Labor costs and the size of government

François Facchini[†] Mickael Melki[‡] Andrew Pickering[♯]

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[†]University of Paris-Sud, Faculté Jean Monnet.

[‡]Centre d'Economie de la Sorbonne. Université Paris 1, Panthéon Sorbonne.

[♯]Corresponding Author. Department of Economics and Related Studies, University of York, York, YO10 5DD, UK. E-mail: Andrew Pickering@york.ac.uk

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Abstract

'Cost disease' is often used, following Baumol (1967), to explain growth in the share of government in the economy. Given that labor represents the primary component of costs, an implication of this argument is that the size of government depends positively on the labor share. Empirically there is a strong statistical association between labor costs and total government size in the OECD. In contrast, transfer spending exhibits no relationship with the labor share. It is only the labor-intensive elements of government which increase in relative expenditure terms with the labor-share. The evidence is consistent with the idea that recent declines in labor costs have contributed to the slowdown in the growth of government witnessed in much of the post-war era.

JEL Codes: H10, H50, O41

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1 Introduction

Explanations of the size of government have historically focussed on its growth. However, as shown in figure 1, the share of government as a percentage of GDP in the OECD area has if anything declined in recent years. The 10 year average up until 2007 was lower than that up to 1998 in all but three of these countries.[1] Notwithstanding important cyclical features in many of the countries it is remarkable how growth in relative government size was the norm from the early 1960s to around the mid-1980s, and thereafter, more-or-less universally ceased - all be it at different levels in different countries.

The literature distinguishes between demand- and supply-side explanations for the growth of government.[2] Pickering and Rockey (2011) attribute the increases and the divergence in government size observed in the earlier part of the sample as due, in important part, to demand-side factors. The income elasticity of demand for public services is argued to exceed unity, as in Wagner's (1893) law, once the median voter has reached a certain level of income, and this income elasticity differs with ideology. However in their theory government still continues to grow with income, converging to a steady state that depends on ideology. This theory successfully explains the growth and divergence observed in the data up until 1998, but the discontinuous nature of the dependent variable noted above suggests other factors at work.[3]

[1] These are Denmark, Iceland and Switzerland. The data are truncated at 2007 because after this date financial bail-outs and fiscal stimuli have led to significant increases in total outlays in many countries. An important question for posterity will concern the legacy of these shocks for government size.

[2] Holsey and Borcherding (1997), Lybeck (1988) and Shelton (2007) survey the extensive literature on the size of government.

[3] Other demand side explanations include demographic change (e.g. see Sanz and Velázquez, 2007), and the median voter's relative income (Meltzer and Richard, 1981). However, again in both cases data would point towards ongoing increases rather than decreases in relative government size. In the former instance, OECD populations have continued to age, and in the instance of the Meltzer and Richard mechanism,

This paper argues that supply side factors, in particular labor costs, are also important, and thus proposes a new explanation that can help to account for the more recent contractions in government size. The seminal supply-side explanation of government growth is Baumol's (1967) cost disease. This follows from the twin assumptions of inelastic demand for government services and economic growth driven by the private sector.[4] Costs are pushed up because of rising wages and stagnant productivity in the public sector, and the relative size of government grows. However, in recent years labor's income share has declined in many countries.[5] It seems plausible that a declining labor share implies lower production costs in the economy.[6] Arguably output in many areas of the public sector is labor-intensive to the extent that labor *is* output in some instances, for example in nursing and one-to-one teaching, so if labor costs exogenously fall then so does government size when demand is inelastic. Nonetheless it should be acknowledged that whilst a lower labor share is not a *cure* for cost disease (ultimately this depends on the sources of technological progress in the economy), it does potentially represent a *palliative*.[7] Holding technology constant, then falling costs, under circumstances of inelastic demand, means a declining expenditure share in the economy. Furthermore, the larger government is, as in regimes that may be classified as left-wing, the greater the sensitivity of government size to any exogenous movements in

measured inequality in the before-tax income distribution has increased in many countries. Both trends would point to increased demand for redistribution rather than government shinkage.

[4]Borcherding (1985) estimates that 31% of the observed growth of total government size in the U.S. between 1902 and 1978 is due to the Baumol effect. Borcherding et al (2004) and Sanz and Velázquez (2007) find similar evidence in the panel of OECD countries.

[5]This phenomenon has not gone unnoticed in the academic literature, e.g. see Azmat et al (2012).

[6]The New Keynesian macroeconomics literature, exemplified in Gali and Gertler (1999), also uses the labor share as a measure of real marginal production costs.

[7]If productivity growth is driven by the private sector alone, then a lower labor share could offset rising relative costs of the public sector, but clearly the labor share cannot fall indefinitely.

the overall labor share of income.

In the theory below it is shown that in the Baumolian setting, wherein productivity growth is driven only by the private sector, the impact of the labor share on government size is predicted to increase as the economy grows, because a larger portion of the workforce gets subsumed into the public sector over time under conditions of inelastic demand. However, in reality it is not clear that productivity improvements are exclusive to the private sector. The rapid advances in information technology and communications have benefited all sectors of the economy. Innovations in the defense sector have in part led to radical reductions in manpower, arguably without loss of effect.[8] Information technology has also arguably underpinned systemic change in public education.[9] Furthermore, recent research laments a slowing down of private sector innovation - for example Cowen (2011) and Gordon (2012). It therefore seems possible that public sector productivity growth could even outstrip that in the private sector. In this environment, economic growth leads to small government under conditions of inelastic demand because a smaller workforce is required to deliver given services. The testable implication here is that the impact of the labor share on the size of government falls rather than increases with income.

These hypotheses are investigated using a panel of OECD countries, augmenting the empirical analysis of Pickering and Rockey (2011) with data up until 2007 and including the labor share as a potential explanatory variable and using a wide range of econometric specifications. We readily acknowledge that satisfactory identification of a causal relation-

[8] Of course it would be possible to take issue with this statement at several levels, but the point is that technological change has at least changed the nature of the activities of the military.

[9] In the UK, the average student-staff ratio in higher education has increased from below 8 in the 1950s to 17 in 2012. Again whether or not these changes are driven by technology or politics is debateable, but the numbers are at least suggestive that productivity is not a given constant.

ship between the labor share and government size is difficult given the myriad underlying drivers of both variables. The labor share and the size of government are both endogenous macroeconomic phenomena. As we discuss below there are many potential mechanisms linking one to the other: there may be reverse causality from government size to labor share, and indeed there may be exogenous third driving variables (for example technology and/or globalization) that drive both.

In order to address the endogeneity problem in the labor share we use the creation of the 'Schengen area' in Europe as a source of exogenous variation in the labor share. The Schengen area was established in 1995, entailing the dismantling of border contols between certain European nations.[10] This has been documented by Zimmerman (1995) as designed to simultaneously increase intra-EU migration, whilst reducing inward-migration from outside the area. The creation of the Schengen area undoubtedly has had important implications for the labor market, and labor mobility within Europe. A larger, and more mobile workforce plausibly increases the bargaining power of employers within many countries for the simple reason that they have a larger pool of workers from which to draw on. On the other hand, the raised external barriers could reduce the potential labor supply, raising labor bargaining power. But in either case the creation of the single market represents a plausible source of exogenous variation in the labor share. The average labor share in the EU countries decreased from 74.5% in the 1970s to 65.8% in the 2000s, whilst in non-EU countries it decreased from 68.1% to 61.9%. The reduction in the EU area was by 8.7% and in non-EU areas by 6.2%. It seems likely that features specific to the EU, including the creation of the Schengen area

[10] In particular within the sample of countries examined in this paper, Austria, Belgium, Denmark, Finland, France, Germany, Iceland, Italy, the Netherlands, Norway Sweden and Switzerland are all part of the Schengen area.

plausibly explain the greater reduction observed in the EU areas. Furthermore, the creation of the European single market is in large part a consequence of geography and history, hence may be treated as an exogenous event, one with significant repercussions for the labor market. In addition to Schengen area membership, we also use the lag of the labor share as an additional instrument.[11] This captures the predetermined element of the labor share. Whilst there may be reasons to expect that the current government size affects the current labor share, it is harder to argue that current government size will affect the lagged labor share data. Furthermore, the use of two instruments permits over-identification tests which can shed light on the validity of the relevant exclusion restrictions, and hence the validity of the instruments used.

We also estimate the relationship using both annual data following previous work, and five year averages of the data. One important endogeneity problem arises from spurious correlation over the business cycle: both the labor share and government size plausibly move with the cycle, and the use of averages over 5 year periods should substantially remove this problem. Furthermore, in the context of our IV strategy it is harder to argue that the lagged labor share will be affected by the current government size when using five year averages.

In the empirical analysis the size of the government is consistently found to be positively associated with the labor share of income. We also find that this relationship is stronger the more left-wing the political environment. However, contrary to the cost-disease explanation of government growth the impact of the labor share is not found to depend on income levels. These results are robust across the wide set of different econometric specifications employed. In particular, both when the labor share is instrumented, and when the data are averaged

[11] Precedents where lagged regressors are used as instruments include Barro (2001) and Yogo (2004).

across five year intervals to eliminate cyclical variation, the results found using more basic techniques hold up.

A further test of the central theoretical prediction is provided by disaggregating total public expenditure. The main argument of the paper clearly should only apply to labor-intensive production sectors of government. However, a considerable portion of total government expenditure in the OECD sample consists of transfers. These expenditures (generally) do not require labor inputs, at least not to the same extent as produced public services. If the link between government size and the labor share is due to production costs, as proposed here, then the testable hypothesis is that there should not be a link between transfers and the labor share. Using the same econometric methods as used to analyze government size, we indeed find no statistical relationship between total expenditure on social benefits as a fraction of GDP and the labor share. The correlation with the labor share thus only applies to public sector production - that uses labor input, rather than transfer expenditures.

The next section revisits Baumol's (1967) model with the objective of deriving an explicit relationship between the relative size of government and the labor share. Section 3 contains the empirical work and section 4 concludes.

2 The Model

Following Baumol (1967) there are two sectors in the economy. Sector one is the public sector and sector two is the private sector. Formally:

$$Y_{1t} = aL_{1t}e^{r_1 t} \quad (1)$$

$$Y_{2t} = bL_{2t}e^{r_2 t} \quad (2)$$

where Y_{1t} and Y_{2t} are respectively output in the public and private sectors, L_{1t} and L_{2t} are the respective employment levels, a and b are exogenous parameters, r_1 and r_2 are exogenous productivity growth parameters, and t is a time index. Note that in Baumol's original paper $r_1 = 0$, though here for generality productivity growth may be higher in either sector. Costs depend only on wages, which following Baumol grow in accord with productivity in the private sector, hence

$$W_t = We^{r_2 t} \quad (3)$$

where W is a constant.

Baumol examines the evolution of an economy in which the relative outputs of the two sectors are maintained. Given (1) and (2) this means that

$$\left(\frac{b}{a}\right)\frac{Y_1}{Y_2} = \frac{L_{1t}e^{(r_1 - r_2)t}}{L_{2t}} = K$$

where K is constant and represents society's choice concerning the appropriate level of public

output relative to private output. Given these elements,

$$L_{1t} = \frac{LKe^{(r_2-r_1)t}}{1+Ke^{(r_2-r_1)t}} \tag{4}$$

$$L_{2t} = \frac{L}{1+Ke^{(r_2-r_1)t}} \tag{5}$$

where $L = L_1 + L_2$. As Baumol discusses, in the scenario where $r_1 = 0$, then the public sector gradually absorbs the labor force over time. In this instance equations (1-5) are simply a restatement of the same in Baumol (1967). However, if $r_1 > r_2$ then it is the private sector which grows in employment terms, and of course if $r_2 = r_1$ then the proportion of the workforce working in the public sector is constant and depends only on K.

The size of the government here is defined by total expenditure on production in the public sector relative to total output:

$$g_t = \frac{W_t L_{1t}}{I_t} \tag{6}$$

where following Baumol $I_t \equiv B_1 Y_{1t} + B_2 Y_{2t}$ is total GDP and B_1 and B_2 are weights. On the other hand the labor share is defined as

$$s_t = \frac{W_t L}{I_t}. \tag{7}$$

Substitution of (4) and (7) into (6) gives government size as a function of the labor share

$$g_t = \frac{s_t Ke^{(r_2-r_1)t}}{1+Ke^{(r_2-r_1)t}} \tag{8}$$

with the following concrete hypotheses:

1. The size of government is increasing in the labor share.

2. The sensitivity of government size to the labor share is increasing with leftist ideology (as proxied in the model by K).

3. (a) If $r_2 > r_1$ (the cost disease case) the sensitivity of government size to the labor share increases with the level of economic development (as proxied in the model by time). (b) If instead $r_2 < r_1$ then the sensitivity of the government size to the labor share decreases with the level of economic development.

Hypothesis 1 is a syllogism following from two premises. The first of these is that the labor share is representative of costs in the public sector. This follows clearly if we take the stark example that labor *is* output in the instance of public services like nursing and one-to-one teaching. But more generally the idea that the labor share denotes production costs is also widely used in modern macroeconomics. For example Galí and Gertler (1999) show that the New Keynesian Phillips Curve has price inflation depending on production costs rather than the output gap, and that production costs are structurally defined by the labor share of income. The second premise is price-inelastic demand. The source of the price inelasticity is an interesting question in its own right (though not the topic of this paper). Arguably it reflects tastes for public sector goods.[12] Most OECD countries adhere, albeit to varying degrees, to ideas of universalism in provision (especially of health and education),

[12] One perhaps should not rule out public choice issues here either. For example Buchanan and Tullock (1962, 1977) explain the rise of public spending by the voting power of bureaucrats. If the voting power of bureaucrats increases, then bureau wages relative to private sector wages may also increase.

and as such exhibit strong inertia in provision of these types of goods, at least in terms of volume. Empirically Borcherding (1985) and others have found demand in the OECD to be inelastic using public-sector price indices.[13]

Hypothesis 2 follows straightforwardly. When the public sector is relatively large, for instance in the case of Sweden, then the effect of a particular change in costs, represented by the labor share, on government size is increased. Note that hypotheses 1 and 2 both hold with or without cost disease. All that is required for these is that labor costs are an important component of total costs, and that demand for public sector output is price-inelastic. However, if it is also the case that the public sector is increasingly absorbing the workforce over time - due to Baumol's twin assumptions of inelastic demand *and* growth driven by the private sector (case 3(a): $r_2 > r_1$), then as the economy develops, and thus diverts more of its resources into the public sector, the impact of variation in costs on government size increases. If instead productivity growth in the public sector is greater than in the private sector (case 3(b): $r_2 < r_1$), then the impact of cost variation on government size falls with overall economic development.

Figure 2 embeds the impact of the labor share on government size in the diagrammatic analysis used by West (1991), Ferris and West (1996) and Winer et al (2008). In the diagram the y-axis denotes the relative price of government services, and the x-axis denotes relative output. There are two alternative demand curves (both considered in Baumol's original paper). A perfectly inelastic demand curve is given by D_{CRO} (demand with constant relative output), whilst demand under constant relative expenditure (D_{CRE}) implies constant unit

[13]Borcherding (1985), Borcherding et al (2004), Henrekson and Lybeck (1988), Ferris and West (1996) and Neck and Getzner (2007) all find demand for public services to be price-inelastic.

elasticity. Under D_{CRE}, nothing on the supply side matters: any cost change is reflected in a quantity change keeping the relative share of expenditure on government constant.[14] However, supply side explanations of the growth of government require that demand is at least to some extent inelastic (D_{CRO}).[15] At any point in time marginal production costs (of government-supplied goods) are denoted by a horizontal line, and which in general depend temporally on underlying productivity in the two sectors.[16] In the cost disease case ($r_2 > r_1$) then at low levels of technology the opportunity cost of public sector output is low (represented in the figure by MC_1) but as private-sector based innovation proceeds the relative cost of government increases (MC_2). Variation in the labor share of income causes fluctuations in costs, as denoted by the arrows in the figure. When the public sector employs an increasingly large portion of the workforce, then the impact of given fluctuations in the labor share of income has an increasingly large impact on government size when demand is inelastic (D_{CRO}). The labor share induced fluctuations around MC_2 are thus larger than those around MC_1. This argument is reversed in the case of $r_2 < r_1$, the marginal production costs of public sector output is now falling as technology progresses, and so fluctuations in the labor share have a smaller impact on government size.

Figure 2 also depicts the Kau and Rubin (1981, 2002) hypothesis that the relative size of government has increased because the social costs of tax collection have fallen over time. A benevolent government equates marginal benefits, given by demand which is to some

[14] Of course shifts in the demand curve, as expressed in Wagner's law or for other reasons, could even here explain government growth.

[15] Clearly D_{CRO} is an extreme case, but all of the arguments go through as long as the elasticity of demand is less than unity.

[16] Costs in the public sector are denoted $C_1 = W_t L_{1t} = P_t Y_t g_t$ given that $g_t = \frac{W_t L_{1t}}{P_t Y_t}$. Using (8) then $C_1 = P_t Y_t \frac{s_t K e^{(r_2 - r_1)t}}{1 + K e^{(r_2 - r_1)t}}$. Given $P_t = 1$ (with no loss of generality) then marginal costs are $\frac{dC_1}{dY_1} = \frac{s_t K e^{(r_2 - r_1)t}}{1 + K e^{(r_2 - r_1)t}}$.

degree elastic, and the full marginal (i.e. including both production and social) costs of government. A rightward shift of $MC + SC$ over time (depicted in the diagram as the shift from $MC_1 + SC_0$ to $MC_1 + SC_1$) therefore leads to larger government spending as long as demand is not perfectly inelastic. But note that if demand is at all inelastic, then the expenditure *share* of government is predicted to decline. Kau and Rubin (2002) and Winer et al (2008) find in particular that increased female participation in the labor force in the US led to greater government expenditure, and interpret this finding as due to reduced tax collection costs when a greater percentage of the population participates in the formal labor market.

The mechanism proposed here is simple, and novel. Given inelastic demand, expenditure on public services increases or falls when the cost of providing those services increases or falls. The contention of this paper is that falls in the labor share have played a part in explaining the absence of government growth observed in recent history. The next section turns to evidence.

3 Evidence

Pickering and Rockey (2011) (henceforth PR) analyze the growth of government in a panel of OECD countries using annual data over the period 1960-1998. The dependent variable is total government outlays as a percentage share of GDP, taken from the OECD Economic Outlook database. In the present paper these data are extended until 2007 (thereafter macroeconomic conditions take a substantial toll on outlays in many countries, hence 2008 and beyond are omitted from the analysis.) Figure 1 depicts these data, which as noted in the

introduction show an upward trend in all countries in the earlier years (though to differing extents), followed by stasis or even slight decline. This paper builds on the previous analysis by augmenting the PR specification with data for the labor share, and also extending the econometric analysis substantially to examine data measured by 5-year averages - to deal with potential co-cyclicality in the data, and also instrumental variables estimation to address the issue of endogeneity in the labor share. We also distinguish between produced government services - where workers are employed, and transfers. The latter should not be affected by changes in labor costs.

The labor share data are also taken from the OECD database and are presented in figure 3, displaying interesting and usable variation across and within countries. The mean value of the labor share data in this sample is 0.69, not far from the two thirds rule of thumb used as standard in macroeconomic calibration. There is nonetheless a notable decline through the sample period in many countries in recent years. In all countries except Iceland and Switzerland the 10 year average to 1990 exceeds the 10 year average to 2007. The argument of this paper is that the declining labor share has played an important role in explaining the slow-down in the growth of government in recent years. Figure 3 also reveals Austria and Iceland as outliers from the other countries, respectively with unusually high and low labor shares throughout much of the sample.

There are a number of important potential difficulties relating to statistical inference when regressing government size on the labor share. A first issue relates to the definition of the labor share. In particular the OECD labor share data includes employer-contributions (social insurance) as well as salaries and wages. The potential problem here is that large government is associated with greater employer-contributions and social insurance - hence

the labor share could be endogenous to government size. However, in raw terms the labor share data do not seem to be systematically larger under larger public sectors (e.g. Norway & Sweden, the countries with the largest governments, do not have abnormally large labor shares). Furthermore the OECD themselves report that these contributions are "remarkably stable", e.g. it was 14% on average in 1975 (near the beginning of our sample), and 14% in 2005 (near the end of our sample).[17] The econometric analysis employs fixed effects, so parameter estimates follow from changes to the labor share over time within each country. If the observed labor share changes within countries are not due to changes in employer contributions, then it is legitimate to assume that they do represent real changes in costs of production beyond employers contributions.

More broadly the labor share itself is an endogenous variable and will also have its own driving variables, which problematically also may independently drive government size. This means that caution should be exercised before inferring that causality runs from the labor share to government size. One possibility is due to the economic cycle: different macroeconomic theories posit different predictions for the cyclical behavior of the labor share. In simple RBC models it is acyclical. In 'old' Keynesian models emphasizing nominal wage rigidity, the labor share can be anti-cyclical depending on the elasticity of demand for labor. In contrast the new Keynesian literature, as exemplified by Gali and Gertler (1999), emphasizes price-stickiness, which implies a pro-cyclical labor share. Because government outlays in the OECD are quite strongly anticyclical (i.e. due to automatic stabilizers) there is a danger that the labor share would be simply picking up a cyclical effect on spending. To address this problem the regression analysis includes controls for the output gap,[18] and

[17] See http://www.oecd.org/tax/taxpolicyanalysis/oecdtaxdatabase.htm

[18] The ouput gap data 'YGAP' are derived following Persson and Tabellini (2003) using the Hodrick-

following Persson and Tabellini (2003) the oil price interacted with an indicator variable depending on whether the country is a net oil-importer or exporter. Common time effects are also included in the regression analysis. Furthermore, and following standard practice in the empirical growth literature, the model is estimated using five year averages of the data to clean out cyclicality from the data.[19]

At a structural level Bentolila and Saint-Paul (2003) show theoretically that the labor share varies with differential labor- and capital-augmenting technology and the degree of complementarity between labor and capital in production. These technological characteristics will also drive GDP - which in turn represents the central mechanism in explaining government growth according to Wagner's (1893) law. Hence for example the labor share may increase (or fall) due to labor- (or capital-) augmenting technological progress. Concurrently increases in GDP may also increase government demand for Wagnerian reasons. Thus it is not impossible that under certain conditions changes in the labor share may conflate labor-share (supply) and Wagner (demand) mechanisms in the econometrics. (Though note from figure 3 that there is no clear correlation between real income per capita and the labor share through the sample.) To address this issue the regression analysis includes time effects, the real oil price (which to some extent may drive changes in relative labor/capital productivity) and of course real GDP per capita to separate out these potential drivers. Furthermore we instrument for the labor share using a dummy variable to indicate membership of the Schengen area from 1995 onwards. The creation of the European single market is plausibly an exogenous event - peculiar to the geography and history of continental europe,

Prescott filter. Observations where the output gap is greater than 5% in magnitude are omitted from the regression analysis.

[19]For example, see Islam (1995), and in a political economy context Besley et al (2010).

and with meaningful implications for the labor share within the member nations.

Alternatively the labor share may also be a reflection of differing or changing preferences/tastes/ideology towards inequality in society. A high labor share may indicate an egalitarian ideology as society sets institutions and policies in order to increase relative rewards to workers rather than owners of capital. Inference therefore could conflate the ideological explanation for government size with the supply-side cost explanation. The regression analysis thus includes fixed effects as standard, which will control for any constant country-specific differences in ideology as well as other time-invariant characteristics. Furthermore the analysis includes the time-varying ideology data used in PR as well as its interaction with income. In addition to these controls, and following Kau and Rubin (2002) and Winer et al (2008), female participation in the labor force is included as an additional variable,[20] so that this alternative supply-side explanation of government growth may also be controlled for.

Column 1a of table 1 contains estimation results in a regression specification extending that used in PR, using annual data. This includes fixed effects, the lagged dependent variable and a number of control variables together with the labor share data.[21] In this specification the estimated coefficient relating to the labor share is positive, and is significant at the 5% level. Given the presence of the lagged dependent variable, the parameter estimates in column 1a reflect the current-period (or short-run) impact of the explanatory variables (making the strong assumption that the labor share is exogenous). Column 1b presents the

[20] Specifically these data, taken from the OECD statistical database, are female labor force as a percentage of the female population between 15 and 64 years.

[21] Column 1 of table 1 is the same specification as used in column 2 of table 2 in PR including the labor share data and female participation as additional explanatory variables, and over the longer time horizon up until 2007.

corresponding long-run parameter estimates,[22] illustrating the impact of particular levels of both income and the labor share on the long-run steady-state level of government size. The p-value for the estimated long-run coefficient for the labor share is 0.4%, and the estimated effect is sizable: A sustained one standard deviation (7%) exogenous increase in the labor share is estimated to result in an eventual increase in the size of government by 8% of GDP.

The impact of the female participation rate on government size is consistent with previous findings.[23] In the context of the US, Kau and Rubin (2002) and Winer et al (2008) found it to be positively related with total government *spending*, but in the OECD sample studied here, increased female participation in the labor force if anything reduces relative government *size*.[24] The obvious interpretation of this is that increased female participation has increased GDP to a greater extent than it has government spending - even though both have increased. A further possible explanation of this could be that increased female labor force participation leads to an increase in the income of the median voter relative to mean income, which in turn reduces the demand for redistribution. These concerns may be greater in the non-US OECD members, wherein redistribution and total government size are greater, but full consideration of this finding lies beyond the scope of this paper. Finally, note that following the discussion of figure 2, given inelastic demand for government, it is entirely consistent that total expenditure may rise, whilst the expenditure *share* will fall, when the social costs

[22] Given the regression $g_t = \alpha g_{t-1} + \beta Y_t + \gamma I_t + \delta Y_t I_t + ...$ the long-run level of g is taken as $g^* = \frac{\beta}{1-\alpha} Y_t + \frac{\gamma}{1-\alpha} I_t + \frac{\delta}{1-\alpha} Y_t I_t + ... = \lambda Y_t + \mu I_t + \nu Y_t I_t + ...$ The standard errors of the long-run parameters, λ, μ, and ν are estimated using the delta method.

[23] Ferris and West (1999) also found an insignificant but negative effect of female participation, on pay in the public sector relative to the private sector, when looking at US data - contrary to the Kau and Rubin (1981, 2002) hypothesis.

[24] Although Winer et al (2008) found "at best a much smaller positive effect" of female participation on government spending levels in their replication of Kau and Rubin (2002).

of tax collection fall.

Column 2 of table 1 presents estimation results excluding Austria and Iceland from the analysis, which as noted above are outliers in terms of their labor share histories. These countries are clearly not driving the results because the labor share is now statistically significant at the 1% level. The standard deviation of the labor share in the sample excluding these two countries is reduced to 5%, but given the parameter estimate in column 2b a permanent one standard deviation exogenous increase in the labor share is estimated in this sample to increase government size in the long-run by 9%.

Columns 3 and 4 repeat the analysis of columns 1 and 2 using 5-year averages of the data. Averaging the data addresses concerns relating to the cyclicality in government size and the labor share, and the potential spurious correlation problem.[25] The results support those found using the annual data. There is a clear positive relationship between government size and the labor share measure, which is statistically stronger when the problem cases of Austria and Iceland are dropped. These results at least suggest that the observed correlation is not due to cyclical features in the data.

Table 2 extends the regression results reported in table 1 to include time effects. In this regression income is no longer statistically significant. PR also found that the inclusion of time effects reduced the explanatory power of income, undermining Wagner's law as an explanation for the growth of government. However, the labor share continues to be positive and statistically significant, both in the full sample and excluding Austria and Iceland in column 2. When the 5-year averages are used instead of the annual data, whilst the estimated

[25] The lagged dependent variable is omitted from the 5-year-average regressions because of the Nickell-bias. In Table 6 we report estimation results using the Bruno (2005) correction.

signs continue to be positive, statistical significance falls in the case of the full sample (column 3), but holds up in the smaller sample.

So far the empirical analysis demonstrates a clear positive association between government size and the labor share. Nonetheless the results do not establish causality, insofar that the movements in the labor share may be endogenous to government size or indeed unobserved effects (though the analysis does include a substantial set of control variables, and the results using five-year averages suggest that it is not cyclicality that is driving the results). To further address this concern table 3 repeats table 2, but instrumenting for the labor share with an indicator for membership of the Schengen area and the lag of the labor share. The results again confirm a consistent positive relationship between the government size and the labor share across all specifications, though as found in the OLS regressions statistical significance is reduced in the case of the full sample with annual data (column 1), relative to the sample excluding Austria and Iceland in column 2, where statistical significance again holds up. In these specifications the standard chi-squared statistic for weak instruments strongly rejects the null hypothesis, hence the instrumental variable have strong explanatory power in the first stage. In both cases the over-identification test is not rejected - supporting the required exclusion restrictions.

Where 5-year averages are used (columns 3 and 4 of table 3) statistical significance is lowered in both samples, although it may be argued that this is a very demanding econometric specification - including fixed and time effects and a substantial set of controls. When the controls are dropped (though maintaining fixed country and time effects) then statistical significance is quite high - as reported in columns 5 and 6.

In table 4, following hypotheses 2 and 3 above, interaction terms are included. The

first of these is the product of the labor share and average median voter ideology within the country over the full sample. As described in PR the average ideology data cohere with the consensus: Scandinavian countries are more left-wing than continental Europe, and Anglo-Saxon countries - especially Australia and the US, are on average the most right-wing amongst the OECD sample. These ideology data vary from -0.13 (Iceland) and -0.11 (the US), to 0.16 (Sweden) and 0.24 (Norway) with more positive numbers indicating more leftist ideologies. Hypothesis 2 anticipates a positive and significantly estimated coefficient pertaining to the interaction of ideology and the labor share, and the results reported in column 1 support this hypotheses. The exclusion of Austria and Iceland (in column 2) again does not alter this inference. Using the parameter estimates in column 2b, a sustained one standard deviation increase in the labor share (5%) is estimated to increase government size by 5.86% in the case of a representative right-wing regime (ideology = -0.1) and by 12.76% in the case of a representative left-wing regime (ideology = 0.1).

The second interaction term is the product of the labor share with mean income. Recall that the theory is ambiguous in its prediction here, anticipating a positive effect if private sector growth outstrips public sector growth (the case of cost-disease), and a negative effect in the opposite case, or insignificance if productivity growth is equal across the sectors. The estimation results over both full and reduced samples relating to this interaction are insignificant, hence are not supportive of cost disease (or indeed its converse, where public sector productivity increases at a faster rate than private sector productivity). This represents a fairly weak test of Baumol's cost disease in the context of explaining government growth, though the evidence suggests that if we take the demand for government services as price-inelastic, then productivity growth in the two sectors is not systematically different. If it

were, then employment shares in the two sectors would change, and the labor-share would have different effects on government size depending on income.[26]

In columns 3 and 4 of table 4 the analysis is repeated using the 5-year average data. Here the unconditional positive effect of the labor share holds up in the case of the reduced sample. However, using these data neither interaction effect is estimated to be statistically significant. This casts some doubt over hypothesis 2 - for which there is support in the context of the annual data. The interaction with ideology is still positive, but significance levels are lower. This may simply be due to the fact that the sample size is quite a bit lower, and given also that the ideology data are unlikely to be perfectly measured, reduced significance is perhaps not surprising.

Table 5 repeats the analysis of table 4 using instrumental variables analysis. The results are quite similar to table 4, but generally with lower significance for the estimated direct (unconditional) effect of the labor share, which nonetheless is estimated to have a positive effect in all instances. In the case of the annual data (columns 1 and 2), we again find that the effect of the labor share is more pronounced the more left-wing the regime. In these regressions, as was found with table 3, the instrumental variables are found to have strong predictive power in the first stage regressions (both *share* and its interaction with ideology are being instrumented), as indicated in the reported Shea partial R^2 statistics. Also in both cases the overidentification test fails to rule out the implied exclusion restrictions. In the case of the 5-year averages, then the estimated effect (including the direct effect and the interactions) is insignificant (though again the sign is always positive as conjectured) when

[26]Relatedly Pilichowski and Turkisch (2008) report that the public sector employment share has indeed been quite stable over time within the OECD countries (see their figure 9.) Given inelastic demand this also implies that productivity growth has been approximately equal in the two sectors.

the full set of controls is included (column 3 and 4). Furthermore in these regressions the Shea partial R^2 statistics indicate low statistical power in the first stage regression (i.e. a weak instrument problem). When the controls are dropped in columns 5 and 6, significance is restored and indeed the instrumental variables exhibit greater explanatory power in the first stage regression.

A further potential source of concern with the econometric inference is the Nickell (1981) bias associated with models involving fixed effects and a lagged dependent variable. The bias is of the order $(\frac{1}{T})$, and the data set contains 36 years of data, hence this problem is likely quite small in the context of using annual data. In the case of the 5-year averages the maximum number of observations per country is 7 hence the problem would be larger, but note that we have excluded the lagged dependent variable in the preceding analysis, not least for this reason. A means to correct this bias, and therefore restore the lagged dependent variable to the 5-year averages analysis, is provided by Bruno's (2005) extension of Kiviet (1995), but which also entails the drawback of reduced statistical efficiency. Furthermore these estimators are consistent only when the cross sectional dimension of the panel tends to infinity (and here there are only 17 or 15 countries). Nonetheless because it is not clear a priori which of the Nickell-bias or estimation inefficiency plus inconsistency is the greater evil, we also present results using the Bruno (2005) estimation procedure. Table 6 contains these results, which largely support the findings already reported. In all 4 specifications the estimated relationship between government size and the labor share is positive, and in all 4 cases this relationship is estimated to be stronger under more left-wing political environments. On the other hand the labor share interaction with income is again insignificantly different from zero.

The central idea proposed in this paper is simple: labor costs help to determine the public expenditure share. However, government activities, and therefore the embodied production technologies, are diverse. In particular transfer payments involve very little in the way of production - and such payments represent a sizeable fraction of total government expenditure in many countries. Investigating the relationship between transfers and the labor share also helps to address concerns of endogeneity. Conceivably, generosity in government provision could enhance labor bargaining power and therefore the labor share - a potential source of reverse causality. Indeed one might expect that this mechanism would be most pronounced in the case of transfers. Higher transfers raise the outside option of the worker and her bargaining power would be increased. Using data for transfers thus provides a vehicle for identifying between this form of reverse causality, and the mechanism proposed in the paper. According to the latter there should not be a link between the labor share and transfers, while in the former there should be such a link.

To measure transfers we use 'Social benefits other than social transfers in kind' from the OECD.[27] These data represent a sizable fraction of public expenditures, ranging from around 15% (for example in Australia in the early part of the sample) to around 38% (in Austria and Germany towards the end of the sample). Table 7 contains regression results using this alternative dependent variable, repeating the econometric analysis above using the preferred 5-year averages (to rule out cyclical variation). Columns 1 and 2 correspond

[27] 'Social transfers in kind' represents outsourced goods and services, where the government pays the private sector for provision of certain services. As these 'transfers' are produced, following the logic of this paper it seems likely that the labor share would generally affect these expenditures. Exclusion is therefore preferable in the context of trying to separate out the reverse causality mechanism outlined in the previous paragraph from the 'cost-push' mechanism proposed in this paper. As with the outlays data these data are divided by GDP to give a measure of relative size. There are data for this variable for all the countries under analysis, although the start dates vary, hence the sample sizes are smaller than for outlays.

to columns 3 and 4 in table 1. In the full sample (column 1), the labor share is no longer statistically significant, indeed now exhibits a negative association with transfers. However in the reduced sample (in column 2), *share* is as before estimated to be positive and statistically significant. Taken at face value this casts some doubt on the mechanism proposed in this paper. Transfers are not 'produced' hence changes to labor costs should not affect transfer payments. Nonetheless this particular specification excludes time effects, and it is possible that the statistically significant relation simply reflects the common trend discussed above. When time effects are also included (in columns 3 and 4 - corresponding to columns 3 and 4 in table 2), the labor share is no longer significant in either sample. Similarly when we repeat the instrumental variables regressions of columns 5 and 6 in table 3 (where previously the labor share was found to be highly significant in both cases) in columns 5 and 6 using the new dependent variable, the labor share ceases to be significant in either case. Movements in the labor share are thus not statistically associated with movements in the generosity of transfers once common time effects are accounted for. If the argument put forward in this paper is correct, that the labor share affects government size through changing costs, then this evidence is fully consistent with this mechanism.

4 Conclusion

The size of government has attracted researchers and explanations for well over 100 years. Previous explanations have predominantly focussed on demand-side explanations, beginning with Wagner's law, but also encompassing ideology, changing demographics, the distribution of income and political economy explanations. The very simple idea that costs play some

part in determining government size has been under-explored. This paper argues that labor costs, as measured by the labor share of income, are an important determinant of the size of government - measured as the share of public expenditure in GDP. Under conditions of inelastic demand for government, the size of government is increasing in labor costs, and secondly the impact of variation in labor costs on government size is greater in left-wing economies. Under Baumolian cost disease, then variation in the labor share is predicted to have a greater impact on the size of government as income grows. Data from the OECD provides consistent evidence of a positive association between the labor share and the size of government. This holds across a wide range of econometric specifications. Furthermore, we generally find that this relationship is stronger under left-wing ideology, though we find no evidence that this relationship increases with income. In contrast, transfer spending exhibits no relationship with the labor share. It is only the labor-intensive elements of government which increase in relative expenditure terms when then labor-share increases.

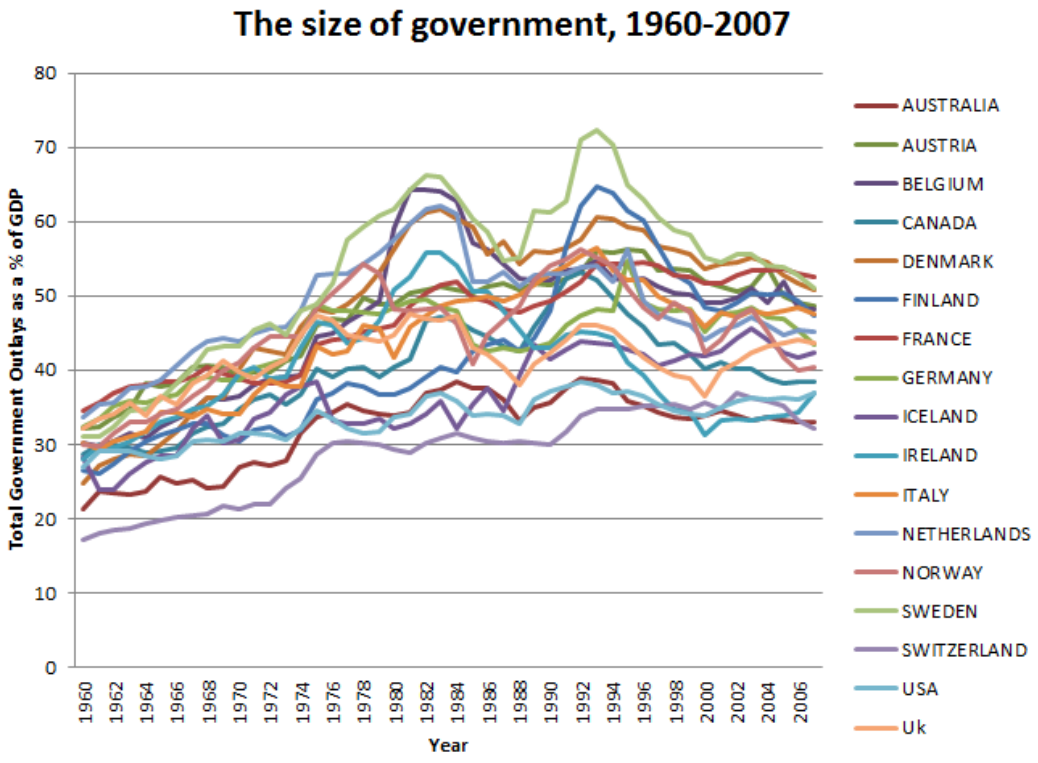

Figure 1: The size of government, 1960-2007

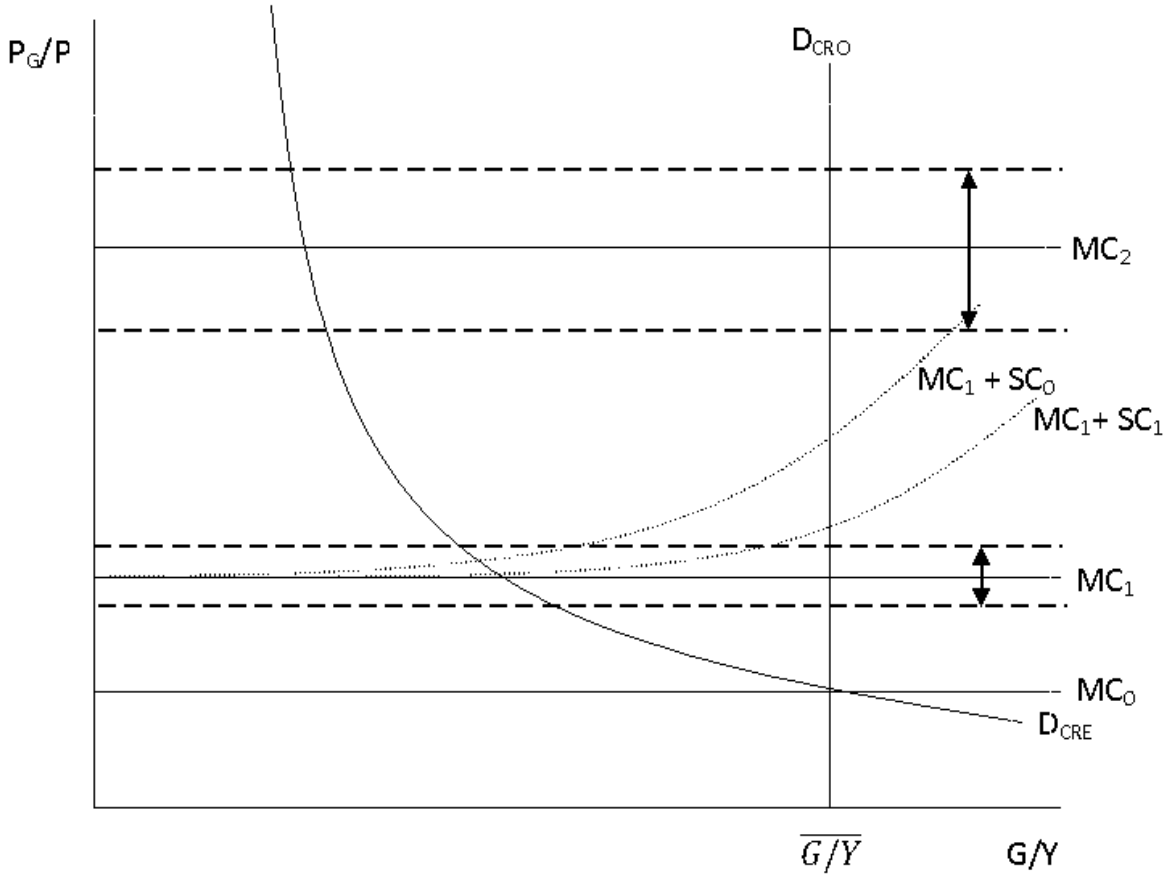

Figure 2: The Demand and Supply of Government

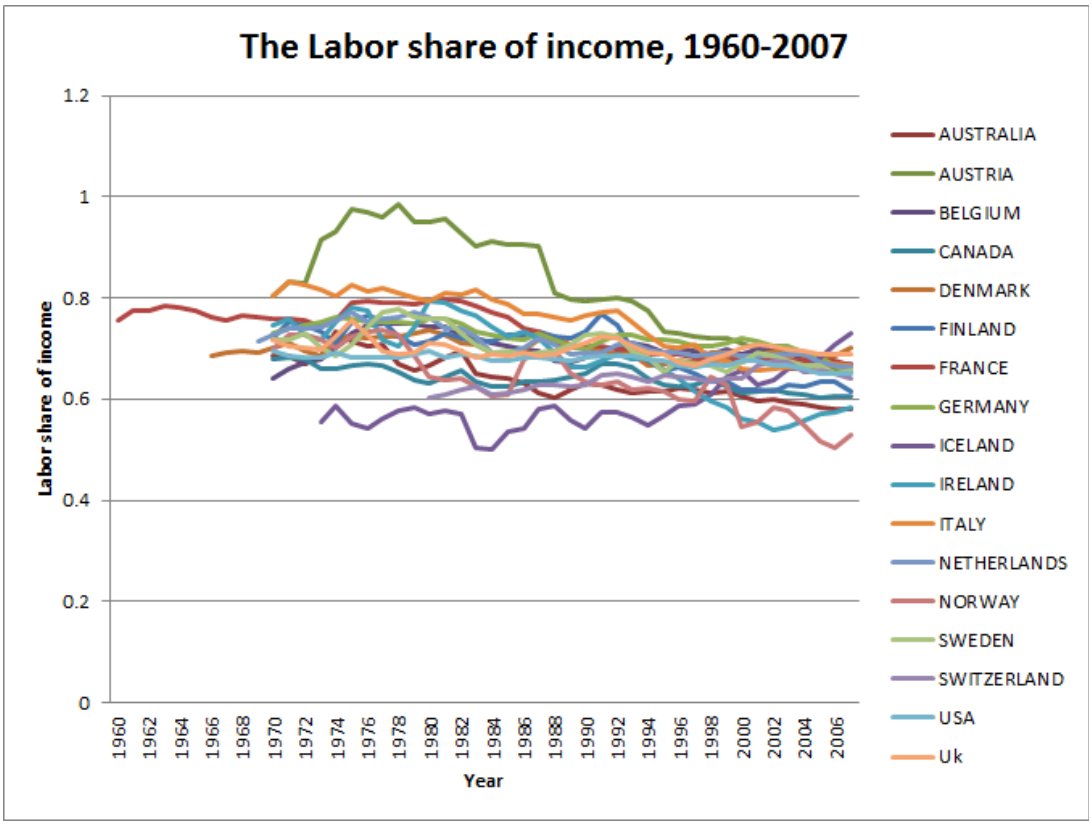

Figure 3: The Labor Share of income 1960-2007

	(1a)	(1b)	(2a)	(2b)	(3)	(4)
L.Outlays	0.882		0.852			
	(0.022)***		(0.024)***			
Y	0.054	0.454	0.078	0.527	−0.117	0.038
	(0.034)	(0.323)	(0.036)*	(0.279)*	(0.197)	(0.196)
share	0.139	1.177	0.285	1.927	0.464	0.947
	(0.054)**	(0.351)***	(0.035)***	(0.290)***	(0.256)*	(0.196)***
fp	−0.020	−0.170	−0.049	−0.332	−0.193	−0.337
	(0.026)	(0.222)	(0.030)	(0.222)	(0.204)	(0.214)
Obs	642		569		137	121
No. Countries	17		15		17	15
Data	Annual		Annual		5-year averages	5-year averages
Method	OLS		OLS		OLS	OLS
R^2 (within)	0.91		0.92		0.41	0.48

Table 1: Dynamic panel estimation with fixed effects

Notes: Panel regressions of Government Outlays as a percentage share of GDP including PROP1564, PROP65, TRADE, YGAP, OIL_EX, and OIL_IM as control variables described in Persson and Tabellini (2003), and ideology $\overline{ideo}$ and its interaction with income as used in PR. *L.Outlays* is the lagged dependent variable. Y is income per capita in $000s of 2005 prices (PPP), fp is the female labor force participation rate amongst 15-64 year olds. *share* is the labor share of income. Robust standard errors are shown in parentheses. Columns (1b) and (2b) contain 'long-run' parameter estimates, with standard errors estimated by the delta method. Columns 2 and 4 exclude Austria and Iceland. The cyclical control variables, YGAP, OIL_EX, and OIL_IM are omitted in the regressions using 5-year averages of the data. *, **, and *** respectively denote significance levels at 10%, 5% and 1%.

	(1a)	(1b)	(2a)	(2b)	(3)	(4)
L.Outlays	0.885		0.874			
	(0.026)***		(0.031)***			
Y	0.093	0.808	0.122	0.966	−0.476	−0.008
	(0.081)	(0.751)	(0.084)	(0.723)	(0.332)	(0.347)
share	0.101	0.881	0.213	1.685	0.153	0.336
	(0.056)*	(0.430)*	(0.054)***	(0.461)***	(0.212)	(0.154)**
fp	−0.019	−0.166	−0.048	−0.378	−0.211	−0.352
	(0.024)	(0.207)	(0.026)*	(0.212)*	(0.167)	(0.161)**
Obs	642		569		137	121
No. Countries	17		15		17	15
Data	Annual		Annual		5-year averages	5-year averages
Method	OLS		OLS		OLS	OLS
R^2 (within)	0.94		0.95		0.68	0.72

Table 2: Panel estimation with fixed and time effects

Notes: As for Table 1.

	(1a)	(1b)	(2a)	(2b)	(3)	(4)	(5)	(6)
L.Outlays	0.887		0.881					
	(0.020)***		(0.021)***					
Y	0.046	0.403	0.069	0.585	−0.490	0.238		
	(0.043)	(0.398)	(0.040)	(0.356)	(0.204)**	(0.327)		
share	0.034	0.302	0.100	0.846	0.103	0.708	0.371	0.591
	(0.021)	(0.196)	(0.030)***	(0.279)***	(0.180)	(0.522)	(0.123)***	(0.192)***
fp	0.004	0.035	−0.024	−0.199	−0.207	−0.472		
	(0.016)	(0.141)	(0.019)	(0.156)	(0.102)**	(0.121)***		
Obs	626		555		120	106	121	107
No. Countries	17		15		17	15	17	15
Data	Annual		Annual		5-year averages	5-year averages	5-year averages	5-year averages
Method	IV		IV		IV	IV	IV	IV
F	738.32		426.49		26.74	3.411	42.71	19.81
p_{χ^2}	0.805		0.863		0.024	0.962	0.507	0.038

Table 3: IV estimation with fixed and time effects

Notes: Two-stage-least squares estimation. In the first stage *share* is instrumented with the variable *Schengen*, an indicator variable set equal to one for Schengen area members from 1995 onwards, and with the lag of the labor share. F is an F-statistic for the statistical significance of the instruments in the first stage regression. p_{χ^2} is the p-value for the Chi-squared test of overidentifying restrictions. See also notes for table 1 for other details.

	(1a)	(1b)	(2a)	(2b)	(3)	(4)
$L.Outlays$	0.891		0.874			
	$(0.030)^{***}$		$(0.035)^{***}$			
Y	0.130	1.189	0.329	2.613	−0.723	0.691
	(0.167)	(1.567)	$(0.147)^{**}$	$(1.367)^{*}$	(0.742)	(0.680)
$\overline{ideo}$	−9.050	−82.93	−10.71	−85.13	−20.05	−24.68
	$(3.417)^{**}$	$(32.21)^{**}$	$(3.198)^{***}$	$(25.59)^{***}$	(22.23)	(19.52)
$\overline{ideo}*Y$	0.424	3.883	0.505	4.013	0.940	0.989
	$(0.120)^{***}$	$(1.363)^{**}$	$(0.115)^{***}$	$(1.205)^{***}$	(0.769)	(0.736)
$share$	0.085	0.783	0.211	1.678	0.022	0.517
	(0.085)	(0.759)	$(0.049)^{***}$	$(0.579)^{**}$	(0.349)	$(0.214)^{**}$
$share*\overline{ideo\_ave}$	1.505	13.79	1.487	11.82	1.407	2.364
	$(0.260)^{***}$	$(4.268)^{***}$	$(0.356)^{***}$	$(3.619)^{***}$	(1.909)	(2.204)
$share*Y$	−0.000	−0.004	−0.003	−0.028	0.004	−0.012
	(0.002)	(0.022)	(0.002)	(0.018)	(0.010)	(0.011)
fp	−0.011	−0.099	−0.042	−0.341	−0.183	−0.355
	(0.028)	(0.257)	(0.028)	(0.235)	(0.198)	$(0.163)^{**}$
Obs	642		569		137	121
No. Countries	17		15		17	15
Data	Annual		Annual		5-year averages	5-year averages
Method	OLS		OLS		OLS	OLS
R^2 (within)	0.94		0.95		0.69	0.73

Table 4 Panel estimation with fixed effects and time effects and including interaction terms

Notes: As for Table 1.

	(1a)	(1b)	(2a)	(2b)	(3)	(4)	(5)	(6)
$L.Outlays$	0.892		0.886					
	(0.019)***		(0.020)***					
Y	0.061	0.569	0.083	0.723	−0.457	0.273		
	(0.041)	(0.409)	(0.038)**	(0.366)**	(0.222)**	(0.307)		
$\overline{ideo}$	−3.691	−34.23	−5.347	−46.80	−74.54	−101.88		
	(3.594)	(33.17)	(3.336)	(29.83)	(60.12)	(89.23)		
$\overline{ideo}*Y$	0.258	2.393	0.311	2.724	2.685	3.238		
	(0.125)**	(1.176)**	(0.112)***	(1.068)**	(1.893)	(2.764)		
$share$	0.019	0.177	0.027	0.232	0.253	0.963	0.383	0.582
	(0.021)	(0.201)	(0.032)	(0.274)	(0.259)	(0.789)	(0.126)***	(0.189)***
$share*\overline{ideo\_ave}$	1.173	10.88	1.227	10.73	6.274	6.754	0.788	0.228
	(0.290)***	(3.154)***	(0.293)***	(3.237)***	(4.270)	(5.410)	(0.876)	(0.848)
fp	0.011	0.104	−0.013	−0.110	−0.186	−0.483		
	(0.016)	(0.149)	(0.019)	(0.161)	(0.111)*	(0.149)***		
Obs	626		555		120	106	121	107
No. Countries	17		15		17	15	17	15
Data	Annual		Annual		5-year averages	5-year averages	5-year averages	5-year averages
Method	IV		IV		IV	IV	IV	IV
Shea partial R^2	0.80		0.71		0.28	0.13	0.51	0.40
	0.66		0.67		0.11	0.19	0.55	0.63
p_{χ^2}	0.554		0.714		0.012	0.734	0.480	0.035

Table 5 IV estimation including fixed and time effects and interactions

Notes: As for Table 3. The Shea partial R^2 statistics correpond to separate first-stage regressions for *share* (1st number) and $share*\overline{ideo\_ave}$ (2nd number).

	(1)	(2)	(3)	(4)
$L.Outlays$	0.903	0.871	0.755	0.680
	$(0.022)^{***}$	$(0.020)^{***}$	$(0.080)^{***}$	$(0.082)^{***}$
Y	-0.303	-0.228	0.241	0.826
	(0.265)	(0.261)	(0.556)	(0.643)
$\overline{ideo}$	-6.346	-8.162	-22.94	-22.53
	(4.962)	(5.268)	(17.96)	(17.96)
$\overline{ideo}*Y$	0.345	0.434	1.109	1.112
	$(0.208)^{*}$	$(0.216)^{**}$	$(0.566)^{**}$	(0.786)
$share$	0.001	0.146	0.288	0.779
	(0.090)	(0.090)	(0.222)	$(0.290)^{***}$
$share*\overline{ideo\_ave}$	1.365	0.926	3.440	2.628
	$(0.322)^{***}$	$(0.375)^{**}$	$(1.209)^{***}$	(1.799)
$share*Y$	0.006	0.005	-0.001	-0.009
	(0.004)	(0.004)	(0.009)	(0.010)
Obs	642	569	137	121
No. Countries	17	15	17	15
Data	Annual	Annual	5-year averages	5-year averages
Method	LSDVC	LSDVC	LSDVC	LSDVC

Table 6 Bias corrected least square dummy variable estimates

Notes: Results are generated using the Bias Corrected Least Squares Dummy Variable estimator proposed by Kiviet (1995) and extended by Bruno (2005) - bootstrap standard errors in parentheses. Estimates are initialized by the Andersen-Hsiao estimator and then corrected such that the maximum bias is $O\left(\frac{1}{NT^2}\right)$. Columns (3)-(4) repeat (1)-(2) using 5-year averages. Other notes as for Table 1.

	(1)	(2)	(3)	(4)	(5)	(6)
Y	−0.022	0.058	0.009	0.075		
	(0.095)	(0.363)	(0.203)	(0.224)		
share	−0.023	0.248	−0.046	0.136	0.005	0.091
	(0.089)	(0.087)**	(0.083)	(0.101)	(0.070)	(0.162)
fp	−0.187	−0.250	−0.270	−0.308		
	(0.129)	(0.122)*	(0.114)**	(0.109)**		
Obs	94	84	94	84	91	81
No. Countries	17	15	17	15	17	15
Data	5-year averages	5-year averages	5-year averages	5-year averages	5-year averages	5-year averages
Method	OLS	OLS	OLS	OLS	IV	IV
R^2 (within)	0.43	0.51	0.61	0.65		

Table 7 Panel estimation of transfer payments

Notes: Transfer payments is the dependent variable (Social benefits other than social transfers in kind as a % share of GDP). Columns 1 and 2 correspond to Columns 3 and 4 of table 1. Columns 3 and 4 correspond to column 3 and 4 of table 2. Columns 5 and 6 correspond to columns 5 and 6 of table 3.

References

Azmat, Ghazala, Alan Manning, and John Van Reenen (2012). Privatization and the Decline of Labour's Share: International Evidence from the Network Industries. *Economica* 79: 470-492.

Barro, Robert (2001). Human Capital and Growth. *American Economic Review Papers and Proceedings* 91(2): 12-17.

Baumol, William J. (1967). Macroeconomics of unbalanced growth: the anatomy of an urban crisis. *American Economic Review* 57(3): 415-426.

Bentolila, Samuel, and Gilles Saint-Paul (2003). Explaining movements in the labor share. *Berkeley Electronic Journal of Macroeconomics (Contributions)* 3(1), Article 9.

Besley, Timothy, Torsten Persson and Daniel Sturm (2010). Political Competition, Policy and Growth: theory and evidence from the US. *Review of Economic Studies* 77: 1329-1352.

Borcherding, Thomas E. (1985). The causes of government expenditure growth: a survey of U.S. evidence. *Journal of Public Economics* 28(3): 359-382.

Borcherding, Thomas E., J. Stephen Ferris and Andrea Garzoni (2004). Growth in the real size of government since 1970. In: Wagner, R. E., Backhaus, J. G. (Eds.), *Handbook of Public Finance*. Kluwer Academic Publisher, Dordrecht.

Bruno, Giovanni S. F. (2005). Approximating the bias of the LSDV estimator for dynamic unbalanced panel data models. *Economics Letters* 87: 361–366.

Buchanan, James M., and Gordon Tullock (1962). *The Calculus of Consent*. University of Michigan Press, Ann Arbor MI.

Buchanan, James M., and Gordon Tullock (1977). The expanding public sector: Wagner squared. *Public Choice* 31: 147-150.

Cowen, Tyler (2011). *The Great Stagnation*. New York: Penguin Press, E-book.

Ferris, J. Stephen, and Edwin G. West (1996). Testing theories of real government size: U.S. experiences, 1959-1989. *Southern Economic Journal*, 62(3): 537-553.

Ferris, J. Stephen, and Edwin G. West (1999). Cost disease versus Leviathan explanations of rising government cost: An empirical investigation. *Public Choice* 98: 307-316.

Galí, Jordi, and Mark Gertler (1999). Inflation dynamics: A structural econometric analysis. *Journal of Monetary Economics* 44(2): 195-222.

Gordon, Robert (2012). Is U.S. economic growth over? Faltering innovation confronts the six headwinds. NBER Working Paper no. 18315.

Henrekson, Magnus, and Johan A. Lybeck (1988). Explaining the growth of government in Sweden: A disequilibrium approach. *Public Choice* 57: 213-232.

Holsey, Cheryl M., and Thomas E. Borcherding (1997). Why Does Government's Share Grow? An Assessment of the Recent Literature on the U.S. Experience. In Dennis C. Mueller (Ed.), *Perspectives on Public Choice: A Handbook*. Cambridge: Cambridge University Press.

Islam, Nazrul (1995). Growth Empirics: A Panel Data Approach. *Quarterly Journal of Economics* 110(4): 1127-170.

Kau, James B., and Paul H. Rubin (1981). The size of government. *Public Choice* 37: 261-274.

Kau, James B., and Paul H. Rubin (2002). The growth of government: Sources and limits. *Public Choice* 113: 389-402.

Kiviet, Jan F. (1995). On bias, inconsistency, and efficiency of various estimators in dynamic panel data models. *Journal of Econometrics* 68, 53–78.

Lybeck, Johan A. (1988). Comparing Government Growth Rates: The Non-Institutional vs the Institutional Approach. in Johan A. Lybeck and Magnus Henrekson (Eds.), *Explaining the Growth of Government.* Amsterdam: Elsevier.

Meltzer, Allan H, and Richard, Scott F. (1981). A rational theory of the size of government. *Journal of Political Economy* 89: 914-927.

Neck, Reinhard, and Michael Getzner (2007). Austrian government expenditures: " Wagner's law" or "Baumol's disease"? *International Business & Economics Research Journal* 6(11): 49-66.

Nickell, Stephen (1981). Biases in dynamic models with fixed effects. *Econometrica* 49(6): 1417–1426.

Persson, Torsten, and Guido Tabellini (2003). *The Economic Effects of Constitutions.* MIT Press, Cambridge, MA.

Pickering, Andrew C., and James Rockey (2011). Ideology and the growth of government. *Review of Economics and Statistics* 93(3): 907-919.

Pilichowski, E. and E. Turkisch (2008). Employment in Government in the Perspective of the Production Costs of Goods and Services in the Public Domain. OECD Working Papers on Public Governance, No. 8, OECD Publishing.

Sanz, Ismael, and Francisco J. Velázquez (2007). The role of ageing in the growth of government and social welfare spending in the OECD. *European Journal of Political Economy* 23: 917–931.

Shelton, Cameron (2007). The size and composition of government expenditure. *Journal of Public Economics* 91(11-12): 2230-2260.

West, Edwin G. (1991). Secular cost changes and the size of government: towards a generalized theory. *Journal of Public Economics* 45: 363-381.

Wagner, Adolph (1893). *Grundlegung der Politischen Oekonomie*, 3rd ed. Leipzig: C. F. Winter.

Winer, Stanley L., Michael W. Tofias, Bernard Grofman and John H. Aldrich (2008). Trending economic factors and the structure of Congress in the growth of government, 1930-2002. *Public Choice* 315: 415-448.

Yogo, Motohiro (2004). Estimating the Elasticity of Intertemporal Substitution When Instruments are Weak. *Review of Economics and Statistics* 86(3): 797-810.

Zimmerman, Klaus F. (1995). Tackling the European Migration Problem. *Journal of Economic Perspectives* 9(2): 45-62.