Article:
Facchini, François, Melki, Mickael and Pickering, Andrew Christopher (2016) Labour Costs and the Size of Government. Oxford Bulletin of Economics and Statistics. pp. 251-275. ISSN: 0305-9049

https://doi.org/10.1111/obes.12140

Labour Costs and the Size of Government

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April 2016

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We thank seminar participants at the Assisi Workshop on Economics and Institutions, Thema (University of Cergy), Economix (Paris 10), the European Public Choice Society Conference, the University of Fribourg, the French Economic Association Conference, the Louis-André Gérard-Varet Conference in Public Economics, the Public Choice Society Conference, and the University of York. We are also grateful to two anonymous referees for helping to substantially improve the paper. Remaining errors are our own.

Abstract

Given inelastic demand for labour-intensive public services, the size of government depends positively on labour costs. OECD data exhibit a strong statistical association between government size and the business-sector labour share of income. When the labour share is instrumented with measures of technological change, institutional variation and predetermined data it continues to positively impact government size. In contrast, transfer spending is unaffected by the labour share. The evidence is consistent with the idea that the recent decline in the labour share has contributed to the slowdown in the growth of government witnessed in much of the post-war era.

Word Count: 8357 words

JEL Code: H10, H50, O41

Keywords: Size of government, labour share

1 Introduction

Explanations of the size of government have historically focussed on its growth. However, as shown in figure 1, the share of government expenditure as a percentage of GDP in the OECD has if anything declined in recent years. The 10 year average up until 2007 was lower than that up to 1998 in all but five out of 29 countries in the sample.[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 - albeit 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 principally to demand-side factors. In their analysis the income elasticity of demand for public services exceeds unity, as in Wagner's (1893) law, once the median voter has reached a certain level of income, and income elasticity differs with ideology. Government grows 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 recent downward movements noted above suggest other factors at work.[3]

[1] The exceptions are France, Iceland, Japan, Korea (a notable outlier in the sample) and Portugal. 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.

[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. Sanz and Velázquez, 2007), and the median voter's relative income (Meltzer and Richard, 1981). However, 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, measured inequality in the before-tax income distribution has increased in many countries. Both trends would point

This paper argues that supply side factors, in particular labour 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: costs are pushed up over time because of rising wages and stagnant productivity in the public sector. Given inelastic demand for public services the relative size of government grows.[4] However, at the present time of writing private sector wage growth is low in the OECD.[5] Furthermore in recent years, labour's income share in the private sector has declined in many countries.[6] It seems plausible that a declining labour share implies lower production costs in labour-intensive sectors of the economy. Arguably output in many areas of the public sector is labour-intensive to the extent that labour *is* output in some instances, for example in nursing and one-to-one teaching, so if labour costs exogenously fall then so does government size when demand is inelastic. Nonetheless it should be acknowledged that whilst a lower labour share is not a *cure* for cost disease (ultimately this depends on the sources of technological progress in the economy as well as the elasticity of demand), it does potentially represent a *palliative*.[7]

To formally analyze the impact of the labour share on government size we combine two canonical models, the Solow (1956) - Swan (1956) growth model, and Baumol's (1967)

to increased demand for redistribution rather than government shrinkage.

Another important potential driver is globalization, which is controlled for in the analysis below.

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

[5]For example see Cowen (2011) or Gordon (2012).

[6]This phenomenon has not gone unnoticed in the academic literature, e.g. see Azmat et al (2012) and Karabarbounis and Neiman (2014).

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

model of a two-sector economy, where the two sectors are the private (business) sector, and the labour-intensive government sector. Wages costs are governed by the private sector, and the technology of production therein. Using this apparatus, a fall in labour's income share is found to have two opposing effects on the expenditure share of government in the economy. Firstly, given a labour-intensive public sector, lower labour costs straightforwardly mean lower taxes and a smaller government holding all else equal. However, a lower labour share also implies higher steady state capital and output levels in the private sector. Under Baumolian demand, which requires that real government output keeps pace with real private output in volume terms, increased private sector output puts upward pressure on taxes.

The relationship between government size and the labour share is investigated empirically using a panel of OECD countries, augmenting the analysis of Pickering and Rockey (2011) with data up until 2007 for the full set of OECD members and including the labour share as a potential explanatory variable and using a wide range of econometric specifications. Following the theory the labour share is measured as the share of income going to labour in the business sector.[8] We readily acknowledge that satisfactory identification of a causal relationship between government size and the labour share is difficult given the myriad underlying drivers of both variables. The labour 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 the labour share, and indeed there may be separate exogenous forces driving both.

In order to address the endogeneity problem in the labour share, a number of separate

[8]The labour share measure is described in more detail below, but it is important to emphasize early that it corresponds to wages and salaries as a share of value added in the private sector alone and not the public sector. Gollin (2002) addresses measurement issues in the context of international data.

instrumental variables are employed in the empirical analysis. An advantage of using more than one instrument is that overidentification tests of the associated exclusion restrictions become available. The principal instrumental variable used encapsulates technological change and is drawn from Karabarbounis and Neiman (2014), who find that international differences in the extent to which the labour share has declined are due foremost to differences in the extent to which the price of investment goods relative to consumption goods has declined.[9] According to Karabarbounis and Neiman (2014) the observed fall in the relative price of investment goods is due to exogenous technological change, inducing firms to shift away from labour towards capital. Their relative price variable, constructed from data drawn from the Penn World Table is thus our first instrument.

A second instrument exploits the creation of the 'Schengen area' in Europe as a potential source of exogenous institutional variation in the labour share. The Schengen area was established in 1995, entailing the dismantling of border controls 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 labour market, and labour mobility both into and within Europe. On the one hand a larger, and more mobile workforce might be expected to increase the bargaining power of employers for the simple reason that they have a larger pool of workers from which to draw on. On the

[9] The declining labour share has also been attributed to globalization (e.g. see Guerriero and Sen, 2012, and Decreuse and Maarek, 2015). However, increased openness has separately also been proposed as a direct driver of government size (e.g. Cameron, 1978, Rodrik (1998) and Epifani and Gancia, 2012) hence the exclusion restriction is unlikely to be satisfied.

[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.

other hand, the raised external barriers could reduce the potential labour supply, raising labour bargaining power. But in either case the creation of the single market represents a possible source of exogenous variation in the labour share. Figure 2 contrasts the movement of the average business-sector labour share over time within the Schengen area against the average of the rest of the sample.[11] Whilst there was a small, though systematic difference between the two groups of countries prior to the early 1990s, a clear divergence appears thereafter: the labour share fell to a lesser degree within the Schengen area than outside. It seems likely that features specific to the EU, including the creation of the Schengen area plausibly explain the dampened reduction observed in the Schengen area.[12] 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 labour market.

Neither of these instruments are bullet-proof. It is possible to make a case for their exogeneity, but it must be acknowledged that technological change may affect the demand for government services directly as well as through production costs. Membership of the Schengen area was an endogenous political decision which may also be related to government size. For these reasons we report exclusion restriction (overidentification) tests in the analysis. Furthermore and in addition to the two instruments detailed, we also use the lag of the labour share as a further instrumental variable.[13] This captures the predetermined element

[11] Note this figure excludes former communist East European countries.

[12] The start of the divergence appears to predate the signing of the Schengen agreement by two or three years. It is possible that European institutional change (with similar geographic constituents to the Schengen area) around this time may instead be responsible. Alternatively wage-negotiating may have been forward-looking to some extent. We take the Schengen agreement as the relevant date of institutional change because of its explicit implications for the labour market.

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

of the labour share. Whilst there may be reasons to expect that the current government size affects or is co-determined with the current labour share, it is harder to argue that current government size will affect or is co-determined with the lagged labour share data.

The empirical analysis covers results 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 labour share and government size plausibly move with the cycle, and the use of averages over 5 year periods should substantially remove this problem.

In the empirical analysis the size of the government is consistently found to be positively associated with the business-sector labour share of income. This is a new finding in the literature. This relationship is robust across the wide set of different econometric specifications employed. In particular, both when the labour share is instrumented, and when the data are averaged across five year intervals to eliminate cyclical variation, the results found using more basic techniques hold up.

A further test of the central hypothesis is provided by disaggregating total public expenditure. The main argument of the paper applies to labour-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 labour inputs, at least not to the same extent as produced public services. If the link between government size and the labour share is due to production costs, as proposed here, then the auxiliary hypothesis is that there should not be a link between transfers and the labour 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

labour share.

The paper also addresses how expenditure across different government departments might be affected by changes in labour costs. There is interesting heterogeneity across departments in terms of statistical significance. Importantly it is expenditure within labour-intensive sectors, and in which it is plausible to argue that demand for services is inelastic, that is more strongly related to the labour income share.

The next section theoretically analyzes how the size of government changes with the labour share. Section 3 contains the empirical work and section 4 concludes.

2 The Model

The theoretical analysis combines the standard neoclassical growth model of Solow (1956) and Swan (1956) and the two-sector model of Baumol (1967). Sector one is the public sector and sector two is the private sector. Formally:

$$Y_{1t} = A_{1t}L_{1t} \tag{1}$$

$$Y_{2t} = (A_{2t}L_{2t})^{1-\alpha} K_{2t}^{\alpha} \tag{2}$$

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, and $A_{1t} = \overline{A}_1 e^{r_1 t}$ and $A_{2t} = \overline{A}_2 e^{r_2 t}$ represent exogenous labour-augmented productivity in the two sectors, and t is a time index. Note that in Baumol's original paper A_1 is constant ($r_1 = 0$), though here for generality productivity growth may be higher in either sector. Capital K_{2t} is required for private sector production, whilst public

sector output, for simplicity, is assumed to only depend on (potentially augmented) labour. We use a Cobb-Douglas specification for private sector production because as is well known under competitive markets α is the capital share of output, whilst $1-\alpha$ is the labour share.

The private sector evolves following the Solow-Swan model. Private sector capital accumulates according to

$$\dot{K}_{2t} = s\left(Y_{2t}\left(1-\tau\right)\right) - \delta K_{2t} \tag{3}$$

where s is the exogenous savings rate, δ is the exogenous depreciation rate, and τ is the tax rate (which funds public sector expenditure). For simplicity public sector employees are assumed to not own capital, hence gross investment $s\left(Y_{2t}\left(1-\tau\right)\right)$ depends only on (disposable) private sector income. This very familiar set-up leads to a steady state,

$$\begin{aligned} \overline{k}_2 &= \left(\frac{s\left(1-\tau\right)}{\delta + r_2}\right)^{\frac{1}{1-\alpha}} \\ \overline{y}_2 &= \left(\frac{s\left(1-\tau\right)}{\delta + r_2}\right)^{\frac{\alpha}{1-\alpha}} \end{aligned}$$

where $k_{2t} = \frac{K_{2t}}{A_{2t}L_{2t}}$ and $y_{2t} = \frac{Y_{2t}}{A_{2t}L_{2t}}$, which are both constant at the steady state $(\overline{k}_2, \overline{y}_2)$. The only difference with the textbook is the introduction of the tax parameter τ: higher taxes reduce disposable income and capital accumulation reduces. Note also that on the balanced growth path the (pre-tax) wage rate paid to effective labour $(A_{2t}L_{2t})$ is

$$W_{2t} = \left(1-\alpha\right)\overline{k}_2^{\alpha}. \tag{4}$$

The government budget is assumed to balance, hence

$$\tau Y_{2t} = W_{1t} A_{1t} L_{1t} \tag{5}$$

where W_{1t} is the wage cost of effective labour in the pubic sector. Tax revenue raised from the private sector finances expenditure (on labour alone) in the public sector. Following Baumol (1967) we assume labour mobility, hence at any point in time public-and after-tax private-sector wages must be equalized, $W_{1t} = (1-\tau) W_{2t}$. Substituting (2) and (4) into (5) therefore yields

$$\tau A_{2t} L_{2t} \overline{k}_2^{\alpha} = (1-\tau)(1-\alpha) \overline{k}_2^{\alpha} A_{1t} L_{1t}$$

hence

$$\frac{\tau}{(1-\tau)} = \frac{(1-\alpha) A_{1t} L_{1t}}{A_{2t} L_{2t}}. \tag{6}$$

Equation (6) establishes a convenient relationship between taxes and relative employment in the two sectors. The higher the level of effective employment in the public relative to the private sector, then taxes must commensurately increase in order to pay their wages. Moreover, the higher the labour share $(1-\alpha)$, the higher wages are, and the higher taxes must be, for given levels of effective labour.[14]

Nonetheless, by itself equation (6) essentially only redefines the budget constraint: for given employment in the two sectors there must be a particular tax rate. Ultimately the

[14]Note that Baumol's cost disease requires $r_2 > r_1$. On inspection of (6) this would appear to imply that the size of government falls over time. However the other necessary element of the cost disease argument is that demand for public goods is inelastic. This means that labour endogenously shifts from the private to the public sector to the extent that taxes have to rise in order that public sector real output keeps pace with that of the private sector.

actual size of the government will also depend on demand which in turn depends on government institutions. Here we follow Baumol (1967) and posit equal shares in total output, hence

$$\frac{Y_{1t}}{Y_{2t}} = C \tag{7}$$

where C is constant and represents society's choice (or ideology) concerning the appropriate level of public output relative to private output.[15] This representation of demand implies that output in the two sectors are perfect complements. This assumption is discussed below. Given steady state private sector output, and using (6) then

$$\frac{\tau}{1-\tau} = C\left(1-\alpha\right)\overline{y}_2. \tag{8}$$

This equation implicitly establishes government size (τ) as a function of the capital share (and hence the labour share) α. Total differentiation with respect to α yields

$$\frac{1}{\left(1-\tau\right)^2}\frac{d\tau}{d\alpha} = -C\overline{y}_2 + C\left(1-\alpha\right)\frac{d\overline{y}_2}{d\alpha}$$

hence

$$\left(\frac{1 + C\alpha\overline{y}_2\left(1-\tau\right)\left(\delta + r_2\right)}{C\overline{y}_2\left(1-\tau\right)^2}\right)\frac{d\tau}{d\alpha} = \ln\overline{k}_2 - 1 \gtrless 0. \tag{9}$$

The relationship between government size and the labour share may be positive or negative depending on $\frac{s(1-\tau)}{\delta+r_2} \gtrless e^{1-\alpha}$. There are two effects in play. Firstly (and corresponding to the

[15] Note that C should not be thought of as 'government size' in the context of this paper. Government size is defined as the *expenditure* share of GDP. C represents society's tastes regarding the appropriate *volume* of public goods.

minus one on the RHS of the equation) there is a negative relationship between government size and the capital share. If the capital share goes up, the labour share falls, labour costs fall and the size of government falls, at least holding the volume of government output constant. The second effect (corresponding to $\ln \overline{k}_2$) is positive and works through the fact that a higher capital share implies a higher steady state private sector output level. Under conditions of Baumolian demand (7), higher private sector output requires higher public sector output to maintain volume in the two sectors. Increased demand for output from the public sector requires higher taxes.

Despite being quite simplistic the theory here is useful in highlighting some of the important mechanisms, and interestingly has an ambiguous prediction on the relationship between government size and the labour share. A falling labour share intuitively implies downward pressure on labour costs, and a smaller government size holding all else constant. The finding that a smaller labour share simultaneously puts upward pressure on spending in volume terms, through increased steady state private sector output is intriguing, but perhaps more tenuous. To an important extent this finding hinges on the Baumolian demand function, requiring constant relative output, and would change if decisions on government spending were determined by absolute rather than relative volume concerns. Arguably public education is provided until school leaving age, and health provision depends on demand, which (at least for given technology) might primarily depend on demographics and incidences of particular illnesses. It is not immediately clear that the volume of public sector provision can or does (or even should) match that of the public sector.

Ultimately the hypothesis that the size of government will decline with the labour share follows from two premises. The first of these is that the labour share is representative of costs

in the public sector. This follows clearly if we take the stark example that labour *is* output in the instance of public services like nursing and one-to-one teaching. But more generally the idea that the labour 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 labour 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.[16] Most OECD countries adhere, albeit to varying degrees, to ideas of universalism in provision (especially of health and education), 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.[17]

The mechanism proposed here is simple, and novel. Given labour-intensive public services and 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 labour share have played a part in explaining the absence of government growth observed in recent history. The next section turns to evidence.

[16] One possible explanation could stem from inertia in political ideology. In addition public choice issues may also be relevant here (e.g. Buchanan and Tullock 1962, 1977).

[17] 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.

3 Evidence

Pickering and Rockey (2011) (henceforth PR) analyze the growth of government in a panel of 17 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 to all OECD countries until 2007 (thereafter macroeconomic conditions take a substantial toll on outlays in many countries, hence 2008 and beyond are omitted from the analysis.)[18] 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 in general by stasis or even slight decline. This paper builds on the previous analysis by augmenting the PR specification with data for the labour 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. In addition three instrumental variables are employed to address the issue of endogeneity in the labour share. We also distinguish between produced government services - where workers are employed, and transfers. The latter should not be affected by changes in labour costs if the mechanism proposed here is the main driver of the correlation between government size and the labour share. Moreover we examine how different categories of government expenditure co-move with the labour share.

The measure of the labour share is the business sector labour share, which is also taken

[18] The mechanism proposed here may apply equally across institutions hence the dataset is expanded to be as inclusive as possible. (In contrast the mechanism in Pickering and Rockey, 2011, relies on sustained universal suffrage, hence the reduced sample.) Thus the only restriction on data is availability. Appendix A lists all of the data used in the analysis and their sources. A previous working paper presents results using the smaller sample.

from the OECD database. The business sector measure of the labour share is preferable to the aggregate measure for three reasons. Firstly the aggregate labour share includes wages and salaries paid to public sector employees, hence would be conflated with the dependent variable.[19] Secondly the business sector labour share accords with the theory above. The parameter α determines the labour share in the private sector alone. Thirdly it is likely to be better measured in that business sector output (value-added) is traded in markets. Public sector output is in most instances non-traded so measurement of true value-added, and therefore shares of value-added, is difficult. As discussed above, the labour share data display interesting and usable variation across and within countries. The mean value in this sample is 0.66, consistent with the two thirds rule of thumb used as standard in macroeconomic calibration. There is nonetheless a notable decline through the sample period in most countries in recent years. For example for the 15 countries for which data are available in 1970, all countries except Belgium and South Korea experienced a decline in the the labour share between 1970 and 2007.[20]

There are a number of important potential difficulties relating to statistical inference when regressing government size on the labour share. A first issue relates to the definition of the labour share. In particular the OECD labour 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 labour share could be endogenous to government size. However, in raw terms the business-sector labour share data do not seem to be systematically larger under larger public sectors

[19] The aggregate labour share is the ratio of total wages and salaries paid in the economy over GDP.

[20] This accords with Karabarbounis and Neiman (2014) who document that the labour share trended downwards in 42 out of 59 countries between 1975 and 2012.

(e.g. Norway & Sweden, the countries with the largest governments, do not have abnormally large labour shares). The OECD report that these contributions have not varied much over time on average, 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).[21] Nonetheless there has been variation in employer-contributions within some countries, and so controlling for fixed effects may not by itself rule out this as a mechanism for explaining the data. However, in regression results reported below, when the sample is separated depending on whether or not employer-contributions have grown over time, the estimation results are robust across the two subsamples. Hence movements in employer-contributions do not appear to be driving the results.

More broadly the labour share itself is an endogenous variable and will also have its own driving variables, which problematically also may independently drive government size. This necessitates that caution should be exercised before inferring that causality runs from the labour share to government size. One possibility is due to the economic cycle: different macroeconomic theories posit different predictions for the cyclical behavior of the labour share. In simple RBC models it is acyclical. In 'old' Keynesian models emphasizing nominal wage rigidity, the labour share can be anti-cyclical depending on the elasticity of demand for labour. In contrast the new Keynesian literature, as exemplified by Gali and Gertler (1999), emphasizes price-stickiness, which implies a pro-cyclical labour share. Because government outlays in the OECD are quite strongly anticyclical (i.e. due to automatic stabilizers) there is a danger that the labour share would be simply picking up a cyclical effect on spending. To address this problem the regression analysis includes controls for the output gap,[22] and

[21] See http://www.oecd-ilibrary.org/taxation/revenue-statistics-2014/tax-levels-and-tax-structures-1965-2013_rev_stats-2014-5-en-fr

[22] 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. Moreover, following standard practice in the empirical growth literature, the model is also estimated using five year averages of the data to clean out cyclicality from the data.[23]

At a structural level Bentolila and Saint-Paul (2003) and Karabarbounis and Neiman (2014) show theoretically that the labour share varies with differential labour- and capital-augmenting technology and the degree of complementarity between labour 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 labour share may increase (or fall) due to labour- (or capital) augmenting technological progress.[24] Concurrently increases in GDP may also increase government demand for Wagnerian reasons. Thus it is not impossible that under certain conditions changes in the labour share may conflate labour-share (supply) and Wagner (demand) mechanisms in the econometrics. The regression analysis therefore includes time effects, the real oil price (which to some extent may drive changes in relative labour/capital productivity) and of course real GDP per capita to account for these potential drivers.

Alternatively the labour share may also be a reflection of differing or changing preferences/tastes/ideology towards inequality in society. A high labour share may indicate an egalitarian ideology where policies are set in order to increase relative rewards to workers

Prescott filter. Following their approach observations where the output gap is greater than 5% in magnitude are omitted from the regression analysis.

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

[24]Maarek and Orgiazzi (2015) find that the labour share is affected by the level of economic development.

rather than owners of capital. Greater amounts of redistribution (under egalitarian ideology) will also likely increase the size of government. 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.[25]

The empirical evidence analyses a period during which some countries experienced significant privatisation of certain industries. Furthermore in many instances the industries in question have often been capital-intensive hence potentially underpinning a concurrent decline in the private sector labour share and the size of government. Schneider (2003) documents a wave of privatisation across the OECD beginning in the 1990s. In order to investigate this channel the sample is split at 1990, and indeed results are also reported (in table 5) for the pre-1990 sample excluding France, Japan and the UK - the only countries with substantial privatisation programmes pre-1990. The results are found to be robust across the subsamples suggesting that it is not privatisation that is driving the results. Moreover the evidence relating to the subcomponents of government expenditure (in table 4) suggests that it is labour-intensive sectors alone which are driving the results, consistent with the argument advanced in this paper

A further potential co-variate with both government size and the labour share is economic openness. Cameron (1978), Rodrik (1998) and Epifani and Gancia (2012) all explore mech-

[25] The ideology data are taken from the Manifesto Research Group (Budge et al, 2001 and Klingemann et al, 2005).

anisms through which government size is affected by openness. Guerriero and Sen (2012) find that globalization has also affected the labour share, though this view is contested by Karabarbounis and Neiman (2014) who argue that technology is the principal driver of the recent declines in the labour share. In order to address this potential problem openness is included as standard as a further control variable.

As a final additional control variable, following Kau and Rubin (2002) and Winer et al (2008), female participation in the labour force is included in the econometric analysis. The argument here is that increased female participation entail lower costs of tax collection - hence government size in terms of total taxation and therefore expenditure is predicted to increase.[26]

3.1 Ordinary Least Squares Regression Results

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 labour share data.[27] In this specification the estimated coefficient relating to the labour share is positive, and is significant at the 1% 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

[26] Ferris and West (1999) 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.

[27] Column 1 of table 1 is the same specification as used in column 2 of table 2 in PR including the labour share data and female participation as additional explanatory variables, using data from all OECD members and over the longer time horizon up until 2007.

(making the strong assumption that the labour share is exogenous).[28] Column 1b presents the corresponding long-run parameter estimates,[29] illustrating the impact of particular levels of both income and the labour share on the long-run steady-state level of government size. The p-value for the estimated long-run coefficient for the labour share is 0.2%, and the estimated effect is sizable: A sustained one standard deviation (6%) exogenous increase in the labour share is estimated to result in an eventual increase in the size of government by 7.6% of GDP.

One possible objection could lie in the measurement of the labour share. In particular self-employment income is implicitly included in the capital share of income as the measure used only includes labour compensation, which means that the labour share is underestimated. This is of concern because arguably an exogenous decline in government size could lead to a movement of workers from the public sector to self-employment, thereby explaining the observed negative association between government size and the labour share. Nonetheless, the OECD report that over time self-employment has been declining in most of the member countries between 1990 and 2010.[30] The declines in the labour share are thus likely due to other factors. Moreover robustness checks are reported in table 5, with the sample split depending on self-employment trends. The relationship between government size and the labour share holds in both subsamples.

[28] Note in a regression using annual data where the fixed effects are dropped, the coefficient estimate on lagged outlays in 0.914 with a robust standard error of 0.012. The issue of persistence is also addressed when five-year averages of the data are used (where the coefficient estimate on the lagged dependent variable is lower still).

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

[30] See http://www.oecd-ilibrary.org/sites/factbook-2011-en/07/01/04/index.html?itemId=/content/chapter/factbook-2011-61-en.

Column 2 of table 1 repeats the analysis of column 1 using 5-year averages of the data.[31] Averaging the data addresses concerns relating to the cyclicality in government size and the labour share, and the potential spurious correlation problem.[32] The results support those found using the annual data. There is a clear positive relationship between government size and the labour share measure, and the estimated statistical significance is unaffected. These results establish that the observed correlation is not due to cyclical features in the data. Appendix B contains full estimation results for this regression. Consistent with Pickering and Rockey (2011) ideology and its interaction with income continue to affect government size in the extended sample. It is also evident that aging populations (the proportion of the population aged 65 and over) positively relate to government size.[33] This latter phenomenon helps to reconcile the argument in this paper with the observation that in most countries government size has not (substantially) fallen. For example on average across the sample between 1987 and 2007 the proportion of the population aged over 65 increased by about 3%. Given the coefficient estimates reported in appendix B such an increase would ceteris paribus be associated with increases in government size of about 5%. Over the same duration the average business-sector labour share fell from 0.65 to 0.61 - with associated estimated reduction in government size of 2.6%. Changing demographics thus have the capacity to offset the concurrent downward trend in the labour share, in terms of the full effect on government size.

[31] In instances with less than five annual observations the average is computed on the basis of available data in order to maximize the sample size.

[32] The lagged dependent variable is omitted from the 5-year-average regressions because of the Nickell-bias (which increases as the T decreases). In Table 2 we report estimation results reinstating the lagged dependent variable using the method proposed by Bruno (2005).

[33] As also identified by Sanz and Velázquez (2007).

Columns 3 (using annual data) and 4 (using 5-year averages) extend the regression results to include time effects. Time effects are included to control for any common secular trend. Whilst the parameter estimate for the labour share falls slightly in magnitude, it continues to be statistically significant at the 1% level in both cases.

3.2 Instrumental Variables Regression Results

So far the empirical analysis demonstrates a clear positive association between government size and the labour share. Nonetheless the results do not establish causality, insofar that the movements in the labour share may be endogenous to government size or indeed co-determined by unobserved drivers - though the analysis does include a substantial set of control variables, and the results using five-year averages establish that cyclicality cannot be driving the results. To further address this issue table 2 contains results instrumenting for the labour share. With the objective of isolating exogenous movements in the labour share three alternative instruments are employed. The first instrument is the Karabarbounis and Neiman (2014) (hereafter, KN) measure of the relative price of investment, constructed using data from the Penn World Table. Following KN we interpret these data to be the outcome of technological change. In the business sector efficiency gains have been concentrated in capital-producing sectors, which in turn has induced firms to shift from labour to capital to the extent that the labour share has declined. The second instrument is an instance of institutional change. The creation of the European single labour market, via the Schengen agreement, is plausibly an exogenous event - peculiar to the geography and history of continental Europe, and with meaningful implications for the labour share within the signatory nations.

However, it has to be acknowledged that both these instruments could conceivably fall foul of the excludability requirement. Technology could affect demand for government services directly, and even though the Schengen agreement was substantially constrained by (exogenous) geography ultimately the decision to join was political and therefore feasibly related to the size of government. We therefore also include the lagged labour share as a third instrumental variable which has the virtue of being predetermined. Moreover using three instruments permits validity checks in terms of both instrument strength (i.e. weak instruments) as well as excludability. In columns (1)-(3) of table 2 each regression employs two of the three instruments, which allows overidentification tests of whether the instruments are correlated with the second-stage regression residuals. Any identified correlation would cast doubt on the exclusion restriction and hence the validity of the instrument(s) used. In the 'Instruments' row of table 2, first stage estimated coefficients and standard errors are reported. These show that the KN instrument is particularly potent (indeed corroborating the findings of their original paper), and also that the lagged labour share is statistically significant in the first stage.

Column 1 reports results using the KN relative price of investment measure and the lagged labour share as instruments.[34] The estimated effect of the labour share on the size of government continues to be positive and significant. The estimated coefficient increases in magnitude somewhat relative to the OLS case. The standard F-statistic for weak instruments strongly rejects the null hypothesis, hence the instruments are found to have strong explanatory power in the first stage. Moreover the over-identification test is not rejected: the

[34]The IV estimation results use only the 5-year averages of the data in order to rule out any possibility of cyclicality in the data. When used as an instrument the 'lagged labour share' is the average of the previous 5-year period.

p-value of the overidentification test is 0.672 - hence neither of the instruments is found to be correlated with the main regression errors providing support for the exclusion restriction.

In the instance of column 2 results are reported using the Schengen identifier and the lagged labour share as instruments and again the labour share continues to be significant. In this instance over-identification is again not rejected and whilst the weak instruments F statistic is marginally lower than the standard benchmark value of 10. Nonetheless inspection of the first stage regression reveals that Schengen membership is insignificant.

In column 3 KN and Schengen are used as instruments without the lagged labour share, and the statistical significance of the labour share in the second-stage regression holds up. Moreover the diagnostic statistics do not reject the exclusion restriction, though again it is clear that KN does the work in the first stage whilst Schengen is evidently a weak instrument.

3.3 Dynamic Panel Data Estimation Results

The results reported so far using the 5-year averages data omit the lagged dependent variable. However government outlays are still persistent even at this frequency. In column 4 we report results when the lagged dependent variable is included in the regression. In this specification the labour share is instrumented using the preferred instrumental variables, KN and the lagged labour share. Again the labour share is estimated to significantly drive movements in government outlays. The diagnostic tests reject weak instruments and do not reject the over-identification restriction. Notably the KN instrument retains high significance.[35]

One potential remaining issue is the Nickell (1981) bias associated with models involving

[35]Indeed in an unreported regression when the labour share is instrumented by KN alone the F-statistic remains above 10 and the labour share is again highly significant in the main regression.

fixed effects and a lagged dependent variable. The bias is of the order $(\frac{1}{T})$, and in the context of the 5-year averages the maximum number of observations per country is 7 hence the bias may be quite large. A means to correct the Nickell bias, and therefore restore the lagged dependent variable to the 5-year averages analysis, is provided by Bruno's (2005) extension of Kiviet (1995). With the caveat that these estimators are consistent only when the cross sectional dimension of the panel tends to infinity (and here there are only 27 countries) results using this procedure are reported in column 5 of table 2. The statistically significant positive relationship between government size and the labour share is maintained.

3.4 Transfers as the Dependent Variable

The central idea proposed in this paper is simple: labour 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.[36] Investigating the relationship between transfers and the labour share also helps to address concerns of endogeneity. Conceivably, generosity in government provision could enhance labour bargaining power and therefore the labour share - a potential source of reverse causality. 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

[36] A separate literature address the political economy of social security, as distinct from government size. For example Tabellini (2000) discusses provision of pensions in democracies.

to the latter there should not be a link between the labour share and transfers, whilst 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.[37] 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). Columns 6 and 7 of table 2 contain regression results using this alternative dependent variable, repeating the econometric analysis above using the 5-year average data. Column 6 contains estimation results using OLS. The sample size is somewhat smaller because of poorer availability of the transfers data, but importantly the labour share is no longer statistically significant. Similarly when we repeat the instrumental variables regressions in column 7 using the new dependent variable, the labour share ceases to be significant.[38] Movements in the labour share are thus not statistically associated with movements in the generosity of transfers. This adds some credence to the cost-based mechanism for the labour share-government size correlation advanced in this paper.

3.5 Disaggregated Expenditure Data

The responsiveness of the size of government to labour costs depends on labour intensity, and this clearly differs across subsectors. The theoretical analysis also highlights the importance

[37] '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 labour 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. Sample sizes are slightly smaller here due to data availability.

[38] In this regression the KN relative price of investment measure and the lagged labour share are used as instruments due to their superior explanatory power in the first stage.

of the (in)elasticity of demand and in general this will also not be identical across different public services. For these reasons this subsection analyses how disaggregated components of government expenditure change with the labour share.

The IMF Government Finance Statistics database provides annual disaggregated expenditure data by functions of government. The separate categories are: General Public Services (GPS); Defence (DEF); Public Order and Safety (POS); Economic Affairs (EA); Environmental Protection (EP); Housing and Community Amenities (HCA); Health (HEALTH); Recreation, Culture and Religion (RCR); Social Protection (SP).[39] Table 3 contains descriptive statistics of these data. By far the largest component is Social Protection - which includes a large part of the transfers data already analyzed. However, note that some transfers are administered through other sub-categories, and also note that SP includes the substantial expenditure on the administrative (and in particular personnel) costs associated with provision. Other important sub-categories include General Public Services, Economic Affairs, Education, and Health. The latter two are often cited as areas in the public sector susceptible to cost disease. The primary component of GPS is the civil service, hence this also is labour-intensive. However labour is relatively less important in EA is, as it includes expenditures on energy and capital-intensive mining, manufacturing and construction.

It is harder to establish variation in terms of elasticity of demand. Arguably there are many areas of public expenditure - in particular education and health - where provision is determined as a matter of principle and not cost. Inelastic demand clearly follows from these underpinnings. Nonetheless, there may be other government departments which are more

[39] These data are defined more fully in the IMF's Government Finance Statistics Manual 2014. Note that data coverage for disaggregated expenditure is rather more limited than for total outlays.

susceptible to discretionary volume changes when prices vary.

Table 4 contains regression results duplicating column 2 of table 1 using the disaggregated expenditure data.[40] The estimated sensitivity of expenditure (again measured as a percentage of GDP) to the labour share varies across departments as conjectured. GPS, POS, HEALTH, EDU and SP all correlate significantly with the labour share. All of these five components parts have substantial labour inputs: GPS, HEALTH, EDU and SP are labour-intensive as discussed above, whilst POS also likely adheres to the requirements of labour intensity (again because labour is the primary element in policing) and indeed inelastic demand.

Amongst the exceptions, defence expenditure is seemingly determined by other factors (both income and ideology are important here), and indeed to an important extent has substantial capital/equipment costs. EA includes expenditures on fuel and energy, whilst grants (i.e. transfers) are a substantial element of EP. It is possible to conjecture that demand for HCA (which also is relatively capital intensive for example including water supply costs) and RCR (and perhaps EP also) is relatively elastic. Expenditure in these areas is generally more subject to discretion than say HEALTH and EDU.

Whilst a full analysis of the determinants of the separate components of expenditure is beyond the scope of this paper, broadly the data are supportive of the hypothesis that the labour share matters most when production is intensive in labour, and when demand is plausibly inelastic.

[40] Ideally the regression specification would include the lagged dependent variable, though this typically reduces the sample from 95 to 67 observations.

3.6 Robustness Checks

It is natural to ask whether the results are specific to a group of countries or a specific time period. In table 5 the sample is split at 1990. The subsample prior to this year thus excludes Eastern European countries, and also the majority of cases of privatisation noted by Schneider (2003). Column 1 uses the same specification as column 4 of table 2 but using pre-1990 observations only. Column 2 further excludes France, Japan and the UK from this sample - countries where there was also sizable privatisation in the 1980s. Column 3 reports results for the post-1990 subsample (including all countries). As can be seen in all cases government size is significantly positively correlated with the labour share. Indeed the point-estimate is highest in absolute terms for column 2 - which rules out privatisation as the primary driving force for the correlation.

A further robustness check distinguishes between countries in which employers' mandatory social security contributions increased or fell over time. As noted above this could potentially explain the observed correlation between government size and the labour share. According to the OECD Revenue Statistics (2014), between the years 1980 and 2008 these increased in Korea, Turkey, Japan, Finland, Greece, Canada, Ireland, Belgium, the UK, the US, Austria and Switzerland. In contrast they were unchanged in Australia and New Zealand, and fell in Denmark, Germany, Norway, Portugal, France, Luxembourg, the Netherlands, Italy, Sweden and Spain. Column 4 of table 5 contains regression results for the former group of countries, and column 5 contains results for the latter group. If employer-contributions explain the previous results, then the coefficient estimate on the labour share should be significantly larger for the former group. The results show that although the coefficient estimate is slightly lower for the subsample of countries where employer contributions

fell, the coefficient estimates are not significantly different.

Similarly, country-specific trends in self-employment could potentially confound the results. As noted above self-employment has fallen over time in the majority of countries though to varying extents.[41] Columns 6 and 7 of table 5 distinguish between countries in which there were strong falls in self-employment and those in which reductions were more modest or even positive.[42] The coefficient estimate is somewhat higher for the subsample of countries where the extent of self-employment hasn't fallen, though statistical significance remains high in both subsamples.

4 Conclusion

The size of government has intrigued researchers 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 also play some part in determining government size has been under-explored. This paper argues that labour costs, measured by the labour share of income in the business sector, are an important determinant of the size of government. Under conditions of inelastic demand for government, the size of government increases with labour costs. Data from the OECD provide consistent evidence of a positive association between the size of government and the business sector labour share. This holds across a wide range of econometric specifications and when the labour share is

[41] For example between 1980 and 2008 fell by 15% of civilian employment in Japan, and fell by 2.4% in the US. The UK is an exception - self-employment rose by 5.3% over the same period.

[42] Note that data coverage on self-employment rates is imperfect. The analysis is restricted to countries for which data are available.

instrumented with variables encapsulating technology, institutional variation and predetermined movements. In contrast, transfer spending exhibits no relationship with the labour share. Whilst we would certainly admit the possibility of alternative mechanisms linking government size and the labour share, we find that it is only the labour-intensive elements of government which increase in relative expenditure terms when then labour share increases.

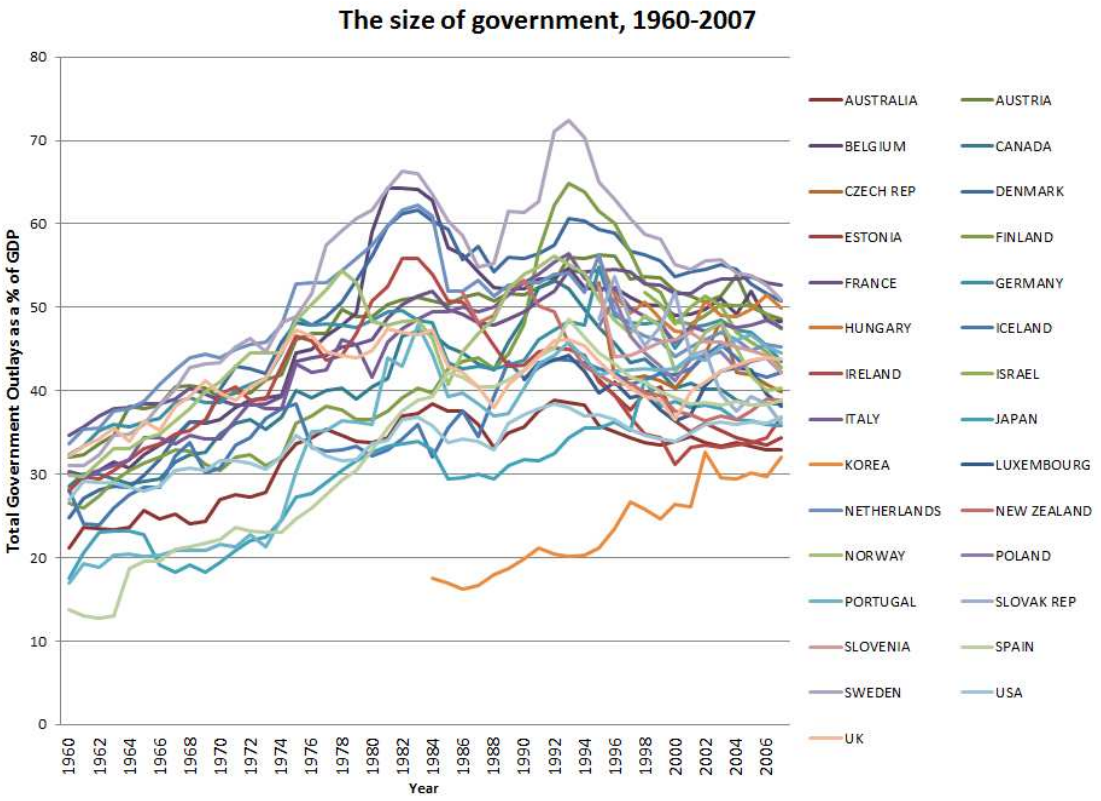

Figure 1: The Size of Government, 1960-2007

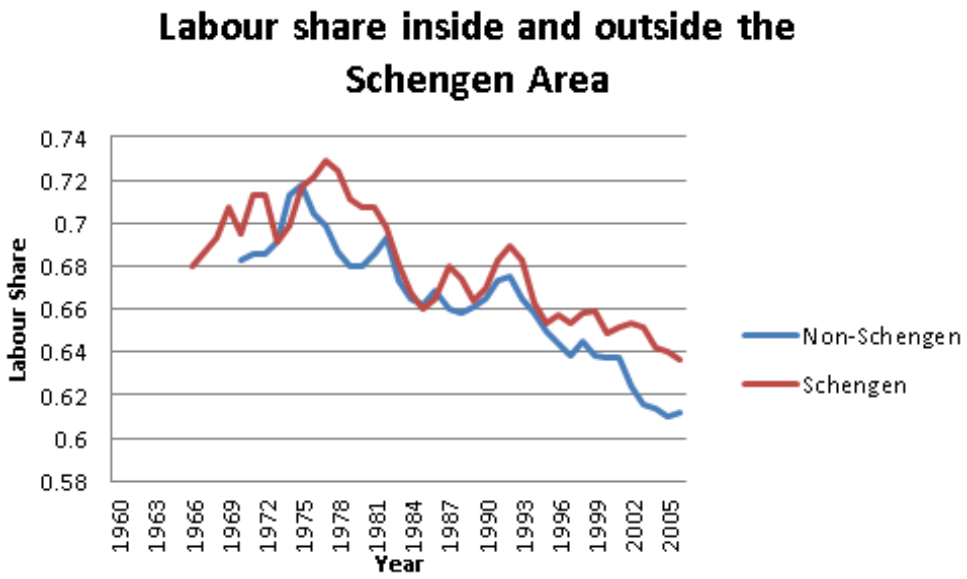

Figure 2: The Average Labour Share of Income, Schengen-Area and Non-Schengen-Area.

	(1a)	(1b)	(2)	(3a)	(3b)	(4)
L.Outlays	0.850			0.849		
	(0.025)***			(0.030)***		
SHARE	19.22	127.3	65.54	14.35	95.45	40.57
	(3.921)***	(33.1)***	(12.29)***	(3.346)***	(26.25)***	(11.57)***
Obs	762		172	762		172
No. Countries	29		29	29		29
Data	Annual		5-year averages	Annual		5-year averages
Time Effects?	No		No	Yes		Yes
R^2 (within)	0.89		0.40	0.92		0.65

Table 1: Basic Estimation Results

Notes: Panel regressions of Government Outlays as a percentage share of GDP including fixed effects, $PROP1564$, $PROP65$, $TRADE$, $YGAP$, OIL_EX, FP, YP, $\overline{ideo}$ and its interaction with YP as used in PR. $L.OUTLAYS$ is the lagged dependent variable. $SHARE$ is the business-sector labour share of income. Robust standard errors are shown in parentheses. Columns (1b) and (3b) contain 'long-run' parameter estimates, with standard errors estimated by the delta method. The cyclical control variables, $YGAP$, OIL_EX, and OIL_IM are excluded in the regressions using 5-year averages of the data. *, **, and *** respectively denote significance levels at 10%, 5% and 1%.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$L.OUTLAYS$				0.493	0.617		
				$(0.079)^{***}$	$(0.075)^{***}$		
$SHARE$	103.1	50.05	87.29	59.18	47.79	1.630	9.334
	$(23.21)^{***}$	$(22.90)^{**}$	$(22.27)^{***}$	$(16.57)^{***}$	$(11.97)^{***}$	(4.670)	(10.05)
Obs	132	154	132	128	166	130	117
No. Countries	27	27	27	27	28	28	27
Data	5-year averages	5-year averages	5-year averages	5-year averages	5-year averages	5-year averages	5-year averages
Method	IV	IV	IV	IV	Bruno (2005)	OLS	IV
Instruments	KN	$SCHENGEN$	KN	KN			KN
	-0.220	0.009	-0.221	-0.263			-0.227
	$(0.048)^{***}$	(0.007)	$(0.042)^{***}$	$(0.068)^{***}$			$(0.059)^{***}$
	$SHARE_{it-1}$	$SHARE_{it-1}$	$SCHENGEN$	$SHARE_{it-1}$			$SHARE_{it-1}$
	0.249	0.356	0.013	0.182			0.217
	$(0.074)^{***}$	$(0.070)^{***}$	(0.009)	$(0.090)^{**}$			$(0.080)^{***}$
F	11.93	9.661	8.746	12.50			17.50
p_{χ^2}	0.670	0.491	0.146	0.646			0.213

Table 2: Further Estimation Results

Notes: In columns (1)-(5) the dependent variable is outlays. IV is estimated by two-stage-least squares. First stage coefficients are reported below the named instruments in the Instruments row. 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. Column (5) contains results using the Bruno (2005) Bias Corrected Least Squares Dummy Variable estimator for unbalanced panels. In column (6)-(7) transfer payments is the dependent variable (Social benefits other than social transfers in kind as a % share of GDP). See also notes for table 1 for other details.

Variable	Full Definition	Obs	Mean	Std. Dev
GPS	General Public Services	576	6.813	2.598
DEF	Defence	576	1.869	1.463
POS	Public Order and Safety	576	1.667	0.453
EA	Economic Affairs	576	4.766	1.872
EP	Environmental Protection	534	0.744	0.303
HCA	Housing and Community Amenities	576	0.827	0.431
$HEALTH$	Health	576	6.103	1.295
RCR	Recreation, Culture and Religion	576	1.159	0.583
EDU	Education	576	5.617	1.211
SP	Social Protection	576	15.449	5.143

Table 3: Disaggregated Government Expenditure Data

Notes: Data are annual and expressed as a percentage of GDP. A detailed description of these subcomponents is provided in the IMF Government Finance Statistics Manual 2014.

Dependent Variable	GPS	DEF	POS	EA	EP
$SHARE$	19.14	−0.089	2.384	4.329	0.791
	(8.112)**	(1.359)	(1.125)**	(6.441)	(0.686)
Obs	95	95	95	95	87
No. Countries	29	29	29	29	28
R^2 (within)	0.38	0.62	0.48	0.44	0.36

Dependent Variable	HCA	$HEALTH$	RCR	EDU	SP
share	0.948	6.812	0.632	8.125	14.699
	(0.985)	(3.047)**	(1.315)	(2.391)***	(4.770)***
Obs	95	95	95	95	95
No. Countries	29	29	29	29	29
R^2 (within)	0.20	0.73	0.28	0.44	0.39

Table 4: Disaggregated Government Expenditure Estimation Results

Notes: Regression specification is the same as column 2 of table 1.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$L.OUTLAYS$	0.196	0.117	0.367	0.637	0.692	0.677	0.398
	(0.124)	(0.123)	(0.109)***	(0.139)***	(0.106)***	(0.116)***	(0.120)***
$SHARE$	69.85	75.13	40.69	60.85	50.39	48.34	85.96
	(21.00)***	(17.55)***	(14.40)***	(23.76)***	(15.96)***	(16.53)***	(24.10)***
Obs	69	57	97	62	84	64	68
No. Countries	19	16	28	9	12	10	9
Data	5-year averages	5-year averages	5-year averages	5-year averages	5-year averages	5-year averages	5-year averages
Method	Bruno (2005)	Bruno (2005)	Bruno (2005)	Bruno (2005)	Bruno (2005)	Bruno (2005)	Bruno (2005)
Sample	Pre-1990	Pre-1990 - France, Japan & UK	Post-1990	Employer-Contributions increase	Employer-Contributions decrease	Self-Employment reductions	Stable Self-Employment

Table 5: Robustness Checks

Notes: The dependent variable is outlays. Estimation is via the Bruno (2005) Bias Corrected Least Squares Dummy Variable estimator for unbalanced panels. See also notes for table 1 for other details.

Appendix A: List of variables

Variable	Description	Source
$OUTLAYS$	General government outlays as a percentage of GDP	OECD Economic Outlook
$PROP1564$	Proportion of the population aged between 15 and 64 years old	World Development Indicators
$PROP65$	Proportion of the population aged over 65 years old	World Development Indicators
$TRADE$	Sum of exports and imports of goods and services measured as a share of GDP	World Development Indicators
YP	Income per capita in $000s of 2005 prices (PPP)	Penn World Tables
$\overline{ideo}$	Median voter ideology	Pickering and Rockey (2011) and authors calculations
FP	Female labour force as a percentage of the female population between 15 and 64 years.	OECD
$SHARE$	Business sector labour income share	OECD Statistics
OIL_EX	Price of oil in US dollars times a dummy equal to 1 if net exports of oil are positive, 0 otherwise	US Energy Information Administration
OIL_IM	Price of oil in US dollars times a dummy equal to 1 if net exports of oil are negative, 0 otherwise	US Energy Information Administration
$YGAP$	Deviation of aggregate output from its trend value in percent, computed as the difference between the natural logarithm of real GDP in a country and its country-specific trend (obtained using the Hodrick-Prescott filter).	World Development Indicators
KN	The Karabarbounis and Neiman (2014) measure of the relative investment prices (using Penn World Tables data)	Karabarbounis and Neiman (2014)
$SCHENGEN$	Dummy variable set equal to one if the country is a member of the Schengen Area in that year	European Commission
GPS	Government expenditure on General Public Services as a percentage share of GDP	IMF Government Finance Statistics
DEF	Government expenditure on Defence as a percentage share of GDP	IMF Government Finance Statistics
POS	Government expenditure on Public Order and Safety as a percentage share of GDP	IMF Government Finance Statistics
EA	Government expenditure on Economic Affairs as a percentage share of GDP	IMF Government Finance Statistics
EP	Government expenditure on Environmental Protection as a percentage share of GDP	IMF Government Finance Statistics
HCA	Government expenditure on Housing and Community Amenities as a percentage share of GDP	IMF Government Finance Statistics
$HEALTH$	Government expenditure on Health as a percentage share of GDP	IMF Government Finance Statistics
RCR	Government expenditure on Recreation, Culture and Religion as a percentage share of GDP	IMF Government Finance Statistics
EDU	Government expenditure on Education as a percentage share of GDP	IMF Government Finance Statistics
SP	Government expenditure on Social Protection as a percentage share of GDP	IMF Government Finance Statistics

Appendix B: Full Regression Results

Variable	Estimates
$PROP1564$	0.733
	(0.460)
$PROP65$	1.664
	$(0.428)^{***}$
$TRADE$	-0.017
	(0.037)
YP	-0.186
	(0.138)
$\overline{ideo}$	-48.45
	$(16.74)^{***}$
$YP{*}\overline{ideo}$	1.244
	$(0.551)^{**}$
FP	0.012
	(0.160)
$SHARE$	65.54
	$(12.29)^{***}$
Obs	172
No. Countries	29
Data	5-year averages
Time Effects?	No
R^2 (within)	0.40

Notes: Full regression results of column 2 table 1.

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