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ARTÍCULO

HUMAN CAPITAL IN SOUTH LATIN AMERICA: THE RÍO DE LA PLATA REGION BETWEEN 1744 AND 1860

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Abstract:

Has the ability to quantify any influence in the formation of human capital? The aim of this paper is to discuss certain characteristics of the labour market in Latin America, specifically in the *Rio dela Plata* region. The study employed a large data set of census and population registers from Montevideo, Buenos Aires and the surrounding areas from 1744 to1858. Through the age-heaping technique and Armstrong's (1972) occupational taxonomy, I confirm that these societies wererelatively equal, holding medium and low positions in the labour market. Furthermore, the classification of the occupational categories in economic sectors confirms that the economic structure of these societies was established in the early colonial period. This paper contributes to the study of the educational inequality and the labour force capabilities from colonial times until the agricultural export boom.

Key words: Human capital, Numeracy, Labour market, Inequality, Río de la Plata, Latin America
JEL: I25, J21, J24, N36

Resumen:

La capacidad de contar ¿tiene alguna influencia en la formación de capital humano? El objetivo de este artículo es discutir sobre algunas características del mercado de trabajo en América Latina y especialmente en la región del Río de la Plata. Se utilizó un extenso conjunto de datos de censos y registros de población de Montevideo, Buenos Aires y alrededores entre los años 1744 y 1858. A partir de la metodología del *age-heaping* y la taxonomía ocupacional de Armstrong (1974) se pudo confirmar que estas sociedades son relativamente equitativas en los niveles medios y bajos de calificación del mercado de trabajo. Además la clasificación de las categorías ocupacionales en sectores económicos confirma que la estructura económica de estas sociedades ya estaba dada en el período de la colonia. Este artículo contribuye con el estudio de la inequidad en la educación y la calificación del capital humano desde el período colonial hasta el boom agro exportador.

Palabras clave: Capital humano, alfabetización numérica, Inequidad, Río de la Plata, América Latina

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1. INTRODUCTION

The economic disadvantage of Latin America lies at the heart of the economic history debate. Part of the literature argues that the economic gap began to emerge in the colonial period. Institutions, natural resources and geography are among the preferred explanations for this. Concepts such as "colonial heritage" or "path dependence" prevail in the discussion (North et al. 1999, Acemoglu et al. 2001, Acemoglu et al. 2002, Acemoglu and Robinson 2012, Bruhn and Gallego 2012). To examine this issue empirically, a large proportion of the research is devoted to the construction of economic and social indicators with the objective of comparing the performance of Latin America with that of developed countries. In this sense, the development of comparative economic history attempts to explain the lag of Latin Americain terms of trends (Coatsworth, 1998, Prados de la Escosura 2004, Prados de la Escosura 2005, Dobado 2009, Bértola and Ocampo 2010, Williamson 2010).

The construction of indicators for a pre-statistical period has many difficulties linked to the scarcity, heterogeneity and lack of precision of the sources. In this paper, I will approximate to one indicator of human capital formation (numeracy) to analyse the performance of the labour market in the Río de la Plata region from the colonial period until the agricultural exportation boom.

The formation of human capital (or lack of it) is one of the main explanations for Latin American disadvantage. Economic growth theories have emphasized the role of human capital in nation formation and it is seen as an essential factor for growth. One of the first drivers of the idea was Mokyr (1983), who analysed the human capital characteristics of Irish emigrants in 1840. According to this author, skill, experience, and professional training in trades and crafts were the primary forms of human capital (Mokyr 1983).

Growth theory has studied the role of human capital in the transition from a Malthusian regime to the modern era of economic growth, finding a positive relationship between population growth, technical change and living standards (Galor and Weil 2000). Given that the accumulation of human capital is a crucial factor in long-term economic growth theory, efforts have been made to strengthen the available empirical evidence. O'Rourke and Williamson (1997) were pioneers in this respect and they concluded that globalization has a great influence on comparative development. These authors consider that since schooling data disappeared in the period before modernization, proxies of literacy should be used, such as the ability to sign marriage certificates and legal documents or numeracy (O'Rourke and Williamson 1997).

Numeracy is considered by Crayen and Baten (2008) to be a good indicator of human capital as the ability to count is probably more important for economic growth than the ability to sign (Crayen and Baten 2008). Numeracy is linked to technological capabilities and is necessary for trade development in modern economies. Weber, Sombart and Schumpeter regard numeracy as the basis of modern capitalism (Crayen and Baten 2008).

The Western world experienced significant changes in the second half of the 18th century linked to the economic environment and general human life. Mortality was progressively reduced, life expectancy increased and a great part of the population became educated (Cervellati and Sunde 2005). In the Río de la Plata region economic conditions changed dramatically towards 1860: there was an expansion in the economy, a great increase in the population and a multiplication in inter-oceanic trade. This was linked to the first economic globalization, modernization and agricultural export boom in these regions. Furthermore, there was considerable diversification in occupational categories with the beginning of urbanization.

Following this introduction, in the remainder of the paper, I analyse the human capital characteristics of the lower Río de la Plata region for the period 1744–1858. In section 2, I describe some characteristics of the background in Latin America and review the main literature. In section 3, I present the data and methodology, describing the dataset and analysis of the sources in terms of the age-heaping technique and Armstrong's (1972) occupational taxonomy. In sections 4, 5 and 6, I present the main results: section 4 addresses qualification and skill levels; section 5 illustrates numeracy trends; section 6 concerns the determinants of numeracy. Finally, in section 7, I make final remarks and draw conclusions. All tables and figures are provided in the Appendices.

2. BRIEF HISTORY AND MAIN LITERATURE

2.1.HUMAN CAPITAL FORMATION IN LATIN AMERICA

As Bértola and Ocampo (2010) have pointed out, education and human capital are different concepts. *Education* is part of human capital development and the acquisition of certain capabilities; *human capital* is part of the production function and determines the competitiveness of an economy. In the first case, an educated population is necessary to amplify the capabilities of a society as a whole. The second case concerns an instrument to generate sustainable economies (Bértola and Ocampo 2010). In this paper, I analyse human capital as part of the performance of the economy on the basis of data linked to the labour market; however, I also make reference to education in the broad sense.

Most of the research related to the formation of human capital is devoted to the study of labour markets. Traditional research on human capital, labour markets and social structure in Latin America is based on the idea of an extremely hierarchical society, in which the main ways to climb the social pyramid were through marriage, inheritance and crown concessions. The colonial society model has often been assumed to be corporate or organic, differing from individualistic and competitive societies (Bethell 1990, Hoberman and Socolow 1992).

Bethell (1990) argues that Spanish Colonial America might be described as a society organized in terms of client relationships. Family ties and patronage were mixed with commercial links. The family was a vertical institution joined by three or four generations through marriage or *padrinazgo*. This kind of family could unify different social classes (Hoberman and Socolow, 1992). As a result, the mechanisms for entry into the labour market in these societies were different from those for capitalist societies. Salary relations were not as well defined as in capitalism. Family labour, many forms of indentured labour and slavery were the main sources of the workforce.

Part of the literature agrees that the poor level of education in Latin America is the main cause of the low-skilled nature of human capital. According to Rama and Tedesco (1979), the cultural and educational system of Latin America gave symbolic legitimacy to the differentiations contained in the social structure. The high and middle sectors, mainly rural and racially white, controlled the main information channels. Meanwhile, the rest of the population, living under different ethnic and linguistic conditions, was outside the channels in which knowledge was spread (Rama and Tedesco, 1979). Furthermore, some researchers argue that the form of education brought to America by the Europeans was hardly more than ornamental culture;literacy was generally unimportant and African slaves were not educated at all (Gomes, 1993).

Recent research has focused on human capital in the long term in Latin America. Taking into account the large databases of Latin America and developed countries, studies have found that inequality ineducation was higher in Latin America before the 20thcentury. 20thcentury globalization seems to have had positive effects by reducing educational inequality (Baten and Mumme, 2010). Regarding numeracy, they argue that Latin America was on a path of convergence with Western Europe during the early 18thcentury and there was stagnation of numeracy levels in the 19thcentury. Furthermore, they found that the differences between the countries increased in this period (Manzel, Baten and Stolz. 2011).

One point of agreement in the literature is the existence of a "colonial legacy" in Latin America, which might have had an influence on later development patterns. The qualification of the human resources is given as one of the fundamental causes of the late development. Among others, the literature has focused in differences in institutions and property rights. Better institutions provide secure property rights and less distorted policies invest more in physical and human capital to achieve better levels of income (North and Thomas 1973, Jones 1981, North 1981). Although path dependence is a factor common to all Latin American countries, part of the literature distinguishesbetween countries. All Latin American countries began with a relative abundance of land and resources, however, after the initial depopulation, there was a variation linked to their factor endowments. This contributed to substantial differences between them in the distribution of land, wealth and political power, in part caused by their natural resources; the Spanish colonies,such as Mexico or Peru, have been characterized since their early histories by extreme inequality. In these cases, the extensive native populations and the rich mineral resources encouraged the elite to promote extractive institutions.The result of this was a high concentration of land and extreme inequality (Engerman and Sokoloff 1994).

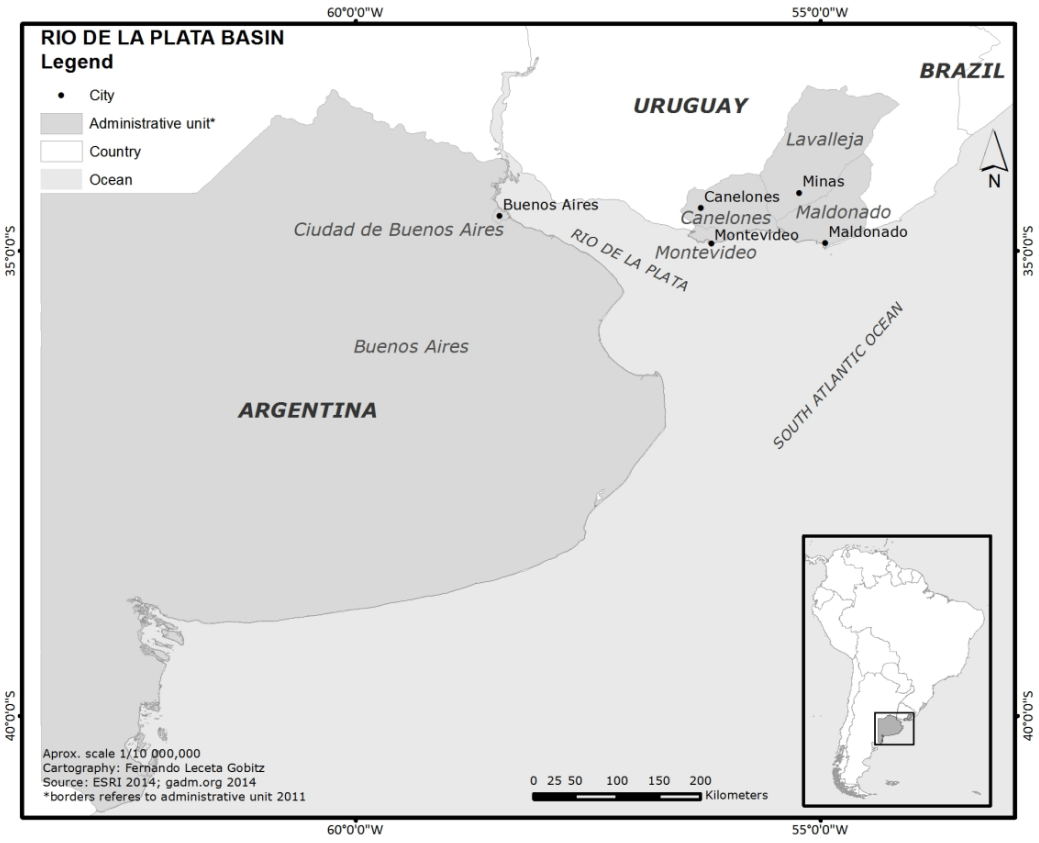
2.2. RÍO DE LA PLATA

The formation of human capital in Río de la Plata has been studied mainly from the point of view of certain characteristics of the labour market and linked to labour and social inequality. Traditional historiography has described the structural characteristics of society and class integration from a static point of view. This description is based on the occupational categories inserted into social strata and relations of dependence of the labour market. In most cases, there is an emphasis on the unequal distribution (generally of land) and the material relationships generated by this production mode (Reyes Abadie et al. 1966), inequality from the point of view of the social classes (Sala de Touron et al. 1967, Sala de Touron 1991) and the characteristics of social production relationships (Sala de Touron and Alonso Eloy 1991). More recent research hasfocused on income distribution (Bértola 2005, Bértola and Ocampo 2010, Gelman and Santilli 2010), the composition of the labour market (Cuesta 2006) and agrarian production (Garavaglia and Meléndez 1985, Moraes 2012).

The region of the *Litoral Platense* was part of a vast economic region of South America organized in about the 16thcentury around the silver production of the *Virreinato del Perú*. Although for most of the colonial period the *Litoral Platense* had a relatively marginal position in this macro-economic region, at the end of the 18thcentury the expansion of the economy and the population brought this region to the fore as a key aspect of political processes in the period1810-1830 until the agricultural exportation boom in the last quarter of the 19th century (Moraes 2012).

Regarding the geography of the region, Río de la Plata is the territory in which there is a confluence of the rivers which are part of the Río de la Plata estuary, which then flow into the Atlantic Ocean. According to Moraes (2012), it is possible to identify two sub regions of the Litoral Platense: in the north there was a missionary region organized in the 16th century around the Jesuit missions of Paraguay; in the south there was an Atlantic region structured around the ports of Montevideo and Buenos Aires.

Rio de la Plata Basin. Current geographical divisions



The colonization of the Río de la Plata region was late in comparison with the rest of Latin America. The land was relatively empty and the civilizations that inhabited this territory were nomadic (with the exception of the Jesuit missions in North Uruguay, South Brazil, Paraguay and North Corrientes, Argentina). After colonization, unlike the rest of Latin America, in Montevideo and Buenos Aires, the settlements were primarily represented by white people (the conquerors).

Real de Azúa (1984) pointed out that the colonial establishment of the region was late and weak. He argued that the frontier condition of Uruguayan society has not been emphasized sufficiently by historians. The frontier is an undefined territory in which intense horizontal mobility is usually clandestine or semi-clandestine due to the weakness of institutions and there are unstable and often contradictory property rights; in the case of Uruguay, all of this exerted a considerable influence on the historical course of the country. Linked to these factors, this was an area in which raids and forays took place, perpetrated by the Portuguese, Indian tribes, porters, pirates, etc. Furthermore, the lateness of the land distribution also meant that the settlement system was not at all precise (Real de Azúa 1984).

This late-coming, white European population made adifference in a number of ways in comparison with the histories of other countries in Latin America.[1] In the first place, the confrontation between the conqueror and the native settler was worst in those cases in which the civilizations were relatively developed. In those cases, the inequalities in terms of human capital and inequality were more pronounced. The kinds of natural resources present and the institutions generated to exploit them are the key reasons why the Río de la Plata region differed from the rest of Latin America in terms of equality (Engerman and Sokoloff 1994, Bruhn and Gallego, 2012).

3. METHODS

3.1.DATA

This paper is based on population data, drawn from census and population registers from Buenos Aires, Montevideo and the surrounding areas for the period 1744–1858. As the topic is the formation of human capital and the labour market, I restricted my data set to a specific part of the whole population, namely those aged between 23 and 72 years with an occupation. The first restriction (age) relates to the age-heaping technique. This method assumes a linear distribution of ages in each five-year age range, i.e. a continuous and linear decrease in the number of persons of each age within the age range considered. Low ages (0–23 years) and high ages (72 years and above), for which the linearity assumption is not plausible, are excluded from the calculation (Spoorenberg and Dutreuilh 2007). Furthermore, those ages included are representative of the active population.

The other condition (occupation) concerns the classification of skills according to Armstrong's (1972) occupational taxonomy with the objective of obtaining a skill premium ranking of the labour market. In accordance with this. I classified the occupational categories in terms of economic sector.

Some of the most important difficulties in coping with pre-statistical data are omissions in some parts of the registers, the incomplete registration of the inhabitants of homes and the lack of precision in declarations (specifically in the occupational categories). Furthermore, censuses were not always taken in the same places in the same years; thus,it was not possible to set up a database for the same cities and their surroundings in the same years. For this reason, I created benchmarks in order to have a time line across the period. The weak point of the database is the different number of records in each benchmark, which is likely to cause bias in the whole data set. Taking this and the restriction of the variables necessary for this study (age and occupation) into account. I collected a database for the whole period which is representative in terms of geographical regions. Although this sample is not representative in terms of population growth, I compared the registers collected with different estimations of the real population of the region. Regarding the data from Buenos Aires, I used Cuesta's (2006b) estimation; for the rest of the region, I used that of Pollero and Vicario (2006). These estimations are based on secondary sources (mainly population estimations of travellers) and census data already edited in diverse studies.

To cover the whole period, I selected as benchmarks certain years or periods for which sources were available. The benchmarks and related years are as follows:

Benchmark A:1744
Benchmark B:1771
Benchmark C:1769-1780
Benchmark D: 1823/1826
Benchmark E:1836
Benchmark F:1855-1858

These benchmarks were selected taking into account the conditions mentioned above, namely: i) information concerning occupation and age, and ii) information concerning urban and rural areas. In most cases, the sources were heterogeneous and the motivation for conducting the census was different (usually the collection of taxes or for military reasons). Each census was analysed individually but the results for the whole period are presented together. The number of registers for the whole period (all benchmarks) is 60,820.

For benchmark A (1744), I collected data for Buenos Aires and the surrounding countryside, comprisingthree populations recounted in the National Archive from Argentina: the first survey, "*Padrón de los habitantes de la ciudad*", was carried out by the city council and refers to 11 blocks of the city; the second was collected for military reasons; the last "*Padrón de los habitants de la campaña de Buenos Aires*", was also ordered by the city council and contains information onthe countryside surrounding Buenos Aires. All of these registers were edited in Ravignani (1955). The number of registers for the year 1744 is 3,190. To compare the number of registers with the real population for this year in Buenos Aires, I used Cuesta's (2006b) estimation of the population; the urban population for this year is estimated to have been 11,600, the rural population 6,033, and the total 17,633. On this basis, the registers that I obtained (3,190) represent 27% of the urban population and 18% of the total population of the province.

For the benchmark B, I collected data for Montevideo in 1769 and Maldonado in 1780. The census for Montevideo in 1769 was collected by Apolant (1965) and is a genealogical compilation of Montevideo city and some parts of the surrounding farms. This census was initiated by a Crown request with the intention of extending the jurisdiction of the city. For this reason,it is important to count the population to determine "the number of living people at present in the government of all grades, status and sex, including their servants, free persons and slaves"(Apolant 1965).The estimation of the population of Montevideo in 1760 is 2,189 for the entire jurisdiction and 1,475 for the city of Montevideo alone. I used Pollero and Vicario's (2009) estimation for 1760 to approximate (by extrapolation) the number of inhabitants in 1769. The result for 1769 is 2,241 inhabitants, hence 59% of the whole jurisdiction. As I do not have population estimates for Maldonado, I onlytake into account the representative data from Montevideo.

For benchmark C (1771), I collected data from Buenos Aires. This register was collated for military reasons (Ravignani 1955). For this period, the number of records is 24,638. The census is not well specified geographically, but judging by the quantity of data and the occupations listed, it can beassumed that it is a census of the city and large surrounding areas.The nearest population estimation for this year is 24,363 in 1778 for the city of Buenos Aires and 1,306 for the countryside (Vicario and Pollero 2009). As there is no estimate for 1771, I extrapolate from the intercensal rate calculated for this period (2.62 %). The result for city inhabitants is 20,207. The rest of the population (4,431) probably relates to a small part of the surrounding towns and villages.

For benchmark D, there is data from Montevideo in 1823 and Canelones in 1826. In this case, I can only evaluate the representativeness of the data for Montevideo, as unfortunately there are no population estimations for the rest of the towns close to Montevideo. In this census, only the household heads and their occupations are recorded; this is the kind of population census which only covers the population active in the labour market. For this year, the number of records is 2,150 from Montevideo City, which represents 17% of the total estimated population. Considering that the average family size is four people per household (Vicario 2010) and including no heads of households in order to not overestimate the data, the number of registered households would be 6,450, i.e. 33% of the 13,307 estimated for this year (Pollero and Vicario 2009). The data from Canelones (2,156) increases the representativeness of the data.

Benchmark E is based on data from Montevideo and many towns and villages nearby in 1836. This census was conducted for electoral reasons (Pollero 2001).Taking into account the city and the rest of the villages and farms, the total number of records for 1836 is 17,114; that is 74% of the estimated population of the province.[2]

Benchmark F is based on data from Buenos Aires in 1855, Minas in 1855 and Montevideo in 1858. Minas is a town close to Montevideo devoted mainly to livestock. For this benchmark, I have a sample of the population.[3] This census was conducted as training for the first National Census in 1860 and was probably linked to electoral reasons (Pollero 2001). The population estimate for Montevideo city in 1860 is 22,812 compared with the data in this study which give a figure of 12,393, representing 54% of the estimated population in 1860.The census of Buenos Aires in1855 was ordered in 1853, at the time when Buenos Aires was formally made an official province.[4] The provincial government created by decree the Department of Statistics, designed to develop these kinds of records. Census data have always been useful for governments, especially in periods of civil war in terms of knowing the number of potential participants in the conflict. In addition, census data have historically provided governments with the most accurate picture of the population they ruled. The census in 1854 was the first attempt to complete the picture of the population in Buenos Aires and the surrounding countryside (*campaña de Buenos Aires*). Since the record was highly criticized, in 1855 the head of the Department of Statistics (Juan de Bernabé) ordered a new population census (Massé 2009).The data collected for this paper are only a fraction of those collated for public buildings, such as different churches, public jails, hospitals and some migrant communities. Although not a census of the whole of Buenos Aires, the regions are well represented: every neighbourhood and census tract appears in this sample. The number of records is 2,219, only 2.4% of the estimated population. Although it is small compared with an entire census, these data are added to the last benchmark in order to have registers from Buenos Aires for this period.

3.2. ABCC INDEX

Quantification depends on numeracy, that is, the ability to count, keep records of counts and make rational calculations. The rise innumeracy can be considered a social process comprising two components. The first, its spread, is the way in which more people become numerate and acquire mathematical capabilities at any given level; hence, more people are able to perform any given numerical task. The second, its development, is the way in which individuals become numerate at higher levels and are thus able to engage in more complicated numerical calculations and representations. Numeracy can also be thought of as an outcome of the interaction between states and societies over time: as one side becomes more numerate, the other side reciprocates. A higher level of knowledge on the part of one party requires a higher level on the part of the other. For example, tax assessments and population statistics require the existence of numerical categories and the ability to record quantities within these. Once the official information is available, individuals make use of it in everyday life, thus spurring the need for more thorough information gathering (Emigh 2002).

Numeracy is also a significant indicator of human capital formation. In order to approximate this indicator, I applied age-heaping methodology.[5] The idea underlying this is that in pre-modern times, when census takers, army recruitment officers, or prison officials asked an individual his or her exact age, only a certain number of the people were able to do so. Depending on the level of numerical education, many of those registered tended to round their age up or down, for example to 40,when in fact they were 39 or 41 (Manzel et al. 2008). The approximation in age manifests itself in the "heaping" phenomenon. Individuals tended to choose an "attractive" number such as those ending in 5 or 0 (A'Hearn et al. 2009).

The quality of age reporting can be measured by means of age-heaping indices to detect the degree of preference for or avoidance of certain ages. Among standard indices (Bachi 1951, Myers 1976, Zelnik 1961),[6]the Whipple index is that most widely applied.[7] The original Whipple index is obtained by summing the number of people in the age range 23–62 (inclusive) and calculating the ratio of reported ages ending in 0 or 5 to one fifth of the total sample. As pointed out above (c.f. 3.1), the index assumes a linear distribution of ages in each range of five years, i.e. a continuous and linear decrease

in the number of persons of each age within the age range considered. Low ages (0–23 years) and high ages (72 years and above), for which the linearity assumption is not plausible, are excluded from the calculation (Spoorenberg and Dutreuilh 2007). Thus:

$$(1)\quad \mathrm{Wh} = \left(\frac{(\mathrm{Age25} + \mathrm{Age30} + \mathrm{Age35} + ...\mathrm{Age60})}{1/5 \times \mathrm{Age23} + \mathrm{Age24} + \mathrm{Age25} + ... + \mathrm{Age62}} \right) \times 100$$

For easier interpretation, A'Hearn et al. (2009) suggested another index: the ABCC index.[8] This is a simple linear transformation of the Whipple index and yields an estimate of the share of individuals who correctly report their age:

$$(2)\quad ABCC = \left(1 - \frac{(Wh - 100)}{400}\right) \times 100 \text{ if } Wh \geq 100 \text{ ; else } ABCC = 100$$

The index takes the values between 0 and 1. A value of 0 means total age-heaping whereas a value of 1 means no heaping at all.To visualize the evolution of the ABCC index by birth decades, I calculated the birth decade of each age group, taking into account the median age of the age group. For example, in the age group 23–32, I calculate the birth decade of those who are 27 years old. The figures of the ABCC index using Armstrong (1972)'s taxonomy are presented by birth decade and by half-birth decade and not by the year of the census.

An advantage of the age-heaping methodology is that age is a form of data more available than other human capital proxies, such as ability to write a signature or school attendance. In general, all population registers have age as one of the main data components. As Reis (2008) points out, age-heaping is a very basic measure of human capital. It is especially useful in the study of human capital development in Latin America during the 17th and 18th centuries, when more advanced human capital indicators were quite scarce and also in terms of offering insights into a broad spectrum of a given population rather than a limited one, i.e. that of the socioeconomic elite (Reis 2008).

Through the age-heaping technique, I approximate the human capital formation of the indivduals classified in different occupations. Age-heaping provides an approximation of the human capital formation a teach level of occupation of the labour market.

3.3. ARMSTRONG'S (1972) OCCUPATIONAL TAXONOMY

Armstrong's (1972) occupational taxonomy was primarily based on two factors: industrial groups (to trace the economic contours of society) and social ranking; in this paper, I analyse social ranking in relation to human capital. The taxonomy of social ranking was initially created to analyse a social class scale in England at the beginning of the Industrial Revolution. The society which existed in Western Europe prior to the Industrial Revolution was hierarchical in character. Pre-industrial society is generally viewed as a kind of pyramid, with the monarchy at the apex, then the peerage, the gentry, farmers, labourers and finally paupers (Armstrong 1972). The ranking was based on the occupations declared in the population census as this was generally the data available in early registers. The taxonomy consists of five groups ranked from unskilled to professional. The following table presents the main occupations that were coded according to these patterns.

Armstrong 's (1972) Occupational Taxonomy

1. Unskilled	Manual workers who usually do heavy unskilled work. Pawns (rural areas), labourers (urban areas).
2. Semi-skilled	Workers who have acquired some level of skill through formal training or experience, e.g.tradesmen's assistants, painters, etc.
3. Skilled	All qualified trades-people, usually after an apprenticeship or other formal training, and also "modern"tasks, such as drivers. Farmers, big owners –estancieros –(rural areas), small traders (urban areas);offices (carpenters, shoemakers).
4. Non-manual intermediate or semi-professional	Lower-level "white collar" (non-manual) workers, such as clerks, technicians, nurses, etc.;skilled workers in managerial positions or technicians. Council and crown employees, large-scaletraders and merchants.
5. Professionals	Those who possess upper secondary, college or university qualifications, or substantial training and superior status.

Source: Armstrong (1972)

Through this taxonomy it is possible to analyse the qualifications of the labour force. By combining the two methodologies (age-heaping and the taxonomy), it is possible to analyse the level of numeracy (mathematical skills) within the skills groups.

To reinforce the analysis, I include some regression models. The objective of applying these models is not to analyse all the determinants of human capital, but rather to approximate the significance of the variables and the relations among them.

4. LABOUR FORCE QUALIFICATIONS IN THE RÍO DE LA PLATA REGION

Figure 1 displays the distribution of the skills in the labour market for the whole period. In general terms, the figure suggests the same pattern: a strong presence of semi-skilled and semi-professional labourers (workers linked to the public administration and church, and small farmers), a very low proportion of professionals (doctors, lawyers) and the rest comprising the unskilled (labourers, pawns, seasonal labourers).The manual jobs represented by the artisans, tailors and shoemakers are underrepresented in this sample. The differences in each period represent the characteristics of each census and not the real evolution of skills. However, the figure suggests several aspects that have already been discussed in the literature.

Figure 1
Labor skill level. Lower Río de la Plata. 1744-1858 (%)

Sources: Buenos Aires 1744 Censo Militar. Documentos para la Historia Argentina. Montevideo 1769 Apolant, Ob. Cit, Buenos Aires 1771 Ravignani 1955. Maldonado 1780 AGN BA IX 20-4-3, Montevideo 1823 AGN 464, Canelones 1826 AGN 279, Censo de Montevideo 1836 AGN 146, Extramuros de Montevideo AGN 148, Extramuros de Montevideo AGN 465, Partido de Manga 1836 AGN 148, Padrón de Santa Lucía 1836 AGN 279, Padrón de las Piedras AGN 279, Padrón de Pando 1836 AGN 279, Padrón de Maldonado 1836 AGN 283, Padrón de Minas 1855 AGN 287, Padrón de Minas 1855 (urbano) AGN 287, Padrón de Montevideo 1858 AGN-AGA 267. Buenos Aires 1855.
* In this figure the slaves are not counted into the skill level for two reasons: in the first place the task of the slave is not declared, the slave is registered only as "slave"; in the second place there is a sub registration of the slaves in all the registers.

In the first place, it is a society, in which most of the people had basic skills, representing relatively equal medium-low qualifications. Since this is a society in expansion, it is expected to have occupations linked to public organization. There was arise in the "unskilled" category in the last two censuses, reaching almost 40%. That does not mean a structural change in the composition of skills, but it givesanidea of the increments in migration as pointed to by the literature (e.g. Reyes Abadie and Bruschera, Melogno1985; Sala de Touron and Alonso 1991; Sala de Touron and de la Torre and Rodríguez 1967).

In the second place, the small proportion of professionals shows the difficulty in achieving higher levels of education. Activities linked to professionals are mostly those related to the law (lawyer, notary), health (doctors) and education (school teachers), but they comprise scarcely 2% of the occupations. These activities are concentrated mostly in urban areas.

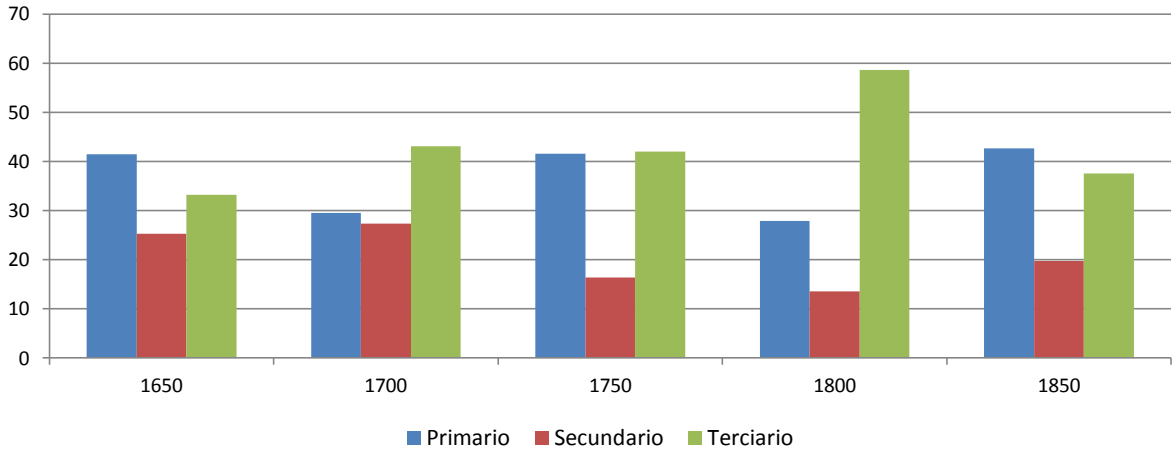
In the third place, there is a considerable difference in the registers in which a greater proportion of the urban population is counted (Montevideo and Maldonado 1769, Montevideo and Minas 1855/1858 and Buenos Aires 1855). In those registers there is an over representation of unskilled workers. Those workers are predominantly registered as "labourers" or just "workers". It is likely that this part of the labour force had no qualifications and was concentrated in the villages or cities where the economic opportunities would be higher.

In sum, the occupational structure according to Armstrong's (1972) taxonomy confirms that this society was not extremely differentiated in terms of qualifications, but that the qualification levels were low. In general terms, most of the labour force had some qualification which allowed these communities to develop small activities linked to trades in leather, wood, cattle and agriculture. Unskilled workers rarely exceeded 30% in the first censuses and reached the 40% in the last periods. Taking into account the imprecision of the declaration of occupation, possibly resulting in the omission of some skills when registered just as "labourer", the small proportion of the "unskilled" category contributes to reinforcing an image of thelabour market in which qualification was at the medium level, with a high proportion of semi-skilled workers and "white collar" workers.

This was a society with abundant natural resources which promoted full employment and the development of diverse activities. This was clearly an open and frontier society. Far from being segmented into a bulk of unskilled labourers and a few qualified people, this labour market was rather homogeneous, mainly in the low and medium levels of qualification. From the previous discussion, it can be assumed that the educational and social borders are not totally defined.

As a complementary measure, I classified occupations into economic sectors based on Cuesta (2006b). The analysis of economic structure is a relevant complement to qualification ranking and gives a more complete idea of the composition of the labour market. Figure 2 displays the information concerning the proportion of the population in each economic sector by birth decade.The primary sector is essentially composed of agrarian activities (farmers andlivestock, amongst others); the secondary sector is linked to manufactured goods (shoemakers, textilesand occupations linked to leather); the tertiary sector is linked to services, administration and education, amongst others.[9]

Figure 2
Economic sectors by birth decades. 1650-1850



Sources: Buenos Aires 1744 Censo Militar. Documentos para la Historia Argentina. Montevideo 1769 Apolant, Ob. Cit, Buenos Aires 1771 Ravignani 1955. Maldonado 1780 AGN BA IX 20-4-3, Montevideo 1823 AGN 464, Canelones 1826 AGN 279, Censo de Montevideo 1836 AGN 146, Extramuros de Montevideo AGN 148, Extramuros de Montevideo AGN 465, Partido de Manga 1836 AGN 148, Padrón de Santa Lucía 1836 AGN 279, Padrón de las Piedras AGN 279, Padrón de Pando 1836 AGN 279, Padrón de Maldonado 1836 AGN 283, Padrón de Minas 1855 AGN 287, Padrón de Minas 1855 (urbano) AGN 287, Padrón de Montevideo 1858 AGN-AGA 267. Buenos Aires 1855.

*This figure is presented in half-decades according to the year of birth.

In general terms, in all the periods, there is a prevalence of the primary and tertiary sectors. As pointed out above, this figure does not display the evolution of the economic structure for the whole period, but rather indicates the importance of these two sectors in all the censuses. Although from this figure it is not possible to approximate changes in the economic sectors overtime, it is possible to expect that the economic structure of this society remained consistent within particular periods of time. As Cuesta (2006b) points out for the case of Buenos Aires, the composition of the economic sectors in any given period does not result in major changes in the census analysed. The primary and secondary sectors have the lead in all the periods analysed. Hence, it could be argued that the basis for the occupational structure was already established in colonial times.

5. NUMERACY TRENDS

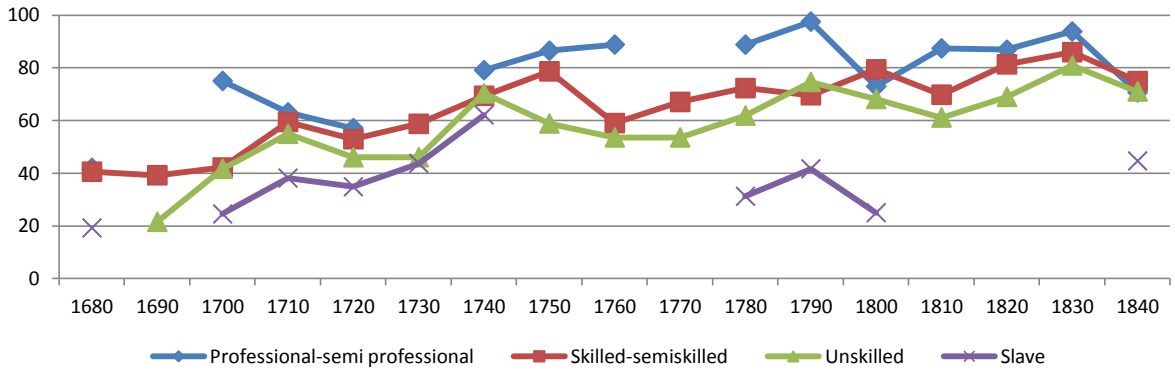
In this section, I combine the age-heaping technique with Armstrong's (1972) occupational taxonomy to analyse the formation of human capital at each level of qualification. I compare the ABCC index with the workers' skill level. Depending on the amount of data available, I constructed groups within taxonomy in order to visualize the different levels of qualification.

First, I analyse the data concerning the ABCC index and Armstrong's (1972) taxonomy by birth decade; second, I focus the discussion on the evolution of the ABCC index in time; finally, I run some regression models in order to estimate possible determinants of human capital formation. In the first part, I aim to highlight the relation between the ABCC index and the labour force qualification; the point here is to analyse the formation of human capital at each skill level. In the second part, I analyse the evolution of the index over time; one of the aims here is to visualize whether the mathematical

capabilities changed over time. Finally, with the logistic regression model, the aim is to analyse potential determinants of numeracy.

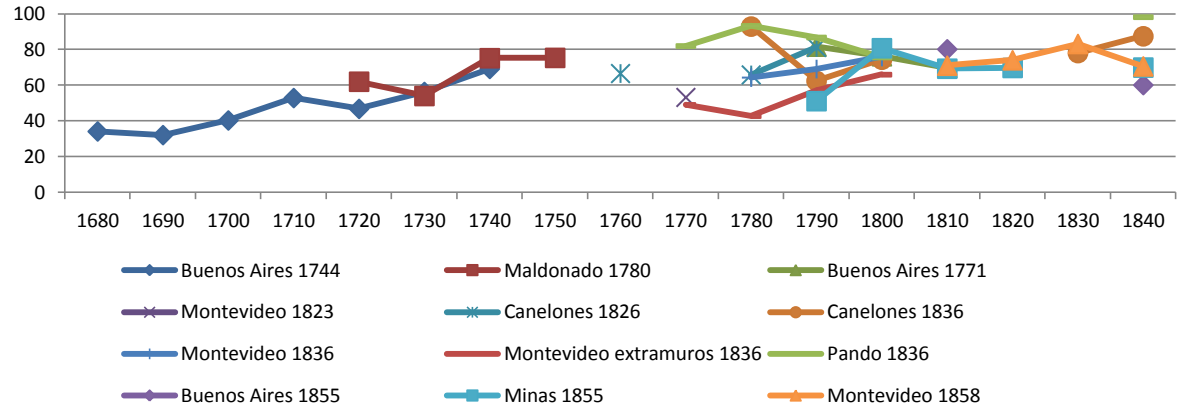
The results of the numeracy trends are displayed in Figures 3–5. Figure 3 displays the numeracy trends by skill premia. The categories "professional/semi-professional" and "skilled/semi-skilled" are in one category in order to improve the trend visualization. Although "slaves" are not part of the Armstrong ranking, I incorporated this separate category to compare the ABCC levels. The main difficulty with the slaves is that they were registered only as "slaves" and it is not possible to know what kinds of activity they carried out. However, as they were an important group in the labour market, I decided to integrate them.

Figure 3
ABCC per skill. 1680-1840



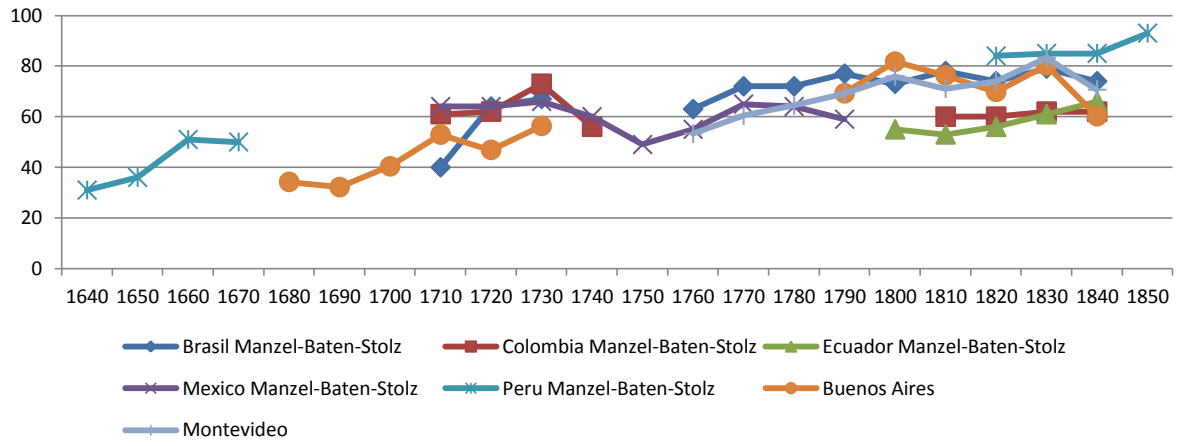
Sources: Buenos Aires 1744 Censo Militar. Documentos para la Historia Argentina. Montevideo 1769 Apolant, Ob. Cit, Buenos Aires 1771 Ravignani 1955. Maldonado 1780 AGN BA IX 20-4-3, Montevideo 1823 AGN 464, Canelones 1826 AGN 279, Censo de Montevideo 1836 AGN 146, Extramuros de Montevideo AGN 148, Extramuros de Montevideo AGN 465, Partido de Manga 1836 AGN 148, Padrón de Santa Lucía 1836 AGN 279, Padrón de las Piedras AGN 279, Padrón de Pando 1836 AGN 279, Padrón de Maldonado 1836 AGN 283, Padrón de Minas 1855 AGN 287, Padrón de Minas 1855 (urbano) AGN 287, Padrón de Montevideo 1858 AGN-AGA 267. Buenos Aires 1855.

Figure 4
ABCC region. 1680-1840



Sources: Buenos Aires 1744 Censo Militar. Documentos para la Historia Argentina. Montevideo 1769 Apolant, Ob. Cit, Buenos Aires 1771 Ravignani 1955. Maldonado 1780 AGN BA IX 20-4-3, Montevideo 1823 AGN 464, Canelones 1826 AGN 279, Censo de Montevideo 1836 AGN 146, Extramuros de Montevideo AGN 148, Extramuros de Montevideo AGN 465, Partido de Manga 1836 AGN 148, Padrón de Santa Lucía 1836 AGN 279, Padrón de las Piedras AGN 279, Padrón de Pando 1836 AGN 279, Padrón de Maldonado 1836 AGN 283, Padrón de Minas 1855 AGN 287, Padrón de Minas 1855 (urbano) AGN 287, Padrón de Montevideo 1858 AGN-AGA 267. Buenos Aires 1855.
* This figure is presented by birth decades.

Figure 5
ABCC compared. 1640-1850



Sources: Brasil, Ecuador, Perú, Colombia, México: Manzel, Baten and Stolz (2012). Montevideo 1769: Apolant (1965), Montevideo 1823 AGN 464, Censo de Montevideo 1836 AGN 146, Extramuros de Montevideo AGN 148, Extramuros de Montevideo AGN 465, Padrón de Montevideo 1858 AGN-AGA 267.
Buenos Aires: Buenos Aires 1744 Censo Militar. Ravignani, Documentos para la Historia Argentina, Buenos Aires 1771 Ravignani 1955, Censo del estado de Buenos Aires de 1855.

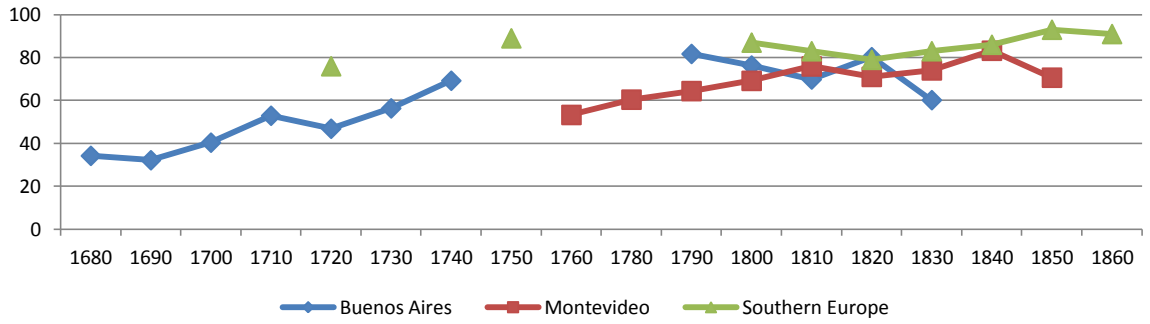
From these figures, it is possible to determine two key facts: first, in all the years and periods analysed, the unskilled workers have the lowest ABCC level (between 40% and 50%). As expected, those who are in the lowest and most unstable positions in the labour market are the least educated in terms of numeracy. The ABCC level of the slaves is between 20% and 40% (the lowest, as expected). The workers in the higher positions of the labour market have higher numeracy levels (between 70% and 90%); consequently, they probably had the possibility of attaining higher salaries. The categories "skilled/semi-skilled" have a considerable high numeracy levels for the period. These findings may seem obvious, but demonstrate that the idea that basic numerical education was important in achieving a better position in the labour market is robust.

Second, the index tends to improve over time and this fact is not related to skill premia. As expected, mathematical capabilities become more necessary over time. The end of the period shows the gap between the categories. Figure 4 displays the numeracy trends all the censuses analysed. In this figure, the difference between the regions is not significant with the exception of "*Montevideo extramuros*" that has the lowest ABCC level in the second half of the period. As previously, there is an increasing trend. At the beginning of the period, the ABCC index is around 40% and 60% and at the end of the period reaches 90% and 100%.In the last part of the period, all the regions tend to converge.

Figure 5 displays the numeracy trends for Montevideo and Buenos Aires in comparison with data from Brazil, Peru, Mexico, Ecuador and Colombia. As for Figure 4, Figure 5 shows an incremental increase in the numeracy levels in all regions. At the end of the period there is a lag for Ecuador and Colombia, but the rest converge in terms of ABCC levels at between 70% and 90%. This means that, independent of qualification, the ABCC index tends to improve over time. Apparently, education in numeracy became more important in the last decades of the period. Even though I cannot confirm that these were societies in which education was highly prevalent (compulsory primary education came later), it seems that to get a position in the labour market the worker needed at least basic numerical education.

Figure 6 displays the numeracy levels for Montevideo, Buenos Aires and Southern Europe. The trends for Buenos Aires and Montevideo start to increase around 1800; Southern Europe already had high ABCC values in this period relative to the Río de la Plata region. Hence, it is possible to confirm that Southern Europe reached higher levels of numeracy in early periods while Montevideo and Buenos Aires started to converge after gaining independence from Spain. However, the ABCC levels for Río de la Plata are lower than those for Europe over the whole period.

Figure 6
ABCC Buenos Aires, Montevideo, Southern Europe. 1680-1860



Sources: South Europe: Stolz, Baten and Reis (2009), Tollnek and Baten (2011).
Montevideo 1769: Apolant (1965), Montevideo 1823 AGN 464, Censo de Montevideo 1836 AGN 146, Extramuros de Montevideo AGN 148, Extramuros de Montevideo AGN 465, Padrón de Montevideo 1858 AGN-AGA 267. Buenos Aires: Buenos Aires 1744 Censo Militar. Ravignani, Documentos para la Historia Argentina, Buenos Aires 1771 Ravignani 1955, Censo del estado de Buenos Aires de 1855.
*Southern Europe in 1630 (1680) refers to the average value of Spain and Portugal in the period 1600-49 (1650-99), see Juif and Baten (2001).

6. DETERMINANTS OF NUMERACY

Tables 3 to 5 (Appendix 4) identify the possible determinants of the formation of human capital in the Río de la Plata region. As pointed out above (cf. Section 3.1), due to the limited availability of data, it is not possible here to run a complete model of human capital determinants; however, I identify a number of potential variables that could explain in part the numeracy levels of the population. These variables are as follows:

1. Qualification: I created dummy variables using Armstrong (1972)'s occupational taxonomy in order to analyse whether these categories are determinants of human capital formation.
2. Age group: I included the age groups created for the age-heaping estimates. I used only the 23–32 year cohort, because those in their twenties tended todisplay a different age-heaping pattern, similar to that of older persons, in that they tended to heap in multiples of five, but also they concentrated ages in multiples of two. Thus, a positive bias was expected relative to the group aged 33–72 years.
3. Farmer/merchant/slave: I created dummy variables for those occupations that are over represented in all the registers. I selected one linked to the urban areas (merchant) and another to the rural areas (farmer). I included the slaves and expected them to have a negative coefficient.
4. Economic sector: I included the economic sectors as dummy variables.
5. Manual/intellectual: I created two dummy categories for the manual workers and the intellectual workers based on the economic sectors.
6. Census years: I included the census years because the differences between them introduce biases in the data set.

The results of the regressions are reported in Tables 3–5. Table 3 displays the marginal effects of a logistic regression in which the dependent variable is 1 if the individual reported an age that was not a multiple of five and 0 otherwise. I run a logistic regression because the dependent variable is binary. The marginal effects were multiplied by 125, so that they could be interpreted as percentage changes in numeracy, taking into account the fact that 20% of ages would correctly end in 0 or 5.[10] The first two models include all the data from the registers and the last includes only the merchants, ranchers, farmers and slaves.

As expected, all Armstrong's (1972) categories are positive in relation to the unskilled workers. This means, for example, that the semi-professional workers were 14% more numerate than the unskilled workers. The semi-skilled workers also have a positive coefficient but lower (6%). I expected that the age cohort 23–32 would be more numerate than the rest of the groups. The results of the regressions confirm that, for example, the cohort aged 53–62 is 19% less numerate than the cohort aged 23–32. As

was pointed in the numeracy trends, mathematical abilities seem to improve with time. When the data set is restricted to ranchers, merchants, farmers and the slave population, the coefficient of the 53–62 cohort is even higher (almost 22%).

Column 3 (table 3) displays the result of the logistic regression with the population restricted as previously described. The reference categories in this case are ranchers and the 23–32 age group. As expected, the slaves are almost 30% less numerate than the ranchers. The categories of merchants and farmers are also negative but not significantly so. [11]

Table 4 displays the marginal effects of a logistic regression linked to the main economic sectors. The reference categories in this case are the primary sector (linked to basic productivity activities) and the 23–32 age group. I had no prior hypothesis concerning the behaviour of coefficients in this case because economic sectors include the population in manner different from qualification ranking. However, as already pointed out, the analysis of the economic sectors is complementary to previous analyses. In the first column of Table 2 are the economic sectors; in the second column I also include the age groups. The tertiary sector seems to be almost 10% more numerate than the primary sector. When age groups are included, this coefficient remains. The tertiary sector includes all the workers linked to professional activities and public positions, thus explaining the higher numeracy levels. The secondary sector is more numerate than the first but with a lower coefficient (5%). As in Table 3, in this regression the age group 23–32 seems to have better numeracy.[12]

Table 5 displays the marginal effects of the logistic regression linked to the kind of job, i.e. manual and intellectual. In this table, I included data on the census and year. As expected, intellectual jobs demonstrate approximately 10% higher numeracy than manual jobs; however, my previous hypothesis concerning this coefficient was even higher. In reference to the census, I established as a control category the census of Buenos Aires in 1771 as it has high geographical and occupational coverage. As I expected, the last census for Montevideo and Buenos Aires (1858) and Minas (1855) showed higher numeracy levels (around 19%). This confirms the statement that numeracy improves with time. [13]

7. CONCLUSIONS

I have analysed the formation of human capital for the Río de la Plata region, taking into account the qualification of the workers and the distribution of the economic sectors. I approximated human capital through the mathematical capabilities given by the declaration of age. Through the data analysis, I have arrived at the following main conclusions:

1. This was a relatively homogeneous society in terms of labour force qualifications: few workers had no skills at all. However, the occupational distribution showed greater representation in the lower and medium qualification positions. Although the majority of the labour force had a skill, i.e. they were trained in traditional handmade work (linked to leather) or in land management (farmers, ranchers, etc.), the jobs linked to more elevated educational achievement were highly restricted to a small part of the population. This means that although there were no significant inequalities in terms of occupational category in this society, but the less-qualified positions predominated. At the same time, this structure remained constant over the whole period, although at the end there were more professional and semi-professional workers and the structure became more diversified. This was an open and frontier society in which the labour force was scarce and the land was abundant. The opportunity to engage in the labour market was almost equal for the major part of the active population.
2. The distribution of the economic sectors shows that the primary and tertiary sectors were those most represented in all the periods analysed. Although it is not possible to analyse the evolution of economic sectors in a period of time, the high presence of the primary and tertiary sectors over the period suggests that the occupational basis of these societies derived from early colonial times. This conclusion is in accord with Cuesta (2006a) findings concerning Buenos Aires.
3. The ABCC index shows that the workers classified in the lowest and most unstable positions in the labour market were the least educated in terms of numeracy. The workers in higher positions of the labour market had higher numeracy levels. In the same line, the slaves had

the lowest numeracy levels even compared with the unskilled workers. This means that mathematical capabilities seem to explain –at least partially– the position achieved in the labour market.

4. The numeracy levels show a growing trend for the whole period. This means that the people registered in censuses close to 1860 declared their age more accurately than those registered in 1744. Independently of occupational category and qualifications, the tendency to heap ages became lower overtime. This trend can be interpreted taking into account the differences between society in 1744 and close to 1860: in 1744, the mechanisms for attaining the highest positions in the labour market were not linked to numeracy to any great extent, whereas by 1860, numerical education mattered. There is no doubt that numeracy and literacy levels are crucial for professional development, but the capabilities required to attain better positions in the labour market were not the same for the whole period. Apparently, mathematical education and human capital training became more important over time. Meanwhile, in 1744, education and literacy were a privilege for a few people; at the end of this period these were extended to a larger part of the population. The reasons are probably the recognition that education is crucial to obtain higher developmental levels in a specific activity. Furthermore, the raise of the mathematical capabilities of the population around the 1860s is related with the insertion of the *Río de la Plata* economy to the international market through the exportation of meat and derivatives. This fact forced to adopt and promote the metric system and to know how to operate with currency. This also coincides with the expansion of the population, which is reflected in increasing urbanization, services and general commercial activities. During this period, the *Río de la Plata* region was a central territory in one of the areas with the highest population growth in Latin America. This was accentuated in the 1860s with economic modernization.
5. Remarkable are the differences between the numeracy trends of Montevideo and Buenos Aires and other countries of Latin America (especially Ecuador and Colombia). This fact may explain the current differences in the economic path of the Latin American countries since the basements of the human capital formation were given before the colonization.
6. Even though it is not possible to confirmthat these societies were equal in terms of human capital formation, some facts might explain the relative advantage of Río de la Plata in terms of equity and development in comparison with other countries of Latin America: the relative homogeneity of the formation of human capital, the relatively small size of the population and the way in which the institutions were implemented (as pointed out by the literature); together, these factors did not allow the powerful consolidation of major social differences as in another Latin American societies.

NOTES

1 "White" and "European" primarily represents the populations of Montevideo and Buenos Aires. In other parts of the territory the settlement was different.

2 1836 was the first census after independence, which is why instead of "jurisdiction" I refer to "provinces".

3 In the Minas census, one in three homes was selected in the urban areas and one in four in the rural areas. In the case of Montevideo, one in ten homes was selected in the old city and one in three in the new city, always taking into account the total number of homes in both cases. A more detailed explanation is provided in Pollero (2001) "Familia y fecundidad en el Uruguay. La inmigración en la conformación de la familia uruguaya. 1850-1908" Tesis de maestría en estudios migratorios. Facultad de Humanidades y Ciencias de la Educación. Montevideo.

4 The first National census in Argentina was in 1869.

5 For more detailed surveys on the age-heaping methodology, see A'Hearn et al. (2009).

6 The methods used to calculate these indices are in Shyrock and Siegel (1976: 115–119).

7 A'Hearn et al. (2009) argue that this is the only index that fulfills the desired properties of scale independence (a linear response to the degree of heaping) and that it offers a reliable ranking of samples among which the degree of heaping varies.

8 The name results from the initials of the authors' last names plus Greg Clark's, who suggested this in a comment on their paper. Whipple indices below 100 are normally caused by random variation of birth rates in the 20th century rich countries. They do not carry important information; hence they are normally set to 100 in the ABCC index.

9 A detailed explanation of this taxonomy is provided in Cuesta (2006b), "Evolución de la población y estructura social de Buenos Aires 1700-1810", Papeles de Población, vol. 12 N°49, Universidad Autónoma de México.

10 A detailed explanation of this is provided in Crayen and Baten (2009) "Global trends in numeracy 1820-1949 and its implications for long term growth, Explorations in Economic History. http://www.journals.elsevier.com/explorations-in-economic-history

11 Model 3 has the highest pseudo R2 (0,037), hence is the model that predicts better the outcome. However the number of observations is smaller.

12 Model 2 has the highest pseudo R2 (0,012). It is the better model to explain the determinants of numeracy

13 Model 2 has the highest pseudo R2 (0,012), hence is the better model to predict the outcome.

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APPENDIX

DATA DESCRIPTION

Table 1. Sources

Year	Book	Region	Original data	Total registers
1744	Militarycensus. Documentos para la Historia Argentina. Vol 10	Buenos Aires	Age, birthplace, occupation, race	3.190
1769	Edited by Apolant 1967	Montevideo	Geographical location, name, marital status, ethnicity, age, occupation, animals	2.528
1771	EditedbyRavignani 1955	Buenos Aires	Age, occupation marital status, race	24.638
1780	AGN BA IX 20-4-3	Maldonado	Name, age, occupation	3.223
1823	AGN 464	Montevideo	Name, age, marital status, birthplace, race, class, occupation	2.156
1826	AGN 279	Canelones	Geographical identification, name, age, marital status, birthplace, race, occupation	2.205
1836	AGN 146	Montevideo	Geographical identification, name, age, birthplace, marital status, occupation, children, dependents, slaves, colons, servants, aggregates.	5.690
1836	AGN 148	Montevideo	Geographical identification, name, age, birthplace, marital status, occupation, children, dependents, slaves, colons, servants, aggregates.	2.870
1836	AGN 465	Montevideo (extramuros)	Name, age, birthplace, marital status, occupation, children, dependents, slaves, colons, servants, aggregates.	1.971
1836	AGN 148	Montevideo (extramuros)	Name, age, birthplace, marital status, occupation, race	523
1836	AGN 279	Canelones (Santa Lucía)	Name, age, birthplace, marital status, occupation, race.	585
1836	AGN 279	Canelones (Las Piedras)	Geographical identification, name, age, birthplace, marital status, occupation, observations	1.225
1836	AGN 279	Canelones (Pando)	Name, age, birthplace, marital status, occupation, class	3.126
1836	AGN 283	Maldonado	Location, name, age, birthplace, class, marital status, occupation.	1.124
1855	AGN 287	Minas (rural)	Geographical identification, individual number, name, color, age, birthplace, marital status, occupation, health status	1.185
1855	AGN 287	Minas (urbano)	Geographical identification, individual number, name, color, age, birthplace, marital status, occupation, health status	632
1858	AGN 288	Montevideo	Geographical location, name, age, birthplace, occupation.	1.730
1858		Buenos Aires	Geographical location, name, age, occupation	2.219
Total				**60.820**

Table 2. ABCC per skill

Census year	Armstrong	ABCC	N
1744	Professional	53	118
1744	Semi-professional	76	301
1744	Semi-skilled	50	356
1744	Skilled	43	632
1744	Slave	27	177
1744	Unskilled	39	191
1771	Professional	46	825
1771	Semi-professional	66	346
1771	Semi-skilled	57	1458
1771	Skilled	57	901
1771	Slave	46	3909
1771	Unskilled	59	347
1780	Professional	92	233
1780	Semi-professional	79	214
1780	Semi-skilled	82	347
1780	Skilled	64	905
1780	Unskilled	51	452
1823	Professional	78	598
1823	Semi-professional	73	522
1823	Semi-skilled	61	859
1823	Skilled	56	463
1823	Unskilled	53	264
1826	Semi-professional	67	498
1826	Semi-skilled	73	30
1826	Skilled	81	398
1826	Unskilled	72	678
1836	Semi-professional	72	151
1836	Semi-skilled	79	113
1836	Skilled	78	1268
1836	Slave	20	151
1836	Unskilled	66	274
1855	Professional	110	183
1855	Semi-professional	89	182
1855	Semi-skilled	73	806
1855	Skilled	75	1066
1855	Unskilled	69	724
1858	Professional	64	30
1858	Semi-professional	74	197
1858	Semi-skilled	80	235
1858	Skilled	86	135
1858	Unskilled	67	163

REGRESSIONS

Table 3. Determinants of Numeracy (as percentages).

	(1)	(2)	(3)
Dependent variable	Numerate	Numerate	Numerate
Estimation technique	Logit (mfx)	Logit (mfx)	Logit (mfx)
Data included	All	All	Only merchant, ranchers, farmers, slaves
professional	10.2125**	12.9625***	
	(0.05)	(0.01)	
Semi-professional	14.9625***	16,1875***	
	(0.00)	(0.00)	
Skilled	8.7625***	10,9375***	
	(0.00)	(0.00)	
Semi-skilled	6.7125***	7,275***	
	(0.00)	(0.00)	
age 33-42		-11,2875***	-14.15***
		(0.00)	(0.00)
age 43-52		-17.4375***	-17.3***
		(0.00)	(0.00)
age 53-62		-18.925***	-21.7***
		(0.00)	(0.00
age 63-72		-7.3625***	-16.1***
		(0.00)	(0.00)
Farmer			-2.237
			(0.46)
Merchant			-1.962
			(0.58)
Slave			-29.0875***
			(0.00)
Observations	24.162	24.162	5.342
Pseudo R-squared	0.0035	0.014	0.037

Note: P-values in parenthesis *** p<0.01, ** p<0.05, * p<0.1
Model 1. Constant refers to Unskilled
Model 2. Constant refers to Unskilled and age group 23-32
Model 3. Constant refers to Ranchers and age group 23-32

I scaled the coefficients of all independent variables up by 125, for a more convenient interpretation of changes in numeracy . See Juif and Baten (2011) Appendix C for the details.

Table 4.Determinants of Numeracy. Economic sectors.

	(1)	(2)
Dependent variable	Numerate	Numerate
Estimation technique	Logit (mfx)	Logit (mfx)
Data included	All	All
Secundary	5.2***	5.775***
	(0.00)	(0.00)
Tertiary	9.875***	9.575***
	(0.00)	(0.00)
Age 33-42		-10.85***
		(0.00)
Age 43-52		-16.4375***
		(0.00)
Age 53-62		-17.625***
		(0.00)
Observations	24.162	23.393
Pseudo R-squared	0.0024	0.012

Note: P-values in parenthesis *** p<0.01, ** p<0.05, * p<0.1
Model 1. Constant refers to Primary sector
Model 2. Constant refers to Primary sector and 23-32 age group
I scaled the coefficients of all independent variables up by 125, for a more convenient interpretation of changes in numeracy . See Juif and Baten (2011) Appendix C for the details.

Table 5.Determinants of Numeracy. Manual and intellectual jobs

	(1)	(2)
Dependent variable	Numerate	Numerate
Estimation technique	Logit (mfx)	Logit (mfx)
Data included	All	All
intelectual	9.875***	9.875***
	(0.00)	(0.00)
_Iyear_1780		13.875***
		(0.00)
_Iyear_1823		4.05***
		(0.00)
_Iyear_1826		16.425***
		(0.00)
_Iyear_1836		16.75***
		(0.00)
_Iyear_1855		17.775***
		(0.00
_Iyear_1858		18.975***
		(0.00)
Observations	24.162	24.162
Pseudo R-squared	0.0012	0.012

Note: P-values in parenthesis *** p<0.01, ** p<0.05, * p<0.1
Model 1. Constant refers to manual job
Model 2 Constant refers to manual job and Census Buenos Aires 1771
I scaled the coefficients of all independent variables up by 125, for a more convenient interpretation of changes in numeracy. See Juif and Baten (2011) Appendix C for the details.