

# Online Appendices: The UK and Western Productivity Puzzle: Does Arthur Lewis Hold the Key?

Nicholas Oulton<sup>1</sup>

*Centre for Macroeconomics, LSE*

*National Institute of Economic and Social Research, and  
Economic Statistics Centre of Excellence*

## Appendix A: Proof of Proposition

The main article puts forward the following proposition comparing the growth of labour productivity and capital intensity under “good” and “bad” conditions for a country’s exports. This appendix provides a proof of that proposition.

*Proposition:* Assume that in the good regime the economy was in a steady state in which output ( $Y$ ), investment ( $I$ ) and capital ( $K$ ) were growing at the same rate  $g + n$ , i.e. labour productivity ( $y$ ) and capital intensity ( $k$ ) were growing at rate  $g$ . Then in the bad regime, with a constant investment ratio, and given the same growth of labour supply in the two regimes, labour productivity and cap-

ital intensity grow more slowly than in the good regime. That is,

$$\begin{aligned} \hat{Y} &= \theta \hat{Z} < g + n \\ \text{and } \hat{K} &< g + n \end{aligned} \quad (1)$$

*Proof.* Let  $S_{bad}$  be the investment ratio in the bad regime, for the moment taken to be constant. It is assumed

$$0 < S_{bad} \leq S \quad (2)$$

i.e. the “bad” investment ratio cannot exceed the old (“good”) one which prevailed in the previous steady state. Equation (20) from the main text now becomes

$$D + X = (1 - S_{bad})Y \quad (3)$$

---

<sup>1</sup> The main article is available at <http://www.csls.ca/ipm/36/Oulton.pdf>.

whence using equation (25) from the main text

$$\widehat{Y} = \theta \widehat{Z} < g + n \quad (4)$$

or

$$\widehat{y} < g \quad (5)$$

Putting (31) and (19) from the main text together we also have:

$$\widehat{Y} = (1 - s_{bad})\theta \widehat{Z} + s_{bad}\widehat{I} \quad (6)$$

whence

$$\widehat{I} = \theta \widehat{Z} < g + n \quad (7)$$

It then follows from the capital accumulation equation  $\widehat{K} = (I/K) - \delta$  that the growth of capital must also fall below its steady state level:

$$\widehat{K} < g + n \quad (8)$$

or

$$\widehat{k} < g \quad (9)$$

which proves the Proposition.  $\square$

## Appendix B: Explaining Slower Productivity Growth in the United Kingdom

### Previous Explanations

Explanations for the productivity puzzle that have so far been put forward include the following:

- Distortion due to hard-to-measure or otherwise problematic sectors;
- Reallocation of labour to sectors where productivity is lower;
- Mis-measurement of GDP due to mis-measurement of banking output and of the digital economy;
- Overheating in the boom (so output was growing more rapidly than was sustainable);
- Labour hoarding;
- The impact of austerity;

- Lower human capital (skill);
- Flat or falling capital intensity; and
- Crippled banks and zombie firms.

I have reviewed these explanations extensively elsewhere (Oulton 2016a). Suffice it to say that I did not find any of them plausible by themselves though one at least, flat or falling capital intensity, has formed part of my own explanation. Of the other explanations, some do not fit the facts (reallocation, lower human capital, austerity), one has been rendered implausible by the length of time that productivity has stagnated (labour hoarding), and another fails to under-

stand how GDP is measured in practice (banking output).

It may well be that the digital economy is mis-measured. But first, this affects only a small part of the economy, some of which drops out of GDP as it is intermediate consumption; second, outside the digital sector the productivity puzzle will remain; third, mis-measurement of digital products has been with us for a long time so to explain the productivity puzzle one needs to show that mis-measurement has become worse since 2007, for which there is no evidence (Byrne *et al.*, 2016).

Any explanation based around the banking crisis has to grapple with four facts: (1) while there is evidence that a banking crisis has a permanent adverse effect on the levels of GDP, employment and productivity, it is much harder to argue that it has a long run effect on their growth rates (Oulton and Sebastián-Barriol 2017); (2) banks in the UK unlike in Europe lend predominantly to smaller firms, while larger firms rely on corporate bonds (where interest rates are low) and on retained profits which have been very healthy;<sup>2</sup> (4) most observers think that the UK banking system is now

functioning normally again.<sup>3</sup>

Firm-level studies are potentially valuable in distinguishing between alternative explanations. For example, one might hypothesize that smaller, independent firms which have no access to the bond market would be particularly affected by restrictions on bank lending. But despite many interesting findings, no such smoking gun has yet been identified (Barnett *et al.*, 2014; Riley *et al.*, 2017).

Finally, as a general comment on all candidate explanations, it is important to show how and why the UK differs from other comparable countries. This is because the UK suffered one of the largest slowdowns in labour productivity growth after 2007; in fact, the eighth largest out of 24 countries. Among advanced countries, only in Finland and Sweden was the slowdown greater (Table 2).

### **Lewis and the Lewis Model**

Despite being awarded the Nobel Prize in Economics in 1979, W. Arthur Lewis (1915-1991) has fallen out of fashion in modern discussions of economic growth. Acemoglu (2009, chapter 21, section 21.3.1) presents

---

2 To quote Martin and Rowthorn (2012): “The emphasis placed on the impact of a sclerotic banking system on the pace of innovation by credit-constrained small and medium-sized enterprises belies the quantitatively small role of SMEs in explaining innovation and productivity growth. Independent SMEs account for just 3.5 per cent of business R&D spending.”

3 Tenreyro (2018) is also sceptical about explanations based on the banking crisis. But she does argue that productivity is likely to rise in finance once the deleveraging process is completed.

a model of dualistic growth based on Lewis (1954). But it formalises only the closed economy version of the Lewis model and lacks the crucial element of foreign demand. He takes the essential element of the model to be a barrier preventing free migration between urban and rural areas whereas Lewis emphasises the ease of migration. In Barro and Sala-i-Martin (2004) Lewis’s 1954 article appears in the list of references but he is not mentioned in the text. Lewis does not appear at all in Jones (2002).

Interestingly, Lewis himself foresaw the possible application of his model to a modern industrial economy like the UK. He writes: “When capital accumulation catches up with the labour supply, wages begin to rise above the subsistence level, and the capitalist surplus is adversely affected. However, if there is still surplus labour in other countries, the capitalists can avoid this in one of two ways, by encouraging immigration or by exporting their capital to countries where there is still abundant labour at a subsistence wage. ... If there were free immigration from India and China to the U.S.A., the wage level of the U.S.A. would certainly be pulled down towards the Indian and Chinese levels. ... This is one of the reasons why, in every country where the wage level is relatively high, the trade unions are bitterly hostile to im-

migration, except of people in special categories, and take steps to have it restricted. The result is that real wages are higher than they would otherwise be, while profits, capital resources, and total output are smaller than they would otherwise be.” Lewis has correctly predicted that business interests would be strongly in favour of immigration in the UK today but so far he has been wrong about the attitude of the trade unions.

### **Aggregate Demand Shocks or Export Demand Shocks?**

The thesis of this article has some resemblance to Pessoa and Van Reenen (2015) who argued that wage flexibility explains both puzzles (low or zero productivity growth accompanied by full employment). Their analysis is framed around the growth accounting equation which in my notation is

$$\Delta \ln(Y/L) = \Delta \ln TFP + \alpha \Delta \ln(K/L) \quad (10)$$

They then argue that a “demand shock” which lowers  $Y$  will, given TFP growth, lead to a fall in capital intensity if wages are sufficiently flexible. They do not refer to export demand and do not mention immigration. The latter omission is bit surprising given that with real wage flexibility a positive labour supply shock would also lower both  $Y/L$  and

$K/L$ . Their approach suggests that the solution to the problem is a fiscal and/or monetary expansion sufficient to compensate for the adverse demand shock. In contrast, my approach relies on shocks to export demand. And in my bad regime model an expansionary fiscal or monetary policy would not solve the problem since it would not increase export demand.<sup>4</sup>

The fundamental difficulty with the Pessoa-Van Reenen story is the inability of the Solow model to explain the UK's productivity puzzle. In conditions of full employment, which is what we currently have in the UK, an increase in labour supply creates an incentive to invest: the marginal product of labour is lower so the real wage falls, but equally the marginal product of capital is higher, so firms want to invest more. This is the mechanism in the Solow model to keep the economy on, or drive it back towards, its long run growth path. But it is this mechanism which has been conspicuously malfunctioning in the UK since 2007. And the neo-Lewis model explains why this is the case.

### **Export Demand Shocks**

Demand for a country's exports as a cause of growth has received sur-

prisingly little attention in the literature on economic growth, as opposed to the literature on economic development (e.g. Thirlwall, 1979). It plays no role for example in the influential study of Mankiw *et al.* (1992) which tested the Solow model on 98, mostly open, countries. The case for export demand shocks as an important cause of recessions and subsequent slow growth, or even slumps, is strengthened by considering the example of smaller countries or sub-national units (regions and cities).

Consider Finland. Between 1990 and 1993 Finland's GDP fell by 9 per cent. It did not surpass its 1990 level till 1996. This had little to do with anything happening in Finland itself but was due rather to the collapse of Finland's then principal trading partner, the Soviet Union. This was followed by a favourable export demand shock when Finland joined the EU in 1995. Finland has undergone a major depression after 2007, with GDP falling nearly 9 per cent in 2009. Since then GDP has largely stagnated; in 2015 it was still over 7 per cent below its 2008 level.<sup>5</sup>

It seems likely that a bad situation has been made worse by the loss of comparative advantage suf-

---

<sup>4</sup> Other papers emphasising the role of aggregate demand in accounting for the productivity puzzle include Martin and Rowthorn (2012) and Carlin and Soskice (2018). The latter is a model of a closed economy.

<sup>5</sup> Source: EU KLEMS, September 2017 release.

ferred by Finland's largest company, Nokia. As the Nokia Annual Report for 2016, "Rebalancing for growth", delicately puts it: "By 1998 Nokia was the world leader in mobile phones, a position it enjoyed for more than a decade."<sup>6</sup> At its peak in 2007 Nokia accounted for 70 per cent of the total market capitalization of firms quoted on the Helsinki stock exchange when its market cap was 106 billion euros. This fell to some 6 billion euros in 2012, though it recovered somewhat to 26 billion euros in 2015 (information from Wikipedia). So on top of the effects of the financial crisis Finland has suffered an additional, Nokia-related, shock as world demand has shifted towards non-Finnish companies such as Apple and Samsung.

The case for export demand shocks is even stronger if one looks at cities and regions. It would be odd to discuss the decline of Detroit without mentioning the problems of its main export industry, cars.

It seems likely that these idiosyncratic shocks affecting small countries are not fully captured by the EWI index. The latter shows a substantial fall for Finland after 2007 but nothing exceptional (Table 2).

If the effect of export demand shocks is easier to spot in the case

of smaller countries, it may be that they are less important usually for larger ones. In the model the imported good cannot be produced at home. This is clearly less realistic for larger countries as evidenced by the fact that the imports-GDP ratio falls with country size. So for a large country a fall in exports could still lead to a parallel fall in imports but this may have only a small effect on domestic production and demand since import-competing industries can expand; in the limit when domestic products are perfect substitutes for foreign ones the effect of a foreign demand shock is zero. This may help to explain why the United States has done better than even the large European countries since 2007.

### **What is Different About the UK Labour Market?**

By comparison at least with continental EU countries the UK is very attractive to migrants for several reasons. First, when eight new countries (the A8), consisting of Poland, Hungary, Slovakia, Slovenia, the Czech Republic and the three Baltic states, joined the EU in 2004, the UK government immediately opened the labour market to citizens of these countries; it followed the same policy when Bul-

---

<sup>6</sup> [https://www.nokia.com/sites/default/files/files/nokia\\_ar16\\_full\\_report\\_english\\_3\\$.pdf](https://www.nokia.com/sites/default/files/files/nokia_ar16_full_report_english_3$.pdf), accessed on 01/12/2107.

garia and Romania joined the EU in 2007 and when Croatia joined in 2013. Other EU countries required a transition period before opening their labour markets.

Second, potential migrants, whether from the EU or elsewhere, are more likely to speak at least some English rather than say French, German or Italian, which makes the UK more attractive as a destination.

Third, the UK labour market is very flexible, in several relevant ways. For a great many jobs, particularly unskilled ones, no formal qualifications are necessary and occupational licensing is comparatively rare. Firing costs are low (employment protection legislation is weak), which makes firms more willing to offer employment. Trade unions are weak, except in the public sector.

And the UK has never adopted any of the continental versions of the Eu-

ropean Social Model.<sup>7</sup> The latter gives a very important role to the “social partners” unions, employers and government in setting wages and working conditions at the industry level. The aim here is to prevent “social dumping”, which would allow firms to undercut the wages of indigenous workers by importing cheaper foreign labour.<sup>8</sup>

Finally, in the case of illegal migrants or overstayers, it is comparatively easy to escape the attention of the authorities since the UK has no system of national identity cards.<sup>9</sup>

A striking demonstration of the advantages of the UK as perceived by migrants themselves is the illegal encampment known as the “jungle” erected outside Calais. Until its demolition by the French authorities in October 2016 it held many thousands of migrants who had often been living there for months or even years in

---

7 The European Social Model comes in four varieties: Nordic, Continental (as in e.g. Austria, Belgium, France, and Germany), Mediterranean (Greece, Italy, Portugal and Spain) and Anglo-Saxon, the latter applying only to the UK and Ireland. (Perhaps after Brexit it will be renamed the Celtic model). The Continental version is characterised by strong “employment protection” legislation and an important role for trade unions (Sapir, 2005). Sapir notes: “Although their membership is on the decline, unions remain strong as regulations extend the coverage of collective bargaining to non-union situations.”

8 The hostility to social dumping in Europe is exemplified by the opposition of President Macron to the Posted Workers Directive which allows firms in (say) France to import workers from (say) Romania and pay Romanian not French social charges, thus doing an end run round French wage policy. Macron has recently (October 2017) succeeded in convincing his fellow heads of government to agree to water down this directive (Financial Times, 2017). An earlier example of opposition to social dumping is the process of German reunification. This initially threatened a large influx of workers from the East into the West and also greater competition for Western workers if firms moved in the opposite direction to take advantage of cheap Eastern labour. The German trade unions were successful in preventing this by obliging the East to adopt the West’s wages and other conditions, at the cost initially of high unemployment in the East (Carlin *et al.*, 2014).

9 David Wood, former head of immigration enforcement at the Home Office, told the House of Commons home affairs committee recently that he believes that there are about a million illegal migrants currently in the UK

squalid conditions. The one aim of these migrants was to smuggle themselves into Britain where they confidently expected to find work. The point here is that these migrants had already reached safety on the territory of the European Union. But they clearly felt that their chances of finding work in France (or any other continental EU country to which they could have travelled) were greatly inferior to their chances in Britain.

### Benefits and Costs of Immigration to Natives

There is a large literature which mostly claims that the impact of immigration on the wages of natives is negligibly small. One strand was started by Card (1990) who studied the Mariel boatlift. His results have been disputed by Borjas (2015) and (2016). These studies attempt to identify the short run elasticity of wages to a labour supply shock. So they are of doubtful relevance to the UK productivity puzzle where the issue is the failure of capital accumulation to respond to additional labour. For the UK, Nickell and Saleheen (2008) also found small effects of immigration on native wages. But their study used data from the boom period, so again is not evidence against the hypothesis of this article.

Standard growth theory suggests another way in which native living

standards can be damaged by immigration, which so far as I am aware has not been discussed in the literature on immigration (it is not mentioned in Borjas (2014) for example). In the Solow model the long run growth rate of labour ( $n$ ) has no effect on the long run growth rate of labour productivity. It does however affect the long run level of labour productivity and capital intensity at each point in time: the higher is  $n$ , the lower is output per hour ( $y$ ) and capital intensity ( $k$ ).

Using the notation of equations (1)-(6) of the main text, the long run steady state level of output per hour at time  $t$  is given by

$$y^*(t) = A(t)^{1/(1-\alpha)} \left[ \frac{s}{n + g + d} \right]^{\alpha/(1-\alpha)} \quad (11)$$

So the ratio of long run output per hour in an economy with fast growing labour to an otherwise identical economy with slow growing labour is

$$\left[ \frac{n_{slow} + g + \delta}{n_{fast} + g + \delta} \right]^{\alpha/(1-\alpha)} \quad (12)$$

Parameters values appropriate for the UK are  $\alpha = 0.35$ ,  $g = 2\%$ ,  $\delta = 7\%$ ,  $n_{slow} = 0.32\%$  and  $n_{fast} = 0.95\%$ . The value for  $n_{slow}$  is the growth rate of native-born employment in the UK while that for  $n_{fast}$  is the growth rate of total (native- and foreign-born) employment, both over 2000-2007 (Table 1). Then the level of labour produc-



tivity and hence of the standard of living (consumption per hour worked) in the economy with fast growth of labour will be only 97 per cent of that in the other economy.

In other words, at any moment in time the standard of living in the fast-labour-growth country will always be about 3 per cent less than in the slow-labour-growth one, a significant effect, in fact comparable to the per capita cost of Brexit according to the OECD's projection quoted earlier (OECD, 2016).

### **Skilled or Unskilled Immigrants?**

I have assumed so far that labour is homogeneous. The case for large-scale immigration is often made on the grounds that migrants bring valuable skills lacking in the native population. No doubt some do but is this true on average? The evidence would suggest not. The OECD skills study (Kuczera *et al.*, 2016) recently measured basic skill levels amongst adults in England on two dimensions, literacy and numeracy:

- Literacy: the ability to read and understand the label on a bottle of Aspirin. To pass you need to be able to answer a question like “What is the maximum number of days you should take this

medicine? List 3 situations for which you should consult a doctor”

- Numeracy: the ability to read the petrol gauge on a truck and calculate how much fuel remains in the tank. To pass, you need to be able to see that the tank is three quarters full and to calculate that 36 gallons remain if you are told that the tank holds 48 gallons.

They found that more than a quarter of adults aged 16-65 in England (and 10 per cent of university graduates!) have low basic skills: they fail one or both of these tests, which is worrying enough. But the more relevant finding in the present context is that the skill levels of migrants are lower than those of the native born.<sup>10</sup>

### **Has TFP Growth Been Understated After 2007?**

At least some of the TFP component of the productivity puzzle would go away if it could be shown that TFP growth had been understated after 2007. This could occur if the growth of capital services has been overstated since the recession began. A high scrapping rate after the recession would lead to this outcome since EUKLEMS uses constant de-

---

<sup>10</sup> A migrant was defined as someone born abroad, at least one of whose parents was also born abroad. Thus this definition excludes the children born to British parents temporarily working abroad. Migrants so defined made up 13 per cent of the population aged 16-65.

preciation rates. But all assets are scrapped, or depreciate essentially to zero, eventually. So premature scrapping may affect TFP estimates during the recession itself but its impact washes out as time goes on and GDP starts growing again. The fact that the post-boom period is eight years long (2007-2015) protects against this

potential distortion. However, it is not clear that recessions do lead, on net, to unusually high scrapping rates. There is the countervailing tendency to delay routine replacement during a recession so asset lives lengthen temporarily (Gordon, 2000). If so, TFP growth after 2007 might have been overstated, accentuating the puzzle.

## **Appendix C: Policies to Raise Productivity Growth**

I have made the case that rapid rates of immigration since the Great Recession began in 2008, along with slow growth rates of export demand, have caused the UK's productivity problem. Since Great Recessions fortunately happen rarely it is very difficult to establish this hypothesis at a fully rigorous empirical level. But policy makers are frequently (always?) in the position of having to make decisions without the economics profession having reached a full consensus. So I list here seven possible policies for raising the rate of productivity growth which merit consideration if the hypothesis is accepted.

### **Do Nothing**

Doing nothing is a possible response. Immigration after all raises GDP and a larger GDP enables the UK to have larger armed forces and to play a bigger role in world affairs ("punching above our weight").

However at the moment the British people show little appetite for any more foreign interventions, even so-called humanitarian ones. They seem much more concerned with raising living standards, which means raising productivity. Hence doing nothing is not a democratic response, provided that there is some alternative with a chance of success.

### **Wait for the World Economy to Revive**

When work on this project began there was much optimism amongst international organizations and commentators about growth prospects in Western countries, particularly in Europe. More recently (March 2019) opinion has become more pessimistic. So these earlier hopes may turn out to be misplaced or exaggerated as have others before them. Of course if we wait long enough and growth in China and the rest of Asia continues at its

present rate, then eventually this will drag Europe out of its current stagnation. But this is clearly not a riskless strategy.

### **Revive the World Economy**

According to the estimates in Table 3, columns (3) and (4), raising the growth rate of demand for UK exports by 1 percentage point would raise productivity growth by between 0.87 and 1.27 per cent per year. The problem here is that it is not clear what policy tools are available to achieve this. What the UK needs is a rise in demand for exports which will in turn lead to a revival of investment, with the growth of labour supply held at something like its current rate or below. So just “ending austerity” in the UK will not do the trick. The effect would be just to worsen further the balance of trade, increase debt, and possibly raise inflation above target. The benefit of higher UK imports would spill over to our suppliers but the consequent second round effect on UK exports would be minimal. One theoretical possibility is a coordinated fiscal and/or monetary expansion across the Western world, combined with incentives to raise investment. To state it in these terms merely emphasises how implausible such a policy sounds. But it is possible that a single, large country or a bloc of smaller ones could adopt

such policies in an uncoordinated way, which might have something of the desired effect.

### **Adopt the European Social Model**

The aim here would be to make inward migration unattractive to potential migrants (whether from the EU or elsewhere) by setting wages and other conditions at levels which lower the demand for labour, via dialogue between the social partners. This is a very unattractive alternative. First, higher wages would attract more migrants so the policy would have to incorporate mechanisms to discriminate in favour of natives (“British jobs for British workers”). Second, in practice the European Social Model (at least as practiced outside the Nordic countries) discriminates against the disadvantaged among the native population: consider for example the very high unemployment and low employment rates in the Parisian banlieues. Third, the flexible labour market has arguably been at the root of the UK’s success prior to the Great Recession (Aghion *et al.*, 2013; Oulton, 2016a). To revert to something like the labour market institutions of the pre-Thatcher era would be a very retrograde step.

### **Restructure UK Trade Towards Faster Growing Areas**

There are no doubt numerous mi-

cro interventions which could help in this aim. And Brexit may well provide a considerable negative incentive for firms to develop new markets outside the EU, helped by new trade deals. How much effect such policies can be expected to have remains controversial.

### **New Incentives for Investment**

A policy which the UK could adopt on its own is to give radical new incentives for investment, for example allowing full expensing of all types of investment in the year in which they are made (100 per cent depreciation for tax purposes). This could even be accompanied by an increase in corporation tax. The motivation for an increase is that a low tax rate reduces the incentive to invest since it reduces the value of existing depreciation allowances. A complementary policy which would also encourage private investment is an expansion of public capital spending on infrastructure and R&D.

### **Control Immigration**

According to the estimates in Table 3, columns (3) and (4), reducing the growth rate of labour by 1 percentage point would raise productivity growth by between 0.43 and 0.51 per cent per year. Assuming Brexit occurs on the scheduled date at the end of October 2019 free movement

of labour from the EU can come to an end (at least after the transition period has expired, supposedly at the end of 2020) but as emphasised earlier migrants from the EU constitute less than half the total foreign-born stock.

In theory it should have been easy to reduce migration from the rest of the world, which after all has been the stated policy of the government since 2010, but in practice this has proved not to be the case; since 2010 and up to mid-2017 EU-born workers rose by a million while non-EU ones rose by “only” 700 thousand (Table 1). Perhaps there are countervailing pressures, either from business interests or from the ethnic minority communities already settled here, which make it difficult.

Nevertheless if the basic hypothesis of this article is accepted, then the case for an immigration policy which responds to the needs of the economy is a strong one. The ten years of stagnating productivity could have been avoided had an “emergency brake” on immigration (from all sources) been imposed. This does not mean no immigrants at all. Rather it suggests varying the total in accordance with the state of the economy and severely limiting unskilled immigration. The examples of Canada and Australia both of whom ban unskilled immigrants (except under humanitarian and family reunion programmes)

suggest that such a policy is perfectly feasible.<sup>11</sup>

Finally, none of the discussion above should be taken to imply that export demand or immigration are the only things holding back productivity growth in the UK and preventing us from closing the long-standing productivity gap between the UK and other developed countries like France, Germany and the US.. To list just a few widely-cited and discussed problems, the low investment ratio, particularly in R&D, inadequate infrastructure, and poor levels of intermediate and even basic skills have contributed. All these issues are to be addressed we must hope by the government's new Industrial Strategy (HM Government, 2017).

## References

- Acemoglu, Daron (2009) *Introduction to Modern Economic Growth*, Princeton and Oxford: Princeton University Press.
- Aghion, Philippe, Tim Besley, John Browne, Francesco Caselli, Richard Lambert, Rachel Lomax, Nick Stern and John Van Reenen (2013) "Investing for prosperity: skills, infrastructure and innovation," in Tim Besley and John Van Reenen eds., *Investing for Prosperity*, pp. 1-50, London: LSE Academic Publishing.
- Barnett, Alina, Sandra Batten, Adrian Chiu, Jeremy Franklin and Maria Sebasti-Barriel (2014) "The UK productivity puzzle," *Quarterly Bulletin*, Vol 54, No. 2, Bank of England.
- Barro, Robert J. and Xavier Sala-i-Martin (2004) *Economic Growth*, Second edition, Cambridge, MA: The MIT Press.
- Borjas, George J. (2014) *Immigration Economics*, Cambridge, MA: Harvard University Press.
- Borjas, George J. (2015) "The wage impact of the Marielitos," NBER Working Paper, No. 21588.
- Borjas, George J. (2016) "The wage impact of the Marielitos: additional evidence," NBER Working Paper, No. 21850.
- Byrne, D.M., J.G. Fernald and M.B. Reinsdorf (2016) "Does the United States have a productivity slowdown or a measurement problem?," *Brookings Papers on Economic Activity*, Spring, pp. 109-174.
- Card, David (1990) "The impact of the Mariel boatlift on the Miami labor market," *Industrial and Labor Relations Review*, Vol. 43, No. 2. (January), pp. 245-257.
- Carlin, Wendy and David Soskice (2018) "Stagnant productivity and low unemployment: stuck in a Keynesian equilibrium," *Oxford Review of Economic Policy*, Vol. 34, No. 1-2, pp. 169-194.
- Carlin, Wendy, Anke Hassel, Andrew Martin and David Soskice (2014) "The transformation of the German social model," in Jon Erik Dlvik and Andrew Martin (eds.) *European Social Models From Crisis to Crisis: Employment and Inequality in the Era of Monetary Integration*, Oxford: Oxford University Press.
- Financial Times (2017) "Poland warns migrant worker curbs will hit competitiveness," 4th December.
- Goodhart, David (2013) *The British Dream: Successes and Failures of Post-war Immigration*, London: Atlantic Books.
- Gordon, Robert J. (2000) "Interpreting the 'one big wave' in U.S. long-term productivity growth," in Bart van Ark, Simon Kuipers, and Gerard Kuper (eds.), *Productivity, Technology and Economic Growth*, pp. 19-65, Boston: Kluwer Publishers.
- HM Government (2017) "Industrial Strategy: Building a Britain Fit for the Future," Cm 9528.
- Jones, Charles I. (2002) *Introduction to Economic Growth*, 2nd edition, New York: W.W. Norton and Company, Inc.

---

<sup>11</sup> The policies discussed here are focused entirely on productivity effects. There are many other social and economic consequences of large-scale immigration which are beyond the scope of this article. For discussion of the economic, demographic and fiscal implications see Rowthorn (2015) and for the wider social implications see Goodhart (2013).

- Kuczera, Malgorzata, Simon Field and Hendrickje Catriona Windrisch (2016) "Building skills for all: a review of England," *OECD Skills Studies*, Paris: OECD.
- Mankiw, N. Gregory, David Romer and David N. Weil (1992) "A contribution to the empirics of economic growth," *Quarterly Journal of Economics*, vol. 107, No. 2, May, pp. 407-437.
- Martin, Bill, and Robert Rowthorn. (2012) "Is the British economy supply constrained II? a renewed critique of productivity pessimism," Centre for Business Research, University of Cambridge.
- Nickell, Stephen, and Jumana Saleheen (2008) "The impact of immigration on occupational wages: evidence from Britain," Federal Reserve Bank of Boston, Working Paper No. 08-6.
- OECD (2016) "The economic consequences of Brexit. a taxing decision," Economic Policy paper, no. 16 (April).
- Oulton, Nicholas (2016a) "Prospects for UK growth in the aftermath of the financial crisis," in Jagjit Chadha, Alec Chrystal, Joseph Pearlman, Peter Smith, and Stephen Wright (eds.) *The UK Economy in the Long Expansion and its Aftermath*, Cambridge: Cambridge University Press.
- Oulton, Nicholas and Maria Sebastiá-Barriel (2017) "Effects of financial crises on productivity, capital and employment," *Review of Income and Wealth*, Series 63, Supplement 1 (February), S90-S112.
- Pessoa, João Paolo and John Van Reenen (2015) "The UK productivity and jobs puzzle: does the answer lie in wage flexibility?," *Economic Journal*, Vol. 124 (May), pp. 433-452.
- Riley, Rebecca, Chiara Rosazza-Bondibene and Garry Young (2017) "The financial crisis, bank lending and UK productivity: sectoral and firm-level evidence," in *The Financial Crisis: Virtual Special Issue, National Institute Economic Review*, <http://journals.sagepub.com/page/ner/collections/financial-crisis>.
- Rowthorn, Robert (2015) *The Costs and Benefits of Large-scale Immigration: Exploring the Economic and Demographic Consequences for the UK*, London: Civitas.
- Sapir, André (2005) *Globalisation and the Reform of European Social Models*, Brussels: Bruegel [<http://www.bruegel.org>].
- Tenreyro, Silvana (2018) "The fall in productivity growth: causes and implications," Speech, [www.bankofengland.co.uk/speeches](http://www.bankofengland.co.uk/speeches).
- Thirlwall, A.P. (1979) "The balance of payments constraint as an explanation of international growth rate differences," *Banca Nazionale del Lavoro Quarterly Review*, Vol. 32, No. 128 (March), pp. 45-53.