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2019

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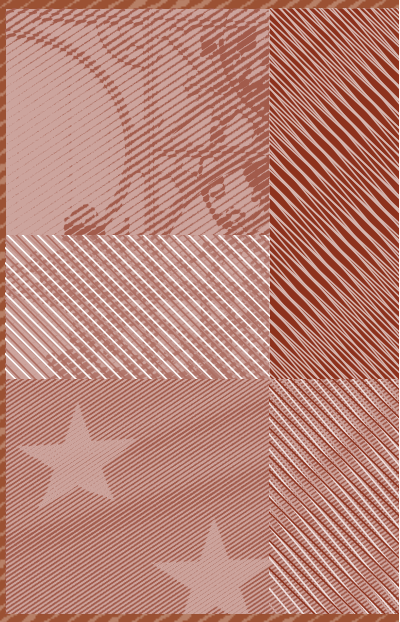

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Abstract

Historical experience and the economic literature show that the process of structural change of economies towards more advanced stages of development is associated with a particular pattern of change in the sectoral composition of economic activity. In a first stage, the manufacturing share increases while agriculture's share decreases. In a second stage, the manufacturing share starts to decline and the services share starts to grow. This paper presents a brief overview of the empirical evidence available on this process of structural change at an international level, highlighting the case of the Spanish economy. As a result of the rapid process of structural change over the last four decades, the productive structure of the Spanish economy has converged towards that of the European countries, with higher shares for services and manufacturing and a lower share for agriculture. Beyond the impact of cyclical fluctuations, we can expect increases in the services share, at the expense of manufacturing and agriculture. According to the literature, these patterns may be related to demand forces (the public's preferences), supply forces (different sectoral productivity patterns) or a combination of both, owing to openness to international trade which can accelerate the process. Therefore, an in-depth analysis of the causes of structural change in Spain is essential, inasmuch as the future development of this process will determine economic growth in the long run.

Keywords: structural change, economic sectors, sectoral analysis, Spanish economy.

JEL classification: O11, O14, O4.

Resumen

La experiencia histórica y la literatura económica muestran que el proceso de cambio estructural de las economías hacia estadios avanzados de desarrollo sigue unas pautas de desarrollo sectorial. En una primera fase, aumenta la producción industrial y disminuye el peso de la agricultura en el producto de la economía. En una segunda fase, se produce una disminución relativa del sector industrial y aumenta de manera sostenida la aportación de la actividad en los servicios. Este trabajo presenta una breve panorámica de la evidencia empírica disponible sobre este proceso de transformación estructural a escala internacional, con especial énfasis en el caso de la economía española. Como resultado del rápido proceso de cambio estructural de las cuatro últimas décadas, la estructura productiva de la economía española ha convergido hacia la de los principales países europeos de referencia, con un mayor peso de los servicios y de las manufacturas, y un sector agrícola con una importancia reducida. Más allá del impacto de las fluctuaciones cíclicas, cabe esperar que continúen ganando peso en el futuro los sectores relacionados con los servicios, en detrimento de las manufacturas y de la agricultura. De acuerdo con la literatura, este sesgo hacia un aumento del peso de los servicios puede deberse a fuerzas de demanda (preferencias de los ciudadanos), de oferta (tendencias diferentes en las productividades sectoriales), o a una combinación de ambas a causa de la apertura al comercio internacional, que puede acelerar el proceso. Con todo esto, investigar en profundidad las causas del fenómeno de transformación estructural en el caso español resulta prioritario, puesto que el devenir futuro de dicho proceso determinará, en buena medida, el crecimiento económico a largo plazo de la economía española.

Palabras clave: cambio estructural, sectores económicos, análisis sectorial, economía española.

Códigos JEL: O11, O14, O4.

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1 Introduction

Historical experience shows that the process of structural change of economies towards more advanced stages of development may be divided into two different stages in terms of productive specialisation. In a first stage, the share of the primary sector (agriculture) declines and the production of the secondary sector (manufacturing)[1] increases in the economy overall. In a second stage, the share of manufacturing declines and tertiary sector (services) activity grows. Since the 1970s, the economic literature has considered this process of structural change to be one of the main determinants of economic growth in the long run (see, for example, Kuznets, 1973).

Compared with other European countries with similar levels of development in terms of GDP per capita,[2] the Spanish economy currently has a similar share of employment and economic activity in the three main sectors of activity. However, compared to the United States, where GDP per capita is significantly higher than in Spain and in Europe,[3] the shares of agriculture and manufacturing are higher and the services share is lower. According to the analysis presented in this paper, this is the result of a secular process of structural change at a global level, which in Spain started later but has evolved faster than in other European economies. In other words, despite its lower level of development in GDP per capita terms and its productive specialisation in agriculture at the start of the period analysed (1960), the Spanish economy has converged towards what is now a very similar situation to that of the other European countries considered. The growth in international trade since 1970 may have encouraged this convergence, as it is a catalyst of the economic development process and would appear to have contributed to the deindustrialisation of the Spanish economy (see Rodrik, 2016). Insofar as GDP per capita continues to grow in a sustained manner, these secular patterns can be expected to continue in coming decades. In consequence, aside of cyclical fluctuations, the share of services-related sectors will continue to grow, to the detriment of manufacturing and agriculture.

Broadly speaking, three alternative mechanisms may be distinguished to explain this process of structural change: one on the demand side (preferences), another on the supply side (productivity) and a third a combination of the two (international trade). On the demand side, structural change may take place as household wealth increases and households start to spend a smaller proportion of their income on food and a larger proportion on manufactured goods (for instance, cars) and, over a certain threshold, when they start to spend a larger proportion on services and a smaller proportion on manufactured goods (see Kongsamut, Rebelo and Xie, 2001). On the supply side, changes in the sectoral composition

1 In this paper we follow the literature and use the term "manufacturing" to refer to the secondary sector in general, that is, to all activities that are neither agriculture nor services. It may seem more appropriate to use the term "industry" to refer to this group, since manufacturing is simply the largest component of industry, but we prefer to use the term employed in the literature.

2 The benchmark European countries with data available in the database used are Denmark, France, the Netherlands, Italy, the United Kingdom and Sweden (see section 2).

3 According to the Penn World Table (PWT), GDP per capita in Spain was $33,864 in 2014, while average GDP per capita in the benchmark European countries was $39,631, compared with $52,292 in the United States (see Table 4.1).

of an economy may be explained in a conceptual framework by the fact that productivity trends vary by sector of activity, giving rise to changes in relative prices (see Baumol, 1967). Lastly, there are two main ways in which international trade may influence the structural transformation process. A decline in the costs of trade affects productive specialisation patterns based on each country's comparative advantages, which in turn have an impact on the allocation of labour and activity between sectors. Also, international trade is a key determinant of economic growth per se (see, for example, Alcalá and Ciccone, 2004) and this boosts household income, speeding up the process of structural change through the demand/preferences channel.

The process of structural transformation towards economic structures based more on services has significant implications for long-term economic growth. Baumol et al. (1985) show how in developed countries this process may detract from productivity growth in the long run, as resources are reallocated to low-productivity services sectors. Given that manufacturing goods and services are complementary, with elasticity of substitution of less than 1, the sector with the lowest productivity growth (services) would ultimately absorb all the employment in the economy (the so-called Baumol disease).[4] Although Duernecker et al. (2017) qualify this conclusion, showing that within the tertiary sector there are low-productivity services and very high-productivity services that are substitutes for each other, the process of reallocation of activity towards services can be expected to reduce aggregate productivity growth in advanced economies, since productivity growth is generally lower in services than in manufacturing. In any event, Matsuyama (2009) stresses the importance of international trade in this respect. In response to an increase in manufacturing productivity, international trade will give rise to more resources being allocated to manufacturing to meet higher external demand, thus countering Baumol disease, at least in part. There is also evidence to show that economic cycles become less volatile as the services share grows to the detriment of manufacturing (Moro, 2015; Carvalho and Gabaix, 2013). Lastly, Galesi and Rachedi (2018) show that as the services share of inputs to all other sectors expands, the transmission of monetary policy may become less effective, as services sector prices are more inflexible.

The remainder of the paper is organised as follows. Section 2 describes the database used, while section 3 sets out the stylised facts that characterise structural change and discusses the mechanisms that the literature has used to understand the causes of this process. Section 4 analyses the specific case of the structural transformation process in Spain, compared with other European countries and the United States. Lastly, section 5 presents some considerations on the future prospects for structural change in the Spanish economy.

4 The fact that the elasticity of substitution between manufacturing and services is less than 1 implies that, in the event of an increase in the relative price of services, stemming from productivity growth in manufacturing, the decline in the amount of services demanded is proportionally lower and, therefore, insufficient to offset the increase in price, giving rise to an increase in the services share.

2 Database

The main data source used is the Groningen Growth and Development Centre (GGDC) 10 Sector Database,[5] which offers the fullest historical coverage of changes in economic sectors in the different countries. The database covers thirteen countries in Africa, eleven in Asia, nine in Latin America and eight in Europe, as well as the United States, and was built drawing on various data sources. Below we summarise how it was constructed for the developed countries, which are those that interest us most here.

The GGDC database draws on three different sources. First, for the pre-1970 period, it draws on the work of van Ark (1996), who in turn uses OECD National Accounts (Vol. II) together with other more complete statistical sources at national level and data generated by other academics. Van Ark (1996) thus constructs sectoral accounts for the post-war years for employment and value added. To ensure that they may be used for international comparisons, the different sectoral classifications have been adapted to the International Standard Industrial Classification of All Economic Activities (ISIC).[6] Second, for the period 1970-1995, the data source used is the EU KLEMS,[7] which essentially draws on national statistics institutes' databases, which are then harmonised to obtain a consistent database (for more details on the EU KLEMS database, see Timmer, O'Mahony and van Ark, 2007). Lastly, for the period 1995-2011, the data source used is the World Input-Output Database (WIOD),[8] created from supply and use tables (SUTs) and from national accounts statistics (for a more exhaustive analysis, see Dietzenbacher et al., 2013).

Timmer, de Vries and de Vries (2015) analyse the intertemporal and international consistency of the GGDC database used here. They conclude, first, that harmonising the different data sources for each country over time allows comparisons to be drawn between the position of each economy in different sub-periods. Second, they show that the variables are also comparable between countries, as the national accounts and the common sectoral classification considered use harmonised definitions of value added and employment.

Table 2.1 shows the set of countries used in this paper and the periods for which there are data available. It should be noted that although 2011 is the last year with data available in the original GGDC database,[9] the value added and employment shares of each sector have been extended, including the data from the EU KLEMS database, the last update of which (published in 2018) includes data for all the countries up to 2015.[10] Even though for some countries we have data for earlier years than those specified in the table, we will use the period

5 Last consulted in January 2019 (http://www.ggdc.net/dseries/10-sector.html).
6 See United Nations (2002) for more details of this classification.
7 Project funded by the European Commission, Directorate-General for Research, as part of the 6th Framework Programme, Priority 8, Policy Support and Anticipating Scientific and Technological Needs.
8 Project funded by the European Commission, Directorate-General for Research, as part of the 7th Framework Programme, Theme 8: Socio-economic Sciences and Humanities.
9 The last year available varies between 2009 and 2011 according to the country and the variable concerned.
10 Last consulted in February 2019 (http://www.euklems.net/).

DATABASE SUMMARY

TABLE 2.1

Country	Country code	Nominal VA	Real VA	Employment
United States	USA	1970-2015	1960-2015	1960-2015
Spain	ESP	1970-2015	1960-2015	1960-2015
Great Britain	GBR	1970-2015	1960-2015	1960-2015
Italy	ITA	1970-2015	1960-2015	1960-2015
France	FRA	1970-2015	1960-2015	1960-2015
Netherlands	NLD	1970-2015	1960-2015	1960-2015
Sweden	SWE	1970-2015	1960-2015	1960-2015
Denmark	DNK	1970-2015	1960-2015	1960-2015

SOURCES: GGDC 10 Sector Database and EU KLEMS.

DESCRIPTION OF ECONOMIC SECTORS

TABLE 2.2

Sector	Description	Average share	
Primary/Agriculture		7.78%	
Agriculture	Agriculture, hunting and forestry, fishing	7.24%	(93.03%)
Mining	Mining and quarrying	0.54%	(6.97%)
Secondary/Manufacturing		28.28%	
Manufacturing	Manufacturing	20.05%	(70.88%)
Utilities	Electricity, gas and water supply	0.66%	(2.32%)
Construction	Construction	7.58%	(26.79%)
Tertiary/Services		63.94%	
Trade services	Wholesale and retail trade, repair of motor vehicles, motorcycles and household goods, hotels and restaurants	18.62%	(29.13%)
Transport services	Transport, storage and communications	6.66%	(10.41%)
Business services	Financial intermediation, renting and business activities (excluding owner-occupied rents)	9.44%	(14.77%)
Government services	Public administration and defence, education, health and social work	23.34%	(36.51%)
Personal services	Other community, social and personal service activities, activities of private households	5.87%	(9.18%)

SOURCES: GGDC 10 Sector Database and EU KLEMS.

1960-2015 for employment and real value added, and the period 1970-2015 for nominal value added, to ensure uniform coverage in terms of countries included in the analysis in all years.[11]

Table 2.2 lists the economic sectors covered, specifying the composition of each of the three classic economic sectors. This classification draws on the aggregate classification provided by ISIC Rev.3.1.

For purposes of illustration, the average share of each sector has been calculated (at an aggregated and disaggregated level) taking into account the employment data for

11 Germany is excluded from the sample of countries because up to 1991 the GGDC database only has data for West Germany.

the United States and the European countries included in the database from 1960 to 2015. Within the primary sector, agriculture stands out, with an average share over the period of 93.03%, with a minority share for mining. The secondary sector also presents a highly uneven distribution (albeit less so), with manufacturing accounting for over 70% of employment in the sector and the lowest share (less than 2.5%) for utilities. This explains why the primary and secondary sectors are labelled agriculture and manufacturing, as these are their main respective components. Lastly, the tertiary sector has a more even distribution by component, although government services and trade services each account for a considerable share.

Tables A.1 and A.2 in the Appendix show the employment and nominal value added share of each sector as a proportion of the total; specifically the figures refer to the average share for each sector and country throughout the period. Given that the sample considered comprises developed European countries and the United States, the tertiary sector (services) predominates, followed by the secondary sector (manufacturing) and, lastly, the primary sector (agriculture) with a very small share. A possible point to note is that in Spain (and Italy) the primary sector share is higher and the services share is lower than in the other countries in the sample. Also, the standard deviation (SD) and the difference between the maximum and minimum values both suggest that the primary and tertiary sector shares are subject to greater variability, indicating a greater level of reallocation of employment and activity between these two sectors over time.

3 Process of structural change at global level

3.1 Characterisation

The structural change that goes hand in hand with the process of modern economic growth is defined according to the reallocation of economic activity between the three main sectors of activity (agriculture, manufacturing and services). Although the literature is plentiful on this subject, including the notable initial contributions by Clark (1957), Chenery (1960), Kuznets (1966) and Syrquin (1988), works such as Herrendorf et al. (2014) or Sposi et al. (2018) summarise the current position of the literature on structural change. This section discusses the stylised facts of the process of structural change documented in the literature, following Herrendorf et al. (2014) and Sposi et al. (2018).

The measures of structural change we use are each sector's share of employment and of the total value added of the economy: the employment shares are calculated in terms of number of workers, while the value added shares are typically expressed in current prices (nominal shares), although they may also be expressed in constant prices (real shares). As regards the measures of economic development, the two most common measures at aggregated level are GDP per capita and a measure of productivity such as GDP per hour, expressed in both cases in international dollars.[12]

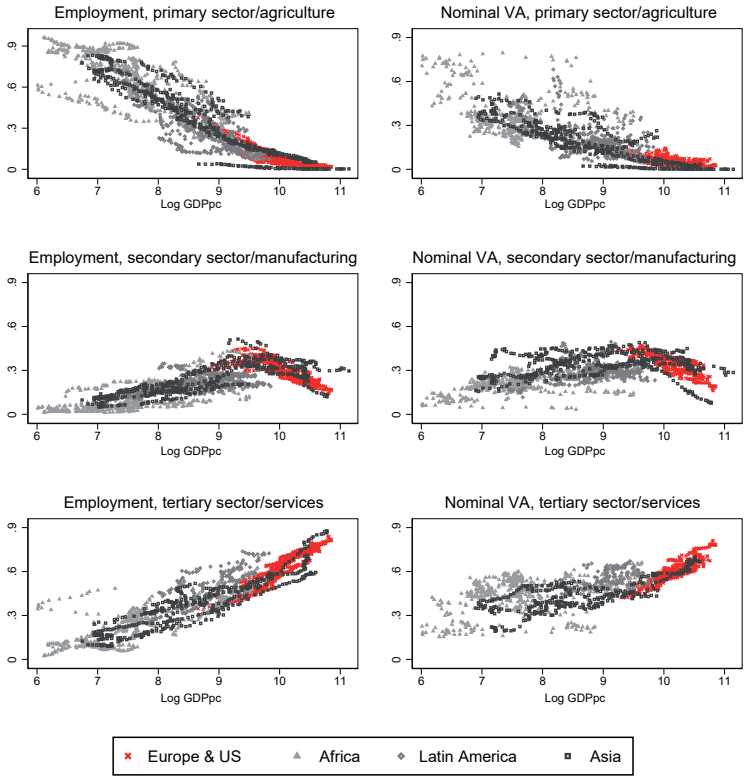
Chart 3.1 depicts the employment and nominal value added shares by sector for each country and year according to the level of development in the corresponding period.[13] Specifically, the horizontal axis represents the level of development measured in terms of the logarithm of GDP per capita for each country and year, and the vertical axis the share of all persons employed (left-hand panels) or nominal value added (right-hand panels) in the three broad sectors analysed.

As the chart shows, increases in GDP per capita are associated with decreases in the employment and the nominal value added share in agriculture and with increases in those shares in services. In manufacturing the pattern is different, as throughout the development process both employment and nominal value added show an inverted U-shape; in other words, their share increases in the initial development stages and falls back in the more advanced stages. All these conclusions are in line with those presented in, among others, Herrendorf et al. (2014).

12 In this paper we measure the level of development of a country by its GDP per capita in 2011 international dollars, taken from Penn World Table 9.0 which is the only measure available for most of the countries for the entire period.

13 The sample includes the United States, eight European countries (Spain, West Germany, Great Britain, Italy, France, the Netherlands, Sweden and Denmark), ten African countries (Botswana, Ethiopia, Ghana, Kenya, Mauritius, Malawi, Nigeria, Senegal, Tanzania and South Africa), four Latin American countries (Argentina, Brazil, Costa Rica and Mexico) and eight Asian countries (China, India, Indonesia, Japan, Malaysia, Philippines, Thailand and Taiwan). For employment it also includes Hong Kong, and for nominal value added Egypt, Morocco and Zambia.

SECTORAL COMPOSITION OF ECONOMY AND ECONOMIC DEVELOPMENT CHART 3.1

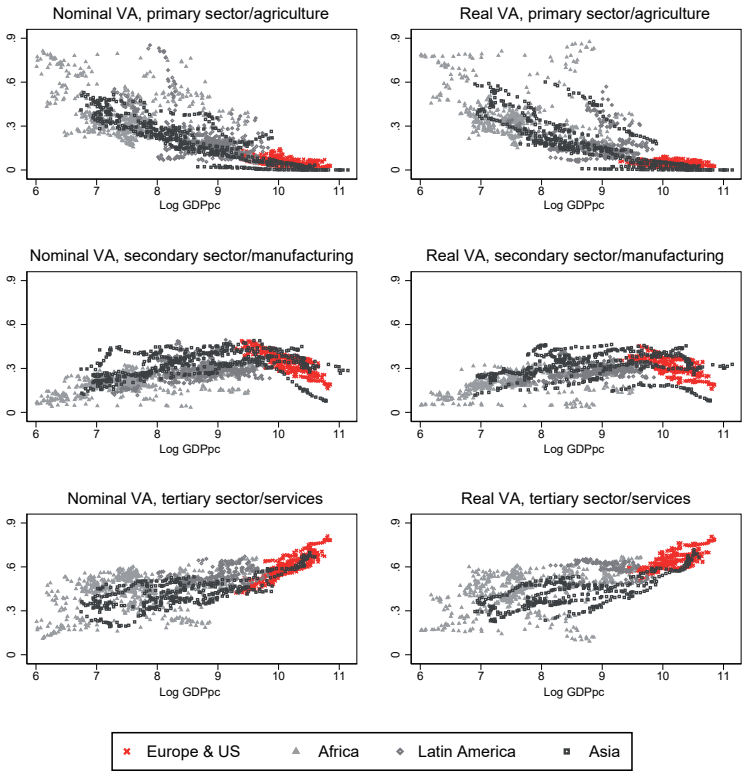


SOURCES: GGDC 10 Sector Database and Penn World Table version 9.0.

Chart 3.1 prompts several important observations. First, that in the case both of employment and nominal value added, the services sector share is above values close to zero – in almost all cases over 10% – for all levels of economic development. This is, therefore, the only sector that accounts for a certain share of the total economy across the different stages of development. Second, that in the case of the primary sector, the downward slope of the relationship between employment and level of development is steeper than that of the relationship between value added and economic development. Accordingly, in less developed economies the employment share in agriculture is substantially higher than the value added share. Or in other words, in less developed countries, employment is concentrated mainly in the least productive sector, i.e. the primary sector. Lastly, Chart 3.1 also suggests that, for services, the nominal value added share accelerates when the logarithm of GDP per capita is around 9, which coincides with the start of the decline in the value added share for the manufacturing sector.

Below we explore the possible differences between each sector's share in terms of real and nominal value added, where nominal value added relates to current prices and real value added to constant prices. Chart 3.2 depicts the nominal value added shares by sector in the left-hand panels and, for purposes of comparison, the real shares in

SECTORAL COMPOSITION OF NOMINAL AND REAL VALUE ADDED CHART 3.2



SOURCES: GGDC 10 Sector Database and Penn World Table version 9.0.

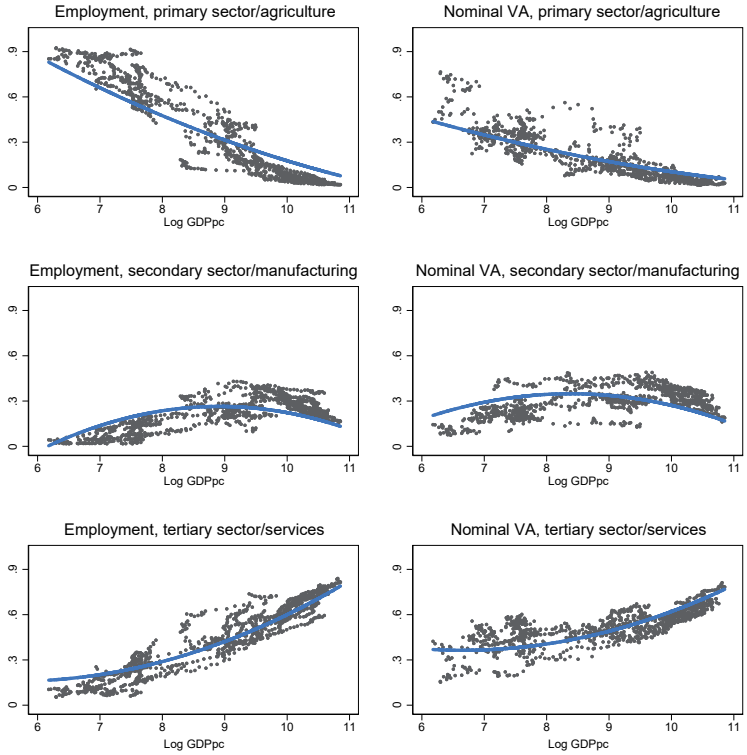
the right-hand panels. As the charts show, the patterns are quite similar, so we will focus throughout this paper on nominal shares.[14]

To compare the trends depicted in Chart 3.1 econometrically, various regressions have been estimated in which the dependent variable is the employment or value added share in each sector, using various polynomials of the Napierian logarithm of GDP per capita as independent variables (the results of the regressions and the procedure used to create the panel are shown in Table A.3 in the Appendix). The main results of the econometric analysis are illustrated in graphic form in Chart 3.3.

The regression line depicted in Chart 3.3 and based on quadratic specification reveals the same qualitative patterns as discussed previously. For example, the hump-shape (or inverted U-shape) is clear for manufacturing's share in both value added and employment. In addition, the adjusted curve in the case of services suggests some acceleration in their value added share when the logarithm of GDP per capita is over 9 (approximately $8,000) and the manufacturing share starts to decline.

14 Herrendorf et al. (2014) and Kuznets (1966) also find similar qualitative patterns for sectoral shares in nominal and real terms.

STRUCTURAL CHANGE AND REGRESSION ANALYSIS CHART 3.3



SOURCES: GGDC 10 Sector Database and Penn World Table version 9.0.

3.2 Causes of structural change

The literature has considered various mechanisms that may explain the process of structural change described in the previous section. Kongsamut, Rebelo and Xie (2001) explain the process of structural change including consumers' non-homothetic preferences, which imply that as their wealth increases, households spend a smaller proportion of their income on food than on manufactured goods (for instance, cars). In addition, secular patterns in changes in relative productivity between sectors and, therefore, in relative prices of the different sectors of activity, may also explain structural change (see, for example, Baumol, 1967).[15] For instance, a productivity increase in the manufacturing sector, with the consequent drop in relative sector prices, would give rise to reallocation of resources to the services sector. This is because, with the elasticities of substitution less than unity typically considered in the literature, the fall in the volume of services is not sufficient to offset the increase in their relative price, resulting in expansion in the services share (the so-called Baumol disease).

Globalisation and international trade may directly explain some productive specialisation patterns in the different economies. As countries open up to international trade, they will

15 Differences in capital intensity between sectors may also justify the process of structural change in the event of a widespread increase in capital intensity (see Acemoglu and Guerrieri, 2008).

specialise in sectors where they have a competitive advantage and this will have a direct impact on the productive structure (see, for example, Uy et al., 2013). Also, international trade can act as a catalyst of the two above-mentioned mechanisms, accelerating the process of structural change. First, the positive effects of trade on countries' wealth generate an income effect that broadens the channel of non-homothetic preferences. In other words, if households in one country become richer as the country opens up to international trade, in relative terms they will spend a larger proportion of their income on luxury goods (personal care services) and a smaller proportion on staple goods (processed food products). Second, lower costs of trade grant countries' access to cheaper products from abroad, and this may heighten the differences in relative productivity between sectors. For instance, higher productivity growth in manufacturing than in services may be exacerbated by openness to international trade if this facilitates access to more competitive inputs. In this respect, Rodrik (2016) shows that the deindustrialisation process (decline in the manufacturing sector share) began sooner than expected (at lower GDP per capita levels) in less developed countries because they opened up to trade, giving rise to "imported" deindustrialisation from developed countries.

More recently, the literature has explored other possible mechanisms in addition to the three described above. For example, García-Santana et al. (2018) show that investment goods (which are more manufacturing intensive) having more weight than consumer goods throughout the economic development process may explain the first industrialisation phase of the process of structural change. In this vein, Sposi (2018) highlights the role that input-output linkages may play in the structural transformation process. Specifically, contrary to traditional belief, changes in final demand in a sector may not necessarily translate into changes in the sector's share. For instance, if agricultural goods are services intensive, higher demand for foodstuffs will prompt, at least in part, higher demand for services.

4 Structural change in the Spanish economy

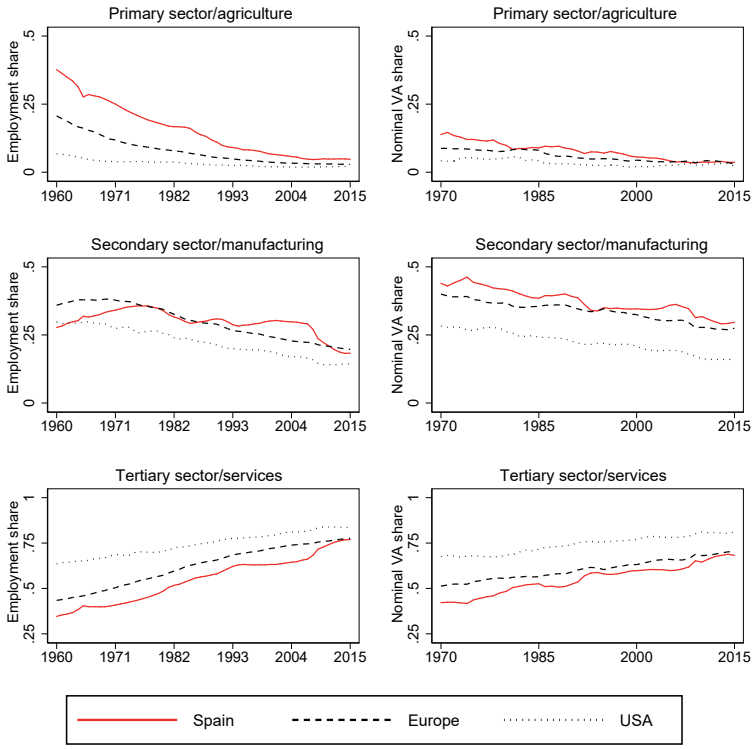
Chart 3.1 in the previous section illustrates the clearly distinct relative position of the advanced European economies and the US economy compared with the other countries in the sample. The main reason for this is that, over the period considered, those economies have been at a more advanced stage of development than the countries of Asia, Africa and Latin America. In consequence, the process of structural change in the Spanish economy must be analysed by comparison with other countries at similar levels of development. In this section, therefore, we concentrate on a subsample of developed countries that includes Spain, the other European countries and the United States.

Chart 4.1 shows how each sector's share has evolved, both in terms of employment and value added, in Spain, in the other developed European countries and in the United States. Each row of charts depicts sector share (agriculture, manufacturing and services), in terms of employment (the left-hand column) and nominal value added (the right-hand column).

Two conclusions may be drawn from the left-hand column of Chart 4.1. First, in 1960 there were certain notable differences between the productive structure of the Spanish economy and that of the other developed economies, with a higher degree of specialisation in the primary sector in Spain, to the detriment of manufacturing and services. Specifically, employment

STRUCTURAL CHANGE IN EMPLOYMENT AND VALUE ADDED

CHART 4.1



SOURCES: GGDC 10 Sector Database and EU KLEMS.

in the Spanish economy was distributed between agriculture, manufacturing and services in a proportion of 38%, 28% and 35%, respectively, compared with 21%, 36% and 43% for the average European country[16] and 7%, 30% and 63% for the United States. Second, the change in the productive structure between 1960 and 2015 reflects, in the case of Spain, a greater loss of share in agriculture in favour of services, while the manufacturing employment share was relatively stable, compared with non-negligible losses in the other countries.

The value added shares in the right-hand column of Chart 4.1 trace similar patterns to the employment shares, but with two important caveats: i) the differences compared with the other countries in the case of agriculture are less marked than for the employment share, which reflects a larger productivity gap between Spain and the other countries for this sector and greater convergence over time (see Tables A.5 and A.6 in the Appendix); and ii) in the case of value added the manufacturing share is not as stable, because the series start in 1970 and it was in the period 1970-75 when Spain achieved its peak manufacturing employment share.

In accordance with the process of structural change described in the previous section, this shows that, in 1960, the Spanish economy started out from a lower level of development than the other countries analysed. Specifically, GDP per inhabitant in 1960 was $5,741 in Spain, compared with $10,223 in Europe and $17,600 in the United States. In consequence, whereas in 1960 the other European countries in the sample and the United States were in a second stage of the process of structural change, where manufacturing was already losing share to services, at least until the early 1970s Spain was still in the first stage, with manufacturing gaining share from agriculture.

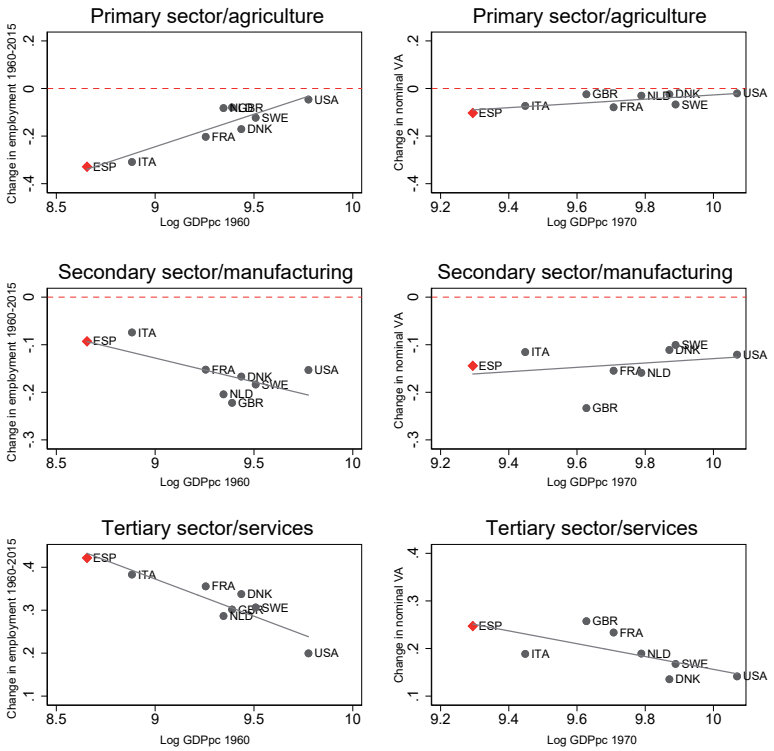
In consequence, between 1960 and 2015 the share of the agricultural sector fell by 33 pp in Spain, whereas in the United States it fell by 5 pp and in the rest of Europe by 18 pp. In the case of manufacturing, the drop of 9 pp in the case of Spain contrasts with the sharper decline of up to 16 pp in the United States and Europe. Lastly, the services employment share rose by 42 pp in Spain, compared with a rise of 20 pp in the United States and 34 pp in the rest of Europe. In this case also, the patterns for the value added share are similar but less pronounced, as a result of the different time period (starting in 1970) and the relative productivity differences (a larger productivity gap between Spain and other countries in agriculture and services than in manufacturing).

That said, Chart 4.2 shows that these changes in the productive structure of the Spanish economy between 1960 and 2015 are reasonably in line with expectations, given the level of development at the outset. In other words, the change in each sector's share coincides with the change predicted by a linear regression model that links the changes in share to the initial level of GDP per capita.[17] This link shows that the lower the initial level of GDP per

16 For reasons of data availability, the European countries included in this comparison are Italy, France, the United Kingdom, Denmark, Sweden and the Netherlands.

17 Given the small number of countries included in this analysis, and the fact that they share quite similar levels of development, a linear specification was used rather than a quadratic or cubic specification as in the previous section.

CHANGE IN VARIABLE VS. GDP PER CAPITA 1960/1970 CHART 4.2



SOURCES: GGDC 10 Sector Database, EU KLEMS and Penn World Table version 9.0.

capita, the greater the decline in the share of agriculture, the lower the decline in manufacturing and the greater the increase in services, especially in the case of employment in view of the longer period covered (1960-2015). Chart 4.2 also shows that, in 1960, Spain's level of development, measured in terms of GDP per capita, was the lowest of all the countries in the sample, similar only to Italy's. In consequence, the level of development of the Spanish economy at the outset would go a long way to explaining the subsequent changes in terms of sectoral composition of activity in accordance with structural change. These changes, in accordance with the initial level of development, are also in line with the growth observed in GDP per capita over the period 1960-2015, as shown in Chart A.1 in the Appendix, considering that the countries with the lowest initial level of development are those that present the highest growth.[18]

However, in the case of Spain, international trade may also play a part in explaining these developments. It was precisely from the 1970s that global exports began to record exponential growth (see, for example, Ortiz-Ospina et al., 2019). Accordingly, despite being at an initial stage of the process of structural change in the 1960s and 1970s, with manufacturing still gaining weight, the Spanish economy was already importing premature deindustrialisation from the other developed countries (see Rodrik, 2016).

18 Chart A.2 in the Appendix depicts the same type of link between the change in share and the initial level of development, but for the nine sectors covered in the GGDC database (excluding utilities owing to its very low share). Broadly speaking, all the sectors' shares have evolved as expected according to the initial level of development.

Turning to the productive specialisation of the Spanish economy in 2015, which is the last year with comparable data between countries and for the full period considered, the first point to note is the convergence observed in terms of GDP per capita over the period 1960-2015. In 1960, Spanish GDP per capita amounted to 33% and 56% of GDP per capita in the United States and Europe, respectively; by 2015, on PWT 9.0 data, these figures had risen to 65% and 85%. In addition, as Table 4.1 shows, the differences between Spain's productive structure and that of the rest of Europe and the United States also narrowed significantly in terms of employment. For instance, the differences between Spain and Europe in terms of employment share in agriculture, manufacturing and services were +17 pp, +8.1 pp and 8.8 pp, respectively, in 1960, compared with +1.9 pp, 1.2 pp and 0.7 pp in 2015. The same pattern, albeit somewhat less pronounced, is observed in terms of value added share between 1970 and 2015 (see Table 4.2).

Accordingly, in 2015 the employment share was distributed between agriculture, manufacturing and services in a proportion of 5%, 18% and 77%, respectively, in Spain, compared with 3%, 20% and 77% for Europe and 2%, 14% and 84% for the United States. The value added share in 2015 was distributed between agriculture, manufacturing and services in a proportion of 4%, 29% and 67%, respectively, in Spain compared with 3%, 27% and 70% for Europe and 2%, 16% and 82% for the United States. In other words, although the productive structure of the Spanish economy is very similar to that of the other European countries in the sample, there are non-negligible differences compared with the United States where GDP per capita is significantly higher than in the European countries overall. Thus, in line with

PRODUCTIVE STRUCTURE IN TERMS OF EMPLOYMENT **TABLE 4.1**

	Spain			Europe (a)			USA		
	1960	2007	2015	1960	2007	2015	1960	2007	2015
Primary/Agriculture	37.7	4.8	4.8	20.7	3.1	2.9	6.7	1.9	2.1
Agriculture	36.5	4.6	4.7	18.3	3.0	2.7	5.7	1.4	1.5
Mining	1.2	0.2	0.1	2.3	0.2	0.2	1.0	0.5	0.6
Secondary/Manufacturing	27.7	29.1	18.4	35.9	22.3	19.6	29.8	16.5	14.4
Manufacturing	19.1	15.2	12.1	27.1	14.4	12.3	23.6	9.9	8.8
Utilities	0.6	0.5	0.6	0.8	0.5	0.6	0.7	0.4	0.4
Construction	8.1	13.4	5.8	7.9	7.3	6.8	5.5	6.3	5.2
Tertiary/Services	34.6	66.1	76.8	43.4	74.6	77.5	63.5	81.6	83.5
Trade services	14.2	22.8	24.4	14.4	19.3	19.5	20.7	24.1	23.8
Transport services	4.8	5.9	6.3	7.7	7.3	7.4	6.6	4.4	4.6
Business services	2.4	9.8	12.8	3.4	14.5	15.7	8.3	18.4	18.6
Government services	7.0	18.6	22.9	14.6	26.2	26.6	23.2	28.3	30.0
Personal services	6.1	9.0	10.4	3.3	7.3	8.0	4.7	6.3	6.5
GDP per capita	5,741	34,938	33,864 (b)	10,224	38,301	39,631 (b)	17,600	51,734	52,292 (b)

SOURCES: GGDC 10 Sector Database, EU KLEMS and Penn World Table version 9.0.

a Includes Denmark, France, Netherlands, Italy, United Kingdom and Sweden.
b PWT 9.0 ends in 2014.

PRODUCTIVE STRUCTURE IN TERMS OF NOMINAL VALUE ADDED TABLE 4.2

	Spain			Europe (a)			USA		
	1970	2007	2015	1970	2007	2015	1970	2007	2015
Primary/Agriculture	13.9	3.9	3.6	8.7	3.9	3.0	4.2	2.8	2.1
Agriculture	13.1	3.5	3.5	7.7	2.1	2.0	2.6	1.0	0.8
Mining	0.8	0.3	0.1	1.1	1.8	1.0	1.5	1.8	1.3
Secondary/Manufacturing	43.9	35.4	29.5	40.0	30.4	27.3	28.2	18.8	16.2
Manufacturing	32.6	18.3	17.3	27.5	20.3	17.4	21.6	12.2	10.9
Utilities	1.7	2.6	3.2	2.8	2.8	2.9	2.2	1.7	1.4
Construction	9.7	14.5	9.0	9.7	7.4	6.9	4.5	4.9	3.8
Tertiary/Services	42.2	60.8	66.9	51.3	65.7	69.7	67.6	78.3	81.7
Trade services	14.3	21.7	23.0	16.8	17.3	17.5	19.3	16.4	15.0
Transport services	6.0	8.3	9.0	9.4	9.1	9.0	6.5	5.5	4.9
Business services	1.6	5.2	5.9	2.5	8.7	10.3	20.1	33.6	40.3
Government services	15.4	20.1	23.3	19.1	25.3	26.5	19.0	19.0	18.0
Personal services	4.9	5.5	5.7	3.4	5.2	5.7	2.6	3.9	3.6
GDP per capita	10,876	34,938	33,864 (b)	15,302	38,301	39,631 (b)	23,608	51,734	52,292 (b)

SOURCES: GGDC 10 Sector Database, EU KLEMS and Penn World Table version 9.0.

a Includes Denmark, France, Netherlands, Italy, United Kingdom and Sweden.
b PWT 9.0 ends in 2014.

the structural change that goes hand in hand with the process of economic development, the country with the highest GDP per capita also has the highest services share, to the detriment of manufacturing and agriculture.

At a more disaggregated level, no major differences are observed between Spain and the other countries within the primary and secondary sector subsectors. There are minor differences between Spain and Europe in the shares of agriculture and mining in the primary sector and of manufacturing, utilities and construction in the secondary sector, and larger differences between Spain and the United States. The role of construction is particularly noteworthy, as it had a considerably higher share for Spain in 2007, right at the end of the Spanish economic boom (1995-2007) that was characterised by a strong real estate component (see, for example, Moral-Benito, 2018). The fact that this difference had vanished by 2015, after the economic cycle had ended (1995-2013), illustrates the importance of analysing lengthy time periods so as to isolate cyclical fluctuations that may mask secular processes such as structural change.

In the tertiary sector some differences are observed between the more disaggregated sectors. For instance, Spain has a higher share of trade services – which include tourism and travel-related services such as hotels and restaurants – than other European countries. Moreover, this specialisation was absent in 1960, which reflects a certain degree of heterogeneity in the process of structural change within the tertiary sector (see Chart A.3 in the Appendix).

This may be owing to factors relating to climate and geography, which play a crucial part in a country's productive specialisation through the process of opening up to international trade and in terms of comparative advantage patterns between countries and sectors. A further point to note is the low weight of business services, especially in value added terms (see Table 4.2), which suggests that these services have a much lower level of productivity in Spain than in the other countries, both in nominal and real terms (see Tables A.5 and A.6 in the Appendix).

5 Discussion and outlook

Spain's productive structure is very similar to that of other European countries in terms of the share of the main sectors of activity. However, compared with a country with higher GDP per capita such as the United States, both Spain and the other European countries have a higher share of primary (agriculture and mining) and secondary (manufacturing and construction) sector activities and a lower share of services (tertiary sector). As discussed, the changes in this specialisation pattern over time respond to a process of structural change that in the period 1960-2015 has been more marked in Spain than in the other European countries.

In accordance with the analysis presented in this paper, it can be expected that as GDP per capita continues to grow in the future, the share of agriculture and manufacturing will continue to shrink in favour of services, to converge towards a productive structure similar to that of the United States. Specifically, with per capita growth of 1.5% per annum (see Cuadrado and Moral-Benito, 2016), the Spanish economy would reach the present US GDP per capita levels in approximately 20 years' time. With those levels of development, the services share of value added would be around 82%, compared with 67% today, to the detriment of manufacturing which would fall from 29% to 16%.[19]

That said, in order to explain the process of structural change in the specific case of Spain in comparison with other countries it is useful to quantify the relative importance of the different mechanisms discussed in section 3. This is because, as explained in the introduction to this paper, the productive specialisation pattern of an economy is a determinant factor in its growth potential. In this respect, economic policy recommendations will be very different, according to whether structural change responds to demand-side forces (the public's preferences) or supply-side forces (sectoral productivity differences) or whether it stems from international trade which may act as a catalyst for both. Identifying the drivers of structural change in Spain is a promising line of research to gain an understanding of the factors underpinning long-term growth and the economic policy challenges that the Spanish economy will face in the coming decades.

Moreover, the importance of structural change and its implications are particularly relevant in a setting such as the present one, characterised by growing global economic integration, expanding trade in services (Loungani et al., 2017) and escalating technological change. In this respect, in recent decades new technologies (social networks, electronic products, search engines) have been linked to effects on consumption patterns. Yet future technology trends will probably be linked to the use of artificial intelligence and robotics in product manufacturing. In consequence, digital goods may increasingly become investment

19 It goes without saying that this projection should be interpreted with caution, as it takes no account of other factors that may play an essential role in the future productive specialisation of the Spanish economy.

goods for use in the manufacturing sector. Indeed, investment in intangible assets has gained significant weight in the Spanish economy in recent years (see Banco de España, 2017). The impact that these developments may have on productive specialisation in the developed economies and on their economic growth performance is an area of research that is still underexplored but that offers great potential.

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Appendix A. Additional charts and tables

EMPLOYMENT SHARE

TABLE A.1

		Employment share				
Country	Sector	Obs.	Avge.	SD	Min	Max
DNK	S1	56	0.07	0.05	0.03	0.20
	S2	56	0.28	0.06	0.19	0.37
	S3	56	0.65	0.10	0.44	0.78
ESP	S1	56	0.15	0.10	0.05	0.38
	S2	56	0.30	0.04	0.18	0.36
	S3	56	0.55	0.12	0.35	0.77
FRA	S1	56	0.09	0.06	0.03	0.23
	S2	56	0.28	0.06	0.18	0.37
	S3	56	0.63	0.12	0.43	0.79
GBR	S1	56	0.04	0.02	0.02	0.10
	S2	56	0.30	0.08	0.18	0.41
	S3	56	0.66	0.10	0.50	0.80
ITA	S1	56	0.12	0.09	0.04	0.35
	S2	56	0.33	0.04	0.25	0.38
	S3	56	0.55	0.12	0.33	0.72
NLD	S1	56	0.05	0.02	0.03	0.11
	S2	56	0.26	0.07	0.16	0.37
	S3	56	0.69	0.09	0.53	0.82
SWE	S1	56	0.06	0.03	0.02	0.15
	S2	56	0.30	0.06	0.21	0.41
	S3	56	0.64	0.10	0.45	0.76
USA	S1	56	0.03	0.01	0.02	0.07
	S2	56	0.22	0.05	0.14	0.30
	S3	56	0.74	0.06	0.64	0.84

SOURCES: GGDC 10 Sector Database and EU KLEMS.
NOTE: S1 denotes primary sector/agriculture, S2 secondary sector/manufacturing and S3 tertiary sector/services.

NOMINAL VALUE ADDED SHARE

TABLE A.2

	Nominal value added share					
Country	Sector	Obs.	Avge.	SD	Min	Max
DNK	S1	46	0.06	0.01	0.05	0.08
	S2	46	0.30	0.03	0.24	0.37
	S3	46	0.64	0.04	0.57	0.70
ESP	S1	46	0.08	0.03	0.03	0.15
	S2	46	0.37	0.05	0.29	0.46
	S3	46	0.55	0.08	0.42	0.67
FRA	S1	46	0.06	0.02	0.03	0.11
	S2	46	0.33	0.05	0.25	0.41
	S3	46	0.62	0.07	0.48	0.72
GBR	S1	46	0.06	0.03	0.03	0.13
	S2	46	0.34	0.08	0.23	0.47
	S3	46	0.61	0.09	0.48	0.73
ITA	S1	46	0.06	0.02	0.03	0.11
	S2	46	0.39	0.04	0.33	0.46
	S3	46	0.55	0.06	0.44	0.63
NLD	S1	46	0.08	0.02	0.05	0.15
	S2	46	0.29	0.04	0.22	0.38
	S3	46	0.63	0.06	0.54	0.73
SWE	S1	46	0.05	0.02	0.02	0.10
	S2	46	0.35	0.03	0.28	0.40
	S3	46	0.59	0.05	0.50	0.69
USA	S1	46	0.03	0.01	0.02	0.06
	S2	46	0.22	0.04	0.16	0.28
	S3	46	0.74	0.05	0.67	0.82

SOURCES: GGDC 10 Sector Database and EU KLEMS.
NOTE: S1 denotes primary sector/agriculture, S2 secondary sector/manufacturing and S3 tertiary sector/services.

ANALYSIS OF PANEL DATA

TABLE A.3

	Employment (1)	Employment (2)	Employment (3)	VA (4)	VA (5)	VA (6)
Primary sector/agriculture						
ln GDPpc	-0.1525***	-0.3617***	2.5998***	-0.0759***	-0.2005***	0.0661
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.8360)
(ln GDPpc)2		0.0118***	-0.3280***		0.0070***	-0.0237
		(0.0000)	(0.0000)		(0.0000)	(0.5160)
(ln GDPpc)3			0.0128***			0.0012
			(0.0000)			(0.3980)
N	1,025	1,025	1,025	1,025	1,025	1,025
Secondary sector/manufacturing						
ln GDPpc	0.0046	0.6218***	-2.1856***	-0.0286***	0.4953***	-0.9574***
	(0.1500)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
(ln GDPpc)2		-0,0349***	0.2873***		-0.0295***	0.1371***
		(0.0000)	(0.0000)		(0.0000)	(0.0000)
(ln GDPpc)3			-0.0122***			-0.0063***
			(0.0000)			(0.0000)
N	1,025	1,025	1,025	1,025	1,025	1,025
Tertiary sector/services						
ln GDPpc	0.1502***	-0.2587***	-0.4054	0.1013***	-0.3041***	0.9069***
	(0.0000)	(0.0000)	(0.1780)	(0.0000)	(0.0000)	(0.0030)
(ln GDPpc)2		0.0230***	0.0398		0.0229***	-0.1162***
		(0.0000)	(0.2470)		(0.0000)	(0.0010)
(ln GDPpc)3			-0.0006			0.0053***
			(0.6260)			(0.0000)
N	1,025	1,025	1,025	1,025	1,025	1,025

SOURCES: GGDC 10 Sector Database and Penn World Table version 9.0.
NOTE: *** 1%, ** 5%, * 10%. To create a balanced panel with the most data possible, the following limitations have been applied: (a) time horizon from 1970 to 2010, both inclusive; (b) excluding countries with an average population under 1 million in the period; and (c) excluding countries where the sectoral composition could be distorted by very high oil receipts as a percentage of GDP.[20] The result is a database consisting of the United States, seven European countries (Spain, Great Britain, Italy, France, the Netherlands, Sweden and Denmark), nine African countries (Botswana, Ethiopia, Ghana, Kenya, Mauritius, Malawi, Senegal, Tanzania and South Africa), three Latin American countries (Argentina, Costa Rica and Mexico) and five Asian countries (China, Indonesia, Japan, Thailand and Taiwan).

20 Countries excluded Egypt and Nigeria, based on *World Bank Open Data*.

PRODUCTIVE STRUCTURE IN TERMS OF REAL VALUE ADDED

TABLE A.4

	Spain			Europe (a)			USA		
	1960	2007	2015	1960	2007	2015	1960	2007	2015
Primary/Agriculture	9.7	4.4	4.5	6.5	3.3	2.9	5.6	2.5	3.4
Agriculture	9.1	4.1	4.4	3.5	1.9	2.2	1.2	0.9	1.0
Mining	0.6	0.3	0.2	3.0	1.4	0.9	4.3	1.6	2.4
Secondary/Manufacturing	24.7	34.6	27.6	30.2	30.4	28.1	26.7	18.7	15.9
Manufacturing	12.4	18.3	16.6	17.0	21.0	20.2	11.3	12.7	11.0
Utilities	0.9	2.4	2.5	1.7	2.5	2.4	1.7	1.6	1.5
Construction	11.4	13.9	8.1	11.4	6.8	5.8	13.7	4.4	3.5
Tertiary/Services	65.6	61.0	67.9	63.3	66.3	68.9	67.7	78.8	80.7
Trade services	28.1	22.0	23.7	14.7	17.3	17.8	9.1	16.8	16.7
Transport services	3.5	8.5	10.0	5.9	9.7	10.4	3.5	5.7	5.9
Business services	1.4	5.1	5.8	2.2	9.8	10.4	21.6	34.0	35.7
Government services	25.5	19.9	23.2	34.3	24.5	25.0	30.3	18.3	18.7
Personal services	7.1	5.5	5.8	6.2	5.1	5.2	3.1	3.9	3.7
GDP per capita	5,741	3,4938	33,864 (b)	10,224	38,301	39,631 (b)	17,600	51,734	52,292 (b)

SOURCES: GGDC 10 Sector Database, EU KLEMS and Penn World Table version 9.0.

a Includes Denmark, France, Netherlands, Italy, United Kingdom and Sweden.
b PWT 9.0 ends in 2014.

RELATIVE NOMINAL PRODUCTIVITY

TABLE A.5

	Spain/USA			Spain/Europe (a)		
	1970	2007	2015	1970	2007	2015
Primary/Agriculture	0.05	0.22	0.25	0.16	0.34	0.37
Agriculture	0.06	0.43	0.48	0.16	0.46	0.51
Mining	0.05	0.17	0.16	0.30	0.12	0.11
Secondary/Manufacturing	0.13	0.44	0.51	0.27	0.39	0.58
Manufacturing	0.15	0.41	0.43	0.32	0.37	0.52
Utilities	0.09	0.48	0.53	0.20	0.47	0.61
Construction	0.10	0.57	0.66	0.18	0.47	0.67
Tertiary/Services	0.10	0.40	0.32	0.22	0.45	0.50
Trade services	0.10	0.58	0.54	0.19	0.47	0.54
Transport services	0.10	0.48	0.48	0.20	0.52	0.61
Business services	0.02	0.12	0.06	0.22	0.36	0.29
Government services	0.25	0.66	0.60	0.37	0.48	0.52
Personal services	0.12	0.41	0.35	0.13	0.38	0.39
GDP per capita	0.46	0.68	0.65 (b)	0.71	0.91	0.85 (b)

SOURCES: GGDC 10 Sector Database, EU KLEMS and Penn World Table version 9.0.

a Includes Denmark, France, Netherlands, Italy, United Kingdom and Sweden.
b PWT 9.0 ends in 2014.

RELATIVE REAL PRODUCTIVITY

TABLE A.6

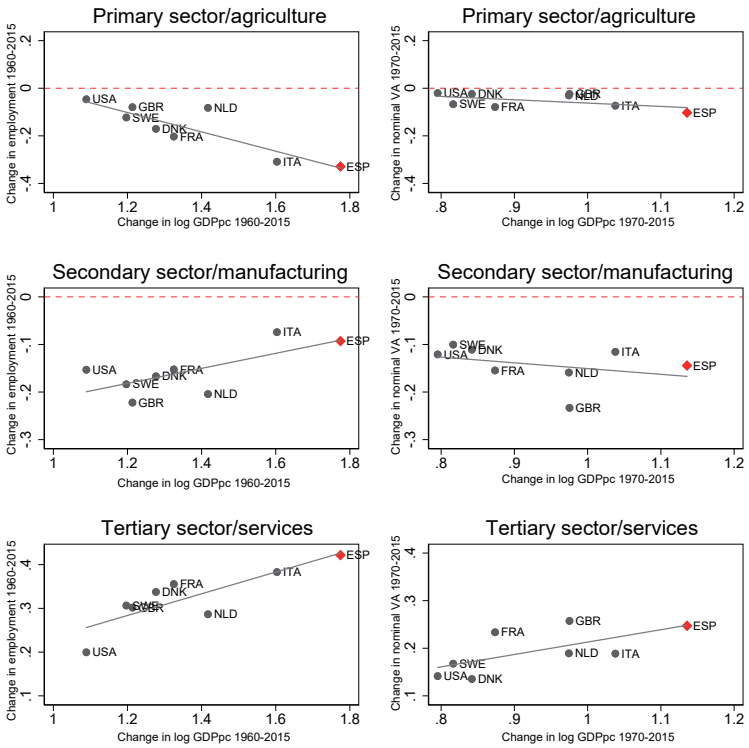
	Spain/USA			Spain/Europe (a)		
	1970	2007	2015	1970	2007	2015
Primary/Agriculture	0.06	0.28	0.25	0.29	0.42	0.50
Agriculture	0.27	0.57	0.62	0.43	0.66	0.63
Mining	0.03	0.17	0.14	0.19	0.09	0.15
Secondary/Manufacturing	0.44	0.43	0.58	0.61	0.43	0.55
Manufacturing	0.55	0.38	0.48	0.63	0.40	0.44
Utilities	0.23	0.49	0.46	0.39	0.54	0.51
Construction	0.28	0.61	0.90	0.56	0.55	0.86
Tertiary/Services	0.49	0.39	0.39	0.64	0.51	0.53
Trade services	1.26	0.57	0.58	0.84	0.52	0.55
Transport services	0.46	0.46	0.54	0.57	0.53	0.63
Business services	0.07	0.12	0.09	0.51	0.38	0.34
Government services	0.76	0.68	0.68	0.81	0.56	0.57
Personal services	0.43	0.41	0.40	0.25	0.43	0.45
GDP per capita	0.46	0.68	0.65 (b)	0.71	0.91	0.85 (b)

SOURCES: GGDC 10 Sector Database, EU KLEMS and Penn World Table version 9.0.

a Includes Denmark, France, Netherlands, Italy, United Kingdom and Sweden.
b PWT 9.0 ends in 2014.

CHANGE IN VARIABLE VS. CHANGE IN GDP PER CAPITA

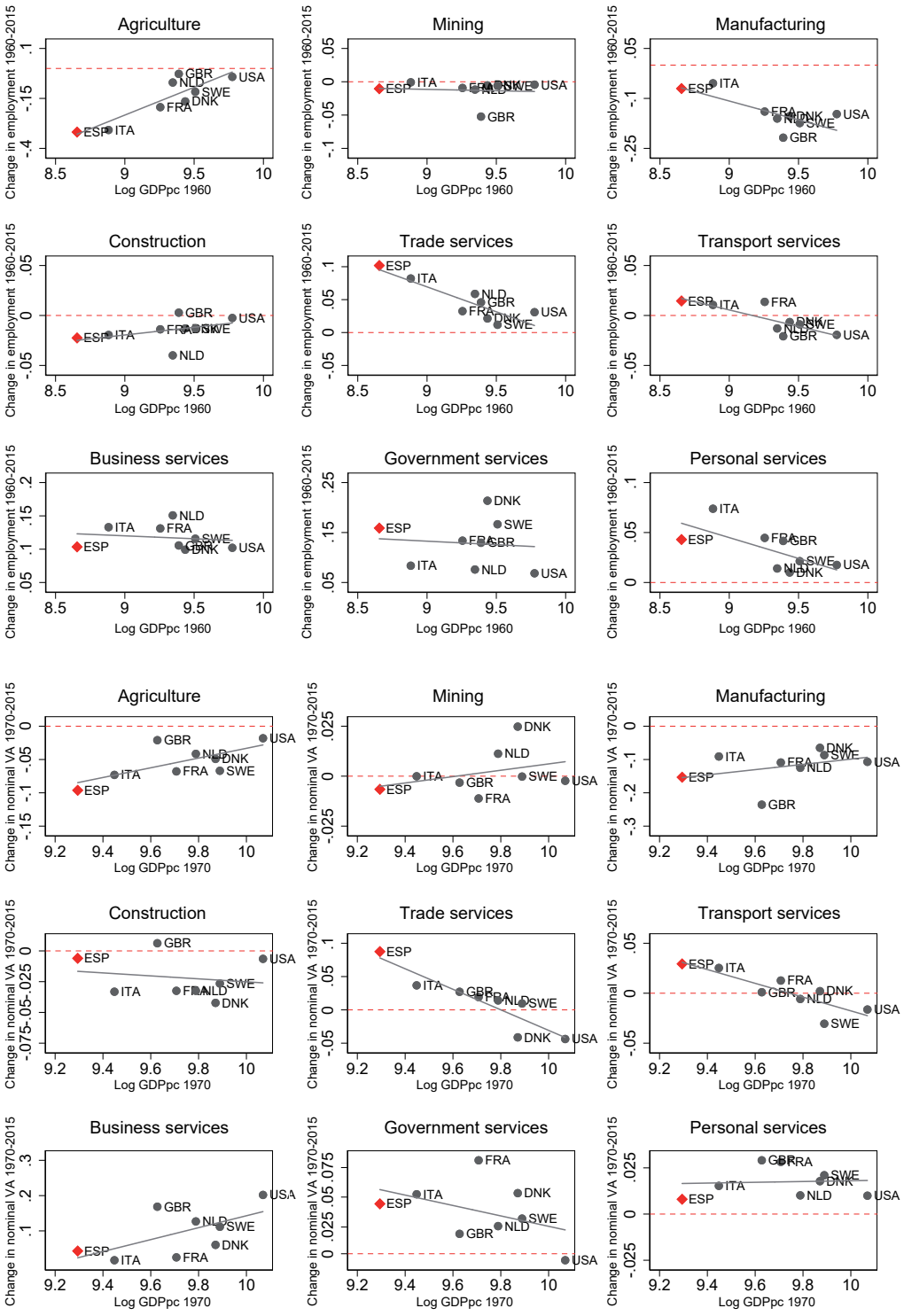
CHART A.1



SOURCES: GGDC 10 Sector Database, EU KLEMS and Penn World Table version 9.0.

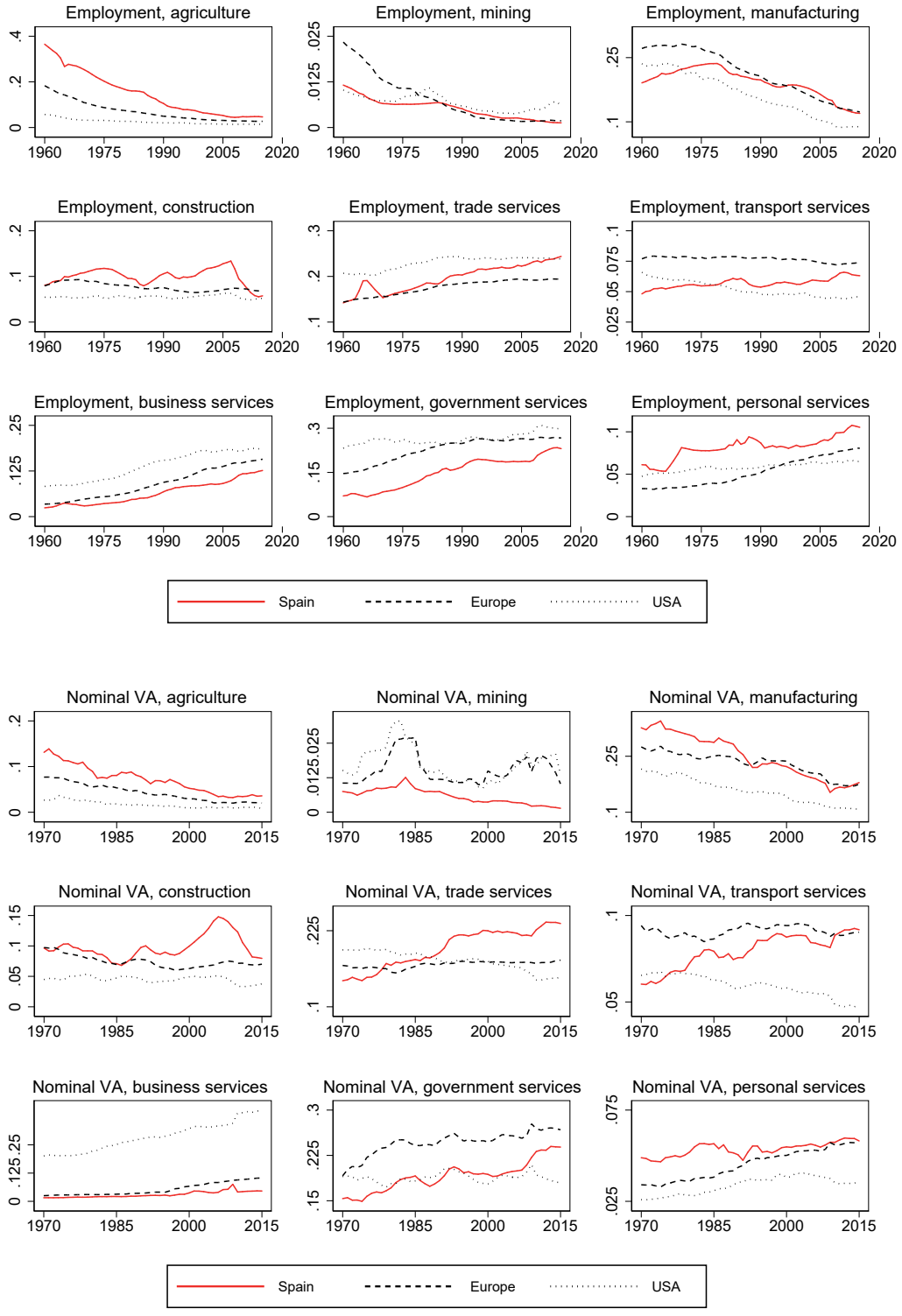
CHANGE IN VARIABLE VS. GDP PER CAPITA 1960/1970, SUBSECTORS

CHART A.2



SOURCES: GGDC 10 Sector Database, EU KLEMS and Penn World Table version 9.0.

STRUCTURAL CHANGE IN EMPLOYMENT AND VALUE ADDED, SUBSECTORS CHART A.3



SOURCES: GGDC 10 Sector Database, EU KLEMS and Penn World Table version 9.0.

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