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Sectoral reallocations, real estate shocks and productivity divergence in Europe: a tale of three countries*

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May 27, 2019

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*We thank Sophie Piton for her comments and suggestions.

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The creation of the European Monetary Union (EMU) in 1999 was expected to become a catalyst for real convergence in Europe. Far from being the case, real divergence increased from the early 1990s as evidenced by low productivity growth in the "periphery" of the Euro area relative to "core" countries. This report investigates the role of sectoral reallocation in this divergence, focusing on three archetypal countries: France, Germany, and Spain. Using the EU-KLEMS database of sectoral Total Factor Productivity (TFP), we first show that sector reallocations have been at the origin of productivity losses in the considered countries and contributed significantly to this divergence. Second, we investigate how the substantially diverging real estate prices between these countries could explain those sectoral reallocations. More specifically, when access to external finance is restricted due to financial frictions, real estate assets may be used as collateral by borrowers to relax these constraints and increase investments. Real estate shocks turn out to be a strong driver of productivity divergence, causing the lag of Spain behind Germany before the Great Recession and that of France afterwards. For comparison purpose, we also shed light on the role of sectoral reallocation in the UK productivity puzzle.[1]

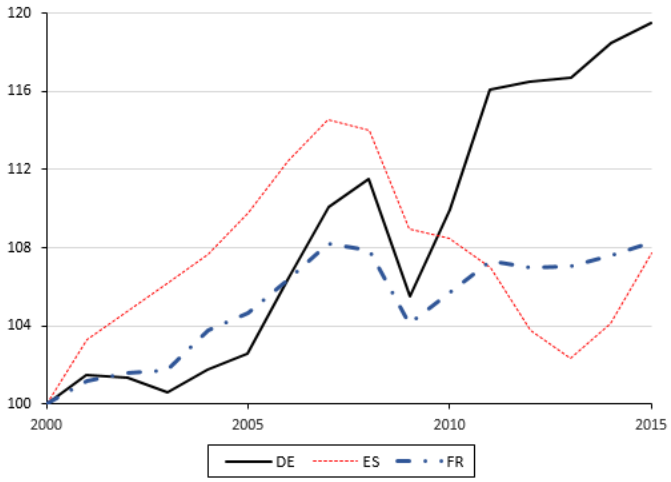
1 The challenge of productivity divergence in a monetary union

When the prospect of the Economic and Monetary Union (EMU) became imminent in the early 1990s, warnings about the restrictive conditions required for the viability of the latter quickly emerge. Whether embedded in the Optimum Currency Area tradition (Bayoumi and Eichengreen, 1992) or the New Economic Geography insights (Krugman, 1993; Krugman and Venables, 1996), all insisted on the fact that a monetary union deprived from a fiscal counterpart would need a high level of business cycle synchronization, and more generally, structural convergence, for making sufferable the loss of monetary policy autonomy. Conversely, EMU optimists such as Frankel and Rose (1998) would argue that the very existence of EMU would bring additional optimality, increased trade between its members delivering more tightly correlated business cycles.

After two decades of existence of the Euro Area (EA), it seems that early warnings were, at the very least, partly justified. While trade creation effects of the euro have been real, but more limited than expected (Glick and Rose, 2016), the very creation of the single currency appears in retrospect at the root of a major asymmetric shock. According to Krugman (2012), it has fueled massive capital flows from EA's core - Germany, Netherlands - to its periphery - e.g., Portugal or Spain. This left peripheral economies with financial and real estate bubbles (Spain being emblematic of the latter), together with a continuously weakening manufacturing sector, while this sector was strengthening in

[1] A detailed presentation of results included in this report can be found in Grjebine et al. (2019).

Figure 1: GDP per capita in France, Germany and Spain, 2000-2015



Note: Source: OECD. Base 100 = 2000.

Germany.

This report focuses on three countries emblematic of the structural divergences within the EMU: Germany and Spain, for the previously mentioned motives, as well as France, often presented as an "in-between" situation. Reporting GDP per capita dynamics between 2000 and 2015, Figure 1 provides a striking illustration of the real implications of this divergence process at work in the EMU since the beginning of the 21st century.

2 Sectoral reallocations, a driver of productivity divergence in Europe

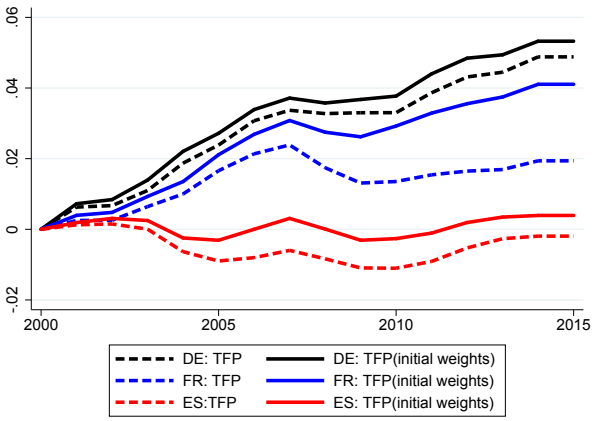
It is widely acknowledged that Total Factor Productivity (TFP) dynamics drive long-run economic (and therefore, GDP per capita) growth. Yet, it is striking that the EA has been characterized by major divergences in TFP dynamics, as shown by the dotted lines reported on the left panel in Figure 2 for Germany, France and Spain.[2] Between 2000 and 2015, whereas Spanish TFP stagnates, French TFP increases half more slowly than the German one.

A recent, though flourishing literature investigates the role of resource misallocation in explaining international differences in productivity, with a clear focus on within-industry reallocation, i.e. on the (in-)efficiency of resource allocation between firms (see e.g., Restuccia and Rogerson, 2008 for the US, Hsieh and Klenow, 2009 for the US, China and India, and Bartelsman et al., 2013, for a

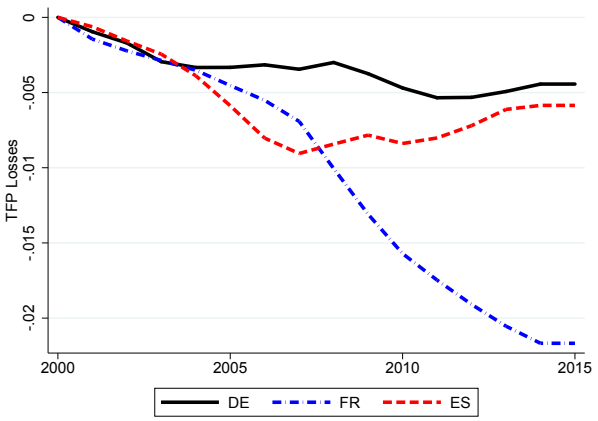
[2]This Figure used EU KLEMS data and measures TFP as a weighted average of sectoral TFP based on a classification with 33 sectors.

Figure 2: TFP Gains/Losses due to sectoral reallocations

(a) TFP vs. TFP without sectoral reallocations



(b) TFP Losses due to sectoral reallocations



Note: Log-Level of TFP using historical share $\log(A_{it})$ "TFP" and Log-Level of TFP using initial weights $\log(\overline{A}_{it})$ "TFP(initial weights)" (Left-hand side) and the gap between the two series: $\log(A_{it}) - \log(\overline{A}_{it})$ (Right-hand side). See Appendix for the construction of series.

cross-country analysis). Based on a manufacturing firm-level dataset, Garcia-Santana et al. (2018) also argue that the source of bad relative TFP performance in Spain was the increase in the within-industry misallocation of production factors across firms.

However, sectoral reallocations may have been overlooked in previous research, since most articles focus mostly on the reallocation among firms within a single industry. These studies focus on the manufacturing sector due to data limitations, and miss an important aspect of these reallocations which is the growing share of services industries. Few papers have already focused on the importance of sectoral reallocations for macroeconomic divergence (Reis, 2013; Benigno and Fornaro, 2014; Piton, 2018). However, these papers mostly focus on reallocations from tradable to non-tradable sectors, for which the aggregate effect on productivity is unclear[3] and is very sensitive to the classification of tradable sectors. Dynamics in these two broad sectors might also hide significant reallocations among sub-sectors of the tradable or non-tradable sector –such as the reallocation from manufacturing to business services in the tradable sector.

To overcome these limitations, this report studies reallocations using a finer disaggregation in 33 industries. Based on the EU KLEMS database for the period 1995-2015, our empirical assessment supports that reallocation between sectors appears as a strong candidate in explaining both the productivity slowdown observed in most EU countries and the divergence between them. This can be seen in Figure 2. All three countries would have experienced higher levels of TFP if their economy

[3]If reproducing Figure 2 with a two sector decomposition, we find no differences in the evolution of TFP including or excluding sector reallocations, see Figure A in the Appendix.

had kept the same sectoral structure than in 2000, as suggested by plain lines (all systematically above their dotted counterparts), reporting a counterfactual aggregate TFP, based on a weighted sum of sectoral TFP, for which the share in value added for each sector has been set to its level in 2000. In France, the TFP level would have been twice higher without sectoral reallocations. In Spain, the TFP dynamics would not have been negative without these reallocations. The right panel shows for each of the three considered countries the difference between the plain and the dotted lines, revealing the extent of the divergences in TFP dynamics fueled by sectoral reallocations: whereas losses have been limited in Germany, they have been significant in Spain until a reversal appears in 2008, while they keep increasing in France.[4]

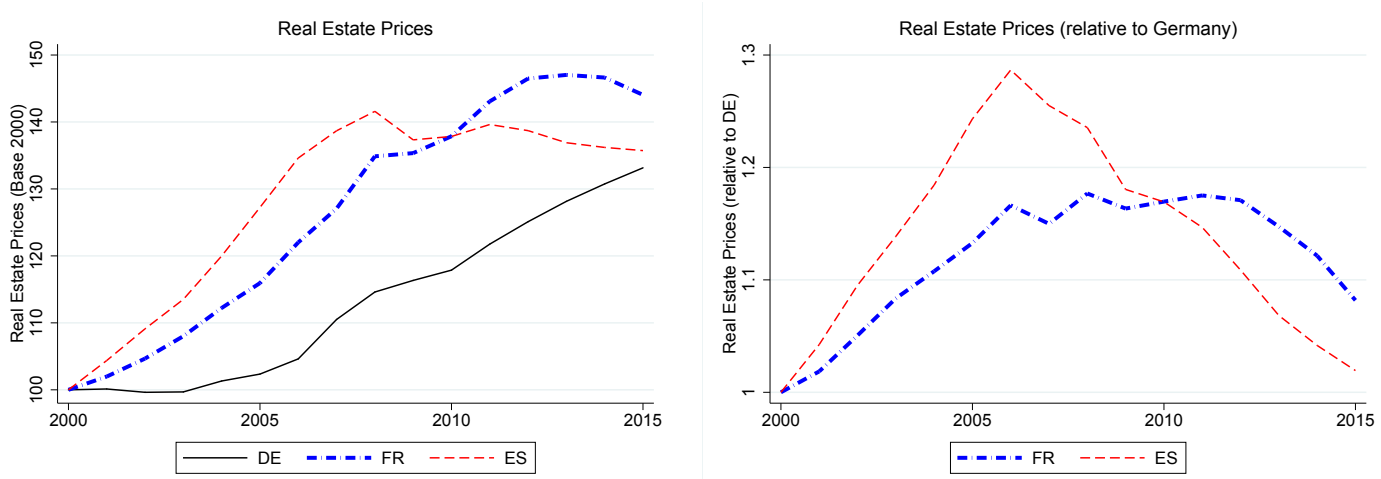
3 Real estate prices are also diverging in Europe

Parallel to this real divergence, European countries also experienced nominal divergence which took the form, in many peripheral economies, of massive boom-bust cycles in house prices. These housing bubbles occurred in Spain notably, and were parallel to the productivity slowdown or even productivity losses. These bubbles have had important implications for the real estate and construction sectors, but also for the broader economy. More specifically, it is likely that real estate shocks fueled a non-negligible share of sectoral reallocations. A first intuition of that result can be found in Figure 3, reporting house prices for Germany, France and Spain on the left panel, and relatively to Germany for France and Spain on the right panel, between 2000 and 2015. When comparing the dynamics of house prices with those of TFP reported in Figure 2, it is striking to see that periods of booming house prices coincide with sectoral reallocations detrimental to TFP. Conversely, when house prices stagnate or even decrease, TFP losses due to sectoral reallocation stop deepening, or even revert –this is the case for Spain, starting in 2008-2009. Germany and France appear as two polar cases: the first experienced the most recent and limited increase in house prices, together with the smallest negative between-sectors reallocation; for the second, house prices have been continuously rising since 2000, before starting into a modest decline in 2012, and the detrimental impact on TFP from sectoral reallocations is the largest of the three countries.

These intuitions are in line with Cecchetti and Kharroubi (2015) and Borio et al. (2015) who investigate how credit booms tend to undermine productivity growth by inducing labour reallocations towards lower productivity growth sectors, in particular the construction sector. According to them, the financial sector's expansion may indeed benefit disproportionately to projects with high collateral

[4]More generally, except a few small countries, all have experienced TFP losses due to sectoral reallocations, both in absolute terms and relatively to Germany. See Grjebine et al. (2019) for more details.

Figure 3: Real Estate Prices



Note: Source: EU KLEMS. Base 100 = 2000.

but low productivity. For example, credit booms in Spain and Ireland coincided with rapid growth of employment in construction at the expense of the more productive manufacturing sector. However, there is so far little systematic evidence on the dynamics of misallocation between countries and the importance of inter-sectoral reallocations. Housing shocks could not only lead to reallocations towards the construction sector but change the whole structure of the economy and the relative size of every sector. This report investigates how real estate shocks lead to reallocations between every sector of the economy, and not only towards construction.

4 How real estate shocks have fueled sectoral reallocations

To test this intuition, the effects of real estate shocks on sectoral reallocations are quantified through a simple econometric model and an accounting exercise. To do so, we look at how changes in the value of real estate assets affect investment, TFP and Gross value Added (GVA) at the country-sector level through a collateral mechanism.[5] It is worth mentioning that we exclude the real estate sector in our empirical analysis as these activities mostly include imputed rents of owner-occupied

[5]Some recent papers have proposed models to investigate how financial frictions affect TFP (Buera et al., 2011, Midrigan and Xu, 2014, Moll, 2014, Buera and Moll, 2015). The typical prediction of these models is that a financial liberalization episode is associated with capital inflows, a better allocation of resources across firms, and an increase in TFP growth. However, it seems that this prediction does not match the experience of countries in South Europe where TFP growth declined. Relying on a model with size-dependent financial frictions, Gopinath et al. (2017) quantify the contribution of heterogeneous financing frictions to sectoral misallocation across manufacturing Spanish firms.

dwellings. Then, we are not interested in the dynamics of the real estate sector per se, but in the use of real estate capital in other sectors (excluding the real estate one).[6]

The collateral mechanism is linked to the "financial accelerator" (Bernanke and Gertler, 1989, Kiyotaki and Moore, 1997): with imperfect financial markets, financially constrained sectors (and firms in these sectors) will use their pledgeable assets as a collateral to finance their investment (e.g. Chaney et al., 2012). An increase in the value of the collateral should therefore allow sectors to increase their investment, the more so if the sector has relatively more collateral (which we measure through the amount of real estate capital owned by the sector). We are interested in changes in the value of sectoral housing portfolio driven by exogenous variations in real estate prices to identify the impact of financing constraints on sectoral reallocations. Adapting Chaney et al. (2012)'s approach[7] to a country-sector environment, the empirical model identifies exogenous shocks to domestic real estate prices through a combination of (world) demand shocks and (country-level) supply constraints on the real estate market. Put differently, we measure how regulatory constraints (such as rent controls) affect the sensitivity of house prices to changes in (world) demand shocks.

World housing demand shocks are proxied through the US commercial real estate price index, consistently with a recent literature pointing out the US as the originator of the global financial cycle (e.g. Rey, 2015).[8] As for country-level constraints explaining the domestic reaction to the world shock, we use a mixture of regulatory and physical supply constraints (see e.g. Hilber and Vermeulen, 2016), including for instance a rent regulation indicator or the number of days required to obtain a construction permit. All other things equal, a positive global demand shock for housing (as captured by an increase in the US commercial real estate price) is expected to push domestic housing prices up, the extent of the response depending on domestic constraints on the housing market. Symmetrically, for a given level of US housing prices, domestic real estate prices will display an all the more positive reaction that domestic supply is inelastic because of various above-mentioned supply constraints.

Our estimates highlight that variations in domestic real estate prices driven by exogenous shocks (as measured by our synthetic indicator of world demand and country-level supply constraints) do bring an increase in sectoral investment[9] and on the size of sectors (as proxied by gross value added),

[6]In average, real estate capital represents more than 40% of total capital.

[7]The micro and aggregate effects of financial frictions on TFP have been increasingly investigated over the recent years. Catherine et al. (2018) recently provided quantification of the aggregate effects of collateral constraints, and find they are responsible for 11% output losses.

[8]Rey (2015) highlights that asset prices around the globe have a strong common component, that can be related to monetary conditions in the US and to changes in risk aversion and uncertainty.

[9]Interestingly, our estimate of the β coefficient of elasticity for Investment is very close to the one found by Chaney

but not in the dynamics of TFP at the sectoral level[10] (see details in Grjebine et al., 2019).

What are the implications of these results for the dynamics of aggregate productivity? Results support that real estate shocks have no significant impact on the TFP at the sectoral level, but affect aggregate productivity by reallocating resources across sectors. Put differently, all variations in aggregate TFP driven by real estate shocks come from composition effects, ie. from the reallocation of value-added between sectors.[11] To quantity this mechanism, we build a counterfactual TFP at the country level which corresponds to the TFP that would have been observed in the economy if its sectoral composition was entirely determined by exogenous real estate prices shocks.

The TFP predicted by real estate shocks is thereafter compared to a TFP excluding any effect from sectoral reallocations. To do so, we compare a TFP measured using sectoral weights (in GVA) predicted by real estate shocks to the TFP measured using the 2000 value of sectoral weights. The gap between the two series measures the time sectoral reallocations exclusively arising from real estate shocks.

Results are presented in Figure 4, which shows that sectoral reallocations driven by exogenous real estate price shocks generate sizable TFP gains or losses. For Germany, TFP gains would have been three times higher if the sectoral composition of this economy had been entirely determined by real estate shocks. France would have experienced TFP losses in amounts equivalent to the gains actually observed over the period if one considers the sectoral composition implied by real estate shocks. In Spain, these shocks have been at the origin of TFP losses while TFP would have remained stable if sectoral shares had stayed at their initial values.

Interestingly, these productivity effects of real estate shocks are not only quantitatively important but also point to a greater divergence between these European countries. Indeed, these effects strengthen productivity gains in Germany, where they are already more important than in Spain and France, while they generate productivity losses in France and Spain. It is important to stress that this divergence is the outcome of external shocks which are common to all considered countries

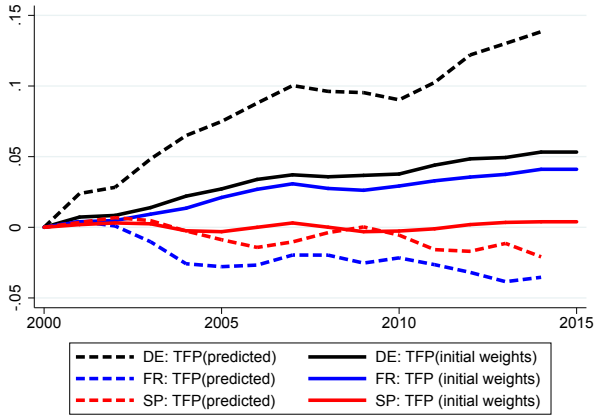
et al. (2012) based on a dataset of US listed firms (between 0.06 and 0.07 vs. 0.08 for us). This is comforting in the sense that it tends to support that moving from (large)-firm to sector-level does not generate major aggregation biases.

[10] We do not find any significant relationship with sectoral TFP.

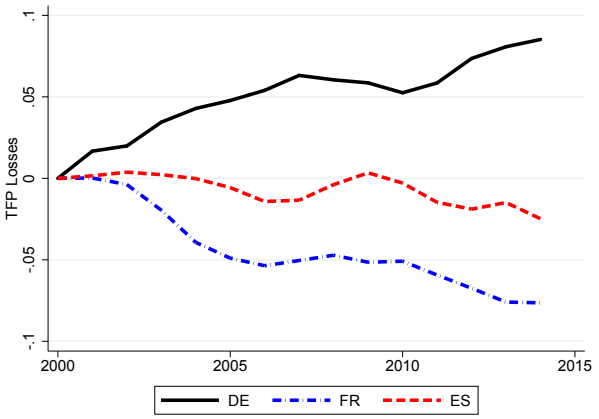
[11] Since we use the nominal value-added, namely $\texttt{VA} = \texttt{Price} \times \texttt{Quantity}$, as a measure of sectoral size, these composition effects include both quantity and price channels. The price channel is in line with the Baumol et al. (1966)'s cost-disease literature: an increase in the TFP of the manufacturing sector which decreases its relative price would lead to a decrease of its share in the total nominal value-added with a potential negative effect on aggregate TFP. Our composition effects encompass both price and quantity channels. For instance, in Spain, real estate shocks lead to an increase in both price and quantity of the construction sector leading to a higher share of this sector in total value-added with a negative impact on aggregate TFP given the slow productivity growth in construction.

Figure 4: TFP Gains/Losses due to sectoral reallocations driven by real estate shocks

(a) Predicted TFP vs. TFP w.o sectoral reallocations



(b) Predicted TFP Gains/Losses



Note: Log-Level of TFP using predicted share $\log\left(\widehat{A}_{it}\right)$ "TFP(predicted)" and Log-Level of TFP using initial weights $\log\left(\overline{A}_{it}\right)$ "TFP(initial weights)" (Left-hand side) and the gap between the two series: $\log\left(\widehat{A}_{it}\right) - \log\left(\overline{A}_{it}\right)$ (Right-hand side)."Predicted" refers to predicted by real estate shocks. See Appendix for the construction of series.

and that the elasticity of sectoral size to these shocks is also identical for all countries.

5 Shedding light on the UK productivity puzzle

The so-called UK "productivity puzzle" has gained much attention in recent years. This puzzle refers to the unexplained and sustained low productivity growth since the 2008-09 Great Recession in the United Kingdom, so that productivity has fallen below its pre-crisis trend, and much more than in any other advanced economies. This low productivity growth is at the heart of the Bank of England's concerns[12] for the definition of its monetary policy and the government for its industrial strategy.[13]

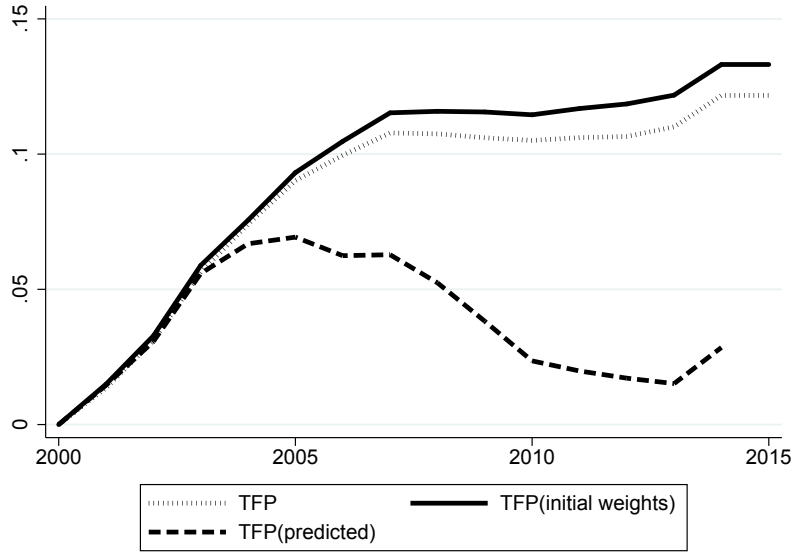
Sectoral dynamics have been extensively discussed as a key aspect of this puzzle. According to Tenreyro (2018), just two sectors, finance and manufacturing, explain most of the low aggregate productivity growth. For Kierzenkowski et al. (2018), non financial services are the main driver of the productivity shortfall –they would explain half of the shortfall followed by financial services for one fourth. The misallocation of resources between sectors was also pointed out as a cause of slowing productivity gains. Barnett et al. (2014) provide evidence of an increase in the standard deviation of productivity shortfalls across sectors and Broadbent (2012) of more cross-sectoral volatility in capital returns since the Great Recession.[14]

[12]See the speeches by Dale (2011) and Tenreyro (2018), among others, and Barnett et al. (2014).

[13]See the white paper "Industrial strategy: Building a Britain fit for the future" published in 2017.

[14]See Pessoa and Van Reenen (2014) for a discussion of this evidence and other related issues on the UK productivity

Figure 5: TFP Gains/Losses due to sectoral reallocations in the United Kingdom



Note: Log-Level of TFP using historical share $\log(A_{it})$ "TFP", Log-Level of TFP using initial weights $\log\left(\overline{A}_{it}\right)$ "TFP(initial weights)" and Log-Level of TFP using predicted share $\log\left(\widehat{A}_{it}\right)$ "TFP(predicted)". "Predicted" refers to predicted by real estate shocks. See Appendix for the construction of series.

Our methodology can shed light on the role of sectoral reallocation and real estate shocks in the UK productivity puzzle.[15] First, Figure 5 confirms the evidence of a UK productivity puzzle: TFP growth halted abruptly around 2006 with a very modest recovery since 2014. Second, cross-sectoral heterogeneity in productivity gains played a role in this process. As shown by Figure 5, sectoral reallocations have led to substantial TFP losses, as evidenced by the gap between TFP in absence of any reallocations (solid line) and observed TFP (dotted line). From this point of view, the UK looks more like France than Spain: TFP losses are sustained and even increased after the Great Recession compared to the previous period. Third, when it comes to the role of real estate shocks, UK seems more importantly impacted than other countries. TFP losses induced by real estate shocks through the sectoral reallocation of resources are found to be the highest among the countries considered, as evidenced by the gap between predicted between TFP in absence of any reallocations (solid line) and the predicted TFP (dashed line). Sectoral reallocations driven by real estate shocks are then an important element of the UK productivity puzzle.

puzzle.

[15]Most studies on this puzzle look at labor productivity, we here focus on total factor productivity, that is joint labor and capital productivity.

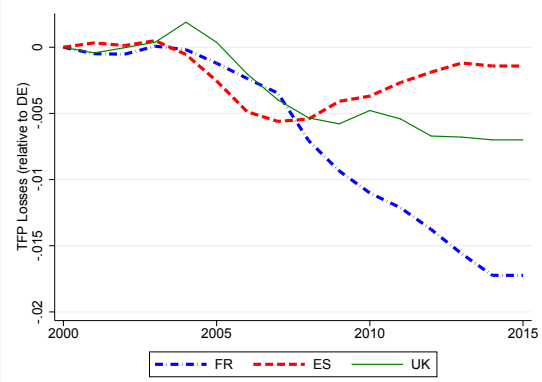
6 Shedding light on the role of construction or Bubble sectors

Are there any specific sector playing a key role for reallocations and the resulting effect on aggregate TFP? For example, it has been argued that the construction sector would be detrimental to growth in particular in Spain or France. According to Borio et al. (2015), "the credit booms in Spain in the decade to 2007 coincided with the rapid growth of employment in construction and real estate services at the expense of the more productive manufacturing sector." We can test this assertion with our empirical framework. Construction is excluded from the list of sectors to measure the role played by construction in sectoral reallocations. Figures 6(c) and 6(d) show that in this case, sectoral reallocations have affected TFP dynamics positively in Spain, meaning that the construction sector is the main driver of TFP losses in Spain over the period. However, this is not the case in France or in the United Kingdom.

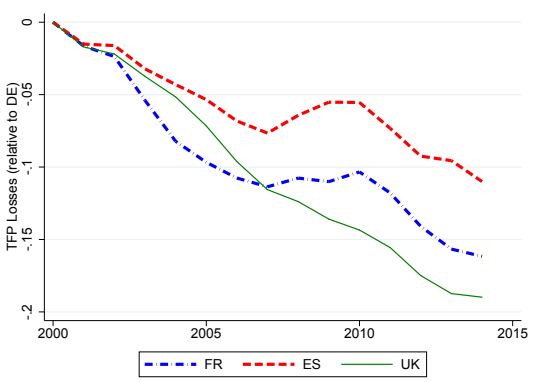
Concerning France, a specific sector responsible for sectoral productivity losses cannot be specifically pointed out. More specifically, we perform a couple of tests excluding "Bubble sectors" (that is, construction, finance, and natural resource) or "IT-producing industries" following the classification proposed by Cette et al. (2016). Excluding "Bubble sectors" divides by 3 the predicted TFP losses relative to Germany. These sectors played negatively in TFP dynamics in France but structural TFP losses cannot be reduced to them. Excluding "IT-producing industries" worsen predicted TFP losses, but cannot explain *per se* the negative pattern observed in France. To our knowledge, no study investigates the role of sectoral reallocations in TFP dynamics in France. The literature focuses on the microeconomic drivers of productivity growth and dispersion within industries, and ignores the role of any sectoral compositional effect (e.g. Fontagné and Santoni, 2015). However, several papers study productivity dynamics focusing not only on the manufacturing sector but on various sectors of the economy. Cette et al. (2017) argue that productivity in France saw a downward trend before the financial crisis, which was widespread over the sectors. This argument was also developed by Askenazy and Erhel (2015) who underlie that the productivity slowdown cannot be attributed to particular market industries as an overwhelming majority of sectors were affected. However, OECD (2019) points out that "while labour productivity has grown in the average manufacturing industry, it has stagnated in market service industries, with a consequent negative effect on the aggregate performance, given the important and increasing weight of this sector in GDP".

Figure 6: TFP Gains/Losses due to sectoral reallocations without Construction and without Bubble sectors

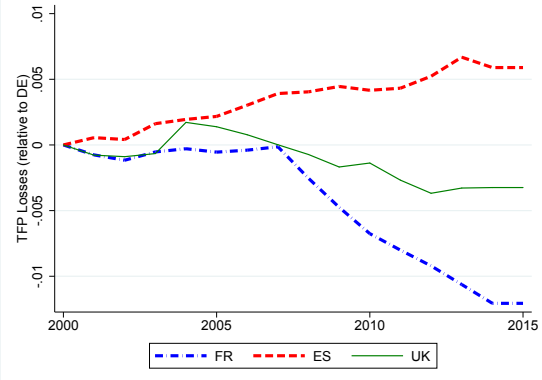
(a) Benchmark: Stylized facts



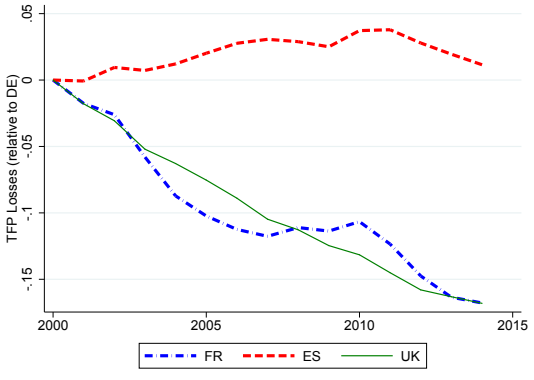
(b) Benchmark: Predicted by Real estate shocks



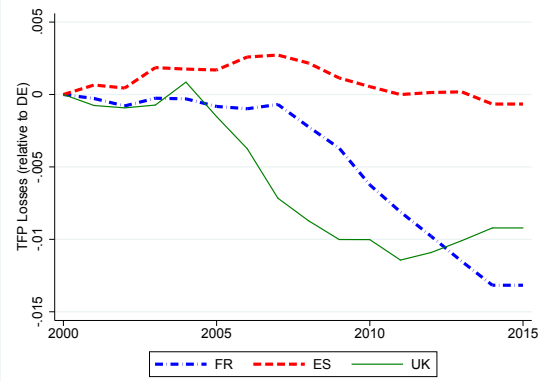
(c) Without Construction: Stylized facts



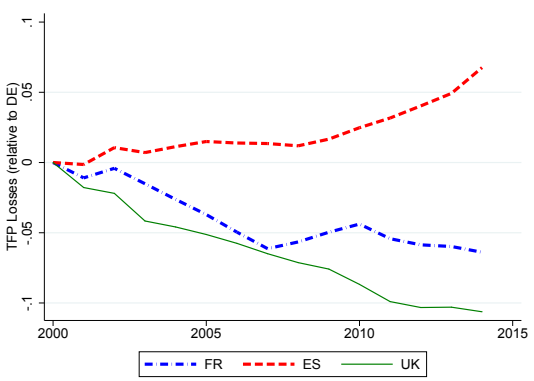
(d) Without Construction: Predicted



(e) Without Bubble sectors: Stylized facts



(f) Without Bubble sectors: Predicted



Note: We measure TFP Gains/Losses due to sectoral reallocations. For comparison purposes, we construct our series in relative terms with respect to Germany. "Predicted" refers to predicted by real estate shocks.

7 Policy Implications

Our results have important policy implications for Europe. They confirm that the lack of real convergence between countries is a major obstacle to the proper functioning of the Euro Area. Beyond this widely shared observation, the contribution of this report is to show the importance of the financial dimension in this lack of real convergence. In this respect, it differs from the approaches generally followed within the European institutions which focus on "real" structural reforms - mainly goods and labour markets - to promote growth and productivity convergence in Europe.

The creation of National Productivity Boards perfectly reflects this position - see the website of the European Commission. As stated by The Council of the European Union in its council recommendation (2016/C 349/01), the objective of these boards is "to analyse developments and policies in the field of productivity and competitiveness, thereby contributing to foster ownership and implementation of the necessary reforms at the national level, and hence foster sustained economic growth and convergence." However, it is striking to see that policies dealing explicitly with financial markets are missing from the discussed toolbox to reverse the productivity divergence. Indeed, the recommendation states that "Raising productivity is a multi-faceted challenge which requires a set of well-balanced policies aimed, in particular, at supporting innovation, increasing skills, reducing rigidities in the labour and product markets, as well as allowing a better allocation of resources." This report supports this is not enough: the financial dimension must be taken into account.

At the same time, considerable efforts have been made towards the convergence of national financial systems to tackle financial fragmentation in Europe: the European System of Financial Supervision has been implemented to "ensure consistent and appropriate financial supervision throughout the EU"; the Banking Union should allow "the consistent application of EU banking rules"; and one aim of the Capital Market Union is to create "a true single market for capital in the EU." Does this financial regulations convergence ensure productivity convergence? The results presented in this report suggest that finance drives productivity through the combination of shocks, originating from financial sectors including housing, and a transmission mechanism, namely the financial accelerator mechanism.

It can be hoped that improvements in the functioning of financial markets will reduce the power of the financial accelerator mechanism through greater transparency and a broadening of markets and sources of financing. Nevertheless, the results presented in this report assume that the accelerator mechanism operates in the same way in the countries under consideration. It is the difference in observed financial shocks that generates the divergence in productivity described and not the heterogeneity in national financial markets. Therefore, synchronising financial cycles must be an

economic policy objective to promote the convergence of productivity in Europe.

Finally, it is important to notice that our approach is informative on the effects of sectoral reallocations on productivity dynamics beyond real estate shocks. If our empirical framework allows drawing inferences about the effects of real estate fluctuations, we remain relatively agnostic about fundamental shocks that drive real estate prices. Diverging financial or housing cycles – in particular between France and Spain on the one hand and Germany on the other hand – could be due to diverging demand shocks at the national level – for instance diverging fiscal policies could both drive house prices and investment dynamics (Geerolf and Grjebine, 2018), leading to diverging productivity patterns.[16] European institutions should thus not only focus on supply-side policies but should also take into account the effects of diverging national demand shocks on the European productivity divergence.

[16]This would be the case for instance if tax measures affect differently investment in the various sectors of the economy leading to sectoral reallocations, that affect country-level productivity dynamics.

Appendix

EU KLEMS. We use the sector-level growth and productivity data up from the EU KLEMS database (Eurostat (2017)). This database relies on NACE, the "statistical classification of economic activities in the European Community" developed since 1970 in the European Union. More precisely, we use NACE Rev. 2, the new revised version of the NACE Rev. 1, which is based on the fourth revision of the United Nations "International Standard Industrial Classification of All Economic Activities" (ISIC Rev. 4). Concerning the level of aggregation, we use the "intermediate aggregation", one of the two standard aggregations of ISIC/NACE categories defined by national accountants to be used from a wide range of countries.[17] It is composed of 33 categories (see Table A for a description of the categories). Because of data limitations, we exclude "U" ("Activities of extra-territorial organisations and bodies") and "T" ("Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use") as Eurostat (2017) asserts that "All of U and part of T (division 98) are outside the SNA production boundary, and will be empty for SNA data reporting, but are included for completeness". We also exclude real estate activities ("L") as this category mostly includes imputed rents of owner-occupied dwellings (Eurostat (2017)).

Measuring TFP. The sectoral TFP growth in sector k, country i as of time t is denoted $\Delta \log(A_{kit})$ and constructed as the Solow residual at the sectoral level:

$$\Delta \log(A_{kit}) = \Delta \log(\texttt{VA}_{kit}) - \texttt{LS}_{kit} \times \Delta L_{kit} - (1 - \texttt{LS}_{kit}) \times \Delta K_{kit}$$

where $\texttt{VA}_{kit} = p_{kit} \times q_{kit}$ is the nominal sectoral value-added, L_{kit} and K_{kit} are the measures of labor input and capital services, respectively, and $\texttt{LS}_{kit}$ is the sectoral share of labor compensation in value-added.

The country log-level of TFP, denoted $\log(A_{it})$, is constructed using sectoral TFP growth rate, $\Delta \log(A_{kit})$, and sectoral value-added shares, ω^{va}_{kit}, to get the country TFP growth rates which are then cumulated over time as follows

$$\log(A_{i\tau}) = \sum_{t=0}^{\tau} \sum_{k=1}^{K} \omega^{va}_{kit} \Delta \log(A_{kit})$$

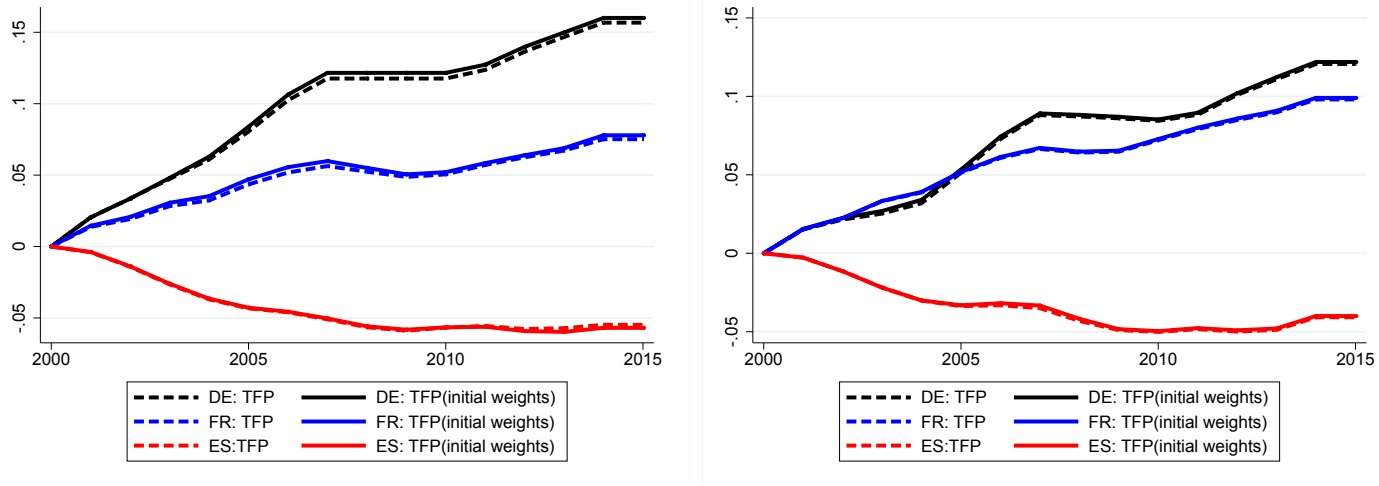
see Oulton (2017) for a discussion on the different methods to construct aggregate measure of TFP using KLEMS data.

[17] The other classification, known as "high-level aggregation", aggregates the ISIC/NACE sections into 10 or 11 categories.

Table A: Classification of Sectors

NACE Rev. 2	Description
"A"	Agriculture, forestry and fishing
"B"	Mining and quarrying
"10-12"	Manufacture of food products, beverages and tobacco products
"13-15"	Manufacture of textiles, apparel, leather and related products
"16-18"	Manufacture of wood and paper products, and printing
"19"	Manufacture of coke, and refined petroleum products
"20-21"	Manufacture of chemicals, chemical products, pharmaceuticals, medicinal chemical and botanical products
"22-23"	Manufacture of rubber and plastics products, and other non-metallic mineral products
"24-25"	Manufacture of basic metals and fabricated metal products, except machinery and equipment
"26-27"	Manufacture of computer, electronic and optical products, electrical equipment
"28"	Manufacture of machinery and equipment n.e.c.
"29-30"	Manufacture of transport equipment
"31-33"	Other manufacturing, and repair and installation of machinery and equipment
"D-E"	Electricity, gas, steam and air-conditioning supply, Water supply, sewerage, waste management and remediation
"F"	Construction
"45"	Wholesale and retail trade and repair of motor vehicles and motorcycles
"46"	Wholesale trade, except of motor vehicles and motorcycles
"47"	Retail trade, except of motor vehicles and motorcycles
"49-52"	Transport and storage
"53"	Postal and courier activities
"I"	Accommodation and food service activities
"58-60"	Publishing, audiovisual and broadcasting activities
"61"	Telecommunications
"62-63"	IT and other information services
"K"	Financial and insurance activities
"L"	Real estate activities
"M-N"	Legal, accounting, management, architecture, engineering, technical testing and analysis activities, Scientific research and development, Other professional, scientific and technical activities, Administrative and support service activities
"O"	Public administration and defence, compulsory social security
"P"	Education
"Q"	Human health services, Residential care and social work activities
"R"	Arts, entertainment and recreation
"S"	Other services
"T"	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
"U"	Activities of extra-territorial organisations and bodies

Figure A: Decomposition into Goods and Services (Left) and Tradable and Non-Tradable Sectors (Right)



To assess the role of sectoral reallocation, we construct a counterfactual TFP using sectoral TFP growth rate, $\Delta \log(A_{kit})$, and the initial values for the sectoral value-added shares, ω_{ki0}^{va}, as follows

$$\log\left(\overline{A}_{i\tau}\right) = \sum_{t=0}^{\tau}\sum_{k=1}^{K}\omega_{ki0}^{va}\Delta\log\left(A_{kit}\right)$$

To assess the role of real estate shocks in sectoral reallocation, we construct a counterfactual TFP using sectoral TFP growth rate, $\Delta \log(A_{kit})$, and the values for the sectoral value-added shares predicted by our regressions: $\widehat{\omega}_{kit}^{va}$, as follows

$$\log\left(\widehat{A}_{i\tau}\right) = \sum_{t=0}^{\tau}\sum_{k=1}^{K}\widehat{\omega}_{kit}^{va}\Delta\log\left(A_{kit}\right)$$

References

Askenazy, P. and Erhel, C. (2015). The french productivity puzzle. CEPREMAP Working Papers 1512, Centre pour la recherche économique et ses applications.

Barnett, A., Batten, S., Chiu, A., Franklin, J., and Sebastia-Barriel, M. (2014). The uk productivity puzzle. Bank of England Quarterly Bulletin, page Q2.

Bartelsman, E., Haltiwanger, J., and Scarpetta, S. (2013). Cross-country differences in productivity: The role of allocation and selection. American Economic Review, 103(1):305–34.

Baumol, W. J., Bowen, W. G., et al. (1966). Performing arts-the economic dilemma: a study of problems common to theater, opera, music and dance. Cambridge, Mass.: M.I.T. Press.

Bayoumi, T. and Eichengreen, B. (1992). Shocking aspects of european monetary unification. NBER Working Papers 3949, National Bureau of Economic Research, Inc.

Benigno, G. and Fornaro, L. (2014). The Financial Resource Curse. Scandinavian Journal of Economics, 116(1):58–86.

Bernanke, B. and Gertler, M. (1989). Agency Costs, Net Worth, and Business Fluctuations. American Economic Review, 79(1):14–31.

Borio, C., Kharroubi, E., Upper, C., and Zampolli, F. (2015). Labour reallocation and productivity dynamics: financial causes, real consequences. BIS Working Papers 534, Bank for International Settlements.

Broadbent, B. (2012). Productivity and the allocation of resources. speech given at Durham Business School, Bank of England, 12.

Buera, F. J., Kaboski, J. P., and Shin, Y. (2011). Finance and Development: A Tale of Two Sectors. American Economic Review, 101(5):1964–2002.

Buera, F. J. and Moll, B. (2015). Aggregate implications of a credit crunch: The importance of heterogeneity. American Economic Journal: Macroeconomics, 7(3):1–42.

Catherine, S., Chaney, T., Huang, Z., Sraer, D. A., and Thesmar, D. (2018). Quantifying reduced-form evidence on collateral constraints. Available at SSRN 2631055.

Cecchetti, S. G. and Kharroubi, E. (2015). Why does financial sector growth crowd out real economic growth? BIS Working Papers 490, Bank for International Settlements.

Cette, G., Corde, S., and Lecat, R. (2017). Stagnation of productivity in france: A legacy of the crisis or a structural slowdown? Economie et Statistique, 494(494):11–36.

Cette, G., Fernald, J., and Mojon, B. (2016). The pre-great recession slowdown in productivity. European Economic Review, 88:3–20.

Chaney, T., Sraer, D., and Thesmar, D. (2012). The collateral channel: How real estate shocks affect corporate investment. American Economic Review, 102(6):2381–2409.

Dale, S. (2011). Productivity and monetary policy. In speech to the South Tyneside Manufacturing Forum, Bank of England. Citeseer.

Eurostat (2017). Nace rev. 2, statistical classification of economic activities in the european community. Technical report, European Commission.

Fontagné, L. and Santoni, G. (2015). Firm Level Allocative Inefficiency: Evidence from France. Working Papers 2015-12, CEPII research center.

Frankel, J. A. and Rose, A. K. (1998). The Endogeneity of the Optimum Currency Area Criteria. Economic Journal, 108(449):1009–1025.

Garcia-Santana, M., Moral-Benito, E., Pijoan-Mas, J., and Ramos, R. (2016 - revised in 2018). Growing like spain: 1995-2007. CEPR Discussion Papers 11144, C.E.P.R. Discussion Papers.

Geerolf, F. and Grjebine, T. (2018). The macroeconomic effects of lump-sum taxes. Working Paper.

Glick, R. and Rose, A. K. (2016). Currency unions and trade: A post-EMU reassessment. European Economic Review, 87(C):78–91.

Gopinath, G., Kalemli-Özcan, Ş., Karabarbounis, L., and Villegas-Sanchez, C. (2017). Capital allocation and productivity in south europe. The Quarterly Journal of Economics, 132(4):1915–1967.

Grjebine, T., Hericourt, J., Piton, S., and Tripier, F. (2019). Sectoral reallocations, financial shocks, and productivity divergence in europe. CEPII Working Papers forthcoming.

Hilber, C. A. and Vermeulen, W. (2016). The impact of supply constraints on house prices in england. The Economic Journal, 126(591):358–405.

Hsieh, C.-T. and Klenow, P. J. (2009). Misallocation and manufacturing tfp in china and india. The Quarterly journal of economics, 124(4):1403–1448.

Kierzenkowski, R., Machlica, G., and Fulop, G. (2018). The uk productivity puzzle through the magnifying glass. (1496).

Kiyotaki, N. and Moore, J. (1997). Credit Cycles. Journal of Political Economy, 105(2):211–248.

Krugman, P. (1993). Lessons of massachusetts for emu. In Torres, F. and Giavazzi, F., editors, Adjustment and Growth in the European Monetary Union, pages 241–261. Cambridge University Press.

Krugman, P. (2012). Revenge of the Optimum Currency Area, pages 439–448. University of Chicago Press.

Krugman, P. and Venables, A. (1996). Integration, specialization, and adjustment. European Economic Review, 40(3-5):959–967.

Midrigan, V. and Xu, D. Y. (2014). Finance and Misallocation: Evidence from Plant-Level Data. American Economic Review, 104(2):422–58.

Moll, B. (2014). Productivity Losses from Financial Frictions: Can Self-Financing Undo Capital Misallocation? American Economic Review, 104(10):3186–3221.

OECD (2019). France. OECD Productivity Insights.

Oulton, N. (2017). The Mystery of TFP. Discussion Papers 1706, Centre for Macroeconomics (CFM).

Pessoa, J. P. and Van Reenen, J. (2014). The uk productivity and jobs puzzle: does the answer lie in wage flexibility? The Economic Journal, 124(576):433–452.

Piton, S. (2018). Do unit labor costs matter? A decomposition exercise on European data. Working Papers 2018-07, CEPII.

Reis, R. (2013). The Portugese Slump and Crash and the Euro Crisis. Brookings Papers on Economic Activity, 44(1 (Spring):143–210.

Restuccia, D. and Rogerson, R. (2008). Policy distortions and aggregate productivity with heterogeneous establishments. Review of Economic dynamics, 11(4):707–720.

Rey, H. (2015). Dilemma not trilemma: the global financial cycle and monetary policy independence. NBER Working Papers 21162, National Bureau of Economic Research, Inc.

Tenreyro, S. (2018). The fall in productivity growth: causes and implications. Peston Lecture Theatre, Queen Mary University of London, Bank of England.

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