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# PEOPLING THE PAMPA: ON THE IMPACT OF MASS MIGRATION TO THE RIVER PLATE, 1870-1914

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## ABSTRACT

The Argentine economy was transformed in the late nineteenth century by the mass migration of millions of Europeans. Various ideas have surfaced concerning the likely impact of this labor inflow: that it favored the wheat revolution on the pampas; that it promoted urbanization and the rapid growth of Buenos Aires; that it paved the way for Argentine industrialization; that it caused slack in the labor markets, lowering wages. This paper attempts an analysis of the impact of migration on the scale and structure of the Argentine economy and tries to resolve various competing hypotheses. The paper presents a new social accounting matrix (SAM) for Argentina, and uses it to calibrate a CGE model. Both tools show promise for further exploration of growth and structural change during and after the Belle Époque.

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## Peopling the Pampa:
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### I. INTRODUCTION

Historians have long studied the processes of mass migration in the late nineteenth century, with the focus of attention being the "greater Atlantic economy" encompassing the European sending regions of the Old World and their corresponding major receiving regions of Australasia and the Americas in the New World. Some 50 million migrants made these crossings in the century before World War One, making this easily the most profound intercontinental labor reallocation ever witnessed. On an absolute level of migration flows, the centers of greatest import were the British Isles on the sending side, and the United States on the receiving side.[1]

However, on a relative scale, measuring the importance of migration relative to the native stock of population, two examples stand out: potentially the two economies most profoundly affected by the migration dynamics of the nineteenth century, Ireland and Argentina.[2] Economic historians are quite familiar by now with the extent of quantitative work devoted to the study of the causes and consequences of emigration from Ireland thanks to the ongoing work of numerous scholars, including Joel Mokyr, Cormac Ó Gráda, and Kevin O'Rourke. In contrast, quantitative history directed at the determinants and impact of the millions arriving on the shores of the Río de la Plata remains relatively scarce. If migration is ever to be shown to have important consequences for economic development and structural change, then late-nineteenth century Argentine represents the ideal test case, for, as the British consul in Buenos Aires noted, circa 1890, "Never has such a proportionally large immigration entered a country in so short a period before" (Cortés Conde, 1993, p. 59). Whilst other work has allowed me to explore the causes of migration from the Mediterranean to Argentina, this paper attempts to provide a counterpoint, with a look at the likely consequences of immigrant absorption in the long run.[3]

The dearth of quantitative analysis of this question is by no means due to a lack of interesting and testable hypotheses concerning the fate of immigrants and their aggregate impact in the rural pampa economy or the urban porteño economy. Numerous conjectures abound in the literature. Some have argued that migration favored the wheat revolution on the pampas, promoting exports and trade; others that it promoted urbanization and fueled the rapid growth of Buenos Aires; yet others that it paved the way for the beginnings of Argentine industrialization, thus crowding out imports and trade; some or all of these authors have added that migration caused slack in the labor markets, benefitting land and capital, lowering wages, and eventually undoing the hopes for prosperity that had drawn the migrants in the first place.

In the view of Roberto Cortés Conde, factor flows rivaled the expansion of trade as a key determinant of Argentina's economic destiny in the period:

> Extraordinary economic growth in Argentina between 1870 and 1914, sustained at an annual rate of approximately 5 percent was, according to many authors, the result of important changes in international trade, changes which brought the New Worlds of America and Oceania into the mainstream of world commerce. It has also been stressed that the decisive factor in the establishment of new trade routes was the reduction in costs of maritime transport. No less important than the increase in world trade and a certain international division of labour was the movement of factors of production, such as capital and labour, between continents which made such changes possible. (Cortés Conde, 1993, p. 49)

Cortés Conde also notes the controversy over real wage trends in the period, countering Ortiz and Scobie's pessimistic claims about real wage decline (Cortés Conde, 1993, p. 59). Still to the extent that wage growth relates to the large immigrant inflows, we may be reminded of Díaz Alejandro's thoughts concerning the likely wage-depressing impact of Argentina's more-or-less open door immigration policy. Díaz-Alejandro asserted that Argentina's immigrant supply was extremely elastic during most of the period, both pre- and post-war:

> Before 1930 Argentina could be said to have faced a labour supply schedule made up of two segments: the first one, consisting of most of the labour force already in the country, was probably fairly inelastic with respect to the real wage rate; the second one, applicable for needs slightly below and beyond the labour force already in the country, was more elastic and, as a simplification, could be said to have been perfectly elastic at the going real wage rate (plus some differential) in the industrial centers of Italy and Spain, the main sources of emigration to Argentina. (Díaz Alejandro, 1970, p. 21–22)

Aldo Ferrer (1967, chaps. 9 and 10) placed less stress on the macroeconomic effects of migration, but more on structural change, noting the importance of migration in solving the "labor shortage" problem, and, hence, in transforming pampa agriculture. Many authors, including Ferrer (1967, chap. 12) and Cortés Conde (1993) have noted the trends in population growth, fueled by immigration, in terms of the breakdown of the "interregional equilibrium" and the "subordination of the interior" (Ferrer's words), referring broadly to the shift in the population distribution from the interior to the littoral, and from rural to urban areas.

Several authors have also made a causal link between immigration and the expansion of arable production, a more labor-intense activity (per hectare) than the traditional extensive cattle-rearing activities on huge tracts of land overseen by a handful of foremen and gauchos. According to Ferrer (1967, p. 121), "Argentina offered huge stretches of fertile lands in the Pampa region, but it was too sparsely populated to properly utilize that area. However, farm output began to increase rapidly due to the arrival of immigrants, the cultivation of new lands, the investment of foreign and national capital in railroads and agriculture, and the improvement in techniques of production." Indeed, the notion that labor-supply shocks beneficial to labor-intense cultivation entered as a major factor in the sectoral-shift known as the wheat "revolution on the pampas" (Scobie, 1964) remains a staple in the literature (Adelman, 1994, for example). However, in terms of structural change, Cortés Conde (1993, p. 75) has suggested that immigration, per se, favored both arable and pastoral production (that, is the entire rural sector relative to the urban sector) because "agriculture and meat production were more labor intensive, they had more linkages, especially backward linkages." Obviously, this interpretation needs some care, since "meat production" encompasses not only rural-pastoral activity (ranching) but manufacturing activity (the saladeros, meat packing plants, and the frigorificos, the meat chilling and freezing plants).

Thus, the potential for a complex interaction between migration and economic structure is already apparent. Yet most of these accounts rest on assertion; taken together, some are potentially contradictory; and none address the key question of quantification—could the immigration experienced, massive and unprecedented as it was, account for the magnitude of the changes witnessed? It is time, I think, to expose the implicit theorizing necessary to draw such a conclusion, and scrutinize the mechanisms embodied in such inferences. Still, few of these hypotheses are amenable to casual empiricism: the impact of a factor allocation shock on the scale and structure of any economy is a complex general-equilibrium problem. Which sectors will be favored? Will rural or urban activities benefit? Will trade expand or contract? Will real wages rise or fall? Will land and capital owners benefit? Embedded deep in any answer to these questions are assumptions, implicit or explicit, about production factor intensities, factor market flexibilities, external trade and factor market characteristics—and much more.

What was migrants' impact on Argentina? I attempt to embrace the complexity of the question, strives to make the theorizing explicit rather than implicit, and still tries to show that a reasonable answer to the question is possible. My paper presents a quantitative general-equilibrium analysis of the likely impact of migration on the growth and structural transformation of the Argentine economy in the late nineteenth century in an effort to resolve the various competing hypotheses. I argue that the appropriate tool for the task is a computable general-equilibrium (CGE) system, the first model of its kind produced for historical work on the Argentine economy. A necessary preliminary task, however, was to calibrate the model using historical data. Here, the first step is to present the basic structural form of the Argentine economy circa 1914 in the best "shorthand" notation known to national accounting economists—the social accounting matrix (SAM). Building the SAM was a data-intensive project, and the effort to produce a SAM represents one novel contribution of this line of research. The SAM is documented here since the construction and contents should prove of use in future research.[4] With the CGE then set up, I then investigate the likely impact of immigration on the Argentine economy at the turn of the century using "no migration" counterfactuals to isolate the impact of population inflows. The richness of the model structure allows me to consider examples of both exogenous (fixed) capital stocks, and endogenous accumulation, where capital chases labor, resulting in incremental net foreign investment. The latter assumption seems a relevant scenario in the late nineteenth century Atlantic economy, with well-integrated capital markets under the classical gold standard.[5] The model also allows for exogenous (fixed) land endowments or an endogenous frontier (land chasing labor and capital, if you will). This third scenario may be an attractive way to model the process of pampa expansion in the period shortly before the frontier closed circa 1920.[6] The study ends with a summary of the results of this exercise and concluding remarks.

## II. CONTOURS OF ARGENTINE IMMIGRATION AND GROWTH, 1870–1913

Between 1870 and 1913, the Argentine economy experienced growth and transformation at rates close to or even exceeding global historical maxima.[7] In 1870, the national population amounted to about 1.8 million in the census of 1869, with a workforce of about 850,000; 71% of the population was based in rural areas, and 21% was of foreign origin. Development was concentrated along the riverine. Smaller towns dotted the sparsely settled interior, a region that had undergone relative economic decline (Newland, 1994). Immigration, even then, had done much to reshape the Argentine economy since independence—national population had increased from half a million in 1810, but virtually all the additional population had accumulated on the coast. Urbanization was looming in 1869, when Buenos Aires' population in the first census numbered 180,000, well in excess of second-city Rosario's 23,000. By 1914, the third census put the city's population at 1.5 million, and the nation's at 7.5 million (5 times the 1869 level, and twice the 1895 level). From 1869 to 1914, the population in the province of Buenos Aires had risen from half a million to 3.6 million. The data are consistent with the hypothesis that immigrants crowded into cities and thus drove the dramatic urban growth of the period.

The rapid growth of the Argentine economy was accompanied by an equally dramatic structural transformation: urbanization paralleled the relative decline of primary production. Sectoral activity data are fragile, but figures from the second (1895) and third (1914) censuses document the contours of this urban-industrial-service transformation: the agricultural employment share fell from 24% to 16%, whilst the industrial share grew from 22% to 26% and the service share from 29% to 33%. In the first census of 1869 the rural share of the population was 71%; by 1895 it was 63%, and by 1914 only 47%. Again, immigration, in this period a key source of population growth, appears to have a part in this transformation: in 1869, 52% of foreigners were in rural areas, by 1914, only 37% (Cortés Conde, 1993, p. 57). Buenos Aires and the interior were polar opposites: in 1914, 30% of the total population was foreign born (and the same was true in the pampean provinces); but in the Federal District the figure was close to 50%, and beyond the pampa only 14% (Díaz Alejandro, 1970). The data here are consistent with the notion that intense immigration went hand in hand with agricultural decline, favoring secondary and tertiary activity (and, as a corollary, urbanization).

The 1870 pattern of specialization and settlement resembled colonial patterns, the emphasis being on livestock. By 1914, sheep were consigned to more marginal lands on the fringe of the pampas even as far south as Patagonia. Wheat and other cultivations shared the pampas with cattle. Tornquist's (1919) data on the evolving pattern of export quanta reported by Díaz Alejandro (1970) provides ample evidence of the massive increase in primary product activity, much of it for export, as shown in Table 1. Trade data is best supplemented here by Cortés Conde's (1994) latest revision and extension of the national accounts figures into the nineteenth century. The series in Table 2 also illustrate the early wheat-growing "revolution on the pampas" and the later strong performance by both arable and livestock sectors. We may observe, then, the rise of wheat, at least before the late spurt by the beef sector, as being consistent with an immigrant-driven response in a labor-intense sector.

The above discussion, then, has given a brief survey of some salient features of the process of growth and structural transformation in the Argentine economy of the late nineteenth century. The major problem with the presentation, as is, is that the manifold structural changes in the Argentine economy might all be somehow conjoined with a notion of immigration causality. Yet such an inference rests on many embedded assumptions, and, indeed, an implicit model of labor absorption.

The discussion stands as a prelude to the construction of a model of that process in the next section of the paper, but it also highlights the important economic features that one might desire even a most basic model to incorporate, and it documents some of the key quantitative dimensions of the development process that warrant explanation. In my design, reflecting on these concerns, I aimed for a model that would incorporate the following features:

- goods markets which include tradable and non-tradable sectors, and which distinguish at the sectoral level between arable (agricultura) and pastoral (ganaderia) activities in agriculture, and which include a distinction between manufacturing and service activities in the non-agricultural sector;[8]
- external trade reflecting Argentina's position as a small, open economy at the time, exporting agricultural goods (arable and livestock products) and importing manufactures;
- a government sector funded by a potentially adjustable tax system (then dominated by import duties as a source of revenue), active as a force in the service sector of the economy;
- a capital market structure that models investment (residential and non-residential, involving construction and manufactured goods), admits various short-run current account closures, and allows possible long-run endogenous adjustment of the domestic capital stock;
- a labor market with various rural-urban migration specifications for short-run and long-run, and which allows total labor endowments to be adjusted in response to immigration;
- a land market which distinguishes between land used for pasture and land used for crop cultivation, and which admits a choice of exogenous or endogenous frontier in each;

- a supply system which admits technological shocks and a tractable demand system, both of which allow simple calibration with scarce historical data;

The model will be applied to investigate the impact of immigration on Argentine economic development from circa 1870 to 1914.

## III. ARGENTINE IMMIGRATION: A GENERAL-EQUILIBRIUM APPROACH

The following section details the construction of a model of the CGE type, a framework that offers a demonstrated and well-established technique for answering exactly the kind of historical question already posed, and which incorporates as standard features the several desiderata outlined above. The novelty of the model, such as it is, boils down to the adoption of an appropriate specification given the structure of the Argentine economy of the day and, in a challenging data-intensive task, the earlier construction of a historically accurate SAM to permit the calibration of the model.

### A Social Accounting Matrix

The schematic layout of the SAM in Figure 1 indicates the broad categories into which the circular expenditure-income flow has been divided. By convention, rows in the SAM show the distribution of funds received by source, whereas columns in the SAM show the distribution of funds expended by type of expense. By construction, row and column totals must equal for the SAM to be valid, so that inconsistencies in empirical data must be subject to some adjustment process to resolve any such imbalances. The conventions used in the construction of this SAM follow King (1985). Given the historical data available and the structure of the Argentine economy at the time, the following major divisions were adopted.

- Production: refers to producers, whose output is Q; expenditures consist of payments for intermediate goods (Dint), payments of net income to factors (NIfac), and indirect taxes paid to government (Tind); receipts consists of output sold to the domestic market for goods (Q–X) and exports sold on the external market (X); thus, Q = Dint + NIfac + Tind = (Q–X) + X.

- Goods: refers to the domestic market for goods, the size of the market being Qd; expenditures consist of goods bought on the domestic market (Q–X), imports bought on the external market (M) adjusted for any export-import taxes levied by the government (Tm+Tx); receipts consist of producers' demand for intermediate goods (Dint), households' private demand for final goods (Cpriv), the government's public demand for goods (Cgov), and domestic investment demand (I); thus, Qd = (Q–X) + (Tm+Tx) + M = Dint + Cpriv + Cgov + I.
- Factors: refers to the factors in the economy, whose net factor income is NIfac; aggregation of factor income by household is the expenditure side of the factor income balance and yields the net income of households (NIhh); on the receipt side, factors derive net income from production (NIfac); thus, NIfac = NIhh.
- Household: refers to households, whose net income is NIhh; on the expenditure side the income may be allocated to households' private consumption (Cpriv), their private saving (Spriv) and to paying any direct taxes to the government (Tdir); receipts consist of aggregated household incomes (NIhh); thus, NIhh = Cpriv + Tdir + Spriv.
- Government: refers to the public sector, whose total expenditure is Egov; expenditures consist of public consumption (Cgov) and saving (Sgov) plus any increment in foreign-exchange reserves (Dres), where the central bank balance-sheet is implicitly included in the public sector aggregation. Income consists of indirect taxes on production (Tind), export-import taxes levied on goods (Tm+Tx), and direct taxes on households (Tdir); thus, Egov = Cgov + Sgov + Dres = Tind + (Tm+Tx) + Tdir.
- Investment: refers to the capital market, where investment demand is I; expenditures consist of the demand for investment goods I; receipts consist of financial inflows of private saving (Spriv), government saving (Sgov), and foreign saving (Sfor); thus, I = Spriv + Sgov + Sfor.
- External: refers to the external balance of the open economy where the foreign-exchange supply is FX; external agents expend foreign exchange to buy exports (X) and loan foreign exchange through saving (Sfor); foreign exchange is dissipated when the domestic economy

purchases imports (M) or when reserves are increased (Dres); thus, FX = X + Sfor = M + Dres

The above relationships describe the basic structure of the SAM. Empirical data were collected to construct the SAM using published sources. The SAM was constructed with items measured in units of percentage of GDP. Principal sources used included Bunge (1917), Cortés Conde (1994), Díaz-Alejandro (1970), ECLA (1958), IEERAL (1986) and Tornquist (1919). Paucity of data had one unexpected positive side-effect in the limited need for reconciliation to make the SAM consistent. Budget share data was not available to construct a cross-check of the implied (residual) consumption shares implied by macroeconomic equilibrium. However, a priori reasoning suggested that household direct consumption of construction goods be set at zero (recognizing, of course, that households do consume construction goods indirectly in the form of services like housing). Other consistency adjustments required adjustment of land value added shares between arable and pastoral activity, and the adjustment of capital versus land shares of national income.

Table 3 shows the SAM used for the analysis in this paper. Full documentation is provided in a set of technical notes (Taylor, 1994d). It is worth spending a few moments to peruse the entries of the SAM. Most entries are unsurprising in magnitude, but a few entries warrant further discussion, especially the implied factor intensities. These ratios enter directly into the production function calibrations and the factor intensity vectors have profound effects on the extent and direction of resource pulls in the CGE model. The overall distribution of after-tax value added assigns about 50% to labor, 16% to land, and 33% to capital. Estimates of labor's share vary greatly in the literature consulted for corroborative purposes, from close to 40% (Randall, 1978) to 60%–70% (Taylor and Williamson, 1994), so a compromise estimate was needed. The capital and land shares were adjusted to produced consistent output shares by sector, but are also compatible with Bunge's (1917) pioneering estimates of the composition of national wealth (patrimonio nacional) reproduced in Tornquist (1919). Looking by sector, the factor shares suggest labor shares (of total labor) of 28% in agriculture, 22% in manufacturing, 8% in construction and 42% in services. This would seem reasonably consistent with the Díaz Alejandro-ECLA estimates of the distribution of labor by sector (Díaz Alejandro, 1970, p. 6–8) once it is realized that rural labor ought to be weighted by a rural wage approximately 70% of the urban wage, and given that the primary share of the labor force is 34% in 1910/14. This is because ECLA (1958) data form the basis for both estimates, though in the present SAM they are augmented by Bunge's (1917) data on agricultural occupations. Primary activity may be overstated, however, given the Germani-Cortés Conde estimates of labor's distribution by sector (between 16% and 23% in primary activity in 1914), though for these data the jornalero classification problem causes ambiguities to intrude and prevents precise estimation (Cortés Conde, 1979; 1993). This much, at least, we can glean from the ECLA-Bunge occupational distribution and the SAM output distribution (from ECLA/IEERAL/Cortés-Conde), plus the IEERAL information on urban-rural wage gaps. However, the extant data provides little means to cross check these derived figures against actual production techniques at the sectoral or firm level. Clearly, the details of sectoral production structure warrant further study.

However, for all its expanse and apparent complexity, a SAM is a sparse matrix, and many entries reflect trivial accounting identities. Only relatively few entries matter for the construction of a CGE. It is well known that some of the crucial entries in the SAM, from a CGE-model comparative-statics viewpoint, are the factor intensity ratios in production: that is, the pure input-output production submatrix embedded in the SAM. That submatrix defines the marginal substitutability of factors in production and, hence, the economy's allocative response to shocks. An inspection of the Argentine SAM is revealing. Within each sector, labor-output ratios implied by the SAM data provide the following labor intensity ranking: manufacturing (0.62), construction (0.56), services (0.44), livestock (0.53), arable (0.08). This ranking would be consistent with higher agricultural labor intensities in arable activity, a commonplace in the historical literature, as we have seen, and a reason often invoked as an explanation of how immigration drove the switch to labor-intense cereal cultivation. However, the overall labor intensities also suggest that agriculture was possibly less labor-intense than some urban activity, as noted by Cortés Conde, suggesting that immigration might have been a potent anti-urbanization force: a story consistent with the oft-cited evidence on urban-rural migration in the golondrina era.[9] Certainly, such Rybczynski-effect explanations would seem plausible given our SAM data, yet it remains to be seen whether such a story holds with any quantitative significance. The direction of the likely impacts seems clear, but what about the magnitudes? How much did mass migration to the region influence the shape and size of the Argentine economy? The SAM alone cannot provide such an accounting, but it forms the basis of a CGE model in the next section that can.

## A Computable General-Equilibrium model

Table 4 provides the full description of the CGE model. It will be seen that the structure embodies most of the requirements outlined above. The sector structure consists of 5 goods produced with 3 types of capital, 2 types of land, and 2 types of labor. Exogenous variables for the system consist of price index weights, production function multiplicative shifts, total labor supply, traded goods prices for this small open economy, and various tax and saving rates. Endogenous variables and their associated equations relate to the various spheres of economic activity in the system: the supply side (goods prices/supplies and factor prices/demands); factor markets (factor prices/supplies); intersectoral and international factor migration (land, labor and capital endogeneity); the demand side (household and government incomes/demands); aggregate market clearing (goods demand/supply); foreign trade (exports/imports excluding non-tradables); and the saving-investment closure (current and capital account identity). The system is completed by the definitions of various price indices and an (arbitrary) price normalization. A consistency check verifies that the system is well specified, with equations and endogenous variables each numbering 164.

In most every respect the system structure is that of a standard textbook open economy CGE model following Dervis, De Melo and Robinson (1982). The demand and supply sides are the only delicate aspects of the model's structure, embodying as they do certain behavioral assumptions: the remaining structure merely consists of market-clearing equations and other identities required to close the model. In private consumption and production CES demand and supply functions are adopted. Lack of disaggregated data on the household demand side confines us to analysis at the level of a hypothetical representative household. Thus, the model as presented here is ill-suited to questions of income distribution and sophisticated demand analysis. This area warrants further study before the model is applied to such questions, but data is certainly sparse. For the present study, which focuses on structural change and growth on the supply side, we can merely appeal to the abstraction of an aggregated demand structure using the single agent utility function, and subject the result to sensitivity analysis as a precaution.

Calibration is mostly routine, with little room for discretion: although the model presents a dizzying 150-plus equations, many of these are either redundant, or trivial accounting identities. The delicate questions are the calibration choices for the behavioral (demand and supply) equations, and the factor market specifications. Shift and share parameters must be consistent with benchmark SAM data, and given CES demand and supply structures this leaves only the relevant elasticity parameters open for determination. On the supply side some basic estimation of elasticity parameters was effected using time-series data from IEERAL's (1986) macroeconomic database over the period 1913–39. Implied CES substitution elasticity parameters were $\sigma$=0.92 for agriculture and $\sigma$=0.70 for non-agriculture (excluding government). On the household demand side, given the dearth of budget studies for any serious econometric analysis of household demand functions, the baseline estimates presented here utilize simple Cobb-Douglas utility function (CES systems when $\sigma$=0). Other parameters, such as tax rates, tariff rates, saving rates, wage gaps and the like are inferred from benchmark SAM data augmented by price data where necessary. In this way a complete model was constructed. Although Tables 3 and 4, and the present discussion, completely describe the model, full documentation may be found in the technical notes to the CGE (Taylor, 1994a).

At this stage we are almost ready to proceed with analysis of the counterfactual impacts, save for final decisions relating to optional features of the model specification. It will be recalled that a flexible model structure was adopted to permit application under a wide range of conditions in goods and factor markets, with several alternate assumptions of factor mobility and closure possible. In this paper, concerned with the long-run impact of external immigration, two factor market choices are considered. In both cases labor is intersectorally quasi-mobile (that is, subject to a fixed urban-rural wage ratio). Both have an endogenous fully flexible current account. The specifications differ with respect to the capital market: both have fully intersectorally mobile capital, but the first presumes a fixed capital stock and a fixed land endowment. The latter allows for international capital flows which re-equilibrate Argentina's marginal product of capital to the "world" price of capital. This specification allows for capital to chase labor internationally, a phenomenon considered central to an understanding of late nineteenth century frontier dynamics, in Argentina and elsewhere.

Migration impact in general equilibrium: results from a "no migration" counterfactual

This paper adopts the conventional historical CGE methodology whereby the actual record of development is compared with simulation exercises driven by perturbations of the model's exogenous parameters. For example, to examine the impact of immigration, we can apply a shock to the 1913 calibration corresponding to the estimated labor-force (stock) impact of immigration over the period 1870–1913, and then examine the resulting counterfactual equilibrium structure to glean to what extent mass immigration over the preceding four decades had any impact on the size and shape of the Argentine economy of 1913.

In such a framework, the endogenous responses are given once the model is calibrated and fully specified. Yet what are the appropriate magnitudes for the exogenous shocks? The question is delicate, since the counterfactuals are often of heroic proportions, involving perturbations that might require the suspension of disbelief. The appendix discusses the matter in more detail, but a brief discussion is in order. The counterfactual attempts to estimate the impact of net immigration 1870–1914, and the natural counterfactual is to posit a labor force and population structure in 1914 that would have prevailed without foreign inflows. A naïve approach would be to simply use population and labor force figures from 1914, and delete the foreign components of each, as if a helicopter drop of people had suddenly been reversed. In such a scenario, population would be reduced by 30% and the labor force by about 43% (Díaz Alejandro, 1970).

In fact, such a rough calculation is easily performed and is arguably not a bad guide—but deeper issues intrude. Without earlier inflows, earlier migrants would not have been present nor reproduced, lowering also the native born stock in 1913, biasing such an estimate toward an overestimate of counterfactual 1913 stocks. Conversely, if the Walker thesis applied in Argentina, actual immigrant-driven population growth and reproduction might have "crowded out" native born reproduction and natural increase, causing a bias toward an underestimate of counterfactual 1913 stocks. In addition, a complete demographic accounting would have to contend with the fact that immigrant inflows were on average over 80% adults of working age, and over 70% masculine, ratios far in excess of the total population ratios (Cortés Conde, 1979, p. 77; Cortés Conde, 1993, pp. 55–57). Such effects are not easy to estimate, even in a fully specified and calibrated demographic model, a kind of model we do not have in any case for Argentina circa 1900. Nonetheless, the appendix suggests several ways to estimate the impact of immigration on population growth, using both time-series and cross-section econometric methods. When all is said and done, the crude rule-of-thumb is quite plausible to within an order of magnitude—a Walker effect may operate, but is less than one for one. A conservative estimate would say that in 1914, absent four decades of immigration, the labor force might have been 30% smaller. That figure is used in the following counterfactuals.

Table 5 attempts to calculate the impact of such immigration by imposing a counterfactual labor force reduction of 30% in 1914. Column A presents "partial equilibrium" results with capital stocks fixed; Column B "general equilibrium" results with capital endogenous. Column A shows the predictable partial equilibrium impacts—with a lower labor stock, labor is scarcer and wages higher, so that returns to capital are reduced (by 12%). Thus, in Column B we indeed see a shrinkage in the capital stock (as counterfactually removed labor is followed out of the country by "chasing" capital). The shock is large: the capital stock is reduced by 12% The latter figure has a natural interpretation—in 1914 almost exactly one half of the Argentine capital stock was owned by foreigners, mostly British investors whose shareholding interest resulted from decades of accumulated capital inflows (Díaz Alejandro, 1970). Our counterfactual suggests that about one quarter of that cumulative foreign investment (12% out of 50%) went to the Argentine in order to chase labor inflows—the rest being drawn in by the inherent resource abundance and relative capital scarcity that prevailed even without the mass migrations. In terms of scale, the large labor inflows had profound effects, as expected. GDP would have been 16% lower in the absence of immigration in partial equilibrium (capital fixed), but as much as 19% lower in general equilibrium with capital chasing (Column B).

The partial and general equilibrium results also provide estimates concerning the impact of mass migrations on living standards and productivity. With fixed land and capital, migration is seen to lower welfare significantly: real wages would have risen 25% and labor productivity 21% in the counterfactual (Column A). When capital may chase labor, the effects are somewhat muted, as expected: real wages rise only 21% and labor productivity only 16% (Column B). Still, in a comparative sense, the estimates do underscore the exceptional impact of net immigration in Argentina amongst New World receiving regions. In a similar calculation for the United States in a CGE framework, Williamson (1974) found only an 11% partial equilibrium impact on real wages arising from immigration 1870–1910.[10] Still, large as they are and equal to within to an order of magnitude, all the results are indicative of the efficiency of the late-nineteenth century transatlantic labor market in reallocating labor from low- to high-wage areas, at least in the Argentine case where practically no barriers to migration were erected. Elsewhere, the migration process has been modeled econometrically and shown to be consistent with a risk-return trade-off prescribed by standard migration models (Taylor, 1994c). The ultimate outcome of that process would be a convergence in real wage levels between sending Mediterranean regions and the receiving region, Argentina. Such was the case (Figure 2) and the CGE model indicates the magnitude of that force.

But what now of the porteño economy? What of the questions of structure, not scale? How did net immigration square with the structural transformation of the period? The results suggest that migration was a modest restraining force on urbanization of the labor force, a countervailing influence in the context of the general rural-urban shift of the period. Absent four decades migration, and the non-agricultural employment share would have risen from 66% to 70%. However, the non-agricultural GDP share would have fallen from 60% to 58%, emphasizing the influence of relative price effects: without immigration there would have been more labor in agriculture, but higher returns on capital in urban areas, raising the urban share of GDP. The labor share results may seem very strange, given the standard view that immigrants drove urbanization by clustering in the cities, and particularly the principal city and port of arrival, Buenos Aires. Yet undoubtedly the picture was considerably more complex than this, with many migrants continuing on from the city to the pampas for agricultural work, whether as laborers or tenants (a pattern of movement clearly true for the golondrinas) (Díaz Alejandro, 1970). Conversely, many native born from the interior participated in a countervailing and long-standing flow of population toward the urban and littoral centers of population (Scobie, 1971; Newland, 1994). Here, then, Argentina again appears exceptional in terms of its two-way patterns of population movement and growth in the age of mass migration, with a particularly fluid and flexible labor market, rich with unskilled and informal labor. Native born and immigrant alike engaged in pushing back the frontier of the pampean economy and in building the urban-industrial centers of the porteño economy.[11]

As for trade and specialization, migration had a predictable partial-equilibrium effect through scale impacts: manufacturing imports would have fallen 11%–15% in the face of a 30% population decline; on the export side, meat exports would have risen 3%–11%, crop exports would have fallen a massive 61%–66%, reflecting the rural sectoral bias of labor force shocks. From 1890 to 1910, recall, arable is relatively labor intense in the model, so reacts dramatically through resource pulls to any labor force shocks. The export pattern mimics the production pattern in agriculture: the GDP share of livestock rises 20%–24%, that of arable declines 16%–

19%, offering quantitative support for the hypothesis that immigration favored arable farming and hurt the older, traditional gaucho economy. In this story, the new wave of European immigrants did not simply come to a national dominance by way of their numerically dominating the Creoles from the ranching frontier of Buenos Aires antigua; the immigrants' impact on factor scarcities alone ushered in a revolution in the structure of rural economic activity. The gaucho way of life was killed off as much by European labor supply as by European cultural imperialism.[12]

Compounding GDP scale and share effects, it is apparent that, absent migration, the livestock sector would have remained approximately the same size, but arable output would have declined by about 40%: migration, by this reckoning, raised the output of wheat on the pampas by 50%, and roughly tripled the exports of wheat. Actual data reveals that wheat output and exports increased somewhat faster as in Tables 1 and 2: from c. 1870 to c. 1914, arable output appears to have risen 50 fold, and exports about 500 fold. Confining attention to the years of highest migration after 1890 indicates an approximate 6 fold output increase, and a 3 fold output increase.[13] Thus, post 1890, migration explains a large share of the wheat revolution on the pampas, that is, in the period when Buenos Aires province rose to dominance in Argentine wheat production.[14] Undoubtedly a large share of the wheat revolution, possibly the balance in this calculation, would be due to endogenous frontier movement that is outside the present calculation. That dynamic response remains the subject of further study (Taylor, 1994b). In the non-agricultural sphere, the main impact is seen in manufacturing sector, which gains about 12% in its share of GDP, implying about a 30% increase in manufacturing output. Thus, we find some support here for the idea that immigration helped stimulate industrialization in Argentina. Nascent industry circa 1914 was a relatively labor intense sector, and was thus able to gain from labor inflows.

## IV. CONCLUDING REMARKS

This paper presents some findings on the influence of mass immigration on the growth and structural change of the Argentine Republic during Belle Époque, 1870–1914. The paper introduces a new set of tools to the debate, by calibrating a general-equilibrium model of the Argentine economy with a newly constructed SAM. Thus, the paper attempts to expand the boundaries of debate beyond pampean and porteño economies considered separately, and beyond the sectoral studies of wheat, beef, commerce and other products which, though vital to our understanding, have not embraced a coherent view of the entire Argentine economy during this unprecedented period of growth and transformation.

The results suggest some intuitive and counterintuitive interpretations of the impact of mass migration to Argentine before 1914. Certainly, immigration alone drove down real wages, and considerably so: by about 25%. Though the inflows entailed about a 43% increase in the labor force (in the present reckoning), diminishing returns generated only about a 19% increase in GDP. The migration was a reflection of the well-integrated international labor market linking the pampas and the cities to Italy and Spain. Indeed, wage convergence was entirely to be expected under these conditions. A look at average wage gaps in Figure 2 suggests that migration, through its impact on the receiving region, explained about half of the convergence between Argentina and her sending regions; and this back-of-the envelope calculation omits consideration of the symmetric impact of migration on the wage levels in Italy and Spain. Thus, wage convergence (the relative wage trend of Argentina versus Italy or Spain) was heavily influenced by international migration flows in the "global" labor market.[15] Inflows also made a difference with respect to the absolute standard of living and labor productivity within Argentina. From 1870 to 1910, real wages rose from an index of 61 to an index of 95 (a 56% increase), with an index of Great Britain equal 100 in 1905 (Taylor and Williamson, 1994); but in the no-migration counterfactual the real wage would have risen a further 25% to an index of 119 (a 95% increase). Labor productivity actually rose from $915 in 1870 to $2,226 in 1910 (1985 U.S. dollars), a 143% increase (Taylor and Williamson, 1994); but, in the no-migration counterfactual, labor productivity would have risen a further 21% to $2,693, a total 194% increase since 1870. Immigration from 1870 to 1910, it might therefore be argued, depressed real wage growth rates by about one half, and labor productivity growth rates by about one quarter—a nontrivial burden.

However, migration considered in partial-equilibrium isolation had predictable impacts on the returns to other factors: capital's rate of return would have risen about 12% and the price of arable land would have risen by a third. Thus, in an era of well-functioning world capital markets, migration in general equilibrium also brought an offsetting positive force to bear on the Argentine economy, attracting additional foreign capital which added around 5% to GDP, real wages and productivity, partially offsetting the diminishing returns to the labor inflows.[16]

Just as migration had profound scale impacts, it also had important structural consequences. On net, it appears that migration actually promoted an urban to rural flow of labor, in particular favoring dramatic expansion of the arable sector: a 50% increase of cereal output on the pampas as a result of immigration appears to be the approximate measure of this effect, though such an impact would be much amplified, I suspect, by endogenous frontier movement. Overall, migration little affected the primary-tertiary-secondary division of GDP, which remained about 40-20-40. Within the non-agricultural sector, however, manufacturing was a modest beneficiary of the immigration, expanding its share of GDP by about 10% as a result of labor inflows. The implications of immigration for specialization naturally had ramifications for Argentina's trade: thus, while in the model immigration expanded domestic manufacturing production by about 30%, it also caused a manufacturing import expansion of about 10%–15%, and almost tripled cereal exports.

The paper thus offers some answers to the many competing conjectures which have surfaced concerning the importance of immigration for Argentine economic development before 1914. Still more remains to be done, however, since immigration was not the only force shaping the country's evolution in this period. A complete analysis would have to balance and assess the multiple impacts arising from several shocks: capital inflows beyond those drawn in by immigrants; the expansion of the land frontier across the pampa; the external terms of trade and their evolution; the process of economic growth through total factor productivity growth. All of these forces no doubt compounded or offset the various impacts associated with immigration that have been enumerated here, and a full accounting is the subject of further study.

## APPENDIX: MIGRATION IMPACT

The delicate counterfactual experiment in this paper rests on the calculation of the impact on population and labor force stocks of net immigration over the years 1870 to 1913. As mentioned in the text, a crude rule-of-thumb might simply adjust Díaz Alejandro's 1914 figures to exclude the foreign components of each group: requiring a 30.3% reduction in population, and a 42.6% reduction in working age population, ages 15–64 (Díaz Alejandro, 1970).

Such estimates provide a benchmark, but they do not address deeper endogeneity and simultaneity issues. The counterfactual simulation can surely not impose labor force shocks of this magnitude as pure parametric exogenous perturbations. For if migration had been prevented for four decades, would not the absence of migrants have lowered reproduction and rates of natural increase, amplifying the effect of their absence on 1914 (end-of-period) stocks? Conversely, might not a countervailing bias operate through the Walker effect, whereby the admission of migrants "crowds out" native born population growth? (Albeit most likely less than the extreme one-for-one crowding out envisaged in the original Walker thesis as posited for the nineteenth century United States.) Also, we might consider the very different composition of migrant and native born populations, the inflows being over 80% masculine, over 70% male in the late nineteenth century (Cortés Conde, 1979; 1993).

All the above issues warrant a fully developed dynamic demographic model of late nineteenth century Argentina, but such a model is not yet available. Given present constraints, the challenge, then, is to postulate appropriate changes in the magnitude of the labor force (L) or population (POP) stocks given a zero net migration counterfactual ($m_{cf}$=0). That is, we seek to calculate counterfactual growth rates of the form $g^{POP}{}_{cf}(m=0)$, given actual growth rates $g^{POP}{}_{act}(m=\text{actual})$.

For simplicity, just consider population. At the very least we need an estimate of the impact of changes in migration rates on rates of population growth $\partial g^{POP}/\partial m$. Now, by identity,

$$g^{POP} = v + m,$$

where $v$ is the rate of natural increase and m is the migration rate.

A simple counterfactual might assume $v$ to be a constant parameter of the demographic system, whereby $\partial g^{POP}/\partial m = -1$, and migration rate shocks pass through fully into population growth rate shocks (a zero Walker effect). This approach was taken by Taylor and Williamson and they estimated the population impact of 1870–1910 immigration to be 53%, and the labor force impact to be possibly as high as 75% given the high labor content of the inflows (Taylor and Williamson, 1994). These estimates might be considered tentative upper bounds for the present study.

The next step is to try to estimate $\partial g^{POP}/\partial m$, and I have used a couple of econometric approaches in this effort, one cross section and one time series. The time-series estimates estimate a regression of the form

$$g^{POP}_t = \alpha + \beta \, m_t + u_t$$

for national time series data over the period 1871 to 1914. A full sample estimate is made, as well as intercensal estimates for pre- and post-1895. The results in Appendix Table A1 suggest a maximal value of $\alpha$ close to 2.3% per annum, the predicted value of $v$ when m is zero. The maximal estimate of $\beta$ is significant and close to 0.5 suggesting a Walker effect of non-trivial magnitude, with 50% crowding out of native born population growth by immigration. Under such parameters, counterfactual (zero net migration) population estimates would have been 3.36 million in 1895 (15% below actual) and 34% in 1914 (34% below actual).

The cross-section estimates use provincial level data on foreign born shares in the population at census dates. Here we cannot explicitly model growth rates as a function of migration rates, although we can run a regression of the following form on intercensal changes from time 0 to time T:

$$g^{POP}[0,T]_i = \gamma + \delta \, FOR(T)_i + v_i,$$

where FOR(T) is the foreign-born share of the population in province i at terminal time T. Heuristically, we may reason that provinces with higher immigration rates during the period will have both higher population growth and higher terminal foreign-born shares. That much is confirmed by the results in Appendix Table A2. How then might a counterfactual of zero net migration be imposed?

Suppose a population of size 1, and initial foreign share $\lambda$ is subject to zero net immigration (m=0). The foreign share decays at a rate d, where d is the mortality rate, but produces native born offspring at a rate b, where b is the birth rate. The offspring also multiply, so that at time t survivors and descendants of the initial foreign stock comprise a group of size $\lambda \exp(gt)$, where g=b–d is the growth rate of population (recall m=0), and this group is divided into foreigners in the amount $\lambda \exp(-dt)$ and native born in the amount $\lambda[\exp(gt)-\exp(-dt)]$. The initial native born multiply so that at time t their survivors and descendants number $(1-\lambda)\exp(gt)$. Thus, at a subsequent time t the share of foreigners would be

$$\lambda \exp(-dt)/\exp(gt) = \lambda \exp(-bt).$$

In the era in question birth rates were around 30 per thousand, or 3%, so using the above formula provides estimates of FOR(T) under counterfactual circumstances at census dates in 1895 and 1914 given initial foreign shares by province in 1869 and 1895, respectively. Using such figures as dependent variables for projection in the regression formula provides an estimate of counterfactual population growth. Such fitted values are reported in Table A3, and they suggest counterfactual populations of 34% below actual in 1895, and 59% below actual in 1914, each assuming no net migration, suggesting a possibly stronger Walker effect than the previous time-series exercise.

To summarize, we have various estimates of the impact of immigration on population and labor force in Argentina from 1870 until 1914. They are all consistent within an order of magnitude, ranging from about 12% to about 60% for population impacts, and possibly higher for labor force impacts. Accordingly this study assumes a fairly conservative estimate of 30% for the impact of four decades of net immigration on 1914 population and labor force stocks.

## NOTES

[1] For a recent survey see Hatton and Williamson (1994).

[2] On the sending side, Ireland stood far above other European countries: average emigration rates per thousand 1870–1914 were 100 in Ireland, 57 in the whole British Isles (including Ireland), 51 in Italy, 45 in Spain, and 44 in Norway and Portugal; no other sending country exceeded a rate of 40. On the receiving side, Argentina exceeded other countries by a similar margin: immigration rates for the same period were 199 for Argentina, 87 for Canada, and 74 for the United States (Hatton and Williamson, 1994, 7).

[3] On the determinants of Argentine immigration and a comparison with the Australian experience 1870–1939 see Taylor (1994c).

[4] Full documentation, and copies of the SAM and the CGE model, are available from the author upon request. The first use of a CGE approach to investigate the Argentine economy was in a post-WW2 application by Thorbecke and Field (1969). The present model is considerably more complicated in static structure, having many more goods and factors. Thorbecke's model admitted model dynamics to capture investment responses. In principle, the present model could be extended in the same way, though such concerns do not arise in the context of the long-run equilibrium counterfactuals investigated here.

[5] Several recent works in the historical-applied-CGE tradition have utilized this notion of capital chasing to extend their counterfactual analysis to cases of international capital mobility (Boyer et al., 1994; O'Rourke et al., 1994).

[6] The importance of the "closing of the frontier" circa 1910–1920 for Argentine development has been widely explored (Di Tella and Zymelman, 1967, for example; Halperín, 1986).

[7] This section draws on Taylor (1994b), where I show that rates of structural transformation and urbanization during the Argentine Belle Époque far exceed those in other nineteenth century industrializing countries, and approach rates seen in late-twentieth century NICs like South Korea.

[8] "Agriculture" in this paper refers to both livestock and crop production.

[9] For example, Díaz Alejandro (1970, p.27) notes "while in the [typical underdeveloped country] labor is supposed to flow secularly from the rural areas in to the cities, in Argentina the opposite was the case before 1930. Immigrants landed mainly in the city of Buenos Aires, from where some went, by railroad, to the rural areas. The two-way flow of labor between urban and rural areas was a further factor strengthening the flexibility of the labor market." This adds justification to my choice of perfect labor mobility between urban and rural areas subject to a fixed wage gap (nonpecuniary real wage elements). On the same theme, according to Cortés Conde (1993, p. 59), "[s]ome of the manpower already in the country moved to the rural sector where the area under cultivation continued to expand..."—a story reminiscent of the U.S. experience of displaced native born moving to the frontier.

[10] In a broader comparative framework, Taylor and Williamson (1994) estimated a 46% real wage impact in Argentina which far exceeded other New World wage responses to mass migration (cf Australia 28%, Brazil 2%, Canada 31%, and United States 15%); but these estimates were much reduced when allowance was made for capital chasing (the Argentine wage rise was then only 17%—author's revised calculations throughout). It should be no surprise that the Taylor-Williamson estimate exceeds the 25% impact in this study since it was predicated on an aggregate production function perspective—in the CGE framework used here, intersectoral factor reallocation could be expected to partially offset the macroeconomic estimate.

[11] In contrast, the United States exhibited a tendency for immigrants to cluster in the cities of the eastern seabord, with the native born dominating the westward flow to the frontier. The possible impact of endowments (e.g., the distribution of land quality) on this pattern of development warrants further exploration, as do the broader political economy considerations of the distinct Argentine economic geography with the better lands situated closer to the riverine areas and generally claimed first. The classic statement of this issue is put forward by Díaz Alejandro in a footnote (Díaz Alejandro, 1970, p. 36n).

[12] This would be consistent with Germani's thesis (as stated by Díaz Alejandro) that "in Argentina, massive immigration implied the virtual disappearance in the urban centers and in the pampean zone of the preimmigration social type and native social structure" (Díaz Alejandro, 1970, p. 25n).

[13] By another reckoning, the value of exports of wheat grew from 99 million gold pesos in 1890–94 to 390 million in 1910–14, almost a quadrupling in the twenty years of peak migration (Adelman, 1994, p. 80).

[14] Before the 1900s, the main wheat producing province was still Santa Fe (Cortés Conde, 1979).

[15] For another look at migration and convergence in the Argentine case see Taylor (1994c). For an examination of convergence in the entire "greater Atlantic" labor market, with a treatment of both sending and receiving region migration-wage impacts, see Taylor and Williamson (1994).

[16] By the same token, higher land prices would have generated endogenous frontier expansion, also offsetting lower wages, a process I explore elsewhere (Taylor, 1994b).

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## TABLE 1
## EXPORT GROWTH

Estimates of Quantum of Exports, 1875–1914 (annual averages, in millions of gold pesos at 1910–14 prices).

| | 1875–79 | 1880–84 | 1890–94 | 1900–04 | 1910–14 |
|---|---|---|---|---|---|
| Wool | 34.1 | 41.3 | 52.7 | 66.7 | 51.9 |
| All hides | 24.6 | 22.5 | 35.6 | 35.6 | 44.0 |
| Salted and jerked meat | 5.3 | 3.6 | 6.6 | 2.8 | 1.1 |
| Chilled and frozen mutton and lamb | 0 | 0 | 3.5 | 9.7 | 8.9 |
| Frozen beef | 0 | 0 | 0.1 | 10.6 | 49.7 |
| Chilled beef | 0 | 0 | 0 | 0 | 4.3 |
| Canned meat | 0 | 0 | 0.6 | 0.5 | 3.0 |
| Wheat | 0.2 | 1.2 | 28.1 | 55.1 | 78.1 |
| Corn | 0.3 | 1.3 | 6.0 | 34.4 | 72.4 |
| Linseed | 0 | 1.2 | 3.6 | 32.2 | 41.0 |
| Oats, barley and rye | 0 | <0.1 | <0.1 | 0.5 | 14.6 |
| Quebracho extract | 0 | 0 | <0.1 | 0.7 | 4.9 |
| Quebracho logs | 0 | 0 | 0.7 | 3.3 | 5.0 |
| Total of items listed | 64.5 | 71.1 | 137.5 | 252.1 | 378.9 |

Notes: Annual averages in million gold pesos at 1910–14 prices.
Source: Díaz Alejandro (1970).

## TABLE 2
## SECTORAL OUTPUT GROWTH

Value added by sector, 1875–1913 (in millions of 1914 gold pesos).

| Year | Livestock (ganaderia) | Arable (agricultura) | Manufacturing (industria) | Construction (construccíon) | Services (other) | Total |
|---|---|---|---|---|---|---|
| 1875 | 288 | 16 | 77 | — | 108 | 513 |
| 1880 | 326 | 27 | 62 | 50 | 113 | 562 |
| 1885 | 457 | 66 | 94 | 181 | 259 | 1,012 |
| 1890 | 353 | 156 | 167 | 225 | 342 | 1,267 |
| 1895 | 563 | 375 | 249 | 109 | 514 | 1,939 |
| 1900 | 453 | 352 | 333 | 142 | 552 | 1,959 |
| 1905 | 588 | 616 | 739 | 492 | 910 | 3,568 |
| 1910 | 753 | 622 | 970 | 677 | 1,241 | 4,567 |
| 1913 | 883 | 878 | 1,267 | 538 | 1,585 | 5,525 |

Notes: Services includes transport, government and commerce. Columns may not sum to total due to rounding. Pre-1900 figures use 1895 census weights in value added; post-1900 figures use 1914 census weights.
Source: Cortés Conde (1994).

## TABLE 3
## SOCIAL ACCOUNTING MATRIX

| | Receipts | Expenditures 1a | 1b | 1c | 1d | 1e | 2a | 2b | 2c | 2d | 2e |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | **Production** | | | | | | | | | | |
| 1a | Livestock | | | | | | 6.29 | | | | |
| 1b | Arable | | | | | | | 15.05 | | | |
| 1c | Manufacturing | | | | | | | | 18.24 | | |
| 1d | Construction | | | | | | | | | 6.89 | |
| 1e | Services | | | | | | | | | | 47.35 |
| **2** | **Goods** | | | | | | | | | | |
| 2a | Livestock | | | | | | | | | | |
| 2b | Arable | | | | | | | | | | |
| 2c | Manufacturing | | | | | | | | | | |
| 2d | Construction | | | | | | | | | | |
| 2e | Services | 2.90 | 4.06 | 4.58 | 1.84 | 5.95 | | | | | |
| **3** | **Factors** | | | | | | | | | | |
| 3v | Labor | 2.08 | 11.77 | 11.32 | 3.90 | 20.93 | | | | | |
| 3w | K-Manufacturing | 1.60 | 0.65 | 1.30 | 0.65 | 1.44 | | | | | |
| 3x | K-Construction | 2.47 | 1.01 | 0.88 | 0.44 | 18.60 | | | | | |
| 3y | K-Livestock | 3.60 | | | | | | | | | |
| 3z | Land | 12.06 | 4.24 | | | | | | | | |
| **4** | **Household** | | | | | | | | | | |
| **5** | **Government** | | | | | | | | | | |
| 5p | Direct/Indir. Tax | 0.22 | 0.19 | 0.16 | 0.06 | 0.42 | | | | | |
| 5q | Import Tax | | | | | | | | 1.24 | | |
| 5r | Export Tax | | | | | | 0.00 | 0.00 | | | |
| **6** | **Investment** | | | | | | | | | | |
| **7** | **External** | | | | | | | | 30.92 | | |
| 8 | Totals | 24.93 | 21.92 | 18.24 | 6.89 | 47.35 | 6.29 | 15.05 | 50.40 | 6.89 | 47.35 |
| 9 | Group Total | 119.33 | | | | | 125.98 | | | | |
| | % of Value Added | 22.03 | 17.86 | 13.66 | 5.05 | 41.40 | | | | | |
| | Total Value Added | 100.00 | | | | | | | | | |

## TABLE 3
## SOCIAL ACCOUNTING MATRIX (CONTINUED)

| | Receipts | Expenditures 3a | 3b | 3c | 3d | 3e | 4 | 5 |
|---|---|---|---|---|---|---|---|---|
| **1** | **Production** | | | | | | | |
| 1a | Livestock | | | | | | | |
| 1b | Arable | | | | | | | |
| 1c | Manufacturing | | | | | | | |
| 1d | Construction | | | | | | | |
| 1e | Services | | | | | | | |
| **2** | **Goods** | | | | | | | |
| 2a | Livestock | | | | | | 5.23 | |
| 2b | Arable | | | | | | 15.05 | |
| 2c | Manufacturing | | | | | | 48.73 | |
| 2d | Construction | | | | | | 0.00 | |
| 2e | Services | | | | | | 23.27 | 4.75 |
| **3** | **Factors** | | | | | | | |
| 3v | Labor | | | | | | | |
| 3w | K-Manufacturing | | | | | | | |
| 3x | K-Construction | | | | | | | |
| 3y | K-Livestock | | | | | | | |
| 3z | Land | | | | | | | |
| **4** | **Household** | 50.00 | 5.65 | 23.39 | 3.60 | 16.30 | | 0.00 |
| **5** | **Government** | | | | | | | |
| 5p | Direct/Indir. Tax | | | | | | 0.00 | |
| 5q | Import Tax | | | | | | | |
| 5r | Export Tax | | | | | | | |
| **6** | **Investment** | | | | | | 6.66 | -2.45 |
| **7** | **External** | | | | | | | 0.00 |
| 8 | Totals | 50.00 | 5.65 | 23.39 | 3.60 | 16.30 | 98.94 | 2.30 |
| 9 | Group Total | 98.94 | | | | | 98.94 | 2.30 |

## TABLE 3
## SOCIAL ACCOUNTING MATRIX (CONTINUED)

| | Receipts | Expenditures 6a | 6b | 6c | 6d | 6e | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | **Production** | | | | | | | | |
| 1a | Livestock | | | | | | 18.64 | 24.93 | 119.33 |
| 1b | Arable | | | | | | 6.87 | 21.92 | |
| 1c | Manufacturing | | | | | | | 18.24 | |
| 1d | Construction | | | | | | | 6.89 | |
| 1e | Services | | | | | | | 47.35 | |
| 2 | **Goods** | | | | | | | | |
| 2a | Livestock | 1.06 | | | | | | 6.29 | 125.98 |
| 2b | Arable | | | | | | | 15.05 | |
| 2c | Manufacturing | 0.47 | 0.19 | 0.38 | 0.19 | 0.43 | | 50.40 | |
| 2d | Construction | 0.73 | 0.30 | 0.26 | 0.13 | 5.48 | | 6.89 | |
| 2e | Services | | | | | | | 47.35 | |
| 3 | **Factors** | | | | | | | | |
| 3v | Labor | | | | | | | 50.00 | 98.94 |
| 3w | K-Manufacturing | | | | | | | 5.65 | |
| 3x | K-Construction | | | | | | | 23.39 | |
| 3y | K-Livestock | | | | | | | 3.60 | |
| 3z | Land | | | | | | | 16.30 | |
| 4 | **Household** | | | | | | | 98.94 | 98.94 |
| 5 | **Government** | | | | | | | | |
| 5p | Direct/Indir. Tax | | | | | | | 1.06 | 2.30 |
| 5q | Import Tax | | | | | | | 1.24 | |
| 5r | Export Tax | | | | | | | 0.00 | |
| 6 | **Investment** | | | | | | 5.41 | 9.62 | 9.62 |
| 7 | **External** | | | | | | | 30.92 | 30.92 |
| 8 | Totals | 2.26 | 0.49 | 0.64 | 0.32 | 5.90 | 30.92 | | |
| 9 | Group Total | 9.62 | | | | | 30.92 | | |

Notes and Sources: See text and Taylor (1994d).

**TABLE 4**
**COMPUTABLE GENERAL-EQUILIBRIUM MODEL**

## Indices

| Set name | Size | Indices | Set elements |
|---|---|---|---|
| Goods | N=5 | i,j | livestock; arable; manufacturing; construction; services-other |
| Capital | K=3 | k | K-livestock; K-manufacturing; K-construction |
| Labor | M=2 | s | L-agriculture; L-nonagriculture |
| Resources | R=2 | l | land-livestock; land-arable |

## Exogenous variables

| Symbol | Meaning | Number of variables |
|---|---|---|
| $\overline{b^C_i}$ | price index weights of consumption | 1 |
| $\overline{b^{GDP}_i}$ | price index weights of GDP | 1 |
| $\overline{b^G_i}$ | price index weights of government | 1 |
| $\overline{b^I_i}$ | price index weights of investment | 1 |
| $\overline{\phi_i}$ | productivity shift parameter, sector i | N |
| $\overline{L}$ | total labor endowment | 1 |
| $\overline{P^W_i}$ | world price, (tradable) good i | N |
| $\overline{\theta_{Gi}}$ | government demand share of GDP, good i | N |
| $\overline{s_h}$ | household saving rate | 1 |
| $\overline{t^D}$ | direct tax rate | 1 |
| $\overline{t^I_i}$ | indirect tax rate, good i | N |
| $\overline{t^M_i}$ | import tax rate (tariff), good i | N |
| $\overline{t^X_i}$ | export tax rate, good i | N |

Number of exogenous variables: 6N + 7 = 37.

## TABLE 4
## COMPUTABLE GENERAL-EQUILIBRIUM MODEL (CONTINUED)

Endogenous variables

| Symbol | Meaning | Number of variables |
|---|---|---|
| $C_i$ | household demand, good i | N |
| E | exchange rate | 1 |
| $G_i$ | government demand, good i | N |
| GDP | gross domestic product | 1 |
| I | investment demand | 1 |
| $I_{ij}$ | investment demand, sector i, good j | $N^2$ |
| $I_j$ | investment demand, good j | N |
| K | total capital stock | 1 |
| $K_{ik}$ | capital input, sector i, type k | NK |
| $L_{is}$ | labor input, sector i, type s | NM |
| $L_s$ | demand for labor, type s | M |
| m | intersectoral labor migration | 1 |
| $M_i$ | imports, good i | N |
| $P^C$ | price index of consumption | 1 |
| $P^G$ | price index of government | 1 |
| $P^{GDP}$ | price index of GDP | 1 |
| $P^I$ | price index of investment | 1 |
| $P_i$ | price, good i | N |
| $Q^D{}_i$ | demand, good i | N |
| $Q^S{}_i$ | supply, good i | N |
| r | return on capital | 1 |
| $R_{il}$ | total resource endowment, sector i, type l | NR |
| $S_f$ | foreign saving | 1 |
| $S_g$ | government saving | 1 |
| $S_h$ | household saving | 1 |
| $VA_i$ | value added, sector i | N |
| $v_{ij}$ | intermediate input, sector i, good j | $N^2$ |
| $v_j$ | demand for intermediate input, good j | N |
| $w_{il}$ | price of resource l, sector i | NR |
| $w_s$ | wage of labor, type s | M |
| $X_i$ | exports, good i | N |
| $Y_g$ | government income | 1 |
| $Y_h$ | household income | 1 |

Number of endogenous variables: $2N^2 + NM + NK + 2NR + 10N + 2M + 15 = 164$.

## TABLE 4
## COMPUTABLE GENERAL-EQUILIBRIUM MODEL (CONTINUED)

Equations

| Equation | Equation number | Number of equations |
|---|---|---|
| **PRODUCTION** | | |
| profit maximization when K is mobile | | |
| $\max P_i(1-\overline{t^I_i})\, f_i(K_{ik}, L_{is}, v_{ij}, R_{il}) - \sum_s w_s L_{is} - \sum_j P_j v_{ij} - \sum_k r K_{ik}$; | | |
| profit maximization when K is fixed | | |
| $\max P_i(1-\overline{t^I_i})\, f_i(\overline{K_{ik}}, L_{is}, v_{ij}, R_{il}) - \sum_s w_s L_{is} - \sum_j P_j v_{ij}$; | | |
| where $f_i = \phi_i\, CES(\tau_i)$ and $\tau_i$ is the elasticity of substitution, implies | | |
| $K_{ik} = K_{ik}(P, \overline{t^I_i}, w_s, r, R_i))$ when K is mobile between sectors | [1] | NK |
| $K_{ik} = \overline{K_{ik}}$ when K is fixed | | |
| $L_{is} = L_{is}(P, \overline{t^I_i}, w_s, r, R_{il})$ when K is mobile between sectors | [2] | NM |
| $L_{is} = L_{is}(P, \overline{t^I_i}, w_s, \overline{K_{ik}}, R_{il})$ when K is fixed | | |
| $v_{ij} = v_{ij}(P, \overline{t^I_i}, w_s, r, R_i)$ when K is mobile between sectors | [3] | $N^2$ |
| $v_{ij} = v_{ij}(P, \overline{t^I_i}, w_s, \overline{K_{ik}}, R_{il})$ when K is fixed | | |
| $Q^S_i = f_i(K_{ik}, L_{is}, v_{ij}, R_i)$ | [4] | N |
| $VA_i = P_i Q^S_i - \sum_j P_j v_{ij}$ | [5] | N |
| $w_{il} = P_i(1-\overline{t^I_i})\, \partial f_i / \partial R_{il}$ | [6] | NR |
| $GDP = \sum_i VA_i$ | [7] | 1 |
| **FACTOR MARKETS** | | |
| $K = \sum_{ik} K_{ik}$ when K is mobile between sectors | [8] | 1 |
| r = 1 when K is fixed | | |
| $L_s = \sum_i L_{is}$ | [9] | M |
| $\overline{L} = \sum_s L_s$ | [10] | 0* |
| $v_j = \sum_i v_{ij}$ | [11] | N |
| **CAPITAL MIGRATION** | | |
| $\delta\, \Delta K + \eta\, \Delta r = 0$ | [12] | 1 |
| where $(\delta, \eta)$= | | |
| (1,0) for total capital stock fixed, endogenous rate of return | | |
| (0,1) for rate of retun fixed, endogenous total capital stock | | |
| **LAND FRONTIER** | | |
| $\xi\, \Delta R_{il} + \varphi\, \Delta w_i = 0$ | [13] | NR |
| where $(\xi, \varphi)$= | | |
| (1,0) for land endowments fixed, endogenous land prices | | |
| (0,1) for land prices fixed, endogenous land endowments | | |

**TABLE 4**
**COMPUTABLE GENERAL-EQUILIBRIUM MODEL (CONTINUED)**

| Equation | Equation number | Number of equations |
|---|---|---|
| **LABOR MIGRATION** | | |
| $\Delta L_1 = m,\ \Delta L_2 = -m + \Delta \overline{L}$ | [14] | M |
| $\alpha m + \beta \Delta \ln(w_1/w_2) + \gamma(\ln(w_1/w_2)) = 0$<br>where $(\alpha,\beta,\gamma)$=<br>(1,0,0) for labor immobile, ag. versus nonag.<br>(0,1,0) for labor quasi-mobile, fixed wage gaps ag. versus nonag.<br>(0,0,1) for labor fully mobile, no wage gaps ag. versus nonag. | [15] | 1 |
| **INCOME** | | |
| $Y_h = (1 - \overline{t^D})[\sum_i VA_i - \sum_i \overline{t^I_i} P_i Q^S_i]$ | [16] | 1 |
| $Y_g = \overline{t^D}[\sum_i VA_i - \sum_i \overline{t^I_i} P_i Q^S_i] + \sum_i \overline{t^I_i} P_i Q^S_i + \sum_i \overline{t^M_i} E \overline{P^W}_i M_i + \sum_i \overline{t^X_i} P_i X_i$ | [17] | 1 |
| **HOUSEHOLD DEMAND** | | |
| utility maximization by the representative household<br>max $u(C_i)$ subject to $P_i C_i \leq (1 - \overline{s_h})Y_h$<br>implies<br>$C_i = C_i(P_i, (1 - \overline{s_h})Y_h)$<br>where $u(C_i) = CES(\sigma)$ and $\sigma$ is the elasticity of substitution | [18] | N–1* |
| **GOVERNMENT DEMAND** | | |
| $P_i G_i = \theta_{Gi}\, GDP$ | [19] | N |
| **AGGREGATE DEMAND AND SUPPLY** | | |
| $Q^D_i = C_i + G_i + I_i + v_i + X_i - M_i$ | [20] | N |
| $Q^D_i = Q^S_i$ | [21] | N |
| **FOREIGN TRADE** | | |
| $X_i = 0$, $P_i = (1 + \overline{t^M_i})E\,\overline{P^W}_i$ — for import goods—manufacturing<br>$M_i = 0$, $E\,\overline{P^W}_i = (1 + \overline{t^X_i})P_i$ — for export goods—livestock & arable<br>$X_i = 0$, $M_i = 0$ — for other goods—construction & services-other | [22] | 2N |

## TABLE 4
## COMPUTABLE GENERAL-EQUILIBRIUM MODEL (CONTINUED)

| Equation | Equation number | Number of equations |
|---|---|---|
| **SAVING, INVESTMENT AND EXTERNAL BALANCE** | | |
| $I_{ij} = \theta_{ij} \, I / P_j$ where $\sum_j \theta_{ij} = 1$ | [23] | $N^2$ |
| $I_j = \sum_i I_{ij}$ | [24] | N |
| $S_h = \overline{s_h} \, Y_h$ | [25] | 1 |
| $S_g = Y_g - \sum_i P_i G_i$ | [26] | 1 |
| $I = S_h + S_g + S_f$ | [27] | 0* |
| $\mu \, \Delta(I/GDP) + (1-\mu) \, \Delta S_f = 0$ <br> $\mu = 0$ when $S_f$ is fixed (exogenous current account) <br> $\mu = 1$ when (I/GDP) is fixed (endogenous current account) | [28] | 1 |
| $\sum_i \overline{P^W_i} X_i + S_f = \sum_i \overline{P^W_i} M_i$ | [29] | 1 |
| **PRICE INDICES** | | |
| $P^{GDP} = \sum_i P_i \overline{b^{GDP}_i} \, / \sum_i \overline{b^{GDP}_i}$ | [30] | 1 |
| $P^C = \sum_i P_i \overline{b^C_i} \, / \sum_i \overline{b^C_i}$ | [31] | 1 |
| $P^I = \sum_i P_i \overline{b^I_i} \, / \sum_i \overline{b^I_i}$ | [32] | 1 |
| $P^G = \sum_i P_i \overline{b^G_i} \, / \sum_i \overline{b^G_i}$ | [33] | 1 |
| **PRICE NORMALIZATION** | | |
| $E = 1$ | [34] | 1 |

* denotes number of independent equations given labor migration specification, Walras' law and the saving-investment identity. Number of endogenous variables: $2N^2 + NM + NK + 2NR + 10N + 2M + 15 = 164$.
Source: Taylor (1994a)

## TABLE 5
## MIGRATION IMPACT: COUNTERFACTUAL SIMULATION ANALYSIS

| | | A<br>Capital Fixed<br>Land Fixed | | B<br>Capital Free<br>Land Fixed | |
|---|---|---|---|---|---|
| | Benchmark | New | Change | New | Change |
| Labor supply | 72.30 | 50.60 | -30% | 50.61 | -30% |
| Share in ag. | 0.34 | 0.30 | -12% | 0.30 | -12% |
| Share in non-ag | 0.66 | 0.70 | 6% | 0.70 | 6% |
| Share in ARBL | 0.29 | 0.24 | -18% | 0.24 | -17% |
| Share in LSTK | 0.05 | 0.06 | 21% | 0.06 | 16% |
| Share in MFNG | 0.21 | 0.21 | 1% | 0.21 | 1% |
| Share in CNSTR | 0.07 | 0.08 | 8% | 0.08 | 7% |
| Share in SERV | 0.38 | 0.41 | 9% | 0.41 | 8% |
| | | | | | |
| GDP | 100.00 | 83.92 | -16% | 80.94 | -19% |
| Share in ag. | 0.40 | 0.42 | 5% | 0.41 | 4% |
| Share in non-ag | 0.60 | 0.58 | -3% | 0.59 | -2% |
| Share in ARBL | 0.18 | 0.14 | -19% | 0.15 | -17% |
| Share in LSTK | 0.22 | 0.27 | 24% | 0.26 | 20% |
| Share in MFNG | 0.14 | 0.12 | -12% | 0.12 | -11% |
| Share in CNSTR | 0.05 | 0.05 | -2% | 0.05 | -2% |
| Share in SERV | 0.41 | 0.41 | 0% | 0.42 | 0% |
| | | | | | |
| Exports of ARBL | 6.87 | 2.32 | -66% | 2.70 | -61% |
| Exports of LSTK | 18.64 | 20.62 | 11% | 19.11 | 3% |
| Imports of MFNG | 32.16 | 28.52 | -11% | 27.18 | -15% |
| | | | | | |
| Capital Stock | 32.64 | 32.64 | 0% | 28.79 | -12% |
| Rate of Return | 1.00 | 0.88 | -12% | 1.00 | 0% |
| | | | | | |
| Price of ARBL land | 1.00 | 0.68 | -32% | 0.68 | -32% |
| Price of LSTK land | 1.00 | 1.04 | 4% | 0.97 | -3% |
| | | | | | |
| Real wage | 0.56 | 0.70 | 25% | 0.68 | 21% |
| Real GDP per worker | 1.38 | 1.68 | 21% | 1.60 | 16% |

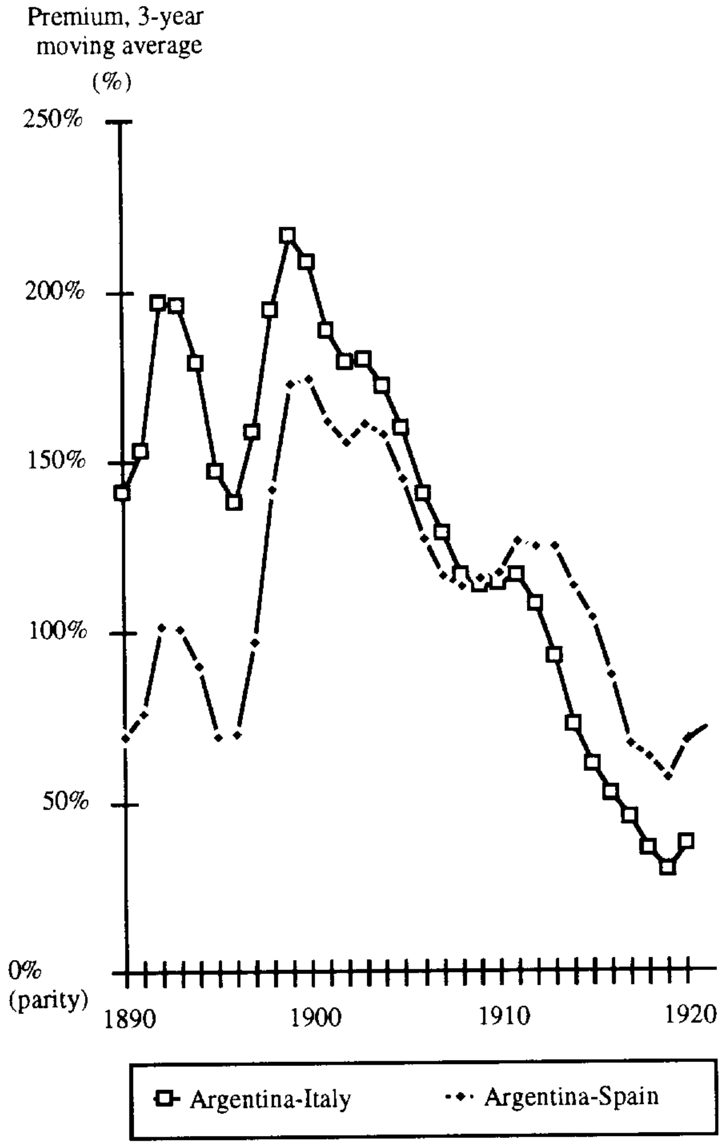
Notes: See text and appendix.

**FIGURE 1**
**SAM SCHEMATIC**

| | Expenditures | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| Receipts | Prod. | Goods | Factors | H.hold. | Govt. | Inv. | External | Totals |
| 1 Production | | Q-X | | | | | X | Q |
| 2 Goods | Dint | | | Cpriv | Cgov | I | | Qd |
| 3 Factors | NIfac | | | | | | | NIfac |
| 4 Household | | | NIhh | | | | | NIhh |
| 5 Government | Tind | Tm+Tx | | Tdir | | | | Egov |
| 6 Investment | | | | Spriv | Sgov | | Sfor | I |
| 7 External | | M | | | Dres | | | FX |
| Totals | Q | Qd | NIfac | NIhh | Egov | I | FX | |

<u>Source</u>: Taylor (1994d)

## FIGURE 2
## WAGE GAPS: ARGENTINA VERSUS ITALY AND SPAIN




Notes: Based on Williamson's (1995) database consisting of national real-wage indices and international real-wage benchmarks calculated using purchasing-power parities. The pre-1913 benchmarks are used throughout. The wage gap shown is the premium, defined as ($W_R/W_S - 1$), where $W_R$ is the wage in the receiving region, and $W_S$ is the wage in the sending region. Three-year moving averages are displayed.

Source: Following Taylor (1994c).

## APPENDIX TABLE A1
## MIGRATION AND POPULATION GROWTH: TIME SERIES

Time-series (OLS) estimates of Walker Effects and counterfactual population growth under zero net migration, annual data, 44 years, 1869–1914.

(a) Regression results:

$g1_t = 0.0296\ (15.12) + 0.163\ (1.83)$ Net migration rate $1_{t-1}$
$R^2 = .95$ DW=1.03 N=44

$g2_t = 0.0234\ (7.32) + 0.519\ (3.48)$ Net migration rate $2_{t-1}$
$R^2 = .89$ DW=1.04 N=44

(b) Counterfactual population in various years given previous periods of zero net migration:

| end YEAR | Counterfactual period with NETMIG=0 | POP (actual) | POP (CF1) | POP (CF2) | change in POP (CF1) | change in POP (CF2) |
|---|---|---|---|---|---|---|
| 1869 | none | 1830 | 1830 | 1830 | 0% | 0% |
| 1895 | 1869–95 | 3956 | 3953 | 3360 | 0% | -15% |
| 1914 | 1869–95 | 7885 | 7880 | 6697 | 0% | -15% |
| 1914 | 1895–1914 | 7885 | 6946 | 6167 | -12% | -22% |
| 1914 | 1869–1914 | 7885 | 6941 | 5238 | -12% | -34% |

Notes: See appendix. First regression and CF1 use Vázquez-Presedo's population series 1; second regression and CF2 use Vázquez-Presedo's population series 2.
Sources: Vázquez-Presedo (1971–76).

## APPENDIX TABLE A2
## MIGRATION AND POPULATION GROWTH: CROSS SECTION

Cross-section (OLS) estimates of Walker Effects and counterfactual population growth under zero net migration, 15 provinces, 1869–95 and 1895–1914.

(a) Regression results:

$g^{1869-1895}_i = 0.0101\ (4.61) + 0.000928\ (8.75)$ Foreign Share of Pop.$^{1895}_i$
$R^2 = .96$ N=15

$g^{1895-1914}_i = 0.0104\ (3.51) + 0.000863\ (6.51)$ Foreign Share of Pop.$^{1914}_i$
$R^2 = .95$ N=15

(b) Counterfactual population in various years given previous periods of "zero net migration" as defined in the appendix:

| end YEAR | NETMIG=0 | POP (actual) | POP (CF) | change in POP (CF) |
|---|---|---|---|---|
| 1869 | | 1729 | 1729 | 0% |
| 1895 | 1869–95 | 3846 | 2553 | -34% |
| 1914 | 1869–95 | 7547 | 5010 | -34% |
| 1914 | 1895–1914 | 7547 | 5888 | -22% |
| 1914 | 1869–1914 | 7547 | 3103 | -59% |

Notes: See appendix.
Sources: Vázquez-Presedo (1971–76).