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Structural change, aggregate demand and employment dynamics in the OECD, 1970–2010

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ABSTRACT

The paper combines Baumol's model of structural change with a model of aggregate demand growth in the Keynesian–Kaleckian tradition to predict the dynamics of aggregate employment. The model for the demand regime is estimated with – and Baumol's model for the productivity regime is calibrated on – OECD data. The trajectory for employment predicted by the combination of the two models tracks the actual employment dynamics in the OECD over the period 1970–2010 remarkably well.

1. Introduction

Baumol (1967) has introduced differential productivity growth as a cause for structural change.[1] In a nutshell, the story of his model goes like this. Productivity growth is higher in the 'progressive' (secondary) than in the 'nonprogressive' – or 'stagnant' – (tertiary) sector of the economy, but wages grow more or less the same in both sectors. Therefore, unit costs and also prices rise much faster in the tertiary sector than in the secondary. Demand for certain services, like health care and education for instance, is hardly price-elastic, hence consumers are willing to pay the higher prices. Therefore, even if the two sectors keep their proportion in terms of real production, an ever higher share of total expenditures will be channelled into the stagnant sector. This phenomenon is known as the 'cost disease'.[2] Also, since aggregate productivity growth is a weighted average of the sectoral productivity growth rates with the weights provided by the nominal value added shares, the aggregate productivity growth rate will decline over time as the industries with low productivity growth receive an ever-increasing weight.

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[1] See Schettkat and Yocarini (2006) for a review of the literature on structural change.

[2] A referee pointed out to me that Baumol was not the originator of the idea of a 'cost disease' due to slow productivity growth in services. It was already known at the time that the relative cost of public services was rising because of slow or non-existent productivity growth. The structural implications of this were discussed by Lengellé (1966).

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The growth pessimism immanent in Baumols's model has always been more controversial than the proposition of the 'cost disease'. Oulton (2001), for instance, was able to show that if the tertiary sector produces intermediate services instead of services to the final consumer, the aggregate productivity (and hence the GDP) growth rate may rise over time rather than fall. Sasaki (2007), however, vindicated Baumol's result of a tendency for the economy to stagnate, showing that the GDP growth rate will decline in the long run as long as *some* services are produced for final demand. Ngai and Pissarides (2007), on the other hand, demonstrated that when capital is added to Baumol's model as an additional factor of production, the economy can reach a balanced growth path in the aggregate under certain circumstances while still exhibiting supply-side driven structural change due to differences in (exogenous) total factor productivity growth across sectors and a low elasticity of substitution across final goods. Against the background of this theoretical debate, recent *empirical* studies have found evidence in favour of Baumol's model: structural change seems to cause aggregate productivity growth to decline, see Nordhaus (2008), Hartwig (2011, 2012).

Baumol's model has been criticised for being relatively mute on the demand side of the economy.[3] The lack of focus on the demand side is explained by the fact that Baumol's model is a neoclassical model: it posits Say's Law and full employment. Notarangelo (1999) has augmented Baumol's model in an important way by introducing autonomous demand growth. Notarangelo models productivity growth as in Baumol (1967), but drops the assumption of full employment. Employment growth is driven by the difference between autonomous demand growth and productivity growth. Unemployment then becomes possible due to deficient demand. Ultimately, however, as demand growth is assumed to be constant, and productivity growth tends towards zero, the system tends towards full employment.

In this paper, I go beyond Notarangelo (1999) in *modelling* demand growth instead of assuming a constant rate. For this task, I draw on a model in the Keynesian–Kaleckian tradition: the Bhaduri and Marglin (1990) model. This model for the demand regime will be estimated with OECD panel data and combined with Baumol's model for aggregate productivity growth, which will likewise be calibrated on OECD data. From the combination of the two models, a prediction for the employment trajectory emerges.[4] This trajectory will be compared with the actual employment dynamics in the OECD over the period 1970–2010. The basic question is whether the 'demand-augmented' Baumol model can explain the dynamics of employment in the real world. It will be seen that it can.

[3] See Harvey (1998) for a discussion of this critique. The demand side is not completely out of the picture, however, as Baumol's model builds on certain – although admittedly not precisely stated – assumptions about the price elasticity of demand (see Section 2).

[4] 'Prediction' here does not mean that the model delivers forecasts out of sample. It means that the model makes a statement how the employment trajectory should have looked like over the period under investigation.

The paper is structured as follows. The next section introduces the theory: Baumol's model of 'unbalanced growth', Notarangelo's extension of that model and the Bhaduri–Marglin model for the demand regime. Section 3 explains the empirical methodology, and Section 4 presents the results. Section 5 concludes.

2. Theory

2.1. Baumol's model of 'unbalanced growth'

Baumol presents a model in which the economy is divided into a 'progressive' and a 'nonprogressive' – or 'stagnant' – sector. For Baumol, regular productivity growth is the result of technological innovation which manifests itself in new capital goods. Capital goods are also the source of economies of scale, being another source of productivity growth. Regular productivity growth is thus defined to depend on certain physico-technological requirements which prevail primarily in the manufacturing industries. In the service industries, Baumol argues, physical capital cannot be employed on a large scale. He cites repeatedly education and health care as examples for industries that will inevitably remain highly labour-intensive. Such industries he relegates to the nonprogressive sector. Baumol does not claim that increases in labour productivity are impossible in the nonprogressive sector, only that this sector comprises "activities which, by their very nature, permit only sporadic increases in productivity" (Baumol, 1967, p. 416). In other words, productivity growth in the services sector (s) may be positive, but it is smaller than productivity growth in the manufacturing sector (r). Finally, Baumol assumes that wages grow in both sectors at a rate set by the productivity growth in the progressive sector. Formally, this can be stated as:

$$Y_{1t} = aL_{1t}e^{st} \tag{1}$$

$$Y_{2t} = bL_{2t}e^{rt}, \text{ with } \quad r > s \geq 0 \tag{2}$$

$$W_t = We^{rt} \tag{3}$$

with Y_1 and Y_2 as output in the two sectors at time t, L_1 and L_2 as quantities of labour employed in the two sectors, s and r as the (constant) growth rates of labour productivity in the nonprogressive sector (1) and the progressive sector (2), respectively, W as the uniform wage rate, and a and b as constants.

This simple model has a couple of interesting implications which Baumol draws out. From (1) to (3), we obtain

$$C_{1t} = \frac{W_t L_{1t}}{Y_{1t}} = \frac{We^{rt}L_{1t}}{aL_{1t}e^{st}} = \frac{We^{(r-s)t}}{a} \tag{4}$$

$$C_{2t} = \frac{W_t L_{2t}}{Y_{2t}} = \frac{We^{rt}L_{2t}}{bL_{2t}e^{rt}} = \frac{W}{b} \tag{5}$$

That is, costs per unit of output in the stagnant sector tend towards infinity while they stay constant in the progressive sector. Since relative costs also tend towards infinity ($C_{1t}/C_{2t} = be^{(r-s)t}/a$), the stagnant sector will vanish under 'normal' circumstances – that is, when prices rise in proportion to costs and when demand is price-elastic. Yet, parts of the stagnant sector produce necessities for which