita. Ambas economías habían comenzado sus procesos de industrialización a la vez que exportaban productos intensivos en recursos naturales e importaban bienes de capital. Ambos estaban escasamente poblados pero recibieron significantes flujos de inmigrantes europeos desde la segunda mitad del siglo XIX. Sin embargo, tras los años 1930, el espacio entre ambos PIB per capita comenzó a crecer, acelerándose más avanzado el siglo. Esta experiencia fue estudiada por una literatura que, por un lado, trata de determinar el momento preciso en el cual comienza la divergencia, mientras que por el otro trata de explicar por qué Argentina no pudo romper esa tendencia y acercarse a Canadá. En este sentido, el trabajo presenta un estudio empírico de los determinantes profundos (Rodrik, 2003) del proceso de divergencia entre ambas economías. A pesar de existir trabajos similares, este trabajo propone una diferente metodología. Más precisamente, se testean económicamente tanto nuevas como viejas hipótesis mientras que momentos específicos en el tiempo son utilizados para evaluar la consistencia de los resultados.

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¹ ghgonza@criba.edu.ar

² vviego@criba.edu.ar

Deep determinants of relative per-capita GDPs, Argentina-Canada from 1870³

Germán H. González (CONICET and UNS)
Valentina Viego (UNS)

1. Introduction

Argentina and Canada showed until the beginning of World War II (WWII) similar per-capita GDPs. Both economies started industrialization processes exporting natural resource intensive products and importing capital goods. Both were barely populated but received significant inflows of European immigrants since the second half of the XIXth century. However after the 1930s, the gap between both per-capita GDPs began to grow, accelerating later in the century. This experience was studied by a literature that, on one hand, tries to determine the precise moment in which the divergence began while on the other tries to explain why Argentina could not break that trend and catch up with Canada.

Gerchunoff and Fajgelbaum (2005: 2) indicate that “comparison makes sense today because it did, indisputably, in the past, and if today it seems to be meaningless it would be worthwhile to find out why”. Seeking the reasons for the divergence between both countries during last century seems to be particularly relevant for Argentina for, at least, three reasons. First, at the same time that Canada reached a level of per-capita GDP corresponding to an advanced economy, Argentina lost its momentum. Understanding why this happened may help to overcome this handicap. Second, Canada has been seen as benchmark for Argentina, instead of any other industrialized economy, because of the widespread idea that, at least hypothetically, Argentina could have gone on a similar expansion path. This idea is reinforced by the fact that both economies were quite similar at the moment of divergence. It is worth to consider whether this idea is actually tenable. Thirdly, interesting and significant questions of economic policy may arise from this comparison. For instance, it would be worth to know whether exogenous or endogenous factors lead to the dismal performance of Argentina. For example, it would be worth to examine the differences among policies of international commerce in both countries. And in more practical terms, should Argentina redefine its development process acting directly over the causes of the increasing divergence with Canada or should exploit more subtle causes of this phenomenon? This paper intends to find answers for the first and the second question, and to draw on them to answer the third one.

In this sense, we will carry out an empirical study of the *deep determinants* (Rodrik, 2003) of the divergence process between both economies. Although similar exercises have been run in the past, mostly historical economic studies, our proposal relies upon a different methodology. More precisely, we conduct econometric tests of some old and new hypotheses, while specific points in time we used to evaluate the consistency of those results.

To do that, firstly, we follow the works of King and Levine (1994), Klenow and Rodriguez-Clare (1997) and Hall and Jones (1999), and offer a development accounting framework. This exercise do nether directly address why output per capita differ across countries nor why the gap was increasing, but it provides careful measures of total factor productivity,

³ This research was supported by the International Council for Canadian Studies's Faculty Research Program administrated in Argentina by the Asociación Argentina de Estudios Canadienses. We thank the comments and recommendations of the participants to the Jornadas de difusión de Investigaciones and the Seminario Interno del Departamento de Economía, both workshops of the Universidad Nacional del Sur. The opinions and conclusions of this study do not necessary represent those of the ICCS and CONICET. Responsibility for errors remains with the authors.

estimates of the shares of production factors, and an approximation of the contributions of physical and human capital, and technological progress to differences in levels of income per capita. Then we use the resulting information to explain the cross-country income differences in levels regressing the deficit in the Argentine performance on, in terms of their taxonomy, geography, integration or trade, and social infrastructure.

The paper contains six sections. In the second section we shall establish the absence of convergence and catching-up of Argentina whereas the third section presents the fundamental issues highlighted by the literature on Canadian and Argentine economic development. According to Temple (1999), historians can usefully point to particular factors that others are likely to miss, and the statistical and econometric work, perhaps using cross-sections variation, is often necessary to quantify the importance of the potentially relevant factors. In this sense, the fourth section introduces the methodology used and the fifth presents the empirical results. Final considerations are discussed in the sixth section.

2. Argentina *catching-up* dynamics

2.1. What *convergence* means and why it matters

It is usual in Economics that terms pass in their historical development through a series of stages, from no-definition to logomachy, and finally to a complete classification of different forms embraced under the original term⁴. The term *convergence* is not an exception and has been used to mean many different things. Baumol, Nelson and Wolff (1994), subsequently denoted BNW, present seven different convergence concepts “in fairly widespread use”: *homogenization*, *catch-up*, *gross convergence*, *explained convergence*, *residual convergence*, *asymptotically perfect convergence*, and *bounded convergence*. Sala-i-Martin (1994) defines *sigma-convergence* and *beta-convergence*. Due to old and new Growth Theory controversy and the dispute in the empiric arena between Baumol (1986), De Long (1988) and Baumol and Wolff (1988), the neoclassical counterrevolution (Barro and Sala-i-Martin, 1991; Mankiw, Romer and Weil, 1992) offered the notions of *conditional* or *relative convergence* and *absolute convergence*. Finally Galor (1996) distinguish between *conditional convergence* and *club convergence*. Moreover, other authors use the term *conditional conditional convergence*⁵ or *policy-conditional conditional convergence*⁶, and so on. To avoid contribution further to any resulting confusion, it is important both to define the terminology clearly and to choice the appropriate measurement tool.

According to BNW, convergence hypothesis “has substantial implications for the welfare of nations and for the prospects for reduction and even the near elimination of poverty in the international community”. Considerations like this should be reason enough for continued study that, nevertheless there exist other reasons for some particular cases. Argentina is one of that. In words of Goodrich (1964: 70), “as a new country of settlement origins Argentina, like the United States, belongs to a small group of historically favoured nations. Since its economic development has differed to a considerable degree from that of others of the group, an examination of Argentina’s experience and relative position may serve to raise questions of interest to students of comparative history”. Those questions have proliferated until our days and its answers have not been convincing. Section 3 reviews some of them.

⁴ This appreciation was made by Moore in 1906 but it is valid at present, see for example Machlup (1963) on *equilibrium*, *structure*, *statics* and *dynamics*; Krishna (1991) on *openness*, and Gonzalez (2006) on *competitiveness*.

⁵ Boulhol (2004)

⁶ Pritchett (1996)

The convergence hypothesis asserts that being backward in level of per-capita income carries a potential for rapid advance (Abramovitz, 1986). That is, in comparisons across countries the growth rates of income per capita in any long period tend to be inversely related to the initial levels of income per capita. This concept is associated with the term *homogenization* and refers to a reduction in the dispersion among some set of countries. However, the more interesting concept for this paper is that one associate with the identity of a leader at some particular time, with the sources of that economy's leadership, and with possible relationships between the leader and the remainder of the group. Indeed the term *catch-up* refers to a narrowing in the percentage gap between the leading country's performance in the variable in question and that of the other countries in the pertinent set (BNW). It is important to note that homogenization is neither necessary nor sufficient to catch-up. Our particular case of study is a clear example. The average productivity of the set of countries could have moved closer to that of the leader –United States of America, subsequently denoted US-, and yet the performance of the other countries might have grown more diverse –e.g. Canada and Argentina-. Up to this point is necessary to clarify how are selected the countries of the *pertinent* set. In this sense, the definitions of *conditional* and *club* convergence of Galor are useful. The first refers to a set of countries that are identical in their structural characteristics –e.g. preferences, technologies, rates of population growth, etc- which converge to one another in the long-run independently of their initial conditions. The second refers to a set of countries that are identical in their structural characteristics and converge to one another in the long-run provided that their initial conditions were similar as well. Clearly the last hypothesis is a particular and more restrictive case of the first one.

Other relevant concept mentioned by BNW is *explained convergence*. This term “refers to statistical evaluation of the role of pertinent and measurable variables that can reasonably be expected to influence the time path and degree of convergence experienced by some economies” (p. 8); for instance, expenditures on capital equipment, education, institutions, political stability. The study of explained convergence is clearly important to the design of policy. One of the more relevant components of the explained variables is total factor productivity (TFP). Following Parente and Prescott (2002: xvii), “TFP at the aggregate level in a country is a function of the barriers that constrain the technology choice of firms located there.” According to their approach, although countries have access to the same stock of knowledge, they do not all make equally efficient use of this knowledge because policies in some countries lead to barriers that effectively prevent firms from adoption more productive technologies and from changing to more efficient work practices. Also, the granting and protection of monopoly rights of industry insiders leads to inefficient use of inferior technologies. Christensen, Cummings, and Jorgenson (1980) found that over the 1947–73 period TFP accounted for 33 percent of GDP growth in the US, 42 percent in Japan, and more than 50 percent in several European countries. Elías (1992) shows that the contribution of TFP to growth in Latin America was also important but lower, at 24.3 percent for the period 1940-1980.

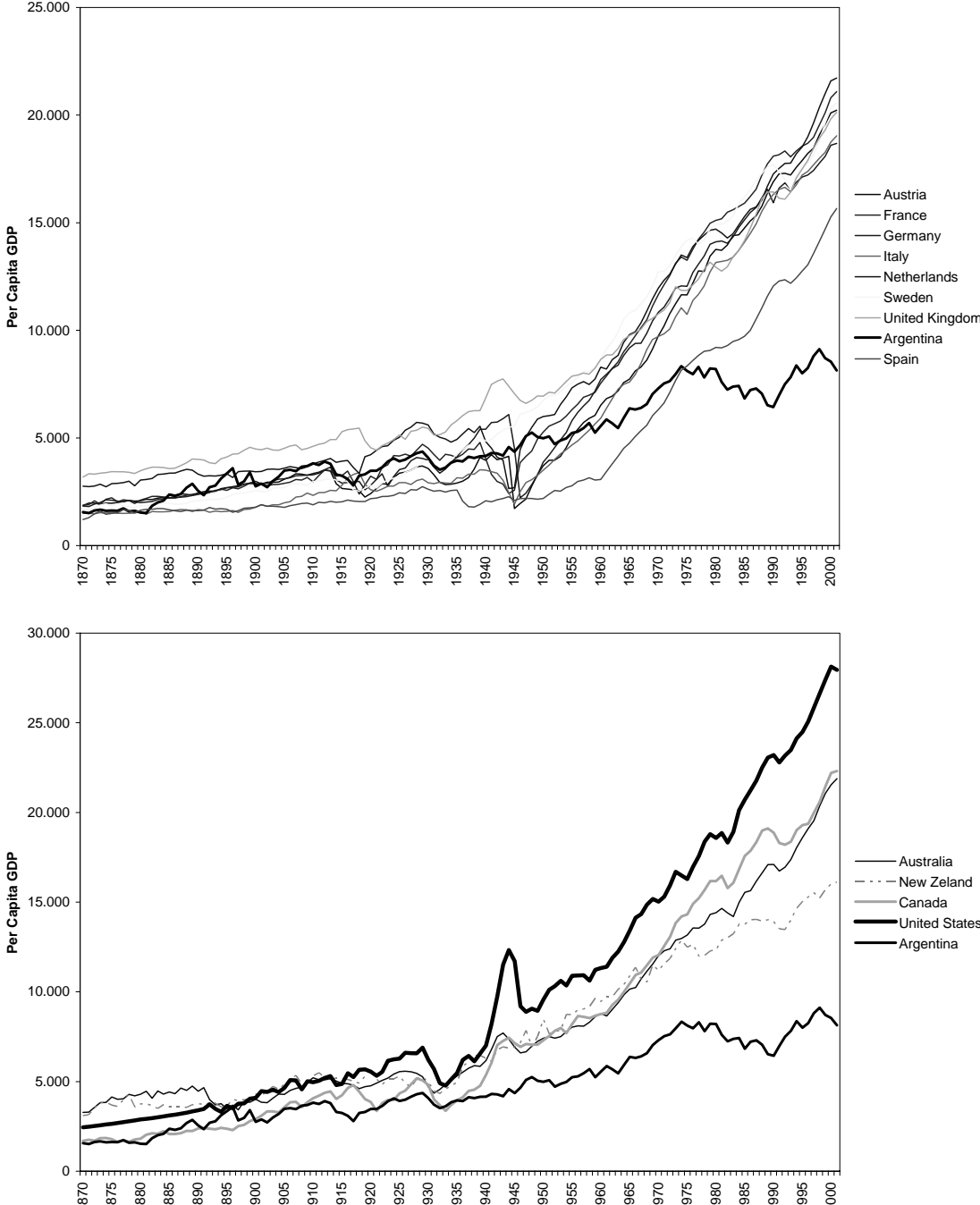
In this way, Blyde and Fernández-Arias (2005) condense in a slower TFP growth, the reasons of the Latin America's relative poorer performance and the continuously falling behind. Other recent papers, such as De Gregorio and Lee (2003), Hopenhayn and Neumeyer (2004), Loayza, Fajnzylber and Calderón (2005), and Cole et al. (2005), seemed to confirm empirically this perception after 1950s. On the contrary, Cavalcanti Ferreira et al. (2006) present evidence that show a better productivity performance than some European countries and United States until 1970s⁷. Anyway, there can be no doubt about the relevance of TFP for the convergence process.

⁷ For other approaches to the increasing gap between Latin America and developed countries see for example Fukuyama (2006) and Bittencourt da Silva (2007).

2.2. A simple image of Argentine convergence (divergence) dynamics

From the 1870s to the 1930s Argentina shows an extraordinary dynamic macroeconomic performance with an income, income per capita and GDP growth comparable to nowadays developed countries. Figure 1 gives a representative image of comparative performance of Argentina since 1870.

Figure 1. Per capita GDP, a comparative view (1990 international Geary-Khamis dollars).



Source: Maddison (2006) and Ferreres (2005)

Between 1900 and 1930 Argentina per capita GDP did not show notable differences with per capita GDP of Austria, Germany, France and Sweden. Its performance was better than some other economies, particularly Italy and Spain. In words of della Paolera and Taylor (2003: 3) “Argentina’s 1913 income level was clearly in the world top ten, and almost the top five. Whatever its exact status in 1913, for all practical purposes Argentina was an advanced country”. This situation motivated that Argentina -like the other new settlement countries- had received a great foreign direct investment and massive labor migration from Europe. Although US, Australia and New Zealand were always over Canada and Argentina, all these countries seemed to be in the same convergence club.

Up the 1930s the picture changed. Moreover the data of Argentine’s economic performance since the end of the WWII shows that the country initiated a diverging path compared to the evolution of the set of economies with similar origin and others. Argentina’s ratio to OECD income fell from 80 percent in 1913 to 65 percent in 1973, and a mere 43 percent in 1987 (della Paolera and Taylor, 2003). As said Miguez (2005: 483): Between 1913 and 1989 Argentina grew to 0.74% annual. If it had grown to 2%, a reasonable level for the world-wide economy in the period, its per capita GDP in 1989 would have been upper than 17000 dollars, that is similar to the one of France.

In order to have an introducing comparison of the different path of development between Canada and Argentina, we present here some remarks from the analysis of data on per capita GDP of both countries relative to the US. More precisely, we study the behavior of the performance of Canada and Argentina with respect to the performance of US over time,

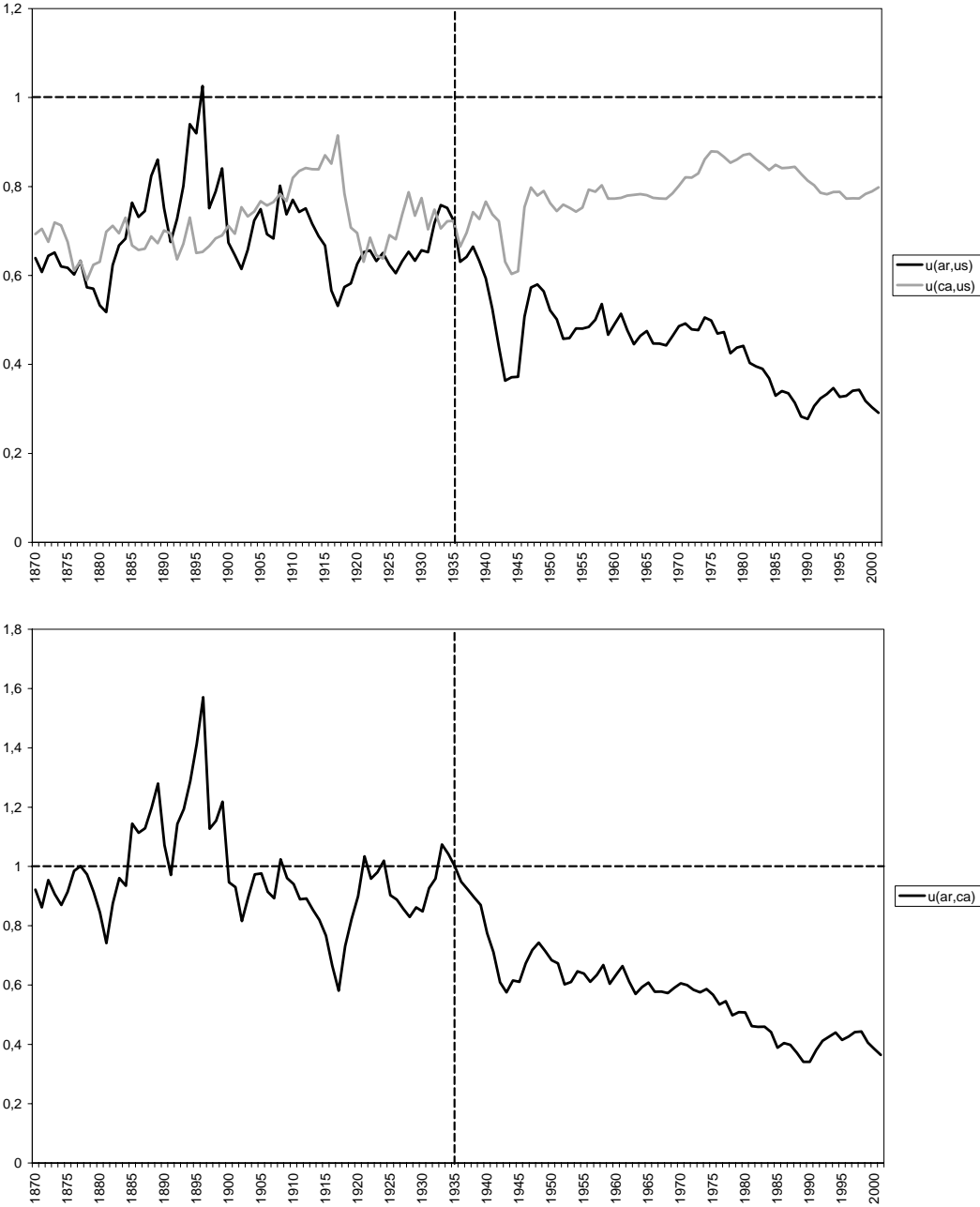
$$u_{it} = \frac{\text{Per capita GDP of Country } i \text{ in year } t}{\text{US per capita GDP in year } t}$$

where the role of country i is occupied for Canada and Argentina, and the US is taken as leader or benchmark.

Figure 2(a) plots the evolution of u_{it} for a long period of years. Several interesting facts emerge from this picture. Firstly, the existence of at least two large dissimilar periods: one lasting from the end of XIXth century to the mid-1930s, the other starting in mid-1930s is lasting until the present day. The first is characterized by a similar path of relative performance, the other shows Canada catching-up while Argentine is falling behind US, and thus behind Canada. Secondly, Argentina and Canada’s relative per capita GDP seems to show an inverse association between the mid-1900s and mid-1930s. Finally, Argentina shows a stable decreasing relative behavior between the ends of WWII and the 1973 Oil Crisis while Canada almost reaches its historical maximum at the end of this sub-period. The first observation points out when Argentina lost its momentum. Argentina experienced the last peak in their per capita income relative to US before mid-1930s. The second one invites us to deep the analysis because this period could be lodge the basis of the subsequent divergence behavior⁸. The dismal performance between both economies after mid-1930s became apparent in the figure 2(b) where Canada is taken as benchmark.

⁸ This hypothesis is also presented by Korol (1991) after an interesting review of the comparative studies of Argentine decline.

Figure 2. (a) Performance of Argentina and Canada relative to United States, and (b) Argentine performance relative to Canada



Sources: Maddison (2006) and Ferreres (2005)

In the next section we will realize a historiographic summary about the Argentine collapse during XXth century. In the light of this review we will reduce the principal approaches to simple abstract relationships that we will test econometrically. By this way we will reduce the range of possible explications and will make our contribution.

3. Some previous studies

3.1. Studies on Canadian economic development

It is impossible to begin a survey of the studies on Canadian economic development without mentioning the staples theory of Mackintosh and Innis. Classic essays⁹ about this approach are the discussion between Buckley and Aitken (Buckley, 1958; Aitken, 1958), the North' application to US economic development (North, 1955; 1956; 1959), the Baldwin's paper about the relationship between the characteristics of the staple and the distribution of income (Baldwin, 1956), the Bertram's critic essay about the Rostow's application of the Take-off hypothesis to the Canadian development process (Bertram,1963), and the discussion initiated by Chambers and Gordon (1966, 1967) and followed by Dales et al. (1967), Bertram (1973), Grant (1974) between others.

There are some excellent expositions of the staple theory but difficultly one more complete than Watkins (1963). Here we follow them about the principal characteristics. "Traditionally, staple production is defined as comprising primary (resource) activities and those primary manufacturing activities, such as lumber, pulp, and paper mills and fish processing plants, in which resources are major inputs to the production process" (Hayter and Barnes, 2000: 158). The country possesses a comparative advantage in a natural resource or staple industry and this advantage is so great that this exporting sector becomes "the leading sector of the economy and sets the pace for economic growth" (Watkins, 1963: 144). Economic development is then a chain of spread effects of the export sector that transform the domestic economy and society. Watkins writes that those spread effects are realized through three types of well-known linkages effects: backward, forward and final demand. Altman (2003: 237) adds the fiscal linkage to the previous list. This last refers to "the income that the state receives as a result of staple and staple-related production" and "result in the investment in social overhead, such as transportation, education, research and development. Fiscal linkages can make the staple economy more efficient and competitive... On the other hand, the state can use its staple-related stream of income unproductively".

Watkins also emphasizes two potential impediments to development that stem from staples production. First, "staple exporters –specifically, those exercising political control- will develop an inhibiting export mentality, resulting in an overconcentration of resources in the export sector and a reluctance to promote domestic development" (p. 150). Second, "sustained growth requires the capacity to shift attention to new foreign or domestic markets. The former requires a favorable combination of external demand and available resources. The latter requires a population base and level of per capita income that permit taking advantage of the economies of scale in modern industrialism. Both require institutions and values consistent with transformation and that requires the good fortune of having avoided specialization in the wrong kind of staple" (p. 151). In other case, the consequence is curtailment of spread effects. Once a region specializes in producing staples, it then finds it very difficult to reconfigure production into other types of sectors. The result is extreme susceptibility to already volatile resource prices, making the staples economy especially prone to crisis (Hayter and Barnes, 2000). "If the pitfalls are avoided –if the staple or staples generate strong linkage effects which are adequately exploited- then eventually the economy will growth and diversify to the point where the appellation staple economy will no longer suffice" (Watkins, 1963: 151)

Some points of disagreement in the Canadian economic historiography are: firstly, if primary sector really have a determinant position in the Canadian development process or if its potential impacts are overestimated; in second place, taking as truth the positive position,

⁹ See the selections of essays edited by Watkins and Grant (2000) and Easterbrook and Watkins (2003).

when did the staple theory stop to be useful to explain the process; finally, about the relative position of Canada with respect to US and its economic consequences. Nowadays, there seems to be consensus about some points in time or circumstances that are empirical milestones in an economic analysis of the post-Confederation Canadian history¹⁰: the National Policy of Tariff (1879), the Import Duties Act (1919) and the Imperial Preference (1932, Ottawa Conference), and the formal alignment with US after the Reciprocal Trade Agreements Act (1934).

The National Policy of Tariff consisted in a development policy characterized for the import substitution industrialization¹¹. However it was a government and businessmen's intent to protect the Canadian market and to reach the equilibrium in the balance of payments instead of creating the conditions to promote the industrialization (Lucchini, 2002). T. di Tella (2007) strengthens this idea mentioning that tariff was necessary for the railway to exist and the railway was indispensable for Canada to exist. This policy was considered positive and the generalized acceptance compelled the Liberal party to accept it despite of upholding the reciprocity treaties years before.

Lucchini (2006) accounts that the Canadian industrial sector was constituted by poor-integrated activities; it was conducted by local businessmen with scarce incidence of foreign capital until 1870. The positive impact of the new economic program took place through a significant technological renewal. The technological progress is explained by the exploitation of scale economies, the early expansion of hydroelectricity and the increasing share of US capital on domestic firms that took advantage of protected market. The industry concentrated over a smaller number of firms controlled by foreign capital. Although this early industrial development, the agricultural sector maintained their leading role. The period between 1901 and 1911 has been characterized by a boom in Canadian wheat exports and considered by many scholars as having been critical to Canada's economic development (Altman, 2003).

The Import Duties Act (1919) and the Imperial Preference (1932) established lower duties to the production with Imperial origin, in the first case, and, similarly, the products that came from the Commonwealth, in the second case. The industrial businessmen get together in the Canadian Manufacturers' Association –to a large extent, executives of subsidiary of US firms- proposed an Imperial import substitution policy similar to the Canadian one. The preferential treatment was given by the Britannic Crown to a substantial number of Canadian manufactures from 1919. During the years of the Great Depression, UK hardened its stance as response to the trade policy of US and Continental Europe, and Canada was obliged to make an effort to keep the British market. As result, the Imperial Preference was agreed upon at the 1932 Ottawa Conference, and Canada government saw it as “a means of putting pressure on the US to reverse its 1930 tariff increases” (Pomfret, 2000: 118). However, one of the indirect effects of this policy was the growth of the US investment in Canada with positive and transcendent implications on Canadian exports of manufactures.

Canada takes away from confrontation with US with the enactment of the Reciprocal Trade Agreements Act (1934). Later, Canada signs a new bilateral agreement in 1935, an

¹⁰ The process of the Canadian independence began with the British North America Act or Constitution Act of 1867 which creates a federal system of government between Province of Canada, Nova Scotia and New Brunswick. Subsequently the Balfour Declaration (1926) established that the ex-colonies were autonomous communities united in common loyalty to the Britannic Crown and the Statute of Westminster (1931) established a status of legislative equality between the self-governing dominions of the British Empire and the UK.

¹¹ The first Canadian-US reciprocity treaty was signed in 1854. There is agreement on understanding it as a defensive response against the US expansion instead of an opportunity for development. The National Policy of Tariff was the principal instrument of economic policy of the Conservative party after the federal election of 1878. The electoral success was due to the explicit opposition to the Canadian-US reciprocity treaties after the failure of the 1871 Washington Act.

agreement with US and UK in 1938. After 1947, Canada embraced multilateralism following those countries, principally US (Pomfret, 2000).¹²

3.2. Studies on Argentinean economic development

As assumed Asencio (1995: 13), disentangling the Argentine enigma is not lamentably an original determination. Not only taken Argentina alone, but through the comparison with Canada, Australia¹³, United States¹⁴ and other countries with, at least notionally, similar initial characteristics. In the first case, Ferrer (1963), Díaz Alejandro (1970), G. di Tella and Zymelman (1967, 1973), Cortés Conde (1997; 1998), Vázquez-Presedo (1992) are classic references between historians and economists. More recent efforts are della Paolera and Taylor (2003) and Rapoport (2005).

Between the scientists that have studied the Argentine economic development exists a certain agreement on describing the Argentine economic structure between 1880 and 1930 with the general characteristics of the agro-exporting peripheral countries. Similar to Canada, the economic growth was closely related with the luck of the primary sector and the government and foreign investment in basic infrastructure; the shortage of labor force made possible the coexistence of a enriched elite not necessarily associated with the production and export of primary goods, and a work class with a relatively high income compared with the income in the European economies. This last characteristic together with the prosperity perspectives promoted an important wave of immigrants and a substantial flow of foreign investment attracted to the domestic market in expansion. During that period, the trade policy was essentially free-trade except for some protected sectors (Lucchini, 2002). The Argentine history did not begin in 1880; however it is a widespread opinion among Argentinists that was that year when the central government and the institutions needed for an economic program based in agro-exporting sector were consolidated.

Some applications of the Staple theory to the Argentine development were Geller (1975), Cincunegui (1982) and Fogarty (1985). Accordingly with those authors, the model could be used to explain the early stages when the primary sector has such influence –direct and indirect- over the economy that stamps it his own character. Then, other sectors replace it and the model loses the explanatory power. About that, Fogarty concludes that explanations about the poor argentine development are to be found in supply-side factors like entrepreneurship and capacity for innovation or in non-economic factors like the institutional environment and government policies (Korol, 1991).

There is a vast discussion about what are the processes that explain the delay of Argentina taken into consideration the period of similarity with Canada. Some bibliographic references have not been mentioned yet because a methodological difference with the previous works: the utilization of comparative method to disentangle the Argentine performance. The Canada-Argentina comparison has been particularly fruitful. Usual references are the collections of papers edited by Platt and G. di Tella (1985, 1986), Taylor (1994); the comparative views of the agrarian development written by Solberg (1987) and Adelman (1992, 1992b, 1994); the study of the formation and the impact in performance of pressure

¹² Finally, Canada liberalized trade substantially with the implementation of Canada-US Free Trade Agreement in 1989 and subsequently with the North American Free Trade Agreement (NAFTA).

¹³ See, for instance, Fogarty et al. (1979) and Duncan and Fogarty (1984, especially their annotated bibliography from page 177 to 199). More recently Gerchunoff and Fajgelbaum (2006) and the set of papers presented in the 2007 Seminary John Fogarty at CEI (Argentina).

¹⁴ See, for example, Véganzonès and Winograd (1998).

groups written by Teichman (1982)¹⁵, Sabato (1988) and Waisman (1987); the comparison of the national systems of innovation by Chudnovsky et al. (2000). More close in time, we find the new economic history approach of Sanz Villarroya (2005, 2007), Sanz Villarroya and Prados de la Escosura (2004, 2006), the historiographic and analytic reviews of Asencio (1995), Muchnik (2003) and Miguez (2005); and the essay about the development of the political parties written by T. Di Tella (2007). Generally, the analyses converge on the reaction of the government and other economic agents to the “historical accidents of relevance”¹⁶. They point out sociological, political, institutional and even geographical constraints to the process of decision making.

Gerchunoff and Fajgelbaum (2005: 16/17) maintain that after the crisis of WWI “in the middle of the uncertainty, each country¹⁷... sought refuge in its recent history to define future policies. Argentine policymakers had no reason to deny what had produced huge returns, and, as a consequence, the deep political changes that followed the electoral reform of 1912 were accompanied by barely superficial changes in economy... it became evident that the bet on trade stayed firm, and even the inherited protectionism was losing strength something opposite to what was happening in other latitudes”. After 1929 “there was not much to argue in a world devastated from the commercial and financial viewpoint,... it was necessary to promote manufacturing, to stimulate the expansion of the domestic market and to obtain as much profit as was possible... from the battered export activities” (p. 18/19). These authors argue that the explanation about the different paths until WWII could be explained by a time lag. Nevertheless the WWII meant not only a new closure of trade that encouraged the import substitution, but an important possibility for allying oneself with the new world-wide economic power. Contrarily, Argentina bet on the external conditions would be the appropriate for the balance of payments and kept the commercial alliance with UK while flirted with Axis powers. The terms of trade fell after the war and “the fifties were dominated by the stop and go, and when exports started resurging, Argentina had become the arena of a distributive struggle” (p. 26). At this point, the geopolitical aspects play an important role in this story of divergence. Could this analysis made for the comparative development analysis between Argentina and Australia, be useful to our purposes?

The Canada-Argentina historiography seems to answer affirmatively. Rapoport (1994) argue that the system of land distribution used in Argentina until the turn of the XXth century stamped a particular production character –principally stockbreeding- and decided the most influential interest group¹⁸. The preponderance of the landowner over the remaining groups explains, according to Rapoport, the strong Anglo-argentine connexion around the middle of XXth century with lasting effects over economy-wide due to the excessive relevance of beef and the delay in the productive diversification. His argument is near to Sábato (1988) who characterizes the landowner as a class that responding to the incentives defined by the

¹⁵ Related with this article, see Alexander’s comment and Teichman’s replay (Alexander, 1982; Teichman, 1982b)

¹⁶ The expression corresponds to Gerchunoff and Fajgelbaum (2006: 55)

¹⁷ Argentina and Australia in this case, but this aspect is similar to Canada as we will see below.

¹⁸ Asencio (1995) argues that the agrarian revolution was not possible until the massive immigration because cultural, technological and economic factors and the combination promoted a process of collateral expansion of the agriculture dependent on the stockbreeding expansion. Between the factors of delay the author mentions the generalized view of the farming activities as non-noble, the limited propensity for scientific advances and the lack of means of transport and storage. But the massive immigration also had a delay due to some factors, one of them the access to land. Neither the early Rivadavia’s attempt (1922) nor the Liberal policies of Mitre, Sarmiento and the Avellaneda Law (1876) had the effects of the Canadian Homestead Act (1872). Between 1833 and 1853, and even some years after of the Roca’s Big Campaign of Desert (1879), the distribution of land followed a prize-giving pattern with a tendency to the concentration of land into large establishments.

international and national contexts behaves in a speculative way, less dynamic and with low propensity to risk¹⁹.

Rapoport mentions that after the WWI, US investment growth principally in those sectors with cost advantages and access to the British market²⁰. Despite the trade between Argentina and US grew notably during the war, after the peace the US imports with Argentine origin returned to pre-war level while its exports kept high. The imbalance with US and the stagnation of the exports towards Europe led Argentine economy to experience difficulty with balance of payments after the 1930s. Hence, the Imperial preferences became a hazard for the sectors related with the primary exporters: In that moment 33% of the production was exported toward UK. The Argentine diplomacy made a real effort to keep the market but results were mediocre. In 1933 both countries signed the Roca-Runciman Agreement; the pact was only useful for reducing the backward movement of this market but not to alter its existence (Asencio, 1995) meanwhile Argentina gradually moved away from US economy²¹.

The Great Depression led Argentina to seek refuge in the domestic market; however it did not get the expected results. In terms of Ferrer (1963) there was an error of design of economic policy that had as consequence a “non-integrated” industrialization and a great dependence of imports of capital and intermediate goods. Similarly, G. di Tella and Zymelman (1967) argue that “structural imbalance” had been obvious, largely due to the “great delay” occurred between the WWI and the Great Crisis. Asencio (1995: 58) points out the delay in the development of basic infrastructure: not only is the capital accumulation but the way that this accumulation takes. Moreover, continues Asencio, it is substantial the opportunity or, in other terms, its timing. Other point of view held Díaz Alejandro (1975) and Cortéz Conde (1998). The first one emphasizes on the closure of the economy after the recuperation of the Crisis and considers a major error the increasing isolationism during the WWII. The second author points that the Peronism policy generated and consolidated social conflicts which have affected the governability and the economic performance during the second half of XXth century.²²

Despite the institutional links with UK, at the beginning of the XXth century Canada was an economy with a diversified production and less dependence on primary exports. Moreover, the division of land into smallholdings and the early industrialization process made that the more powerful interest group was the manufacturer one (Lucchini, 2006) and its principal objective to hold the economic links with US without losing the advantage of being a member of the Commonwealth²³. Rapoport (1994: 194) points that “Canada never reached a critical situation like which Argentina suffered because the trade deficit with US had different characteristics: most of the Canadian exports went to the bordering country and the flow of American investments was quantitatively more important than for Argentina. In addition, the US and Canadian banks installed in New York played a fundamental role to facilitate the transaction of pounds and dollars in agreement with the movements of the economic climate, being avoided many of the problems that had the Argentine economy”. Despite the toughening of the US policy and the Ottawa response reduce outstandingly the trade

¹⁹ Schvarzer (1996) and Rocchi (2006) discuss a similar characterization of the industrial businessman.

²⁰ Towards the 1920s US capital took control of the meat processing industry (Smith, 1983).

²¹ The temporary improvement during the beginning of WWII was lost because the Argentine neutrality.

²² Gerchunoff and L. Llach (2003) analyse this point and following other framework coincide with them.

²³ Promfret (2000) mentions that “At Confederation in 1867 Britain supplied 60 per cent and the USA 32 per cent of Canada’s imports, but by 1938, despite Imperial Preference, the shares were 18 per cent from Britain and 63 per cent from the USA. The reorientation was reinforced during the 1920s by a sharp change in the source of capital inflows. In 1920, 53 per cent of the foreign capital in Canada was British and 44 per cent from the USA, but by 1926 these proportions had been reversed and in 1930, 36 per cent was from Britain and 60 per cent from the USA” (p. 116/117)

between both economies, the treaty of reciprocal preferences enacted in 1935 returned to the beginning the commercial plane while the alignment with US to the WWII reinforced the political relationship so that the economic links was strong like never before.

T. di Tella (2007) argues that the Britain precedent of the institutional frame also could be important because the Latin-American institutional change was inspired in those but imposed by weak or threatened elites; therefore it is understandable an evolution completely different. Moreover, the population of Canada came mostly from countries with the highest level of development. Instead neither the first settlers nor the subsequent immigration to Argentina carried that cultural knowledge. Those are summed up to a deeper problem of nationality. The author hypothesizes that Canada was a Britain Dominion and, consequently, there has not been a problem of change of citizenship for getting civic rights. In Argentina, instead, the weakness of the political participation of the urban middle class contrasted with its economic power, and this situation generated political instability.

4. Methodology

4.1. Development accounting

In Caselli (2005: 681) we find a synopsis of what we know as *development accounting*: it “uses cross-country data on output and inputs, at one point in time, to assess the relative contribution of differences in factor quantities, and differences in the efficiency with which those factors are used, to these vast differences in per-worker incomes”. Likewise, King and Levine (1994) present Denison’s definition in this terms: While a development accounting question is what part of cross-country differences in income per capita is accounted for by differences in physical capital per capita, a growth accounting question is what part of cross-country differences in growth rates of output is accounted for by differences in growth rates of capital per capita. It is readily apparent a distinction in the methodological approach, but we could find deeper differences. We consider, agreeing with Hall and Jones (1997), that growth research has not provided effective explanations for the extreme diversity in output per worker across countries, and a study of levels of economic activity would give alternative and complementary insights.

A number of recent papers with both theoretical and empirical models seems to set up that differences in growth rates across countries are mostly transitory. In this regard Hall and Jones (1997: 174) argue that “if technology and capital can move across borders, the force of arbitrage will raise output per worker in poorer countries. An explanation of highly stable differences in output per worker must invoke highly persistent barriers to arbitrage” This persistence do that we, as they, primarily concentrate in a cross-country development accounting instead of the familiar growth accounting. On the other hand, Rodrik (2003) argue that neither the cross-country literature nor most country studies have made adequate progress in answering those questions but he point out to other methodological aspect: the necessity of country narratives.

The mentioned authors agree in emphasizes that the country performance is driven by other fundamental determinants, not directly captured in typical accounting (factor accumulation and technological efficiency). Hall and Jones point out the *social infrastructure*, defined as the collection of laws, institutions, and government policies that make up the economic environment, and consider that “a perverse infrastructure discourages production in ways that are detrimental to economic performance” (p. 174). Their works conclude with the statement that when social infrastructure favours *diversion* of resources over *production*, investment in capital, skills, research and technology transfer are reduced. Hence social infrastructure affects income levels per worker through each element of the production function. The concept of social infrastructure is associated with the notion of *cultural*

differences, presented by Acemoglu (2007) as another fundamental cause of cross-country differences in per-capita GDP. He argues that cultural differences determine individuals' values, preferences and beliefs. We could expect that these cultural differences then led to dissimilar institutional arrangement.

Other sources of direct differences, according to Rodrik (2003), are *geography* (climate and resources) and *integration* to the world economy. Using an expression of Acemoglu (2007: 23), "geographic differences that affect the environment in which individuals live and that influence the productivity of agriculture, the availability of natural resources, certain constraints on individual behaviour, or even individual attitudes". Rodrik argue that geography also affects income via integration -e.g. access to the market and transport costs- and institutions -e.g. geopolitical considerations and effects of natural resources-booms in quality of institutions-.

Finally, Acemoglu adds the *luck* as other fundamental sources of differences. In economic terms, he refers to the existence of multiple equilibria and the possibility of two countries moving on divergent paths although they have identical opportunities, preferences and market structures²⁴.

All of them argue that this deep or fundamental determinants change slowly or hardly at all in time. As they, we are interested in the long-run determinants of economic success and not in the transition dynamics; hence we put special attention to historical episodes that represent an institutional break or abrupt changes in rules-of-game. In this sense, Rodrik recognize the evidence that "moderate changes in country-specific circumstances, often interacting with the external environment, can produce discontinuous changes in economic performances".

After the presentation of the development accounting model we will return to those determinants, the theoretical connections with performance and its empirical applicability.

Our departure point is the development accounting exercises performed by Mankiw, Romer and Weil (1992), Klenow and Rodriguez-Claire (1997) and Hall and Jones (1999). Accordingly, consider the following aggregate production function with constant returns,

$$Y = K^{\alpha} H^{\beta} (AL)^{1-\alpha-\beta}$$

where Y represents output, K the (total) stock of physical capital, A is a productivity index, and L is the number of (employed) workers in the economy. The total stock of human capital is the product of the average level of human capital, h , and the number of workers ($H = h \times L$). This production function can be rearranged as

$$\frac{Y}{L} = \left(\frac{K}{Y}\right)^{\frac{\alpha}{1-\alpha-\beta}} \left(\frac{H}{Y}\right)^{\frac{\beta}{1-\alpha-\beta}} A$$

In order to consider per capita income instead of per worker income²⁵, let P be total population. Using the relationship

²⁴ Ros (2003) and González (2005) present two similar models with multiple equilibria that could explain how two identical economies could diverge by economic cause, specifically coordination failures.

²⁵ Blyde and Fernández-Arias (2005) and Manuelli (2005) use similar expression while Hopenhayn and Neumeyer (2004) prefers income per worker to explain the Latin American performance relative to developed countries.

$$\frac{Y}{P} = \frac{L}{P} \times \frac{Y}{L},$$

we rewrite the production function as

$$(1) \quad y = l \left(\tilde{K} \right)^{\frac{\alpha}{1-\alpha-\beta}} \left(\tilde{H} \right)^{\frac{\beta}{1-\alpha-\beta}} A$$

where y ($\equiv Y/P$) is per capita income and l ($\equiv L/P$) is the employment rate; \tilde{K} ($\equiv K/Y$) and \tilde{H} ($\equiv H/Y$) express physical and human capital intensities²⁶. The effect combined of the three components can be interpreted as the effect of factor accumulation. We follow King and Levine (1994) and use the Perpetual Inventory Method with steady-state estimates of initial capital in the construction of K series²⁷. Similarly, we follow Mankiw et al. (1992) to compute the human capital intensity

$$\tilde{H} = \frac{I_H/Y}{n + g_{st} + \delta}$$

where I_H is the inversion in human capital, g_{st} is the steady-state growth rate of the country, n is the growth rate of the country's population, and δ is the rate at which human capital depreciate²⁸. I_H/Y is computed using

$$\frac{I_H}{Y} = \text{secondary school enrolment rate} \times \left[\frac{15-19 \text{ population}}{15-64 \text{ population}} \right]$$

which approximates the percentage of the working-age population that is in secondary school.

The last component in (1), the productivity index or total factor productivity, partially reflects the level of technology. However, this variable also could capture unemployment of available resources and technological inefficiency²⁹. Whereas resource unemployment could be considered as an important measurement error in some studies, it is relatively unimportant for us. Mainly, with Blyde and Fernández-Arias, we are particularly interesting in the explanation of long-run gaps between countries instead of cyclical variations in the utilization of the production factors.

²⁶ We use the decomposition in terms of capital intensity rather than the capital per worker ratio due to the reasons mentioned in Hall and Jones (1999). Mainly, we could distinguish between an increase in output that is fundamentally due to the increase in productivity and the increase in output that is due to factor accumulation. Authors that use the same decomposition approach are Mankiw, Romer and Weil (1992), Klenow and Rodriguez (1997) and Hopenhayn and Neumeyer (2004).

²⁷ For initial GDP we took the average of the period 1910-13 while for the inversion rate in the steady state we took the average for the period 1915-84.

²⁸ The same values of g_{st} , n and δ are used for both K and H estimations. The rate g_{st} is computed following Easterly et al. (1993) and King and Levine (1994): $g_{st} = \lambda g + (1-\lambda)g_w$; where g is the average of the annual GDP growth rate for the country, g_w is the world-wide average growth rate and $\lambda = 0.25$. Parameter n is the average of the annual growth rate of the domestic population. The period taken for the computation of the growth rates covers the years between 1910 and 1984. The capital's depreciation rate is supposed constant and equal to 0.03.

²⁹ Variable A also could capture non-desirable effects, e.g. measurement error, omitted variables, aggregation bias and specification errors. For a more detailed discussion, see Nadiri (1970), Griliches (1995), Good, Nadiri and Sickles (1995), Hulten (2000) and Lipsey and Carlaw (2001).

Then, it is possible to undertake development accounting on the basis of the production function above. That is, we can take the ratio of two national measures of per capita income using expression (1),

$$(2) \quad \frac{y_i}{y_j} = \frac{l_i}{l_j} \left(\frac{\tilde{K}_i}{\tilde{K}_j} \right)^{1-\alpha-\beta} \left(\frac{\tilde{H}_i}{\tilde{H}_j} \right)^{1-\alpha-\beta} \frac{A_i}{A_j}$$

Given data on relative quantities of factor production and specific values of α and β , we can measure cross-country differences in TFP, relationship expressed here as A_i/A_j , as residuals:

$$(3) \quad \frac{A_i}{A_j} = \frac{y_i/y_j}{\left[l_i/l_j \right] \left[\tilde{K}_i/\tilde{K}_j \right]^{1-\alpha-\beta} \left[\tilde{H}_i/\tilde{H}_j \right]^{1-\alpha-\beta}}$$

To describe the extent to which labor, physical and human capital and TFP account for cross-country differences in per capita income, we begin by constructing the following ratios

$$(4) \quad \varphi_{li} = \frac{\ln \left[l_i/l_j \right]}{\ln \left[y_i/y_j \right]} \quad \varphi_{Ki} = \frac{\ln \left[\left(\tilde{K}_i/\tilde{K}_j \right)^{\alpha/(1-\alpha-\beta)} \right]}{\ln \left[y_i/y_j \right]}$$

$$\varphi_{Hi} = \frac{\ln \left[\left(\tilde{H}_i/\tilde{H}_j \right)^{\beta/(1-\alpha-\beta)} \right]}{\ln \left[y_i/y_j \right]} \quad \varphi_{Ai} = \frac{\ln \left[A_i/A_j \right]}{\ln \left[y_i/y_j \right]}$$

The ratio $\varphi_{\bullet i}$ expresses the fraction of differences in output per capita levels due to component \bullet .

Finally, following King and Levine (1994) we could calculate the underperformance in output for country i relative to the reference country j as $U_i = (y_j - y_i)/y_j$ and construct the contribution of each component to the underperformance multiplying U_i by the respective ratio φ_{\bullet} ,

$$(5) \quad U_{i\bullet} \equiv U_i \times \varphi_{\bullet}$$

Usually the computation of (4) or (5) is realized for one year or one period using means. The repetition for another year (period) or several years (periods) allows us to see shortfalls and trends, and guide us toward the second stage of the analysis: the explanation of the divergence path.

Thus far, we present the tool for answer which factors are more relevant to explain the divergence path between two countries (or groups of countries). However to address our central problem, that is the explanation of such divergence, we must to analyze what drives φ_{\bullet} or, alternatively, what drives each component of the relative per-capita GDPs –expression (2)-.

In the following we shall try to identify the fundamental sources explaining the dynamics of divergence using the described methodology. We discriminate three wide ranges of explanatory variables: (i) Differences in the quality of social infrastructure, (ii) differences in

terms of integration to the world economy and (iii) dissimilar geographic aspects. In the final observations we will be back with the possibility of differences in *luck*, expressed as unexpected events that push an economy toward a divergence path (or inferior/superior equilibria).

Hall and Jones argue that social action is a prime determinant of output in almost any view and that government has at least two roles in this picture. First, the suppression of resource diversion appears to be most efficient if it is carried out collectively, and second, it have the power to make and enforce rules. Then, a government supports productive activity by deterring private resource diversion and by abstaining from diverting itself. Following the important contributions in this theme we proxy the quality of the social infrastructure by some variables:

- Public expenditure, defined as the average ratio of public expenditure to GDP. A higher government consumption rate is considered responsible for causing distortions to private decisions and to compete for scarce resources (De Gregorio and Lee, 2003). Loayza, Fajnzylber and Calderón (2005) uphold this measure arguing that “much of current (or consumption) expenditures by government do not have a clear social return and, in fact, are mostly devoted to covering the bureaucracy’s wage bill”.
- Inflation, approximated by the natural logarithm of CPI. Macroeconomic mismanagement cause high inflation rates that affect negatively in performance by distorting relative prices and altering the fundamental terms of long-term contracts. Some authors that use different proxies of the inflation rate or depreciation of money are De Gregorio (1992), De Gregorio and Lee (2003), Rodriguez (2005), Loayza, Fajnzylber and Calderón, (2005) between others. From the Monetarist approach to the inflation, inflation rate and public expenditure must show a positive high correlation. Conversely, from the Structuralist point of view, growing prices would reflect a production bottlenecks caused by the scarcity of foreign currency. Hence the public expenditure and inflation would not be correlated but it is possible to find a significant and positive correlation between inflation and the terms of trade.
- Type of government regime in Argentina, captured by a dummy variable that takes the value 1 for years with any government controlled by a nonmilitary component of the nation's population and 0 otherwise. Although a civilian government is not guarantee of a democratic regime, a military government is generally associated with an authoritarian regime. Therefore we take two complementary course: firstly, we introduce a correction to the mentioned dummy variable assigning value 0 for the years with civilian government effectively controlled by a military elite³⁰; secondly, we incorporate a second variable that introduce a characterization of the political or governmental organization of the society through an annual score. Two variables were used in this sense: Polity and the Index of Democratization. Rodriguez (2005) summarizes the arguments of Barro (1997) about the difficult to identify empirically the effects of democracy in the performance: increases in democracy at low levels of democracy leading to high economic growth –by relaxation of restrictions on civil liberties and rights of association and property rights that are important to capital accumulation- but further increases leading to a decline in economic performance –due to emergence to redistributive pressures that reduce the stimulus for investment. However, a weakly democratic or authoritarian regime seems to be more permeable to rent-seeking groups and elites influences. Engerman and Sokoloff (2003) argue that elites might prefer policies that raise their share of national income, even if they reduce long-run rates of growth and the distribution of political influence may be

³⁰ The Banks Dataset presents this variable with four possible values: (1) civilian, (2) military-civilian, (3) military and (4) other. We reduced it to a dichotomy variable taken (1) civilian and (0) other. We completed the dataset for the inter-war years and changed the values to the periods 1930-31, 1955-57 and 1976-82 originally assigned with values (2) and (3).

rather broad and inclusive. Suffrage institutions, in particular, had a direct bearing on the extent to which elites based on wealth, human capital, and gender held disproportionate political power in their respective countries.

- Polity scale ranges from +10 (strongly democratic) to -10 (strongly autocratic). The variable -provided by Center for Global Policy of George Mason University- is a composite index derived from the coded values of authority characteristic component variables. Marshall and Jaggers (2005) define a mature and internally coherent democracy (scored with 10) as one in which (a) political participation is fully competitive, (b) executive recruitment is elective, and (c) constraints on the chief executive are substantial.
- Index of Democratization. This variable -provided by Vanhanen (2002)- is the combination of two indices: Electoral participation and Electoral competition. The first one is measured as the percentage of the total population which actually voted in the same election while the second is defined as the smaller parties' share of the votes cast in parliamentary or presidential elections, or both. The two indicators are combined into an index by multiplying them and dividing the outcome by 100.
- Infant mortality rate. This variable could capture two different effects on social infrastructure. Abouharb and Kimball (2005) argue that researchers concerned with political and economic development across nations have examined the infant mortality rate as it relates to government expenditures on health and education. This aspect is really close to the first variable mentioned, government consumption, and then we would take IMR as a complement of that. Other direction take Bueno de Mesquita et al. (2003), they provide evidence that infant mortality rates are negatively related to the size of the minimum winning coalition: the smallest number of individuals whose approval is required for a leader to retain political power. These results are consistent with their claim that as the size of the minimum winning coalition increases governments need to improve the welfare of larger numbers of their citizens to retain office. This argument is taken for us to introduce IMR as a complement of Type of Regime and the proxy variables of the quality of the polity system.

The relevance of integration to world economy has been studied by abundant literature. It is accepted that there may not be an unambiguous link between openness and performance (Edwards, 1998; Rodriguez and Rodrik, 2000; Miller and Upadhyay, 2000; González, 2002). The literature remarks the possibility of specialization following the comparative advantages as a positive impact of openness, together with the possibility of reaching economies of scale, and the absorption of foreign technological advance and improvement in managerial practices. Moreover, trade liberalization forces to domestic firms to improve competitiveness through gains in productivity instead of diverting resources to rent-seeking and other unproductive activities. However, Rodriguez (2005: 134) point out that "although trade barriers generate static efficiency losses that lower the steady state level of per capita GDP they can also raise production in industries that have positive externalities. Thus if the forces of comparative advantage lead the economy to specialize away from technologically dynamic sectors that produce knowledge spillovers then trade restrictions may, by raising output of these industries, stimulate economic growth". Moreover, we accept the possibility that countries may differ in their effort and ability to adopt new technologies (Eaton and Kortum, 1996; Keller, 2001). The absorptive capacity depends on the country's possibilities to redirect resources towards the process of assimilating the knowledge created by others (Kneller, 2005). Following these arguments we attempt to capture the impact of the integration to the world economy through a set of variables:

- Openness. We approximate this variable by two usual alternatives. One of them is measured as total trade (export plus import) over GDP while the other is computed as customs duties on total budgetary revenue.

- Terms of trade, taken as natural logarithm. An improvement in terms of trade relaxes the external constraint to growth and reduces the risk of balance of payment difficulties, extending the possibilities of incorporate foreign technology through imports of machinery and intermediate goods. We will intend to capture this effects using an external terms of trade index, defined as export price on import price indexes (Easterly, Loayza and Montiel, 1997; De Gregorio and Lee, 1999, 2003; Fernández-Arias and Montiel, 2001; Blyde and Fernández-Arias, 2004)
- International interest rate. Grossman and Helpmann (1991) provide the theoretical framework to explain how a developing country could achieve technology by means of foreign direct investment. Due to the effect of a particular FDI depend on its motivation we do not use a direct indicator of this variable. Instead we use the international interest rate as a measure of the opportunity cost of sinking capital. To do that we use the series of UK interest rate.
- US total factor productivity index. We use Végonzonès and Winograd (1998)'s estimation of this variable as a proxy for available foreign technology.

Finally, Argentina and Canada seems to have no relevant geographic difference. However, the distance between a country and its principal export market or the technological leader could affect negatively the performance. Kneller (2005) argues that the positive effect of frontier technology on domestic economy could vary with physical distance if the knowledge generated in one country is not instantaneously and costless available to all. However the impact of this geographic characteristic is hardly isolated, we could see its effects through the magnitude of the estimated elasticity of US TFP. Other geographic characteristic is resource abundance, particularly, arable land, mineral and water resources, and other raw materials (For example, Canadian cod and fur, and Argentine leather and beef). Following the Staple theory, we might find a strong influence of this variable on Canadian per capita GDP but also in Argentine development process. Altman (2003: 224) argues that “whether or not the potential of a staple export is fully tapped critically depends on the available social and economic infrastructure. Therefore, two regions producing identical staples may follow quite different paths of development simply as a result of different social and economic infrastructures”. On this way it would be manifest a close relationship between the variables that represent the staple evolution and the social infrastructure proxies mentioned above. The question that we will try to answer is if the differences in the evolution of the staple relevance are significant when we try to explain the long-run path of the relative per capita GDP between Canada and Argentina. Hence we use

- Natural resources abundances, proxied by primary production and computed as the participation of the sum of product in agriculture, fishing and trapping, and forestry on total GDP³¹. The exclusion of mining is due to we believe that the early-developed Canadian mining and the Argentine antipode could over-estimate the relative relevance of the Canadian primary sector or, in the same sense, the relative relevance of the Argentine non-primary sector. Furthermore, the reason for using the sum total of product of primary sectors is founded in the critic article of Buckley (1958: 443/4): “Although the staple approach assigns a strategic role to natural resources, it is not a variant of geographic determinism. Resources are a function of technology and tastes; the emergence of successive staple-producing regions is dependent upon advances in technology and changes in tastes within the larger economy of which the regions become parts”. The essentially changing nature of staple exports -e.g. cod, fur, timber, wheat, oil, natural gas, iron ore, nonferrous metals for Canada according to Aitken (1958)'s sequence- make necessary to consider an aggregate measure instead of an always subjective number of individual production indexes which reduce the degrees of freedom.

³¹ We do not include primary manufacturing that, in accordance with Bertram (1963), involves operations where relatively minor processing of domestic resources is required (p. 168).

Nevertheless we isolate two sectors with particular implications: wheat and beef production, and introduce two complementary variables.

- Wheat production. This variable is a pure measure of the relevance of the wheat sector and could capture the possible impact of a different process of industrialization in concordance with the Staple theory and the relevance of the Wheat Boom in Canada.
- Beef exports³². As Wheat production, this variable could capture the possible impact of a different path of industrialization as it is pointed in Rapoport (1994).

4.2. The data and estimation methodology

As described below, we estimate a dynamic model of the relative underperformance of Argentina taken Canada as benchmark. To do that, we first compute the relative underperformance, u , and then we calculate the contribution of each component of the aggregate production function to this underperformance, $\varphi_{\cdot i}$. Later, we will try to explain the developing gap using the set of variables mentioned in the previous section. The main sample corresponds to the years 1913-1984.

TABLE 1
Descriptive Statistics, 1913-1984. Argentina and Canada

Variable	Description		Mean	Std. dev.	Min.	Max.
y	Per capita Real GDP (Y/P)	Arg	5201.5	1590.1	2790.1	8334.1
		Can	8073.2	4018.0	3357.0	16472.4
\tilde{K}	Physical capital intensity (K/Y)	Arg	2.14	0.46	1.49	3.36
		Can	3.42	0.60	1.77	4.91
\tilde{H}	Human capital intensity (H/Y)	Arg	3.79	2.64	0.60	8.57
		Can	7.36	5.11	1.15	16.83
l	Employment rate (L/P)	Arg	0.37	0.01	0.34	0.39
		Can	0.36	0.03	0.32	0.45
Y/L	Labor productivity	Arg	14.13	4.76	7.48	23.81
		Can	21.82	9.43	9.71	37.13

For the first stage –i.e. the estimation and decomposition of the developing gap– the raw data are taken from some sources. Canadian and Argentine Real GDP (million 1990 international Geary-Khamis US\$) and Population are taken from Maddison (2006). The source of Argentina's labor data is IEERAL (1986). Canada's employment data is taken from Denton (1983) and Statistics Canada's CANSIM database (some tables). Human capital computation requires data on population by age groups and data on secondary school enrolment. For the Argentine case, the data are taken principally from Vázquez-Présedo (1988), Banks (2003), Ferreres (2005) and World Bank (2007). For Canada, the data are taken from the CANSIM database, Banks dataset and UNESCO estimates. Our measure of physical capital is estimated by investment data from IEERAL for Argentina and three sources for Canada, these are Jones and Obstfeld (2001), Crozier (1983) and the CANSIM database. Table 1 shows univariate statistics, including the mean, standard deviation, minimum and maximum of all variables.

³² We use beef exports instead of beef production because the unusual domestic consumption of beef in Argentina.

Table 2 and Table 3 show correlations between pairs of variables. In the case of Argentina, income per capita appears strongly correlated with labour productivity and human capital-product ratio. Capital-product ratio shows also high correlation with income per capita, but more detailed analysis shows that correlation is stronger, but not linear (see scatter diagrams in Appendix 1). Employment rate has negative correlation with per capita income but a detailed look at the scatter diagram shows that negative correlation coefficient emerges from later observations (i.e. 1976 and after), when employment rate fell below 35% and product grew much faster than population. Before that period, the relationship between both variables seems to be positive.

TABLE 2
Argentina. Correlation figures

	Y	\tilde{K}	\tilde{H}	L	Y/L
Y	1.000				
\tilde{K}	0.835	1.000			
\tilde{H}	0.978	0.908	1.000		
L	-0.692	-0.773	-0.720	1.000	
Y/L	0.995	0.855	0.978	-0.755	1.000

TABLE 3
Canada. Correlation figures

	y	\tilde{K}	\tilde{H}	L	Y/L
Y	1.000				
\tilde{K}	0.398	1.000			
\tilde{H}	0.950	0.527	1.000		
L	0.685	0.182	0.606	1.000	
Y/L	0.977	0.380	0.938	0.520	1.000

In the case of Canada, capital-output ratio shows a weak correlation coefficient with product per capita. A careful look of scatter shows that after the 1940s a positive and higher relation seems to prevail. Before that period the relation between both series becomes to negative³³. In the case of human capital-product ratio, the correlation is high and positive but only for highest levels of per capita income; in lower per capita product values the relation becomes more instable. Something similar occurs with employment rate and per capita income; at higher levels of income, employment rate increases parallel with per capita product. The relationship becomes negative in middle range income figures and turns back to be positive (but at a lesser slope) in lower levels of per capita income. These patterns alert us about a structural break in Canadian economy near 1940s that altered economic aggregates. This breakpoint also matches up with the period of acceleration of the gap between Argentina and Canada.

Appendix 2 exhibits the sources of the explanatory variables used at the second stage –i.e. the explanation of the developing gap- and gives some descriptive statistics. In the explaining stage we concentrate in the most relevant component of the relative per capita GDP at the time of clearing up the divergence path between Argentina and Canada. We proceed to estimate a linear model for explaining that behavior. Instead of taking ϕ_{*i} , only the numerator of its expression is considered as the dependent variable. All explanatory variables but REG, UKI and UST were expressed as country ratios.

³³ This relationship could be explained by the conjunction of some effects: the last phase of strong capitalization in railways and the expansion of US investment in the Canadian manufacturer sector, the increasing population by the immigration process and the negative effect of the Great Crisis on gross domestic product.

5. Empirical results

5.1. Decomposing the development gap³⁴

We calibrate the production function keeping $\alpha = 0.30$ and $\beta = 0.28$ ($1 - \alpha - \beta = 0.42$) as do it Mankiw et al (1992) and Klenow and Rodriguez-Claire (1997). Végonzònès and Winograd (1998) use the same α for a comparative historical study between Argentina and United States. Blyde and Fernández-Arias (2005) uses a capital income share of 1/3 but their sensibility analysis showed no qualitative differences in the results when they use capital share of 0.4 or 0.5. Manuelli (2005) mentions that the analysis of the individual Latin American country studies suggest values of α ranging from 0.3 to 0.7 and cites Gollin (2002)'s advice about adjusting downward the estimate of the capital share because problems in measurement. Katz et al. (2007) compute the participation of labor in the Argentine product following Gollin's methodology and achieve the value of 0.52 for our $1 - \alpha - \beta$ parameter. However they specify a production function without human capital, therefore both models do not totally comparable and this value is not directly applicable. Hence, although we recognize some possible bias coming from model specification or measurement problems, the selected parameters and the later sensibility analysis let us to think that its magnitude is low.

Figure 3. Decomposition of relative per capita GDP between Argentina and Canada

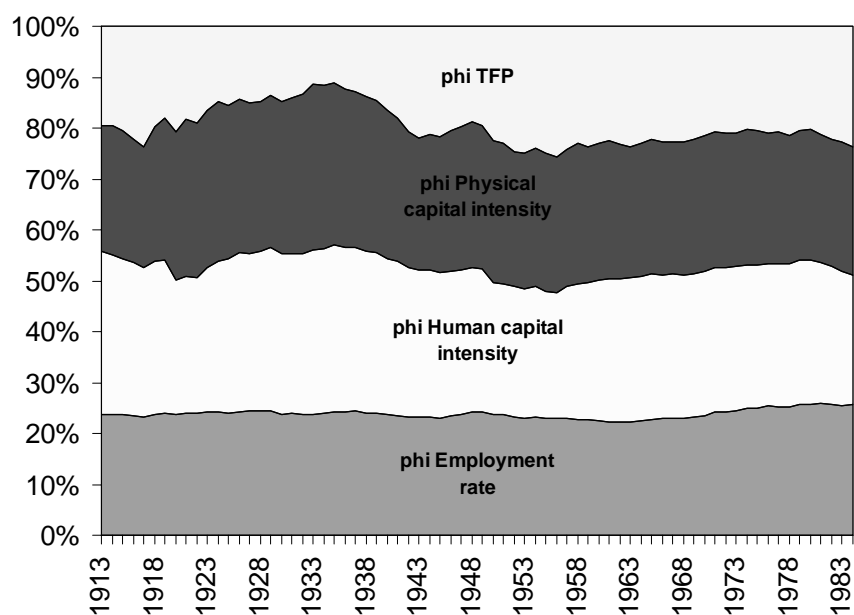


Figure 3 shows the decomposition of the relative per capita GDP between Argentina and Canada during the period, that is the evolution of index φ_i ³⁵. Roughly, factor accumulation explains 80% of per capita GDP differences between Canada and Argentina over 1913-1984. Nevertheless, technological differences are not a minor source of per capita GDP

³⁴ For convenience purposes, Canadian figures are placed in numerator, thus a fall (rise) in any ratio above 1 means convergence (divergence) between both economies. While a fall (rise) in any ratio down on 1 means divergence (convergence) between both economies.

³⁵ For convenience purposes, expressions in (4) were transformed multiplying the arguments of the logarithms of the numerator by 10 and the argument of the logarithms of the denominator by 10000. Naturally all of them add up to 1 and this transformation do not change the descriptive power of the index.

differences, accounting between 11 and 26%. The most relevant feature is that the relative importance of both aspects changed over time.

It is clear that there are at least four sections on the figure of the indexes. The φ_{Ai} reduces its magnitude during a first phase (1913-35), then it increases substantially until 1956 (second phase) and drop again toward the same standard as the beginning of the first phase. Finally, the year 1980 starts a new phase with an increasing relevance for relative TFP. Lower values of φ_{Ai} mean that TFP gap was lower than per capita GDP one. Conversely, the increases in φ_{Ki} and φ_{Hi} must be interpreted as signals of increasing divergence in physical and human capital-product ratios. The first and third phases matched that characterization. Contrary, during the second and four phases TFP, although behind factor accumulation, is gaining importance compared to mere fixed investment for per capita GDP gaps explanation. Table 5 resumes this description. Both annual dates and period averages tell a similar story: During the phase of similar per-capita income, physical and human capital intensity increased its importance and TFP decreased its contribution to income gap. After that, when divergence between both economies tends to consolidate, TFP gap increased its weight³⁶.

TABLE 5
Decomposition of the relative per capita GDP between
Argentina and Canada

	1913	1935	1955	1979	1984	1913- 1935	1936- 1955	1956- 1979	1980- 1984
φ_{li}	23.8	24.1	22.9	25.6	25.7	23.9	23.5	23.5	25.7
φ_{Ki}	24.9	31.6	27.0	25.5	25.2	29.0	28.1	26.4	25.3
φ_{Hi}	31.9	33.1	25.1	28.4	25.4	30.4	28.6	27.9	27.0
φ_{Ai}	19.4	11.2	25.0	20.5	23.7	16.6	19.8	22.2	22.0

Periodization follows major breakdowns registered above.

Considering gaps in per capita GDP, factor accumulation and TFP evolution, our results show that Canadian take-off started at mid-1930s. The sources of that structural change must be placed on a decline in Canadian capital-product ratio counterweighed by strong improves in global efficiency. Conversely, Argentina boosted physical capital intensity at the expense of missing steps in efficiency and technology upgrading. The Argentina's experience seems to illustrate that capacity expansion (not only in equipment, but also in workers' formal education) must be accompanied by growing technological competences; otherwise inefficiencies would arise and per capita income stagnates or decline over time. These results are consistent with Véganzonès and Winograd (1998) who find a relatively low efficiency of the Argentine economy after 1933 with a slower adoption of foreign technological progress and weaker diffusion.

Figure 4 shows the behavior of the Canadian, Argentine and relative TFPs for the benchmark case, forthcoming Model 1. Figure 5 shows the same lines for different values of parameters of the production function. For Model 2 we use $\alpha = 0.30$ and $\beta = 0.40$ resulting $1-\alpha-\beta = 0.30$. Model 3 is computed using $\alpha = 0.40$ and $\beta = 0.28$ and $1-\alpha-\beta = 0.32$. Model 4 and model 5 are considered extreme because the very low participation of human capital on product. For the first one we use $\alpha = 0.30$ and $\beta = 0.10$ resulting $1-\alpha-\beta = 0.69$ while for the last we use $\alpha = 0.50$ and $\beta = 0.01$ resulting $1-\alpha-\beta = 0.49$.

³⁶ Sanz Villarroya (2005) finds econometrically the chronological point of break in the convergence path in 1936 and some structural breaks in the Argentine and Canadian per capita GDPs. Following her results for other periodization, we find a confirmation of the preceding analysis.

Figure 4. Canadian (thin line), Argentine (gross line) and relative (line with mark) TFPs: Model 1

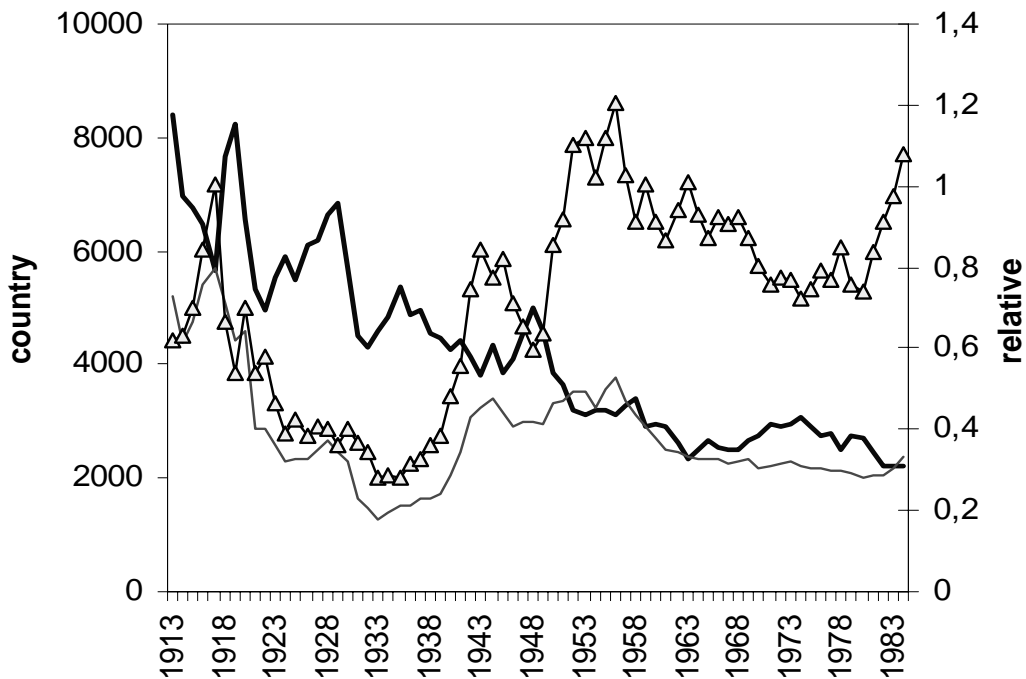
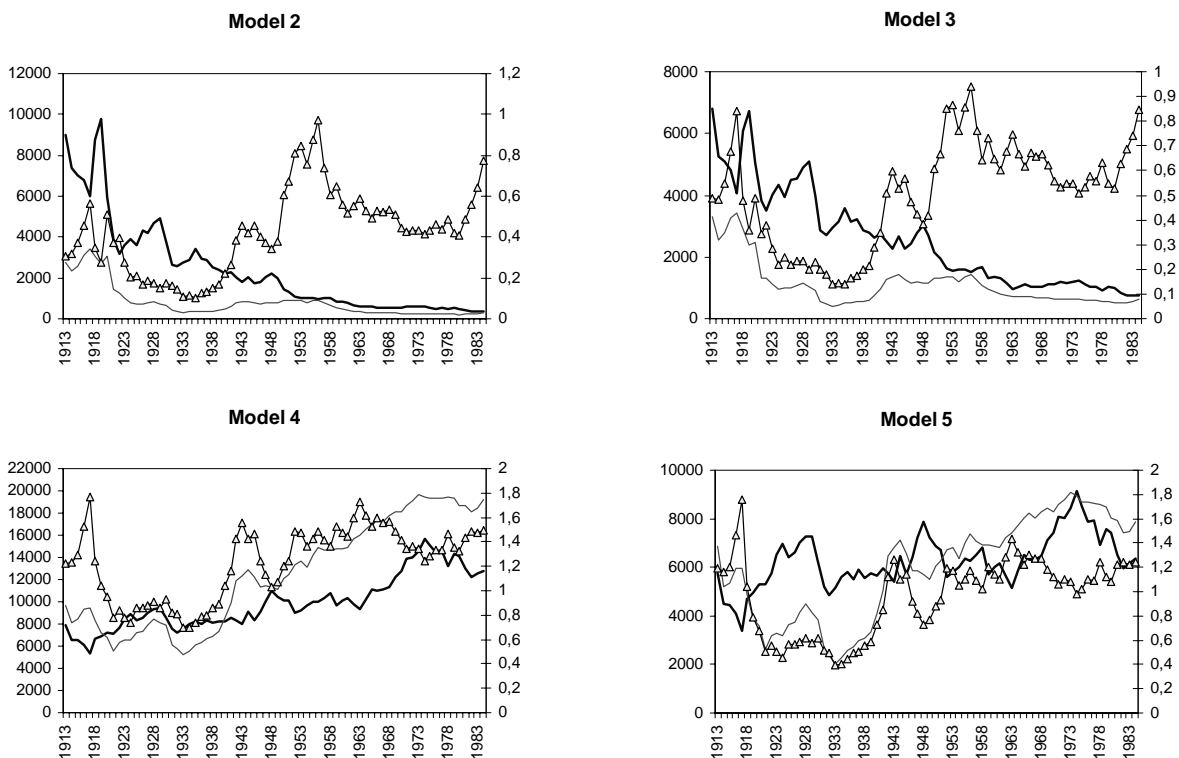


Figure 5. Canadian (thin line), Argentine (gross line) and relative (line with mark) TFPs: Model 2 to 5



We should note that models one to three tell a story somewhat different of the following. While they show that Argentine (and Canadian) TFP fell all over the period, it is possible draw an upward line with models four and five. However, under any computation of A, TFP

gaps between Argentina and Canada show two clear phases; the former going from 1913 up to early 1930s where efficiency gap shows a rapid increase in favor of Canada at the beginning and a downward evolution after where Argentina seems leading in technological terms. The second period, from early 1930s to 1984, covers the relative take-off of Canadian TFP. Different TFP estimations show that, besides a similar gap behavior, the levels of relative efficiency differ. When labor participation is near or above 0.5, Canada surpasses Argentina in TFP. When factors contribute in similar magnitude, Argentina is rather superior to Canada³⁷.

5.2. Explaining the development gap

As a result of the previous empirical exercise, we proceed to estimate a linear model for explaining the technological gap. The ratio between technological levels of each country, A_{CAN}/A_{ARG} , is considered as the dependent variable. Results are presented in Table 6.

Applying OLS, we first estimated a “full” model for alternative TFP ratios. For each TFP ratio regression, three alternative measures of institutional quality were included, but collinearity with other regressors hides their individual impact on efficiency gaps³⁸, although individually these indicators proved to be statistically significant (POL showed a better performance than REG and DEM). Under all estimations, only UST and WHE were found to be robust in explaining technological gaps for all values of the dependent³⁹.

At the other extreme, public expenditure (as percentage of GDP) and terms of trade variation do not exert significant influence over TFP gaps, neither in multivariate nor individual regressions under any specification of TFP. So they can be excluded from the model. The rest of the explanatory variables show a variety of results.

³⁷ It is possible to differ some sub-phases; for example, the effects on TFP of the world crises or particular aspects of the history of both countries. While the (positive or negative) effect of a specific event is the same in any case, there are differences in degrees (the magnitude of the change on the series).

³⁸ Appendix 2 shows the tables with the correlation rates between pairs of variables.

³⁹ For any regression presented here, an augmented Dickey-Fuller test on residuals was carried in order to check for spurious regression. For all these trials the null hypothesis of stochastic root was rejected.

TABLE 6
Explaining technological gap, 1913-1984[†]

	Model 1			Model 2			Model 3			Model 4			Model 5		
GOV	-.0282 (.6224)	-.0254 (.6591)	-.0271 (.6401)	-.0406 (.4081)	-.0358 (.4692)	-.0362 (.4671)	-.0297 (.4686)	-.0351 (.4082)	-.0386 (.3659)	.0185 (.8095)	.0173 (.8219)	.0144 (.8513)	-.0026 (.9777)	-.0058 (.9504)	-.0112 (.9040)
CPI	-1.0010 (.0811)	-1.0631 (.0740)	-1.1177 (.0647)	-1.1778 (.0214)	-1.2409 (.0195)	-1.2975 (.0164)	-7.281 (.0276)	-7.437 (.0472)	-7.661 (.0480)	-2.920 (.6715)	-3.447 (.6242)	-3.682 (.6043)	-3.520 (.6619)	-4.010 (.6226)	-4.295 (.6024)
IMR	.3403 (.0194)	.3333 (.0230)	.3223 (.0281)	.3251 (.0090)	.3223 (.0103)	.3143 (.0124)	.3811 (.0005)	.3153 (.0043)	.2977 (.0072)	.3323 (.0816)	.3174 (.0970)	.3061 (.1103)	.3907 (.0845)	.3735 (.0992)	.3544 (.1181)
POL	-.0014 (.5148)			-.0017 (.3593)			-.0016 (.3080)			-.0008 (.7738)			-.0004 (.9113)		
DEM		.0003 (.7876)			.0002 (.8295)			.0003 (.7863)			.0007 (.6649)			.0009 (.6152)	
REG			-.0196 (.5172)			-.0167 (.5124)			-.0134 (.5579)			-.0223 (.5771)			-.0322 (.4924)
OPE	-.0413 (.6060)	-.0376 (.3522)	-.0348 (.3873)	-.0546 (.1092)	-.0514 (.1340)	-.0489 (.1515)	-.0264 (.3890)	-.0241 (.4418)	-.0219 (.4813)	.0033 (.9498)	.0076 (.8856)	.0094 (.8582)	.0105 (.8658)	.0149 (.8096)	.0178 (.7735)
DUT	.0436 (.0563)	.0410 (.0702)	.0382 (.0911)	.0498 (.0116)	.0471 (.0157)	.0446 (.0215)	.0496 (.0023)	.0366 (.0318)	.0330 (.0537)	.0183 (.5243)	.0173 (.5471)	.0147 (.6105)	.0118 (.7263)	.0118 (.7250)	.0082 (.8077)
TOT	.0166 (.8394)	.0050 (.9515)	-.0023 (.9774)	.0586 (.3959)	.0469 (.4995)	.0399 (.5655)	-.0069 (.9149)	-.0133 (.8374)	-.0195 (.7631)	-.0920 (.3935)	-.1041 (.3378)	-.1079 (.3211)	-.1391 (.2728)	-.1520 (.2342)	-.1580 (.2158)
UST	.0012 (.0003)	.0011 (.0012)	.0010 (.0028)	.0009 (.0013)	.0009 (.0045)	.0008 (.0101)	.0008 (.0000)	.0007 (.0013)	.0007 (.0030)	.0014 (.0004)	.0013 (.0015)	.0013 (.0022)	.0014 (.0016)	.0013 (.0041)	.0013 (.0064)
IIR	-.0050 (.5394)	-.0038 (.6412)	-.0037 (.6467)	-.0039 (.5732)	-.0026 (.7096)	-.0024 (.7272)	-.0050 (.4019)	-.0022 (.7220)	-.0019 (.7519)	-.0056 (.6005)	-.0047 (.6566)	-.0051 (.6341)	-.0023 (.8529)	-.0017 (.8936)	-.0022 (.8612)
WHE	.0227 (.0071)	.0219 (.0090)	.0214 (.0101)	.0136 (.0499)	.0127 (.0658)	.0124 (.0734)	.0207 (.0032)	.0191 (.0042)	0.188 (.0044)	.0379 (.0009)	.0371 (.0011)	.0368 (.0011)	.0438 (.0011)	.0431 (.0012)	.0427 (.0013)
BEE	-.2812 (.2834)	-.2799 (.2853)	-.2848 (.2742)	-.2365 (.2810)	-.2343 (.2873)	-.2392 (.2745)	-.1611 (.4413)	-.1591 (.4351)	-.1632 (.4194)	-.2950 (.3956)	-.2918 (.3988)	-.2943 (.3934)	-.3480 (.3825)	-.3444 (.3954)	-.3469 (.3901)
NRA	.1645 (.1984)	.1667 (.1935)	.1668 (.1925)	.2310 (.0341)	.2361 (.0316)	.2364 (.0313)	.0817 (.3608)	.0824 (.3823)	.0814 (.3902)	-.0598 (.7203)	-.0606 (.9195)	-.0579 (.7284)	-.0912 (.6435)	-.0952 (.6286)	-.0925 (.6378)
C	-.5821 (.0457)	-.5481 (.0704)	-.4800 (.1339)	-.7311 (.0038)	-.7060 (.0073)	-.6444 (.0208)	-.7492 (.0004)	-.6031 (.0067)	-.5437 (.0199)	-.0144 (.9689)	0.385 (.9195)	.0920 (.8187)	-.3288 (.4434)	-.2684 (.5436)	-.1898 (.6834)
Observations	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71
R2	.9139	.9134	.9139	.9105	.9292	.9098	.8640	.8625	.8631	.8961	.8963	.8965	.8734	.8740	.8744
Akaike info crit	-2.0308	-2.0246	-2.0305	-2.3805	-2.3661	-2.3727	-2.5951	-2.5842	-2.5882	-1.4823	-1.4842	-1.4862	-1.1636	-1.1679	-1.1715
χ^2 serial corr test 2 lags	.8796 (.6442)	1.6673 (.4344)	1.9844 (.3708)	.9322 (.6274)	1.9077 (.3853)	2.2065 (.3318)	4.3085 (.1160)	4.3578 (.1132)	4.4861 (.1061)	1.3206 (.5167)	2.2552 (.3238)	2.2377 (.3267)	2.6047 (.2719)	3.6053 (.1649)	3.6900 (.1580)

[†] All explanatory variables but REG, IIR and UST were expressed as country ratios. p-values in parenthesis. Regressions also include autoregressive term to control for autocorrelation in error terms.

Inflation and duties on foreign exchange prove to be relevant under some TFP estimations but lose significance in contexts where technical efficiency participation is higher. In a sense, its robustness can be considered as weak or contingent to certain technological scenarios. In particular, DUT has a positive influence in any TFP measure. Higher values of DUT notice an economy more dependent of the international trade. So a positive coefficient points out that the greater the relative international integration the greater the magnitude of the relative coefficient of TFP⁴⁰.

Finally, variables like OPE, IIR, BEE, NRA show high collinearity with other regressors so their individual impact on TFP gap can not be identified. A test to check their joint contribution to TFP differences, do reject the null hypothesis about no contribution at all. So, there are signs of their potential influence but our work can not identify their individual impact in a context of multivariate regressors.

A special commentary deserves IMR, that shows significant coefficients but the sign does not meet the expected one. A careful look at simple correlation between TFP and IMR for each country shows that during 1913-1920 Canada exhibited high infant mortality rates (that were also a major concern for population and authorities) with a major progress in TFP figures, compared to Argentinean ones. For that reason, a scatter between TFP and IMR (expressed as ratios between Canada and Argentina) shows a kind of U-shaped relationship. Actually, IMR can be considered as a proxy of inequality. In turn, higher inequality could have favored in some periods global efficiency gains (through a mechanism of worst labor conditions, lower access to social capital and consequently higher profit rates oriented to improve TFP). For some instance, this pattern supports the Kuznets hypothesis. This argument justifies the introduction of a quadratic term in regression models.

A second wave of estimations was explored introducing some adjustments to equation specification. First, as mentioned, irrelevant variables that also showed no symptoms of collinearity were omitted (namely, public expenditure and terms of trade variation)⁴¹. Second, it was considered a quadratic functional form between TFP and IMR. Third, POL was selected as the best indicator of institutional quality. Results are presented in Table 7.

Summing up, between robust determinants of technological gaps during 1913-1984, there is one exogenous variable: geographical and political vicinity between US and Canada favors technological exchanges not emerging (at least in comparable magnitude) between US and Argentina. The other robust explanatory variable in TFP gaps is one associated with natural resource-oriented activities, giving some support to the staple production thesis. Nevertheless, empirical results show that primary activities per se did not assure relative growth in income per capita figures. Instead, the specific orientation of these activities must be taken on in order to enlarge technical efficiency gains. For example, meat exports and wheat production have an opposite impact on TFP gaps. In general, primary activities' weight on GDP has different impact on TFP relative gains depending upon the context. When technical efficiency contribution is higher; their impact is negative and reverts in contexts where traditional factors show upper participation figures.

⁴⁰ The other variable indicating openness score has a negative coefficient in some contexts.

⁴¹ Infant mortality rate depicts strong and negative correlation with OPE, IIR and UST. Also, openness degree has a strong (and positive) correlation with IIR and UST figures. Argentine political regime has modest and negative correlation with UST. Besides that these correlations have no theoretical relationship inside, they must be taken into account in econometrical exercises in order to avoid biases by dropping relevant regressors. See correlations between regressors in Appendix 2.

TABLE 7
Results of the second wave of estimations

	Model 1	Model 2	Model 3	Model 4	Model 5
CPI	-.7528 (.1749)	-1.0890 (.0347)	-.5644 (.0566)	.0720 (.9112)	.0025 (.9971)
IMR	-.5174 (.3389)	-.1893 (.6833)	-.3101 (.3877)	-.9036 (.2027)	-1.1360 (.1611)
IMR ²	.4850 (.1045)	.2841 (.2648)	.3660 (.0390)	.7359 (.0556)	.9709 (.0237)
POL	-.0015 (.4563)	-.0014 (.4110)	-.0022 (.1124)	-.0018 (.5011)	-.0022 (.4816)
OPE	-.0429 (.2729)	-.0563 (.0919)	-.0245 (.3682)	.0058 (.9096)	.0093 (.8765)
DUT	.0499 (.0249)	.0505 (.0092)	.0643 (.0000)	.0256 (.3421)	.0284 (.3421)
UST	.0011 (.0005)	.0008 (.0038)	.0007 (.0000)	.0013 (.0004)	.0014 (.0009)
IIR	-.0074 (.3480)	-.0030 (.6507)	-.0100 (.0555)	-.0135 (.1925)	-.0143 (.2293)
WHE	.0216 (.0080)	.0135 (.0493)	.0212 (.0029)	.0354 (.0015)	.0408 (.0025)
BEE	-.2579 (.3136)	-.2316 (.2830)	-.1252 (.5473)	-.2603 (.4482)	-.3149 (.4441)
NRA	.1976 (.0981)	.2595 (.0125)	.0886 (.2707)	-.0464 (.7644)	-.0531 (.7665)
C	-.1776 (.6236)	-.4194 (.1803)	-.4064 (.1090)	.4546 (.3401)	.1440 (.7945)
Observations	71	71	71	71	71
R2	.9173	.9105	.8725	.9007	.8785
Akaike info crit	-2.0992	-2.4089	-2.6873	-1.5551	-1.2330
χ^2 serial corr test	2.5357	1.4390	11.0749	3.5844	4.9721
2 lags	(.2814)	(.4870)	(.0039)	(.1666)	(.0832)

† All explanatory variables but REG, IIR and UST were expressed as country ratios. p-values in parenthesis. Regressions also include an autoregressive term to control for autocorrelation in error terms.

There are another two factors (though lesser robust) shaping TFP gaps. One of them is associated with short term economic polity (inflation) and the other (duties on foreign exchange operations) depends on several internal and external factors (trade policy, but also international prices, profit rate of export and domestic market oriented sectors, firm decisions, etc.). In any case, concerning specifically duties, governments can effectively influence the direction of that indicator but its ex post magnitude depends on other factors more complex to control.

There is another group of regressors with no individual significance but involved in collinearity problems (like, infant mortality rates, measures of institutional quality, openness, and international interest rate) where our work can not be conclusive.

6. Final considerations

Comparative Studies allow us to identify in the contrast between the parties, questions or problems which are underestimated or go unnoticed. They offer, above all, the opportunity to understand better the causes of the success or fail, the dissimilar impact of environmental or human factors, etc. (Rapaport, 1994: 175). The “Argentine failure”

abounds in explications, for that reason we have not set out to deepen something but to take which the literature remarks and to contrast these with the available statistics and a quantitative approach.

It has been possible to ascertain that the development process of Canada moved away from the Argentinean. Around the period between wars, Canada has reached an advanced stage of industrialization through a process of import substitution meanwhile Argentina went through a crisis associated with the exhaustion of the agro-exporting model. During the last thirty years, Canada has been one of the most prosperous economies meanwhile Argentina has suffered the difficulties related with the failure of the model of import substitution, the stagnation of its production, high inflation and severe distributive disputes. Why did similar political instruments have so different results? Is it just a question of timing, design, social or political peculiarities, accident or has some exogenous actor been determinant? May be the diverging paths were the result of a mixture of all of them. We have showed quantitatively which elements have been more significant. We concentrated in the relative TFP figure after establishing that it was the more important component at the time of explaining the relative per-capita GDP behaviour. The econometrical exercise produced the desired results.

First, we could reduce the number of hypothesis. Neither the idea of an Argentine government with excessive size nor the thesis of more severe balance of payments constraints seem to be significant to explain the behaviour of the relative technological advance. On the contrary, the Canadian Wheat Boom and Canadian alignment with US are the most outstanding factors. Moreover, the greater Argentine world integration in the first phase favoured a better technological performance with respect to Canada, but the roles were exchanged in the second phase.

It is necessary more evidence about the relevance of some aspects concerning social infrastructure. The relevance of the dissimilar grade of government's interferences to private decisions seems to be debatable. Inflation, taken as a result of macroeconomic mismanagement, is significant only in some calibrations. Taken in mind these scenarios, the effects on contracts and incentives of higher inflation rates in Argentina have harmed its TFP evolution. However, the results about the differences in the quality of the polity system were not what we expected. High collinearity make impossible to conclude about the effects of the political instability and repeated change to authoritarian governments in Argentina. Nevertheless, the positive and robust result for the relative IMR opened an interesting window for future extensions.

Second, our results offer more evidence in favour of Altman, Dales and Bertram - against the Chamber and Gordon's position- about the relevance of the Wheat Boom in the Canadian development process.

Finally, Canada was drawn into a successful path due to the proximity with a bigger and complementary economy. Geography stamps on this process a peculiar feature. Nevertheless there had been endogenous factors that made it possible; sadly we do not have convincing results about that. On the other side, Argentina fell into a "staple trap" and the timing of the changes in the economic policy was the reverse of the Canadian one. Again, "explanations about the way actually chosen by a country should be sought within its society" (Korol, 1991: 7)

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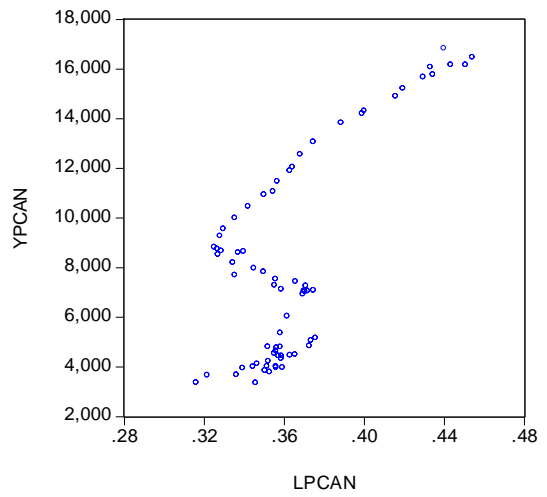
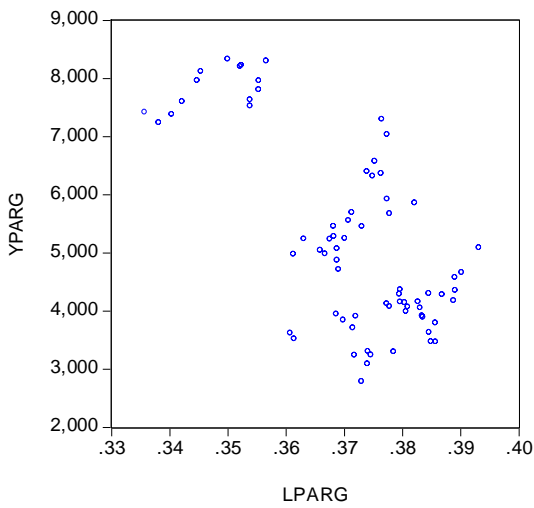
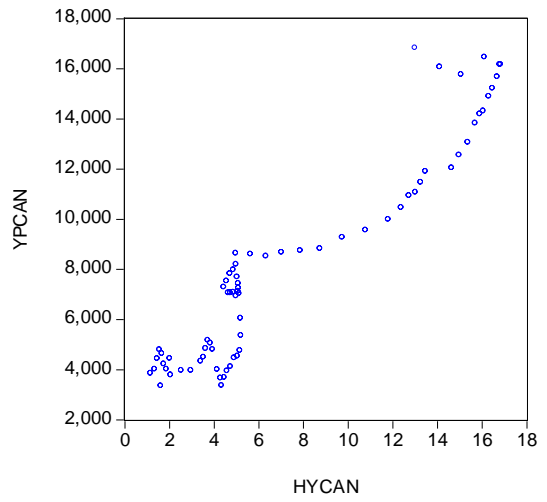
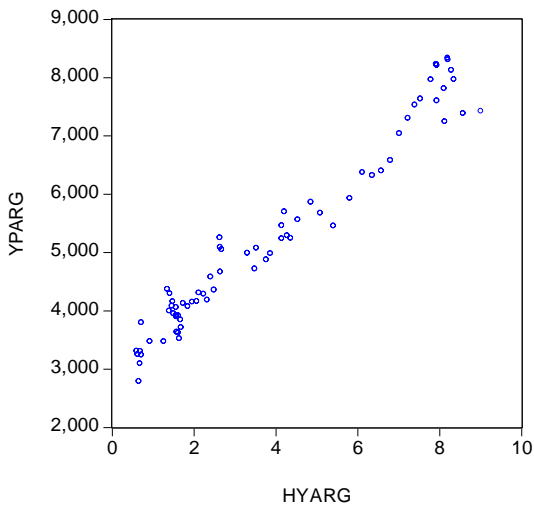
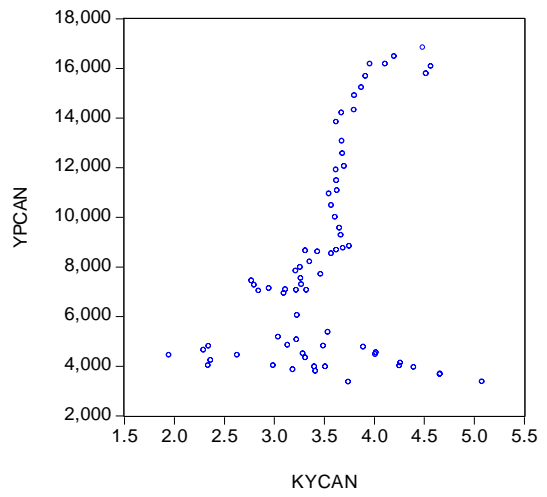
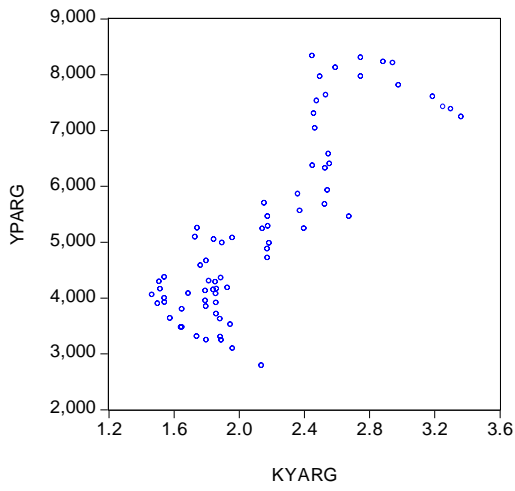
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Appendix 1 Scatter diagrams



Appendix 2 Sources and descriptive statistics

TABLE 4
Sources and descriptive statistics, 1913-1984. Argentina and Canada

Variable	Sources and description		Mean	Std. dev.	Min.	Max.
<i>Roughly indicators of social infrastructure:</i>						
Public expenditure (GOV)	Ferrerres (2005) and McInnis (2004); Public expenditure/GDP	Arg	21.7	7.9	7.9	45.4
		Can	15.1	6.6	6.8	41.6
Inflation (CPI)	Ferrerres (2005) and CANSIM; Ln(CPI 1999=100)	Arg	-23.8	4.6	-27.3	-8.5
		Can	2.7	0.6	1.8	4.2
Infant Mortality Rate (IMR)	Abouharb & Kimball (2005)	Arg	78.4	30.8	30.0	138.0
		Can	59.8	49.7	8.0	186.3
Polity (POL)	Variable "Polity 2" of Gleditsh's Polity IV Data Archive ^{††}	Arg	-2.8	5.8	-9.0	8.0
		Can	9.9	0.3	9.0	10.0
Index of Democratization (DEM)	Vanhanen (2002)'s Polyarchy Dataset	Arg	7.1	8.8	0.0	29.9
		Can	20.4	5.2	7.2	29.3
Political Regime (REG)	Banks dataset; Argentine Regime Dummy [†]		0.7	0.5	0	1
<i>Integration status:</i>						
Openness 1 (OPE)	IEERAL (1986) and McInnis (2004); X plus M/GDP	Arg	0.4	0.3	0.1	1.0
		Can	0.4	0.1	0.2	0.6
Openness 2 (DUT)	Ferrerres (2005), Bird (1985); Customs Duties on total Budgetary Revenue	Arg	0.3	0.2	0.0	0.6
		Can	0.2	0.2	0.0	0.6
Terms of Trade (TOT)	Ferrerres (2005), Wilkinson (1985) and CANSIM; ln(TOT 1971=100)	Arg	4.5	0.2	4.1	4.9
		Can	4.6	0.1	4.4	4.7
US TFP index (UST)	Véganzonès and Winograd (1998)		757.3	219.1	435.8	1071.2
International interest rate (IIR)	Ferrerres (2005); Short-term UK interest rate		4.5	3.5	0.5	15.1
<i>Geography:</i>						
Wheat production (WHE)	Ferrerres (2005) and CANSIM; Wheat production (000, ton)	Arg	6434.9	2188.1	2100.0	15000.0
		Can	12967.2	5393.9	4389.2	26714.7
Beef exports (BEE)	Ferrerres (2005), Trant (1985) and CANSIM; Beef exports (000, ton)	Arg	554.4	156.8	230.3	981.2
		Can	28.3	24.6	0.7	104.5
Natural resources abundances (NRA)	IEERAL (1986), Crozier (1985) and CANSIM; Primary activities/GDP	Arg	0.2	0.1	0.1	0.5
		Can	0.1	0.1	0.0	0.3

[†] See text for details. ^{††} Previous to the regression process, we added 10 units to each figure of the original dataset for avoiding negative values.

TABLE A3
Canada/Argentina. Correlations, 1913-1984

	GOV	CPI	IMR	POL	DEM	REG	OPE	DUT	TOT	UST	IIR	WHE	BEE	NRA
GOV	1													
CPI	0.1390	1.0000												
IMR	0.4515	0.5887	1.0000											
POL	-0.2872	-0.1691	-0.4170	1.0000										
DEM	0.0431	-0.3225	-0.3674	0.4834	1.0000									
REG	-0.0595	0.3121	0.4117	-0.5251	-0.8996	1.0000								
OPE	-0.1751	-0.5338	-0.7449	0.5172	0.4206	-0.4657	1.0000							
DUT	-0.3011	0.1420	-0.0429	0.1399	-0.0958	0.0425	0.2895	1.0000						
TOT	0.0047	-0.0739	-0.1069	-0.0830	0.1678	-0.2050	0.0088	0.1345	1.0000					
UST	-0.2022	-0.6697	-0.8719	0.4369	0.5196	-0.5435	0.8638	0.0413	0.0653	1.0000				
IIR	-0.0573	-0.7532	-0.4376	0.0937	0.4413	-0.4199	0.4965	-0.1773	0.3302	0.6178	1.0000			
WHE	-0.1719	-0.1627	-0.2829	0.3135	0.1872	-0.1712	0.3948	0.1535	0.1092	0.3151	0.1597	1.0000		
BEE	-0.0117	-0.7265	-0.3744	0.2243	0.1330	-0.1510	0.4405	-0.0709	-0.1121	0.4964	0.3815	0.1565	1.0000	
NRA	0.2017	0.4245	0.5950	-0.0592	-0.3094	0.3513	-0.3222	0.1408	-0.1107	-0.5515	-0.3546	0.1406	-0.0483	1.0000