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Artículo

The tails of two cities: living conditions in Burgos and Bilbao in the first half of the 20th century

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ABSTRACT

This paper compares the living conditions of two Spanish cities during the interwar period: Burgos, provincial capital of one of the important grain-producing provinces, and Bilbao, also a provincial capital and an emerging industrial center. The two cities, opposed in productive character, were well-connected by a railway spanning 194 kilometers. We contrast whether these neighboring cities experienced similar changes in their living standards over time. Specifically, we analyze the effects of changes in prices and income on household consumption, mortality rates, causes of death, and pawning. To conduct our analysis, we have collected homogeneous comparable data series from the official monthly statistics of both municipalities. We find that the impacts of price and wage changes during and after World War I and the Great Depression differed significantly between the two cities.

El recuento de dos ciudades: condiciones de vida en Burgos y Bilbao en la primera mitad del siglo xx

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RESUMEN

Este trabajo presenta un análisis comparativo de las condiciones de vida entre dos ciudades en España en el periodo de entreguerras: Burgos, capital de una provincia importante de producción de cereales, y Bilbao, también capital de provincia y un centro industrial emergente. Las dos ciudades, situadas en extremos productivos, estaban bien conectadas por ferrocarril, a unos 194 km. Contrastamos si estas dos ciudades geográficamente vecinas siguieron patrones similares en la evolución de sus niveles de vida. Examinamos el impacto de los cambios de precios e ingresos sobre la compra de la cesta familiar, mortalidad, causas de muerte y empeños. La comparación se lleva a cabo con series homogéneas y comparables extraídas de las estadísticas mensuales oficiales de sus municipios. El análisis muestra que los cambios en los precios y los ingresos tuvieron impactos muy diferentes en las condiciones de vida en las dos ciudades durante y después de la Primera Guerra Mundial y la Gran Depresión.

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1. Introduction

Boom and bust sequences, business cycles in general, seem to show similar laws of motion in emerging economies as they do in consolidated economies, but their amplitude and length of cycles tend to differ substantially. Some of these differences arise from the stickiness and over-exposure of backward economies. Others have more to do with the ease of expansion and the pain of contraction. In the past and even in more recent times differences prevail. Contemporary mechanisms that deepen the cost of adjustment in emerging economies today are the extra price of readjustment of debt exposure arising largely from high-risk bandwagon effects (Jordá, Schularick and Taylor, 2013) or insufficient home markets and the relative impact of international trade contraction leading to deteriorating terms of trade (Almunia *et al.*, 2010, p. 226).

Economic backwardness, in the Gerschenkron sense, describes countries as dual economic systems in transition to modernization —initially far from an ideal-type general equilibrium economy framework. Backward economies over the first third of the 20th century, as for example Spain, were more than often characterized by thin markets combined with additional deadweight such as clientelism, corporatism, firms and elites in dominant positions and growing collusive practices. Additionally, they carried a burden of poor health, low educational attainment and bad infrastructures. Geographically differentiated degrees of resistance or openness to economic modernization and the speed of structural change were driven by the opportunities and profits they entailed. This oftentimes made certain geographical regions more prone to overinvest in rapid short-term growth strategies when strong economic windfalls became available and consequently to suffer more deeply their debt overexposure in times of economic adversity.

This paper seeks to reveal only a tiny historical glimpse in time and space of such a boom and bust sequence and its differential geographical effects —the impact of World War I and the interwar period in two cities in war-neutral Spain. The impact of early 20th century shocks —wars, recessions and economic depression— had different outcomes on different parts of the world. World War I meant disruption, restructuring to war economy and very slow post-war recovery in the case of the participating more advanced Western economies. In the case of war-neutral backward Spain, the conflict stimulated import substitution industrialization and forced it to face increased demand for its products from the countries at war. The end of the confrontation implied the collapse of the flow of wartime windfalls and the abrupt mandate for economic readjustment, both in prices and economic activity.

The degree of backwardness or modernization in Spain was not uniformly prevalent. This made the impact of war and interwar adjustment very different in rural, urban and industrial contexts. To this end, we examine the case of the industrial trade-port Bilbao —more open to progress and change— and the case of agrarian-centred Burgos —more deeply rooted in agrarian rural Old Castile. Each of them represents one side of the duality of a country in transition to a more modern economy. Burgos was a stronghold of a more resilient traditional agrarian social system in slow transition, whereas Bilbao was already well established as a liberal-progressive modern industrial center. These two cities can be used as case studies of the modernization divide and two-speed transition. Only around 30% of Spain's population lived in cities of more than 20.000 inhabitants by 1930 (25% in 1900). Over the first third of the century the weight of agriculture in GDP had dropped only from around 32 to 24%. In the 1930's approximately 50% of its working population was still active in agriculture and fishing (Soto Carmona, 1989, p. 695; Carreras y Tafunell, 2005, Tables 15.13 and 17.10).

We examine a period of economic turmoil in these well-differentiated settings. The differences generated by modernization and continuity will be brought to light by examining the impact of price changes on living standards and other economic and social indicators (infant mortality, disease prevalence and pawning as a last resort) during the First World War and the inter-war period. For both provincial capitals the hypothesis to be tested is that price shocks during and after World War I and the Great Depression had very different effects on both cities. To what extent that might have reinforced their positioning within the political polarization of the time is something to be considered.

2. Some history and facts

The importance of the Way of Saint James —Camino de Santiago— had been essential for the economic growth of Burgos over the Middle Ages, gaining wealth and momentum through income from trade and pilgrimage. Romanesque and Gothic architecture flourished. The Catholic Monarchs created the Consulate of Burgos in 1494, an institution which channelled the trade in highly-valued Castilian Merino wool. As a result, Burgos came to coordinate and control the commerce of Mesta wool through the ports of Bilbao and Laredo to Flanders and the commerce of fine cloths from Flanders to the rest of the Iberian Peninsula. Already in 1447 Burgos had established a trade court, a vanguard institution in economic development, similar to those created throughout the Mediterranean in the Italian city states, or in Barcelona, Valencia, and the Balearic Islands. These courts had jurisdiction over commercial cases. Reducing transaction costs were both a constituting precondition and a *raison d'être* for the Consulate.

In 1512, the Catholic Monarchy also dictated the Laws of Burgos, the first collection of codified laws to be applied in the Habsburg Empire. Therefore, the "long" 15th century was for Burgos a century of plenitude: the city developed over and beyond its hinterland to become a flourishing inland commercial hub. Burgos fully exploited the advantages of its monopoly situation and its central position in the two-way flow of commerce with Flanders.

Over the 16th century, its economic grandeur came to a gradual decline with the religious wars in Flanders, the increasing shift of commerce to Atlantic colonial trade, and the growing centralization of administrative and economic power of Phillip II's kingdom in Madrid. The recurring plagues —1565 and 1599— punished Burgos severely, decimating its population. As the socio-economic basis of Burgos' wealth weakened, roads and communication routes decayed; and Burgos fell into lethargy and isolation. Burgos remained in this state of decadence until well into the last decades of the 18th century. Enlightened Despotism tried to re-establish the city's lost affluence by restoring the Consulate. However, by then, in a world economy now dominated by colonial trade, a wool monopoly made little sense as a motor of development.

The 19th century brought with it two important events: the Napoleonic Wars with the ensuing Spanish War of Independence. Burgos first resisted the invading French troops and then suffered four years of French occupation. After monarchic Restoration, Burgos became a provincial capital with the corresponding administrative duties. It also became an important military and ecclesiastic administrative center.

The 20th century brought changes mainly during the Dictatorship of Primo de Rivera, with its public works reforms and strong capital injections which subsidized economic activities and communication routes. The boost given to interprovincial and regional communications, the concentration in Burgos of the interests of two major railways (the Santander-Mediterranean and the direct Madrid-Burgos), reduced transport costs for immigrants. With these changes the city experimented a certain degree of economic integration and promoted its modest industrialization.

Bilbao, on the other hand, originated as a settlement of seafaring people on the banks of the Nervión estuary, one of the few well-protected navigable inland ports of the Spanish northern Atlantic coast. From far back, its inhabitants traded with iron ore found close-by and the products of their iron foundries. In 1300 the settlement received a charter and the privilege of self-government as an independent municipality. After the Spanish Reconquista, Bilbao's port also became one of the main exit points for the high-quality Merino wool commerce monopolized by Burgos to Flanders. It was then already the most important port in Atlantic northern Spain. In 1511 the city obtained, as Burgos had in 1447, its own commercial tribunal with similar competences of regulating commerce and disputes and the privilege to issue laws in the form of ordinances. Much like Burgos, the wars with Flanders and the decline of wool trade pushed its main activities back to its traditional commerce and seafaring.

In the late 18th century, after the Bourbon Reform liberalization of trade with the Americas, Bilbao's economy received a small boost from overall more intensive trade. During the early 19th century the city was sacked by French troops in the Peninsular War (1808-14) and over the century it was besieged four times during the recurrent Carlist wars. After the last siege, Bilbao was able to expand its inland trade through the railways connecting it to the center and the Mediterranean. The city extended its geographical area beyond its traditional limits and to the other side of the Nervión river. Especially over the later decades of the 19th century, the Bessemer-steel-driven iron-ore mining boom attracted substantial infrastructure investment and massive immigration, which laid the foundations for rapid industrialization. Iron and steel, ship-building, metallurgy, paper, printing and tin were among the new industries to grow and prosper over the next decades. Bilbao became one of the most important industrial centers in Spain.

Although, as we can see, the two cities share a common commercial history going back many centuries, by the nineteenth century little more than the trade route to and from the Atlantic sea connected them. It was the Bilbao mining boom at the turn of the 19th century that established new socio-economic ties. The province of Burgos became the most important provider of dayworker immigrants to the mining districts of Bilbao. Over the early twentieth century chain migration maintained these initial bonds and helped extend them via internal migrations into the greater area of Bilbao. The province of Burgos provided the second-most important flow of immigrant population to Bilbao from the last decades of the nineteenth century well into the 1930s (Gonzalez Portilla, 2001, chap. 4; González Portilla and García Abad, 2006).

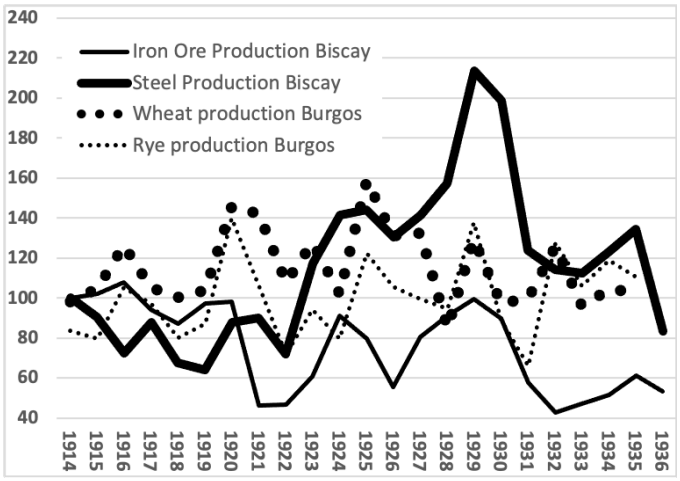

Figure 1. Wheat and rye production in Burgos (100 = 1900-13) and iron ore and steel production in Biscay (100 =1914).

Sources: Burgos: GEHR (1991), cuadro BU-1, p. 292; Biscay: Barreiro Zabala (1943), data from Consejo de Minería.

Economic activity in Burgos and its province over the first third of the 20th century is closely related to the value-added tied to agriculture. Figure 1 depicts the production of its agrarian staples, wheat and rye. Variations are driven by yearly weather conditions and not by the cultivated surface area. Production is higher when yield per hectare is higher. The early and mid-1920's provided exceptionally good harvests; 1928, 1930, 1931 and 1933 were relatively bad harvests. The productive portrait of Burgos reveals a fixed-factor stagnant technology economy subject to year-round weather conditions. For the 1920s and 1930s production fluctuates around an average level of 120 and 100, respectively, with standard deviations of 20 points.

Over the period examined the economy in Bilbao was driven by iron ore mining —with its ores in progressive exhaustion— and iron transformation industries. Again Figure 1 shows the production of Biscay's two main production staples, iron ore and steel. Iron ore mining is in oscillating decline. By the early 1930's it had halved its initial production. Steel production contracted over the war and early post-war. It gained momentum over the Primo dictatorship and reverted to its 1920´s levels during the Spanish Second Republic. Biscay was suffering the slow depletion of its iron ore mining activity and the growing subordination of its steel industry to nationalist economic politics and policy.

From the very onset of our enquiry we find that very different income dynamics will be driving the socio-economic circumstances in each city. Burgos will be much more exposed to harvest cycles determined by weather conditions and with a far lower potential for rapid economic expansion given its accommodation to a model of agrarian capitalism. Bilbao is in a mature phase of transition from an export-led mining-based economy to inward-looking industrial capitalism. Thereby it is

comparatively far more exposed to business cycles and general economic uncertainty.

3. Data

By the mid-nineteenth century, keeping a close eye on virulent processes that could easily get out of hand in major cities —using carefully elaborated statistics— became increasingly widespread throughout Western Europe. In Spain, the procedure to elaborate specific and detailed statistics for large urban nuclei of population —given the importance of controlling public health, mortality, and crime in these unprecedented large population agglomerations— was not contemplated by the Spanish government until the Royal Decree of 25 April of 1902[1]. The decree designated the Dirección General del Instituto Geográfico y Estadístico as the organism responsible for its execution and for centralizing and unifying the information provided. The results of the data collection were to be published monthly as "statistical municipal bulletins" by provincial Statistical Deputies. The 1902 decree was not enacted until just before the First World War with the Royal Decree of 29 June, 1913. Therein the Ministerio de Instrucción Pública y Bellas Artes limited the elaboration of these statistics to the provincial capitals. It also defined the exact statistics to be recorded for each capital: vital statistics, suicides, weather, consumption and bromatology, hygiene, poor relief, primary schooling, economic statistics (food prices, food supply and wages), pawning, savings banks' activity, accidents, fires, crime and imprisonment, and occasionally anthropometric indicators. Other statistics considered of local interest could also be included. These monthly statistics were initially published from the early 1914s on in many provincial capitals. Distribution was free and the cost of publication was carried by the municipalities themselves. Many provincial capitals discontinued the series over the following years, but Burgos and Bilbao continued their publication up into the 1930s and beyond the Spanish Civil War. They have some of the most complete collections available. Given the common formats defined both for data collection and its presentation in published form makes them homogeneous and strictly comparable. The data extracted and presented here is taken from the bulletins available online: Burgos from December, 1913 to June 1933; Bilbao from January 1914 to September 1936.

An exception are the wage series for Bilbao. The series from the municipal bulletins is incomplete with data missing from 1920 to 1927 and after 1932. Consequently, applying the principle of using one single sources throughout the period examined, the incomplete nominal wage series for Bilbao were replaced with a complete wage series from Altos Hornos de Vizcaya company records. Altos Hornos de Vizcaya [AHV] was the biggest industrial employer in Bilbao and the wages are averages of 6.000 to around 8.000 workers. We have contrasted these incomes with the maximum and minimum metalworker wages registered by the Bilbao municipal statistics, by Bilbao Chamber of Commerce and data remitted to the national geographical institute by the Baracaldo municipality (one of the locations of AHV). The monthly wages (overall averages, but also averages for transport day-laborers, bricklayers and miners) at AHV are within or above the bands provided by these sources over the complete period analyzed. If any, this source introduces upward wage bias in our analysis, as AHV workers were considered highly paid workers at the time.

4. Construction of cost-of-living indexes

Using the available monthly price data for basic goods and calculations of family spending we have calibrated a family consumption basket for both Bilbao and Burgos. With the clear objective of making them comparable over time and space we have constructed five cost-of-living indexes: two moving-weight baskets which try to accommodate for the nutritional transition which was taking place in Spain at the beginning of the 20th century (Cussó Segura, 2005; Pujol-Andreu and Cussó Segura, 2014; Cussó Segura, Gamboa and Pujol-Andreu, 2018); two fixed-weight baskets used to exclude diet changes; and a control basket for Burgos using the fixed-weights for Palencia, 80 kilometres by train, proposed by Moreno Lázaro (2006). Monthly price data for consumer goods taken from municipal bulletins has been used previously to construct annual cost-of-living indexes among others by Pérez Castroviejo (2006) for Biscay, Molina de Dios (2007) for Mallorca, Germán Zubero (2009) for Saragossa; and monthly indexes by Houpt and Rojo Cagigal (2022) for Bilbao.

For the nutritional transition changes taking place we assume traditional foods such as bread, wine, legumes, lard and stock-fish to be increasingly replaced with higher amounts of milk, eggs, meat, fresh fish, oil and sugar. Table 1 shows the beginning and end weights for 1914 and 1934. The calculations of the changing weight cost-of-living indexes apply a gradual monthly change in weight from 1914 to 1933/1936. The Palencia-weighted Burgos cost-of-living index uses the basket and weights from Moreno Lázaro (2006) for Palencia and the prices for Burgos.

In the period we examine, we assume the amount of calories required for the work effort of the workers we collect wages for to remain constant[2]. Therefore, when altering the weights of different products in the bundle, we have kept total calorie content in nutrition stable. Our strategy has been to define two food bundle benchmarks which provide the same amounts of calories required by an average family at that point of time, but at the same time allowing their different composition to reflect changes in diet and preferences[3]. The first bundle for 1914 already reflects that some important changes in the preferences and products having taken place compared to diet prevalent in the 19th century. Large amounts of carbohydrates, lard, stock-fish and wine (which we may

[1] International conferences held in Brussels in 1853 and Paris in 1855 first presented this as a common initiative on a European level.

[2] Steel mills work 24 hours, 7 days a week. They only stop for relining and serious maintenance problems between campaigns. Bricklayers can work from dusk to dawn year-over unless rain or snow impedes.

[3] The relative weights of each item in the average family basket have been calibrated as described, but considering previous studies for the industrial and mining area: Pérez Castroviejo (1992, 2000, 2006), Pérez-Fuentes Hernández (1993), Pérez Castroviejo and Tussel (2007), Escudero and Pérez Castroviejo (2010). We have also considered other recent studies for other regions of Spain: Moreno Lázaro (2006) for Palencia; Molina de Dios (2007) for Mallorca and García-Gómez and Escudero (2018) for Alcoy.

Table 1.
Food commodity bundles for a 5-member worker family

		Bilbao		Burgos		Palencia	Spain
	Kcalories	1914	1934	1914	1934	1900-36	Average 1930
	per Kg/l	Kg/l	Kg/l	Kg/l	Kg/l	Kg/l	consumption
Bread	2,660	1.75	1.50	1.50	1.25	1.85	1.72
Rice	3,600	0.11	0.09	0.05	0.11	0.15	0.12
Beans and Chickpeas	3,330	0.50	0.45	0.50	0.45	0.12	0.14
Potatoes	690	0.90	0.75	0.30	0.45	0.50	2.29
Lard	9,020	0.13	0.09	0.13	0.09		0.09
Meat	2,780	0.33	0.50	0.33	0.39	0.82	0.18
Stockfish	2,900	0.20	0.15	0.20	0.10		0.18
Oil	8,840	0.15	0.20	0.15	0.20	0.46	0.16
Sugar	3,870	0.10	0.15	0.10	0.15		0.16
Eggs	756	0.10	0.20	0.06	0.10	0.02	0.06
Sardines	888	0.30	0.45	0.30	0.45	0.12	0.00
Wine	830	1.00	0.80	0.76	0.50	0.49	1.09
Milk	610	1.00	1.50	1.00	1.50	0.02	0.74
Family Kcalories approx.		13,460	13,460	11,900	11,900	13,100	
Average Kcalories p.p.		2,690	2,690	2,380	2,380	2,620	2,426 - 2,854

Sources: Houpt and Rojo Cagigal (2022), online appendix; Palencia-Moreno Lázaro (2006), and Spain-Simpson (1989).

consider inferior products in lower income consumption baskets) had already been replaced with higher quantities of meat, fresh fish, eggs, milk, oil and sugar. The ponderations are calibrated using school budgets, school menus, and family diets and they have been additionally contrasted with hospital food accounting in Bilbao[4]. Six detailed school menus from 1914/15 taken from Bilbao school canteens have been compared to spending records in the Bilbao Basurto hospital for 1915, 1916 and 1924 to calibrate the food basket. Following Medina-Albaladejo and Calatayud (2020) we assume that hospital spending on food can be regarded as similar to that normally made by workers. Regarding Bilbao, over half the workers were unskilled laborers and they and their families were the greater part of the patients at the Basurto hospital around 1914 (González Portilla, 1995, p. 297).

The Palencia weights calibrated for an urban center in Castile do not yield a substantially different index, if anything a higher cost in the early and late 1920's. For lack of better data on diets in Burgos and given the similarity to the Palencia-weighted index, we have co-opted the Bilbao basket for Burgos. A conservative view will be represented by the 1914 fixed-weight basket which has no change in composition over the following 20 years. The exact weighting seems less relevant, as we are more interested in comparing the impact of price change in a time of political and economic uncertainty than calibrating exact levels.

For the 1934 bundle benchmark, we have maintained the substitution trends we contrasted in Bilbao between the late 19th century and 1914 but at decelerating rates (Houpt and Rojo Cagigal, 2022, online appendix). We have then interpolated the weights linearly month-by-month between the benchmark bundles. This gradual adaption in the composition of the food basket maintaining calorie content at the same level amends for some of the substitution bias introduced by changes in preferences over the beginning of the 20th century. We increase the cost of the food basket with house rent for a working-class family and the cost of heating and cooking coal. The 1914 basket is key to the exercises we are to perform. It compares well to the average consumption of food items in northern Spain reported for 1885/1913 by Pujol-Andreu and Cussó Segura (2014, table 7). Higher consumption of fish, wine and fats, and slightly reducing the consumption of bread, potatoes and legumes are justified. Bilbao will be further advanced in its nutritional transition. The same is true for including milk at 104 liters per person per year (see Hernández Adell, 2012, table 4.8). Market availability is coherent with Gallego Martínez (2016). Market integration was high as reflected in Figure A in the Appendix.

A first approximation will be to compare the four annualized cost-of-living indexes we have composed for Burgos and Bilbao with those constructed for Biscay, Palencia and Spain by other authors. The cost-of-living stayed fairly stable over the first decade of the 20th century both in Palencia, Castile;

[4] Olábarri (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. We have scrutinized this in the previously cited work on Biscay and Bilbao. See Houpt and Rojo Cagigal (2022), online appendix for more details on the Bilbao weighting.

Biscay; and Spain (Ballesteros, 1997; Pérez Castroviejo, 2006; Moreno Lázaro, 2006). We can see a common strong increase over World War I and the immediate post-war period. The fall up to 1923 was more pronounced in Palencia, Burgos and Spain than in Bilbao, and there are important differences both in levels and fluctuations in the 1930s. The series compare well with previous assessments of the cost-of-living during and after the war. They show a strong increase between 1915 and 1918 and a slower increase in 1919 and 1920. The turning point to price readjustment is attained in 1920 and 1921. At this highest point, the cost-of-living doubles the fairly constant pre-war level.

More will need to be said about the changes in relative prices that took place over the same time period. The war had a differential impact on both individual economic sectors and across geography. Supply chains were disrupted and this affected both production processes and rail and ship transport. The actual years of the war saw a much higher increase in wholesale prices, whereas the post-war years up to 1923 saw an acceleration of food prices. The primary international economic impact of the war was an increased trade surplus primarily due to substantial reductions of imports; at the same time, trade surpluses had little impact on investment and production (Martínez Méndez, 2021).

The generally held view is that World War I, the immediate post-war period and later the coming of the Second Spanish Republic in the 1930s brought with them significant increases in food prices which had an important impact on living conditions and social unrest. The interim years of the Primo de Rivera dictatorship were more stable, with more social peace and a strong injection of public works spending.

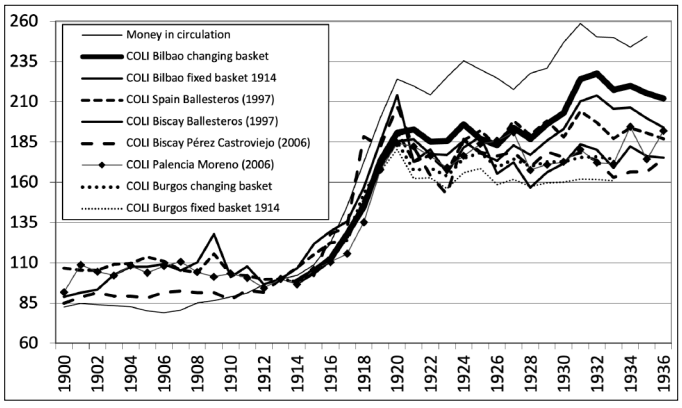

Figure 2. Cost-of-living indexes: Spain, Biscay, Bilbao, Burgos and Palencia. 1900-36 (100 = 1913).

Source: Bilbao and Burgos: Houpt and Rojo Cagigal (2022), prices taken from *Boletín de la Estadística Municipal* de Bilbao and Burgos, corresponding years; Spain: Ballesteros (1997); Biscay: Pérez Castroviejo (2006), and Palencia: Moreno Lázaro (2006), money in circulation: Carreras y Tafunell (dirs.) (2005), Cuadro 9.9, p. 683, Banco de España, billetes en circulación.

The monthly cost-of-living in Burgos and Bilbao (represented in Figure B of the Appendix) shows a co-movement during the war, but important divergences after the First World War. In Burgos, the cost of living adjusted back to the levels reached immediately after the war and stayed within fairly constant one peseta bands up into the 1930s. In the case of Bilbao, the cost did not adjust downward from the maximum obtained in the post-war period and experimented an important increase in level with the coming of the Second Spanish Republic. There is a growing relative cost cleavage between the two cities starting in the mid-1920s. It derives from a resistance to downward adjustment in Bilbao throughout the 1920s with a strong cost hike towards the end of the decade compared to cost stability in Burgos. Of course, these costs-of-living need to put into perspective with the changes in salaries, in order to assess how living conditions might have changed over time.

An easy way to measure and interpret the compensating forces of nominal income increases and costs of living are welfare ratios. Normally this would compare all of family income with the cost of the family basket: how many times a family basket can be bought with the family income? Values below one would indicate that family income does not cover the cost of the basket, and values above would indicate by what percentage point income covers more than the cost. Figure 3 shows a quasi-welfare ratio. We compare nominal male AHV-workers' incomes for Bilbao and nominal male wages for bricklayers in the case of Burgos with their respective family baskets costs. Family income would be higher than indicated here if we had the corresponding female and children's incomes together with male income. Therefore, these calculations are lower bounds and quasi-welfare ratios. Their use is purely comparative over time.

Quasi-welfare ratios show a common downward trend between 1914 and 1920, with a much stronger war contraction in Burgos than Bilbao. Pre-war levels were retrieved in the early 1920's in both cases, immediately in Bilbao in 1920 and gradually in Burgos between 1920 and 1922. Thereafter family's purchasing power increased far more in Bilbao during the Primo dictatorship than in Burgos. The opposite can be said for the following decade. Over the early 1930's the purchasing power of bricklayers' families in Burgos improved substantially, whereas that of average factory workers' families in Bilbao contracted abruptly with the synchronized shift in industrial perspectives: the end of the Primo dictatorship, economic contraction and the Great Depression. The drop of quasi-welfare ratios in Bilbao in the early 1930s is clearly related to strong cost of living increases as we can see in Figure B of the Appendix. It is also related to the fact that income improvements were hard to be obtained in a context of recession and increasing unemployment in Bilbao. Burgos quasi-welfare ratios suffer hardly any impact from increase in cost of living (Figure B) in the early 1930s. In this context of contained price changes, wage increases —especially in maximum wages perceived— over the early 1930s are the driving force in the upward trend in quasi-welfare ratios in Burgos. The moments of industrial recession, 1922 and the early 1930s are when both quasi-welfare ratios converge.

Provincial strikes in Biscay, as recorded in the Spanish National Statistics yearbooks, are strongly correlated to quasi-welfare ratios for Bilbao. We have established a strong directionality on a much finer level between strike conflict as reported in daily newspapers and welfare ratios in the case of Bilbao (Houpt and Rojo Cagigal, 2014). Burgos provincial strikes are far less responsive to the quasi-welfare ratios. Carmen Delgado Viñas (1993) has referred to labor conflict in Burgos over this period as weak and responding mainly to falling material conditions as happened between 1915 and 1920 and in 1923, or national union-called mobilizations.

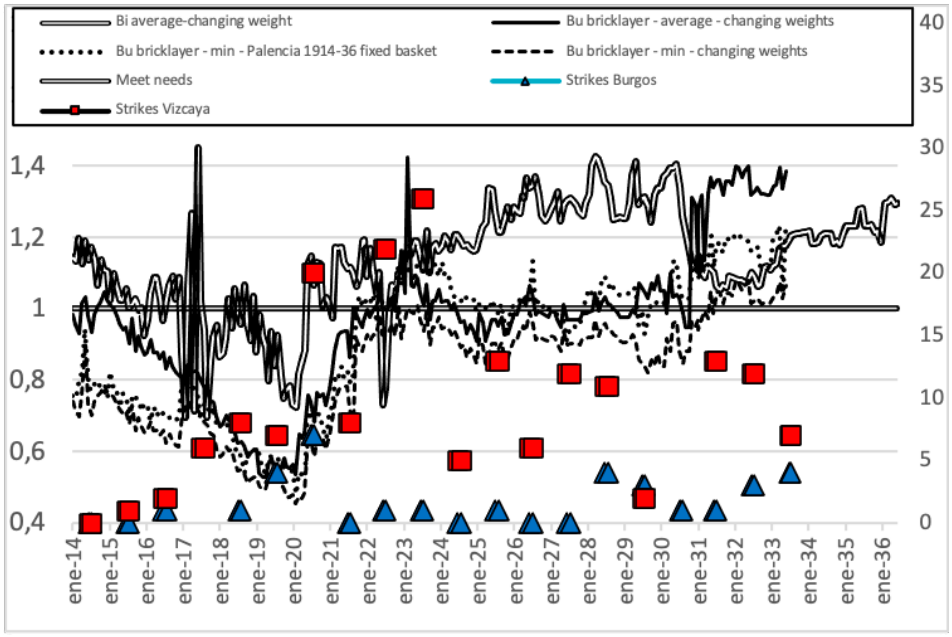

Figure 3. Quasi-welfare ratios-number of family baskets a male wage buys (lhs) with annual number of strikes (rhs) in Biscay and Burgos, 1914-1936.

Sources: Number of strikes: INE Anuarios 1920-1934. Quasi-welfare ratios: calculated with *Boletín de la Estadística Municipal* de Bilbao and Burgos (corresponding years) and Bilbao wages: Altos Hornos de Vizcaya (see Primary sources).

We lack data on wealth and income distribution, but we can use the municipal registration of bicycles and private automobiles as approximations to the purchasing power of middle and upper classes to acquire durable consumer goods[5]. Automobiles can be considered a luxury good with a clear high-income-class demonstration effect. The use of the automobile in the upper classes had been strongly encouraged by both aristocracy and elite automobile clubs. In 1923 a small Citroën automobile, the cheapest foreign car at a Madrid exposition, cost 8,500 pesetas —over 750 day-labors of a metal worker in Bilbao and more than 1,200 day-labors of a bricklayer in Burgos (Vilar Rodríguez and Vallejo Pousada, 2018). The number of registered cars per thousand inhabitants increased substantially in Bilbao in the late 1920's and was one half to two thirds lower in Burgos up into the 1930's. High income and wealth measured in terms of being able to own an automobile was substantially higher in Bilbao. The trends in the 1930's clearly reveal more stability of automobile registration in Burgos and a stronger reversal with a downward trend in Bilbao. Wealth in terms of maintaining a registered automobile suffered a greater contraction in Bilbao than in Burgos.

If we use the number of bicycles per thousand inhabitants as a proxy for middle-class durable goods purchasing power, we can see a strong increase in Bilbao between 1921 and 1926 and a strong contraction after 1929. The steep increase in Burgos is between 1925 and 1931, with a contraction in 1932. The patterns in registration of this transport durable would reveal different redistributions towards middle income earners in both cities, a five-year prosperity in the early 1920s in Bilbao and a lagged prosperity in the late 20's in Burgos. The early 1930s show a much stronger contraction in the registration of middle-class transport durables in Bilbao.

[5] There is very little historiography for Spain on the use of bicycles before the war (Anaya and Gorostiza, 2014).

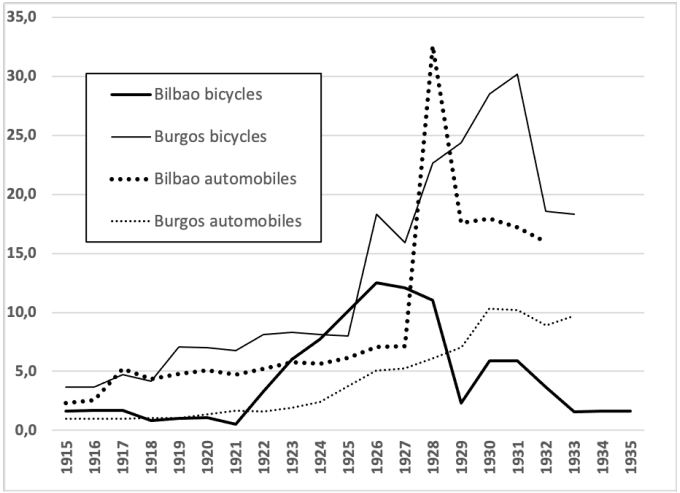

Figure 4. Revealed wealth. Registered bicycles and registered private automobiles: Burgos and Bilbao, 1915-35. (per thousand inhabitants).

Source: *Boletín de la Estadística Municipal* de Bilbao and Burgos corresponding years.

5. Other welfare indicators

In this section we would like to present complementary measures to validate the changes and differences in welfare levels in agrarian-based Burgos versus industry-lead Bilbao. A first thing we can see in the vital statistics shown in figure 5 is that the cycles in marriage and birth patterns are quite similar, but that patterns in mortality differ. Death rates in Burgos retain the summer surge associated to gastro-intestinal infectious diseases and Bilbao reflects a much higher mortality rate in winter months associated more to serious respiratory infections.

Death rates were particularly high in both cities in the fall of 1918 (August to December, peaking in October) as a consequence of the Spanish influenza outbreak. Excess mortality reached Spain's highest level in the Burgos province at 212 per 10,000 compared to 117.4 in Biscay and compared to an average of 115.9 for Spain (Chowell *et al.*, 2014). Given that population density is one of the significant explanatory variables in their models for calculation, we can assume the impact on both municipalities to have been even more severe[6]. Illness and deaths in terms of lowering income and disease resistance thereby surely affected Burgos to a greater extent than Bilbao.

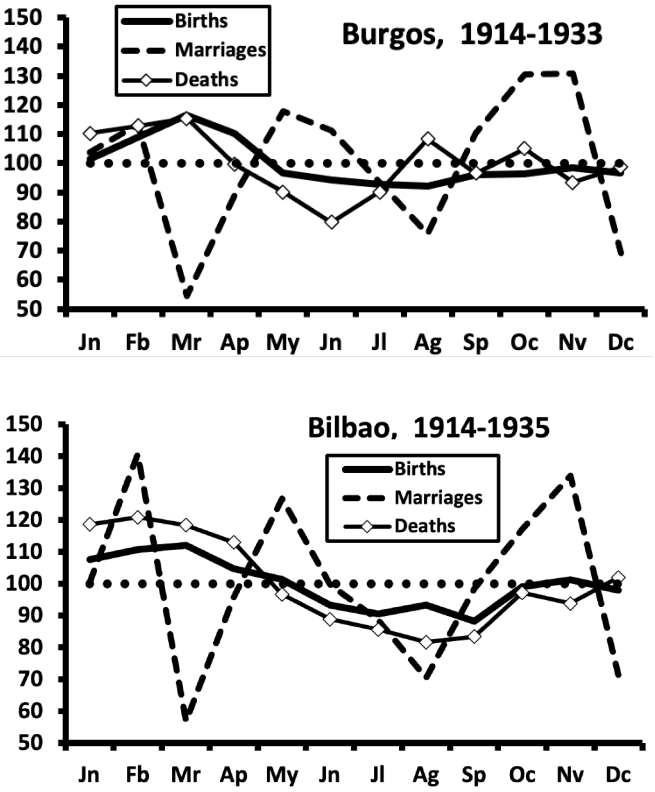

Figure 5. Cycles in Vital Statistics. Deviation from total average (100 = total average for period).

Source: *Boletín de la Estadística Municipal* de Bilbao and Burgos corresponding years.

We are aware of the fact that the relationship between malnutrition and mortality is intricate, because many other factors intervene in complex ways in provoking death (Scrimshaw and SanGiovanni, 1997; Katona and Katona-Apte, 2008; Yang *et al.*, 2021). Poverty, hygiene, health care, crowded housing, safe water and sanitation are but a few factors co-determining mortality that could be mentioned for the place and time we are examining. Nonetheless, we would like to make use of the possible lethal incidence on malnourishment-related disease to find support from the quasi-welfare variations in both towns, as depicted in figure 3. We assume death related to malnutrition to happen prevalently in the left tail of the income distribution. Our motivation is the clinical evidence that shows how severe acute shortage of food activates physiological mechanisms to adapt which impair bodily functions, especially those related to resistance to disease. We have examined three infectious diseases that can strongly interact with malnutrition: diarrhoea, which interrelates via reduced nutrient absorption; acute lower respiratory infections (pneumonia and bronchiolitis); and tuberculosis. Case fatality in diarrhea is especially high among children between 6 and 12 months, so we will examine infant mortality for both cities.

Infant mortality in Burgos situates rates clearly above 200 up to 1923, it fluctuates around 200 up to 1929 and stays below 200 thereafter[7]. Bilbao infant mortality is already below 200 at the outbreak of World War I. It increases slightly during the fall of purchasing power and the Spanish influenza episodes 1918 and 1919. Thereafter it steadily decreases to a 100 level in 1927 and stabilizes below 100 until the end of 1929. It increases above 100 from 1930 to 1931 and starts a renewed decrease thereafter. The evolution of infant mortality rates —to the extent in which they may reflect the impact of malnourishment in the lower tail of income distribution— corresponds to the important movements of quasi-welfare ratios, especially in the case of Bilbao.

Two additional assessments can be added. Infant mortality has been calculated for both genders. Even today infant mortality is higher in boys than girls in most parts of the world, boys being biologically weaker and more susceptible to diseases and premature death. Higher female infant mortality could reveal higher neglect of girls during moments of economic stress. We see no clear patterns of this in Bilbao and possible episode of this in Burgos 1929 through 1930. Figure C of the Appendix also shows the ratio between infant mortality and mortality of children less than 5 years of age by gender —infant mortality prevalence. Burgos shows an increasingly higher infant death prevalence after 1921with a slight improvement between 1924 and 1926, whereas Bilbao reduces that prevalence by half after 1927. This reduction might be explained by the important reforms and policies introduced in Bilbao — the maternity hospital created in 1895 and mainly the Gota de Leche institution which actively promoted hygiene and nutrition in child-care. This institution received an important enhancement of its activities through the savings bank confederacy after 1927, substantially expanding its services and public health educational function (Gondra, 2005; Gondra Razol, n.d.).

Infant mortality as an indicator of living standards by itself and its sensitivity to changes in real income reveal important differences between Bilbao and Burgos: higher levels in Burgos and almost no reduction until the 1930s. Infant mortality halved in the second half of the 1920s in Bilbao, but remained responsive to fluctuations in real family incomes.

[6] According to Frutos Herranz (2020) over 200 persons died in the city of Burgos during the fall of 1918.

[7] Infant mortality is measured by annualizing monthly infant deaths over the number of infants born in the preceding 12 months. The fraction is reported as annual equivalent infant deaths per thousand born alive. The 12 month moving averages are a proxy to the usual annual infant mortality rates. We are interested in comparing these proxies and their relative evolution over time and not so much their absolute values or how they relate to annual infant mortality rates.

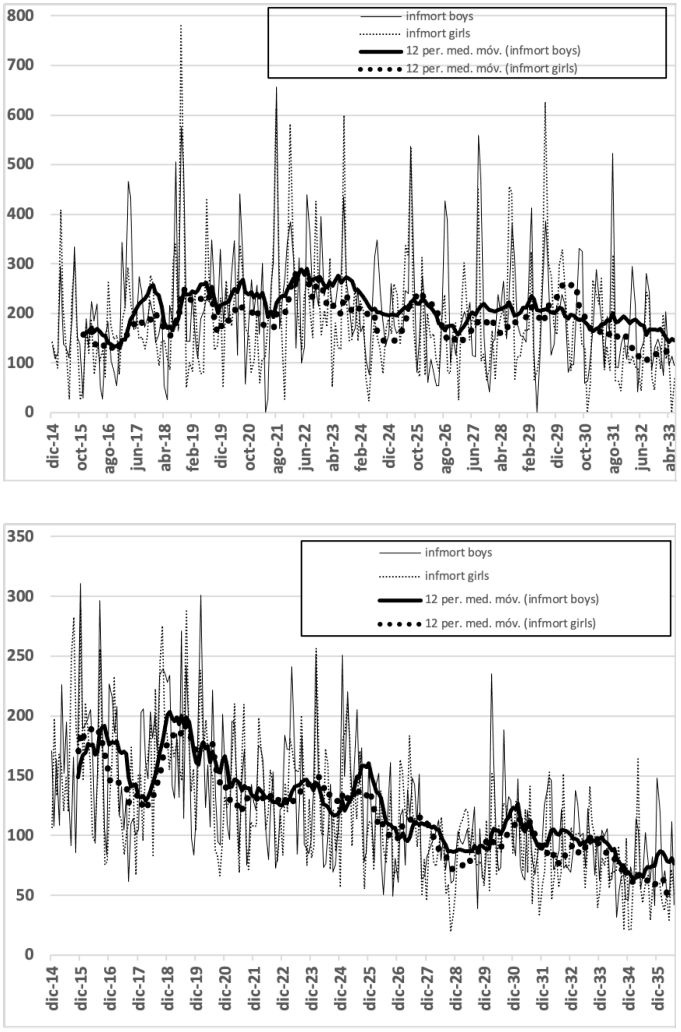

Figure 6. Infant mortality Burgos 1914-1933 [upper] and Bilbao 1914-1936 [lower].

Note: Infant mortality was calculated using the annualized number of children less than one year of age who died in the corresponding month (multiplying that number by the number of days in the month and dividing by 365) and dividing this number by the number of children born during the twelve preceding months. For 1914, we have no data on the preceding months, and we have used the annual average for 1914-1916 during these years; the number of births remained fairly stable. Missing values have been interpolated with monthly averages.

Source: *Boletín de la Estadística Municipal* de Bilbao and Burgos corresponding years.

Tuberculosis is caused by bacteria (Mycobacterium tuberculosis). It spreads primarily from person to person through the air when people with lung tuberculosis cough, sneeze or spit. The contagion rate increases with overcrowding. The risk of being infected is higher for persons with compromised immune systems, those suffering malnutrition, heavy smokers, and people who have suffered alcohol abuse (WHO, 2014a, p. 12; 2014b, pp. xi, 1).

Over the late 19th century and the beginning of the 20th century contemporary doctors attributed falling ill with tuberculosis to insufficient food intake, long working days, living in unhealthy dwellings and alcoholism[8]. Vicente Álvarez Rodríguez-Villamil, a pulmonologist analyzing income and spending of average families at the beginning of the 20th century concluded that workers lacking sufficient intake of calories made them especially vulnerable to tuberculosis (Molero Mesa, 2001, pp. 202-217).

The risk of transmission was greater during late-winter and early-spring months, when the reduction of ultraviolet light reduced the accumulation of vitamin D (see Figure D in Appendix). The Bilbao estuary located in a narrow valley and the high levels of air pollution caused by the iron-and-steel industry promoted the accumulation of industrial smog that aggravated this condition. Indoor confinement due to cold weather, frequent rainfall, and overcrowded housing enhanced contagion. This combination of factors was complemented by malnutrition during moments of lower real family income.

As we can see in Figure 8, there was an inverse relationship both in annualized trends and lagged peaks-troughs between real wages and tuberculosis death rates, accentuated during strong falls and alleviated during increases in real wages. The autoregressive distributed-lag [ARDL] model regression in table 2 shows a significant inverse impact of real wage variation with a delay of six months on tuberculosis death incidence. It is quite remarkable to find the same six-month lag between malnutrition and tuberculosis deaths as Leyton (1946) had found for British and Russian soldiers in German prisoner camps during World War II. Figure E in the Appendix shows overall lung disease death rates and real wages. In the case of overall lung disease deaths, ARDL regressions again show significant inverse impacts with lags of 5 and 6 months, similar to the case of tuberculosis mortality rates.

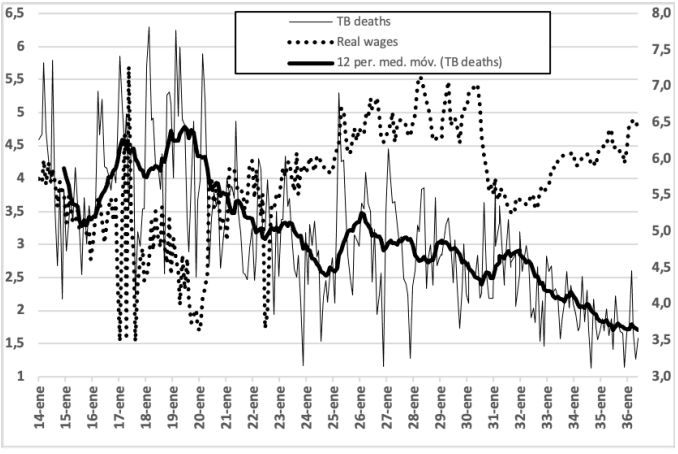

Figure 8. Bilbao. Real wages [rhs] (pesetas) and tuberculosis death rates [lhs] (per thousand), 1914-1936.

Source: *Boletín de la Estadística Municipal* de Bilbao and Burgos corresponding years.

[8] We find no strong correlation between cirrhosis and tuberculosis for Bilbao.

Table 2.

ARDL model regressions: Explanatory variables: real wages [RW] with 6 monthly lags and autoregressive term (death rate [DR] from tuberculosis or lung disease) with six monthly lags. (Standard errors in parenthesis)

	(1) Tuberculosis	(2) Lung disease	(3) Equation 2 with temperature & rainfall
DLOG(RW)	0,042	0,091	0,155
	(0,192)	(0,196)	(0,189)
DLOG(RW(-1))	-0,034	-0,114	-0,102
	(0,218)	(0,224)	(0,216)
DLOG(RW(-2))	0,059	0,046	0,104
	(0,221)	(0,230)	(0,221)
DLOG(RW(-3))	-0,120	-0,216	-0,073
	(0,222)	(0,229)	(0,222)
DLOG(RW(-4))	0,174	-0,281	-0,127
	(0,221)	(0,226)	(0,220)
DLOG(RW(-5))	-0,295	-0,639***	-0,515**
	(0,217)	(0,220)	(0,213)
DLOG(RW(-6))	-0,554***	-0,570***	-0,516***
	(0,192)	(0,195)	(0,187)
DLOG(DR(-1))	-0,537***	-0,062	-0,152**
	(0,063)	(0,061)	(0,062)
DLOG(DR(-2))	-0,252***	-0,042	-0,120**
	(0,071)	(0,059)	(0,059)
DLOG(DR(-3))	-0,181**	-0,130**	-0,196***
	(0,072)	(0,059)	(0,059)
DLOG(DR(-4))	-0,167**	-0,007	-0,039
	(0,072)	(0,059)	(0,057)
DLOG(DR(-5))	-0,187***	-0,225***	-0,182***
	(0,071)	(0,059)	(0,058)
DLOG(DR(-6))	-0,075	-0,247***	-0,200***
	(0,063)	(0,061)	(0,059)
Temperatures			-0,008***
			(0,002)
Rainfall			0,001***
			(0,000)
R-squared	0,278	0,178	0,247
Durbin-Watson	2,032	2,133	2,121

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

Sources: death from tuberculosis and lung disease, temperatures and rainfall from *Boletín de la Estadística Municipal de Bilbao* corresponding years. Real wages calculated with wage data from AHV (see description in Primary Sources) and family food basket constructed with price data from municipal bulletins.

Both the visual examination of trends in mortality and the detailed contrast of lagged relationships between short-term shocks to real wages confirm that the patterns in malnourishment enhanced deaths. They are closely tied to quasi-welfare ratio movements and changes in real wages. These social indicators serve both to validate the cost-of-living and quasi-welfare ratios we have calculated and to show how short-term economic shocks in the cost-of-living affect the lethal incidence of malnutrition-sensitive infectious diseases.

6. The lender of last resort

We have one last measure, the pressure on the credit of last resort: pawning a heavy coat or valued piece of clothing, a type of credit more readily available to poor income groups. The increase in pawning began much earlier in the period examined in Bilbao than in Burgos. Using clothing as a collateral for small credits actually decreased after 1916 in Burgos up to 1920 and then picked up sharply until 1925, maybe driven by a series of bad harvests. Bilbao seemed much more exposed to the war food-price shocks and began its increase in pawns between 1917 and 1920, followed by a short fall. It then retained levels until 1927, followed through with a constant fall and a final rebound in the early 1930´s reflecting economic contraction and the coming of the Second Republic. As in the case of tuberculosis and lung disease related deaths, we are able to identify lag structures at which families increasingly resorted to this kind of credit at two months of a shock. In Burgos two divergent trends stand out: the lagged increase in pawning beginning in the post-war period and the flat curve in the 1930's. Neither of these differences would question the evolution of its quasi-welfare ratios.

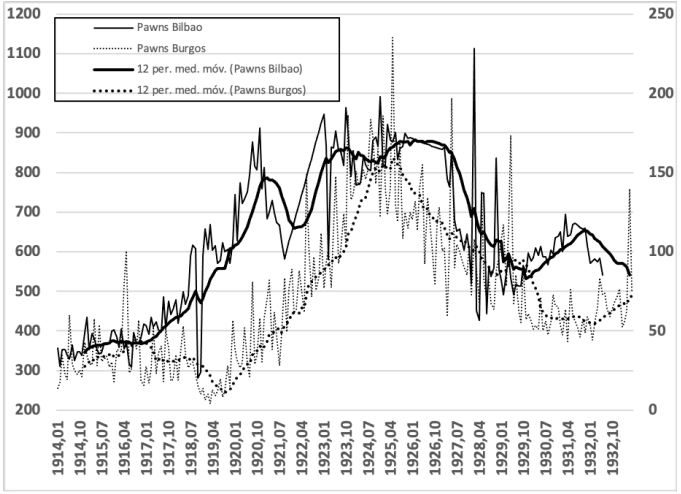

Figure 9. Pawns. Clothes, new and rollovers in pesetas, Burgos [rhs] and Bilbao [lhs] 1914-1933 (per thousand).

Source: *Boletín de la Estadística Municipal* de Bilbao and Burgos corresponding years.

7. Putting things into perspective

It seems appropriate to compare our results to other welfare indicators calculated with the same homogeneous source — municipal statistics from the provincial capitals: Molina de Dios (2007) for Mallorca and Germán Zubero (2009) for Saragossa. Pérez Castroviejo (2006) also used these sources to

calculate the living conditions for Biscay. We can add indexes calculated for cities: Alcoy (García Gómez, 2013) and Palencia (Moreno Lázaro, 2006), and the general index for Spain (Ballesteros, 1997). We see very different evolutions even between rural cities such as Burgos and Palencia, but also common patterns in industrial cities like Bilbao, Saragossa and Alcoy, which show important cost increases in the early 1930s.

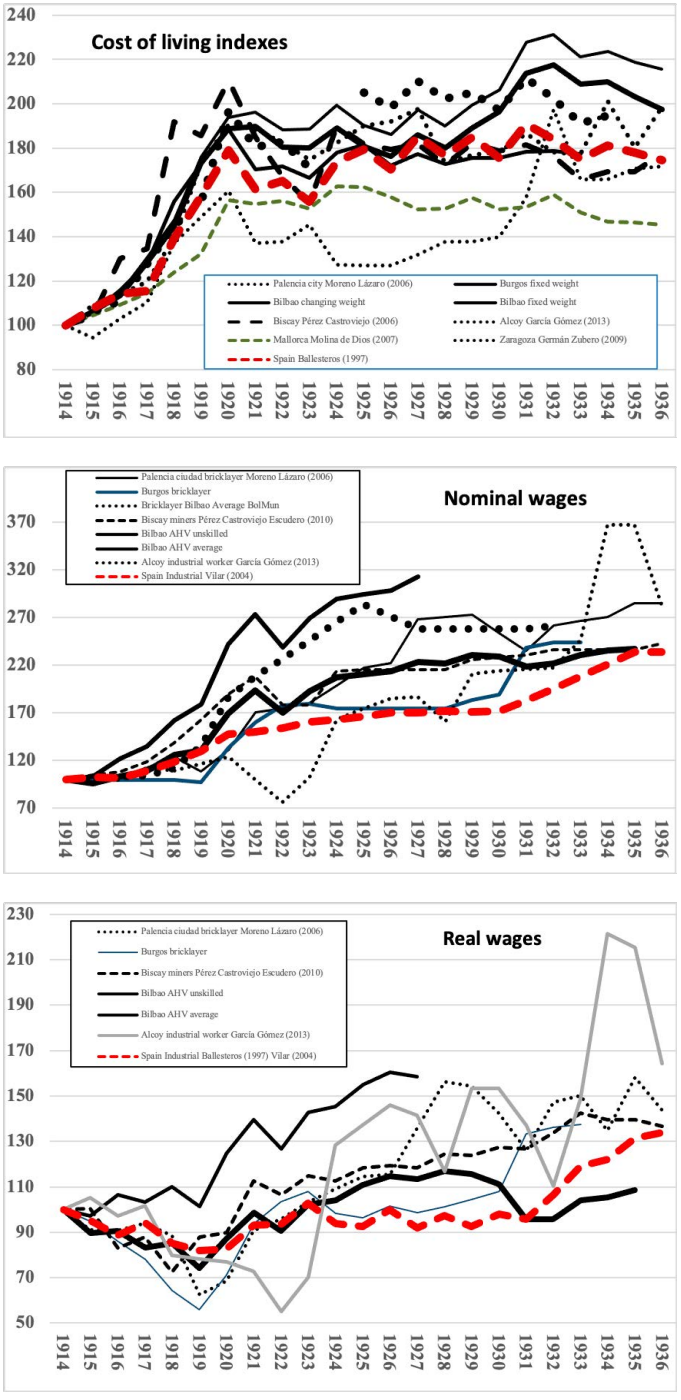

Figure 10. Comparisons of cost of living indexes [upper], nominal wages [middle] and real wages [lower].

Sources: Palencia: Moreno Lázaro (2006); Biscay: Pérez Castroviejo (2006) and Pérez Castroviejo and Escudero (2010); Mallorca: Molina de Dios (2007); Alcoy: Gómez García (2013); Zaragoza: Germán Zubero (2009); Spain: Ballesteros (1997), and Burgos and Bilbao: *Boletín de la Estadística Municipal* de Bilbao and Burgos corresponding years.

Real wages show the convergence in the early 1930s proposed by Sánchez Alonso and Roses (2006), but the driving force we identify is not market integration. Moreover, the downward trend in industrial real wages is driven mainly by increases in the cost of living and the upward trend in unskilled real wages is forced by the Spanish Second Republic's labor policies.

8. Conclusions

Our primary conclusion is that living conditions evolved very differently in agrarian-based Burgos and industry-driven Bilbao. We find no support for converging living conditions. The costs of their family baskets follow very different patterns both in the 1920s but especially in the 1930s, with a much higher increase in Bilbao. This is embodied in the family purchasing power which we have measured in quasi-welfare ratios. Higher labor mobilization seems to have brought more purchasing power to Bilbao in the 1920's. The cause may be the large investments in public works by the Primo Dictatorship, which benefited industrial areas like Bilbao, based on heavy industry. That situation was reversed in the 1930s by industrial crisis, economic contraction and high unemployment. The different evolution of living standards in cities in Castile had already been established by Hernández and Moreno Lazaro (2010) for a far longer period. Our comparison of Burgos and Bilbao reveals an even greater cleavage. Overall, based on methodologically similar microstudies on living standards and real wages available for different cities in Spain over this period, we find that transitory real wage convergence is driven by strong industrial contractions and/or pro-unskilled wage policies during the Second Spanish Republic.

The redistribution of wealth towards the middle and upper classes as reflected by vehicle registrations also reveals differences. Affluence gathers higher momentum for upper classes in the late 1920s in Bilbao, but contraction after 1929 is stronger. Redistribution towards middle classes — as reflected by bicycle registration— persists well into the 1930s in Burgos, but subsides already in the mid-twenties in Bilbao.

Vital statistics also disclose different mortality patterns in the two cities we have compared. Different public health environments prevail. Summer gastrointestinal infections predominate in Burgos and winter and early spring respiratory infects overweigh in Bilbao. At a time when malnutrition may have played an important role in infant deaths via typhoid, diarrhea and enteritis, we find support for co-movement between quasi-welfare ratios and infant mortality. In the case of tuberculosis and lung-disease-related deaths, both the visual examination of data and the ARDL model regressions lead us to conclude that increases in respiratory-disease-related deaths in Bilbao are correlated with losses of purchasing power. During food-price shocks, the undernourished on the left-hand tails of income distribution lowered their resistance to infectious disease. Water was safer in Bilbao and air was probably worse, which helps to interpret the mortality differences of gastrointestinal prevalence in Burgos and respiratory related death prevalence in Bilbao. Surely, more proactive public health interventions in Bilbao explain the differences in their levels and trends as the strong fall in the ratio of infant deaths over child deaths in the late 20s reveal.

High-frequency monthly data has been determinant in contrasting short-term differences and identifying lagged effects.

Vital statistics and cause of death have been instrumental in contrasting how living conditions evolved with the price shocks and wage data at our disposal. We find the use of monthly data reveals dynamics that are undetectable in annual data, especially in a context of changes in economic cycles and strong price shocks related to war, recovery, recession and economic depression. Of special interest is the impact of price shocks on more responsive social indicators in the tails of the lower income distribution.

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Primary sources

The nominal wage series for Bilbao were reconstructed from surviving company records and secondary sources which have used the same company's records. Two of the biggest Spanish iron and steel firms merged with a tinplate mill in 1901 and their archives were deposited in the new firm: Altos Hornos de Vizcaya. The records were originally consulted at the firm archive in Baracaldo. Since then this archive has been donated to the Archivo Foral de Bizkaia [AFB/BFA]. The monthly wages for blast furnace workers at the Bilbao factory of Altos Hornos de Vizcaya from January 1914 to December 1921 are taken from the cost accounting books *(Libro balance del ejercicio de [year] de la Sociedad Altos Hornos de Vizcaya.)*. Their signatures are: AHV 0295 [1914], AHV 0297 [1915], AHV 0298 [1916], AHV 0299 [1917], AHV 0300 [1918], AHV 0302 [1919], AHV 0303 [1920], AHV 0304 [1921]. Average Baracaldo factory wages from January 1922 to December 1927 were taken from AHV 0305 [1922], AHV 0306 [1923], AHV 0307 [1924], AHV 0308 [1925], AHV 0309 [1926], and AHV 0310 [1927]. Catálogo del Archivo Histórico de la Diputación Foral de Bizkaia, Consulted on March 31st, 2022. Available at: http://apps.bizkaia.net/ARIT/servlet/webAgentARIT. Annual averages for 1928 to 1936 have been taken from González Portilla (1984, pp. 74, 85) (quoted as taken from the "libros de cuentas de AHV" Ejercicios 1902-1936, Consejo de Administración y Carpeta Financiera).

For Bilbao, all other series have been taken from *Boletín Mensual Estadístico Sanitario de Bilbao* [Jan 1897 to Sep 1921] and *Boletín de la Estadística Municipal de Bilbao* (December 1913 to October 1921 and February 1923 to December 1936]. Consulted on March 31st, 2022 as available online at: URL: https://cutt.ly/i6uxUms. The price data from October 1921 to May 1922 was supplemented with data from the *Boletín del Instituto de Reformas Sociales* and data from October 1919 to July 1921 was supplemented by product price data which had been collected from municipal records at the Archivo Municipal de Baracaldo by José Manuel González Vesga.

For Burgos, all series have been taken from *Boletín de la Estadística Municipal de Burgos* [December 1913 to June 1933]. Missing data has been interpolated using previous and posterior monthly averages when values are cyclical and using previous value (one missing value) or smooth-closing the gap for two or more missing values. Available at: https://cutt.ly/c6uxXwJ.

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Appendix

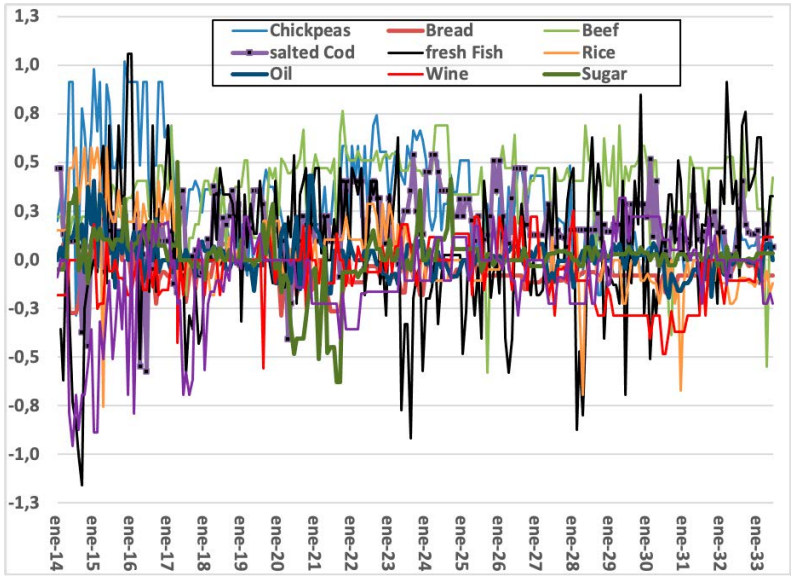

Figure A. Price convergence-margin for arbitrage, Bilbao-Burgos. Buy high in low market and sell low in high market. (log diffs for maximum price in low market minus minimum price in high market).

Source: *Boletín de la Estadística Municipal* de Bilbao and Burgos corresponding years.

The log-difference of prices shown are between the lower maximum price in either of the cities and the opposing minimum price in the other city. This is a way of contrasting the extreme potential of arbitrage: buying at the highest price in the least expensive place and selling at the lowest price in the more expensive place. The figure shows a high degree of market integration. Only the disruptions from the First World War increase the price spreads being shown. The products on the outer bands are consistently more perishable products more easily obtained in one of the two places (fresh fish in Bilbao and beef in Burgos).

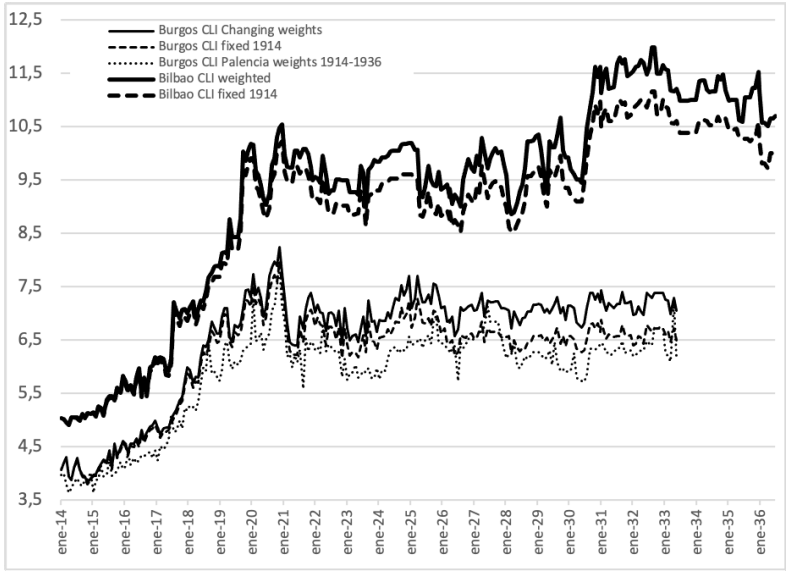

Figure B. Monthly cost-of-living five-member family. Bilbao and Burgos: changing-weights, fixed 1914-weights and Palencia-weights, 1914-1936. Nominal pesetas.

Source: *Boletín de la Estadística Municipal* de Bilbao and Burgos corresponding years.

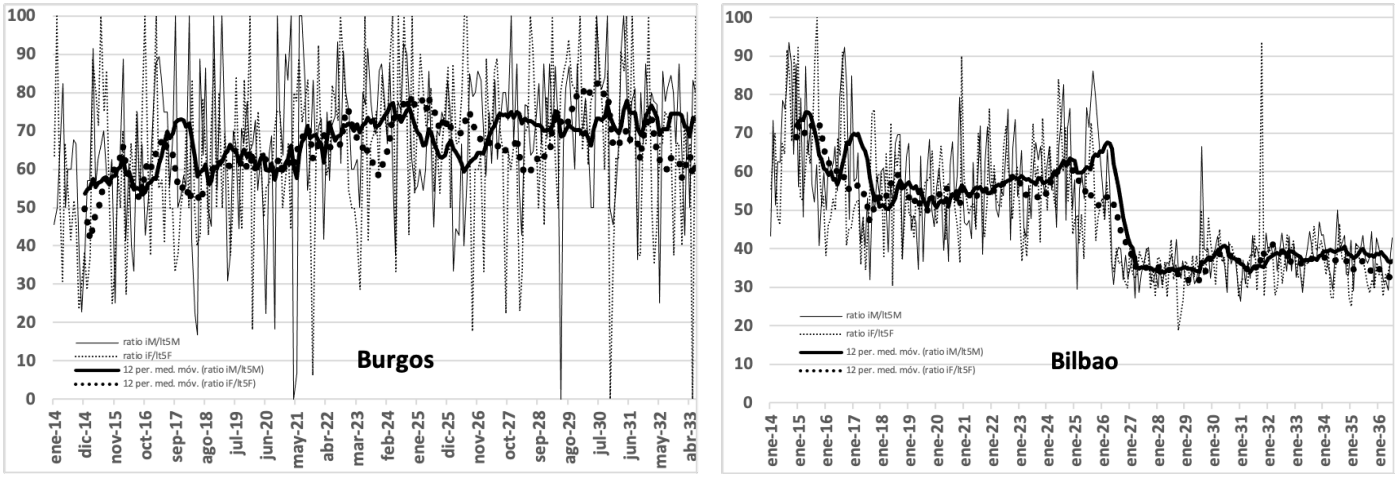

Figure C. Percentage of infant deaths per death of children less than five: Burgos and Bilbao.
Source: *Boletín de la Estadística Municipal* de Bilbao and Burgos corresponding years.

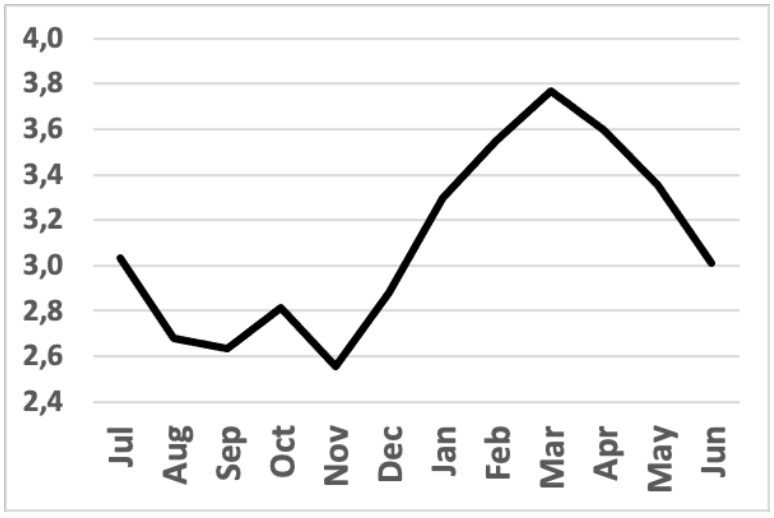

Figure D. Seasonality of tuberculosis in Bilbao, Jan 1914-Dec 1936 (deaths per thousand).
Source: Calculated with data taken from Boletín de la Estadística Municipal de Bilbao and Burgos corresponding years.

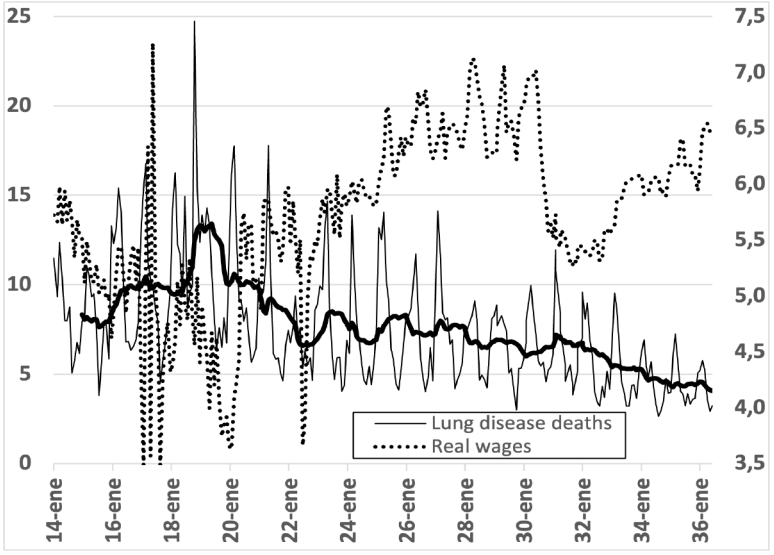

Figure E. Bilbao. Real wages [rhs] (pesetas) and lung disease death rates [lhs] (per thousand), 1914-1936.
Source: *Boletín de la Estadística Municipal* de Bilbao and Burgos corresponding years.