Not Evidence for Baumol's Cost Disease. A Reply to Atanda and Reed (International Journal for Re-Views in Empirical Economics, 2020)

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Data Availability: The code to reproduce the results of Atanda and Reed's replication (2020) can be downloaded at IREE's data archive (DOI: 10.15456/iree.2019129.193231).

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1 Introduction

In my 2008 *Journal of Health Economics* article (Hartwig 2008), I suggested testing whether Baumol's Cost Disease (BCD) affects health spending in OECD countries by regressing the growth in health care expenditure (HCE) on the growth of what I called the 'Baumol variable'. I found a coefficient of around +1 on the 'Baumol variable' which was statistically significant at the 1% level (see Table 2 in my article). I defined the 'Baumol variable' as [nominal wage growth – productivity growth] or, alternatively, as [nominal wage growth – real GDP growth + employment growth]. As a preliminary step, I regressed HCE growth on nominal wage growth, real GDP growth and employment growth separately and found coefficients $C(1)$, $C(2)$ and $C(3)$, respectively, on the three explanatory variables. I then tested whether $C(1) - C(2) + C(3) = 0$. Since the test failed to reject the hypothesis (see Table 1 in my article), I claimed that it was 'legitimate' to combine the three explanatory variables into one, the 'Baumol variable'.

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2 Discussion

Atanda and Reed's (2020) objection is based on mathematical reasoning. If my regression equation was:

$$d\log(HCE) = \alpha_0 + \alpha_1 Baumol + \epsilon, \text{it follows that} \quad (1)$$

$$d\log(HCE) = \alpha_0 + \alpha_1(\textit{nominal wage growth} - \textit{real GDP growth} + \textit{employment growth}) + \epsilon, \quad (2)$$

and also

$$d\log(HCE) = \alpha_0 + \alpha_1 \textit{nominal wage growth} - \alpha_1 \textit{real GDP growth} + \alpha_1 \textit{employment growth} + \epsilon, \quad (3)$$

So the right hypothesis to test was not $C(1) - C(2) + C(3) = 0$, but $C(1) = -C(2) = C(3)$. If a Wald test rejects this hypothesis – as it does, as Atanda and Reed show – then it follows that the 'Baumol variable' cannot be constructed; and the whole argument in Hartwig (2008), which relies on this variable, breaks down.

Atanda and Reed (2020) are right that there is a mistake on my part involved here. However, the mistake is not what they claim it to be, i.e. that I 'test the wrong hypothesis'. My real mistake was to claim that it was (only) 'legitimate' to combine the three explanatory variables into one because a Wald test failed to reject the hypothesis that their coefficients are subject to a certain linear restriction. In truth, it is 'legitimate' to use the combined variable no matter what linear restrictions their coefficients are subject to when used as explanatory variables separately.

What I called the 'Baumol variable' is nothing else but the growth rate of nominal unit labor cost (NULC). Of course, everybody is perfectly entitled to download cross-country and/or time series data on NULC from an appropriate database and to use it in empirical analysis.[1] Numerous researchers have done so (see Decramer et al. 2014, Böing and Stadtmann 2016, Fedderke and Liu 2018 for some recent studies). What Atanda and Reed's critique amounts to is to demand of these researchers (and of me) to start by testing the three constituent parts of NULC (nominal wage, real GDP, employment) separately. Only if it can be shown that in such a regression these three variables have the same coefficient in absolute value are we entitled to proceed to combine them into, and use, NULC. Otherwise, Atanda and Reed's argument implies that NULC does not exit. Of course it does.

The problem behind Atanda and Reed's reasoning is that it confuses a mathematical/deterministic model with an empirical/stochastic model. The coefficients from two differently specified empirical models, like models (1) and (3) above, are disparate and irreducible to each other. Hence, instead of 'α_1' in (3), it should read 'β_1', 'β_2' and 'β_3'. Each explanatory variable in (3) has its own elasticity. These are neither robust to the inclusion of additional regressors nor need they be identical to the coefficient on NULC growth in (1).

I must take some blame for Atanda and Reed's mistake – which consists of treating my wrong claim mentioned above as if it were true – because I advocated such a 'two stage' approach myself

[1] See for instance https://ec.europa.eu/eurostat/web/products-datasets/product?code=tipslm40.

in Hartwig (2008). That was just a detour, however, and totally nonessential for the rest of my paper. I could have – and with hindsight, I should have – started with the results in Table 2 and move on from there as I did.

My Table 2 reports results for estimating Equation (1) above. I find a positive and significant value for α_1, and Atanda and Reed (2020) were able to replicate this result. My Table 1 reports results for estimating Equation (3) above, only that it should read 'β_1', 'β_2' and 'β_3' instead of 'α_1'. Atanda and Reed (2020) were able to replicate these results also. My Tables 1 and 2 test different hypotheses, which have nothing to do with each other. Now, Atanda and Reed (2020), in a new section (5) which was not part of earlier versions I had the pleasure to review, seem to imply that if both sets of hypotheses cannot be rejected, then rejection of the hypothesis $C(1) = -C(2) = C(3)$ in Table 1 somehow disproves BCD because "(i)t shouldn't matter whether the reason there is a surplus of wages over productivity is because wages are 'too high', or productivity is 'too low'" (Atanda and Reed, 2020, p. 6). This is not correct. Since both sets of hypotheses have nothing to do with each other, Table 1 disproves nothing w.r.t Table 2. NULC growth equals wage growth in excess of productivity growth. "Baumol's model implies that wage increases in excess of labor productivity growth are responsible for the rise in health expenditures", as Atanda and Reed (2020, p. 4) admit. My Table 2 shows that this in fact the case and therefore produces strong evidence in favor of BCD.

Further down in Hartwig (2008), I deflated the explanatory variable NULC by the GDP deflator in order to control for purely monetary changes. This turns NULC into real unit labor cost (RULC). RULC, which is not an object of Atanda and Reed's scrutiny, is the preferred explanatory variable in Hartwig (2008) and in the literature that has followed up on that article (see Bates and Santerre 2013, Medeiros and Schwierz 2013, Hartwig and Sturm 2014, Colombier 2017 and, most recently, Tian et al. 2018 and Bellido et al. 2018). This literature thoroughly confirms a (more or less strong) effect of RULC growth on HCE growth.[2] Following Atanda and Reed's logic, growth in the price level would also have to have the same coefficient in absolute value as nominal wage growth, real GDP growth and employment growth in an augmented model (3). If, on the other hand, a Wald test rejects the hypothesis $C(1) = C(2) = -C(3) = -(C4)$,[3] then RULC growth cannot be 'validly' constructed or used in econometric analyses. RULC, of course, is nothing but the wage share in nominal GDP. If Atanda and Reed want to convince us that the wage share (or its growth rate) can only be 'validly' constructed if a Wald test fails to reject the hypothesis mentioned above, they should present more evidence.[4]

[2] Only Atanda et al. (2018) could not find evidence in favor of BCD. Their paper is a clear outlier in this area of research.

[3] $C(1)$: coefficient on nominal wage growth, $C(2)$: coefficient on employment growth, $C(3)$: coefficient on price level growth, $C(4)$: coefficient on real GDP growth.

[4] Note that RULC growth is the decisive explanatory variable tested in the post Keynesian/Kaleckian literature on 'wage-led' versus 'profit-led' growth. The journal Review of Keynesian Economics devoted four special issues in a row to this (mostly empirical) literature during 2016/17. This literature would be meaningless if RULC growth could not be 'validly' constructed.

References

Atanda, Akinwande, Andrea K. Menclova and W. Robert Reed (2018). "Is health care infected by Baumol's cost disease? Test of a new model." *Health Economics* 27(5): 832–849. DOI: 10.1002/hec.3641.

Atanda, Akinwande and W. Robert Reed (2018). "Not Evidence of Baumol's Cost Disease. A replication study of Hartwig (Journal of Health Economics, 2008)" *International Journal for ReViews in Empirical Economics* 4(1): 1–10. DOI: 10.18718/81781.16.

Bates, Laurie J. and Rexford E. Santerre (2013). "Does the US health care sector suffer from Baumol's cost disease? Evidence from the 50 states." *Journal of Health Economics* 32(2): 386–391. DOI: 10.1016/j.jhealeco.2012.12.003.

Bellido, Héctor, Lorena Olmos and Juan A. Román-Aso (2018). "Do political factors influence public health expenditures? Evidence pre- and post-great recession." *The European Journal of Health Economics* 20(3): 455–474. DOI: 10.1007/s10198-018-1010-2.

Böing, Tobias and Georg Stadtmann (2016). "Competitiveness and current account adjustments in the Euro area." *European University Viadrina Frankfurt (Oder), Department of Business Administration and Economics, Discussion Paper No.* 382. URL: hdl.handle.net/10419/129884.

Colombier, Carsten. (2017). "Drivers of health-care expenditure: what role does Baumol's Cost Disease play?" *Social Science Quarterly* 95(5): 1603–1621. DOI: 10.1111/ssqu.12384.

Decramer, Stefaan, Catherine Fuss and Jozef Konings (2014). "How do Exporters React to Changes in Cost Competitiveness?" *ECB Working Paper* No. 1752, Frankfurt am Main. URL: https://ssrn.com/abstract=2535748.

Fedderke, Johannes and Yang Liu (2018). "Inflation in South Africa: An Assessment of Alternative Inflation Models" *South African Journal of Economics* 86(2): 197–230. DOI: 10.1111/saje.12192.

Hartwig, Jochen (2008). "What drives health care expenditure?—Baumol's model of 'unbalanced growth' revisited." *Journal of Health Economics* 27(3): 603–623. DOI: 10.1016/j.jhealeco.2007.05.006.

Hartwig, Jochen and Jan-Egbert Sturm (2014). "Robust determinants of health care expenditure growth." *Applied Economics* 46(36): 4455–4474. DOI: 10.1080/00036846.2014.964829.

Medeiros, João and Christoph Schwierz (2013). "Estimating the drivers and projecting long-term public health expenditure in the European Union: Baumol's" cost disease" revisited." *European Commission Directorate-General for Economic and Financial Affairs, Economic Papers* 507. URL: ec.europa.eu/economy_finance/publications/economic_paper/2013/ecp507_en.htm.

Tian, Fengping, Jiti Gao and Ke Yang (2018). "A quantile regression approach to panel data analysis of health-care expenditure in Organisation for Economic Co-operation and Development countries'.' *Health Economics* 27(12): 1921–1944. DOI: 10.1002/hec.3811.