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*Juan Carlos Rojo Cagigal and Stefan Houpt*

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## Introduction

This paper examines interwar-period living conditions in northern Spain during late industrialization. We concentrate on one of Spain's emerging industrial areas during the last 22 years of its sixty year industrialization. The high incidence of price shocks and real income fluctuations over this period make it an ideal test bench for contrasting family fragility and living conditions.

A first distinction to previous studies on living conditions is the use of high frequency data. We have collected monthly data on vital events together with basic food prices and housing and heating costs from the bulletin published by Bilbao municipal statistics office. These series are used to calculate a family consumption bundle. The family expenses are complemented with detailed worker incomes for the major employer in Bilbao taken from their monthly cost accounting and administrative records. That includes both money wages and all extra pay, such as piece rate premiums and overtime pay. Combining both we have a very good approximation to real average family incomes, both for skilled and unskilled workers. Real incomes are then put into perspective with socio-economic and demographic indicators which reflect economic strife —overall mortality, infant mortality, 1-5 year child mortality, pawns and child abandoning— in an effort to decipher urban families' reactions and exposure to short-term economic fluctuations[1].

Family fragility or vital event sensitivity to exogenous shocks has evolved as a new way of measuring material well-being over the last decades. The pioneering work of Lee (1981) opened new frontiers for examining how vital statistics react to short-term economic stress[2]. Bengtsson and Dribe (2005) is a recent example of studying the effect of short run economic variations on a population in economic and structural transition and the deprivation this caused[3]. We apply a similar approach, in conjunction with other more standard contrasts.

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1 Recent research supplies a number of econometric models to choose from. VAR models: Nicolini (2007), Bengtsson and Broström (1997) comparing distributed lag and VAR, Fernihough (2010) also using State Space (repeated application of Kalman filter methods, Rathke and Sarferaz (2010) use a time-varying VAR. For distributed lag see Lee (1981), Bengtsson (1984), Weir (1984), Richards (1984), Hammel (1984), Galloway (1985, 1988, 1993), Palloni et al. (1996) and Kelly and Ó Gráda (2010). For simplicity and ease of interpretation we will use both the VAR approach and distributed lag regression in this paper.

2 See Bailey and Chambers (1993), Eckstein *et al.* (1986), Galloway (1985) and (1988), Hagnell (1991), Hammel (1984), Lee (1985, 1990 and 1993), Lee and Anderson (2002), Palloni *et al.* (1996), Richards (1983) and (1984).

3 We were inspired by the similarity of their findings: There was a strong impact of short-term economic stress on the mortality among the landless during agricultural transformation. The effect was stronger on parents than their children, and particularly high for girls. "Excess mortality resulted from infectious disease, airbourne and waterbourne, though not always from the same disease. Thus, we find no evidence that a single disease was spread in bad harvest years but rather that they died of any common disease due to low resistance, which implied they were malnourished. Mortality typically increased in the spring after a fall with increasing food prices. The rapid response implies that their resistance was low. Another indication of low resistance is that not just very high prices but also moderately high prices affected mortality, while mortality did not decline much in years of low prices (downward sticky). Evidently many among the landless lived close to the margin. Remedial measures taken at individual, household, or societal level failed for this group. We believe the mortality response to be more pronounced for children above age one and for adults in the working age group. Infants seem to be more dependent on breast-feeding practices, and the elderly on their investments and sustained relationships and agreements." Bengtsson and Dribe (2005: 358).

By using the high frequency data set in this very turbulent inter-war period, we seek to make two contributions to the debate on family living conditions during industrialization. Following Bengtsson and Dribe (2005), we introduce and examine the idea of nutritional energy balance, relating real income and energy requirements. On the other hand, we propose a different approach at contrasting the evolution of living conditions. We examine how families responded to economic shocks, i.e. we "measure the[ir] standard of living by the ability to overcome short-term economic stress. If one cannot fulfil one's long-term plans —to survive, to marry, and to have children— in the face of acute short-term changes in the environment, one can be said to have a rather low level standard of living. By short-term economic stress we mean variations in income or the cost of living, particularly in food prices, from one year to the next or even in shorter time spans"[4].

Our story of late industrialization in the European periphery shows certain similarities, but is somewhat different from the more extensively studied cases of living conditions during industrialization. We have contradicting evidence on how living standards evolved. On one hand we find no indication of rising real incomes, but at the same time there are strong downward trends in overall mortality rates. Our empirical results strongly support the hypothesis that increases in life expectancy were more related to public health measures than significant nutritional improvements. Given the contradiction in real income and mortality trends, we have considered a different approach to well-being. We examined how the nutritional balance within families responded to economic shocks. The results suggest that family incomes were probably sufficient to meet nutritional requirements under the antebellum economic stability, but low enough to react strongly to the short-term economic shocks of the interwar period in terms of deprivation, disease and death. Our analysis hereby reveals the fragility of breadwinner families' incomes even during late industrialization.

The article begins by describing the setting of our research. This includes generating family income series and putting them into perspective with the cost of living. We then go on to combine the real income discussed with vital and social events for this same population in a first effort to identify economic distress and the relations that exist between the described variables. We move on to the statistical examination of the impact of short-term economic stress on vital events and social indicators of deprivation. In this section we start off with a VAR exercise which imposes no functional relation between the variables and allows them to 'speak for themselves'. Once we have established the relation between short-term economic shocks and mortality, we analyse the timing and strategies surrounding families' relative deprivation in a distributed lag regression framework which allows us to identify the echo effects of shocks. We add infant mortality, child mortality, pawning and child abandonment to contrast family decisions and the coherence of deprivation, disease and death in the context of steadily falling mortality. We end our exposition by summarizing our findings and emphasising the issues they raise.

[4] Bengtsson and Dribe (2005: 350).

**Time and place**

This paper takes a first step at reviewing the evolution of family living standards during Spanish industrialization. We focus on an industrial enclave in northern Spain, the area surrounding the Bilbao estuary. Bilbao was an emerging industrial centre in Spain from the latter decades of the 19th century. Its initial momentum came from iron ore exports to Great Britain, Germany, Belgium and France. It went on to establish an important iron and steel industry and diversified into downstream activities such as shipbuilding, machine building, railroad equipment, mechanical engineering and other capital goods industries[5]. Immigration into the industrial centre had been intense during the mining boom and had drawn agricultural labour from beyond the immediate *hinterland,* the surrounding provinces, very much like other northern European industrial regions had in the nineteenth century.[6] A large amount of the early capital for infrastructures had been made available by British interests and further capital for industrial take-off was added by reinvested direct and indirect mining profits, but foremost by local and national investors.[7] Global economy and the pickup in Spanish economic growth in the early twentieth century provided the markets and factors for rapid growth.

We may add that what makes the Bilbao estuary an interesting natural experiment for understanding the process of industrialisation and its impact on standards of living is its speed and scale[8]. Together with Catalonia, Biscay was a forerunner and would be the only other province on the Iberian Peninsula where the percentage of labour employed in agriculture was less than 50 % before the end of the nineteenth century. Biscay had gained higher access to Spanish markets in 1829 when customs were shifted from it borders with the rest of Spain to its coast, i.e. it became part of the Spanish common market. The 1869 liberalization of mining and commerce opened its vast iron ore resources to international markets and foreign investors, such as Great Britain, Belgium, France and Germany. Trade with European iron and steel centres established the bridges for the transfer of technical equipment and skills[9]. Not to mention that it provided markets, competition and the high quality coal needed to transform Bilbao into the iron and steel centre of Spain. Between 1876 and 1936 the Bilbao region developed from a major iron ore mining district on to the most important centre of heavy industry.

Whereas living conditions improved substantially over the late nineteenth and early twentieth century, Spanish historiography has sought to find slower improvement in standards of living over the interwar period as one of the causes or aggravating circumstance that led to the Spanish Civil War[10]. More recent Spanish research sustains the view that material conditions and equality in

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5 See Harrison (1978).

6 For a detailed study on immigration to Bilbao see González Portilla (2001: Vol. I, 165-284) and García Abad (2005).

7 See Flinn (1952 and 1955) and Valdaliso (1993).

8 Both will increase the intensity of the relations between disruption, deprivation, disease and death. Szreter (1997).

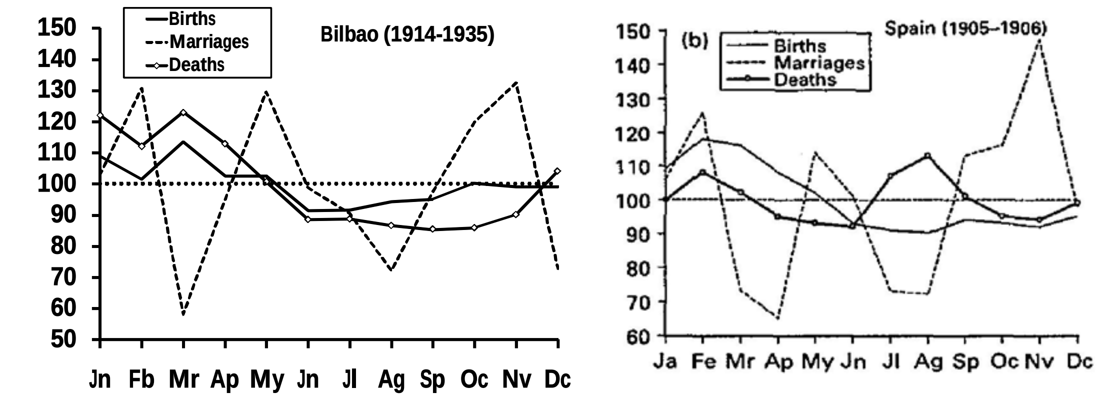
9 Pérez Castroviejo (1992: 168-174) and Houpt and Rojo Cagigal (2006).

10 Tuñon de Lara (1972: 564, 756 and 824) finds that real wages decreased by more than 21 % in iron and steel during WWI up to 1920, they went on to increase by 12% by 1925, and remained constant up to 1930 and then on to 1936. For differing views see Olabarri (1978: 502), who calculates real wages decreasing 4-8 % from 1914 to 1920, situating it 12-17 points above the 1914 level by 1925 and reaching an over 40 point increase by 1930. More recently Escudero and Pérez Castroviejo (2010: 533-34) have calculated a 40 point increase of real wages for miners in Biscay

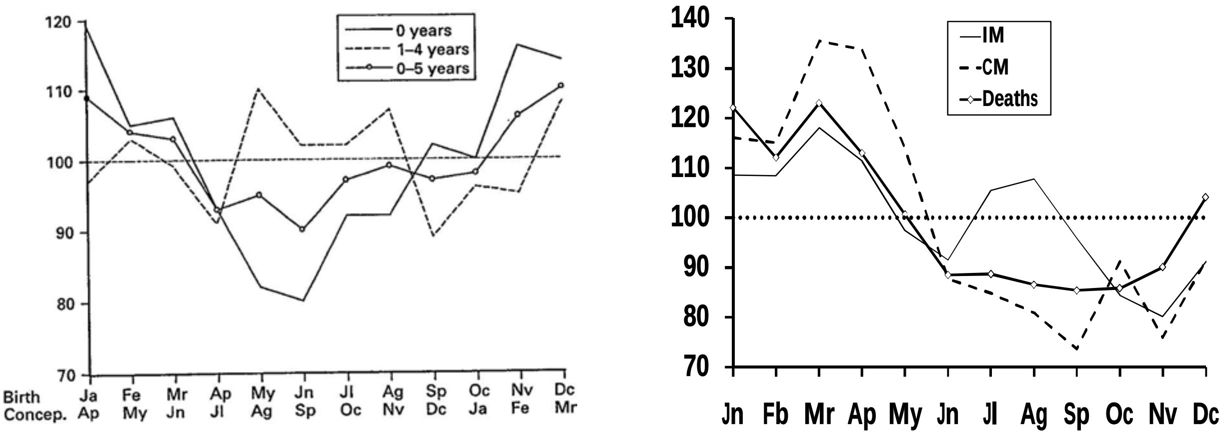
Spain improved over the interwar period[11]. At the same time Spanish demographers have identified the clear downward trends in almost all mortality rates over the interwar period as an indicator of improving living conditions[12].

**Figure 1. Comparing Demographic Seasonality.**

a) Seasonality of vital statistics Spain and Bilbao




b) Infant and child mortality Aranjuez (1871-1970) and Bilbao (1914-1935)




Sources: Spain, Aranjuez – Reher and Sanz-Gimeno (2006); Bilbao – Boletín Municipal de Estadística Bilbao.

A comparison of the seasonality of vital events in Bilbao and Spain reveals the relevance of examining this particular context. Patterns in births and marriages are similar. Differently in mortality the July-August-September peak linked to infectious intestinal disease is absent in Bilbao. Differences can also be found when comparing our data with that analysed by Reher and Sanz

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between 1914 and 1936; these calculations are similar to Pérez Castroviejo (2006: 140-41) who finds a 43.25 point increase in real wages for unskilled miners in Biscay between 1914 and 1931.

[11] Over the interwar period Prados de la Escosura (2008: 288, 306-7) computes a 2.8 % annual growth in GDP per capita in the 1920s and an overall 20 % drop in Gini estimates (60% decrease in actual poverty headcount); Vilar Rodríguez (2004: 124-25) calculates a 30% increase in deflated industrial wages; Silvestre Rodríguez (2005) finds that the urban-rural wage differentials is what drew land labourers to the cities in quest of a better living.

[12] See Reher (1990), Gómez Redondo (1992) and Dopico and Reher (1998).

Gimeno (2006) for Aranjuez, a town 50 km south of Madrid. Infant mortality shows a similar trend to Aranjuez's from January to August with an inverse trend for September to December. For Bilbao high levels of winter child mortality extend to April and then remain low until December. The high summer child mortality is not present in Bilbao. Overall high peaks in mortality for Bilbao are situated in March. Without a doubt, resisting the respiratory infections of winter months seem to hold the key to survival in Bilbao. These very dissimilar mortality patterns make our research different to most of the nineteenth century studies on urbanization and standards of living. These studies for earlier periods include the strong effect of infectious childhood diseases and waterbourne intestinal diseases, added to the summer bacteria virulence and their countermeasures as elements that codetermined mortality. Deciphering the role of nutrition and energy balance should be easier in this more advanced disease environment.

The main point of reference for the standards of living during industrialization remains the British industrial revolution where the on-going dispute between the optimist and pessimist view has been rekindled in favour of the latter in contributions by Feinstein (1995, 1998) and Allen (2007, 2009). By way of these revisions, as Voth (2003) has stressed, stagnant wages and well-being were no longer at variance with the overwhelming evidence that output and TFP growth was slow during the Industrial Revolution. More recently Harris *et al.* (2010) have underlined this idea by insisting on the closer alignment between mortality and the new real wage series provided by Feinstein (1995) and Allen (2007). Nevertheless anthropometric evidence, studies on the masculinization of the workforce and the evolution of life expectancy in the highly urban and industrial section of working population recommend a revision even of this pessimistic account of living conditions[13]. Kelly and Ó Gráda (2010) and Szreter (1997) have proposed that the key to reversing the deteriorating living conditions were charities and public health institutions established well after the process of industrialization had concluded and not the fact that higher nutritional levels had been attained[14]. There are therefore indications for little improvement in nutritional levels beyond those strictly necessary during industrialization itself. Our micro study on late industrialization in the European periphery aims at contributing evidence to this vision by measuring the impact of short-term economic shocks on family nutrition-energy balances.

Our data sustains that in the Spanish case the strong resistance to address social and economic questions of redistribution on behalf of the resilient *Ancien Régime* —to quote Gramsci: "the old is dying and the new cannot be born"— may be at the root of this episode of growing relative

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[13] Szreter and Mooney (1998) and Szreter (1997).

[14] "Ashton [has] marshalled economic statistics and a great deal of logic to argue that many of the abuses associated with industrialism were already present in pre-industrial Britain or were the products of a population boom, technological change, and Irish immigration, all too rapid for the antiquated institutions of the late eighteenth and early nineteenth centuries to cope with. The Industrial Revolution did not create misery; it only concentrated it in cities. Once misery was on display for all to see it provoked the demand for social reform which has eased so many of the burdens of the working class. Ashton does not deny that there was hunger, unemployment, and difficult social adjustments connected with industrialism but he insists that in the long run the machine improved the standard of living for the masses, increased opportunities and social mobility, produced objects of beauty, and that without industrialism and with the population explosion nineteenth-century Britain would have suffered the same fate as famine-ridden agrarian Ireland." McCaffrey (1964).

deprivation well into the 20th century[15]. The organization of an efficient system of poor relief could have mitigated the effect of sudden falls of real income on mortality, as Kelly and Ó Gráda have shown for preindustrial England in the 17th century.[16] If the authorities and public institutions had reasons to enforce poor relief in order to prevent social unrest, we would think that the incentives to do so were even greater in the Bilbao district with a very well organised working class movement in the first third of the 20th century. Nonetheless a careful review of the system of poor relief in Bilbao reveals it as overdue and laggardly adaptive. The detailed study of the relief system suggests that it had a limited response capacity to overcome the situations of distress caused by sudden drops in real incomes, at least up into the 1930s.

Subsidizing poorer families' incomes was not considered. This is reflected in the number of children abandoned to homes which increased as a reaction to falls in real incomes in 1915-1917 and 1930-1932. In the same way child abandoning fell drastically as family incomes increased over the 1920's. The monthly series of meals served by outdoor institutions and permanent soup kitchens follow similar trends, higher numbers of meals in 1915-1919 and 1931-1933, and lower numbers in the 1920s, when real incomes situated higher above the cost of the consumption bundle. Nevertheless, in moments of extreme necessity, as when real income fell drastically during World War I, the number of meals failed to follow needs. It resisted going beyond the threshold determined by the institution's budget constraints and the constricting increase of prices[17]. Following Southall and Gilbert (1996), when we invert marriage rates as a proxy to unemployment[18] in order to measure the responsiveness of poor relief, we do not find an important reaction to this unemployment proxy until 1931-1933, when meal rations responded to the dramatic increase in unemployment suffered as a consequence of the world crisis and political instability in Spain.

It is striking to see that the impact of changes in income on mortality and the other social distress indicators we have collected do seem to be mitigated by this late increase in poor relief. We have contrasted this with distributed lag regressions run for the thirties. Serving up to 90,000 meals a month in 1931/32, equivalent to feeding 3,000 persons a day had an effect. Thereby a 15% decrease in real income could be associated with a 5 ‰ increase in mortality during WWI and at most a 3 ‰ increase at the beginning of the thirties.

In any case we must not forget that the adverse social and political context we are examining was further enhanced by the economic instability of the interwar years which added price fluctuations, unemployment and disruption to deprivation. Contemporaries insist on the high unemployment in the early 1920's and again in the early 1930's

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[15] Evidence of such deprivation may be reflected by the importance and persistence of anarchism in Spain which has been attributed to the lack of faith in a change from above by large sectors of the urban poor. See Radcliff (1992: 167-9) for a summary of explanations for the strength of anarchism in Spain.

[16] They show that the implementation of a system of poor rates and the growth of Poor Law expenditure significantly reduced the impact of living standards on death rates around the 1620s. Kelly and Ó Gráda (2010: 23-24).

[17] The annual number of meals served by the Asociación Vizcaína de Caridad during 1905-1906 was 500.000, whereas during 1914-1918 the year it served most meals was 1914 with a total of 203.000. Price hikes restricted the number of meals that could be served during the war. Reference for 1905-1906 in Aranceta (2010: 82). Boletín Municipal de Estadística. Price hikes restricted the number of meals that could be served during the war.

[18] Unemployment rates are not available for this period.

**Calculating the cost of living**

The usual approach taken by many standard of living analysts —especially those examining the pre-industrial and the industrializing context— is to measure material wellbeing. For populations immersed in the early phases of modern development (industrialization) this can be approximated using raw variables such as nominal wages and the cost of clothing, housing, health and nutrition. The classical method has been to transform nominal wage to real wages with a cost of living index [CLI]. The evolution of real wages over time then reflects whether material well-being for wage earners has improved or not.

Figure 2 shows the cost of living index we have calculated for Bilbao from 1900 to 1936. The cost of living index for Bilbao is an arithmetic mean of the upper and lower bound calculations we have performed; the graph shows an annual average of those monthly observations[19]. When compared to the annual index calculated by Ballesteros (1997) for Spain and that calculated by Pérez Castroviejo (2006) for Biscay, we find a high degree of co-movement[20]. During the period we examine it more closely replicates the movements and trends of the Spanish CLI and it situates above both after 1929. This may have its origins in the fact that for much of our approach, we have followed the work method of Ballesteros (1997). A difference to both Ballesteros (1997) and Perez Castroviejo (2006) has been to calculate the real cost of a consumption bundle rather than an index. In a second step, real income —wages plus extra pay for overtime or piecework— and this real cost of a consumption bundle, representative for a working class family, enabled us to construct welfare lines, similar to those proposed by Allen (2001).

For most of the calculations, we follow the work of Ballesteros (1997) and Feinstein (1998). Both suggest using consumer retail prices registered in markets and taken from a single source rather than wholesale prices or prices taken from institutions' accounting books[21]. We have been fortunate to find monthly retail price data registered by the Bilbao municipality and published in their monthly bulletin. This has been complemented with similar sources from an adjoining municipality during a short period when the series were not published.[22] Ballesteros' second principle for her calculations of the Spanish CPI was to choose products which remain homogeneous over time so as to avoid concerns about quality and composition changes in the consumed goods. Most of the goods we have included have little margin for quality change over time or contain a seal of precedence (stockfish from Iceland, chickpeas from Castile, etc.)

A major concern has always been the choice of goods to include in the consumer bundle in order to reflect consumer preferences and habits adjusted to family budgets. We know from

[19] The index from 1900 to 1913 is indicative and has been calculated with the quarterly price data provided by the Instituto de Reformas Sociales. It is included to stress the differences that arise by using market prices.

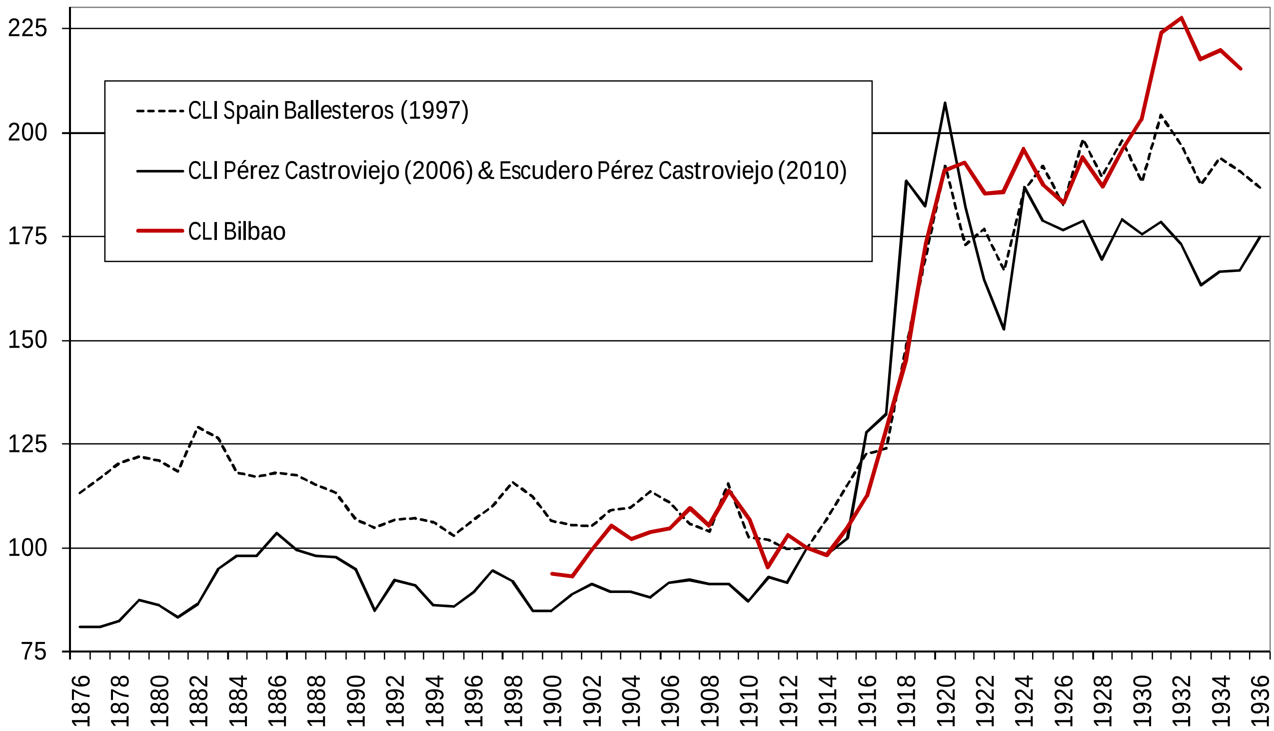
[20] A more recent study performed by Escudero and Pérez Castroviejo (2010) on the living standards of miners in Biscay uses the same cost of living index.

[21] Two items distinguish our index from the Biscay index calculated by Pérez Castroviejo (2006). Prices for non-food items taken from the accounting of the main hospital of Bilbao and prices for food items from 1891 to 1927 are the retail prices sent to the Instituto de Reformas Sociales [IRS] and Instituto Geográfico y Catastral taken from the Barakaldo municipal archive. Secondly housing costs have been extracted from rents paid for housing and offices uses by public civil registries and notaries. Pérez Castroviejo (2006: 105-7)

[22] January 1920 to July 1921 monthly data recollected from Archivo Municipal de Baracaldo and October 1921 to May 1922 monthly data taken from IRS.

Ballesteros for nineteenth century Spain that at the time there was a limited list of commodities consumed by the average Spaniard: bread, potatoes, legumes, lard, oil and very little meat; wine and brandy were the main energy complements. Most authors coincide that about 70 per cent of family budgets was spent on nutrition.[23] The remaining 30 per cent of the budget has been allocated to housing, clothing and other expenses. We also know that during the first third of the century Spaniards added new products such as milk, beans, stock fish, eggs, sugar and coffee to their diets. We have made an effort at including these changes in the composition of the bundle over time[24].

**Figure 2. Comparing Cost of Living Indexes for Spain, Biscay and Bilbao. (1913 = 100)**




In the twenty two year period we examine, we have assumed that the average work effort in terms of calorie requirements to remain constant but food preferences to change rapidly. Therefore, instead of keeping the consumption bundle with fixed weights, we modify weights to reflect changes in consumption patterns, but keep the energy content in nutrition in the bundle stable. Our point of departure has been to calibrate three food bundle benchmarks which provide the same amount of calories to an average family over the time period. At the same time, the difference in the composition of the bundle reflects changes in diet and preferences. The first bundle for 1894 replicates a diet based on menus taken from Pérez Castroviejo and Mártinez

[23] Reher and Ballesteros (1993), Fusi (1975), p. 37; Pérez Castroviejo (2006).

[24] Compared to previous studies, our bundle also includes a higher than average consumption of beans and a lower than average consumption of potatoes. The amounts we have chosen of both commodities better reflect their real weight in Biscayan diets. In terms of calories these differences compensate each other out (2.29 - 0.75 kg of potatoes)* 690 cal = 1,062 cal and (0.45 – 0.14 beans and chickpeas)*3,330 cal = 1,032 cal. See Pérez Castroviejo (1992: 146-8) for descriptions of Biscayan working class diets at the beginning of the 20th century.

Mardones (1996) for a Bilbao poorhouse and family consumption patterns observed by working class newspapers and labour inspectors[25]. It has a high-carbohydrate content, proteins and fat are provided mainly by stockfish and lard and the food diet is complemented by abundant wine consumption. The bundle for 1914 reflects important changes in the preferences and products available to average consumers: carbohydrates, lard, stockfish and wine (inferior products) are reduced and replaced with higher quantities of meat, fresh fish, eggs, milk, oil and sugar. Weights are based on school meal budgets, school menus, family diets and have been contrasted with hospital food accounting[26]. For the 1934 bundle we have maintained the substitution trends observed in the changing consumer preferences between 1894 and 1914 but at decelerating rates[27]. In a second step we have interpolated the weights linearly month by month between the three benchmark bundles. This corrects for some of the bias introduced by substitution and changes in preferences over time. As a reminder, we assume that quality of products remains constant over the period. We add house rent for a working class family accommodation and heating and cooking coal[28]. Excess demand maintained housing prices high throughout the period and the rents registered by the Bilbao municipality show a similar trend as food prices. Table 1 below shows the benchmark food bundles for 1894, 1914 and 1934.

A few words need to be said to explain why we choose families as consumption and production units in our comparisons. Our main assumption is that bread-winner families are those first stricken by increases in the cost of living or reductions in real incomes. The vast majority of the families in Bilbao over this time adopted a predominantly male breadwinner family system. Based on municipal statistics only 9.41 per cent of married women worked in 1900 and by 1935 this had decreased to 3.71 per cent[29]. Some degree of informal female work existed in washing, sewing, retailing and agricultural work especially in families with high dependency rates. A very common practice was for women with younger children or children in the age of becoming independent to complement the family income with lodgers. Hosting lodgers became less and less common as the decline of mining activities reduced the need for temporary migrants and urban development provided alternative accommodation[30].

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[25] For 01/10/1898 *Lucha de Clase* in Fusi (1975: 56, fn. 81) , for 1904 Sanz Escartín, Salillas and Puyol Alonso (1904) *Informe referente a las minas de Vizcaya* and 1907 Solinis “El obrero en Vizcaya.” El Socialista, 9/8/1907 see Pérez Castroviejo (1992: 146).

[26] Olabarri (1978); “Proyecto de Reglamento Provisional de la cantina que como ensayo se establece por el Excmo. Ayuntamiento de Bilbao en el Grupo escolar de Urazurrutia” (1911), “Cantinas escolares en Bilbao curso 1914-1915”, Archivo Municipal de Bilbao, sección segunda; “Gastos en alimentación del Hospital de Basurto”, 1915, 1916, 1924. Data provided by Juan Gondra.

[27] We a-/decelerate by 50 % for all but grains and new products for which we maintained roughly the same rate of change.

[28] An exception to the assumption of constant quality may be housing, which improved throughout the period examined. We have assumed the units of housing and heating requirements to remain stable over these years.

[29] González Portilla (1995: 304). For married women between the age of 15 and 59, data was constructed from municipal registers of population, Bilbao archives. García Abad (2005: 191-93) quotes 10.2 % of female population working in 1900 and 5.9 % in 1920 in the nearby Baracaldo worker’s suburb. García Abad and Ruzafa Ortega (2009: 31) calculate 0.77 % of married women to be employed in the Biscayan mining districts between 1920 and 1935. (10.08 % for single women and 4.74 % for widows). The percentage of women employed in the mining district between 1920 and 1935 was 4.31%, García Abad (2010: 68).

[30] García Abad and Ruzafa Ortega (2009: 39-42) and García Abad (2010: 78)

Even previous to industrialization, as a result of Basque hereditary practices by which rural estates were designated to a single heir, urban areas like Bilbao had developed a low pressure nuclear family system, similar to that of north-western Europe. In the preindustrial era the majority of non-inheriting rural migrants and urban population, both men and women, had engaged as apprentices and life cycle servants between the ages of 10 and 25 in guilds, commerce and households. Thereby they had accumulated expertise, skills and, most important, dowries and assets for founding family units. The mining boom and the rise of the iron and steel and mechanical trades had altered this demographic model only slightly. Given the physical strain involved in these new job opportunities, the two-parent breadwinner nuclear family evolved into a male-breadwinner nuclear family unit in which women, by exclusion from labour markets, lost economic participation and were forced to specialize on the reproduction, consumption and welfare of the family[31]. This did not hinder them from receiving complementary income in informal markets such as lodging, washing or sewing. The average family size in Bilbao between 1920 and 1935 was 5.16, i.e. father, mother and three children[32].

Given that our real incomes are for medium skilled steel workers, we will consider the energy necessities for a 5 member steel worker family. Following reports and handbooks on human food and energy requirements we have calibrated male steel worker's calorie requirements at 4,000 cal, women working in some degree of informal activity, childrearing, nutrition, family care and hygiene at 3,000 cal and an average 2,150 cal for each of the three children[33]. This gives us a total of 13,450 cal for the family unit. Male steel workers energy balance is coherent with other references to exceptionally active occupations[34]. We have set the level slightly higher —200 cal— to compensate for the lower degrees of mechanization at the time we are observing and the higher exposure to heat and piecework bonus schemes[35].

Energy requirements for women providing for children, clothes, hygiene, heating material, and home may seem high, but we are in the pre-electric-appliance age. Providing food and water, washing, cleaning and child rearing were physically more demanding than what we may register in

[31] An estimated 70.8 per cent of all families were nuclear families in 1900 and 68.4 per cent in 1930. The average age of marriage in Bilbao rose from 27 to 28 years of age for men and fell from 27.6 to 25.5 for women between 1825 and 1930 as a consequence of segmentation and masculinization of labour markets. Around 50 % of all heads of families were day labourers. González Portilla (1995: 268-297).

[32] González Portilla (2001: Vol. I, 403). García Abad (2005: 201) states that immigrant families arriving in Bilbao had an average of 4.56 members, which increased over time to 5.04 members over the period of industrialization.

[33] As a control, we have calculated the average amount of calories in the meals served by *a domicile* poor relief between January 1914 and December 1935. We use total amounts of food purchased divided number of meals served by the institution. On average meals amount to 3058,7 calories without milk; 3124 calories with milk (served as a supplement to weak and ill persons). These were meals for elderly, sick and unemployed.

[34] WHO (1974), *Handbook on Human Nutricional Requirements*, chapter 2, table 2. FAO (2001), Human energy requirements. Chapter 5, tables 5.4 and 5.5. Evidence for Chinese mine and shipbuilding workers for the 1980s confirm this balance. Fernández de Pinedo (1992: 127-28) uses a food bundle equivalent to 4.810 cal to deflate nominal incomes.

[35] See Fernández de Pinedo (1992) for a discussion of bonus schemes in AHV, the company whose real work earnings we are using in this study. Consolazio et al. (1961) studied the effect of extreme heat on young men exposed to average temperatures of 40$^{o}$ C during 9 hours as opposed to an average daily temperature of 26$^{o}$ C. Extreme heat increased their energy requirements from 2733 cal at a normal temperature to over 4000 cal.

more recent times or in rural environments with extensive families[36]. The 2,150 cal is obtained as an average for infants, children and adolescents between 0 and 18 years, taking into account the different metabolisms in girls and boys and assuming medium hard physical exercise from age 12 on[37].

**Table 1. Food commodity bundles for 5 member nuclear working class family**

| | Calories per Kg/l | 1894 Kg/l | 1914 Kg/l | 1934 Kg/l | Above Below | Average 1930 consumption Spain |
|---|---|---|---|---|---|---|
| **Bread** | 2,660 | 2.00 | 1.75 | 1.50 | 👎 | 1.72 |
| **Rice** | 3,600 | 0.13 | 0.11 | 0.09 | 👎 | 0.12 |
| **Beans and Chickpeas** | 3,330 | 0.70 | 0.50 | 0.45 | fn.12 | 0.14 |
| **Potatoes** | 690 | 1.15 | 0.90 | 0.75 | fn.12 | 2.29 |
| **Lard** | 9,020 | 0.21 | 0.13 | 0.09 | = | 0.09 |
| **Meat** | 2,780 | 0.01 | 0.33 | 0.50 | 👍 | 0.18 |
| **Stockfish** | 2,900 | 0.30 | 0.20 | 0.15 | 👎 | 0.18 |
| **Oil** | 8,840 | 0.02 | 0.15 | 0.20 | 👍 | 0.16 |
| **Sugar** | 3,870 | 0.03 | 0.10 | 0.15 | ~ | 0.16 |
| **Eggs** | 756 | 0.03 | 0.10 | 0.20 | 👍 | 0.06 |
| **Sardines** | 888 | 0.10 | 0.30 | 0.45 | 👍 | 0.00 |
| **Wine** | 830 | 1.40 | 1.00 | 0.80 | 👎 | 1.09 |
| **Milk** | 610 | 0.46 | 1.00 | 1.50 | 👍 | 0.74 |
| **Family Calories** | | 13,460 | 13,460 | 13,460 | | |
| **Man Calories** | | 4,000 | 4,000 | 4,000 | | |
| **Average Calories** | | 2,690 | 2,690 | 2,690 | | 2,426 - 2,854 |

Sources: Calories - USDA National Nutrient Database http://www.nal.usda.gov/fnic/foodcomp/search/ and Simpson (1989). Average consumption Spain 1930 is calculated using average harvests 1929-1932 in Simpson (1989).

Note: last column, last row: 2,426-2,854 cal average cal per person per family per day in Spain using Simpson's estimations of average consumption clearly point at high seasonality of heavy workloads and unaccounted for food complements in family diets in most of rural Spain. Both sources of underestimating family energy balances are less relevant in an industrial urban context where workload is regular and complementing diets more difficult to come by. Harris et al. (2010: 16 and 27) have calculated the number of calories available per capita per day in England and Wales to be 2,237; 2,439 and 2,544 in 1750, 1800 and 1850. This compares well to the 2,690 per capita per day we are assuming. They have also calculated that an average sized (height and weight) recruit doing heavy work in nineteenth century England required around 3,500 cal.

Figure 2 shows the monthly upper and lower bound cost in pesetas for the family bundle which varies in composition month by month. We have calculated Laspeyres and Paasche type bundles for

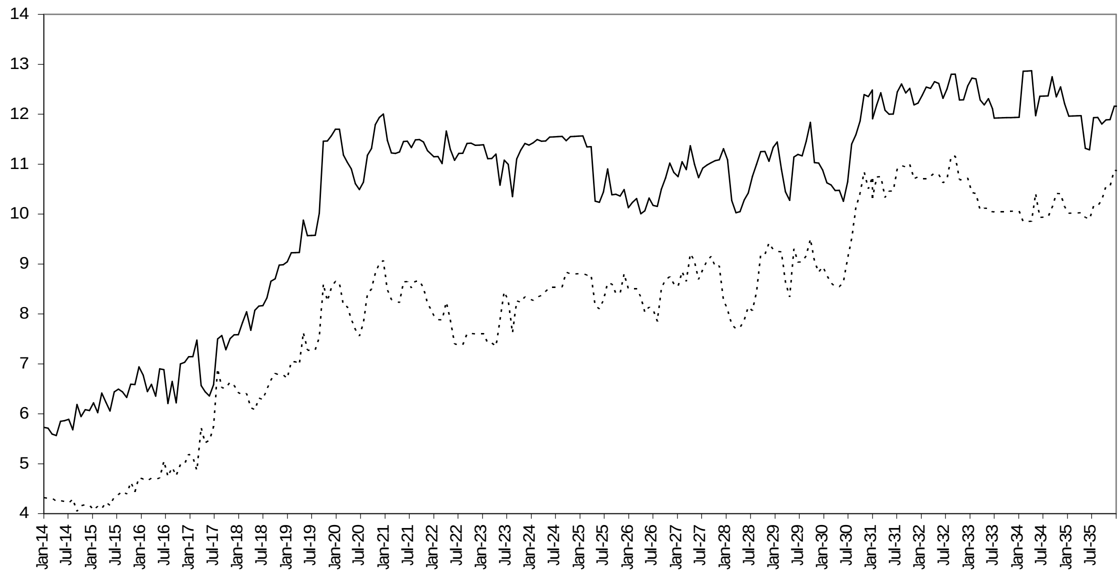
[36] Women take on a great part of the responsibility of smoothing out income. Besides subletting to lodgers, this includes everything from neighbourhood sharing, pawning, and informal irregular work. (We thank Pamela Radcliff for this comment). Three surviving children may imply an average of 5 pregnancies and 4 two year lactation periods. The energy drain for mothers during the first six month of lactation with exclusive feeding the energy cost was 675 cal per day and the remaining time with partial feeding 460 cal. See FAO (2001) Chapter on energy requirements during lactation, p. 65. Pregnancy consumes 85 cal/day, 285 cal/day and 475 cal/day during the first, second and third trimestres respectively. See FAO (2001), Chapter on energy requirements during pregnancy.

[37] Averages calculated from WHO (1974).

each month and the bundles shown below are a geometric average *á la Fisher*. The prices used for the upper bound are the highest prices registered on the Bilbao market and the lower bound uses the lowest prices.

Looking at the best possible scenario, the lower bound cost of living, this shows a sharp and constant increase throughout the First World War and the immediate post-war years up to 1920, a downward trend between 1921 and 1923 followed by a very gradual increase up to 1930. A second sharp increase is observed between 1930 and 1931, followed by certain stability and a slow decrease between 1932 and 1934, further stability in 1935 and a renewed increase in 1936.

**Figure 3. Monthly cost of living for 5 member working class family in Bilbao. Upper and lower bound, 1914-36. (Pesetas)**




**Nominal incomes**

Fortune has conserved the exceptionally detailed nominal income series for the largest iron and steel concern in Bilbao and Spain for this period. Altos Hornos de Vizcaya [AHV] was created by merger of two of the leading iron and steel companies with a smaller tinplate factory in 1901. They employed 5,905 workers in 1916 and 8,300 in 1930, approximately one third of the workers employed in the Spanish iron and steel industry.

Pedro María Pérez Castroviejo (1992) has carried out a very detailed study of this workforce for the period 1900 to 1915 using the company's worker ledgers (Libros de Matricula), and management records. Based on his findings we know that in those 15 years sixty four per cent of the newly hired workers came from other provinces (out of a total of 23,847). Nevertheless the main source of population growth in Bilbao over the first third of the twentieth century was not immigration but the natural growth rate based on high birth rates and descending death rates[38]. This pattern was only briefly altered during the war boom economic upswing during the First World

[38] González Portilla (2001: Vol. I, 141).

War when immigration regained prominence for a brief period[39]. In 1914 at AHV, men represented 94.71 per cent of the labour force, 74.1 per cent younger than thirty nine. Over 50 % of them had been hired between the ages of 20 and 29 years. Sixty seven per cent spent less than 6 years in Altos Hornos de Vizcaya, 74 per cent of the workers that left their jobs, did so voluntarily, mainly to work in other factories or for family reasons. Hiring and average wages show no seasonality. Between 1910 and 1915 28.24 per cent of the workers were married or widowers (1.4 %).[40] In 1930 the payroll of Altos Hornos de Vizcaya represented approximately 32 per cent of the workforce living on the south-western river bank industrial area of Bilbao, the *margen izquierda*[41].

Not only are we looking at the highest paid workers in the iron and steel industry but possibly the highest paid workforce in Spain[42]. The beauty of these series is that they reproduce the net income of workers. The predominant work system in the AHV factories were piecework contracts by which a base task wage was set and all additional work effort was paid as premiums or overtime. The series include both the wage and all other pay received. This is quite a unique source and will increase the precision of our judgement on family living standards considerably.

The nominal earnings for workers presented here splice three series, all three of which are taken from the same source, for the same factory and the same workers. The first series is an average monthly income which includes day wage, other premiums and overtime payment for a blast furnace worker at Altos Hornos de Vizcaya[43]. It runs from January 1914 to December 1921. We have chosen blast furnace workers because their income is close to the overall average workers' income as shown in Figure 4. From January 1922 to December 1927 we no longer have detailed data on a shop level and only have the average monthly income of all workers at the factory including bonuses and extra hours. And finally from January 1928 to July 1936 we have interpolated annual average incomes to obtain monthly averages because we have no monthly observations. The first series, monthly blast furnace worker's income, is represented in Figure 4 through a thin dark blue line, the second, monthly average factory income, with a thin light blue line and the annual average income is a thicker fuchsia coloured line.

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[39] González Portilla (2001: Vol. I, 154). Biscay witnessed the highest rate of population growth between 1860 and 1930, 42 % of that growth can attributed to Bilbao and 39 % to the surrounding municipalities in the Bilbao Statuary.

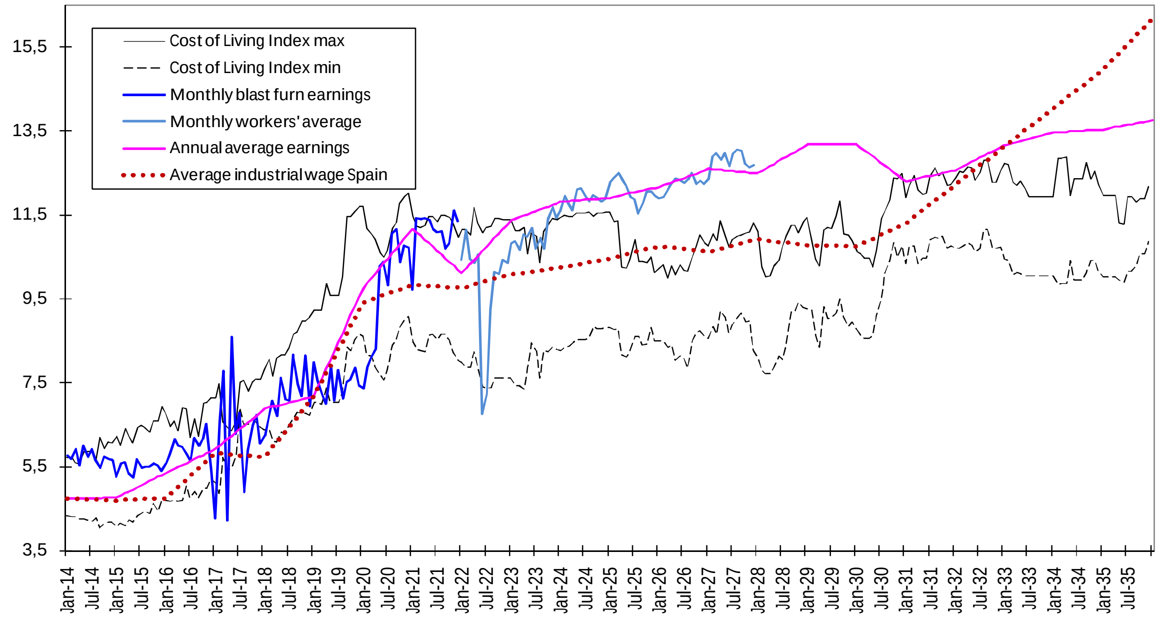
[40] Perez Castroviejo (1992) p. 41 immigrants; p. 51 male – female; pp. 54-6 hiring and working age; p. 51 marital status; p. 188 seniority; p. 190 for seasonality; p. 219 reasons for leaving company.

[41] González Portilla (2001: Vol. I, 139) for the population of Baracaldo, Sestao, Portugalete, Erandio and Lejona. González Portilla (1995: 171) for active population in Bilbao.

[42] Pérez Castroviejo (1992: 115 and 122).

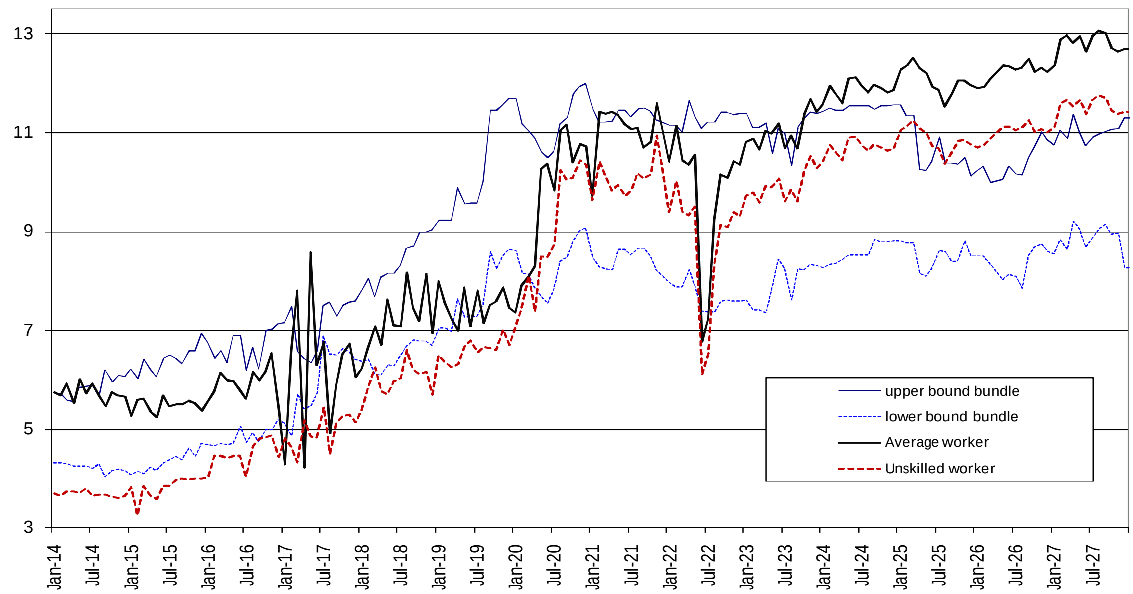
[43] For a detailed discussion of the source we use, see Fernández de Pinedo (1992: 125-26). Today they can be found at Archivo Foral de Vizcaya, signaturas 0295 [1914] to 0310 [1927]. Annual averages for 1929 to 1935 have been taken from Gonzalez Portilla (1984: 74 and 85) (quoted as taken from the Libros de Cuentas de AHV, Ejercicios 1902-1936, Consejo de Administración y Carpeta Financiera). The dotted red line running through the figure depicts what nominal wages would have been if they had evolved at the annual rates proposed by Vilar Rodíguez for average industrial nominal wages in Spain. The differences could be interpreted as the more than proportional growth of extra income from premiums and overtime payments. There is definitely a strong discrepancy of the two series for the 1930s.

**Figure 4. Working class family, Bilbao 1914-36. Upper and lower bound cost of living versus daily earnings at Altos Hornos de Vizcaya.**




Sources: average rate of change in Spanish industrial wage, Vilar Rodríguez (2004)

**Figure 5. Skilled versus unskilled labour**




The incomes shown in Figure 4 are average nominal incomes. Given that we have very detailed disaggregated workers´ incomes up to 1921, we have chosen the blast furnace workers as representative of a medium skilled worker and average earning worker in the factory. But economic strife was sure to hit unskilled workers first. Figure 5 shows the income of unskilled workers in the same factory. They were packers and loaders employed in moving raw materials, intermediate products and final product within the factory. Their income remained below the minimum cost of the consumption bundle up to 1920. Their gap to the higher incomes closed during the war and the first two post-war years[44].

The exercises we present here provide certain advantages. They are based on very detailed data proceeding from a single source, both for the cost of living and for nominal incomes. A further advantage to this study is that it concentrates on a small geographic area in which the process of industrialization took place in quite an isolated form. As one of Spain's major ports, Bilbao had well integrated commodity markets and as a consequence of the late 19th century iron ore mining boom, it had a well-functioning labour market.

The monthly data introduces a much higher frequency and seasonality which adds important aspects to the standard of living debate. Studies on energy requirements in present day agricultural environments in East Asia today have shown that during high workload seasons land workers consistently consume more energy than they take in. This is sustainable during short intervals, but energy reserves must be built up again during idler seasons of the year. Factory work does not allow for such inter-annual energy compensation or smoothing. Energy requirements are constant year round and workers will be much more sensitive to sudden falls in real income and therefore nutrition, even over very short periods. Breadwinners and their families will be fragile to short-term economic fluctuations, especially if their real incomes are fairly close to the purchasing power required to maintain their energy balances without draining their reserves and thereby reducing their resistance to disease. As price shocks in an integrated market will affect all families, finding complementary informal work income to compensate lost purchasing power will therefore be more difficult. Resorting to high-carbohydrate low cost diets may have even reduced calorie intake[45]. The extensive families of immigrants are not close enough and the existing neighbourhood networks will be affected uniformly, reducing their ability to alleviate temporary deprivation.

We are considering two explanations for breadwinner family fragility. On one hand, their real incomes may have allow them to secure only a very basic nutritional levels, which makes families sensitive even to small sudden changes in prices and/or real incomes. On the other hand, social disruption could have momentarily deprived families of their economic backing. Ashton insisted on the IR's contribution to providing regular income and smoothing out consumption cycles. But during the rural-urban immigration phases of industrialization, we are more prone to believe that immigrant breadwinner families settling in the new industrial city were to some extent deprived of 'a cushion' for hard times, which was the extensive family typically present in rural areas[46]. This was more relevant at times of high immigrant pressure, when sudden real income changes would affect large numbers of less-integrated families.

This second explanation could have added volatility to the already turbulent World War I period, when the economic boom deriving from Spain´s war neutrality and rural depression led to a final

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[44] Fernández de Pinedo (1992: 147-8) describes the reduction of the wage gap between skilled and unskilled workers as a consequence of the price hikes during the war. Employers were more concerned with increasing the lower wage to a sustainable level and thereby reduced the skill premium. The six years up to 1928 of this series were extrapolated as a fixed proportion of the average wage as we have no disaggregated data on unskilled labour after 1921.

[45] Dasgupta and Ray argue that the consumption of high-fibre cereal diets leads to an important reduction in nutrient retention. Harris et al. (2010: 20).

[46] Arbaiza et al. (1996: 51)

surge of immigration. García Abad (2005) describes this second wave of mass immigration to Bilbao as more closely linked to industrial development. It stretched between 1905 and 1920 with a final resurge during Wold War I. From there on immigration trickled off. In any case, between 1920 and 1935 immigrants were increasingly from more distant provinces and immigrant families were also younger than previous groups —18.4 % were children under four[47]. We therefore have reason to believe that although immigration was lessening its pressure on public goods and housing over the period examined, it may have increased the amount of families showing breadwinner fragility.

We may be in some way examining similar disruptions to those witnessed in many industrial districts during Western Europe's industrialization. In the brief period of time, during which the continuous push of labour arrived to industrial centres seeking a better life, workers may have been deprived of negotiating power by the advancing host of unskilled workers willing to take their jobs at the given wage. In this low income environment and without collaterals they had less means of smoothing out the effect of price shocks on consumption. They were cut off to a higher degree from money wage complements found in rural areas and detached from their extensive families which could have supported them through hard moments. The conjunction of these circumstances could more easily lead to short-term nutritional deprivation.

This makes the hypothesis of adjustments to real income shocks within families plausible. Families can compensate the reduction of purchasing power to some extent. At first by pawning or having the members of the family consume less. Transferring food resources from women and children to the male breadwinner was also a rational response, as it secured for a continuity of income[48]. But in the mid-term the lack of nutrition would have negative effects on the abstaining family member's health. If during these dire straits young children or mothers in their last trimester of pregnancy ate less, we would expect children's resistance to disease to decrease.

Before going on to examine the frailty of breadwinner families in this later phase of industrialization, we can formulate some preliminary conclusions. We can assert that the escape from poverty, even for this area of Spain which housed its highest paid industrial workers, still needed waiting over the first third of the twentieth century. We can illustrate this using welfare ratios —average monthly earning divided by the cost of family consumption bundle— as proposed in Allen (2001). Values below one will show when families are in nutritional poverty[49]. According to our calculations living conditions measured in income purchasing power worsened between January 1914 and December 1919. They improved from January 1920 to April 1930, from then on material living conditions worsened again until August 1932. They recovered to the levels attained in the mid-1920s by May 1935 but started a downward trend from there on. Some of these results

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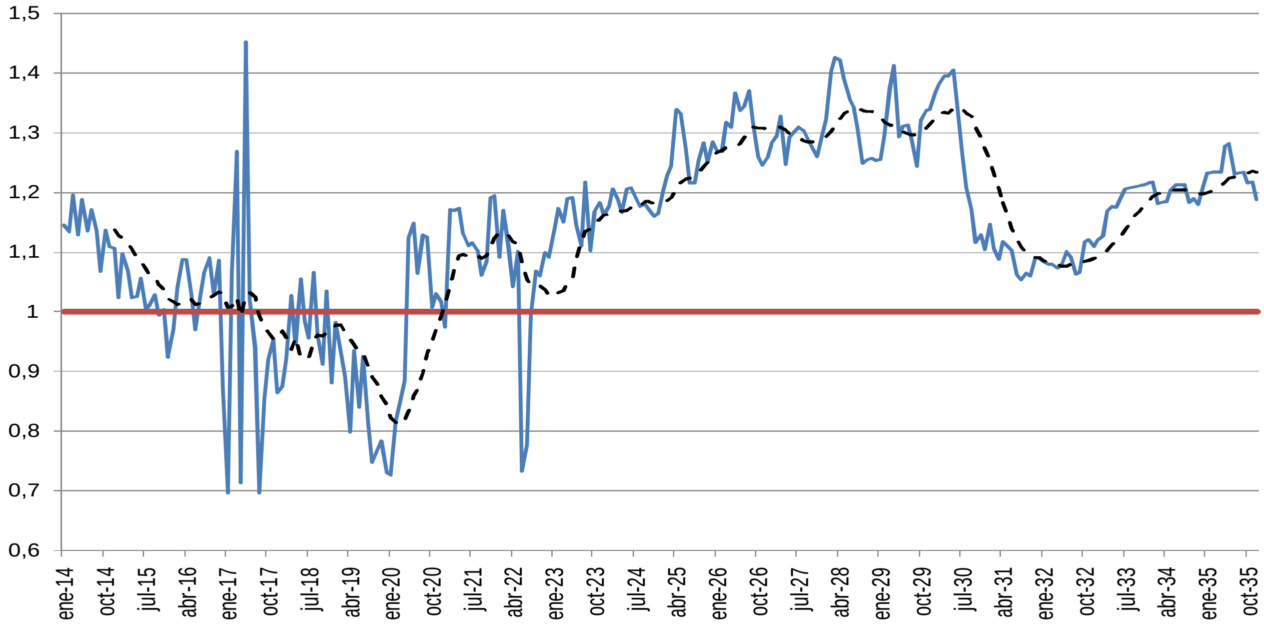
47 Garcia Abad (2005), pp. 150-55, 197-201. More than half of all immigrants to Bilbao migrated as or into families, of these 92.7 % were nuclear families with an average number of children that evolved from 2.5 to 3 siblings.

48 See Harris et al. (2010: 28).

49 The average daily income was multiplied by 300 working days (Pérez Castroviejo 1992: 186) and divided by the daily cost of the family consumption bundle multiplied by 365. Within our margin of error we adhere to Allen's caveat: "Obviously the calculation is notional in that it makes arbitrary assumptions about the size of the family, who earned income, and the number of days worked per year. Equally clearly, these could —and did— vary. Anyone who objects to these assumptions can ignore them; in that case, the welfare ratio is just a peculiarly scaled real wage index." Allen (2001:427).

are surprising, others expected. As expected, family incomes exceeded the cost of their consumption bundle for most of the period. The golden years of family income were from early 1925 to the summer of 1930 during which real incomes surpassed consumption costs by 20 to 40 per cent. The biggest surprise perhaps is that welfare ratios are more or less at the same level in late 1935 as at the beginning of 1914. War and post-war economic distortions deteriorated living conditions, dictatorship and right-wing democracy improved them and left-wing democracy maintained or worsened standards of living for these families. In light of these strong fluctuations and very modest overall changes in family welfare ratios, we have felt the need to examine other evidence to contrast whether our results may be considered coherent. In what follows we have collected data to examine other social indicators reflecting living conditions. We will examine the evolution of mortality, child mortality, pawns and child abandoning together with the real income series we calculate from nominal incomes and the Cost of Living Index.

**Figure 6. Welfare ratios for AHV steel worker's families, 1914-1936.**

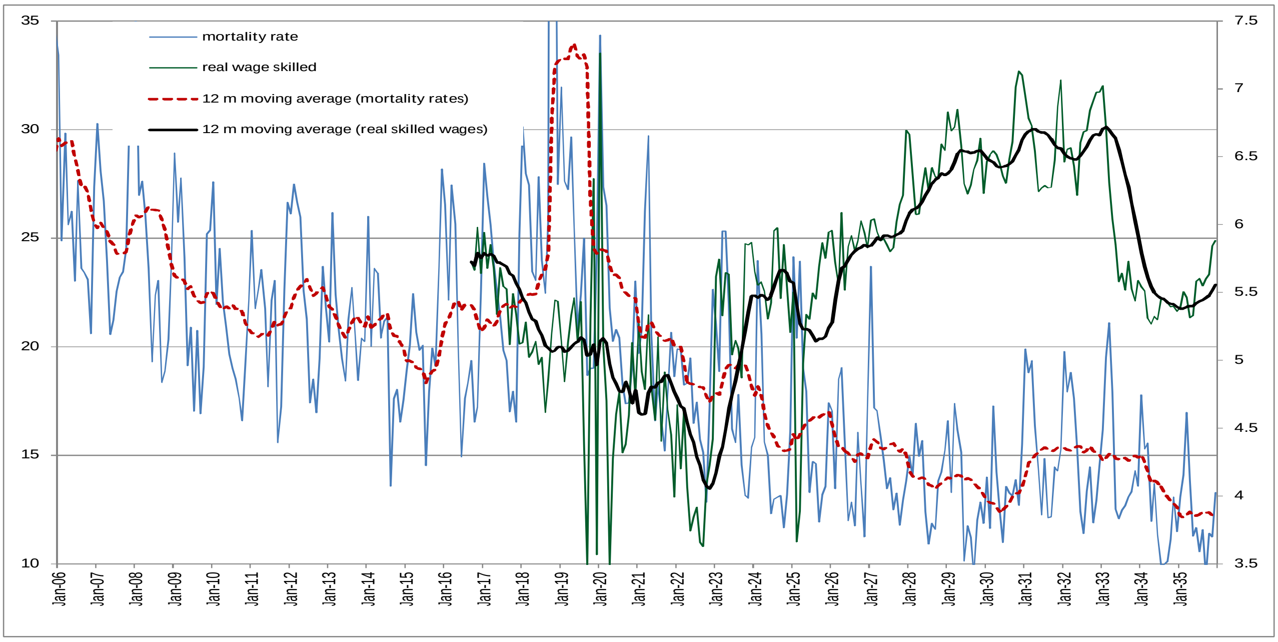



## Indicators of livings conditions

The graph below shows mortality and real income over the first third of the century. Mortality rates show a constant long-run downward trend. This trend is only interrupted by the First World War and shows a spike during the outbreak of Spanish influenza. Between 1910/11 and 1930/31 life expectancy increased by 7.7, 2.7 and 1.2 years at birth, the age of 25 and the age of 50, respectively.

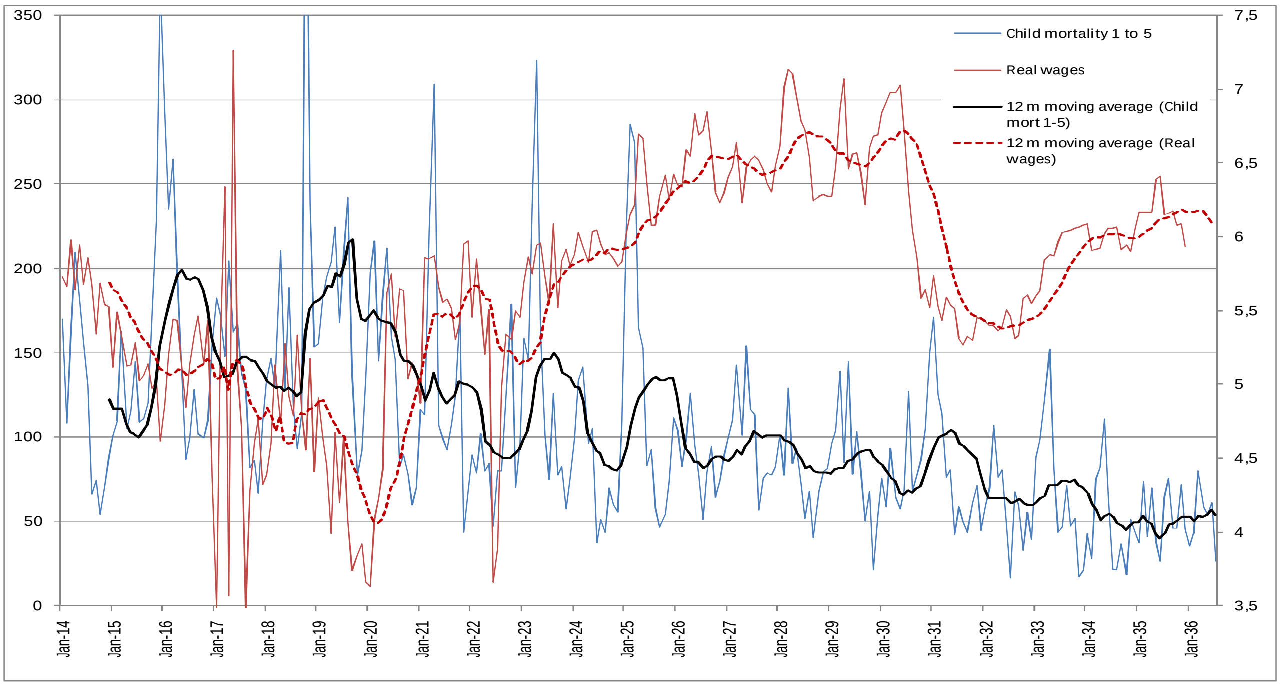
A careful examination of Dopico and Reher (1998) life tables for Biscay suggest that increasing life expectancy was more a result of declining infant and child mortality than an increased adult longevity, the same driving force that was consistently lowering overall mortality rates. Sanz Gimeno (2001: 137-41) indicates that infant and child death rates in Spain dropped by 42 % between 1906 and 1932, with a 27 % contribution by the reduction of intestinal disease, whereby the reduction in urban settings was twice as fast as in rural environments. He argues that sanitary infrastructures, public hygiene, water distribution and sewage are at the root of the reductions.

### Figure 7. Mortality [‰ – lh scale] versus Real Wages [pesetas – rh scale]




Note: the unusually high mortality rate of 92 ‰ in October 1918 is not shown on the graph. Most certainly it was due to Spanish influenza whose second wave hit Bilbao hardest in October (675 killed by it and 803 burials) and November (320 flu victims and 408 burials). Erkoreka (2006).

### Figure 8. Child Mortality Rate [‰ rhs] (1<age<5) and Real Wage [ptas - lhs] , 1914-1935




But along with this general downward trend in mortality, we can also observe a lagged correlation between the series both in their moving average trends and in the inter-monthly fluctuations[50]. The strong lagged correlation between the two variables seems reflect a high

50 The monthly mortality rates are based on the detailed series of burials recollected by Juan Gondra. The Bilbao cemetery was moved from Mallona to Derio, well outside the city limits, at the beginning of the century. González

sensitivity of mortality rates to changes in real income. This would be what we would expect to find, if important parts of the population lived near to “a level of nourishment just capable of supporting its energy requirements”[51]. Just as a reminder, the family welfare ratios in Figure 6 displayed 14 out of 22 years below the 120 % level of consumption coverage. Yet we had biased our contrasts against our hypothesis. We chose the income data from the highest paying factory —Baracaldo— of the iron and steel company[52]. We used medium skilled workers income instead of unskilled workers earnings. And for lack of monthly data, we have excluded clothing, light, coffee and transportation from the family consumption bundle, which situates our upper and lower bounds below the actual levels. Although part of this upward bias may be compensated by family incomes deriving from female and child earnings we are not able to quantify, there is still reason to believe that families were even closer to just covering their energy requirements than the welfare ratios indicate.

The Figure 8 displays child mortality (age one to five) and real incomes. Again we observe a strong codetermination both in trends and fluctuations. Bengtsson, and Alter and Oris have found this pattern in Sweden and Belgium respectively and have attributed it to small children being at the bottom of the food chain hierarchy.[53] We have also examined infant mortality and real income and we find a similar trend coherence of the data, although in this case fluctuations coincide less[54].

The following figure shows pawns. The number of clothes items turned in as a collateral for small loans. This is one of the quick recourses poorer income groups had to adjusting to sudden falls in their food provisions. Again we observe a co-movement in trends and a lagged reaction of pawns to falls and rises of real income. As real incomes fell during and after WWI we can see how pawning picked up steadily and to the contrary how the rise in real incomes in the early 20s reduced pawning. The strong fluctuations in real income after 1927 reactivate pawning activity. And the steady fall of real income in 1930 and 1931 coincide with a constant increase in the number of pawns. This is what we would expect in a population which has difficulties making ends meet throughout the early 1930s. The amount of pawns in the early 30’s is nearing the levels of 1923-1925, at both moments real incomes are at 1914 levels.

The strong downward trend in all of the mortality rates shown and the strong lagged correlation between real income fluctuations and changes in mortality rates raise a number of important issues. If variations in real income carry over to proportional variations in the level of nutrition, producing imbalances in energy and nutrition which cause changes in mortality rates, population would be living at very tightly adjusted nutritional levels. This would put the McKeown thesis as an explanation for mortality reduction in question. Improvements in the nutritional status of

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Ugarte (1994: 40) registered mortality rates for Baracaldo in 1902 (30.5 ‰), in 1920 (19.1 ‰) and in 1930 (12.2 ‰) and for Sestao in 1900 (28.9 ‰), in 1920 (21.5 ‰), and in 1930 (11.5‰). Our annualized data for Bilbao in 1920 (22.2‰) and 1930 (13.6‰) compares well to that.

[51] Paraphrasing Malthus in his essay on the principle of population. Harris et al. (2010: 2)

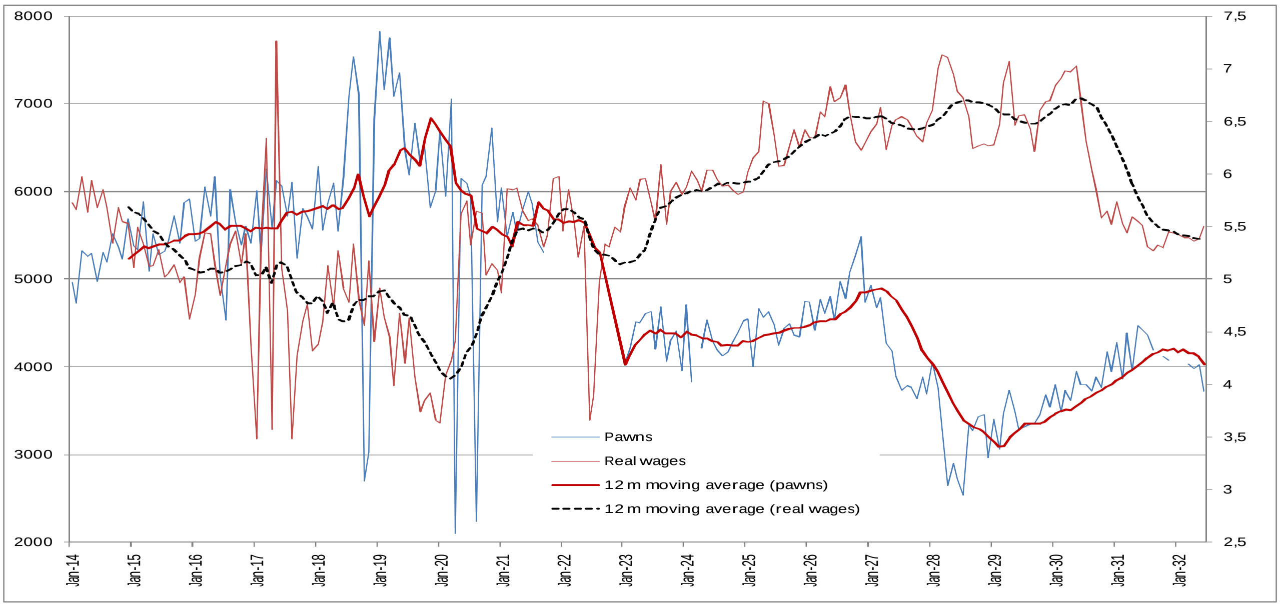
[52] Fernández de Pinedo (1992: 140). Sestao paid between 20 and 6 per cent less between 1901 and 1927.

[53] Bengtsson, Saito and Reher (1998: 111).

[54] González Ugarte (1994) calculates infant mortality for Baracaldo in 1910-4 at (136.6 ‰), in 1919-21 at (148 ‰) and in 1928-32 at (101.1 ‰) and for Sestao in 1900-09 at (147.4 ‰), in 1910-4 at (141.7 ‰), in 1919-21 at (133.9 ‰) and in 1928-32 at (68.6 ‰)[54]. Our data for 1914 at (138.2‰), 1919-21 at (152.4‰) and 1928-32 at (93.4‰) match well.

population can't be driving a downward trend in mortality rates and at the same time maintain such a high mortality sensitivity to short-term variations in income.

**Figure 9. Number of pawned cloths items versus real income (Jan 1914 = 1)**




Higher levels of nutrition should increase people's disease resistance to short-term nutritional shocks. The only possible explanation is that the downward trend is driven mainly by factors other than high nutritional levels. These could range from better hygiene, public health measures, cleaner water, vaccines against childhood diseases and poor relief, all the way to a higher overall resistance to disease. We could be observing a context in which a number of forces were determining a steady decrease in mortality, but the average nutritional intake of families remained largely stable. This nutritional level may have been sufficient in a stable economic context, but the higher price shocks produced by political, social and economic instability during the interwar period introduced sharp variations in the day to day energy balances which had an important impact on the population's health and morbidity.

In a strive to address more closely the interaction between the variables we have considered so far, we will now examine the same simple question Lee (1981) raised thirty years ago: **Did decreases in purchasing power cause mortality (and economic strife) and if so, how soon?** We will statistically examine the same relations we have graphed in the previous part of our analysis. The variables to be scrutinized are mortality rates, infant mortality rates, child mortality rates (1 to 5 years), pawns, child abandoning, rainfall, and temperatures. For these statistical analyses all variables are expressed in natural logarithms which correct for heteroscedasticity and makes additive models more suitable.[55] See Appendix I for a description of the sources, calculations and controls.

[55] Bengtsson and Broström (1997: 167).

**Demographic response to short-term economic stress.**

Previous to modelling, all variables in natural logarithms have been tested for stationarity, both in levels and in first differences[56]. We have performed two tests to contrast the null hypothesis of a unit root (Augmented-Dickey-Fuller [ADF] and Phillips-Perron [PP] tests) and one test to contrast the null hypothesis of stationarity (Kwiatkowski, Phillips, Schmidt, and Shin [KPSS] Test). We find that all the log variables are trend stationary[57] or their first differences are I[0] integrated respectively. This is a precondition for constructing both the distributed lag and VAR models shown below and will be helpful, as the coefficients in the distributed lag fits may be interpreted as close proxies to elasticities.

Our first approach to relating the variables will be a multivariate (linear) time series model because it allows us to approximate the association between the variables we are relating without imposing an explicit theoretical design of the dynamic tie between them. VAR analysis can also help identify possible weak causality (Granger causality). This seems most appropriate as a first approximation. From there we will go on to formulate a distributed lag model similar to those promoted by Lee (1981) that better reflect the functional form that we may assume between variables and will allow us to get a better intuition of the magnitude and timing of the connections involved[58].

We start by replicating the fits proposed by Nicolini (2007) or more recently by Fernihough (2010). According to the stationarity tests the vector of detrended birth rates, death rates and wages [CBR, DR, W] in natural logarithms can be assumed covariance stationary[59]. As expected the result does not reflect a Malthusian scenario as those found by Nicolini (2007) for Britain [1541-1640] or Fernihough (2010) for Northern Italy [1650-1881]. But the exercise does show what we have been postulating: **a strong and significant negative influence of real wages on mortality**.

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[56] The time series techniques we will be applying can only be employed when variables of interest follows normal distributions, which means that the chance of observing a value very far from the mean value is close to zero. Sometimes data series show unbounded fluctuation around the mean or with some systematic trend. This unbounded nature of variability in the data is commonly known as non-stationarity. Making the results of our statistical exercise reliable requires making our series stationary. We perform certain transformations on data so that excessive volatile nature of data is contained and is made more suitable for uni- and multivariate analysis. Nelson and Plosser (1982) suggest that most time series have a stochastic trend, $y_t = y_{t-1} + u_t$. Others have a time trend. Hence if we first difference or detrend, this produces a stationary variable.

[57] We could not apply the 121 month centred moving average proposed by Lee (1981: 358 and 739). This would have reduced our sample range almost by half.

[58] Also Richards (1983), Hammel (1985), Weir (1984).

[59] We have excluded four high mortality outliers caused by Spanish influenza August-November 1918 and 8 unusually low nominal income outliers due to strikes or lockouts in December 1916 (strike), January 1917, March-May 1917, August 1917 (strike), and June-July 1922 (end of labour agreement, attempt to cut wages by 20 %). We have used Schwarz [SC] and Hannan-Quinn information criteria [HQ] to determine the lag length. SC indicates one lag and HQ indicates three. We have fitted a two-lag VAR model. The one-lag and three-lag specifications give very similar results. The inverse roots of the autoregressive characteristic polynomial are less than one in absolute value, which indicates that the model is stable. Residuals show some seasonal correlation with BR, normality for CBR and W —the variables we are interested in relating.

**Table 2. Stationarity tests for detrended birth rates, detrended death rates and detrended real wages. All tests in levels and with intercept.**

| | Augm. Dickey-Fuller (ADF) $H_0$: unit root | Phillips-Perron (PP) $H_0$: unit root | Kwiatkowski-Phillips-Schmidt-Shin (KPSS) $H_0$: stationarity |
|---|---|---|---|
| Birth Rate detrended | -7.032* [1] | -11.575* [5] | 0.1019** [9] |
| Death Rate detrended | -7.242* [0] | -7.289* [5] | 0.1684** [8] |
| Real Wage detrended | -3.873* [0] | -3.572* [5] | 0.2218** [11] |

Note: [] indicate lag length or Newey-West bandwidth in Bartlett kernel estimation. Augmented Dickey Fuller and Phillips-Perron test for unit root. *rejects null hypothesis of unit root at 5 % level. Kwiatkowski-Phillips-Schmidt-Shin tests for stationarity. ** cannot reject the null of stationarity at a 5 % level. Critical values for ADF and PP are 1% — 3.455; 5% — 2.872; 10% — 2.573. Asymptotic critical values for KPSS are 1% — 0.739; 5% — 0.463; 10% — 0.347.

**Table 3. VAR Model Coefficients. (Standard error in parenthesis)**

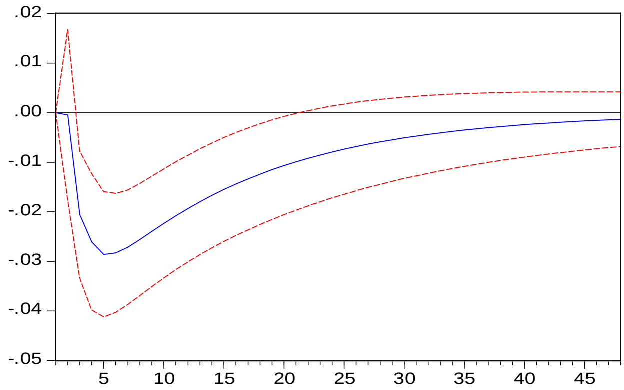
| VAR model coefficients | Birth rates detrended | Death rates detrended | Real Wages detrended |
|---|---|---|---|
| BRD(-1) | 0.269*** (0.067) | 0.021 (0.098) | 0.012 (0.031) |
| BRD(-2) | 0.230*** (0.06855) | 0.367*** (0.09996) | 0.047* (0.03185) |
| DRD(-1) | 0.057 (0.044) | 0.596*** (0.065) | -0.005 (0.021) |
| DRD(-2) | -0.061* (0.043) | -0.169*** (0.063) | 0.002 (0.020) |
| WD(-1) | 0.074 (0.138) | -0.010 (0.201) | 0.732 (0.064) |
| WD(-2) | -0.164 (0.138) | -0.448*** (0.202) | 0.192*** (0.064) |
| C | 1.866*** (0.277) | 1.220*** (0.404) | -0.070 (0.129) |

Note: * denotes significance at 10%, ** at 5% and *** at 1%

What is also important to see here, is that there are no other significant influences between vital rates and real wages, only that between real wages on death rates. We can also see that the effect is not immediate; it has a lag of 2 months. The magnitudes of the variations implied are hard to interpret due to the data transformations and the fact that the results may be biased because of simultaneity. But imposing the same previously established ordering of the variables as Nicolini and

Fernihough, we can give an idea of the response of death rates to an unexpected increase in the current value of real wages with a VAR impulse response analysis[60].

**Figure 11. Response of death rate detrended to a one standard deviation real wage detrended innovation.**




The response is shown with one-standard-error bands that yield confidence intervals of approximately 66%. We can see that the unexpected decrease in real wages causes a persistent increase in mortality that will fade away slowly over the next five years. According to the VAR model we have specified, the contribution of the variability in real wages on the variability of death rates after six year is 21 %. Over one fifth of the fluctuations in mortality can be explained by the rise and fall of real wages.

The objective of this section is to reveal the impact and scope of economic disruption of the interwar period in an effort to assess nutritional and health living standards in this late phase of industrialization. The VAR analysis has been helpful in confirming that there may be a strong causation running from real wages to mortality in late industrializing Bilbao.[61] To learn more about this and other aspects of Bilbao's economic and living conditions we will now turn to a different method, the distributed lag regression. This second method will allow us to identify the effect of both contemporaneous and previous variations in the level of real wages on the level of mortality; we will be able to discern the delayed echo responses to a shock[62]. We perform this by estimating the linear relationships between the past and present fluctuations in the variables. The results we obtain may thereby be interpreted as elasticities.

The three most important conclusions to be drawn from the first set of regressions shown in Table 4 are the following. The impact of a shock on real wages has a lagged effect of three to five months on mortality rates. Also temperature and rainfall play a significant but small role in determining mortality. And including outliers which correspond to very abrupt falls in real incomes due to strikes or lockouts at AHV or the very sudden increases in mortality due to the Spanish

[60] We use the same ordering based on their assumptions of recursiveness for the impulse response functions. Nicolini (2007: 107) and Fernihough (2010:18).

[61] Testing for Granger causality, the only other causation we have found is for birth rates Granger causing death rates. Tommy Bengtsson has pointed out to us that this may just be a mechanical size effect. Since infant mortality on average is high, in years of many births, the crude death rate goes up.

[62] See Lee (1981: 359)

influenza in the fall of 1918 (12 observations in all) moves the mortality response two periods forward to the fifth and sixth month[63].

**Table 4. Distributed lag regressions. Death rates, real wages and weather** (S.E. in parenthesis)

| | (1) full sample | (2) no outliers | (3) (2) with t & r |
|---|---|---|---|
| **DLOG(W)** | **-0,0499** | **0,2570** | **0,2775** |
| | (0,1422) | (0,2622) | (0,2606) |
| **DLOG(W(-1))** | **-0,1076** | **0,2768** | **0,2871** |
| | (0,1624) | (0,2582) | (0,2593) |
| **DLOG(W(-2))** | **0,0386** | **-0,1661** | **-0,0948** |
| | (0,1663) | (0,2495) | (0,2744) |
| **DLOG(W(-3))** | **-0,0706** | **-0,5015**** | **-0,3921** |
| | (0,1655) | (0,2476) | (0,2512) |
| **DLOG(W(-4))** | **-0,2946** | **-0,5996***** | **-0,4953**** |
| | (0,1630) | (0,2451) | (0,2456) |
| **DLOG(W(-5))** | **-0,3430**** | **-0,7414***** | **-0,7132***** |
| | (0,1591) | (0,2562) | (0,2695) |
| **DLOG(W(-6))** | **-0,3961***** | **-0,1011** | **0,0167** |
| | (0,1403) | (0,2503) | (0,2462) |
| **DLOG(DR(-1))** | **-0,1945***** | **-0,2336***** | **-0,2712***** |
| | (0,0627) | (0,0687) | (0,0699) |
| **DLOG(DR(-2))** | **-0,2474***** | **-0,1976***** | **-0,2106***** |
| | (0,0631) | (0,0681) | (0,0701) |
| **DLOG(DR(-3))** | **-0,1412**** | **-0,1505**** | **-0,2269***** |
| | (0,0654) | (0,0679) | (0,0703) |
| **DLOG(DR(-4))** | **-0,0710** | **-0,0604** | **-0,0997** |
| | (0,0658) | (0,0669) | (0,0681) |
| **DLOG(DR(-5))** | **-0,1641***** | **-0,1585***** | **-0,1497**** |
| | (0,0641) | (0,0660) | (0,0685) |
| **DLOG(DR(-6))** | **-0,1161*** | **-0,1189*** | **-0,0913** |
| | (0,0634) | (0,0667) | (0,0674) |
| **Temperatures** | | | **-0,0036***** |
| | | | (0,0012) |
| **Rainfall** | | | **0,0004**** |
| | | | (0,0002) |
| **R-squared** | **0,1319** | **0,1575** | **0,1995** |
| **Log likelihood** | **82,023** | **103,222** | **106,271** |
| **Durbin-Watson stat** | **2,025** | **2,027** | **2,077** |

Note: * denotes significance at 10%, ** at 5% and *** at 1%

[63] This 5 to 6 month lag is precisely the echo effect found by Bengtsson (2004), Bengtsson and Dribe (2005) and Bengtsson and Ohlsson (1989) for micro level data in Scania and monthly aggregated data for Sweden.

The impact of a decrease in real income is considerable. A monthly fall of real income of 0.05 % over seven years (as was the case between 1914 and 1920) would increase the death rate in at least the same proportion. Approximately three thousand five hundred persons would die as a consequence of this persistent fall in real income —approximately 3 per cent of the population. The result is surprising as the general reduction in mortality is also reducing the impact of diseases not related to economic fluctuations, moving those related to economic fluctuations in the foreground. Therefore there is far less noise in calibrating living standards by reactions to short-term economic fluctuations.

The high sensitivity of death rates to changes in real income is a sign of people living on a tight energy balance[64]. It would be assuring to contrast that there were previous reactions before death when adjusting to falling incomes. Finding strategies such as pawning, giving children less to eat to assure the energy balance of the bread-winner, taking children to homes would reinforce our hypothesis. The following exercises seek to shed some light on the use of these family strategies.

Comparing infant mortality, child mortality and the overall death rate we find a similar pattern to what Bengtsson and Dribe (2005) found for Sweden's transition in agriculture in the 18th and 19th centuries. Infant mortality does not react to real income shocks —perhaps due to the fact that lactation depends more on the mothers' reserves[65]—; child mortality reacts more vehemently —in the same lags but twice as intense— than overall mortality, pointing at a reduction in small children's nutrition due to their defencelessness as a strategy when ends don´t meet, the fact that overall mortality is driven by child mortality, or both; pawning leads all other strategies as expected in the second month after the shock; and last but not least, abandoning children to homes is almost contemporaneous with death, just one month earlier —a last resort to reduce morbidity. The regressions support the idea of a population living very close to their energy needs. The impact structure is very consistent with what we should expect under the hypothesis of a family seeking to reduce the risk of death.

How is this compatible with the steady downward trend in mortality rates? Very different from the studies for London by Galloway (1985) and Kelly and Ó Gráda (2010) for London and Paris, many of the big ´killers´ were being exterminated by public works and public health in Bilbao over the period we are examining. Sewage had been provided by major reforms before the turn of the century[66]. Running water was provided in the twenties and thirties[67]. The *intramuro* city's cemeteries had been closed down and a central cemetery had been designated far beyond the city limits. This had reduced cholera, typhus and dysentery. Chicken pox inoculations were immunizing population by the early twentieth century. The seasonal pattern of death in Table 1 supports the

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[64] When relating reductions in mortality to changes in real wages, the impact of changes in wages have a lag of only three months before they improve mortality rates. The lag length increases to five months when we examine only the increases in mortality. People resist more to dying than to living longer as we would expect.

[65] This confirms Bengtsson and Ohlsson (1985), Bengtsson (1989 and 1996) and Alter and Oris (1997) quoted in Bengtsson et al. (1998: 111)

[66] A major project for Bilbao was presented in December 1893 and executed between 1895 and 1903 by Recaredo Uhagón. The surrounding suburbs began to see sewage in the 1920's (Baracaldo, San Salvador) but other had insufficient installations as late as 1930 (Sestao, Erandio). González Portilla ( 2001, Vol. II: 315-347).

[67] González Portilla ( 2001, Vol. II: 360-390).

idea that the intestinal infectious diseases were reduced over the period under examination. We have run all regression additionally with variables adjusted for seasonality using Census X12. There are no relevant differences in lag structure, signs or magnitudes[68]

**Table 5. Family strategies. Death, feeding children less, pawns and putting children into homes (standard errors in parenthesis)**

| Y | Death Rates | Infant Mortality | Child Mortality | Pawns | Children to Homes |
|---|---|---|---|---|---|
| **DLOG(W1)** | **0,2570** | **0,2946** | **-0,1445** | **0,010** | **-0,4352** |
| | (0,2622) | (0,4643) | (0,6225) | (0,2371) | (0,4376) |
| **DLOG(W1(-1))** | **0,2768** | **0,7687*** | **0,5237** | **0,3390** | **-0,4932** |
| | (0,2582) | (0,4675) | (0,6169) | (0,2426) | (0,4470) |
| **DLOG(W1(-2))** | **-0,1661** | **0,5668** | **0,7572** | **-0,8071***** | **0,3225** |
| | (0,2495) | (0,4609) | (0,6107) | (0,2346) | (0,4312) |
| **DLOG(W1(-3))** | **-0,5015**** | **0,1293** | **-0,8895** | **-0,4151*** | **-0,0232** |
| | (0,2476) | (0,4589) | (0,6126) | (0,2393) | (0,4336) |
| **DLOG(W1(-4))** | **-0,5996***** | **-0,4653** | **-1,5797***** | **0,2687** | **-0,8929**** |
| | (0,2451) | (0,4508) | (0,6020) | (0,2353) | (0,4292) |
| **DLOG(W1(-5))** | **-0,7414***** | **-0,3654** | **-1,7386***** | **-0,2886** | **-0,7317*** |
| | (0,2562) | (0,4615) | (0,6184) | (0,2417) | (0,4438) |
| **DLOG(W1(-6))** | **-0,1011** | **0,2248** | **-0,3900** | **-0,0570** | **-0,4039** |
| | (0,2503) | (0,4431) | (0,5955) | (0,2240) | (0,4239) |
| **DLOG(Y(-1))** | **-0,2336***** | **-0,5438***** | **-0,3380***** | **-0,5760***** | **-0,6327***** |
| | (0,0687) | (0,0681) | (0,0679) | (0,0763) | (0,0684) |
| **DLOG(Y(-2))** | **-0,1976***** | **-0,4772***** | **-0,1830***** | **-0,4782***** | **-0,4167***** |
| | (0,0681) | (0,0772) | (0,0700) | (0,0860) | (0,0791) |
| **DLOG(Y(-3))** | **-0,1505**** | **-0,4366***** | **-0,1212*** | **-0,6755***** | **-0,3152***** |
| | (0,0679) | (0,0814) | (0,0690) | (0,0924) | (0,0816) |
| **DLOG(Y(-4))** | **-0,0604** | **-0,3020***** | **-0,2437***** | **-0,1997**** | **-0,2379***** |
| | (0,0669) | (0,0820) | (0,0683) | (0,0925) | (0,0814) |
| **DLOG(Y(-5))** | **-0,1585***** | **-0,0835** | **-0,0916** | **-0,2484***** | **-0,1107** |
| | (0,0660) | (0,0783) | (0,0694) | (0,0858) | (0,0793) |
| **DLOG(Y(-6))** | **-0,1189*** | **-0,0749** | **-0,0573** | **-0,2052***** | **-0,1216*** |
| | (0,0667) | (0,0693) | (0,0690) | (0,0755) | (0,0669) |
| **$R^2$** | **0,158** | **0,275** | **0,178** | **0,451** | **0,308** |

Note: * denotes significance at 10%, ** at 5% and *** at 1%

[68] Coefficients vary by a magnitude of less than 15 %.

González Ugarte (1994: 49) has attributed the highest percentage (30 %) of the mortality in Baracaldo in 1930 —one of the main working class suburbs— to illnesses associated to the respiratory system. Cold weather, rain, pollution and low defences converted colds into pneumonias. This is of course only a conjecture. Sanz Gimeno (2001: 148) does however indicate that the highest rates of infant and child mortality were to be found in the major urban nuclei: Madrid, Barcelona, Valencia and Bilbao. Certainly people did not starve to death, but they didn't simply fall over dead either. Perhaps as their health faded from the negative shocks to their energy balance, some resisted to colds and but in others colds evolved on to bronchitis and pneumonias. Lee (1981) has pointed out the lack of closer knowledge on the process nutritional deprivation, disease and death[69].

Be what may, we have established a solid strong and significant link between material family income and mortality which is indicative of nutritional levels close to energy necessity over the interwar period. We have established this by comparing the nominal income of a medium skilled worker's family in one of the highest paying industries and cities in Spain.

**Conclusions**

We have assembled an exceptional database to contrast the stylized facts and conclusions related to standards of living that economic historians and demographers have led us to believe over the last decades. Our working hypothesis was that, albeit in a context of steadily falling mortality rates, real incomes did not improved substantially over the period and that living conditions and the lack of material improvement remained largely unaltered for great parts of the population. We based our analysis on the examination of the impact of short-term variations of prices and fluctuations in real family incomes on vital statistics and on other indicators of socioeconomic distress. The analysis has revealed that even in a context of falling mortality, the nutritional imbalances, which population suffered as a consequence of economic shocks, and their impact on deprivation, disease and death put an improvement in living standards very much in question.

Our most important conclusion is that material well-being did not improve even during this late phase of industrialization over the interwar period, an age of political and social turmoil which ended in a civil war. Real incomes were very slightly above 1914 levels in December of 1935. Secondly, standards of living measured in terms of family fragility to changes in the prices of basic needs and real income remained low throughout the period. Higher mortality in response to short-term economic stress must be regarded as a clear indicator of a low standard of living. We have found exactly such a response. Other indicators of economic strife examined here have fallen into

[69] "There are, of course, a number of ways in which wheat prices [real incomes] might affect mortality. Outright starvation was probably uncommon, but it is likely that high prices led to a gradual physical weakening of segments of the population, as they were first forced to draw upon financial or food reserves, then on bodily reserves. And a population so weakened might well be more vulnerable to disease and death, although this latter link does not receive strong support from the medical literature. Another possibility is that harvest failure prompted short-term migration of people in search of food and work, and that this mobility may have helped spread disease." Lee (1981: 370).

place both in magnitude and chronology. Families reacted first by pawning clothes; the increase in child mortality seems to reflect the weak position of small children in the food chain as an easy recourse to adjust to less food in the family; and finally children were increasingly abandoned as a last resort to reduce morbidity.

The results raise a number of interesting questions. The first concerns the distinguishing of levels and flows. The absolute level of nutrition may not be a good indicator of living conditions if work energy requirements change substantially by moving from a rural to an urban setting[70]. Secondly, the regular provision of nutrition becomes an important issue for health in a working environment that demands a regular workload. This may only be observable with high frequency data. The response pattern to short-term economic distress we have found is similar to that observed for the disruption caused by agricultural transformation in southern Sweden. The difference is that our data does not show a seasonal bad harvest cycle, but reacts to the turbulence of the interwar years. Rural Spaniards that arrived in Bilbao searching to escape the tyranny of weather remained exposed to arbitrary shocks affecting their health and survival. Over the interwar period distress thereby continued to be endemic in a context of rising social and political tensions. Thus the role of recurrent material deprivation in the social conflictivity and polarization present at the outburst of the Spanish Civil War is an element that needs to be considered in more detail.

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[70] Increasing heights would be indicative of better diets and nutritional intake at early ages and during puberty, but they also point at higher energy requirements for both baseline maintenance and work energy. Taller individuals are more exposed to sudden variations in their food intake.

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**Appendix A. Data description and sources.** [* taken from the Boletín Estadístico de Bilbao]

Burials expressed in number of persons buried in Derio cemetery. Monthly data collected by Juan Gondra.

Death rate calculated by dividing monthly burials by population (multiplied by 12 to annualize and by 1000 to express as ‰). Monthly population interpolated with the annual population data taken from the Boletín Estadístico de Bilbao.

Infant mortality calculated using annualized number of children that died* in the corresponding month (multiplying number by 12) and dividing this number by the number of children born the twelve preceding months*. For 1914 we have no data on the preceding months and we have used 2.600 births which is the annual average for 1914-1916 during these years the number of births remained fairly stable.

Child mortality expressed as per thousand of born surviving to the age of one year. Number of children who died between the age of 1 and five* divided by the number of children born* surviving to the age of one and multiplied by a thousand.

Birth rate calculated by multiplying the number of monthly births* by 12, dividing by population* and multiplied by 1000 to obtain ‰.

Stillborn expressed as number of monthly stillborn* divided by the sum of births* and stillborn and multiplied by 1000 to obtain ‰.

Nuptiality in our case is a crude marriage rate. It is the number of marriages* times 12, divided by population* and multiplied by 1000 to obtain ‰.

Pawns is the total number of clothing pieces pawned in the corresponding month*

Meals served in soupkitchen* total number of meals served by the private and public soup kitchens registered by the Boletin municipal de Bilbao.

Rainfall mm of rain registered in the meteorological stations of Instituto de Segunda Enseñanza, Larrasquitu and Punta Galea* complemented (especially for 1916 and 1917) and controlled for with data from C. Almarza Mata, J. A. López Díaz y C. Flores Herráez (1996): *Homogeneidad y variabilidad de los registros históricos de precipitación de España*. Madrid: Ministerio de Medio Ambiente, Dirección General del Instituto Nacional de Meteorología. The series we use are very similar to Almarza et al. for 1914-1920. For 1920 to 1930 they do not report data for Bilbao and we have interpolated missing data with their series for San Sebastián.

Temperatures registered for Punta Galea*.

Children left in child homes* number of boy and girls entering the Casa Provincial de Expósitos, an institution created in 1880 to take care of orphans and abandoned children. Many of these children come from the Casa de Maternidad (maternity home), situated in the next building. Mothers had the option to remain with their children during lactation and were paid to feed their children and others. The institution was financed by the regional government. This series has two spikes, one in 1916-1918 and the other in 1930-31. This coincides with major drops in real incomes. The data can discriminate boys and girls, but there seems to be no gender bias.

Children and elderly left in homes*

3000 cal meals served in Soup Kitchens*