ICEI

03

Baumol's diseases: a subsystem perspective

Adrián Rial Quiroga

WP03/21

WorkingPapers

Abstract

In his paper "Baumol's diseases: a macroeconomic perspective", Nordhaus (2008) applies a new testing framework in order to estimate the six hypotheses that lie at the core of Baumol's (1967) model, following an industry perspective. In this work, I extend Nordhaus' testing framework to estimate Baumol's diseases in the US economy over the period 1999-2018 according to a subsystem perspective, by making use of the US Bureau of Economic Analysis input-output tables. In order to check whether Baumol's diseases depend on the perspective that is followed, I apply both the usual industry perspective and the novel subsystem framework and compare the results. For both subsystems and industries, I do not find robust evidence in favour of the persistent demand hypothesis and the hypothesis of declining nominal value added shares in the progressive sector, while my results do support the cost and price disease hypothesis, the hypothesis of declining employment shares in the progressive sector and the hypothesis of uniform wage growth. As a result, Baumol's growth disease does not substantially lower aggregate labour productivity growth over the period across both subsystems and industries. This happens mainly because progressive services increase their real output at a faster rate than the economy's average, restraining the reallocation of nominal value added towards stagnant subsystems or industries and thereby providing a strong palliative against Baumol's growth disease.

JEL Classification: L16, L80, O47
Keywords: Baumol's diseases; subsystems; input-output analysis; labour productivity growth; US economy

Instituto Complutense de Estudios Internacionales, Universidad Complutense de Madrid. Campus de Somosaguas, Finca Mas Ferré. 28223, Pozuelo de Alarcón, Madrid, Spain.

Adrián Rial Quiroga*: Complutense Institute for International Studies (ICEI) (*arial@ucm.es)*

** The author wishes to acknowledge the financial support from a PhD research fellowship funded by the Complutense University of Madrid and Banco Santander (CT45/15-CT46/15).*

ICEI Instituto Complutense de Estudios Internacionales

1. Introduction

The relative expansion of the service sector in employment and nominal value added (tertiarisation) with income per capita is one of the most salient aspects of structural change and economic development (Fisher, 1939; Jorgenson and Timmer, 2011; Kuznets, 1957, 1966).

Given the significance of this process, a growing number of literature has tried to understand the factors that drive this reallocation of employment and nominal value added. Within this literature, it is possible to distinguish between two strands, depending on whether they underscore demand or supply mechanisms. On the one hand, some authors claim that tertiarisation arises due to the existence of non-homothetic preferences, that is, heterogeneous income elasticities of demand across sectors (Clark, 1957; Comin *et al.*, 2015; Foellmi and Zweimller, 2008; Kongsamut *et al.,* 2001; Pasinetti, 1981). Since it is argued that services exhibit higher income elasticities of demand, the growth of real income shifts final consumption towards services and fosters structural change. On the other hand, some scholars link structural transformation to cross-sector differences in technological conditions, such as productivity growth (Baumol, 1967; Ngai and Pissarides, 2007), factor intensity (Acemoglu and Guerrieri, 2006) or the elasticity of substitution between factors (Alvarez-Cuadrado et al., 2017, 2018). According to this view, tertiarisation takes place due to the fact that services present slower productivity growth, lower capital intensity or higher substitutability. Within this second strand of literature, Baumol's (1967) model is highly regarded as one of the most relevant contributions to the understanding of the drivers of the service sector expansion.

Baumol's model considers one factor of production, labour, and divides the economy into two sectors that produce for final consumption. It is assumed that the first sector has stagnant productivity and resembles the service sector, while the second sector presents increasing productivity and is more akin to manufacturing. If wages rise at a similar pace in both sectors, the productivity gains of manufacturing are passed on to consumers, leading to above-average increases in unit costs and prices in the service sector in a phenomenon known as Baumol's cost and price disease. As a result, "[t]he growth of [...] productivity in manufacturing becomes a sort of fund in which [...] both manufacturing and the services share equally" (Baumol and Wolff, 1984). The macroeconomic relevance of Baumol's model arises from the fact that, despite their "exploding costs", it is assumed that services have "persistent demand" (ten Raa and Schettkat, 2001), which means that real output grows at about the same pace in both sectors. Consequently, if the service sector exhibits below-average productivity growth, above-average increases in its unit costs and prices and persistent demand, this sector will take ever-increasing shares in employment and nominal output. Then, according to Baumol's model, the expansion of the service sector arises when there is unbalanced productivity growth between sectors and wages and demand in services grow at about the same pace as in manufacturing. Nevertheless, Baumol's model is not limited to acknowledge the factors that drive the expansion of the service sector, as it also points out the negative impact that this process brings to economic growth. Since aggregate labour productivity growth is just a weighted average of the sectoral productivity growth rates (where the weights are the nominal value added shares), the gradual reallocation of nominal value added towards the service sector that comes with tertiarisation increasingly undermines aggregate productivity growth, which asymptotically tends to mirror productivity growth in the service sector. This negative impact of the service sector expansion on productivity growth has been known in the literature as Baumol's growth disease (BGD) (Nordhaus, 2008).

In an attempt to test the model empirically, Nordhaus (2008) proposes the application of a panel data analysis to the hypotheses that lie at the core of Baumol's model. According to Nordhaus (see also Hartwig, 2011), it is possible to distinguish the following six hypotheses, which he also labels as syndromes or variants of Baumol's diseases:

1) The cost and price disease hypothesis. Costs and prices in stagnant industries rise relative to the average.

2) The persistent demand hypothesis. Real output grows at about the same rate in both sectors.

3) The hypothesis of declining employment shares in the progressive sector. If there is unbalanced productivity growth and persistent demand across sectors, then labour reallocates towards the stagnant sector.

4) The hypothesis of declining nominal value added shares in the progressive sector. If real output grows at about the same rate

in both sectors and the relative productivity gains of the progressive sector dissipate into the consumers' rent [by means of declining relative prices] instead of raising the nominal value added earned by the [sector]" (Peneder and Streicher, 2018), then the stagnant sector gains weight in terms of nominal value added.

5) The hypothesis of uniform wage growth. Wages grow at about the same pace in both sectors.

6) The growth disease hypothesis. If hypothesis (4) is fulfilled, then the reallocation of nominal value added towards the stagnant sector will undermine aggregate productivity growth.

Nordhaus tests the six hypotheses for the US economy using industry data from the Bureau of Economic Analysis (BEA) and finds supporting evidence for all of them except for the persistent demand hypothesis. More recently, Hartwig has applied Nordhaus' testing framework to other economies such as Switzerland (Hartwig, 2010), the EU economies (Hartwig, 2011) and Japan (Hartwig, 2019). While he finds that the EU economies and the US are similarly affected by Baumol's diseases, Japan and Switzerland exhibit a weaker price disease. As a result, evidence in favour of declining nominal value added shares in the progressive sector seems to be stronger for the US and the UE economies than for Japan and Switzerland. Still, in all these economies real output seems to grow faster in progressive industries than in stagnant ones, providing robust evidence against hypothesis (2).

Since both Nordhaus and Hartwig take the industry as the unit of analysis, in this paper I aim to extend Nordhaus' testing framework to estimate Baumol's diseases in the US economy over the period 1999-2018, following a subsystem perspective. In order to check whether Baumol's diseases depend on the perspective that is followed, I apply both the usual industry perspective and the novel subsystem framework and compare the results.

Adopting a subsystem perspective allows us to transform the circular nature of the production process, as represented in the input-output tables, to an ideal classification made by autonomous units (subsystems) that include all the inputs needed to directly or indirectly satisfy its final demand (Antonioli et al., 2020; Ciriaci and Palma, 2016; Montresor and Vittucci Marzetti, 2011; Pasinetti, 1981; Sarra et al., 2019). As compared to an industry framework, adopting the subsystem as the unit of analysis has several advantages to test Baumol's diseases:

1) Given that Baumol assumes that each sector produces only for final consumption, the model is implicitly taking the subsystem as the unit of analysis. Consequently, it seems more appropriate to follow a subsystem perspective if one wants to test Baumol's diseases.

2) The literature on the drivers of structural change has pointed out to the role of the changing input-output structure as a determinant of the tertiarisation process (Berlingieri, 2014; Pasinetti, 1981; Sposi, 2016). Within this framework, some studies stress the increasing reliance of the manufacturing sector on intermediate services (Lind, 2014) and claim that tertiarisation is linked to some extent to the outsourcing of services that were previously performed in-house in manufacturing firms to specialised suppliers (Berlingieri, 2014; Ciriaci and Palma, 2016; Greenhalgh and Gregory, 2001; Montresor and Vittucci Marzetti, 2011; Russo and Schettkat, 2001; Petit, 1986). As such, the relative expansion of services would be partly a "statistical illusion" or "statistical artefact" (Palma, 2005; Rowthorn and Coutts, 2004; Tregenna, 2015), caused by this re-classification of activities spurred by outsourcing. As a result, adopting an industry perspective can be misleading and might actually overestimate the extent of the tertiarisation process. In order to overcome this bias, a subsystem framework should be used.

3) One of the most prominent critiques to Baumol's model was formulated by Oulton (2001). According to Oulton, Baumol's growth disease only holds when services produce final products. If these service industries supply intermediate inputs to the manufacturing sector and present below-average but positive productivity growth, manufacturing benefits from these productivity gains and tertiarisation boosts aggregate productivity growth[1]. While an industry perspective faces severe problems to address the role of these spillovers, a subsystem framework takes into account how the productivity gains originated in one industry are not limited to that industry, but rather induce further productivity gains in the rest of the subsystem (De Juan and Febrero, 2000). As such, adopting a subsystem perspective makes Baumol's growth disease inmune to Oulton's critique.

The remainder of this paper is organised as follows. Section 2 addresses the methodo-

1 In the same vein, there has been a growing number of empirical studies that stress the role of knowledge intensive business services to generate positive spillovers, even for the manufacturing sector (Ciarli et al., 2012; Ciriaci et al., 2015; Guerrieri and Meliciani, 2005; Kox and Rubalcaba, 2007).

logical considerations regarding the Nordhaus testing strategy used to test Baumol's diseases and the procedure to classify the production process according to subsystems. Section 3 discusses the results regarding each of the six hypotheses. Given that testing hypothesis (6) requires a different method, this section first discusses results on hypotheses (1) to (5) and subsequently deals with Baumol's growth disease. Lastly, section 4 summarises the main conclusions drawn from this study.

2. Method

Assuming a Cobb-Douglas economy and an almost ideal demand system, Nordhaus shows that hypotheses (1) to (5) can be econometrically tested as reduced-form equations with the following specification:

$$x_{it} = \beta_{0i} + \beta_1 q_{it} + z_t + \varepsilon_{it} \quad (1)$$

Where q is labour productivity growth, x is the growth of the variable that defines the hypothesis that is being tested, z denotes time dummies, ε is the error term, subscript i refers to industry or subsystem i and subscript t denotes the time period.

Since hypotheses (1) to (5) established a predicted correlation between productivity growth and the growth of another variable, the coefficient of interest to test each of the six hypotheses is β_1. Accordingly, these are the coefficients signs that must be found in order to get evidence in favour of each hypothesis:

1) The cost and price disease hypothesis: β_1 must be significantly lower than zero. This implies that there is a negative correlation between productivity growth and price growth (p) across industries or subsystems.

2) The persistent demand hypothesis: β_1 cannot be significantly different from zero. This means that productivity growth is not correlated with real output growth (rva) across industries subsystems.

3) The hypothesis of declining employment shares in the progressive sector: β_1 must be significantly lower than zero, which implies that there is a negative correlation between productivity growth and employment growth (l) across industries or subsystems.

4) The hypothesis of declining nominal value added shares in the progressive sector: β_1 must be significantly lower than zero, so that there is a negative correlation between productivity growth and nominal value added growth (nva) across industries or subsystems.

5) The hypothesis of uniform wage growth: β_1 cannot be significantly different from zero. This implies that productivity growth is not correlated with wage growth (w) across industries or subsystems.

Equation (1) is estimated controlling both fixed and time effects for the period 1999-2018. Following Nordhaus and Hartwig, in order to check for the robustness of the results, I also estimate this equation cross-sectionally for the period average 1999-2018.

Regarding hypothesis (6), Nordhaus proposes a different methodology to test Baumol's growth disease. As he shows, aggregate labour productivity growth can be approximated as a weighted average of the industry or subsystem productivity growth rates, where the weights are the nominal value added shares[2]:

$$q_t = \Sigma w_{it-1} q_{it} \quad (2)$$

Where w denotes nominal value added share.

According to equation (2), if progressive industries or subsystems gradually lose weight in terms of nominal value added, as Baumol's model predicts, aggregate productivity growth will follow a declining trend. In order to capture this, we need to keep the weights in equation (2) fixed with respect to the base period:

$$q_t = \Sigma w_{it-1} q_{it} = \Sigma w_{i0} q_{it} + \Sigma (w_{it-1} - w_{i0}) q_{it} \quad (3)$$

As a result, aggregate labour productivity growth is broken down into two terms or effects. The first term on the right-hand side captures the so-called within effect and measures how much productivity would grow if there was not any structural change in terms of nominal value added. The second term estimates the impact that the cumulative reallocation of nominal value added (that has taken place since the base period) exerts on aggregate productivity growth when there is unbalanced productivity growth across industries or subsystems. Consequently, this second term corresponds to BGD.

However, Nordhaus proposes an additional refinement on the estimation of BGD. Given that BGD in equation (3) is affected by the instability of the cross-industries or subsystem

2 Nordhaus abstracts from the contribution to aggregate labour productivity growth stemming from the reallocation of labour across subsystems with heterogeneous nominal productivity levels. In a previous paper (Nordhaus, 2001), he argues that a welfare measure of aggregate productivity growth should not consider this effect.

differences in productivity growth, he recommends to use the average productivity growth rates for each industry or subsystem during the period under study and update their respective nominal value added shares:

$$\sum c_{it}^{BGD} = \sum(w_{it-1} - w_{i0})\overline{q_{it}} \quad (4)$$

Where Σc_{it}^{BGD} corresponds to the aggregate BGD effect and the symbol $^{-}$ stands for the average value of the variable over the whole period. If, consistently with Baumol's prediction nominal value added gradually reallocates towards stagnant industries or subsystems, then we will expect to see how this effect exhibits a negative magnitude and follows a declining trend.

When applying this formula to the US economy, Nordhaus finds that BGD lowered aggregate productivity growth by about 0.5 percentages points over the second half of the twentieth century. Besides Nordhaus, equation (4) has also been applied by other authors to test for BGD in different economies. Hartwig (2011) finds that annual aggregate productivity growth slowed down in 0.5 percentages points in the UE economies due to BGD over the period 1970-2005. Contrary to the previous studies, Hartwig (2010), Nishi (2019) and Oh and Kim (2015) do not find evidence in favour of BGD in Switzerland, Japan and Korea, respectively. Lastly, similarly to Nordhaus, Duernecker et al. (2017) finds that BGD lowered aggregate productivity growth by 0.6 percentage points in the US economy over the period 1948-2010.

As equation (4) shows, the aggregate BGD effect can be broken down into industry or subsystem contributions. This will allow us to assess which industries or subsystems behave consistently with Baumol's prediction by exerting a negative and declining contribution. However, given that equation (4) does not normalise industry or subsystem productivity growth with respect to aggregate productivity growth $(\overline{q_t})$, industry or subsystem contributions to BGD do not yield plausible economic results. In order to correct this flaw, deviations from means are taken:

$$\sum c_{it}^{BGD} = \sum(w_{it-1} - w_{i0})(\overline{q_{it}} - \overline{q_t}) \quad (5)$$

According to equation (5), a progressive (stagnant) industry or subsystem will only exert a negative contribution to BGD if it loses (gains) weight in terms of nominal value added.

In order to analyse these industry or subsystem contributions, industries or subsystems are classified in different groups according to the nature of the final product and their progressive/stagnant status[3]. Consequently, I distinguish the following industries or subsystem groups: manufacturing, progressive manufacturing, stagnant manufacturing, services, progressive services, stagnant services and other industries or subsystems. By disaggregating both services and manufacturing, I take into account that the dichotomy between services and manufacturing on which both Baumol's model is based has been questioned in the empirical literature. After Baumol et al. (1985) corrected his previous position to admit the existence of progressive services, several authors have emphasized the need to distinguish between different types of services in the analysis (Duarte and Restuccia, 2017; Duernecker et al., 2017; IMF, 2018; Inklaar and Timmer, 2014; Jorgenson and Timmer, 2011; Maroto-Sánchez and Cuadrado-Roura, 2009). Although the literature on BGD do not stress the existent heterogeneity within manufacturing, arguably due to the small and declining share of the manufacturing sector in employment and nominal value added, this internal diversity is not neglected a priori in this study. In light of this heterogeneity within both sectors, whether BGD evolves consistently with Baumol's prediction depends on which industries or subsystems are the ones that gain weight in terms of nominal value added.

In order to test Baumol's diseases across subsystems, we need to reclassify the production process according to this unit of analysis. Given that national statistics services do not directly report data on subsystems, we need to apply the following lineal operator O to remap data from industries to subsystems by making use of the national input-output tables:

$$O = (\hat{x})^{-1}(I - DB)^{-1}(\widehat{De}) \quad (6)$$

Where $\hat{x}$ is the diagonalised vector of industry gross output, D is the industry-by-commodity market share matrix, B is the commodity-by-industry domestic direct requirements matrix and e is the vector of commodity final demand. Since in this paper I use input-output tables in a commodity-industry format, the market share matrix D is applied in order to obtain the industry-by-industry total domestic requirements matrix $(I{-}DB)^{-1}$ and the diagonalised vector of industry final demand $\widehat{De}$

3 An industry or subsystem is classified as progressive (stagnant) if it exhibits a productivity growth rate higher (lower) than that of the economy.

(Miller and Blair, 2009), so that equation (6) is equivalent to the one used in the subsystems literature (Antonioli et al., 2020; Ciriaci and Palma, 2016; Montresor and Vittucci Marzetti, 2011; Pasinetti, 1981; Sarra et al., 2019).

After calculating O, this operator is used to derive matrix N:

$$N=\hat{v}O \quad (7)$$

Where $\hat{v}$ is the diagonalised vector of the variable that needs to be remapped from industries to subsystems.

On the one hand, each column j in matrix N shows the amount of the variable v referred to each industry i that is directly or indirectly used by subsystem j in order to produce its final output. Consequently, the sum across all the elements of column j yields the value of the variable for subsystem j. On the other hand, each row i shows the amount of the variable v referred to industry i that is directly or indirectly used by each subsystem j. As a result, the sum across all the elements of row i yields the value of the variable for industry i.

The data used in this paper is from the Bureau of Economic Analysis. The BEA provides consistent time series input-output tables for the period 1997-2018. Data on nominal output (nominal value added) and wages (compensation of employees) is taken from the input-output tables, while data on real output (real value added) and employment (persons engaged in production) is taken from the Industry Economic Accounts Data. Rather than considering employment in hours worked, I use the number of persons engaged in production because there are more available years for the latter variable. However, given that the number of persons engaged by industry is only available since 1998 according to the 2012 NAICS, this variable determines the period studied in this paper.

In order to check for the robustness of the results on hypotheses (1) to (5), I use the two levels of aggregation which are provided by the BEA input-output tables in consistent time series[4]. While the summary level of aggregation consists of 71 industries (subsystems), the sector level reports data on 15 industries (subsystems)[5]. The summary level is used to test Baumol's growth disease so as to capture at a finer level of aggregation the impact of the reallocation of nominal value added on productivity growth. Table A1 and Table A2 in the Appendix provide a detailed classification of industries (subsystems) at the two aggregation levels and defines the progressive/stagnant status of every industry/subsystem.

3. Results

3.1 Testing hypotheses (1) to (5)

Table 1 shows the results on the estimation of hypotheses (1) to (5). For each disease and framework (either an industry one or a subsystem one), four coefficients are reported according to the level of aggregation (summary or sector) and the type of data (panel, cross section or 5-year non-overlapping moving averages) that are used. Following Nordhaus (2008) and Hartwig (2011), I also report the weighted (where the weights are provided by the number of observations) and unweighted coefficients across all the specifications for each framework. The last rows of Table 1 show Nordhaus and Hartwig's coefficients, so that my results can be easily compared to theirs. While Nordhaus estimates Baumol's diseases in the US economy over the period 1948-2001 using BEA data (1987 SIC), Hartwig analyses the diseases in the EU economies over the period 1970-2005 using EU KLEMS data.

Regarding the cost and price disease hypothesis, I find robust evidence that both stagnant subsystems and stagnant industries exhibit above-average price increases. However, my weighted and unweighted coefficients are significantly lower than those found in Nordhaus. While Nordhaus finds that consumers mostly capture all productivity gains due to a coefficient that is about -1, my results show that both progressive subsystems and progressive industries use to some extent their relative productivity gains to increase their nominal value added. With respect to Hartwig's coefficients, even though they are similar to mine, he downplays the difference with respect to Nordhaus by attributing it to the different dataset used in both studies (the BEA in Nordhaus and EU KLEMS in Hartwig). He argues that when this disease is estimated for the US economy using EU KLEMS data the coefficients are similar to the ones found here and in Hartwig.

Consistently with the previous literature (Hartwig, 2010, 2011, 2019; Nordhaus, 2008;

4 The most detailed published level (405 industries or subsystems) is not used in this paper because the BEA only provides data for two benchmark years (2007 and 2012).

5 Given that the sector level of aggregation would only provide 15 observations if a cross-section analysis were to be used, I apply 5-year non-overlapping moving averages instead of performing a cross-section regression when checking the robustness of the results for this aggregation level.

Oh and Kim, 2015), my results on the persistent demand hypothesis provide robust evidence against it. Most of the coefficients are positive and significant at the 1% level. Consequently, the faster real output growth in both progressive subsystems and progressive industries works as a palliative against Baumol's diseases, restraining the reallocation of employment and nominal value added towards stagnant subsystems or industries. However, since I find that coefficients are higher for industries than for subsystems, this unbalanced real output growth alleviates Baumol's diseases more for the former than for the latter. Compared to my estimates, Nordhaus and Hartwig's findings seem to lie within the interval defined by my subsystem and industry coefficients.

Regarding the hypothesis of declining employment shares in the progressive sector, a significantly negative coefficient is found in every estimation. Given that unbalanced real output growth worked more as a palliative against Baumol's diseases for industries than for subsystems, the latter also experiences a more negative reallocation of labour towards stagnant subsystems. As a result, subsystems exhibit more negative coefficients on hypothesis (3). Likewise, Nordhaus and Hartwig's coefficients mostly lie again within the interval defined by my subsystem and industry estimates.

With respect to hypothesis (4), I do not obtain robust evidence in favour of a reallocation of nominal value added towards stagnant subsystems or stagnant industries. While subsystems and industries do exhibit a significantly negative coefficient when using the sector level of aggregation, estimates at the summary level are insignificant in most of the specifications. In order to understand this finding, it is important to note that the coefficient on hypothesis (4) theoretically equals the sum of the coefficient on hypothesis (1) and the coefficient on hypothesis (2). In other words, the coefficient on hypothesis (4) depends on both the extent to which the relative productivity gains of progressive subsystems (industries) are passed on to consumers (coefficient on hypothesis (1)) and the extent to which real production growth in progressive subsystems (industries) exceeds real production growth in stagnant subsystems (industries) (coefficient on hypothesis (2))[6]. Since the relative productive gains of the progressive subsystems (industries) are not completely passed on to consumers and real output grows at a slower rate in stagnant subsystems (industries), nominal output does not significantly reallocate towards stagnant subsystems (industries). My results on hypothesis (4) are similar to those in Nordhaus or Hartwig. However, they downplay this finding by claiming that their test of Baumol's growth disease provides indirect evidence in favour of a reallocation of nominal value added towards stagnant industries.

The estimation of hypothesis (5) seems to confirm that higher productivity growth does not lead to higher wages. Even though I find a significantly positive (but small) coefficient for subsystems at the summary level of aggregation, this result is not robust to the estimation of the hypothesis using 5-year non-overlapping moving averages at the sector level. In conjunction with evidence on hypothesis (1), it seems that relative productivity gains dissipate into the consumer's rent rather than raising wages in progressive subsystems (industries). These results are consistent with Nordhaus and Hartwig findings, who also acknowledge that productivity growth does not seem to lead to higher wage growth in progressive industries.

All in all, the evidence reported on hypotheses (1) to (5) stresses that results do not differ much between a subsystem perspective and an industry one. For both subsystems and industries, my findings reject the persistent demand hypothesis and the hypothesis of declining nominal value added shares in the progressive sector, while they confirm the cost and price disease hypothesis, the hypothesis of declining employment shares in the progressive sector and the hypothesis of uniform wage growth. However, given that the coefficients on hypothesis (2) are significantly higher for industries than for subsystems, I find that real output grows faster in progressive industries than in progressive subsystems, acting as a stronger palliative against Baumol's diseases. As a result, stagnant subsystems gain more weight in terms of employment than stagnant industries.

[Insert Table 1 here]

3.2 Testing Baumol's growth disease

Figure 1 shows the results on the actual subsystem contributions to Baumol's growth disease at the summary level. I find that the aggregate contribution to BGD across subsystems does follow a significant declining trend, suggesting that there is a reallocation of nominal value added towards stagnant subsystems. However, despite this negative trend, BGD has only lowered aggregate labour productivity

6 Alternatively, the coefficient on hypothesis (4) also equals the coefficient on hypothesis (3) plus the sum of one and the coefficient on hypothesis (1).

growth by about 0.11 points over 1999-2018. According to this result, it would take 100 years for BGD to slow down productivity growth in 0.5 points with this structural change. This small magnitude of the BGD effect seems to explain why we did not find robust evidence in favour of a significant reallocation of nominal value added towards stagnant subsystems in Table 1.

Looking at the contributions of the different subsystem groups in Figure 1, it seems that the only subsystem group that behaves consistently with Baumol's model, exerting a substantial and declining contribution, is (progressive) manufacturing. If the remaining subsystem groups do not satisfy Baumol's prediction, this must be mostly explained by the fact that progressive (stagnant) subsystem groups do not gradually and considerably lose (gain) weight in terms of nominal value added. In line with the econometric results reported in Table 1, this fact must be linked to the evidence found on hypothesis (1) and (2), which ultimately explains why hypothesis (4) was rejected and why BGD exhibits a small magnitude.

Two simple counterfactual exercises allows us to assess what is the link between each subsystem group and the results found for hypothesis (1) and (2), that is, the factors that explain why nominal value added does not reallocate towards stagnant subsystems and why aggregate labour productivity growth is not increasingly undermined by BGD. The results on these two counterfactual exercises are depicted in Figure 2 and Figure 3.

Figure 2 shows the counterfactual subsystem contributions to Baumol's growth disease if relative productivity gains were fully passed on to consumers. To calculate these counterfactual contributions, instead of using the actual nominal value added shares in equation (5), I use the actual employment shares as counterfactual nominal value added shares. Therefore, I assume in this scenario that the counterfactual cumulative reallocation of nominal value added mirrors the actual cumulative reallocation of employment, which would only happen if relative productivity gains were fully passed on to consumers. By comparing the results shown in Figure 2 with the ones depicted in Figure 1, it is possible to obtain indirect evidence about the subsystem groups that mostly explain the fact that the relative productivity gains did not fully dissipate into the consumer's rent and its impact on BGD. According to the evidence reported in Figure 2, if relative productivity gains were fully passed on to consumers, BGD would lower aggregate labour productivity growth in 0.16 points over the period, that is, 0.05 additional points compared to the actual BGD. Looking at the subsystem contributions, both progressive services and stagnant services seem to explain the more negative impact of BGD on this counterfactual scenario, contributing in -0.02 percentage points and -0.03 points with respect to the actual BGD, respectively. This suggests that progressive services are not sharing to some extent their productivity gains with stagnant services. However, given the small magnitude of this additional negative impact, the incomplete pass on to consumers of the relative productivity gains does not seem to explain why BGD has not substantially undermined aggregate labour productivity growth over 1999-2018.

Figure 3 shows the counterfactual subsystem contributions to Baumol's growth disease if hypothesis (2) was fulfilled, that is, if real output grew at about the same pace in progressive subsystems and stagnant subsystems. To estimate these counterfactual contributions, instead of using the actual nominal value added shares in equation (5), I use counterfactual nominal value added shares that are calculated from the assumption that real output grow at the same rate in every subsystem. By subtracting for each subsystem its real output growth differential (that is, with respect to the economy's average) from its actual nominal value added growth, I calculate counterfactual nominal growth rates for every subsystem. These counterfactual rates allows me to estimate counterfactual nominal value added shares that fulfill hypothesis (2). By comparing the results shown in Figure 3 with the ones depicted in Figure 1, it is possible to obtain indirect evidence about the subsystem groups that mostly explain the rejection of hypothesis (2) and its impact on BGD. According to Figure 3, if real output grew at the same rate in every subsystem, BGD would lower aggregate labour productivity growth in 0.24 percentage points over the period, that is, 0.13 additional points compared to the actual BGD. Consequently, contrary to the incomplete pass on to consumers of the relative productivity gains, unbalanced real output growth seems to significantly restrain the actual BGD. Looking at the subsystem contributions, since progressive services account for most of the additional negative impact on this counterfactual scenario (contributing in -0.07 points with respect to the actual BGD), the above-average real output growth of these services provides the strongest palliative for the actual BGD.

After having estimated BGD across subsystems, in Figure 4 to 6 I repeat this analysis following an industry perspective.

As Figure 4 shows, I do not find evidence of a substantial negative impact of BGD across industries and, contrary to when analysed at a subsystem perspective, BGD does not even follow a significant declining trend. Again, the only group that behaves consistently with Baumol's prediction is (progressive) manufacturing.

Figure 5 sheds light on the role of the incomplete pass on to consumers of the relative productivity gains in explaining BGD's impact across industries. According to my results, if relative productivity gains fully dissipated into the consumer's rent, then BGD would lower aggregate labour productivity growth in 0.19 percentage points over the period, that is, 0.21 additional points with respect to the actual BGD. As a result, this mechanisms seems more relevant to restrain BGD for industries than for subsystems and is even able to explain why BGD does not follow a declining trend when the industry is taken as the unit of analysis. Looking at the industry contributions, both progressive services and stagnant services mostly explain the more negative impact of BGD on this counterfactual scenario, contributing in -0.09 points and -0.08 points with respect to the actual BGD, respectively. As for subsystems, progressive services do not seem to be fully sharing their productivity gains with stagnant services, although this happens to a larger extent than for subsystems.

Figure 6 depicts the results on the counterfactual industry contributions to BGD if hypothesis (2) was fulfilled. On this counterfactual scenario, the cumulative reallocation of nominal value added would lower aggregate labour productivity growth in 0.54 percentage points over the period, that is, 0.56 additional points with respect to the actual BGD. As for subsystems, unbalanced real output growth seems more relevant to restrain BGD than the incomplete pass on to consumers of the relative productivity gains, although unbalanced real output growth does provide a stronger palliative for industries than for subsystems. This evidence is consistent with the results reported in Table 1 on hypothesis (2). Looking at the industry contributions, the more negative impact of BGD on the counterfactual scenario is linked to a large extent to progressive services, which contribute in -0.24 points with respect to the actual BGD.

All in all, my results on hypothesis (6) stress that BGD does not substantially lower aggregate labour productivity growth mainly because unbalanced real output growth provides a strong palliative for this disease across both subsystems or industries[7]. To a large extent, this is explained by the above-average real output growth of progressive subsystems (industries), which restrains the reallocation of nominal value added towards stagnant subsystems (industries).

[Insert Figure 1 here]
[Insert Figure 2 here]
[Insert Figure 3 here]
[Insert Figure 4 here]
[Insert Figure 5 here]
[Insert Figure 6 here]

4. Concluding remarks

This paper has extended Nordhaus' testing framework to estimate Baumol's diseases in the US economy over the period 1999-2018 according to a subsystem perspective, by making use of the US BEA input-output tables. In order to check whether Baumol's diseases depend on the perspective that is followed, I apply both the usual industry perspective and the novel subsystem framework and compare the results.

As compared to an industry framework, adopting the subsystem as the unit of analysis has several advantages to test Baumol's diseases: 1) it better corresponds to the unit of analysis implicitly taken in Baumol's model, 2) it avoids the bias that might arise in studies on tertiarisation due to the outsourcing process when an industry perspective is followed and 3) it makes Baumol's growth disease immune to Oulton's critique.

My results show that Baumol's diseses do not differ much between a subsystem perspective and an industry one. Regarding hypothesis (1) to (5), for both subsystems and industries, my findings reject the persistent demand hypothesis and the hypothesis of declining nominal value added shares in the progressive sector, while they confirm the cost and price disease hypothesis, the hypothesis of declining employment shares in the progressive sector and the hypothesis of uniform wage growth. However, given that the coefficients on hypothesis (2) are significantly higher for industries than for subsystems, I find that real output grows faster in progressive industries than in progressive subsystems, acting as a stronger palliative against Baumol's diseases. As a result, stagnant subsystems seem to gain more weight in terms

7 Unlike Nordhaus (2008) and Hartwig (2011) (who find a substantial negative impact stemming from BGD, but do not find robust evidence in favour of hypothesis (4)), my results are consistent with the evidence reported on hypothesis (4).

of employment than stagnant industries.

With respect to Baumol's growth disease, my results stress that BGD does not substantially lower aggregate labour productivity growth across both subsystems and industries, even though I do find that BGD follows a significant declining trend when following a subsystem perspective. All in all, the small magnitude of BGD is linked to the rejection of hypothesis (2). Unbalanced real output growth restrains the reallocation of nominal value added towards stagnant subsystems or industries, thereby providing a strong palliative against Baumol's growth disease. To a large extent, this is explained by the fact that progressive services increase their real output at a faster rate than the economy's average.

In a future investigation, it would be interesting to extend this analysis to a wider sample of developed economies by making use of the WIOD input-ouput tables in order to check whether "countries are similarly affected by Baumol's diseases" (Hartwig, 2011) when adopting a subsystem perspective. Likewise, since Baumol's growth disease arises as a long-term process, I hope that in the near future time series of input-output tables become available for a longer time-span.

References

Acemoglu, D. and V. Guerrieri, "Capital Deepening and Non-Balanced Economic Growth," *Journal of Political Economy*, 116, 467-498, 2006.

Alvarez-Cuadrado, F., N.V. Long, and M. Poschke, "Capital-labor substitution, structural change, and growth," *Theoretical Economics*, 12, 1229-1266, 2017.

Alvarez-Cuadrado, F., N.V. Long, and M. Poschke, "Capital-labour substitution, structural change and the labor income share," *Journal of Economic Dynamics & Control*, 87, 206-231, 2018.

Antonioli, D., C. D. Berardino, G. Onesti, "Specialization and KIBS in the Euro area: a vertically integrated sector perspective," *International Review of Applied Economics*, 34 (2), 267-290, 2020.

Baumol, W., "Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crisis," *American Economic Review*, 57 (3), 415-426, 1967.

Baumol, W., S. Blackman, and E. Wolff, "Unbalanced Growth Revisited: Asymptotic Stagnancy and New Evidence," *American Economic Review*, 75 (4), 806-817, 1985.

Baumol, W. and E. Wolff, "On Interindustry Differences in Absolute Productivity," *Journal of Political Economy*, 92 (6), 1017-1034, 1984.

Berlingieri, G., "Outsourcing and the rise in services," London School of Economics, Centre for Economic Performance, CEP Discussion Paper No. 1199, 2014.

Ciarli, T., V. Meliciani, and M. Savona, "Knowledge Dynamics, Structural Change and the Geography of Business Services," *Journal of Economic Surveys*, 26 (3), 445-67, 2012.

Ciriaci, D., S. Montresor, and D. Palma, "Do KIBS make manufacturing more innovative? An empirical investigation of four European countries," *Technological Forecasting and Social Change*, 95, 135-151, 2015.

Ciriaci, D. and D. Palma, "Structural change and blurred sectoral boundaries: assessing the extent to which knowledge-intensive business services satisfy manufacturing final demand in Western countries," *Economic Systems Research*, 28 (1), 55-77, 2016.

Clark, C., The Conditions of Economic Progress, London: Macmillan, 1957.

Comin, D., D. Lashkari, and M. Mestieri, "Structural Change with Long-Run Income and Price Effects," NBER Working Paper No. 21595, 2015.

De Juan, O. and E. Febrero, "Measuring productivity from vertically integrated sectors," *Economic Systems Research*, 12 (1), 65-82, 2000.

Duarte, M. and D. Restuccia, "Relative Prices and Sectoral Productivity," NBER Working Paper 23979, 2017.

Duernecker, G., B. Herrendorf, and A. Valentinyi, "Structural Change within the Service Sector and the Future of Baumol Disease," Working Paper, 2017.

Fisher, A., "Production, primary, secondary and tertiary," *The Economic Record*, 15, 24-38, 1939.

Foellmi, R. and J. Zweimller, "Structural change, Engel's consumption cycles and Kaldor's facts of economic growth," *Journal of Monetary Economics*, 55, 1317-1328, 2008.

Greenhalgh, C. and M. Gregory, "Structural change and the emergence of the new service economy," *Oxford Bulletin of Economics and Statistics*, 63, 629-646, 2001.

Guerrieri, P. and V. Meliciani, "Technology and international competitiveness: The interdependence between manufacturing and producer services," *Structural Change and Economic Dynamics*, 16 (4), 489-502, 2005.

Hartwig, J., "Baumol's diseases: The case of Switzerland," *Swiss Journal of Economics and Statistics*, 146 (3), 533-552, 2010.

Hartwig, J., "Testing the Baumol-Nordhaus

Model with EU KLEMS Data," *Review of Income and Wealth*, 57 (3), 471-489, 2011.

Hartwig, J., "Testing the growth effects of structural change," *Structural Change and Economic Dynamics*, 23, 11-24, 2012.

Hartwig, J., "Further insights into 'Baumol's disease' in Japan," *Economics Bulletin*, 39 (4), 2308-2316, 2019.

IMF, "Manufacturing Jobs: Implications for Productivity and Inequality," *World Economic Outlook*, Chapter 3, April, 2018.

Inklaar, R. and M. Timmer, "The Relative Price of Services," *Review of Income and Wealth*, 60 (4), 727-746, 2014.

Jorgenson, D. and M. Timmer, "Structural Change in Advanced Nations: A New Set of Stylised Facts," *The Scandinavian Journal of Economics*, 113 (1), 1-29, 2011.

Kongsamut, P., S. Rebelo, and D. Xie, "Beyond balanced growth," *Review of Economic Studies*, 68, 869-882, 2001.

Kox, H. and L. Rubalcaba, "Analysing the contribution of business services to European economic growth," Bruges European Economic Research Papers No. 9, 2007.

Kuznets, S., "Quantitative aspects of the economic growth of nations: II. Industrial distribution of national product and labour force," *Economic Development and Cultural Change*, 5 (supplement), 3-111, 1957.

Kuznets, S., Modern Economic Growth: Rate, Structure, and Spread, *CT: Yale University Press*, New Haven, 1966.

Lind, D., Value Creation and Structural Change during the Third Industrial Revolution. *The Swedish Economy from a Vertical Perspective*, PhD Dissertation, 2014.

Maroto-Sánchez, A. and J. Cuadrado-Roura, "Is growth of services an obstacle to productivity growth? A comparative analysis," *Structural Change and Economic Dynamics*, 20, 254-265, 2009.

Miller, R. and P. Blair, Input-output analysis: foundations and extensions, *Cambridge University Press*, Cambridge, 2009.

Montresor, S. and G. Vittucci Marzetti, "The deindustrialization/tertiarisation hypothesis reconsidered: a subsystem application to the OECD7," *Cambridge Journal of Economics*, 35, 401-421, 2011.

Ngai, L. and C. Pissarides, "Structural change in a multi-sector model of growth," *American Economic Review*, 97, 429-443, 2007.

Nishi, H., "Sources of Productivity Growth Dynamics: Is Japan Suffering From Baumol's Growth Disease?," *Review of Income and Wealth*, 65 (3), 592-616, 2019.

Nordhaus, W., "Alternative Methods for Measuring Productivity Growth," NBER Working Paper 8095, 2001.

Nordhaus, W., "Baumol's Diseases: A Macroeconomic Perspective," *The B.E. Journal of Macroeconomics*, 8 (1) (Contributions), Article 9, 2008.

Oh, W. and K. Kim, "The Baumol Diseases and the Korean Economy," *Emerging Markets Finance and Trade*, 51 (sup1), S214-S223, 2015.

Oulton, N., "Must the growth rate decline? Baumol's unbalanced growth revisited," *Oxford Economic Papers*, 53 (4), 605-627, 2001.

Palma, G., "Four Sources of De-industrialization and a New Concept of 'Dutch Disease'," in Ocampo, J. (ed.), *Beyond Reforms: Structural Reforms and Macroeconomic Vulnerability, Washington*, DC: ECLAC, 71-116, 2005.

Pasinetti, L, Structural Change and Economic Growth: A Theoretical Essay of the Dynamics of the Wealth of Nations, *Cambridge University Press*, Cambridge, 1981.

Peneder, M. and G. Streicher, "De-industrialization and comparative advantage in the global value chain," *Economic Systems Research*, 30 (1), 85-104, 2018.

Petit, P., Slow Growth and The Service Economy, Frances Pinter: London, 1986.

Raa, T. and R. Schettkat, The Growth of Service Industries: The Paradox of Exploding Costs and Persistent Demand, Edward Elgar, Cheltenham, 2001.

Rowthorn, R. and K. Coutts, "De-industrialisation and the balance of payments in advanced economies," *Cambridge Journal of Economics*, 28 (5), 767-790, 2004.

Russo, G. and R. Schettkat, "Structural economic dynamics: myth or reality? Structural change and the final product concept," in Raa, T. and R. Schettkat (eds.), The Growth of Service Industries: The Paradox of Exploding Costs and Persistent Demand, Edward Elgar, Cheltenham, 2001.

Sarra, A., C.D. Berardino, and D. Quaglione, "Deindustrialization and the technological intensity of manufacturing subsystems in the European Union," *Economia Politica*, 36 (1), 205-243, 2019.

Sposi, M., "Evolving Comparative Advantage, Sectoral Linkages, and Structural Change," Federal Reserve Bank of Dallas, Globalization and Monetary Policy Institute, Manuscript, 2016.

Tregenna, F., "Deindustrialization, structural change and sustainable economic growth. Inclusive and Sustainable Industrial Development," *UNU- MERIT Working Papers*, Working Paper 02-2015, 2015.

Tables and Figures

Table 1. Estimation of hypotheses (1) to (5) across subsystems or industries (continues on the next page).

	(1) p		(2) rva		(3) l		(4) nva		(5) w	
	Coefficient	No. of obs.	Coefficient	No. of obs.	Coefficient	No. of obs.	Coefficient	No. of obs.	Coefficient	No. of obs.
71 Subsystems										
Panel	-0.387***	1420	0.358***	1420	-0.642***	1420	-0.0292	1420	0.185***	1420
	(0.0177)		(0.0364)		(0.0364)		(0.0412)		(0.0145)	
Cross section	-0.586***	71	0.484**	71	-0.516**	71	-0.102	71	0.138***	71
	(0.0635)		(0.208)		(0.208)		(0.235)		(0.0465)	
15 Subsystems										
Panel	-0.874***	300	0.153**	300	-0.847***	300	-0.722***	300	0.0894***	300
	(0.0519)		(0.0770)		(0.0770)		(0.0957)		(0.0292)	
5-year MA	-1.088***	60	0.418*	60	-0.582***	60	-0.670**	60	-0.0704	60
	(0.197)		(0.209)		(0.209)		(0.285)		(0.0597)	
Summary statistics (subsystems)										
Weighted	-0.64		0.33		-0.67		-0.17		0.16	
Unweighted	-0.73		0.35		-0.65		-0.38		0.09	
71 Industries										
Panel	-0.336***	1420	0.868***	1420	-0.132***	1420	0.531***	1420	0.0163	1420
	(0.0203)		(0.0138)		(0.0138)		(0.0242)		(0.0296)	
Cross section	-0.700***	71	0.757***	71	-0.243**	71	0.0572	71	-0.0139	71
	(0.0607)		(0.0930)		(0.0930)		(0.113)		(0.0814)	
15 Industries										
Panel	-1.191***	300	0.758***	300	-0.242***	300	-0.433***	300	-0.0376	300
	(0.0794)		(0.0375)		(0.0375)		(0.0901)		(0.0430)	
5-year MA	-1.229***	60	0.454***	60	-0.546***	60	-0.775***	60	-0.160***	60
	(0.212)		(0.119)		(0.119)		(0.245)		(0.0578)	
Summary statistics (industries)										
Weighted	-0.52		0.83		-0.17		0.31		0.00	
Unweighted	-0.87		0.71		-0.29		-0.15		-0.05	
Nordhaus (2008)										
Weighted	-0.96		0.67		-0.28		-0.28		-0.001	
Unweighted	-0.94		0.67		-0.26		-0.28		0.017	
Hartwig (2011)										
Weighted	-0.47		0.57		-0.38		0.12		0.197	
Unweighted	-0.59		0.49		-0.48		-0.11		0.122	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Fixed and time effects are used in all panel estimations

Figure 1. Subsystem contributions to BGD (summary level).

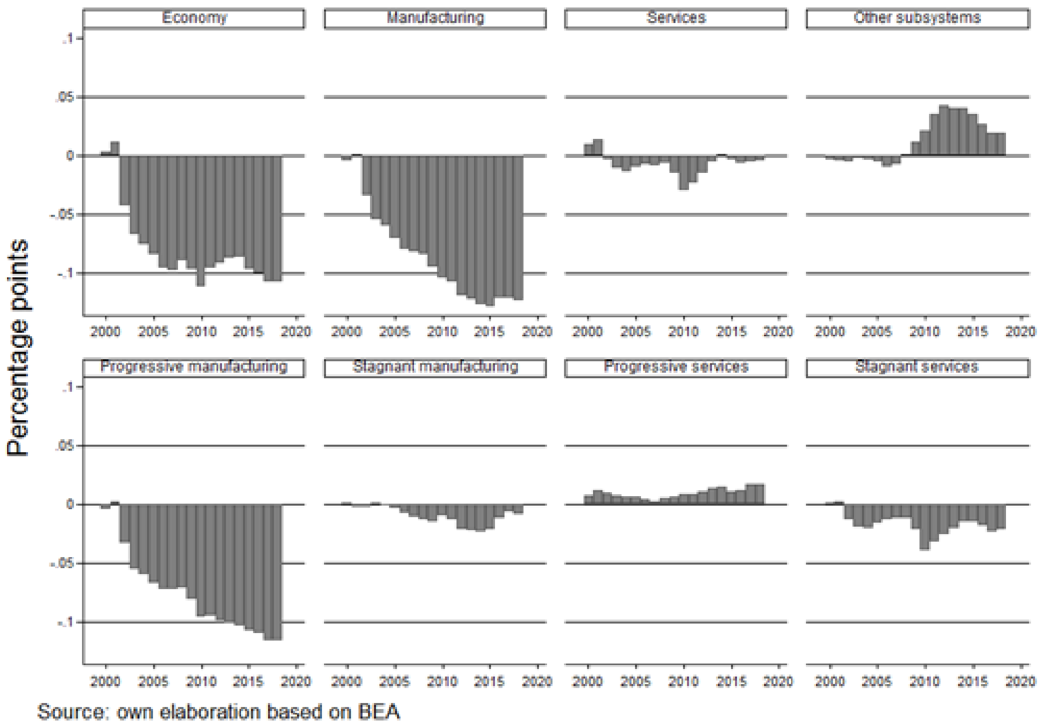


Figure 2. Counterfactual subsystem contributions to BGD if relative productivity gains were fully passed on to consumers (summary level).

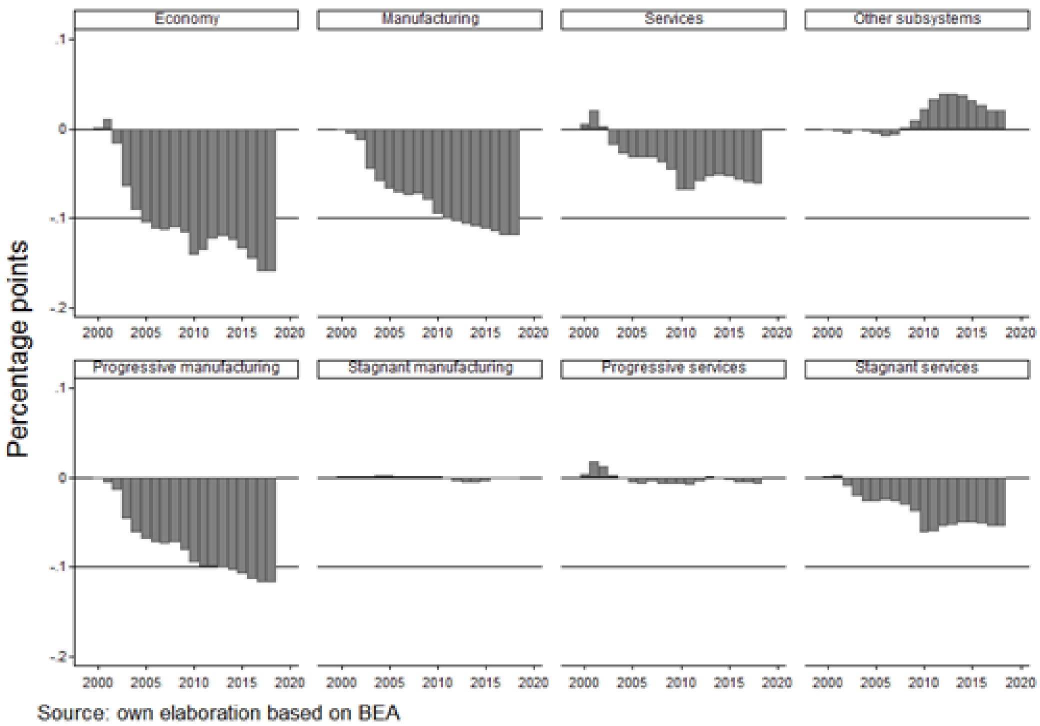


Figure 3. Counterfactual subsystem contributions to BGD if hypothesis (2) was fulfilled (summary level).

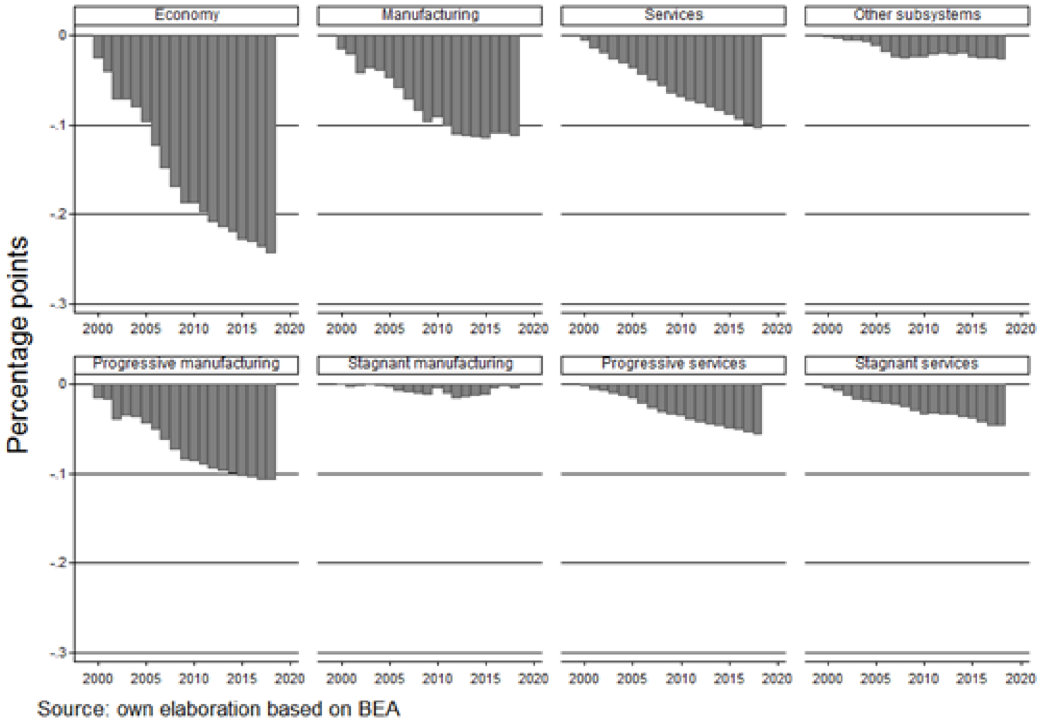


Figure 4. Industry contributions to BGD (summary level).

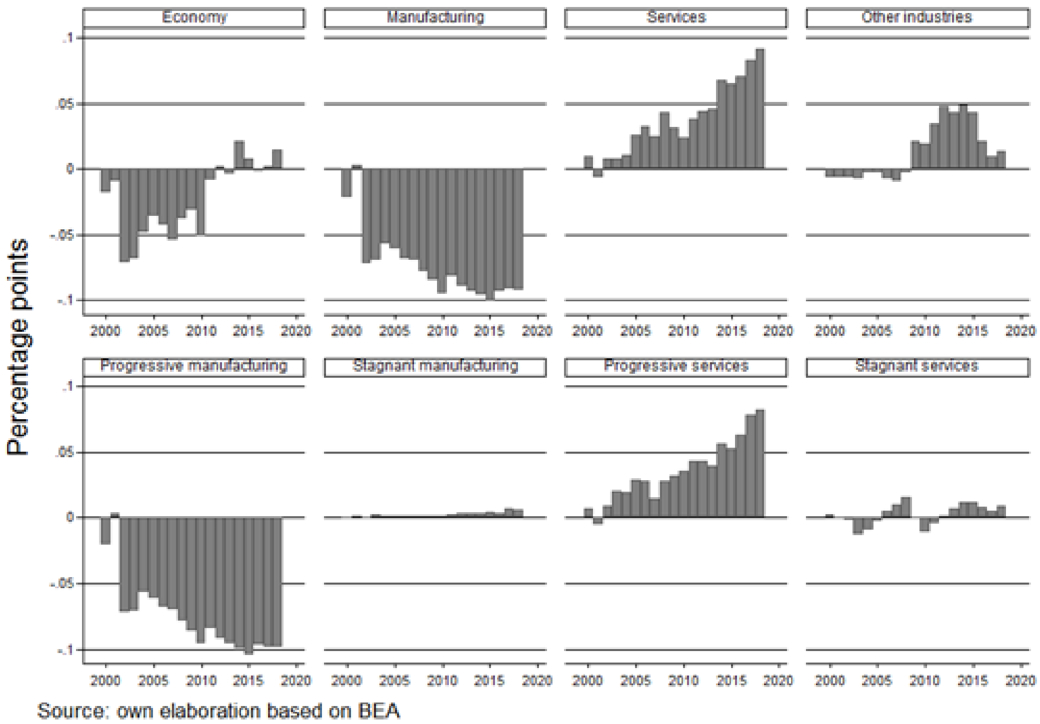


Figure 5. Counterfactual industry contributions to BGD if relative productivity gains were fully passed on to consumers (summary level).

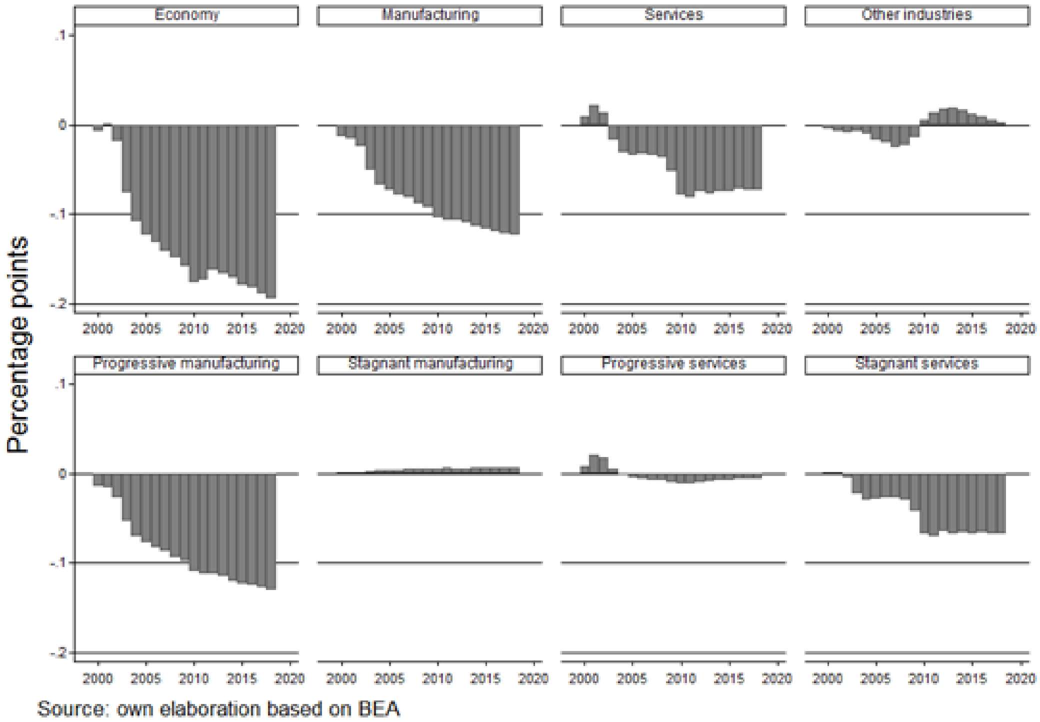
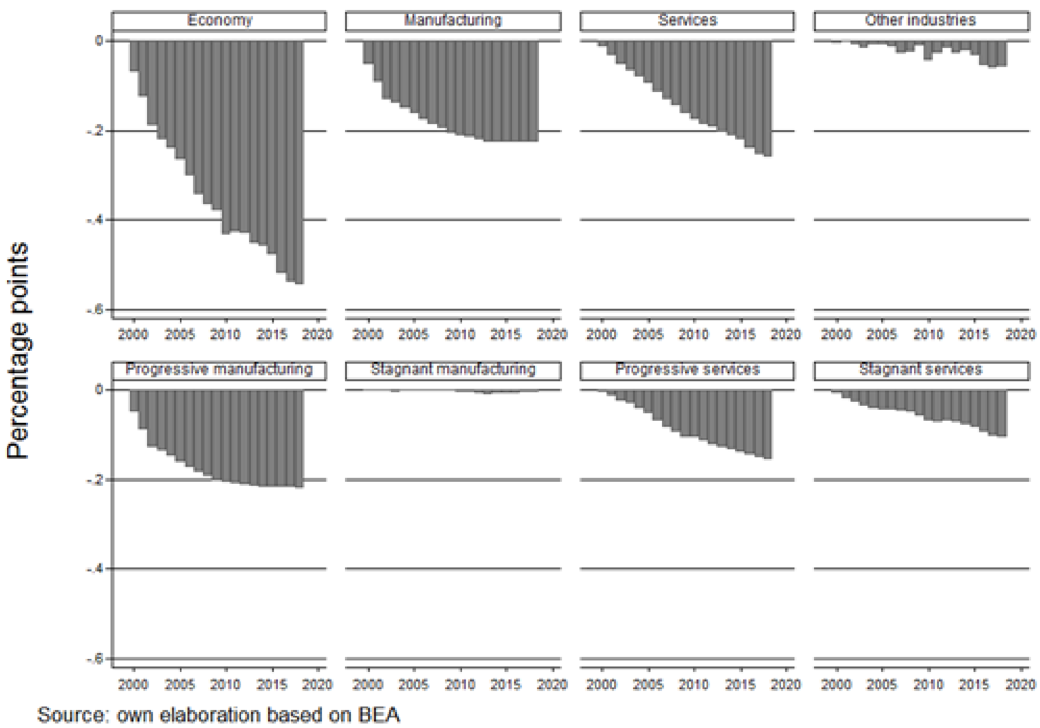


Figure 6. Counterfactual industry contributions to BGD if hypothesis (2) was fulfilled (summary level).



Appendix.

Table A1. Classification of subsystems and industries at the summary level (continues on the next page).

	As a subsystem	As an industry
Farms	Progressive	Stagnant
Forestry, fishing, and related activities	Stagnant	Stagnant
Oil and gas extraction	Stagnant	Stagnant
Mining, except oil and gas	Stagnant	Stagnant
Support activities for mining	Progressive	Stagnant
Utilities	Stagnant	Stagnant
Construction	Stagnant	Stagnant
Wood products	Progressive	Progressive
Nonmetallic mineral products	Stagnant	Stagnant
Primary metals	Progressive	Progressive
Fabricated metal products	Stagnant	Stagnant
Machinery	Progressive	Progressive
Computer and electronic products	Progressive	Progressive
Electrical equipment, appliances, and components	Progressive	Progressive
Motor vehicles, bodies and trailers, and parts	Progressive	Progressive
Other transportation equipment	Progressive	Progressive
Furniture and related products	Stagnant	Stagnant
Miscellaneous manufacturing	Progressive	Progressive
Food and beverage and tobacco products	Stagnant	Stagnant
Textile mills and textile product mills	Progressive	Progressive
Apparel and leather and allied products	Progressive	Progressive
Paper products	Stagnant	Stagnant
Printing and related support activities	Progressive	Progressive
Petroleum and coal products	Stagnant	Stagnant
Chemical products	Progressive	Progressive
Plastics and rubber products	Progressive	Progressive
Wholesale trade	Progressive	Progressive
Motor vehicle and parts dealers	Stagnant	Stagnant
Food and beverage stores	Stagnant	Stagnant
General merchandise stores	Progressive	Progressive
Other retail	Progressive	Progressive
Air transportation	Progressive	Progressive
Rail transportation	Stagnant	Stagnant
Water transportation	Stagnant	Progressive
Truck transportation	Stagnant	Stagnant
Transit and ground passenger transportation	Stagnant	Stagnant
Pipeline transportation	Progressive	Progressive
Other transportation and support activities	Stagnant	Stagnant
Warehousing and storage	Progressive	Stagnant
Publishing industries, except internet (includes software)	Progressive	Progressive

Motion picture and sound recording industries	Progressive	Progressive
Broadcasting and telecommunications	Progressive	Progressive
Data processing, internet publishing, and other information services	Progressive	Progressive
Federal Reserve banks, credit intermediation, and related activities	Stagnant	Stagnant
Securities, commodity contracts, and investments	Progressive	Progressive
Insurance carriers and related activities	Progressive	Progressive
Funds, trusts, and other financial vehicles	Stagnant	Stagnant
Housing	Stagnant	Stagnant
Other real estate	Progressive	Progressive
Rental and leasing services and lessors of intangible assets	Progressive	Progressive
Legal services	Stagnant	Stagnant
Computer systems design and related services	Progressive	Progressive
Miscellaneous professional, scientific, and technical services	Stagnant	Stagnant
Management of companies and enterprises	Stagnant	Stagnant
Administrative and support services	Progressive	Progressive
Waste management and remediation services	Stagnant	Stagnant
Educational services	Stagnant	Stagnant
Ambulatory health care services	Stagnant	Stagnant
Hospitals	Stagnant	Stagnant
Nursing and residential care facilities	Stagnant	Stagnant
Social assistance	Stagnant	Stagnant
Performing arts, spectator sports, museums, and related activities	Stagnant	Stagnant
Amusements, gambling, and recreation industries	Stagnant	Stagnant
Accommodation	Stagnant	Stagnant
Food services and drinking places	Stagnant	Stagnant
Other services, except government	Stagnant	Stagnant
Federal general government (defense)	Stagnant	Stagnant
Federal general government (nondefense)	Progressive	Progressive
Federal government enterprises	Stagnant	Stagnant
State and local general government	Stagnant	Stagnant
State and local government enterprises	Stagnant	Stagnant

Table A2. Classification of subsystems and industries at the sector level.

	As a subsystem	As an industry
Agriculture, forestry, fishing, and hunting	Progressive	Progressive
Mining	Stagnant	Progressive
Utilities	Stagnant	Progressive
Construction	Stagnant	Stagnant
Manufacturing	Progressive	Progressive
Wholesale trade	Progressive	Progressive
Retail trade	Progressive	Stagnant
Transportation and warehousing	Stagnant	Stagnant
Information	Progressive	Progressive
Finance, insurance, real estate, rental, and leasing	Stagnant	Progressive
Professional and business services	Progressive	Progressive
Educational services, health care, and social assistance	Stagnant	Stagnant
Arts, entertainment, recreation, accommodation, and food services	Stagnant	Stagnant
Other services, except government	Stagnant	Stagnant
Government	Stagnant	Stagnant

Últimos títulos publicados

WORKING PAPERS

WP02/21 Yang, Li : *La estrategia de la búsqueda de activos de las empresas multinacionales de países emergentes, transferencia de conocimiento y modernización industrial: El caso de China*

WP01/21 Castillo Manteca, Jose Manuel : *Crisis de la deuda en Grecia y gestión del programa económico de austeridad por parte de Syriza.*

WP06/20 Vilariño, Ángel; Alonso, Nuria; Trillo, David : *Análisis de la sostenibilidad de la deuda pública en España*

WP05/20 Herrero, Daniel : *Productive linkages in a segmented model: analyzing the role of services in the exporting performance of German manufacturing*

WP04/20 Braña Pino, Francisco-Javier : *Cuarta revolución industrial, automatización y digitalización: una visión desde la periferia de la Unión Europea en tiempos de pandemia*

WP03/20 Cerdá, Elena: *Claves de internacionalización de las universidades españolas. Las universidades públicas madrileñas en el Horizonte 2020.*

WP02/20 Fuertes, Alberto: *External adjustment with a common currency: The Case of the Euro Area*

WP01/20 Gómez Gómez, Marina: *La gestación subrogada: un análisis desde una perspectiva comparativa y del sistema español de Derecho internacional privado*

WP05/19 Biurrun, Antonio: *New empirics about innovation and inequality in Europe*

WP04/19 Martín, Diego: *Entre las agendas globales y la política territorial: estrategias alimentarias urbanas en el marco del Pacto de Milán (2015-2018)*

WP03/19 Colón, Dahil: *Instituciones Extractivas e Improductivas: El caso de Puerto Rico*

WP02/19 Martínez Villalobos, Álvaro. A: *Cooperación en empresas subsidiarias en España*

WP01/19 García Gómez, Raúl; Onrubia, Jorge; Sánchez-Fuentes, A. Jesús: *Is public Sector Performance just a matter of money? The case of the Spanish regional governments*

WP02/18 García-García, Jose-Marino; Valiño Castro, Aurelia; Sánchez Fuentes, Antonio-Jesús: *Path and speed of spectrum management reform under uncertain costs and benefits.*

WP01/18 Sanahuja, José Antonio: *La Estrategia Global y de Seguridad de la Unión Europea: narrativas securitarias, legitimidad e identidad de un actor en crisis.*

WP09/17 Gómez-Puig, Marta; Sosvilla-Rivero, Simón: *Public debt and economic growth: Further evidence for the euro area.*

WP08/17 Gómez-Puig, Marta; Sosvilla-Rivero, Simón: *Nonfinancial debt and economic growth in euro-area countries.*

WP07/17 Hussain, Imran, y Sosvilla-Rivero, Simón: *Seeking price and macroeconomic stabilisation in the euro area: the role of house prices and stock prices*

WP06/17 Echevarria-Icazaa, Victor y Sosvilla-Rivero, Simón: *Systemic banks, capital composition and CoCo bonds issuance: The effects on bank risk.*

WP05/17 Álvarez, Ignacio; Uxó, Jorge y Febrero Eladio: *Internal devaluation in a wage-led economy. The case of Spain.*

WP04/17 Albis, Nadia y Álvarez Isabel.: *Estimating technological spillover effects in presence of knowledge heterogeneous foreign subsidiaries: Evidence from Colombia.*

WP03/17 Echevarria-Icazaa, Victor. y Sosvilla-Rivero, Simón: *Yields on sovereign debt, fragmentation and monetary policy transmission in the euro area: A GVAR approach.*

WP02/17 Morales-Zumaquero, Amalia.; Sosvilla-Rivero, Simón.: *Volatility spillovers between foreing-exchange and stock markets.*

WP01/17 Alonso, Miren.: *I open a bank account, you pay your mortgage, he/she gets a credit card, we buy health insurance, you invest safely, they… enjoy a bailout. A critical analysis of financial education in Spain.*

WP04/16 Fernández-Rodríguez Fernando y Sosvilla Rivero, Simón: *Volatility transmission between stock and exchange-rate markets: A connectedness analysis.*

WP03/16 García Sánchez, Antonio; Molero, José; Rama, Ruth: *Patterns of local R&D cooperation of foreign subsidiaries in an intermediate country: innovative and structural factors.*

WP02/16 Gómez-Puig, Marta; Sosvilla-Rivero, Simón: *Debt-growth linkages in EMU across countries and time horizon.*

WP01/16 Rodríguez, Carlos; Ramos, Javier: El sistema español de Garantía Juvenil y Formación Profesional Dual en el contexto de la Estrategia Europea de Empleo.

Desempleo Juvenil en España. Vol 2. Ruiz-Gálvez Juzgado, María Eugenia; Rodríguez Crespo, Carlos.

Desempleo Juvenil en España. Vol 1. Ramos, Javier; Vicent Valverde, Lucía; Recuenco-Vegas, Luis: *Desempleo Juvenil en España.*

WP05/15 Pérez Pineda, Jorge Antonio; Alañón Pardo, Ángel: *Mediciones alternativas de la cooperación internacional para el desarrollo en el contexto de la agenda post 2015.*

WP04/15 Fernández-Rodríguez, Fernando; Gómez-Puig, Marta; Sosvilla-Rivero, Simón: *Volatility spillovers in EMU sovereign bond markets.*

WP03/15 Stupariu, Patricia; Ruiz, Juan Rafael; Vilariño, Angel: *Reformas regulatorias y crisis de los-modelos VaR.*

WP02/15 Sosvilla, Simón; Ramos, María del Carmen: *De facto exchange-rate regimes in Central and Eastern European Countries*

WP01/15 Fernández, Fernando; Gómez, Marta; Sosvilla, Simón: *Financial stress transmission in EMU sovereign bond market volatility: A connectedness analysis.*

WP08/14 Albis, Nadia; Álvarez, Isabel: *Desempeño innovador de las subsidiarias de empresas multinacionales en la industria manufacturera de Colombia*

WP07/14 Pérez, Luis; Hernández, Julio; Berumen, Sergio: *La motivación extrínseca del profesorado universitario en Alemania y en España: un análisis empírico.*

WP06/14 Donoso, Vicente; Martín, Víctor; Minondo, Asier: *Exposure to Chinese imports and local labor market outcomes. An Analysis for Spanish provinces*

WP05/14 Donoso, Vicente; Martín, Victor; Minondo, Asier: *Import competition from China and un employment. An analysis using Spanish workers'micro-data.*

WP04/14 Stupariu, Patricia; Vilariño, Ángel: *Retos y carencias de la regulación financiera internacional.*

WP03/14 García, Antonio; Molero, José; Rama, Ruth: *Foreign MNEs and domestic innovative capabilities: are there conditions for reverse spillovers in the spanish industry*

WP 02/14 Sosvilla Rivero, Simón; Ramos Herrera, María del Carmen: *On the forecast accuracy and consistency of exchange rate expectations: The Spanish PwC Survey*

WP01/14 Kropacheva, Anna; Molero, José: *Russian technological specialization in terms of world's innovation changes during 1994-2008. Comparison with countries of BRIC and European Innovation-driven economies.*

WP 07/13 Sanchís, Raúl G.: *Extended theory about the allocation of the time. Description and application to the increase in the retirement age policies.*

WP 06/13 Morales-Zumaquero, Amalia; Sosvilla-Rivero, Simón: *Real exchange rate volatility, financial crises and nominal exchange regimes.*

WP 05/13 Álvarez, Isabel; Labra, Romilio: *Identifying the role of natural resources in knowledge-based strategies of development.*

WP 04/13 Alonso Gallo, Nuria; Trillo del Pozo, David: *La respuesta de la regulación prudencial a la 29 crisis: Basilea II.*

WP 05/13 Sosvilla-Rivero, Simón; Ramos-Herrera, María del Carmen: *On the forecast and consistency of exchange rate expectations: The Spanish PwC Survey.*

WP 04/12 Sosvilla-Rivero, Simón; Morales-Zumaquero, Amalia: *Real exchange rate volatility, financial crises and nominal exchange regimes.*

WP 03/13 Revuelta, Julio; Alonso, Fernando: *Presencia de las multilatinas en Europa. Tipología y estrategia empresarial.*

WP 02/13 Nicolau Ibarra, Ignacio: *Evolución de la cooperación española en El Salvador.*

WP 01/13 Monedero, Juan Carlos; Jerez, Ariel; Ramos, Alfredo; Fernández, Jose Luis: *Participación ciudadana y Democracia. Una revisión de las mejores experiencias Iberoamericanas.*

WP 05/12 Sanchís, Raúl G.: *Trying to escape the Malaise State in the future. A macroecnomic design to hinder another Great Recession which risks the Welfare State.*

WP 04/12 Basave Kunhardt, J., *Flujos de IED mexicana hacia Europa y presencia de grandes multinacionales mexicanas en España. Evidencia empírica y reflexiones teóricas.*

WP 03/12 Luengo Escalonilla, F., Gracia Santos, M., Vicent Valverde, L., *Productividad y Posicionamiento Esctructural en la industria de bienes de equipo española.*

WP 02/12 Alonso (dir.), José A.; Castillo, Alberto; García, Héctor; Ospina, Shirley; Aguirre, Pablo; Millán, Natalia; Santander, Guillermo: *Estimación de la ayuda española a la infancia: una propuesta metodológica.*

WP 01/12 Alonso (dir.), José A.; Aguirre, Pablo; Castillo, Alberto: *La cooperación al desarrollo y la infancia. Apuntes estratégicos para el caso de España*.

WP 09/11 Torrecillas, Celia; Fischer, Bruno B.: *Technological Attraction of FDI flows in Knowledge-Intensive Services: a Regional Innovation System Perspective for Spain.*

WP 08/11 Gómez-Puig, Marta; Sosvilla-Rivero, Simón: *Causality and contagion in peripheral emupublic debt markets: a dynamic approach.*

WP 07/11 Sosvilla-Rivero, Simón; Ramos-Herrera, María del Carmen: *The US Dollar-Euro exchange rate and US-EMU bond yield differentials: A Causality Analysis.*

WP 06/11 Sosvilla-Rivero, Simón; Morales-Zumaquero, Amalia: *Volatility in EMU sovereign bond yields: Permanent and transitory components .*

WP 05/11 Castellacci, Fulvio; Natera, José Miguel: *A new panel dataset for cross-country analyses of national systems, growth and development (CANA).*

WP 04/11 Álvarez, Isabel; Marín, Raquel; Santos-Arteaga, Franciso J.: *FDI entry modes, development and technological spillovers.*

WP 03/11 Luengo Escalonilla, Fernando: *Industria de bienes de equipo: Inserción comercial y cambio estructural.*

WP 02/11 Álvarez Peralta, Ignacio; Luengo Escalonilla, Fernando: *Competitividad y costes laborales en la UE: más allá de las apariencias.*

WP 01/11 Fischer, Bruno B; Molero, José: *Towards a Taxonomy of Firms Engaged in International R&D Cooperation Programs: The Case of Spain in Eureka.*

WP 09/10 Éltető, Andrea: *Foreign direct investment in Central and East European Countries and Spain – a short overview.*

WP 08/10 Alonso, José Antonio; Garcimartín, Carlos: *El impacto de la ayuda internacional en la calidad de las instituciones.*

WP 07/10	Vázquez, Guillermo: *Convergencia real en Centroamérica: evidencia empírica para el período 1990-2005.*
WP 06/10	P. Jože; Kostevc, Damijan, Črt; Rojec, Matija: *Does a foreign subsidiary's network status affect its innovation activity? Evidence from post-socialist economies.*
WP 05/10	Garcimartín, Carlos; Rivas Luis; García Martínez, Pilar: O*n the role of relative prices and capital flows in balance-of-payments constrained growth: the experiences of Portugal and Spain in the euro area.*
WP 04/10	Álvarez, Ignacio; Luengo, Fernando*: Financiarización, empleo y salario en la UE: el impacto de las nuevas estrategias empresariales.*
WP 03/10	Sass, Magdolna: *Foreign direct investments and relocations in business services – what are the locational factors? The case of Hungary.*
WP 02/10	Santos-Arteaga, Francisco J.: *Bank Runs Without Sunspots*.
WP 01/10	Donoso, Vicente; Martín, Víctor: *La sostenibilidad del déficit exterior de España.*
WP 14/09	Dobado, Rafael; García, Héctor: *Neither so low nor so short! Wages and heights in eighteenth and early nineteenth centuries colonial Hispanic America.*
WP 13/09	Alonso, José Antonio: *Colonisation, formal and informal institutions, and development.*
WP 12/09	Álvarez, Francisco: *Opportunity cost of CO2 emission reductions: developing vs. developed* economies.
WP 11/09	J. André, Francisco: *Los Biocombustibles. El Estado de la cuestión.*
WP 10/09	Luengo, Fernando: *Las deslocalizaciones internacionales. Una visión desde la economía crítica.*
WP 09/09	Dobado, Rafael; Guerrero, David: *The Integration of Western Hemisphere Grain Markets in the Eighteenth Century: Early Progress and Decline of Globalization.*
WP 08/09	Álvarez, Isabel; Marín, Raquel; Maldonado, Georgina: *Internal and external factors of competitiveness in the middle-income countries.*
WP 07/09	Minondo, Asier: *Especialización productiva y crecimiento en los países de renta media.*
WP 06/09	Martín, Víctor; Donoso, Vicente**:** *Selección de mercados prioritarios para los Países de Renta Media.*
WP 05/09	Donoso, Vicente; Martín, Víctor: *Exportaciones y crecimiento económico: estudios empíricos.*
WP 04/09	Minondo, Asier; Requena, Francisco: *¿Qué explica las diferencias en el crecimiento de las exportaciones entre los países de renta media?*
WP 03/09	Alonso, José Antonio; Garcimartín, Carlos: *The Determinants of Institutional Quality. More on the Debate.*
WP 02/09	Granda, Inés; Fonfría, Antonio: *Technology and economic inequality effects on international trade.*
WP 01/09	Molero, José; Portela, Javier y Álvarez Isabel**:** *Innovative MNEs' Subsidiaries in different domestic environments.*
WP 08/08	Boege, Volker; Brown, Anne; Clements, Kevin y Nolan Anna: *¿Qué es lo "fallido"? ¿Los Estados del Sur,o la investigación y las políticas de Occidente? Un estudio sobre órdenes políticos híbridos y los Estados emergentes.*
WP 07/08	Medialdea García, Bibiana; Álvarez Peralta, Nacho: *Liberalización financiera internacional, inversores institucionales y gobierno corporativo de la empresa.*
WP 06/08	Álvarez, Isabel; Marín, Raquel: *FDI and world heterogeneities: The role of absorptive capacities.*
WP 05/08	Molero, José; García, Antonio: *Factors affecting innovation revisited.*

WP 04/08 Tezanos Vázquez, Sergio: *The Spanish pattern of aid giving.*

WP 03/08 Fernández, Esther; Pérez, Rafaela; Ruiz, Jesús: *Double Dividend in an Endogenous Growth Model with Pollution and Abatement.*

WP 02/08 Álvarez, Francisco; Camiña, Ester: *Moral hazard and tradeable pollution emission permits*.

WP 01/08 Cerdá Tena, Emilio; Quiroga Gómez, Sonia: *Cost-loss decision models with risk aversion*.

WP 05/07 Palazuelos, Enrique; García, *Clara: La transición energética en China.*

WP 04/07 Palazuelos, Enrique: *Dinámica macroeconómica de Estados Unidos: ¿Transición entre dos recesiones?*

WP 03/07 Angulo, Gloria: *Opinión pública, participación ciudadana y política de cooperación en España.*

WP 02/07 Luengo, Fernando; Álvarez, Ignacio: *Integración comercial y dinámica económica: España ante el reto de la ampliación.*

WP 01/07 Álvarez, Isabel; Magaña, Gerardo: *ICT and Cross-Country Comparisons: A proposal of a new composite index.*

WP 05/06 Schünemann, Julia: *Cooperación interregional e interregionalismo: una aproximación social-constructivista.*

WP 04/06 Kruijt, Dirk: *América Latina. Democracia, pobreza y violencia: Viejos y nuevos actores.*

WP 03/06 Donoso, Vicente; Martín, Víctor: *Exportaciones y crecimiento en España (1980-2004): Cointegración y simulación de Montecarlo*.

WP 02/06 García Sánchez, Antonio; Molero, José: *Innovación en servicios en la UE: Una aproximación a la densidad de innovación y la importancia económica de los innovadores a partir de los datos agregados de la CIS3.*

WP 01/06 Briscoe, Ivan*: Debt crises, political change and the state in the developing world*.

WP 06/05 Palazuelos, Enrique: *Fases del crecimiento económico de los países de la Unión Europea–15.*

WP 05/05 Leyra, Begoña: *Trabajo infantil femenino: Las niñas en las calles de la Ciudad de México.*

WP 04/05 Álvarez, Isabel; Fonfría, Antonio; Marín Raquel: *The role of networking in the competitiveness profile of Spanish firms.*

WP 03/05 Kausch, Kristina; Barreñada, Isaías: *Alliance of Civilizations. International Security and Cosmopolitan Democracy.*

WP 02/05 Sastre, Luis: *An alternative model for the trade balance of countries with open economies: the Spanish case.*

WP 01/05 Díaz de la Guardia, Carlos; Molero, José; Valadez, Patricia: *International competitiveness in services in some European countries: Basic facts and a preliminary attempt of interpretation.*

WP 03/04 Angulo, Gloria: *La opinión pública española y la ayuda al desarrollo*.

WP 02/04 Freres, Christian; Mold, Andrew: *European Union trade policy and the poor. Towards improving the poverty impact of the GSP in Latin America.*

WP 01/04 Álvarez, Isabel; Molero, José: *Technology and the generation of international knowledge spillovers. An application to Spanish manufacturing firms*.

OCCASIONAL PAPERS

OP 04/20 Conde Pérez, E. (coord.): Proyecto I+D+i "Fiscalización internacional de drogas: problemas y soluciones" (DER-2016-74872-R) - *Ensayos para un nuevo paradigma en la política de drogas*

OP 03/18 Conde Pérez, E. (coord.): Proyecto Jean Monnet - *La Unión Europea y la seguridad: defensa de los espacios e intereses comunes*

OP 02/17 Braña, Francisco J.; Molero, José: *The economic role of the State on the Spanish democratization and "development" process. A case of success?*

OP 01/16 Borrell, Josep; Mella, José María; Melle, Mónica; Nieto, José Antonio. *"¿Es posible otra Euro pa? Debate abierto."*

POLICY PAPERS

PP 01/15 De la Cruz, C.: *Cambio, Poder y Justicia de Género en la Agenda 2030: Reflexiones para no perdernos en el camino.*

PP 01/14 Luego F.; Vicent L.: *Encrucijadas de la moneda única. Algunas claves para una reflexión desde la periferia.*

PP 01/11 Monedero J.C., Democracia y Estado en Améríca Latina: *Por una imprudente reinvención de la política.*

PP 02/10 Alonso, José Antonio; Garcimartín, Carlos; Ruiz Huerta, Jesús; Díaz Sarralde, Santiago: *Strengthening the fiscal capacity of developing countries and supporting the international fight against tax evasión.*

PP 02/10 Alonso, José Antonio; Garcimartín, Carlos; Ruiz Huerta, Jesús; Díaz Sarralde, Santiago: *Fortalecimiento de la capacidad fiscal de los países en desarrollo y apoyo a la lucha internacional contra la evasión fiscal.*

PP 01/10 Molero, José: *Factores críticos de la innovación tecnológica en la economía española.*

PP 03/09 Ferguson, Lucy: *Analysing the Gender Dimensions of Tourism as a Development Strategy.*

PP 02/09 Carrasco Gallego ,José Antonio: *La Ronda de Doha y los países de renta media.*

PP 01/09 Rodríguez Blanco, Eugenia: *Género, Cultura y Desarrollo: Límites y oportunidades para el cambio cultural pro-igualdad de género en Mozambique*.

PP 04/08 Tezanos, Sergio: *Políticas públicas de apoyo a la investigación para el desarrollo. Los casos de Canadá, Holanda y Reino Unido.*

PP 03/08 Mattioli, Natalia *Including Disability into Development Cooperation. Analysis of Initiatives by National and International Donors.*

PP 02/08 Elizondo, Luis: *Espacio para Respirar: El humanitarismo en Afganistán (2001-2008).*

PP 01/08 Caramés Boada, Albert: *Desarme como vínculo entre seguridad y desarrollo. La reintegración comunitaria en los programas de Desarme, desmovilización y reintegración (DDR) de combatientes en Haití.*

PP 03/07 Guimón, José: *Government strategies to attract R&D-intensive FDI*.

PP 02/07 Czaplińska, Agata: *Building public support for development cooperation.*

PP 01/07 Martínez, Ignacio: *La cooperación de las ONGD españolas en Perú: hacia una acción más estratégica.*

PP 02/06 Ruiz Sandoval, Erika: *Latinoamericanos con destino a Europa: Migración, remesas y codesarrollo como temas emergentes en la relación UE-AL.*

PP 01/06 Freres, Christian; Sanahuja, José Antonio: *Hacia una nueva estrategia en las relaciones Unión Europea – América Latina.*

PP 04/05 Manalo, Rosario; Reyes, Melanie: *The MDGs: Boon or bane for gender equality and wo-men's rights?*

PP 03/05 Fernández, Rafael: *Irlanda y Finlandia: dos modelos de especialización en tecnologías avanzadas.*

PP 02/05 Alonso, José Antonio; Garcimartín, Carlos: *Apertura comercial y estrategia de desarrollo.*

PP 01/05 Lorente, Maite: *Diálogos entre culturas: una reflexión sobre feminismo, género, desarrollo y mujeres indígenas kichwuas.*

PP 02/04 Álvarez, Isabel: *La política europea de I+D: Situación actual y perspectivas*.

PP 01/04 Alonso, José Antonio; Lozano, Liliana; Prialé, María Ángela: *La cooperación cultural española: Más allá de la promoción exterior.*

DOCUMENTOS DE TRABAJO "EL VALOR ECONÓMICO DEL ESPAÑOL"

DT 16/11 Fernández Vítores, David: *El papel del español en las relaciones y foros internacionales: Los casos de la Unión Europea y las Naciones Unidas.*

DT 15/11 Rupérez Javier: *El Español en las Relaciones Internacionales*.

DT 14/10 Antonio Alonso, José; Gutiérrez, Rodolfo: *Lengua y emigración: España y el español en las migraciones internacionales.*

DT 13/08 de Diego Álvarez, Dorotea; Rodrigues-Silveira, Rodrigo; Carrera Troyano Miguel: *Estrategias para el Desarrollo del Cluster de Enseñanza de Español en Salamanca.*

DT 12/08 Quirós Romero, Cipriano: *Lengua e internacionalización: El papel de la lengua en la internacionalización de las operadoras de telecomunicaciones.*

DT 11/08 Girón, Francisco Javier; Cañada, Agustín: *La contribución de la lengua española al PIB y al empleo: una aproximación macroeconómica.*

DT 10/08 Jiménez, Juan Carlos; Narbona, Aranzazu: *El español en el comercio internacional.*

DT 09/07 Carrera, Miguel; Ogonowski, Michał: *El valor económico del español: España ante el espejo de Polonia.*

DT 08/07 Rojo, Guillermo: *El español en la red.*

DT 07/07 Carrera, Miguel; Bonete, Rafael; Muñoz de Bustillo, Rafael: *El programa ERASMUS en el marco del valor económico de la Enseñanza del Español como Lengua Extranjera.*

DT 06/07 Criado, María Jesús: *Inmigración y población latina en los Estados Unidos: un perfil socio-demográfico.*

DT 05/07 Gutiérrez, Rodolfo: *Lengua, migraciones y mercado de trabajo.*

DT 04/07 Quirós Romero, Cipriano; Crespo Galán, Jorge: *Sociedad de la Información y presencia del español en Internet.*

DT 03/06 Moreno Fernández, Francisco; Otero Roth, Jaime: *Demografía de la lengua española.*

DT 02/06 Alonso, José Antonio: *Naturaleza económica de la lengua.*

DT 01/06 Jiménez, Juan Carlos: *La Economía de la lengua: una visión de conjunto.*