Public Sector Economics /2019

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n Belgian government debt-servicing costs offset increased MIKKEL BARSLUND. LARS LUDOLPH: Could the decrease age-related expenditure?



Institute of Public Finance ittps://doi.org/10.3326/pse.43.3

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Could the decrease in Belgian government debt-servicing costs offset increased age-related expenditure?

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Article** JEL: E43, H50, H63, J11 https://doi.org/10.3326.pse.43.3.1

* The authors would like to thank to the two anonymous referees for helpful comments on the paper.
** Received: July 12, 2018

Accepted: July 23, 2019

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Abstract

This paper argues that none of the secular trends that have driven down real interest rates over the past decades is likely to reverse in the near future. Government debt-servicing costs have therefore decreased significantly and can be expected to decrease further over the coming years. We calculate the direct gains accruing to the Belgian government from lower net debt interest payments and contrast them to the projected future increases in age-related expenditures. If interest rates remain on their current levels and savings on interest payments are channelled to cover the increases in age-related expenditures, they will cover two thirds of financing needs in these areas until 2030.

Keywords: interest rates, ageing, government debt management, risk

1 INTRODUCTION

One of the key stylised facts of advanced economies over the last three to four decades has been the persistent decrease in real interest rates. A related, parallel and intertwined development is the decline in the policy rate of central banks.

A number of negative effects stemming from the decline in these interest rates have been at the centre of monetary and financial policy debates in recent years. For central banks, the issue of the zero lower bound - i.e. how to conduct monetary policy when policy rates are at or just above zero - has been the central policy question. Pension funds and life insurers, which have traditionally relied on long-dated government bonds to finance liabilities, are finding themselves particularly challenged in meeting past commitments of financial return. Asset bubbles, in particular in the housing market, may further increase contingent liabilities of governments across the globe.

We argue in this paper, however, that this preoccupation is one-sided. Another key consequence of falling interest rates is the reduction in the servicing costs of large sovereign debt burdens. With a focus on Belgium, we show that the favourable re-financing environment has benefitted public finances in several ways. Like other heavily indebted countries, Belgium has managed to save significantly on debt-servicing costs. In addition, there is an on-going process of decreasing government debt in real terms and the government has managed to make its debt maturity profile less vulnerable to interest rate shocks.

On the other hand, the main future challenge to public finances in developed countries is the rising pressure stemming from their ageing societies. In some European countries, the increased expenditure is projected to amount to up to 7% of GDP by 2060 (European Commission, 2015). For Belgium, the situation is less dire. After the pension reform in 2015, which reduced the projected increase in pension expenditures by 2 percentage points by 2030, Belgium now faces an additional public expenditure burden of around 2.4% of GDP by 2030 (Federal Planning Bureau, 2017).

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While government windfalls from lower interest rates are clearly not linked to any one specific expenditure item (i.e. expenditures related to an ageing population), in this case it is sensible to consider the two together. Both the downward movement in interest rates and the increase in pension and health-related expenditures are to some extent driven by demographic changes and societal ageing. Thus, if one (partly) offsets the other, this should be taken into account when addressing the public finance challenges of an ageing population.

In this study, we first review recent contributions to the debate on persistently low real interest rates and conclude that none of the trends that led to a decrease in risk-free interest rates can be expected to be reversed in the near future. We then relate the two diametrical trends, decreasing debt-servicing costs and the rise in age-related expenditure, and argue that, after the recent pension reform, the savings on the former offset around two thirds of the increase in the latter. Our projections, based on current secondary market yields on Belgian government bonds, show a further decrease in net debt interest payments by 1.6 percentage points of GDP between 2013 and 2030. Even in a hypothetical scenario in which interest rates rise moderately, the savings on debt-servicing costs would cover more than half of the additional public expenditure.

The remainder of this paper is structured as follows. The second and third sections provide the theoretical and empirical background for the fall in real interest rates across developed countries. It makes an effort to reconcile the results from diverse recent contributions, which range from overlapping generation models to growth accounting, and argues that a reversal of the strongest secular trends driving down real interest is not imminent or even likely. In the fourth section, the focus turns to Belgium and the direct impact of persistently low interest rates on its public finances. Section five concludes.

2 SAVINGS, INVESTMENT AND THE REAL RATE OF INTEREST

It is useful to start by breaking down the factors determining the real interest rate into a simple supply and demand problem. If supply, i.e. the propensity to save, increases, this puts a downward pressure on interest rates. Similarly, if demand, i.e. the propensity to invest, decreases, interest rates are expected to decline. Figure 1 (left hand side) shows a hypothetical scenario where the propensity to invest declines (i.e. an inward shift) and the propensity to save rises (i.e. an outward shift) such that the equilibrium volume of savings and investment as a share of GDP remains unchanged. This is in line with observed savings and investment (figure 1, right hand side): the amount of global savings and investment relative to GDP has remained approximately constant over the past three decades. A small increase can be observed between 2002 and 2007 and a new stable relative volume thereafter, interrupted only by a slump and a quick resurgence during the global financial crisis. During this period, long-term real interest rates have been in secular decline.





Note: EU-7 real interest rate is the unweighted average of long-term real interest rates in Belgium, Denmark, France, Germany, Italy, the Netherlands and the UK. Countries were selected based on long-term data availability.

Source: authors' own configuration based on Bean et al. (2015, left); AMECO and IMF WEO (right).

Determining the shape of the investments/savings schedules and the concomitant move in the interest rate is a classic economic identification problem. Hence, the sensitivity of both savings and investment to changes in the interest rate has been analysed in a number of empirical studies with the most recent calculations by the IMF (2014a) showing the elasticity of investment to the real interest rate to be about -0.5, and an elasticity of saving to the real rate of about 0.15.

Although even extreme cases, i.e. a complete insensitivity of either desired investment or desired savings, cannot be ruled out, as noted by Bean et al. (2015), it is likely that the observed decline in real interest rates combined with unchanged relative volume is due to a shift in both the investment and savings schedules.

Given the uncertainties related to the shape of the investment and savings schedules and the observed trend in the real interest rate, recent contributions have focused on analysing secular trends that coincide with the decline in the real interest rate and affect either the savings and/or the investment schedule. Bean et al. (2015:21) argue that "while we cannot rely on the evolution of the global savings/ investment share to identify the drivers of the decline in interest rates, we can still look directly at the correlation between those drivers and the movements in interest rates". While such a narrative approach will not establish causal links, with the aid of structural models of drivers of investment and savings, we should nonetheless be able to infer the direction of the effects (see Eggertson, Mehrotra and Robbins, 2017; and Rachel and Smith, 2015 for recent examples).¹ Our ambition here

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¹ Borio et al. (2017) point out two technical issues with such a structural modeling approach: first, the underlying theoretical models rest on untested assumptions. Second, empirical models tend to be overidentified, which may pose a challenge to out-of-sample predictions. We will get back to that discussion below.

is therefore not to quantify these drivers in a growth accounting framework, but rather to assess to what extent secular trends that have been considered important drivers of global real interest rates in the recent literature can be expected to be reversed.

Our discussion of these interest rate drivers in section three is naturally based on what is often referred to as the risk-free long-term advanced country interest rate, commonly measured by 10-year sovereign bond yields adjusted by inflation expectations to convert nominal into real rates.² Projections of savings on government debt servicing cost in Belgium in section four are calculated based on nominal interest rates, under the implicit assumption of a constant inflation (expectation) rate over the relevant time period.³

3 SECULAR DRIVERS OF SAVINGS AND INVESTMENT AND THE ROLE OF MONETARY POLICY

In this section, we first briefly review the secular drivers that have been increasing desired savings and decreasing desired investment and qualitatively assess the likelihood of trend reversals in these variables, closely building on Rachel and Smith (2016). We then provide a brief discussion of the potential role of monetary regimes in determining real interest rates.

3.1 DESIRED SAVINGS

3.1.1 DEMOGRAPHICS

Analyses of the effect of ageing on the real interest are based on the life-cycle model of consumption and savings (Brumberg and Modigliani, 1954). Individual saving takes place when people are in their high-earning years, typically starting in their late 30s until they reach retirement age. Börsch-Supan (2003) has conducted the most comprehensive empirical study on six advanced countries - the United States, the United Kingdom, Germany, the Netherlands, Italy and Japan and their results indeed show the above-described hump shape for most countries. Moreover, the author shows that there is little dissaving at older ages, a trend exacerbated by a rise in retirement age in many developed countries. The relatively recent trend of longer working lives adds additional uncertainty because it prolongs the prime savings years. Carvalho, Ferrero and Nechio (2016) stress that an increase in life expectancy heightens the propensity to save among the middleaged cohort, as a prolonged retirement period is anticipated.

INCREASED AGE-RELATED EXPENDITURE?

² A simple way to measure inflation expectations is to calculate the spread between yields of inflation-linked bonds and bond yields of the same maturity. A more precise theoretical concept is that of the equilibrium real interest rate; the real interest rate where real GDP equals potential GDP, i.e. where the output gap is zero and where the inflation rate is at the level of the target inflation rate. This unobserved interest rate has received much attention in recent literature and several authors have suggested models for estimating it (Justiniano and Primiceri, 2010; Barsky, Justiniano and Melosi, 2014; Cúrdia et al., 2015; Kiley, 2015; Laubach and Williams, 2015; Lubik and Matthes, 2015). See also Taylor and Wieland (2016) for a discussion on the shortcomings of these model-based approaches,

³ In Belgium, inflation, as measured by changes in the consumer price index (CPI), has remained remarkably constant over the past decades (see figure A1 in the appendix I). Currently, all Belgian government bonds yield negatively when adjusted by inflation (see figure A2 in the appendix I).

At the same time, a slowdown in population growth has an ambiguous effect on the real interest rate: while the increase in capital per worker puts downward pressure on interest rates, an increasing number of retirees with a lower propensity to save might well offset this effect in the long run.

Overall, while global demographic forces may be slowly reversed over the coming decade, both the increase in longevity and retirement age are likely to dampen the reversal sufficiently to postpone the effect beyond the 2030 time horizon relevant to this study (Rachel and Smith, 2015).

3.1.2 WITHIN-COUNTRY INCOME INEQUALITY

While inequality among countries has fallen, within-country inequality has risen overall in recent decades. This observation has most remarkably been brought to the surface of the debate by Piketty (2014). He provides evidence for a rising share of income held by the top decile of the population for a number of advanced and emerging economies.

While within-country inequality has indeed risen among OECD countries on average, detailed studies on the effect of rising inequality on savings are only available for the US (see Dynan, Skinner and Zeldes, 2004; Saez and Zucamn, 2014) where the effect is more pronounced than in other OECD countries, as shown in figure 2.

Regardless of the causal effect of within-country inequality on global real interest rates, there appears to be no evidence of a trend reversal in the short to medium term.

FIGURE 2

Gini coefficient of income inequality in the US and the OECD (average value of all OECD members)



Source: author's own configuration based on OECD data.

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3.1.3. SAVINGS IN EMERGING MARKETS AND CHINESE FINANCIAL MARKET INTEGRATION

After 2000, savings in emerging markets relative to GDP have increased significantly, after being roughly constant in the preceding two decades. The IMF (2014a) notes that global savings rates went up by 1.7 percentage points between 2000 and 2007, 1.5 percentage points of which were due to higher emerging market savings, 0.8 percentage points to the higher share of emerging markets in global GDP and a 0.6 percentage point decline to lower relative savings rates in advanced economies.

While foreign exchange accumulation in the aftermath of the 1997-98 crisis in the whole of Asia has certainly contributed to higher demand for safe advanced-economy assets. Bean et al. (2015) stress that China in particular has been a drag on global interest rates. The combination of a rise in savings and large current account surpluses caused by China's export-led growth model resulted in an extensive outflow of funds. These went mainly into advanced economies where they pushed down real interest rates, enabled by Chinese financial market integration. Many underlying drivers for high net savings rates, which are deeply rooted in the household, the firm and the government sector, have been cited (Tao Yang, 2012). Ma and Yi (2010), for example, identify corporate restructuring, the Lewis model of transformation and rapid ageing as the main driving forces. In the medium term, these forces will reach a plateau and slightly reverse (Ma and Tao Yang, 2013). This trajectory is in line with IMF forecasts that predict a decline in both Chinese gross national savings and a more moderate current account. In the same vein, Chinese foreign exchange reserves dropped sharply between the end of 2014 and early 2016, but the latest numbers show that this trend is already faltering, albeit not reversing (IMF, 2016a).

3.2 DESIRED INVESTMENT

3.2.1 RISE IN THE SPREAD BETWEEN THE RISK-FREE RATE AND THE COST OF CAPITAL

There appears to be a clear shift of preference among investors, towards safe assets.⁴ The aggregate equity risk premium, defined by the cost of equity minus the risk-free rate, has increased globally between 2000 and 2016 with the exception of emerging market economies where it has fluctuated around a constant level since 2000 (Credit Suisse, 2016).

The reason this trend has important implications for global real interest rates is its impact on companies' investment decisions. Investment decisions depend on the weighted average cost of capital (WACC), the weighted average of a company's debt servicing costs and its cost of equity. With the equity risk premium shooting up, these costs increased vis-à-vis the risk-free rate, making corporate investment relatively less attractive. As Rachel and Smith (2015) note, predicting the future

⁴ This shift in itself may be driven by aging societies, see Liu and Spiegel (2011).

of the equity premium is difficult, but the post-crisis regulatory landscape does not favour a trend in either direction.

3.2.2 RELATIVE PRICE OF CAPITAL GOODS

Cheaper capital may have two effects on investment: first, it may trigger more investment as lower marginal returns are needed to recoup the price of capital, and second, a given amount of investment can be maintained by dedicating a relatively smaller share of overall production to capital-intensive projects. As illustrated convincingly by Rachel and Smith (2015), the 30% decline in the relative price of capital goods from the 1980s had an overall negative effect on investment, as the elasticity of substitution between labour and capital was not sufficiently high to contain the effect (see also Thwaites, 2015).

3.2.3 REDUCED PROFITABILITY OF INVESTMENT

The above decline in the relative price of investment was predominant until the early 2000s. In the aftermath of the global financial crisis, a different force took over: a drop in investment profitability. A study by the IMF (2014a) shows empirically that between 1980 and 2013, both total factor productivity and the expected investment profitability declined substantially.⁵

The study points to the conclusion that, in the near to medium term, there are no signs of increasing investment profitability, absent substantial structural reforms.

3.2.4 PUBLIC INVESTMENT DECLINE IN ADVANCED ECONOMIES

Public investment in advanced economies has been on a declining path since the 1980s, putting a downward pressure on real interest rates (IMF, 2014b). Recent declines are partly explained by the downward pressure on total public expenditures in many countries after the 2008 financial crisis. However, Jäger and Schmidt (2016) suggest that the long-run trend is a structural feature of an ageing society. They predict that the trend will only reverse once the share of older people in the electorate reverses. Analyses by the IMF (2016b) confirm this view and do not predict a reversal of the trend in the near future.

In conclusion, while linking secular trends to the decline in the propensity to invest seems evident, explaining the rise in the propensity to save is more difficult. While emerging market reserve accumulation and structural phenomena in China have certainly contributed to lower real interest rates in advanced economies, other secular trends such as the rise in within-country inequality and the link between ageing and desired savings, albeit widely accepted, are difficult to establish empirically. The conclusion we draw is that while we cannot quantify the

⁵ See IMF (2014a:19) for details on the empirical specification estimated. Essentially, the authors regress real private investment on a measure of lagged real GDP. They then analyse the structure of the forecast error under the hypothesis that it is negative if real investment declined more than what can be predicted by the lagged real output term.

importance of the different secular drivers of low real interest rates, we consider it unlikely that any of the causative factors will reverse any time soon.

3.3 MONETARY POLICY

The above qualitative review of the structural determinants of savings and investment implicitly assumes long-run neutrality of monetary policy. This view has been challenged, most prominently in a recent contribution by Borio et al. (2017), who argue that "interest rates necessarily reflect the interplay between the central bank's reaction function and private-sector beliefs and behaviour" (p. 22).

Empirically, their criticism of the structural explanations deduced by proponents of the savings-investment narrative is based on the observation that the decline in real interest rates across the globe also coincided with a change in monetary policy regimes from post-Bretton Woods to an explicit inflation/price stability targeting.

For our research question at hand, two points are important to mention with respect to these findings. First, disentangling a potentially endogenous monetary policy regime change from structural economic factors is impossible for a number of econometric reasons.⁶ Second, it is unlikely that advanced-country monetary regimes will change over the relevant time horizon until 2030.

An issue more relevant to short- and medium-term changes in advanced country real interest rates is the unconventional monetary policies recently carried out by major central banks. Quantitative easing (QE) programmes in Japan, the United Kingdom, the United States and the euro area have certainly had a negative effect on long-term government bond yields.⁷ Although there is an ongoing discussion of the effectiveness of the different (short term) transmission channels of QE (see Alcidi et al., 2015), the general phenomenon of low interest rates have not been reversed after the end of the first generation of the ECB's QE programme; conceivably because structural factors driving longer term interest rates are unchanged.⁸

⁶ Boeri et al. (2017) attempt to tackle this issue by analyzing long-term data over more than a century and including both monetary regime change dummies as well as variables that capture savings and investment drivers in an empirical specification. They then proceed to argue that variation in country-specific real interest rates is mostly explained by the regime-change dummies. However, this approach is econometrically difficult: since all trends coincide, the regime change dummies are essentially country-specific era fixed effects. In such a specification, the investment and saving proxy variables are estimated based on the variation left around the mean within these country-by-era fixed effects. This could still be informative if there was heterogeneity across countries in monetary regime changes which do not coincide with trends in relevant structural parameters; however, there is very little of such heterogeneity in advanced countries (see table 9, p. 27 in Boeri et al., 2017). A further issue with including savings and investment drivers as independent variables simultaneously is the multi-collinearity between these variables. Some of them, such as GDP growth, population growth and life expectancy are by definition highly correlated, which will both affect point estimates (in an a priori unknown manner) and increase the standard errors around these estimates.

⁷ See for example Breedon, Chadha and Waters (2012), who find that the Bank of England's QE1 lowered government bond yields by 50 to 100 basis points.

⁸ The ECB's President, Mario Draghi, summed up the situation well in a recent speech: "[raising real interest rates can] only be achieved by structural reforms that elicit a structural rebalancing of saving and investment".

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4 THE EFFECT OF PERSISTENTLY LOW INTEREST RATES ON PUBLIC FINANCES: THE CASE OF BELGIUM

In this section, we first discuss and calculate the potential for Belgium to save on net debt interest payments. We then contrast these potential savings with projected additional age-related expenditure.

4.1 SAVINGS ON NET DEBT INTEREST PAYMENTS IN BELGIUM

The falling interest rates have led to lower government net debt interest payments throughout European countries. Most of the gains have already been realised over the past decade. Table 1 below shows the current interest payments of selected European governments (column 2) and contrasts them with current 10-year benchmark yields (column 3) to indicate additional savings potential.

TABLE 1

Selected European governments and their potential to save further on debt servicing costs

| Country | Current (2017) net debt interest payments (in %) | Current (02/2017) 10-year government bond yields (in %) | CurrentCurrent(02/2017)(01/2017)10-yearaveragegovernmentresidualbond yieldsmaturity of(in %)totaloutstandingblat (in we | | Share of government gross debt held by foreign investors (2018, in %) | |
|----------|---|--|---|-------|--|--|
| France | 1.7 | 1.07 | 7.2 | 87.5 | 47.3 | |
| Germany | 0.8 | 0.26 | 5.8 | 44.5 | 47.7 | |
| UK | 2.2 | 1.20 | 14.9 | 77.5 | n/a | |
| Italy | 3.6 | 2.21 | 6.8 | 119.0 | 29.4 | |
| Belgium | 2.3 | 0.82 | 8.7 | 90.1 | 52.7 | |
| Portugal | 3.7 | 3.92 | 6.5 | 110.1 | 52.1 | |

Data sources: OECD Economic Outlook 2016, Bloomberg, ECB, IMF WEO 2017 and Eurostat for columns from left to right.

The current average residual maturity (column 4) gives an additional indication of the cost-saving potential: the low interest rate environment makes it cheaper to de-risk the maturity profile of government debt. Governments that have issued debt with a longer average maturity have therefore more potential to save on the issuance of future debt. Current government net debt as a share of GDP (column 5) indicates the potential for savings relative to the total debt burden when assets held by the government are subtracted.⁹

With government net debt (calculated as gross debt net of intra-governmental debt, financial assets held by the government and debt held by the central bank) of

⁹ Arguably, government gross debt to GDP is the more relevant measure for short- to medium- term debt sustainability analysis. However, for our purposes, it is important to consider assets held by the government as their value will be equally affected by changes in the interest rate environment.

around 90.1% in 2017, a fall in the real interest rates has had a substantial impact on public finances in Belgium.¹⁰ Net debt interest payments have decreased from about 7% of GDP in 1998 to the current level of around 2.3% (figure 3).



The maturity profile indicates that spikes mostly emerge in the short term, with 16% of total government debt maturing in 2016 and slightly more than that in 2017. After a third peak in 2021, the profile flattens out (European Commission, 2016 and Bloomberg data). Major forecasts predict a decrease in interest rate expenditure between 0.5 percentage points of GDP (IMF, 2016c) and 0.3 percentage points of GDP (OECD, 2015) over the years 2018 and 2019. Our own calculations confirm these projections and extends them until 2030. To do so, we first utilise detailed data on Belgian government debt composition for all years until 2030, including information on coupon payments and maturity dates for all liabilities.¹¹ Figure 4 (left hand side) below shows the weighted average fixed coupons of non-treasury bill debt maturing by year (2016-30).¹²

We then calculate savings on government interest rate payments until 2030 based on a number of reasonable assumptions. First, we assume that debt composition, i.e. the shares issued in treasury bills, government bonds and other loans, remains constant.¹³ Second, we then assume that the government rolls over maturing sovereign bonds by issuing new bonds that pay coupons equal to the secondary market

¹⁰ Note that net government debt is decreasing in most euro area countries due to the ECB's sovereign bond purchasing program. In January 2017, the euro area national central banks held 14% of gross government debt in the euro area (with the exception of Greece, which is not eligible to participate in the program).

¹¹ Data was extracted from Bloomberg.

¹² Since treasury bills have a maximum maturity of one year, we do not expect further gains accruing to them. We thus focus our estimates on all other bonds.

¹³ The Belgian government also entered into a number of forward rate agreements, typically using 3 month and 6 month Euribor as the floating rate. The resulting coupons are all very close to zero. We do not consider them in our analysis for both their negligible small amounts and reasons of simplicity.

yields of bonds with a maturity equivalent to the weighted average maturity of total government bonds¹⁴. Under the additional assumption that both real interest rates and inflation expectations remain constant over the relevant time horizon ewe can estimate expected savings on interest payments (figure 4, right hand side).

FIGURE 4

Weighted average fixed coupon on Belgian non-treasury bill debt maturing in the indicated years 2016-2030 (left hand side) and savings on coupon payments as a percentage of GDP under a no-interest-rate-change assumption, 2016-2030



Source: authors' elaboration on Bloomberg and IMF WEO data.

The highest gains were thus realised in 2017 and are expected for 2022, with declining interest rate expenditure of 0.3% and 0.25% of GDP, respectively. A further peak occurs in 2028.

How much can the Belgian government possibly save? In order to determine the lower bound for net debt interest payments, consider the following thought experiment: bonds of a maturity equalling slightly above eight years – the weighted average maturity of all outstanding debt – currently yield 0.37%. Multiplying this number by outstanding Belgian net debt to GDP of 90.1% gives us a lower bound for net debt interest payments of 0.33% of GDP.¹⁵ Of course, this extreme scenario is not likely to materialise in full due to other considerations affecting the optimal composition of total government debt. Accumulating the expected gains displayed in figure 3 and adjusting them downward to consider only interest payments on government net debt gives us an estimate for savings of about 1.1 percentage points of GDP until the end of 2030, taking 2015 as the base year (figure 5). This number increases to 1.6 percentage points of GDP if measured from 2013 (from which year we have age related expenditure projections, cf. below).¹⁶

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¹⁴ This assumption is conservative for two reasons. First, we assume a linear and positively sloped yield curve. Figure A2 in the appendix shows that this assumption is reasonable – the "flattening out" of the yield curve for maturities >20 years only increases potential gains. Second, in reality, public debt management is not static. Increased future growth expectations that would result in a steeper yield curve could easily be compensated for by issuing more short-term debt.

¹⁵ Data on the Belgian net debt-to-GDP ratio were extracted from the IMF's World Economic Outlook database.
¹⁶ To see this, add the 0.5 percentage point fall in figure 5 from 2013 to 2015 to the projected 1.1 percentage points from 2015 to 2030.

FIGURE 5

Historical and forecast aggregate savings on Belgian government net debt coupon payments, 2016-30 (percent of GDP)



Source: authors' own calculations based on Bloomberg data.

An important question is how the savings (as a percent of GDP) on interest payments translate into an improvement of public finances. Since part of the windfall for the government in terms of lower interest payments represents a loss in interest income of the domestic population, it does have implications in terms of income and consumption taxes; government tax intake will be lower. In addition, there may be second-order general equilibrium effects. Because lower interest rates on debt are a global phenomenon, the extent to which the domestic population is exposed depends on the net international investment position of the country's investors.¹⁷ As an example, foreigners hold around 50% of outstanding Belgian government debt (table 1 above). If the volume of foreign debt held by Belgians (which experienced a similar decline in interest rates) was at a value of less than 50% of government gross debt, parts of the government savings on interest rate payments would be a windfall from abroad and would not affect the real domestic economy. If, on the other hand, Belgians held foreign bonds equivalent to a value greater than 50% of Belgian government gross debt, the global fall in interest rates would affect the domestic real economy to a relatively larger extent.

Belgium's net international investment position (NIIP) shows that the country is a net global investor with net assets valued at approximate 50% of GDP, a value that has remained relatively stable over the past few years. However, this surplus is composed of a large surplus in equity securities (€147 billion or 35% of GDP) and a surplus in residual investment, including financial derivatives (€112 billion or 27% of GDP). The position in debt securities, on the other hand, shows a deficit of €66 billion (or -17% of GDP).¹⁸ Thus, the direct effect of a global decline in interest rates (and a rise in the equity premium) is likely to benefit Belgian investors.

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MIKKEL BARSLUND, LARS LUDOLPH: COULD THE DECREASE IN BELGIAN GOVERNMENT DEBT-SERVICING COSTS OFFSET

INCREASED AGE-RELATED EXPENDITURE?

¹⁷ The relative riskiness of the investment portfolio (i.e. the composition in terms of equity and debt instruments) across countries is also a factor. If Belgians are more likely to hold equity relative to other nationalities, lower interest rates would affect their investment income comparatively less.

¹⁸ All calculations based on 2016-Q4 data of the Bank of Belgium; GDP (2016) data as reported by Eurostat.

The overall impact that lower interest rates have on consumption via implicit transfers from bond holders to the government is arguably small. First, there is a limited direct effect on households. In the case of Belgium, residents outside the financial sectors held only a very small share (<5%) of outstanding Belgian government debt in 2018.¹⁹ Hence, the effect would come from lower dividends or equity valuations of banks and insurance companies, which only have a small effect on consumption (Case, Quigley and Shiller, 2005). Other holders of government debt are pension funds and mutual funds invested in safe assets. The impact of their investment performance on household behaviour is arguably limited.

The persistently low interest rates further allowed Belgian public debt managers to strategically issue sovereign bonds and thereby flatten out the debt maturity profile despite the high debt-to-GDP ratio. While it is more difficult to quantify the positive value of such de-risking (and we can thus not directly account for it in our calculations), we nevertheless discuss the implications further in appendix II.

4.1 CAN DECREASED DEBT-SERVICING COSTS OFFSET INCREASED AGE-RELATED EXPENDITURE?

Combining information from the European Commission's 2015 ageing report and the Belgium Federal Planning Bureau's (2017) update on forecast pension expenditure allows us to display changes in age-related expenditure in Belgium from 2013 to 2030 (and 2020) (figure 6).

FIGURE 6

Disaggregated changes in age-related expenditure in Belgium with base year 2013 as a percent of GDP, 2013-2030



Source: authors' illustration based on data from the European Commission and the Belgian Federal Planning Bureau.

Overall, age-related expenditure increases by 2.4 percentage points of GDP over the time horizon under consideration. Increased spending on public pensions

¹⁹ Eurostat data.

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(+2.0), long-term care (+0.5) and education (+0.2) are slightly counter-balanced by lower health care (-0.1) and decreased unemployment expenditure (-0.2).

Comparing these numbers to the projected savings on government net debt interest payments of 1.6 percentage points of GDP from 2013 to 2030 shows that the latter offsets the former to a large extent. More precisely, savings on net debt interest payments can cover roughly two thirds of age-related expenditure under the no-interest-rate change scenario measured from the baseline of 2013. In a hypothetical scenario where secondary market yields on average maturity debt increase to 1.5% in 2020 (thus, by 113 basis points), savings on net debt interest payments would still cover 54% of the additional age-related expenditure (see appendix I).

5 CONCLUSION

In this paper, we review recent contributions to the debate on the drivers of real interest rates. We conclude that, while we are uncertain to what extent each secular driver contributed to the decline in real rates over the past two decades, there is no evidence that any of them could be reversed substantially in the near future. Thus, we expect real interest rates to remain low in the medium-term.

The following expected decrease in Belgium's debt-servicing costs could offset the increase in age-related expenditure to a large extent. Even in a scenario of slowly increasing interest rates, the direct gains accruing to Belgian public finances from persistently low interest rates cover a substantial share of agerelated financing needs until 2030, thus minimizing the need for further adjustments to Belgium's primary balance if these savings are channelled towards public pensions, long-term care and education. Similar mechanisms would apply to other highly indebted countries.

Indirect gains stem from an extension of debt maturities (see appendix II) and a decrease of Belgian government debt in real terms, with potential long-term benefits for sovereign debt sustainability.

We note that our findings are relevant to the medium-term only. Despite the pension reform in Belgium, age-related expenditure will continue to increase in Belgium until 2069 (Belgium Federal Planning Bureau, 2017) and the dampening effect from the low interest rate environment will soon reach its peak. This finding thus closely relates to a recent contribution by Elmendorf and Sheiner (2017) who argue that the combination of an aging society and low interest rates changes the government's optimal spending path: while spending adjustments to cover future liabilities should be enacted as soon as possible (and thus give relevant actors time to adjust), they should not be implemented now. The low interest environment can thus be seen as a tool to buy time, but not to abandon inevitable structural reforms.

Disclosure statement

No potential conflict of interest was reported by the authors.

APPENDIX I BACKGROUND FIGURES

FIGURE A1

Annual growth of CPI inflation in Belgium (in percent), 1986-2016



Data source: OECD.

FIGURE A2

Belgian secondary market government bond yields (07/05/2017) and Belgian y-o-y CPI inflation (03/2017) (in percent)



Note: all government issued bonds are currently below the Belgian CPI inflation rate (figure A2). Thus, virtually any newly issued bond decreases Belgian government debt in real terms. Source: OECD.

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FIGURE A3

Overall change in age-related expenditure by 2020 and 2030 in Belgium (base year 2013; in percent)



Source: authors' illustration based on data from the European Commission and Belgian FPB.

FIGURE A4

Forecast annual savings on net debt coupon payments (in percent of GDP) -----0.9 0.8 _____, -----0.7 _____ 0.6 -----0.5 04 0.3 0.2 0.1 0.0 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030

Note: based on a hypothetical scenario that assumes an increase in the average yield of maturity debt in the secondary market from the current level to 1.5% in 2020.

Source: authors' own calculations based on Bloomberg data.

APPENDIX II

BELGIUM'S GOVERNMENT DEBT MATURITY PROFILE

The low interest environment led to a shift in Belgium's government debt maturity profile. The weighted average maturity of total outstanding government debt increased by 3.5 years between January 2010 and March 2017, allowing the Belgian government to de-risk its debt structure without paying a high default risk premium (figure A5).²⁰

FIGURE A5

Weighted average maturity of total Belgian government debt, in years

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| | | | | | | | | | | | | | | | | | | | | | | | |

Data source: ECB.

An extension of maturities is a difficult yet important task. Heavily indebted countries like Belgium usually have maturity profiles skewed to the short term as governments' commitments to low inflation become less credible when debt is high (Blanchard and Missale, 1991). While the credibility argument only applies to a very limited extent in a monetary union, several authors emphasise a second reason.²¹ Default risk alone may explain the short-term nature of debt maturity profiles when governments have accumulated significant debt in the past (Alesina et al., 1992).

The more debt a government takes on, the higher the default risk premium that investors demand on long-term debt. Rolling over large amounts of debt every year entails a high vulnerability to sudden rises in interest rates, rendering default exponentially more likely with every year. This motivates governments to take on

²⁰ As pointed out by Gros (2016), purchasing domestic government bonds by national central banks effectively decreases their maturity to 0. As of 31 March 2017, the National Bank of Belgium held Belgian government debt worth ϵ 49 billion (11% of outstanding debt) with a weighted average maturity of 10.1 years within the ECB's public sector purchase program (PSPP). This effectively reduces the weighted average maturity of government debt still traded on the secondary market to 8.7 years and the weighted average maturity of total outstanding debt to 7.9 years, which still constitutes a large increase over the past years.

²¹ The costs of leaving a monetary union are generally considered too high.

high amounts of short-term debt, which exacerbates the issue rather than solving it. Escaping from such a bad equilibrium can generally only be accomplished by a significant reduction in the debt burden. Belgium and other heavily indebted advanced countries, however, seem to have managed a reduction of their shortterm debt owing to the current low-interest environment.

In general, lengthening and thus smoothing the structure of government debt by avoiding maturity peaks makes confidence crises among investors less likely. If the amount of debt maturing every year is small, even severe crises characterised by a rapid rise in sovereign bond yields would not put pressure on public finances. As these dynamics are typically priced in by financial market participants, the magnitude of a sovereign bond price decline will eventually be less severe.

All in all, the government of Belgium has thus benefitted substantially from the global decline in interest rates. Besides the immediately favourable effect on debtservicing costs, Belgium's government debt is currently decreasing in real terms and its maturity profile has become less risky. The direct gains from the latter two effects are difficult to quantify. The most significant indirect effect is the positive impact on Belgium's credit rating as the above factors are taken into consideration by all major credit rating agencies. As stated in the introduction, we abstain from speculating on potential private sector losses that may eventually inflict costs on the public sector. Contrasting the increased financial market risk caused by the low interest rate environment with the gains on decreased government interest payments would be another useful exercise. Further analysis of the case of Belgium should also consider the impact on pension funds and the "search-for-yield" behaviour to meet commitments made to beneficiaries.

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Willingness to redistribute: the case of Poland



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Preliminary communication** JEL: A13, D31, D64 https://doi.org/10.3326.pse.43.3.2

* The authors declare no financial or non-financial interests related to the research in this paper. The authors would like to thank to R. Kurach and P. Kuśmierczyk for their comments on the research methods. The authors would also like to thank J. Mieloszyk for conducting the survey at Warsaw University of Technology as well as the two anonymous referees for helpful comments on the paper.

** Received: June 26, 2019 Accepted: July 18, 2019

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Abstract

The primary motives for redistribution were related to the desire to fight poverty and to help the poorest. Later on, other motives emerged, such as the desire to gain social support and the self-interest of rich people who agree to transfer part of their funds provided this increases their utility.

The aim of the study is to present the determinants of willingness to redistribute in a group of Polish students. The case study focuses on sharing behaviour in this group. The survey was conducted among 399 students representing four higher education institutions in Poland. The research, based on a solidarity game, has shown that willingness to share with others depended on gender, the profile of studies and the city of studies.

Keywords: redistribution, gender, income, generosity, social policy

1 INTRODUCTION

Every person that is a member of a group shares some of their resources with others. Meeker (1971) points out that sharing and transfer decisions result from "exchange principles": reciprocity, rationality, altruism, status, consistency, joint gain and competition (rivalry). Thus, individual sharing behaviour may not lead to the results expected at the society/community level. Only the commonality can give each person a better chance of realising their interests independently by participating in the group. Thus, each community should be built and upheld according to the theory of social justice (particularly distributive justice) and fairness (Nicolaïdis and Viehoff, 2012).

So, the desired distribution of resources depends on the adopted definition of fairness and social justice. The theory of social justice derives from the concept of fair distribution of resources among the members of a society. Fair distribution may be determined by the needs, merits, opportunities or outcomes of individual activities (Barr, 1993). It may also result from justice in acquisition or transfer (bequest) of wealth or come from the rectification of unjust acquisition or transfer (Nozick, 1974). Utilitarianists claim that just income distribution exists when total social welfare (utility) is maximised (Rawls, 1991). Assuming diminishing marginal utility, this means the equal distribution of income.

Distribution of income in a society depends on numerous factors, including individual decisions taken at different stages of life and the proverbial luck. Apart from the definition of justice or fairness used, unfair income allocation creates a field for income redistribution that may eliminate undesired inequalities.

Redistribution is a government activity aimed at transferring funds or wealth among various groups of citizens. It is an intrinsic element of every social policy aimed at social justice and probably one of the most important functions of the

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modern state (Tullock, 1997a). By definition, income redistribution means changes in the structure of income distribution in favour of certain groups (or individuals) and at the cost of others (Stiglitz, 2000). The main reasons for redistribution include (Rawls, 1991; Tullock, 1997a; Dagdeviren, Van Der Hoeven and Weeks, 2002):

- generosity people are willing to help those who are worse off than themselves,
- benefits and power people use redistribution to get power or receive some benefits (e.g. politicians),
- envy people are afraid of those who are frustrated with income inequality (low income class) and want to reduce their envy,
- utility maximisation when one operates "behind the veil of ignorance".

As mentioned earlier, the very first motives of redistribution were related to the desire to fight poverty and to help the poorest (Tullock, 1997b). Later on, other motives emerged, such as, for instance, the desire to gain social support (compulsion through the ballot box), or the self-interest of rich people who agree to transfer part of their funds provided this increases their utility (voluntary compulsion) (Barr, 1993; Dagdeviren, Van Der Hoeven and Weeks, 2002; Grossman and Helpman, 1996; Acemoglu and Robinson, 2001; Brunner, Ross and Washington, 2008).

Previous studies indicated a negative correlation between individual willingness to redistribute and level of income (Ravallion and Lokshin, 2000; Alesina and La Ferrara, 2005a). Further experiments in the form of a "solidarity game" (Selten and Ockenfels, 1998; Büchner, Coricelli and Greiner, 2007; Bolle et al., 2012), i.e. studying the declared willingness to share the win, conducted in several countries worldwide, confirmed this thesis. Also, there is a negative correlation between the preference for redistribution and income level (Ravallion and Lokshin, 2000; Alesina and La Ferrara, 2005b). Moreover, the willingness to redistribute is higher in times of prosperity and lower during periods of unemployment (Brunner, Ross and Washington, 2008). Growing income inequality leads, in turn, to more individual support for redistribution (Olivera, 2015). The impact of age on redistribution/solidarity is positive, but it stabilises over time (Kakes and de Winter, 2008). Women's attitude towards income redistribution is on average more generous than men's (Eckel and Grossman, 2001; Blekesaune and Quadagno, 2003), partly because women display different financial behaviours (Walczak and Pieńkowska-Kamieniecka, 2018). Individuals are also more generous in public than in private (Montano-Camposa and Perez-Truglia, 2019). Additionally, diversity of social problems in different countries results in people being willing to support the same social and professional groups in a different way (Blekesaune and Quadagno, 2003). In turn van Oorschot (2000) stresses that expectation of reciprocity is of great importance for willingness to help. "What have you done, or what can you do for us?" - this is the key question asked by the individual (consciously or subconsciously) while making the decision about any form of help.

The aim of the study is to present the determinants of willingness to redistribute in a group of Polish students. Taking into account this aim, the following two hypotheses were assumed:

Hypothesis 1: Women are more willing to redistribute than men.

Hypothesis 2: People think that they are more generous than others.

The presented study is based on a "solidarity game". Solidarity refers to the ties in a society that come from unities of interests, goals or standards. Solidarity aims at a reciprocal relationship, but a more subtle one than just giving right after one has received (Selten and Ockenfels, 1996). Solidarity is also not altruism as it refers to carrying common burden undertaking joint efforts so as to maximise the welfare of the community. Like the notion of "redistribution" used in the present work, it denotes supporting others, but on the group/community level. Hinrichs (1995) even points out that justification of redistribution in a society is based on the "culture of solidarity"/"solidaristic culture" (Karagiannis, 2007). Therefore, solidarity can be understood as a redistributive arrangement (Maarse and Paulus, 2003).

The willingness to redistribute among a group of members, or even widely in a society, is of utmost importance in times of rising inequalities. Analysis of redistributive attitudes of individuals may help to prepare adequate social policy and reduce some of the negative effects resulting from undesired income distribution. As mentioned before, studies of individual willingness to redistribute and to share the win were conducted in several countries. But no such analysis has been carried out in Poland or other Eastern European countries so far. This study, the first research project into the redistributive attitudes of Polish people, fills a significant gap in this field.

2 METHODOLOGY

A survey study was conducted in the period from November 2016 to January 2017. In all, 399 students from four higher education institutions located in three cities in Poland, i.e. Warsaw (Central Poland), Toruń (North) and Olsztyn (North-East) participated in the study. In Warsaw the subjects came from two institutions, i.e. the Warsaw School of Economics and the Warsaw University of Technology, in Toruń from Nicolaus Copernicus University, and in Olsztyn from the University of Warmia and Mazury.

In each institution the scheme of the study was the same. The students received a survey questionnaire which consisted of two parts (in the appendix to this paper). The first part included questions regarding their willingness to redistribute while the second part contained particulars which allowed identification of the sociode-mographic characteristics of respondents. In the course of the study the respondents were initially informed that theoretically they were randomly assigned to a group of 3 where each person rolls a dice. If they rolled 1, 2, 3, 4, they won, otherwise they lost. Winning means a prize of PLN 10¹ which can be shared with the

¹ Middle exchange rate of July 18, 2019 according to National Bank of Poland is 1 Euro = 4.26 PLN.

losers inside the group (players may be in groups of 3 winners and losers). Not knowing the result of the roll (behind the veil of ignorance), the respondents had to decide if and to what degree they would share their prize with other group members. They had to take into account the fact that they may also lose and then they would receive only as much as others declared to share. They were asked to answer the question concerning what part of the win, PLN 10, they would be willing to share with one or two losers from the group. In a further part, the respondents were asked to state their opinion on what part of the prize (PLN 10) other group members would be willing to share with the losers (one as well as two persons) from their group. The students could freely dispose of the amount greater than PLN 0.50.

To realise the research objectives, in the analysis of the study results non-parametric methods were used, i.e. the Mann-Whitney U Test, Kruskal-Wallis test with multiple comparison tests and Spearman's rank correlation. The use of non-parametric tests resulted from the lack of normality regarding variable distribution. SPSS version 24 for Windows was used to conduct all the analyses.

The Mann-Whitney U test is used to compare distributions in two groups of variables which are at least ordinal in character. It can be used for continuous variables and also for small samples of subjects (Nachar, 2008). The Mann-Whitney U test is valid for data from any distribution, when, for example, there is no assumption regarding normality of distribution. This is an important advantage of this test which makes it a frequently used alternative to the t-Student test (Wild and Seber, 2011). In a general form, the null hypothesis of the test states that the two analysed distributions are the same (equal population means or medians) and the alternative states the opposite (Feltovich, 2003).

The Mann-Whitney U test for large samples (up to $n_1=n_2=12$), when both sample sizes are 10 or greater, follows the normal distribution, with parameters (Wild and Seber, 2011):

$$\mu_{A} = \frac{n_{A}(n_{A} + n_{B} + 1)}{2} \text{ and } \sigma_{A} = \sqrt{\frac{n_{A}n_{B}(n_{A} + n_{B} + 1)}{12}}$$
(1)

The test is verified using the normal approximation of the U distribution.

We also used in this research the Kruskal-Wallis test. This is a more generalised form of the Mann-Whitney U test. The Kruskal-Wallis test is an extension of the two group Mann-Whitney U test. Like the Mann-Whitney U test, it can be used for data that are at least ordinal in character. The null hypothesis of the test states that the medians of all the compared groups are equal with the alternative hypothesis stating that at least one group has a median significantly different from the rest of the population (McKight and Najab, 2010). Rejection of the null hypothesis means that at least two groups are different (distributions are different). We would also like to know in what way these distributions are different. In order to understand this, we used the Bonferroni multiple comparisons procedure (Vargha and Delaney, 1998; Elliott and Hynan, 2011).

3 RESULTS

In the study 399 students from four higher education institutions located in three cities in Poland took part. These were both women and men, students of economic and non-economic profiles. The respondents were from undergraduate as well as postgraduate studies, both in full-time and part-time form. The characteristics of respondents are presented in table 1.

TABLE 1

Characteristics of the group

| Specificity | Ν | In % |
|--|-----|------|
| Gender ^a | | |
| women | 284 | 71.4 |
| men | 114 | 28.6 |
| Place of permanent residence ^{<i>a</i>} | | |
| rural areas | 136 | 34.2 |
| towns < 20 k. | 62 | 15.6 |
| towns 20-100 k. | 67 | 16.8 |
| towns 100-500 k. | 79 | 19.8 |
| cities > 500 k. | 54 | 13.6 |
| Place of studies | | |
| Toruń | 101 | 25.4 |
| Olsztyn | 149 | 37.3 |
| Warsaw | 149 | 37.3 |
| Profile of studies | | |
| economic | 342 | 85.7 |
| non-economic | 57 | 14.3 |
| Form of studies | | - |
| full-time | 279 | 69.9 |
| part-time | 120 | 30.1 |
| Level of studies | | |
| undergraduate studies | 213 | 53.4 |
| postgraduate studies | 186 | 46.6 |

"In the case of gender and place of permanent residence N=398 as one person did not provide this data.

Source: own elaboration based on the research.

The average age of subjects was 22.4 years. The average net income per capita in their households was PLN 2,399.93, yet it may be observed that it varied depending on the student's place of permanent residence. It was the highest among students in Warsaw (PLN 3,996.64) and significantly lower among students from Olsztyn (PLN 1,498.86) and Toruń (PLN 1,353.40).

The results of the study indicate that 20% of the subjects would not share their prize in the case in which one person lost in their group, yet in the event of there being two losers as many as 22.6% subjects would keep the prize to themselves. Average amounts of the prize (PLN 10) which the respondents would be willing to share with one or two losers as well as the sums that in their opinion other winners would share with the group are presented in graph 1.

Graph 1

Mean declared amounts shared with one and two losers by the respondents if they win PLN 10 and amounts shared by other winners with the group in the respondents' opinion



Source: own elaboration based on the research.

The study shows that the willingness to redistribute, measured with the amount of shared sums increases with the number of people who "lost" in the group. However, as mentioned before, an increased number of losers in a group results in a greater number of respondents who do not intend to share their prize at all. If the respondents are in a group of two winners and one loser, on average they are willing to share almost one quarter (PLN 2.38) of their prize. In the event in which there are two losers in a group, they declare they will transfer nearly one third of their prize (PLN 3.27). Moreover, they consider themselves to be more generous than other, randomly selected members of the group. They claim that they will share more with one as well as two losers than others will (in both cases on average more by about 20%).

With the use of the Mann-Whitney U test it was confirmed that there are significant differences between women and men with regard to the amounts of money shared. Women proved to be more generous than men, both with regard to the amounts of money they are willing to share as well as the amounts they think others would share (not knowing the gender of other group members). Women generally give more, which results from the fact that mean ranks for women are higher than for men, so the first hypothesis was supported (see table 2).

TABLE 2

How much money the respondents want to give to one and two losers and how much money they think others give – depending on gender (Mann-Whitney U Test)

| C | Respo | ndents | Others in respondents' opinion | | | | |
|----------------|------------|-------------|--------------------------------|-------------|--|--|--|
| specificity | Women | Men | Women | Men | | | |
| For one loser | | | | | | | |
| Maan nanla | 215.83 | 158.83 | 158.83 211.27 | | | | |
| Mean rank | U=11,551.5 | 500; p=.000 | U=12,846.0 | 000; p=.001 | | | |
| Mean (in PLN) | 2.61 | 1.83 | 2.12 | 1.66 | | | |
| For two losers | | | | | | | |
| Maan rank | 212.26 | 167.72 | 207.20 | 180.32 | | | |
| Mean rank | U=12,565.5 | 500; p=.000 | U=14,002.0 | 000; p=.033 | | | |
| Mean (in PLN) | 3.52 | 2.63 | 2.83 | 2.37 | | | |

Source: own elaboration based on the research.

A similar regularity may be observed while analysing mean values declared by the respondents. Women are willing to share about 43% more with one loser and about 34% more with two losers than men. Just like men, women claim that others are less generous than them. However, women also claim that others are more willing to share their prize (PLN 2.12 with one and PLN 2.83 with two losers) than men do (PLN 1.66 with one and PLN 2.37 with two losers). Therefore, men declare their own smaller generosity and perceive others as less generous. The difference between women and men regarding the amounts shared by others with one loser is 28% and 19% with two losers.

In the article it has also been assessed whether winners who declare to share higher amounts with the losers think that others will also be more generous. For this purpose, the respondents were divided into three ranges in accordance with declared amounts: different for amounts shared with one loser (up to PLN 1, from PLN 1 to 3, over PLN 3) and different for amounts for two losers (up to PLN 1, from PLN 1 to 5, over PLN 5) due to lower amounts declared for one loser and higher for two losers. Next, the average amounts shared by the respondents and other group members in particular ranges were compared. As a result of Kruskal-Wallis tests where mean variable levels were compared, it may be concluded that there are statistically significant differences among them. Similar regularities may be observed when comparing the means (graphs 2 and 3).

GRAPH 2

Mean declared amounts to be shared with one and two losers by the respondents if they win PLN 10 and amounts that will be shared by other winners with the group in the respondents' opinion



Source: own elaboration based on the research.

GRAPH 3

Comparison of how much respondents from particular ranges will on average share with 2 losers and how much they think others will share with 2 losers (in PLN)



 $x^2 = 361.128$, df=2, p=.000 (for "Mean respondents"); $x^2=148.193$, df=2, p=.000 (for "Mean others")

Source: own elaboration based on the research.

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On the basis of these data two basic conclusions can be drawn. Firstly, it can be observed that more generous persons claim that others are also more generous. As the amount shared by the respondents with other losers increased, they thought that others would also be willing to share more with the losers. Secondly, it was again confirmed, that the respondents perceive themselves as more generous than others. Thus the second hypothesis was supported. Only those willing to share with one and two losers the lowest amounts from their prize of PLN 10 claimed that others would share more. For instance, the respondents from the first range (i.e. up to PLN 1) were willing to share on average PLN 0.23 with one loser, but they claimed that others in this situation would share PLN 0.97. On the other hand, respondents willing to share the highest amounts with one loser (i.e. from the range over PLN 3) on average wanted to share PLN 3.92 and they claimed that others would share PLN 2.78 (graph 2). The situation is similar in the case of sharing with two losers where the respondents from the highest range (i.e. over PLN 5) on average wanted to share PLN 5.49 with the losers and claimed that others in this situation would share only PLN 4.05 (graph 3).

With the use of the Mann-Whitney U test it was also concluded that there are significant differences between students of economic and non-economic profiles with respect to the shared amounts. Comparison of mean ranks indicates that the students of economic profiles are more generous and they expect others to be more generous, by contrast to non-economic profiles (see table 3).

TABLE 3

How much money the respondents want to give to one and two losers and how much money they think others will give – depending on the study (Mann-Whitney U Test)

| Specificity | Resp | ondents | Others in respondents' opinion | | | |
|--------------------|----------|--------------|--------------------------------|--------------|--|--|
| Profile of studies | Economic | Non-economic | Economic | Non-economic | | |
| For one loser | | | | | | |
| Maan nanla | 205.97 | 164.19 | 206.56 | 160.65 | | |
| Mean rank | U=7,706. | 000; p=.010 | U=7,504. | .000; p=.005 | | |
| Mean (in PLN) | 2.47 | 1.85 | 2.07 | 1.56 | | |
| For two losers | | | | | | |
| Maan nanla | 205.13 | 169.19 | 206.23 | 162.61 | | |
| Mean rank | U=7,991. | 000; p=.027 | U=7,616.000; p=.007 | | | |
| Mean (in PLN) | 3.38 | 2.61 | 2.80 | 2.03 | | |

Source: own elaboration based on the research.

A similar regularity may be observed when analysing the means. For instance, the students of economic profiles were willing to share PLN 2.47 on average with one loser whereas the students of non-economic profiles were 33.5% less willing. In the opinion of students of economic profiles, others would be also more generous. They claimed that others would share PLN 2.80 with two losers while the students of non-economic profiles thought this amount would be lower by 37.9%.

Additionally, the Mann-Whitney U test was conducted in order to evaluate if there is a link between the declared amount and the level of studies. P-value higher than .05 was obtained, therefore the null hypothesis regarding lack of correlation between the above mentioned variables was not rejected.

The results of Spearman's rank correlation indicate that age, place of permanent residence and mean net income per person in the subject's household were not significant. Therefore, these variables do not correlate with respondents' willingness to share part of their prize with the losers as well as with the respondents' opinion of others' willingness to redistribute.

In the study presented in this article conducted in institutions of higher education in Warsaw, Toruń and Olsztyn it was also assessed if there were differences in answers given by students from these cities. As a result of the Kruskal-Wallis tests conducted it may be stated that there were statistically significant differences, but only between the students from Olsztyn and those from Toruń (p-value \leq .005) (see table 4).

TABLE 4

Testing the relationship between the declared amount and the city of studies (Kruskal-Wallis test)

| Specificity | x ² | Significance adjusted ^a | Mean (in PLN) – pair comparison | | |
|-----------------------|-----------------------|---------------------------------------|------------------------------------|--|--|
| Respondents for two l | osers | | | | |
| Olsztyn-Toruń 44.867 | | .007 | 2.95 - 3.75 | | |
| Others for one loser | | | | | |
| Olsztyn-Toruń 42.835 | | .010 | 1.73 - 2.32 | | |
| Others for two losers | | | | | |
| Olsztyn-Toruń | 46.350 | .005 | 2.35 - 3.16 | | |

Note: significance adjusted by Bonferroni's method.

Source: own elaboration based on the research.

The comparison of mean amounts indicates that in each of the cases above where statistically significant differences were observed, students from Olsztyn were definitely less generous than students from Toruń. They were willing to share lower amounts with two losers, and also they claimed that others would share lower amounts, with one as well as two losers.

4 DISCUSSION

Our research generally confirms the results of other studies where it is analysed whether demographic factors influence generosity and willingness to redistribute. There is evidence in the literature that social and economic behaviour varies with respect to gender. Many authors (Eckel and Grossman, 1998; Warner, 1991; Oswald and Powdthavee, 2010; Cox and Deck, 2006; Chaudhuri and Gangadharan, 2003) signal that gender determines generosity, preferences toward

redistribution and altruism. Nonetheless, it may be observed that this impact is not unambiguous and equal. Alesina and La Ferrara (2005b) prove in their research that women are 4 percentage points more likely to give the highest support and 3 percentage points less likely to give the lowest support to the poor. Landry et al. (2005) find that contributions to public good are higher when women are involved in their raising. In effect, women are more likely to conduct effective collections and charities than men. By contrast, Brown-Kruse and Hummels (1993) and Cox (2002) suggest that men are more generous than women. Also, Cox and Deck (2006) on the basis of their research conclude that there is no simple and unambiguous answer to the question regarding who is more generous as it depends on the decision context, like social distance between the decision-makers and others, total monetary cost of generosity, or occurrence of reciprocal motivation. However, in our study we prove that women are more generous, they are willing to share bigger amounts with others and, therefore, they display a higher level of reciprocity than men do.

Jung et al. (2014) also claim that our behaviour is heavily influenced by the perception of the behaviours of others. We observe others and our beliefs about them impact on how we decide to behave in a particular situation. Moreover, people tend to think that they are fairer and more generous than others (Epley and Dunning, 2000; Dunning, Meyerowitz and Holzberg, 1989) who, in their opinion, are definitely more selfish. This results from the fact that people prefer to have rather positive than negative beliefs about themselves (Allison, Messick and Goethals, 1989). Thus, as in our study, people think that others are less willing to share what they have, demonstrate less empathy and a lower degree of reciprocity than themselves.

Another issue broadly discussed in the literature is whether the rich are less willing to redistribute than the poor. Alesina and La Ferrara (2005b) state that the impact of income on preferences for redistribution is complex. This is reflected in the results of numerous studies conducted worldwide. For instance, Andreoni, Nikiforakis and Stoop (2017) claim that there are no differences in pro-social preferences between the poor and the rich. Also, Schervish and Havens (1995) found that generosity is not strongly related with income, but they see the difference between the absolute (the amount which people want to donate for charity) and relative giving (amount donated in relation to the income of a given household). They conclude that though people with a higher level of education are more generous, proportionately, the poor and the rich share the same amount, i.e. the same part of their income. In turn Li (2015) thinks that in relative terms people with lower incomes tend to give more. Alternatively, James and Sharpe (2007) prove that the poor and the rich have the same willingness to give more. Nonetheless, people with middle incomes are less willing to share with others. In our study we observed that the income of respondents' households did not impact on their willingness to redistribute the hypothetical prize, nor did their place of permanent residence. Similar observations were made by Yao (2015), who claims that the size of residential area is insignificant in terms of charitable giving. We
can also find other results in the literature concerning the place of residence (Carroll, McCarthy and Newman, 2005; Regnerus, Smith and Sikkink, 1998; Andreoni and Scholz, 1998) where living in larger communities increases the chances for support to the poorest. But according to the studies of Ma et al. (2015) it may be concluded that a rural upbringing produced people who were more generous than those with an urban upbringing.

5 CONCLUSIONS

The study shows that people are willing to redistribute when they make decisions behind the veil of ignorance, i.e. in a game with random outcomes. The results indicate a sense of solidarity among Polish students, which increases with the number of people in need.

The results of our research support the two assumed hypotheses. Firstly, women tend to be more willing to redistribute their income than men. Secondly, there is a general human tendency to perceive oneself as more generous than others. The mean value of the amount others would share declared by the respondents was significantly lower than the mean quota that each respondent was willing to distribute individually. Therefore, it can be stated that the declared willingness of the individual to share is significantly different from the assessment of other players' tendency to redistribute declared by the same individual.

The more people are willing to redistribute, the more they tend to think others will be prepared to redistribute too. In this respect it may constitute a certain reference to solidarity, the sense of community and expectation of reciprocity. The more the individual is willing to help, the more they are convinced that others will also help them in a case in which they are worse off. As a result, one's generosity determines how other's generosity is perceived.

The study did not show a correlation between the willingness to share the prize (redistribute) and the level of income, age and place of residence. However, the profile of studies and partially the place of studies turned out to be of significance. Economics students are more willing to share their financial resources than students of non-economic ones. Moreover, they claim that others are less generous than themselves. The reason behind this difference may result from various aspects, such as personality, which determines the choice of study profile, as well as the idiosyncrasies of economic studies that shape the students' worldview, or both factors jointly. Nonetheless, of importance is the direction of the impact: students of economic profiles are more generous.

The willingness to redistribute, therefore, results from numerous variables, which confirms all previous studies in this area. The research conduct allows us to draw attention to the individual and subjective perception of distribution. This conclusion is especially significant with respect to social policy in any country. Knowing that redistributive policy may meet social approval only if each social group is offered "something" in the long-term, is of utmost importance for policy makers. The sense of community and expectations of mutual benefits may be used to reach a broad social consensus on social transfers, like a "fair solidarity tax" from the richest to the most needy, but not only based on the income criteria.

This study has some limitations. Firstly, other factors, including, for example, the number of persons in the household or marital status of the participants, have not been taken into account. Secondly, according to the original paper we used non-random sampling. In order to increase the representativeness of the research future studies with random sampling should be conducted.

Disclosure statement

No potential conflict of interest was reported by the authors.

APPENDIX

SURVEY QUESTIONNAIRE

| 1 | If I win PLN 10 I am willing to hand over to each loser in my group |
|---|--|
| a | in the case of one loser PLN |
| b | in the case of two losers PLN |
| | |
| 2 | How much do you think the others would be willing to hand over to each loser |
| | on average? |

| а | in the case of one loser PLN |
|---|-------------------------------|
| b | in the case of two losers PLN |

3 Age

I'm years old

| 4 | Profile of studies |
|---|--------------------|
| | Economic |
| | Non-economic |

| 5 | Gender |
|---|--------|
| | Woman |
| | Man |

| 6 | Year of studies |
|---|-------------------------------------|
| | Year 1 of the undergraduate studies |
| | Year 2 of the undergraduate studies |
| | Year 3 of the undergraduate studies |
| | Year 1 of the postgraduate studies |
| | Year 2 of the postgraduate studies |

| 7 | Place of residence |
|---|--------------------|
| | Rural areas |
| | Towns < 20 k. |
| | Towns 20-100 k. |
| | Towns 100-500 k. |
| | Cities > 500 k. |

| 8 | Average monthly net income per person in your household | | | | | | |
|---|---|--|--|--|--|--|--|
| | | | | | | | |

Thank you very much

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Added by the researcher (after filling in by the group)

| 9 | Form of studies |
|---|-----------------|
| | Full-time |
| | Part-time |

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Place of studies

Toruń Olsztyn Warszaw

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| CASE OF | , JOANNA |
| POLAND | . RUTECKA-GÓRA, |
| | DAMIAN |
| | WALCZAK: |

| 11 | University |
|----|--|
| | Warsaw School of Economics |
| | Warsaw University of Technology |
| | Nicolaus Copernicus University in Toruń |
| | University of Warmia and Mazury in Olsztyn |

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The behavior of U.S. States' debts and deficits

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Preliminary communication** JEL: E62, H63, H74 https://doi.org/10.3326.pse.43.3.3

** Received: February 21, 2019 Accepted: May 17, 2019

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^{*} The author declares no financial or non-financial interests related to the research in this paper. The author thanks two anonymous referees for helpful comments.

Abstract

Do governments satisfy an intertemporal budget constraint? This paper uses a panel of U.S. state data from 1978-1998 to empirically investigate whether primary surpluses respond to rising debt/GDP ratios. Instead of relying solely on the time-series characteristics of various data series, the paper focuses on the response of primary surpluses when cyclical fluctuations in output and government spending are explicitly considered. Results suggest no surplus response to the accumulation of debt, whether or not cyclical fluctuations are controlled for, in contrast to similar studies done using U.S. federal government data.

Keywords: fiscal policy, fiscal sustainability, public debt, budget deficits

1 INTRODUCTION

Do governments implement sustainable fiscal policies? That is, do they pursue fiscal policies that will result in "manageable" deficit and debt levels rather than explosive debt and insolvency? This is an important question for several reasons. Clearly, governments lose a stabilization tool if the use of the public budget, due to insolvency, is no longer an option during economic downturns. Aging populations that will increase future liabilities require "appropriate" levels of debt today. Large debt burdens may hamper the central bank's ability to resist the temptation to inflate the debt away. The debt crisis in Greece and multiple countries' repeated violations of the Eurozone's debt and deficit limits have renewed interest in the issue of fiscal sustainability.

Given its importance, there is surprisingly no universally agreed upon definition for the sustainability of fiscal policy (see Balassone and Franco (2000) for a discussion of various interpretations). Most empirical papers focus on the government's intertemporal budget constraint: the current value of the public debt must equal the discounted value of future primary (non-interest) surpluses. A violation of the intertemporal budget constraint means that debt will grow at a rate faster than the growth rate of the economy. If the government were able to borrow to pay interest costs, it would face no constraint and would be engaging in a Ponzi scheme.

One stream in the empirical literature on debt sustainability focuses on testing relevant variables for stationarity or co-integration to determine if the government intertemporally balances its budget (see, e.g. Hamilton and Flavin, 1986; Trehan and Walsh, 1988, 1991; Bohn, 1991; Kremers, 1989; Hakkio and Rush, 1991; and Quintos, 1995). However, Bohn (2007) has faulted these types of tests as invalid, given that the intertemporal budget constraint is satisfied if either the debt or revenue and with-interest spending series are integrated of arbitrarily higher order, i.e. if they are stationary after an arbitrary sequence of differencing.

Additionally, these types of tests have been criticized in a series of papers by Bohn (1995, 1998, 2008) as uninformative because in the case of uncertainty, finding an appropriate rate at which to discount future surpluses is problematic. In particular,

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Bohn (1995) shows that bond returns are unsuitable as discount rates in transversality conditions as the relevant uncertainty pertains to the level of future total public debt, and not the riskiness of specific debt securities. Thus studies focusing on unit root and cointegration tests – that is, testing whether various fiscal time series are consistent with the hypothesis that the expected present value of primary balances equals discounted initial debt – are incorrect as they use the wrong discount rate.

Given these problematic issues with time series tests in this context, Bohn (1998) focuses on testing a fiscal policy reaction function. Using Barro's (1979) tax smoothing model and Barro's (1986) and Sahasakul's (1986) empirical work as starting points, Bohn (1998) shows that if the primary (noninterest) budget surplus-income ratio responds positively to changes in the debt-income ratio, then fiscal policy is sustainable. He also shows that this relationship can be obscured by war-time spending and cyclical fluctuations in output, thus providing an additional explanation as to why unit root tests might fail to find evidence of corrective action. Importantly, this method is also independent of the discount rate used. This theoretical and empirical strategy has been termed the "fiscal reaction function" approach or "model based sustainability" approach. Using U.S. federal government data, Bohn (1998) finds that the primary surplus-income is an increasing function of the debt-GDP ratio; that is, the intertemporal budget constraint is satisfied for the U.S.

Several papers have used the fiscal reaction function approach of Bohn (1998) to test for sustainability in other countries. Greiner, Köller and Semmler (2007) focus on Italy (for its high debt/GDP ratio) and France, Germany, and Portugal (violators of the Maastricht treaty's deficit limit of three percent of GDP) and find evidence for sustainability. Mendoza and Ostry (2008) use panels of advanced and emerging countries and also find that fiscal policy is responsible – the primary fiscal balance responds positively to changes in debt.

This paper uses techniques similar to those of Barro (1986) and Bohn (1998) and investigates the response of U.S. states' primary surplus-income ratios to their debt-income ratios, in order to shed some light on the sustainability of fiscal policies among members of a monetary union. As in Barro (1986) and Bohn (1998), cyclical variables are constructed and controlled for in a consideration of the surplus response to debt. Also as in Barro (1986) and Bohn (1998), the paper considers how this relationship is affected if an interest rate variable is included. Findings are robust and indicate that U.S. states' primary surplus-income ratios do not respond to their debt-income ratios, in contrast to Bohn's (1998) results for the federal government. This result also runs counter to Mendoza and Ostry (2008) and Greiner and Semmler (2007). However, Greiner and Semmler (2007) focuses on individual countries and the samples in Mendoza and Ostry (2008) mix Eurozone and non-Eurozone countries. It is also found that states do not respond to credit market pressure, in the sense that the primary budget surplus-income ratio does not increase in response to an increasing risk premium.

2 THE USE OF STATE DATA

The existence of various types of balanced budget rules and tax and expenditure limitations in U.S. states would seem to hinder their ability to run deficits/surpluses and thus limit the application of an intertemporal, optimizing model. However, while Bohn and Inman (1996) find that states that have regulations limiting the amount of debt have lower average deficits, Sørensen, Wu and Yosha (1998) find that states are able to systematically smooth income shocks, suggesting that in practice states are not bound by these requirements. Kula (2014) examines the extent of public consumption smoothing at the state and local level. Furthermore, Chaney, Copley and Stone (2002) find that budget stressed states underfund their pensions and choose discount rates that obscure the underfunding in order to meet balanced budget requirements. Anecdotal evidence of budgetary "finesse" can be found in newspapers on a regular basis, e.g.: "N.J. Pension Fund Endangered by Diverted Billions" (The New York Times 4/4/07); "The Illusion of Pension Savings" (The New York Times 9/17/10). For more examples of state and local governments skirting balanced budget laws/budget regulations, see, Holtz-Eakin, Rosen and Tilly (1994).

3 MODEL AND ESTIMATING EQUATIONS

This section reviews work by Barro (1979, 1986, 1989) and Sahasakul (1986) that is used by Bohn (1998) to develop a fiscal policy reaction function estimating equation.

According to Barro's (1979) tax smoothing model, an optimizing government smoothes the costs of distortionary taxation over time by adjusting its tax rate only in response to changes in permanent government spending or its debt level. Temporary changes in spending or income result in budget deficits or surpluses. Denote the real cost of collecting taxes at time *t* by Z_t . This cost is a time invariant, linearly homogeneous function of real tax revenue T_t and real aggregate output Y_t . Denote the tax rate by τ_t . Thus $Z_t = F(T_t, Y_t) = f(\tau_t)Y_t$ where f' > 0, f'' > 0.

The government chooses its sequence of tax rates to minimize this convex excess burden function subject to two constraints: raised tax revenue must equal exogenously given government spending (G_i), and the government cannot engage in perpetual debt finance (where B_0 is initial debt):

$$min\sum_{t=0}^{\infty} \frac{f(\tau_t)Y_t}{(1+r)^t}$$

subject to

$$\sum_{t=0}^{\infty} \frac{T_t}{(1+r)^t} = \sum_{t=0}^{\infty} \frac{G_t}{(1+r)^t} + B_0$$

and

$$\lim_{T \to \infty} \frac{B_t}{\left(1+r\right)^t} = 0$$

$$\sum_{t=i}^{\infty} \frac{1}{(1+r)^{t}} T_{t} = \sum_{t=i}^{\infty} \left(\frac{1}{(1+r)^{t}} \right) G_{t} + B_{i-1}$$

Imposing the tax smoothing condition of $\tau_t = \tau_i$ for all t > 1 on the budget constraint gives the tax rate at time *i* as

$$\tau_{i} = \frac{\sum_{i=1}^{\infty} \left(\frac{1}{(1+r)^{t}}\right) G_{t} + B_{i-1}}{\sum_{t=i}^{\infty} \left(\frac{1}{(1+r)^{t}}\right) Y_{t}}$$
(1)

Assume that in steady state G_t and Y_t grow at rate *n*. Then "normal" or permanent (the annuity value of current and expected expenditures) spending G_t^* and "normal" or permanent output (constant for $t \ge 1$) sequences can be defined as those that satisfy

$$G_{i}^{*} \sum_{t=i}^{\infty} \left(\frac{1}{(1+r)^{t}} \right) (1+n)^{t-i} = \sum_{t=i}^{\infty} \left(\frac{1}{(1+r)^{t}} \right) G_{t}$$

and

at time *i* gives

$$Y_{i}^{*}\sum_{t=i}^{\infty} \left(\frac{1}{(1+r)^{t}}\right) (1+n)^{t-i} = \sum_{t=i}^{\infty} \left(\frac{1}{(1+r)^{t}}\right) Y_{t}$$

Then, as in Barro (1986, 1989), substituting the permanent variables into equation (1) leads to period i tax rate

$$\tau_i = \frac{G_i^* + (r - n)B_{i-1}}{Y_i^*} \tag{2}$$

The period *i* budget surplus is given by the government's budget constraint:

$$G_i + rB_{i-1} - \tau_i Y_i = B_i - B_{i-1} \tag{3}$$

Substituting equation (2) into equation (3) and re-arranging terms gives:

$$B_{i} - B_{i-1} = G_{i} - G_{i}^{*} + \left[\left(Y_{i}^{*} - Y_{i} \right) / Y_{i}^{*} \right] \left[G_{i}^{*} + (r - n) B_{i-1} \right] + nB_{i-1}$$

$$B_{i-1} = G_{i-1} - G_{i-1}^{*} + \left(1 - Y_{i-1} / Y_{i-1}^{*} \right) \left[G_{i-1}^{*} - (r - n) B_{i-1} \right] + nB_{i-1}$$

$$(1 - 1) \left[G_{i-1}^{*} - (r - n) B_{i-1} \right] + nB_{i-1}$$

or

$$B_i - B_{i-1} = G_i - G_i + (1 - Y_i / Y_i) \left[G_i + (r - n) B_{i-1} \right] + n B_{i-1}$$
(4)

where $(r-n)B_{i-1}$ is assumed to be small relative to G_i^* , $G_i - G_i^*$ is temporary spending, or *GVAR*; and $(1 - Y_i/Y_i^*)G_i^*$ is cyclical output, or *YVAR*. Thus the surplus responds to increases in temporary spending and cyclical output shortfalls, as well as debt level.

Bohn (1998) uses the above derivation to motivate his estimating equation (from equation (4)):

$$s_t = \alpha_0 + \beta_1 d_t + \beta_2 GVAR_t + \beta_3 YVAR_t + \varepsilon_t$$
(5)

where s_t is the primary surplus divided by output (GNP is used as his sample begins in 1916); d_t is the outstanding debt at the beginning of period t divided by GNP; $GVAR_t$ is the temporary government spending to output ratio; and $YVAR_t$ is a measure of the cyclical fluctuation of output. Using a sample from 1916-1995, he finds that the primary surplus is an increasing function of the debt-GNP ratio, meaning that the U.S. government systematically responds to changes in the debt-GNP ratio and behaves according to an intertemporal budget constraint, with this result being sensitive to the inclusion of temporary spending and output. When these variables are left out, the relationship disappears. In one criticism of statistically based studies, Bohn (1998) notes that regressions testing for a unit root in the debt/GDP ratio are misspecified because of the omission of the cyclical variables GVAR and YVAR– and therefore it is not surprising that they cannot reject the unit root.

As an extension, consider a non-constant interest rate, as discussed in Barro (1989). If the interest rate varies around a trend, the permanent interest rate (i.e. an asset paying r_{i-1}^* has the same present value of an asset with varying payments) is given by

$$r_{i-1}^* = 1 / \sum_{t=i}^{\infty} \left(\frac{d_t}{d_{i-1}} \right)$$

and equation (4) becomes

$$B_{i} - B_{i-1} = G_{i} - G_{i}^{*} + \left(1 - Y_{i} / Y_{i}^{*}\right) \left[G_{i}^{*} + \left(r_{i-1} - n\right)B_{i-1}\right] + nB_{i-1} + \left(r_{i-1} - r_{i-1}^{*}\right)B_{i-1}$$
(6)

where $(r_{i-1} - r_{i-1}^*)B_{i-1}$ represents "temporary interest payments" (*RVAR*). Thus the surplus also responds to movements in interest rates around trend levels.

Equation (6) can be written as

$$s_t = GVAR_t + YVAR_t + d_t + RVAR_t + \varepsilon_t$$
(7)

Bohn (1998) also examines whether the debt-surplus relationship for the U.S. is invariant to the real interest rate by estimating equation (7). He finds that the positive relationship between debt and surplus is not affected by various real interest rate measures, such as the average real return on government debt.

This paper uses a panel of U.S. states and unique data on interest rates to examine fiscal sustainability. Specifications with and without the cyclical variables will be used to compare results to Bohn's (1998) finding that their inclusion affects the impact of debt on the surplus when federal data is used. Additionally, specifications with and without an interest rate variable will be used to check Bohn's (1998)

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finding that its inclusion does not affect the impact of debt on the surplus. Importantly, this specification also sheds light on whether or not the surplus responds to the interest rate; that is, whether credit markets influence government spending and taxing decisions.

For the panel, we have estimating equations:

$$s_{jt} = \alpha_0 + \beta_1 d_{jt} + \varepsilon_{jt} \tag{8}$$

$$s_{jt} = \alpha_0 + \beta_1 d_{jt} + \beta_2 GVAR_{jt} + \beta_3 YVAR_{jt} + \varepsilon_{jt}$$
(9)

$$s_{jt} = \alpha_0 + \beta_1 d_{jt} + \beta_2 R_{jt} + \varepsilon_{jt}$$
⁽¹⁰⁾

and

$$s_{it} = \alpha_0 + \beta_1 d_{it} + \beta_2 R_{it} + \beta_3 GVAR_{it} + \beta_4 YVAR_{it} + \varepsilon_{it}$$
(11)

where S_{ij} is the primary (noninterest) budget surplus-income ratio for state j at time t, d_{it} is the beginning of period t debt-income ratio, R_{it} is the period t interest rate, $GVAR_{ii}$ is cyclical government spending, and $YVAR_{ii}$ is cyclical output. A positive coefficient on d_{ii} would indicate that the government takes corrective action. Additionally, a positive coefficient on the interest rate variable would indicate that the government takes corrective action in response to higher borrowing costs. Note, however, the potentially endogenous relationship between the interest rate and the surplus. A larger primary surplus, e.g. may indicate a lower likelihood of default, and thus correspond to a lower interest rate. Given the potential endogeneity between the surplus and the interest rate, the lagged interest rate is used. Additionally, to capture unobserved, time invariant state-specific attributes that may affect spending, state fixed effects are included in the estimation. With the panel data approach and the use of a state fixed effects parameter to capture state-specific time invariant characteristics, some inherent differences across states that account for differences in the interest rates are accounted for in the specification, and are thus less likely to be caught in the residual, allowing for the lagged interest rate to be an acceptable method to control for endogeneity.

The final estimation issue concerns spurious correlation. Augmented Dickey Fuller tests on each data series were unable to reject that they were unit root processes. However, given the length of the series and the low power of ADF tests, this result is not unexpected. Each series with state and time fixed effects removed was plotted over time to determine whether the removal of time fixed effects would be sufficient for stationarity. The graphs for each of the series suggest that the removal of time fixed effects is, in fact, sufficient for stationarity. Estimating equations are thus: PUBLIC SECTOR ECONOMICS

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$$s_{jt} = \alpha_j + \gamma_t + \beta_1 d_{jt} + \varepsilon_{jt}$$
(12)

$$s_{jt} = \alpha_j + \gamma_t + \beta_1 d_{jt} + \beta_2 GVAR_{jt} + \beta_3 YVAR_{jt} + \varepsilon_{jt}$$
(13)

$$s_{jt} = \alpha_j + \gamma_t + \beta_1 d_{jt} + \beta_2 R_{jt-1} + \varepsilon_{jt}$$
(14)

and

$$s_{jt} = \alpha_j + \gamma_t + \beta_1 d_{jt} + \beta_2 R_{jt-1} + \beta_3 GVAR_{jt} + \beta_4 YVAR_{jt} + \varepsilon_{jt}$$
(15)

3.1 FORMATION OF THE CYCLICAL VARIABLES GVAR, AND YVAR,

As in Barro (1986), Sahasakul (1986) and Bohn (1998), the permanent and temporary series must be constructed; each of these uses methods from Barro (1979) and they begin by decomposing government spending into defense and nondefense components. The series for permanent defense spending is derived from the premise that actual defense spending is determined by lagged casualty rate measures and the lagged stock of military equipment. Temporary spending is actual spending minus permanent spending. For U.S. states, this method would not be appropriate.

The temporary spending variable $GVAR_{jt}$ is found for each state for each time period in two steps. First, the sensitivity of government expenditure to the unemployment rate and the growth rate of output and its lag is determined. The cyclical spending variable is then constructed by considering these sensitivity parameters and the deviations of the actual unemployment rate and the growth rate of output at time *t* (and its lag) from their "permanent", or estimated weighted average levels at time *t*.

Specifically, consider the formation of the noncyclical unemployment rate and the growth rate of output. To construct these series, the underlying data generating process for each observed series must be determined. After the removal of time fixed effects, graphs of the unemployment rate and the growth rate of output indicate that an AR(1) process is a good descriptor for each. Focusing on the unemployment rate series, the data generating process for the unemployment rate with time fixed effects removed can be written as:

$$u_{jt} = \Gamma_j + \gamma_1 u_{jt-1} + \varepsilon_{jt}^u \tag{16}$$

Then,

$$u_{jt+s} = \Gamma_j + \gamma_1 u_{jt+s-1} + \varepsilon_{jt+s}^u \tag{17}$$

Summing from s = 1 to ∞ and assuming that the real interest rate net of the growth rate of output is the same for all states ($\rho = r - n = 0.2$), gives the equation for the estimated weighted average unemployment rate series:

$$u_{jt}^{*} = \frac{\Gamma_{j}}{1 + \rho - \gamma_{1}} + \frac{\rho}{1 + \rho - \gamma_{1}} u_{jt}$$
(18)

Equation (16) is estimated and parameters $\widehat{\Gamma_j}$ and $\widehat{\gamma_j}$ are found. They are used in equation (18) to obtain the complete series for the estimated weighted average unemployment rate. A similar procedure is used to find the series for the estimated weighted average of the growth rate of output.

The sensitivity of spending to the unemployment rate and the growth rate of output and its lag is found by estimating:

$$g_{jt} = \alpha_j + \alpha_t + \lambda_1 u_{jt} + \lambda_2 \frac{\Delta y_{jt}}{y_{jt}} + \lambda_3 \frac{\Delta y_{jt-1}}{y_{jt} - 1} + \varepsilon_{jt}$$
(19)

where g_{ii} is the government expenditure to output ratio.

Estimated parameters $\widehat{\lambda}_i$, $\widehat{\lambda}_2$, and $\widehat{\lambda}_3$ are used along with u_{jt}^* , the estimated weighted average unemployment rate series, and output growth rate series, $\left[\frac{\Delta y_{jt}}{y_{jt}}\right]^*$, to calculate $GVAR_{it}$.

$$GVAR_{jt} = \widehat{\lambda}_{i} \left(u_{jt}^{*} - u_{jt} \right) + \widehat{\lambda}_{2} \left(\left[\frac{\Delta y_{jt}}{y_{jt}} \right]^{*} - \frac{\Delta y_{jt}}{y_{jt}} \right] + \widehat{\lambda}_{3} \left(\left[\frac{\Delta y_{jt-1}}{y_{jt-1}} \right]^{*} - \frac{\Delta y_{jt-1}}{y_{jt-1}} \right)$$

Temporary output $YVAR_{jt}$ is formed in a manner similar to that of Barro (1986) and Bohn (1998). Barro (1986) discusses the difficulties in forming a permanent, and therefore temporary, output series, and shows the algebraic manipulation necessary to arrive at a convenient form for temporary output:

$$YVAR_t = (u_t - .054)g_t^*$$

where 5.4% is the assumed natural unemployment rate and g^* is the permanent government spending to output ratio. Barro (1986) also discusses why the above measure is preferred to various alternatives attempted.

$$YVAR_{jt} = \left(u_{jt} - u_{t}\right)g_{jt}^{*}$$

Here, instead of making an assumption about the natural unemployment rate, the average unemployment rate for each state over the sample period is used (with all results robust to using the natural rate of 5.4%). The permanent government spending to output ratio, g^* equals the actual expenditure series for each state, g_{ji} , minus $GVAR_{ii}$. Thus

$$YVAR_{jt} = (u_{jt} - \overline{u}_{t})g_{jt}^*$$

4 DATA

The primary (noninterest) surplus-income ratio, s_{jt} is defined as state and local direct general expenditure minus interest payments on general debt minus tax revenue divided by gross state product (GSP). The combined state and local sector is used to avoid problems resulting from the differing assignment of functional responsibilities of state and local governments across states. The debt-income ratio, d_{jt} , is long term debt as a percentage of GSP. Data on direct general expenditure, interest payments on general debt, long term debt and total revenue are from *Government Finances*, Bureau of the Census, for the years 1978-1998. GSP is from the Census Bureau; the unemployment rate series are from the Bureau of Labor Statistics (1978-1998). The sample covers the years 1978-1998, except for GSP, where data from 1963-2009 are used to estimate the parameters used in constructing the noncyclical series.

Regressions which include the interest rate raise an issue regarding the appropriate variable to use. As discussed in Bohn (2005), past statistical based studies have confused the uncertainty about the level of future total public debt, which is what is needed, with the riskiness of specific debt securities, which is what researchers have used. This paper uses a unique data source to solve this problem. The Chubb Relative Value Study was started in 1973 (ending in 1998) by the Chubb Insurance Company to address the lack of information available on municipal bond trading values, as the market for state general obligation bonds is typically very thin, resulting in a lack of availability of market prices for individual issues (Bayoumi, Goldsteina and Woglom, 1995; Park, 1997; Liu and Thakor, 1984). Additionally, state general obligation bond issues may vary for several reasons, including call provisions, maturity dates, tax issues, and insurance coverage. Semi-annually, twenty to twenty-five sell-side traders at major brokerage firms dealing in tax exempt bonds were polled as to where they thought twenty-year comparable state general obligation bonds should trade relative to the chosen benchmark state, New Jersey (chosen as at the time it was close to the midpoint of state trading values and was seen as being stable regarding creditworthiness). The traders considered similar bonds for the states, so the difference in spreads reflects only differences in default risk, thus solving the problems of comparing state general obligation bond issues and isolating a default risk premium for each state. Importantly for the current paper, the default risk would clearly be tied to expectations of the future path of total public debt (and specifically not tied to the riskiness of a particular security), so using this measure avoids Bohn's (2005) criticism of empirical work using the wrong interest rate when testing sustainability. Because the Chubb data spans the period 1973-1998 and long term debt is available beginning in 1978, the sample data used runs from 1978 to 1998.

Given the uniqueness of the Chubb data in allowing for the comparison of state bond yields, they have been used in several papers including Goldstein and Woglom (1992) and Bayoumi, Goldstein, and Woglom (1995) in their investigation of the effect of rising government debt on state bond yields; Poterba and Rueben

(1999, 2001) which focus on the relationship between fiscal institutions and bond yields; and Andersen et al. (2014), which examines how the quality of fiscal governance, proxied for by the government's ability to submit an on-time budget, affects state borrowing costs.

The survey excluded states that had no outstanding debt when the survey began (Arizona, Arkansas, Colorado, Idaho, Iowa, Indiana, Kansas, Nebraska, South Dakota, and Wyoming). Here, Puerto Rico (not a state), Alaska (unique in its relative oil and mineral endowments), and Hawaii (unique in its constitutional structure) are also excluded from the panel, leaving a full sample of thirty-eight states. The average Chubb yield for each state over the sample period 1973-1998 and other descriptive statistics are given in table 1.

TABLE 1

| | Chubb | yld | surp | lus | de | bt | GV | AR | YV | AR |
|----------------|---------|--------|--------|-------|---------|-------|--------|-------|--------|-------|
| State | mean | stdev | mean | stdev | mean | stdev | mean | stdev | mean | stdev |
| Alabama | 11.270 | 6.147 | -0.009 | 0.006 | 0.133 | 0.015 | 0.016 | 0.041 | 0.007 | 0.251 |
| California | 9.266 | 12.167 | -0.011 | 0.003 | 0.112 | 0.028 | 0.000 | 0.002 | 0.064 | 0.193 |
| Connecticut | 9.087 | 14.542 | -0.015 | 0.008 | 0.144 | 0.019 | 0.012 | 0.016 | 0.083 | 0.145 |
| Delaware | 20.241 | 19.968 | -0.022 | 0.006 | 0.202 | 0.031 | 0.089 | 0.125 | 0.045 | 0.307 |
| Florida | 15.537 | 10.295 | -0.011 | 0.004 | 0.164 | 0.041 | 0.003 | 0.008 | 0.085 | 0.159 |
| Georgia | -6.963 | 3.761 | -0.011 | 0.004 | 0.114 | 0.009 | 0.004 | 0.021 | 0.060 | 0.124 |
| Illinois | 17.118 | 6.785 | -0.013 | 0.002 | 0.116 | 0.018 | 0.001 | 0.009 | 0.043 | 0.221 |
| Kentucky | 4.005 | 6.457 | -0.016 | 0.007 | 0.204 | 0.013 | 0.004 | 0.033 | 0.028 | 0.221 |
| Louisiana | 33.487 | 31.183 | -0.015 | 0.006 | 0.173 | 0.051 | -0.002 | 0.035 | 0.045 | 0.294 |
| Maine | 11.926 | 5.288 | -0.017 | 0.006 | 0.146 | 0.018 | 0.049 | 0.093 | 0.092 | 0.203 |
| Maryland | -3.440 | 3.336 | -0.017 | 0.005 | 0.160 | 0.012 | 0.007 | 0.020 | 0.099 | 0.170 |
| Massachusetts | 43.978 | 32.523 | -0.016 | 0.005 | 0.156 | 0.024 | 0.006 | 0.012 | 0.090 | 0.207 |
| Michigan | 35.550 | 39.887 | -0.011 | 0.004 | 0.111 | 0.011 | 0.009 | 0.018 | 0.141 | 0.449 |
| Minnesota | 5.480 | 10.195 | -0.015 | 0.006 | 0.171 | 0.021 | 0.003 | 0.018 | 0.068 | 0.206 |
| Mississippi | 10.663 | 5.793 | -0.011 | 0.005 | 0.112 | 0.016 | -0.002 | 0.066 | -0.032 | 0.312 |
| Missouri | -10.334 | 5.634 | -0.011 | 0.003 | 0.090 | 0.011 | 0.005 | 0.023 | 0.040 | 0.170 |
| Montana | 3.685 | 8.986 | -0.020 | 0.007 | 0.155 | 0.037 | -0.057 | 0.145 | 0.058 | 0.270 |
| Nevada | 19.581 | 7.953 | -0.005 | 0.006 | 0.145 | 0.026 | 0.017 | 0.051 | 0.031 | 0.210 |
| New Hampshire | 12.881 | 13.337 | -0.011 | 0.005 | 0.169 | 0.035 | 0.023 | 0.093 | 0.057 | 0.201 |
| New Jersey | 0.000 | 0.000 | -0.015 | 0.005 | 0.142 | 0.010 | 0.006 | 0.009 | 0.096 | 0.172 |
| New Mexico | 10.232 | 6.620 | -0.024 | 0.012 | 0.157 | 0.039 | 0.011 | 0.095 | 0.063 | 0.186 |
| New York | 30.336 | 21.598 | -0.019 | 0.006 | 0.198 | 0.022 | 0.002 | 0.004 | 0.113 | 0.192 |
| North Carolina | -12.746 | 5.031 | -0.008 | 0.004 | 0.097 | 0.019 | 0.004 | 0.022 | 0.045 | 0.180 |
| North Dakota | 7.635 | 13.844 | -0.016 | 0.006 | 0.137 | 0.061 | -0.080 | 0.385 | 0.076 | 0.389 |
| Ohio | 9.900 | 16.103 | -0.009 | 0.004 | 0.090 | 0.010 | 0.003 | 0.010 | 0.050 | 0.270 |
| Oklahoma | -1.630 | 16.920 | -0.014 | 0.004 | 0.126 | 0.029 | -0.015 | 0.037 | 0.028 | 0.219 |
| Oregon | 23.775 | 25.132 | -0.018 | 0.005 | 0.198 | 0.050 | 0.001 | 0.033 | 0.093 | 0.342 |
| Pennsylvania | 34.453 | 31.244 | -0.017 | 0.005 | 0.161 | 0.018 | 0.004 | 0.008 | 0.082 | 0.225 |
| Rhode Island | 20.035 | 6.831 | -0.015 | 0.008 | 0.212 | 0.027 | 0.050 | 0.073 | 0.057 | 0.203 |
| South Carolina | -9.187 | 4.414 | -0.009 | 0.006 | 0.146 | 0.016 | 0.007 | 0.039 | 0.021 | 0.211 |
| Tennessee | -6.952 | 4.595 | -0.008 | 0.004 | 0.120 | 0.015 | 0.008 | 0.029 | 0.031 | 0.196 |
| Texas | 4 4 4 1 | 18 007 | -0.011 | 0.002 | 0 1 3 4 | 0.029 | -0.002 | 0.004 | 0.020 | 0.127 |

Descriptive statistics

| | Chubb | yld | surp | lus | de | bt | GV | AR | YV | AR |
|---------------|---------|--------|--------|-------|-------|-------|--------|-------|--------|-------|
| State | mean | stdev | mean | stdev | mean | stdev | mean | stdev | mean | stdev |
| Utah | -6.147 | 9.823 | -0.012 | 0.007 | 0.248 | 0.091 | 0.014 | 0.062 | 0.001 | 0.157 |
| Vermont | 14.988 | 8.250 | -0.017 | 0.005 | 0.154 | 0.010 | 0.082 | 0.166 | 0.036 | 0.244 |
| Virginia | -10.169 | 9.393 | -0.008 | 0.003 | 0.105 | 0.015 | 0.003 | 0.016 | 0.066 | 0.130 |
| Washington | 32.765 | 29.820 | -0.007 | 0.008 | 0.224 | 0.023 | 0.008 | 0.014 | 0.068 | 0.219 |
| West Virginia | 23.134 | 8.691 | -0.016 | 0.005 | 0.188 | 0.023 | -0.005 | 0.090 | -0.143 | 0.376 |
| Wisconsin | 10.883 | 9.737 | -0.010 | 0.004 | 0.117 | 0.015 | 0.005 | 0.016 | 0.053 | 0.286 |

Notes: all data 1978-1998. Average Chubb yield in basis points. Surplus and debt are shares of gross state product; GVAR and YVAR defined in section 4.

The average Chubb yield for each year for the sample period and the high-low spread are given in table 2. The recession years of 1976, 1982, and 1983 show the largest spreads while the smallest occur in 1998, a period of low inflation and unemployment and high growth for the U.S.

TABLE 2

Average Chubb yields over all states and high-low spread by year

| Year | Average | High-low spread |
|------|---------|------------------------|
| 1973 | 3.759 | 37.40 |
| 1974 | 2.384 | 38.50 |
| 1975 | 5.338 | 63.70 |
| 1976 | -19.722 | 189.00 |
| 1977 | 0.670 | 108.90 |
| 1978 | 2.205 | 95.30 |
| 1979 | 6.473 | 93.50 |
| 1980 | 9.565 | 101.70 |
| 1981 | 12.412 | 116.67 |
| 1982 | 16.856 | 146.42 |
| 1983 | 17.599 | 136.47 |
| 1984 | 21.244 | 117.70 |
| 1985 | 15.575 | 77.35 |
| 1986 | 18.001 | 72.00 |
| 1987 | 16.186 | 103.83 |
| 1988 | 14.583 | 120.16 |
| 1989 | 10.673 | 88.50 |
| 1990 | 8.939 | 73.08 |
| 1991 | 14.585 | 84.10 |
| 1992 | 8.962 | 44.10 |
| 1993 | 7.997 | 44.70 |
| 1994 | 5.449 | 31.90 |
| 1995 | 4.916 | 37.60 |
| 1996 | 5.237 | 35.90 |
| 1997 | 3.808 | 27.50 |
| 1998 | 2.813 | 21.40 |

Notes: yield is in basis points. See table 1 for states.

5 RESULTS

Consider equations (12) and (13). If governments satisfy an intertemporal budget constraint in that they take corrective action in response to an increasing debtincome ratio, β_1 is expected to be positive in equation (12). If this relationship is obscured by cyclical spending and output, we should find β_1 to be positive in equation (13). The coefficients on cyclical spending and output should be negative. The same holds true for equations (14) and (15), which add the interest rate to the regressions; here, it should also be found that β_2 is positive in equations (14) and (15).

First consider the results when the interest rate variable is not included. Table 3 contains results for pooled data; table 4 contains results when only state fixed effects are included; and table 5 contains results when both state and time fixed effects are included. The (a) section of each table does not include the cyclical variables; the (b) section does. Whether or not cyclical variables are included, the coefficient on the debt-income ratio is negative, contrary to theory, and statistically significant for all specifications (pooled, state fixed effects only included; state and time fixed effects included). The coefficients on cyclical spending and output are either statistically insignificant or are statistically significant and positive, contrary to what is predicted, except for the pooled regression, where the cyclical spending coefficient is negative and statistically significant at the ten percent level.

TABLE 3A

 $s_{it} = \alpha + \beta_1 d_{it} + \varepsilon_{it}$

| | $\widehat{oldsymbol{eta}}_1$ |
|----------------|------------------------------|
| Estimate | -0.03 |
| Standard error | 0.007 |
| t-stat | -4.56*** |

Notes: autocorrelation corrected maximum likelihood estimates. See table 1 for states; 1978-1998.

*** statistically significant at the 1% level.

TABLE 3B

| $s_{jt} = \alpha + \beta_1 d_{jt} + \beta_2 G$ | $VAR_{jt} + \beta_3 Y$ | $VAR_{jt} + \epsilon$ | jt |
|--|------------------------|-----------------------|----|
|--|------------------------|-----------------------|----|

| | $\widehat{oldsymbol{eta}}_1$ | $\widehat{\beta_2}$ | $\widehat{\beta_3}$ |
|----------------|------------------------------|---------------------|---------------------|
| Estimate | -0.04 | -0.005 | -0.000 |
| Standard error | 0.005 | 0.003 | 0.001 |
| t-stat | -9.13*** | -1.91* | 0.15 |

Notes: autocorrelation corrected maximum likelihood estimates. See table 1 for states; 1978-1998.

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*** statistically significant at the 1% level; * statistically significant at the 10% level.

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TABLE 4A

 $s_{jt} = \alpha_j + \beta_1 d_{jt} + \varepsilon_{jt}$

| | $\widehat{\beta_1}$ |
|----------------|---------------------|
| Estimate | -0.03 |
| Standard error | 0.008 |
| t-stat | -3.65*** |

Notes: autocorrelation corrected maximum likelihood estimates. See table 1 for states; 1978-1998.

*** statistically significant at the 1% level.

TABLE 4B

$$s_{jt} = \alpha_j + \beta_1 d_{jt} + \beta_2 GVAR_{jt} + \beta_3 YVAR_{jt} + \varepsilon_{jt}$$

| | $\widehat{oldsymbol{eta}}_1$ | $\widehat{\beta_2}$ | $\widehat{\beta_3}$ |
|----------------|------------------------------|---------------------|---------------------|
| Estimate | -0.03 | -0.002 | 0.002 |
| Standard error | 0.008 | 0.002 | 0.001 |
| t-stat | -3.63*** | 1.05 | 1.15 |

Notes: autocorrelation corrected maximum likelihood estimates. See table 1 for states; 1978-1998.

*** statistically significant at the 1% level.

TABLE 5A

 $s_{jt} = \alpha_j + \gamma_t + \beta_1 d_{jt} + \varepsilon_{jt}$

| | $\widehat{oldsymbol{eta}}_1$ |
|----------------|------------------------------|
| Estimate | -0.04 |
| Standard error | 0.008 |
| t-stat | -4.76*** |

Notes: autocorrelation corrected maximum likelihood estimates. See table 1 for states; 1978-1998.

*** statistically significant at the 1% level.

TABLE 5B

$$s_{jt} = \alpha_j + \gamma_t + \beta_1 d_{jt} + \beta_2 GVAR_{jt} + \beta_3 YVAR_{jt} + \varepsilon_{jt}$$

| | $\widehat{oldsymbol{eta}}_1$ | $\widehat{\beta_2}$ | $\widehat{\beta_3}$ |
|----------------|------------------------------|---------------------|---------------------|
| Estimate | -0.04 | 0.004 | 0.004 |
| Standard error | 0.008 | 0.02 | 0.001 |
| t-stat | -5.25*** | -1.94* | 2.85*** |

Notes: autocorrelation corrected maximum likelihood estimates. See table 1 for states; 1978-1998.

*** statistically significant at the 1% level; * statistically significant at the 10% level.

Tables 6-8 contain results for all of the above regressions, this time with the interest rate variable included. Table 6 contains results for pooled data; table 7 contains results when only state fixed effects are included; and table 8 contains results when both state and time fixed effects are included. The (a) section of each table does not include the cyclical variables; the (b) section does. As in all regressions which did not include the interest rate variable, whether or not cyclical variables are included, the coefficient on the debt-income ratio is negative and statistically significant for all specifications (pooled, state fixed effects only included; state and time fixed effects included). The coefficients on cyclical spending and output are either statistically insignificant or are statistically significant and positive, contrary to what is predicted, except for the pooled regression, where the cyclical output coefficient is negative and statistically significant at the ten percent level. Additionally, the coefficient on the interest rate risk premium is also negative and statistically significant whether or not cyclical variables are included, and for all specifications (pooled, state fixed effects only included; state and time fixed effects included). This suggests there is no response by governments in their spending and taxing behavior to credit market signals. The positive coefficient on the output gap when state and time fixed effects are included can be interpreted as states running a countercyclical fiscal policy or may reflect the greater responsiveness of tax revenues to downturns than government spending at the state level.

TABLE 6A

$$s_{jt} = \alpha + \beta_1 d_{jt} + \beta_2 R_{jt-1} + \varepsilon_{jt}$$

| | $\widehat{oldsymbol{eta}}_1$ | $\widehat{\beta_2}$ |
|----------------|------------------------------|---------------------|
| Estimate | -0.03 | -0.58 |
| Standard error | 0.01 | 0.16 |
| t-stat | -3.55*** | -3.58*** |

Notes: autocorrelation corrected maximum likelihood estimates.

See table 1 for states; 1978-1998.

*** statistically significant at the 1% level.

TABLE 6B

| $s_{jt} = \alpha + \beta_1 d_{jt}$ | $+\beta_2 R_{jt-1}$ | $+\beta_3 GVAR_j$ | $_{t} + \beta_{4}$ | $YVAR_{jt}$ | $+ \varepsilon_{jt}$ |
|------------------------------------|---------------------|-------------------|--------------------|-------------|----------------------|
|------------------------------------|---------------------|-------------------|--------------------|-------------|----------------------|

| | $\widehat{oldsymbol{eta}}_1$ | $\widehat{\beta_2}$ | $\widehat{\beta_3}$ | $\widehat{oldsymbol{eta}_4}$ |
|----------------|------------------------------|---------------------|---------------------|------------------------------|
| Estimate | -0.04 | -0.42 | -0.001 | -0.004 |
| Standard error | 0.01 | 0.12 | 0.001 | 0.003 |
| t-stat | -7.46*** | -3.53*** | 1.01 | -1.68* |

Notes: autocorrelation corrected maximum likelihood estimates.

See table 1 for states; 1978-1998.

* statistically significant at the 10% level; *** statistically significant at the 1% level.

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TABLE 7A

$$s_{jt} = \alpha_j + \beta_1 d_{jt} + \beta_2 R_{jt-1} + \varepsilon_{jt}$$

| | $\widehat{oldsymbol{eta}}_1$ | $\widehat{oldsymbol{eta}_2}$ |
|----------------|------------------------------|------------------------------|
| Estimate | -0.02 | -0.59 |
| Standard error | 0.01 | 0.16 |
| t-stat | -2.82*** | -3.68*** |

Notes: autocorrelation corrected maximum likelihood estimates. See table 1 for states; 1978-1998. *** statistically significant at the 1% level.

TABLE 7B

| $s_{jt} = \alpha_j + \beta_1 d_{jt} + \beta_2 R_{jt-1} + \beta_2 R_{jt-1}$ | $\beta_3 GVAR_{jt} + \beta_4 Y$ | $VAR_{jt} + \varepsilon_{jt}$ | | |
|--|---------------------------------|-------------------------------|------------------------------|------------------------------|
| | $\widehat{oldsymbol{eta}}_1$ | $\widehat{oldsymbol{eta}}_2$ | $\widehat{oldsymbol{eta}}_3$ | $\widehat{oldsymbol{eta}}_4$ |
| Estimate | -0.02 | -0.67 | 0.002 | 0.003 |
| Standard error | 0.01 | 0.16 | 0.001 | 0.002 |
| t-stat | -2.69*** | -4.07*** | 2.09** | 1.36 |

Notes: autocorrelation corrected maximum likelihood estimates.

See table 1 for states; 1978-1998.

** statistically significant at the 5% level; *** statistically significant at the 1% level.

TABLE 8A

$$s_{jt} = \alpha_j + \gamma_t + \beta_1 d_{jt} + \beta_2 R_{jt-1} + \varepsilon_{jt}$$

| | $\widehat{oldsymbol{eta}}_1$ | $\widehat{\beta_2}$ |
|----------------|------------------------------|---------------------|
| Estimate | -0.03 | -0.32 |
| Standard error | 0.01 | 0.15 |
| t-stat | -3.98*** | -2.11** |

Notes: autocorrelation corrected maximum likelihood estimates.

See table 1 for states; 1978-1998.

** statistically significant at the 5% level; *** statistically significant at the 1% level.

TABLE 8B

| S_{jt} | $= \alpha_{j}$ | $+ \gamma_t$ | $+\beta_1 d_{jt}$ | $+\beta_2 R_{jt-1}$ | $+\beta_3 GV$ | AR_{jt} + | $\beta_4 Y l$ | $VAR_{jt} +$ | \mathcal{E}_{jt} |
|----------|----------------|--------------|-------------------|---------------------|---------------|-------------|---------------|--------------|--------------------|
|----------|----------------|--------------|-------------------|---------------------|---------------|-------------|---------------|--------------|--------------------|

| | $\widehat{oldsymbol{eta}}_1$ | $\widehat{\beta_2}$ | $\widehat{\beta_3}$ | $\widehat{oldsymbol{eta}}_4$ |
|----------------|------------------------------|---------------------|---------------------|------------------------------|
| Estimate | -0.04 | -0.42 | 0.004 | 0.004 |
| Standard error | 0.01 | 0.15 | 0.001 | 0.002 |
| t-stat | -4.44*** | -2.75*** | 3.38*** | 2.09** |

Notes: autocorrelation corrected maximum likelihood estimates. See table 1 for states; 1978-1998.

*** statistically significant at the 1% level; ** statistically significant at the 5% level.

As a further check, adding the lagged surplus-income ratio as an independent variable to equation (15) and using Arellano and Bond (1991) difference GMM estimation supports the conclusion on the surplus-debt relationship reached above: the coefficient on the debt-income ratio is negative and statistically significant, while that for the interest rate is statistically insignificant from zero (one step estimates with robust test statistics) for various lag lengths used for instruments.

Finally, the sample is split into two groups based on a ranking by debt/GSP. The high debt states are those with debt at or above the mean of 14% of GSP (25 states); the low debt states have debt below 14% of GSP (13 states). Results are in table 9 (high debt) and 10 (low debt). (Results in tables 9 and 10 are robust to moving the four states with 14% debt levels into the low debt group.) For the high debt subsample, all results match the full sample when the cyclical variables are included; when the cyclical variables are not included, the coefficient on the debt-income ratio is negative and statistically significant while the interest rate coefficient is not significant. All results for the low debt subsample are not statistically significant different than zero. The overall conclusion remains the same as that with the full sample: the surplus-income ratio does not respond to the debt-income ratio in the way predicted by fiscal sustainability; nor does it respond to credit market signals.

TABLE 9A

| $s_{jt} = \alpha_j + \gamma_t + \beta_1 d_{jt} + \beta_2 R_{jt-1}$ | $\varepsilon_1 + \varepsilon_{jt}$ | |
|--|------------------------------------|---------------------|
| | $\widehat{oldsymbol{eta}}_1$ | $\widehat{\beta_2}$ |
| Estimate | -0.04 | -0.34 |
| Standard error | 0.01 | 0.22 |
| t-stat | -3.68*** | -1.58 |

Notes: high debt/GSP subsample: Connecticut, Delaware, Florida, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Minnesota, Montana, Nevada, New Hampshire, New Jersey, New Mexico, New York, Oregon, Pennsylvania, Rhode Island, South Carolina, Utah, Vermont, Washington, West Virginia; 1978-1998.

Autocorrelation corrected maximum likelihood estimates.

** statistically significant at the 5% level; *** statistically significant at the 1% level.

TABLE 9B

| S_{jt} | $= \alpha_{i}$ | $+ \gamma_t$ | +, | $\beta_1 d_{ji}$ | , + , | $\beta_2 R$ | jt-1 | $+\beta$ | $_{3}G$ | VAR_{it} | +/ | $B_4 Y$ | VAR _i | , + E | 5 |
|----------|----------------|--------------|----|------------------|-------|-------------|------|----------|---------|------------|----|---------|------------------|-------|---|
|----------|----------------|--------------|----|------------------|-------|-------------|------|----------|---------|------------|----|---------|------------------|-------|---|

| | $\widehat{oldsymbol{eta}}_1$ | $\widehat{\beta_2}$ | $\widehat{oldsymbol{eta}}_3$ | $\widehat{oldsymbol{eta}_4}$ |
|----------------|------------------------------|---------------------|------------------------------|------------------------------|
| Estimate | -0.05 | -0.45 | 0.011 | 0.006 |
| Standard error | 0.01 | 0.22 | 0.005 | 0.002 |
| t-stat | -4.14*** | -2.09** | 2.21*** | 2.99*** |

Notes: high debt/GSP subsample: see table 9a for states.

Autocorrelation corrected maximum likelihood estimates; 1978-1998.

*** statistically significant at the 1% level; ** statistically significant at the 5% level.

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TABLE 10A

| $_{jt} = \alpha_j + \gamma_t + \beta_1 d_{jt} + \beta_2 R_{jt-1} + \varepsilon_{jt}$ | | | | | | | |
|--|------------------------------|------------------------------|--|--|--|--|--|
| | $\widehat{oldsymbol{eta}}_1$ | $\widehat{oldsymbol{eta}_2}$ | | | | | |
| Estimate | -0.009 | -0.229 | | | | | |
| Standard error | 0.011 | 0.195 | | | | | |
| t-stat | -0.859 | -1.18 | | | | | |

Notes: low debt/GSP subsample: Alabama, California, Georgia, Illinois, Michigan, Mississippi, Missouri, North Carolina, North Dakota, Ohio, Oklahoma, Tennessee, Texas, Virginia, Wisconsin.

Autocorrelation corrected maximum likelihood estimates; 1978-1998.

TABLE 10B

| $s_{jt} = \alpha_j + \gamma_t + \beta_1 d_{jt} + \beta_2 R_{jt-1} + \beta_3 GVAR_{jt} + \beta_4 YVAR_{jt} + \varepsilon_{jt}$ | | | | | | | | |
|---|------------------------------|------------------------------|------------------------------|------------------------------|--|--|--|--|
| | $\widehat{oldsymbol{eta}}_1$ | $\widehat{oldsymbol{eta}}_2$ | $\widehat{oldsymbol{eta}}_3$ | $\widehat{oldsymbol{eta}_4}$ | | | | |
| Estimate | -0.013 | -0.32 | 0.001 | 0.002 | | | | |
| Standard error | 0.011 | 0.20 | 0.002 | 0.002 | | | | |
| t-stat | -1.2 | -1.57 | 0.58 | 1.46 | | | | |

Notes: low debt/GSP subsample: see table 10a for states.

Autocorrelation corrected maximum likelihood estimates: 1978-1998.

All of the results serve as a strong repudiation of any type of optimizing behavior on the part of U.S. states over the time period studied. They do not take corrective actions in response to the accumulation of debt and thus do not satisfy an intertemporal budget constraint. This result contrasts with those of Bohn (1998), which finds that the U.S. federal government satisfies an intertemporal budget constraint, and Mendoza and Ostry (2008), which uses panels of advanced and emerging countries and finds that fiscal policy is responsible.

Why do results for the states differ from those for the U.S. federal government found in Bohn (1998)? One explanation is that the states believe that they will be helped either by other branches of state government, like the judicial branch, or by the federal government – where federal help need not be in the form of an explicit bailout. For example, during the time period of this study, states implemented various strategies to garner payments from the federal government via its program for assisting state hospitals that served a "disproportionate share" of uninsured people and those receiving Medicaid, a health insurance program for those with low incomes which had low reimbursement rates. In a study of disproportionate share payments, Ku and Coughlin (1995) concluded that the programs were usually created to generate extra revenue for the overall state budget: "How did the States use the additional \$4.9 billion gained through these mechanisms? ... the common reply was that 'money is fungible'. The additional funds generally flowed into State general fund coffers, were mixed with other state funds...".

Also during this time period, states were pursuing legal action against tobacco companies. Major cigarette producers entered into a Master Settlement Agree-

ment in 1998 with 46 states that had sued to recover health care costs related to treating smokers. In return for giving up future legal claims, the states received payments in perpetuity as compensation for smoking-related taxpayer-paid health care. The MSA did not require states to use their ongoing settlement payments for tobacco control programs. In 2007 the GAO (Shames, 2007) found that from 2000-2005, while 30% of the payments went to health care, the next highest total, 22.9%, went to cover budget shortfalls (and the lowest share, 3.5%, went to tobacco-control programs).

An out-of-sample example that again illustrates the possibility of states' abilities to access one-off funding occurred in 2011, when Google settled a Department of Justice suit by forfeiting \$500 million for allowing Canadian pharmacies to illegally sell prescription drugs to U.S. consumers through Google's AdWords program. The forfeited money was split between federal agencies, e.g. the FDA and IRS, and Rhode Island state and local law enforcement agencies (about \$230 million) that helped in the investigation. How exactly did Rhode Island use its portion of the forfeiture?

"The settlement by Google, which was announced a year ago, has been used in part to relieve the underfunded pensions for retired policemen in two small Rhode Island cities, East Providence and North Providence. This unique deployment of \$70 million (or 15% of the \$500 million forfeiture) was made possible through the intervention of Rhode Island Senator Sheldon Whitehouse, who prevailed upon Attorney General Eric Holder to bypass restrictions on the rules for the use of such criminal proceeds. Sen. Whitehouse called this settlement "a transformational financial moment" in that the proceeds ordinarily could be used only for law enforcement investigations, training and equipment. Attorney General Holder acquiesced in allowing the money to be used to relieve some of the underfunded pension plans for retired policemen in Rhode Island (Lenzner, 2014).

The examples discussed above suggest one reason for a finding of unsustainable fiscal behavior by states: they have some ability to engage strategically with the federal government with respect to obtaining funds. States may also be able to rely on one-off events not available at the federal/sovereign level where judicial settlements, for example, would be too small to have any significant budgetary impacts.

6 CONCLUSION

Using the empirical framework of Bohn (1998) and Barro (1986), which build on Barro's (1979) tax smoothing model, this paper investigates the response of U.S. states' primary surplus-income ratios to their debt-income ratios as a test of the sustainability of state fiscal policy. In contrast to the findings of Bohn (1998) that the U.S. federal government responds to increases in its debt-income ratios by increasing its primary surplus, results for a sample of U.S. states during the period 1978-1998 indicate no response to a rising debt-income ratio: that is, they were not fiscally "responsible". Additionally, it is found that during this period U.S. states did



PUBLIC SECTOR ECONOMICS 43 (3) 267-289 (2019) not respond to credit market pressure, in the sense that the primary budget surplusincome ratio did not increase in response to an increasing risk premium.

Disclosure statement

No potential conflict of interest was reported by the author.

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The impact of tax structure on investment: an empirical assessment for OECD countries

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Article** JEL: D25, E62, H21, O47 https://doi.org/10.3326.pse.43.3.4

** Received: July 8, 2019

Accepted: July 26, 2019

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¹ The opinions expressed herein are those of the author and do not necessarily reflect those of his employers. This research paper is supported by Universidade de Lisboa and ISEG – Lisbon School of Economics and Management, through a PhD Support Scholarship. The author thanks two anonymous referees for helpful comments. Any remaining errors are the author's sole responsibility.

Abstract

Does taxation structure have an impact on investment dynamics? In our paper we evaluate the share of tax revenues in GDP and investment outcomes, making use of gross fixed capital formation as a proxy for investment. This empirical analysis is carried out for all OECD countries, during the period of 1980-2015, to assess the tax system composition effects in both the short- and the long-run. Resorting to panel data econometric techniques, the paper also aims to find optimal tax-investment threshold values. Our results lead us to conclude that there is a maximising effect of income taxation on investment growth when revenues from this tax source are about 10.7%. Furthermore, we find that revenues from social security contributions are detrimental to growth, in both the short- and the long-run, while tax revenues from firms and consumption are only detrimental in the short-run.

Keywords: investment growth, tax systems, fiscal policy, optimal taxation

1 INTRODUCTION

Since Adam Smith shared thoughts and reflections of an economic nature in *The Wealth of Nations*, it has become clear that investment is fundamental for economic development. Nowadays, be they academics or not, everyone recognises the validity of this hypothesis quite nonchalantly. Investment is promoted as a guarantee of long-run growth, is seen almost as an input for an economic unit to be able to function perfectly, in a sustainable way.

In fact, investment enables sustainable consumption in the long-run, by applying economic productive factors in both old and new economic production processes. This allows us to create not only more products for exchange in markets, but also more opportunities to intensify the trade of previous investments. This is because investment decisions can improve the older production processes through efficiency gains, allowing the creation of more added value.

On the other hand, the existence of the state can jeopardise investment decisions. For when a government levies taxes on the private side of the economy, in effect it reduces both private consumption and investment. Taxation can jeopardise investment decisions, particularly when the increase in revenues of both income and consumption taxes from the private-side of an economy can both lead to a reduction in the level of aggregate consumption and also decrease investment profitability rates through the reduction of the expected aggregate demand for the outcomes of these investments.

It is also true that funds raised from taxes are spent through government consumption and investment. Furthermore, apart from the fact that the main purpose of taxes is to guarantee sufficient funds to conduct various fiscal policies, taxes are also levied on economic agents to correct for externalities that arise from the production process. In this case, taxes play a kind of a broker role for any nefarious behaviour of the productive process over the many dimensions of an economy,

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such as the environment, for example. Additionally, taxes can stimulate certain production process behaviours which present good externalities for the economy, as in the case of investment in human capital for the production process.

On the other hand, from a macroeconomic perspective, the utility of taxation can be positively justified. When investment levels are beyond the optimal level, i.e. they are not in accordance with an optimal consumption balanced path, it is imperative to promote the reduction of investment decisions. This happens when the condition of economic dynamic efficiency is not verified, i.e. when the return rate on capital exceeds investment growth rates. Put more specifically, a non-optimal level of investment is verified when the marginal product of capital is less than the economic growth rate - as illustrated in several economic exogenous growth theories, such as, for instance, in Solow (1956); Swan (1956) and Ramsey (1928); Cass (1965); Koopmans (1963). In contrast to this perspective, when investment levels are below the optimal level required to guarantee a sustainable growth path, one point of view is that government intervention is required - through public spending and an increase in investment. In fact, there is empirical evidence sustaining the argument that an increase in public investment can lead to crowding-in effects in private investment, and, therefore, lead to increases in aggregate investment levels (Afonso and St. Aubyn, 2009).

Furthermore, several tax arrangements can have a decided impact on investment decisions. If governments decide to levy less tax on individual income, for example, this may lead to increase aggregate demand for both durable and non-durable goods which may not only give rise to higher profits but provide new investment opportunities. Moreover, when fiscal authorities decide to change corporate tax rates, they influence several branches of economic activity. In particular, tax benefits can lead to specialization in economic activities with higher added-value for the overall economy. Additionally, tax rises on consumption, on property and social security contributions lead generally to a reduction of current consumption. These tax policies may impact on movements of interest rates, depressing them and promoting investment decisions, in general.

According to the analysis above, we think that it is essential to analyse the effects of taxation on investment dynamics. Is it possible empirically to find a correlation between taxation structure and investment dynamics outcomes? In particular, is there a relationship to be found between each source of tax revenue and GDP and investment performance? These questions point up the importance of studying the way in which investment is influenced by fiscal policy. We recognise that this issue has already been studied in depth; however, academic researchers have mainly studied this relationship from the angle of the spending side of fiscal policy. We therefore think that it is important to revisit the investment – fiscal policy relationship looked at from the revenue side of fiscal policy. Accordingly, when taking it into consideration that tax revenues are reintroduced into the economic circuit via overall government expenditure, control variables are required to assess

the tax structure – investment connection. On the other hand, we are aware that the macroeconomic study of taxation has not taken into account the particularities of each tax incidence, or any other tax exemptions or tax law particularities capable of explaining the different degrees of compliance of each tax, in each country under analysis. However, having decided to develop this study from a macroeconomic perspective, we think that an optimal structure of taxation can result in a better design of each tax. In specific terms, we believe that our research is a good starting point for studying taxation analysis in more depth, and for being able to reach, at the same time, a higher rate of tax compliance, resulting in greater efficiency and reliability from the microeconomic perspective – ensuring the much-needed revenues that governments require to conduct their policies.

Our results lead us to conclude that there is an investment threshold with respect to some tax revenue sources. In particular, with the exception of taxes on individual income, an increase of revenues from tax sources seems to be detrimental to investment dynamics. Furthermore, even though we achieve a maximizing effect of almost 11% of revenues from individual income taxes, in GDP terms, in the short-run, we do not find evidence for optimal thresholds for income tax in the long-run.

This study is organised into the following sections: section 2 provides a brief review of the existing literature on the causalities of taxation on investment; section 3 highlights the applied methodology and also the databases used in this analysis; section 4 details the obtained results, and, lastly, section 5 summarises our conclusions.

2 LITERATURE REVIEW

The existing literature on taxation is vast. With respect to the impact of taxation on economic performance, it is particularly worth mentioning the studies conducted in Lee and Gordon (2005), where the authors evaluate the tax structures and their impact on economic growth for a set of 70 countries over the last three decades of twentieth century, concluding that while their results point out the negative impact of corporate taxes on growth, labour income taxes are not significant for economic performance. This negative result regarding the impact of corporate taxes on growth is also confirmed by Arnold (2008), assessing 21 OECD countries' tax structures over a period of more than 30 years. On the opposite side, this author concludes that taxation of property and consumption enhances growth more, which is also in accordance with Xing's (2010) results. In fact, this author also concludes that levying taxes on income, both individual and corporation, as well as on consumption is associated with lower long-term per capita GDP. Lastly, Grdinic, Drezgic and Blazic (2017) assess the correlation between economic evolution and tax composition in Central and Eastern European countries, concluding that taxation arrangements present different effects than those in the existing literature investigating the effects of taxation in OECD countries. In specific terms, the authors claim there is a negative impact of all taxation on growth, underlining income taxes as the source of revenue most detrimental to growth.
In respect of the relationship between taxation and investment, this subjects has also been deeply studied from different perspectives in economics. In fact, some of the literature has highlighted the impact of tax policies on investment behaviour, especially corporate income tax and its effects on investment decision-making processes. For instance, a study conducted by Da Rin, Sembenelli and Di Giacomo (2010) makes use of panel data techniques to assess the impact of taxation on firms for a set of more than 2.5 million firms in 17 European countries, during the period of 1997-2004. The authors conclude that a corporate tax reduction is related with a decreasing capital-labour ratio, and, specifically, the impact of corporate taxes is stronger on capital than on labour. However, as the authors point out, a tax reduction is desirable for the promotion of the entry of firms into the market – however, this policy can also favour the entry of less-financially robust firms. The same conclusion regarding the effect of corporate taxation and market entry is reached in Braunerhjelm and Eklund (2014), where the authors verify that a 10% reduction in corporate taxation increases market entry by 3%. Complementing the previous conclusions, research conducted in Da Rin, Di Giacomo and Sembenelli (2011) concludes that there is a non-linear relationship between tax and firm entry into the market.

On the other hand, in a study of 14 developed countries during the period of 1982-2007, Bond and Xing (2015) find a negative relationship between taxes on firms and their effects on a firm's capital – output ratios. The authors develop an econometric specification derived from a constant elasticity of substitution in a neoclassical model of investment, finding in both short- and long-run that a 1% increase in a firm's taxation has a negative impact on capital-output ratios of between -0.3% and -0.7%. These results are also corroborated by Djankov et al. (2010) for a sample of 85 countries in 2004. Additionally, these authors also found that, with respect to the tax effects on industries, manufacturing is more exposed than other segments to the detrimental effects of corporate taxation. These conclusions are also reached in Mukherjee, Singh and Žaldokas (2017). However, besides finding a negative correlation between taxes on corporate income and R&D activities, the authors also conclude that higher taxes result in a reduced supply of new goods and services into the market economy. Furthermore, by analysing the effects of consumption taxes on corporate investment decisions, Jacob, Michaely and Müller (2017) conclude that this source of taxation is also detrimental to a firm's investment policy. The results reached by the authors led to the conclusion that the detrimental effect of consumption taxation is stronger for firms with a higher degree of demand elasticity, besides having a higher exposure to domestic final consumers and to financial restrictions.

With regards to the effect of taxation on firm size and ownership, Galindo and Pombo (2011) find that corporate taxes affect big firms more than small and medium sized firms, regarding investment decisions and productivity. In addition, Brandstetter and Jacob (2013) apply a difference-in-differences approach to assess the effect of corporate tax on investment dynamics for the German case, and find

heterogeneous responses – i.e. a cut in corporate tax can lead to growth in investment for domestically-owned firms higher than that of foreign-owned corporations. However, Baliamoune-Lutz and Garello (2014) found that tax progressivity tends to stimulate market entry more in low-to-average income than in high-income individuals.

With regards to the productivity-tax linkage, empirical research carried out by Gemmell et al. (2016) for a set of 11 European countries between 1996 and 2005 concludes that while higher statutory corporate tax rates impact the productivity levels of small firms negatively, the productivity of bigger firms is only affected by effective marginal tax rates. Additionally, Langenmayr, Haufler and Bauer (2015) highlight the fact that the existence of an optimal corporation tax structure depends on the degree of competition. The authors conclude that when the degree of market competition is low, higher taxes favour firms with high productivity. Conversely, when the degree of competition is in alignment with competitive market conditions and firms' taxes on profit are low, then low-productivity firms tend to be favoured.

Another topic is tax burden and its relationship with risk-taking decisions for firms' investment. On this subject, Ljungqvist, Zhang and Zuo (2017) conclude that the response to a tax change is not symmetric. In fact, the results suggest that a tax increase is accompanied by a reduction in R&D, among other activities. The authors also conclude that only low financial leverage firms react to tax cuts when it comes to risk-increasing investment decisions. In addition, a study carried out by Ljungqvist and Smolyansky (2016) on the effect of corporate taxation on employment and income in the United States, between 1970 and 2010, concluded that while a reduction in corporate taxes has little impact on economic growth, tax cuts during an economic contraction can bring about an increase in both levels of employment and income.

From the macroeconomic perspective, several studies also assessed the effects of fiscal policies on investment dynamics. In particular, an empirical study was carried out by Vergara (2010) to assess the linkage between tax reforms and investment dynamics for the case of Chile, between 1975 and 2003. The paper's conclusion is in accordance with the theoretical predictions regarding the tax-investment relationship – namely that a reduction of corporate income tax led to a boost in investment in Chile. Furthermore, the author also discovered two channels that explain the negative correlation between taxes and investment: one is related with the positive correlation between higher tax rates and capital costs, and the other is related to higher taxes with liquidity constraints derived from a reduction of the availability of internal funds to promote investment. Additionally, Romer and Romer (2010) evaluated the dynamics of post-WWII tax changes in investment to positive tax changes is quite large. In fact, on a quarterly basis, investment seems to reduce by almost 12% in response to a positive tax shock. This magnitude is

much greater than the sensitivity of both GDP and consumption to tax increases. Furthermore, Mertens and Ravn (2012) evaluate the impact of both anticipated and unanticipated tax shocks for the U.S. economy, making use of VAR econometric techniques for the second-half of the 20th century. Their conclusions follow the theoretical predictions – and the authors highlight the important role of anticipated tax shocks for the dynamics of several economic issues.

On the other hand, Mountford and Uhlig (2009), resorting to the same econometric techniques, conclude that not only is there a negative response of investment to an increase in fiscal revenues, but also that a public budget deficit crowds out investment, which is also corroborated in Barro and Redlick (2011). Additionally, and besides coming to the same negative conclusions about the investment-taxes nexus, Alesina and Ardagna (2010) reached the conclusion that fiscal consolidation via taxation is more detrimental than via the spending side. In fact, raising taxes is more likely to produce economic recessions, and a more inefficient control of government deficit and debt dynamics when compared with fiscal adjustment via cuts in government expenditures.

Finally, Afonso and Jalles (2015) evaluate the impact of fiscal policy on investment for a large panel of 95 countries, during 38 years. While the authors find that private investment evidences a negative correlation with social security spending for all OECD countries, they also found that interest payments and subsidies have detrimental effects on both public and private investments. It is thus clear that the study of taxation structure and investment dynamics can provide new insights leading to the promotion of the latter without hampering government in its implementation of fiscal policies.

3 METHODOLOGY AND DATA

In order to empirically study the impact of taxation on investment growth, we determined that investment dynamics is a function of taxation composition. More specifically, the share of each tax revenue source, as a percentage of GDP, is denoted by *T*, of the $\Delta I = F(T)$ type, as detailed in equation (1). Furthermore, we make use of gross fixed capital formation growth rate as a proxy for investment growth.

$$\Delta I_{i,t} = \beta_{i,t} + \beta_1 y_{i,t-1} + \sum \beta_n \tau_{n,i,t} + \beta_j x_{i,t} + \nu_i + \eta_t + \varepsilon_{i,t},$$

$$j = 1, 2, \ t = 1, ..., T, \ i = 1, ..., N$$
(1)

where $\Delta I_{i,t}$ is the investment growth rate (annual or 5-years average), $y_{i,t-1}$ is the one-lag real *per capita* GDP, $\tau_{n,i,t}$ represents the revenue of each tax item *n*, in GDP terms, $x_{i,t}$ represents the set of control variables, v_i and η_t are, respectively, the country and time-specific effects, and $\varepsilon_{i,t}$ is the error term of the white noise-type.

Additionally, and in order to assess the existence of non-linear effects of taxation structure on investment decisions, we decided to introduce a squared term, as demonstrated in equation (2).

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$$\Delta I_{i,t} = \beta_0 + \beta_1 y_{i,t-1} + \sum \beta_2 \tau_{n,i,t} + \sum \beta_3 \tau_{n,i,t}^2 + \beta_j x_{i,t} + \nu_i + \eta_t + \varepsilon_{i,t},$$

$$t = 1, \dots, T, \ i = 1, \dots, N$$
(2)

Therefore, by deriving equation (2) in respect for each tax component, $\tau_{n,i,i}$, as expressed in equation (3), and by then equalising the derivative function to zero, as detailed in equation (4), we can obtain each tax item threshold in respect to investment growth:

$$\frac{\partial \Delta I_{i,t}}{\partial (\boldsymbol{\tau}_{n,i,t})} = \frac{\partial \left(\beta_0 + \beta_1 y_{i,t-1} + \sum \beta_2 \boldsymbol{\tau}_t + \sum \beta_{3,i,t} \boldsymbol{\tau}_t^2 + \beta_i x_{i,t} + \boldsymbol{v}_i + \eta_t + \boldsymbol{\varepsilon}_{i,t}\right)}{\partial (\boldsymbol{\tau}_{i,t}, \boldsymbol{\tau}_{i,t}^2)}$$
(3)

$$0 = \beta_{2,n,i,t} + 2\beta_{3,n,i,t} \tau_{n,i,t}^* \Leftrightarrow \tau_{n,i,t}^* = \frac{-\beta_{2,n,i,t}}{2\beta_{3,n,i,t}}$$
(4)

Therefore, if we obtain a significant negative signal for $\beta_{3,i,t}$, we thus have a concave relationship between a tax item and the investment dynamic, which translates into an optimal value for that tax source to maximise investment. On the other hand, a convex relationship through a positive coefficient for $\beta_{3,i,t}$ translates into a value that hampers investment growth decisions. Therefore, in the empirical results section, when we obtain non-linear relations, we then highlight each coefficient to differentiate between maximum and minimum optimal levels.

The model computed in this paper considers the period between 1980 and 2015, for all the OECD countries: Australia (AUS), Austria (AUT), Belgium (BEL), Canada (CAN), Chile (CHL), the Czech Republic (CZE), Denmark (DNK), Estonia (EST), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Hungary (HUN), Iceland (ISL), Ireland (IRL), Israel (ISR), Italy (ITA), Japan (JPN), South Korea (KOR), Latvia (LVA), Luxembourg (LUX), Mexico (MEX), the Netherlands (NLD), New Zealand (NZL), Norway (NOR), Poland (POL), Portugal (PRT), the Slovak Republic (SVK), Slovenia (SVN), Spain (ESP), Sweden (SWE), Switzerland (CHE), Turkey (TUR), the United Kingdom (GBR) and the United States (USA).

The database used in our analysis includes data from several sources: PPP *per capita* GDP (*realgdppc*); public debt (*debt*) and total government spending (*tot-exp*) – both as a ratio of GDP, output gap, as a percentage of potential GDP (*out-putgap*) are all obtained from the World Economic Outlook (IMF). On the other hand, taxes on income, profits and capital gains of individuals (*taxinc*), as well as taxes on income, profits and capital gains of corporates (*taxfirms*), social security contributions (*ssc*), taxes on payroll and workforce (*taxpayroll*), taxes on property (*taxprop*), taxes on goods and services (*taxvat*), gross fixed capital formation (*gfcf*) and its growth rate (*gfcfgr*) were all retrieved from the *OECD.Stats* database. Age dependency ratio, as a percentage of active population (*ageratio*), and also deposit interest rate (*depositrate*), net foreign direct investment-to-GDP ratio

(*foreigninvestment*), and GDP percentage of household final consumption expenditure (*hconsggdp*) are all collected from World Development Indicators (WDI). Population in millions (pop) and the real total factor productivity (*rtfpna*) were obtained from the data of Feenstra, Inklaar and Timmer (2015). Lastly, the liquid liabilities-to-GDP ratio (*llgdp*) is based on International Financial Statistics (IFS), from the IMF. Table 1 presents the summary statistics for each variable used in our regressions.

For the estimation of the coefficients, we resort to panel data techniques, applying the OLS, OLS-Fixed Effects (FE), by resorting to the Hausman Test to evaluate if the respective specification should be run with fixed effects¹, Generalized Method of Moments (GMM) and Robust Least Squares (RLS) resorting to the M-estimation technique.

With the exception of RLS, all these estimations assume the white diagonal covariance matrix hypothesis. Additionally, we estimate both equations (1) and (2) for both annual and 5-year average growth rates. Lastly, we only discuss the existence of a threshold when the coefficients of each tax item present statistical significance for both linear and square term tax regressors, for a minimum of 90% confidence interval.

| | realgdppc | taxinc | taxfirms | ssc | taxpayroll | taxprop |
|-----------|-------------------|--------|----------|-------------|------------|-----------|
| Mean | 24.448 | 8.82 | 2.806 | 8.345 | 0.369 | 1.745 |
| Std. dev. | 14.313 | 4.635 | 1.500 | 4.981 | 0.728 | 1.003 |
| Max | 101.054 | 26.780 | 12.594 | 19.173 | 5.661 | 7.334 |
| Min | 2.184 | 0.873 | 0.261 | 0.000 | 0.000 | 0.074 |
| Obs. | 1,195 | 1,106 | 1,106 | 1,137 | 1,137 | 1,137 |
| | taxvat | gfcf | gfcfgr | depositrate | ageratio | debt |
| Mean | 10.588 | 23.161 | 3.314 | 9.253 | 51.287 | 55.728 |
| Std. dev. | 3.046 | 4.091 | 8.917 | 25.364 | 6.931 | 35.901 |
| Max | 18.730 | 39.404 | 45.119 | 682.530 | 96.457 | 242.113 |
| Min | 2.979 | 11.546 | -47.761 | -0.180 | 36.323 | 3.664 |
| Obs. | 1,137 | 1,174 | 1,164 | 1,055 | 1,260 | 943 |
| | foreigninvestment | rtfpna | totexp | рор | hconsggdp | outputgap |
| Mean | 3.645 | 0.941 | 42.621 | 33.531 | 56.382 | -0.319 |
| Std. dev. | 10.487 | 0.123 | 9.657 | 52.235 | 7.069 | 2.850 |
| Max | 252.308 | 1.539 | 68.436 | 319.449 | 79.551 | 14.911 |
| Min | -58.323 | 0.472 | 14.244 | 0.228 | 29.918 | -11.437 |
| Obs. | 1,120 | 1,173 | 977 | 1,173 | 1,174 | 851 |

TABLE 1

Summary statistics of the variables set for investment regressions, 1980-2015

¹ For reasons of parsimony we do not provide the Hausman test results in the article, although they are available upon request.

4 EMPIRICAL ANALYSIS

4.1 SHORT-RUN EFFECTS OF TAXATION ON INVESTMENT DYNAMICS

The short-run analysis for equation (1), i.e. without the tax items square terms, show that tax burden has, in general, a negative impact on investment dynamics. In detail, a unit increase in the tax burden of individual income taxes is associated with a decrease of 0.14%, approximately, while an increase in the tax on firms' revenues, as a proportion of GDP, presents a negative elasticity greater than the unity (-1.15), on average. Moreover, revenues of social security contributions also show an average reduction of -0.66% by a percentage point increase in this tax source. In fact, these obtained results are expected: taxes levied on household income and on social security contributions reduce aggregate demand and, therefore, they reduce the demand for goods and services, which can decisively influence new investment decisions. On the other hand, it is certain that a rise in the tax burden on these two sources can indicate wage rises, which cut into firm profits, decreasing the expected returns of previous investments, as well as of any new investments. Furthermore, a rise of taxes on firms, controlled by the cyclical conditions of the economy, also reduces the expected present value of future investment, leading investors to postpone their decisions to promote capital growth and, therefore, the aggregate level of investment. For the same reasons, the negative coefficients obtained for taxes on consumption of goods and services as well as for taxes on property are expected in line with traditional economic theory. Yet, and if we admit that the increase of revenues from taxes on consumption results from changes in tax rates, the price system will incorporate those tax policy changes, reducing investment opportunities. In fact, even if firms can accommodate a higher tax rate without changing their prices, the net profits will necessarily decrease, increasing the time required for an investment decision to result in a profit.

With regards to the control variables, we also find the expected signs. Specifically, a rise in deposit interest rates may be a sign of a consequent increase in lending interest rates, if bank entities decided to keep their spreads. In that sense, an upward movement of deposit rates is associated with a decrease of investment of about 0.4%. On the other hand, we conclude that there is a surprisingly negative impact of foreign investment on aggregate investment decisions. However, the magnitude of this effect is very small, representing a negative impact of no more than 0.08% on aggregate investment growth by an increase of a percentage point of foreign investment. In fact, this result needs to be more accurately explored. This result may arise from the substitution and complementary degree between aggregate investment and foreign investment. Furthermore, household consumption seems to be detrimental to investment growth, which can be explained by the reduction of savings and consequently fewer funds being available for capital allocations and other investment decisions.

Looking in detail at the government debt growth impact, it seems that this variable crowds out aggregate investment. On the other hand, while there is no evidence that growth in the public expenditure and age dependency ratio influences

investment decisions, and the output gap is revealed to be procyclical with gross fixed capital formation – ranging between 0.27% and 0.74%. This positive effect can be explained by the fact that when the economy is overheating, inflation pressures tend to decrease the amortization time of the investment, and, consequently, to increase its profitability.

With regards to tax item thresholds for investment decision-making, through the use of the growth rate of gross fixed capital formation, it is possible to verify the non-existence of these thresholds for both taxes on payrolls and taxes on property. Regarding the other tax items, we obtained a value of 10.65% for taxes on individual income on GDP, which translates to the maximum value that promotes investment, while we see minimizing values on average of 12.09% for social security contributions, and of 7.37% and 14.18% for tax on firms and consumption, respectively. The values of these last three tax items evidence their minimum revenue, as a proportion of GDP, which is required to promote growth in investment. The above-mentioned results are presented in table 2.

TABLE 2

Linear and non-linear short-run impact results of taxation structure on investment decisions

| | OLS | | OLS | S-FE | GMM | | RLS | |
|---|-----------|-----------|----------|----------|-----------|-----------|-----------|-----------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| A | 0.004*** | 0.003*** | 0.003*** | 0.003*** | 0.004*** | 0.005*** | 0.004*** | 0.004*** |
| ∆reaigappc | (0.000) | (0.000) | (0.001) | (0.001) | (0.001) | (0.001) | (0.000) | (0.000) |
| | -0.144** | -0.069 | 0.131 | 1.491** | -0.127 | 0.037 | -0.128** | -0.182 |
| $taxinc_{-1}$ | (0.070) | (0.215) | (0.199) | (0.577) | (0.112) | (0.367) | (0.061) | (0.175) |
| | | -0.007 | | -0.070** | | -0.015 | | -0.001 |
| taxinc ² -1 | | (0.009) | | (0.031) | | (0.017) | | (0.008) |
| 4 | -0.442** | -1.580*** | 0.277 | -0.595 | -0.561*** | -3.859*** | -0.289** | -1.032** |
| $tax firm S_{-1}$ | (0.176) | (0.568) | (0.272) | (0.779) | (0.263) | (1.488) | (0.140) | (0.427) |
| | | 0.107** | | 0.070 | | 0.279** | | 0.066* |
| taxfirms1 | | (0.044) | | (0.060) | | (0.115) | | (0.039) |
| | -0.121** | -0.436** | -0.047 | -2.007** | -0.151 | -0.703 | -0.086* | -0.276 |
| SSC_{-1} | (0.058) | (0.209) | (0.230) | (1.013) | (0.095) | (0.437) | (0.050) | (0.180) |
| 2 | | 0.017 | | 0.083** | | 0.028 | | 0.010 |
| SSC-1 | | (0.011) | | (0.039) | | (0.021) | | (0.010) |
| 4 | -0.324 | 0.420 | 1.990** | 3.002 | -0.065 | -2.013 | -0.284 | 0.107 |
| taxpayrott_1 | (0.262) | (0.929) | (0.968) | (1.904) | (0.381) | (1.546) | (0.277) | (0.934) |
| 4 IP | | -0.365 | | -0.304 | | 0.729 | | -0.144 |
| taxpayroll ² -1 | | (0.356) | | (0.540) | | (0.682) | | (0.383) |
| | -0.571* | -0.588 | -0.211 | 0.775 | -0.036 | 3.822 | -0.013 | 1.139 |
| taxprop_1 | (0.295) | (1.025) | (0.508) | (1.521) | (0.649) | (2.793) | (0.255) | (0.770) |
| <i>taxprop</i> ² ₋₁ | | 0.042 | | -0.118 | | -0.658 | | -0.208 |
| | | (0.166) | | (0.214) | | (0.443) | | (0.141) |
| | -0.612*** | -2.640*** | 0.413 | 0.291 | -0.103 | -2.691* | -0.663*** | -1.982*** |
| taxvat_1 | (0.163) | (0.635) | (0.363) | (1.127) | (0.3) | (1.519) | (0.133) | (0.538) |
| | | 0.099*** | | 0.016 | | 0.111 | | 0.066** |
| $taxvat_{-1}$ | | (0.033) | | (0.057) | | (0.072) | | (0.026) |

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| | OLS | | OLS | S-FE | GMM | | RLS | |
|---------------------------------|------------|------------|-----------|-----------|----------|----------|------------|------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 6.6 | -0.521*** | -0.615*** | -1.283*** | -1.337*** | -0.077 | -0.340 | -0.505*** | -0.599*** |
| gf¢f-1 | (0.104) | (0.123) | (0.148) | (0.159) | (0.111) | (0.208) | (0.072) | (0.079) |
| | 0.242*** | 0.242*** | 0.225*** | 0.221*** | 0.429** | 0.267 | 0.259*** | 0.257*** |
| gjcjgr ₋₁ | (0.057) | (0.058) | (0.061) | (0.061) | (0.183) | (0.169) | (0.032) | (0.032) |
| A. 1 | -0.426* | -0.435* | -0.436* | -0.414* | 1.063 | -1.323 | -0.583*** | -0.606*** |
| ∆aepositrate | (0.241) | (0.238) | (0.256) | (0.251) | (1.233) | (1.526) | (0.160) | (0.159) |
| | -0.016 | -0.053 | -0.065 | -0.029 | -0.044 | -0.029 | -0.027 | -0.058 |
| ageratio ₋₁ | (0.067) | (0.071) | (0.137) | (0.144) | (0.116) | (0.104) | (0.053) | (0.055) |
| | -0.275*** | -0.303*** | -0.189** | -0.200** | -0.487* | -0.543** | -0.264*** | -0.295*** |
| ∆debt | (0.078) | (0.082) | (0.082) | (0.084) | (0.258) | (0.218) | (0.047) | (0.047) |
| | -12.705*** | -12.809*** | -6.562 | -2.947 | 2.829 | -0.873 | -10.328*** | -10.345*** |
| rtfpna | (3.769) | (3.884) | (5.536) | (6.308) | (4.246) | (5.567) | (2.677) | (2.770) |
| $\Delta totexp_{-1}$ | -0.148 | -0.160 | -0.088 | -0.081 | 0.315 | -0.139 | 0.053 | 0.032 |
| | (0.159) | (0.163) | (0.154) | (0.157) | (0.654) | (0.602) | (0.104) | (0.104) |
| | -0.497 | -0.580 | 61.785*** | 63.702*** | 0.228 | -0.501 | -0.926*** | -0.997*** |
| log(pop) | (0.397) | (0.396) | (10.841) | (11.771) | (0.878) | (0.974) | (0.237) | (0.243) |
| | -0.075*** | -0.066*** | -0.070*** | -0.066*** | 0.028 | 0.009 | -0.075*** | -0.073*** |
| foreigninvestment ₋₁ | (0.017) | (0.016) | (0.017) | (0.017) | (0.087) | (0.091) | (0.015) | (0.015) |
| 1 | 0.039 | 0.013 | -0.214** | -0.242** | 0.07 | 0.000 | 0.036 | 0.024 |
| hconsumption ₋₁ | (0.027) | (0.028) | (0.093) | (0.094) | (0.048) | (0.049) | (0.027) | (0.028) |
| | 0.369** | 0.466*** | 0.690*** | 0.736*** | -0.849** | 0.121 | 0.271*** | 0.352*** |
| outputgap | (0.157) | (0.157) | (0.159) | (0.170) | (0.395) | (0.565) | (0.091) | (0.093) |
| Tax thresholds | | | | | | | | |
| taxinc | _ | _ | _ | 10.65% | _ | _ | _ | _ |
| taxfirms | _ | 7.38% | _ | _ | _ | 6.92% | _ | 7.82% |
| SSC | _ | _ | _ | 12.09% | _ | _ | _ | |
| taxpayroll | _ | _ | _ | _ | _ | _ | _ | |
| taxprop | _ | _ | _ | _ | _ | _ | _ | _ |
| taxvat | | 13.33% | _ | _ | _ | _ | _ | 15.02% |
| R ² | 0.540 | 0.554 | 0.680 | 0.687 | 0.343 | 0.477 | 0.401 | 0.414 |
| DW-Stat | 1.856 | 1.875 | 2.000 | 2.018 | 2.110 | 1.949 | n.a. | n.a. |
| Obs. | 529 | 529 | 529 | 529 | 473 | 473 | 529 | 529 |

Notes: *, ** and *** represent statistical significance at levels of 10%, 5%, and 1%, respectively. The robust standard errors are in brackets. The White diagonal covariance matrix is used in order to assume residual heteroskedasticity, with the exception of the RLS technique. The DW-statistic is the Durbin-Watson statistic. The non-bold and bold values express, respectively, maximum and minimum levels of optimal tax items.

3.2. LONG-RUN EFFECTS OF TAXATION ON INVESTMENT DYNAMICS

From a long-run perspective, with regards to linear relationships between tax revenues and investment (see Regressions (9), (11), (13) and (15)), the results obtained highlight patterns similar to those verified for short-run effects on tax items and investment growth, the exception being property tax – which appears to be irrelevant for determining investment decisions in the long run. In addition, we can observe that the values presented in tables 2 and 3 highlight similar magnitudes for the coefficient of taxation items in investment growth.

Regarding the other control variables, as in the short-run perspective, we find that population size shows a contradictory signal. Furthermore, household consump-

tion and output gap variables highlight a non-clear effect on investment dynamics, as these last two variables also present different signals, depending on the econometric technique used.

Nevertheless, it seems that deposit interest rates have a negative effect on investment from a long-term perspective. For example, a 1 p.p. increase in deposit interest rates tends to lead to a decrease in investment of between 0.4 p.p. and 0.6 p.p., approximately. Furthermore, government spending variation also seems to gain importance in the long term – presenting a slightly negative impact on gross fixed capital formation.

With regards to the analysis of the non-linear relationships of tax items on investment decisions, by computing the consequent existing tax items-to-investment thresholds, we find maximum values of 6.27% and 9.19% for taxation on firms' profits and for consumption taxes, respectively. By contrast, we find a minimum threshold value for social security contributions of 11.35%. In the long run, and similarly to what we can observe in the short-run analysis, we can also conclude for the non-existence of any threshold values for payroll taxes. The above-discussed results may be observed in detail in table 3.

TABLE 3

Linear and non-linear long-run impact results of taxation structure on investment decisions

| | OLS | | OLS | -FE | GMM | | RLS | |
|-----------------------|----------|----------|----------|----------|----------|---------|-----------|-----------|
| | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) |
| A 1 1 | 0.000** | 0.000** | 0.003*** | 0.001** | 0.004*** | 0.001** | 0.004*** | 0.000* |
| ∆realgappc | (0.000) | (0.000) | (0.001) | (0.000) | (0.001) | (0.000) | (0.000) | (0.000) |
| tavina | -0.042 | -0.085 | 0.131 | 0.740 | -0.127 | -0.263 | -0.128** | 0.021 |
| <i>luxinc_1</i> | (0.051) | (0.091) | (0.199) | (0.571) | (0.112) | (0.169) | (0.061) | (0.114) |
| 4 | | 0.003 | | -0.042 | | 0.012* | | -0.004 |
| laxinc-1 | | (0.004) | | (0.029) | | (0.007) | | (0.005) |
| 4 | -0.098 | -0.197 | 0.277 | 0.489 | -0.561** | -0.601 | -0.289** | -0.828*** |
| taxfirms_1 | (0.107) | (0.458) | (0.272) | (0.747) | (0.263) | (0.734) | (0.140) | (0.278) |
| 4 | | 0.014 | | -0.028 | | 0.041 | | 0.066*** |
| taxjtrms=1 | | (0.034) | | (0.053) | | (0.055) | | (0.025) |
| | -0.069** | -0.227** | -0.047 | -0.417 | -0.151 | -0.150 | -0.086* | -0.255** |
| SSC-1 | (0.034) | (0.091) | (0.230) | (0.662) | (0.095) | (0.172) | (0.050) | (0.117) |
| ? | | 0.010* | | 0.008 | | 0.006 | | 0.009 |
| SSC-1 | | (0.005) | | (0.023) | | (0.010) | | (0.006) |
| 4 | -0.168 | 0.170 | 1.990** | 1.156 | -0.065 | 0.221 | -0.284 | -0.164 |
| laxpayroll_1 | (0.160) | (0.490) | (0.968) | (1.352) | (0.381) | (0.986) | (0.277) | (0.608) |
| 4 IP | | -0.215 | | -0.467 | | -0.334 | | -0.044 |
| taxpayrott-1 | | (0.185) | | (0.503) | | (0.415) | | (0.249) |
| | -0.258 | -0.971 | -0.211 | -0.816 | -0.036 | -1.381 | -0.013 | 0.447 |
| $taxprop_{-1}$ | (0.181) | (0.868) | (0.508) | (1.838) | (0.649) | (1.260) | (0.255) | (0.501) |
| | | 0.137 | | 0.122 | | 0.190 | | -0.052 |
| iaxprop ₋₁ | | (0.124) | | (0.219) | | (0.198) | | (0.092) |
| | -0.271** | -0.183 | 0.413 | 1.985*** | -0.103 | 0.298 | -0.663*** | -0.499 |
| $taxvat_{-1}$ | (0.109) | (0.397) | (0.363) | (0.571) | (0.300) | (0.853) | (0.133) | (0.350) |

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| | OLS | | OLS | -FE GMM | | MM | RLS | |
|----------------------|-----------|-----------|-----------|-----------|----------|-----------|------------|-----------|
| | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) |
| 4 | | -0.007 | | -0.108*** | | -0.040 | | 0.022 |
| taxvat-1 | | (0.021) | | (0.029) | | (0.035) | | (0.017) |
| -6-6 | -0.114* | -0.100 | -1.283*** | -0.259*** | -0.077 | 0.096 | -0.505*** | -0.083 |
| gfcf ₋₁ | (0.062) | (0.069) | (0.148) | (0.091) | (0.111) | (0.115) | (0.072) | (0.052) |
| -6-6 | 0.274*** | 0.267*** | 0.225*** | 0.214*** | 0.429** | 0.265*** | 0.259*** | 0.292*** |
| gjcjgr ₋₁ | (0.034) | (0.036) | (0.061) | (0.036) | (0.183) | (0.100) | (0.032) | (0.021) |
| A. J | -0.648*** | -0.644*** | -0.436* | -0.468*** | 1.063 | -0.388 | -0.583*** | -0.573*** |
| ∆aeposiiraie | (0.124) | (0.191) | (0.256) | (0.131) | (1.233) | (0.815) | (0.160) | (0.104) |
| | -0.064 | -0.053 | -0.065 | -0.052 | -0.044 | 0.089** | -0.027 | -0.071** |
| ageratio_1 | (0.040) | (0.032) | (0.137) | (0.112) | (0.116) | (0.045) | (0.053) | (0.036) |
| A J-L4 | -0.239*** | -0.238*** | -0.189** | -0.150*** | -0.487* | -0.631*** | -0.264*** | -0.245*** |
| Δαεθί | (0.050) | (0.057) | (0.082) | (0.041) | (0.258) | (0.124) | (0.047) | (0.031) |
| | -4.849** | -4.240* | -6.562 | 0.082 | 2.829 | 1.089 | -10.328*** | -4.070** |
| rijpna | (2.074) | (2.551) | (5.536) | (4.644) | (4.246) | (3.229) | (2.677) | (1.803) |
| $\Delta totexp_{-1}$ | -0.046 | -0.050 | -0.088 | 0.002 | 0.315 | 0.517 | 0.053 | -0.125* |
| | (0.091) | (0.077) | (0.154) | (0.079) | (0.654) | (0.327) | (0.104) | (0.068) |
| 1 () | -0.436** | -0.421 | 61.785*** | 14.650** | 0.228 | -0.203 | -0.926*** | -0.415*** |
| log(pop) | (0.189) | (0.299) | (10.841) | (7.225) | (0.878) | (0.391) | (0.237) | (0.158) |
| foreigninvest- | -0.004 | -0.002 | -0.070*** | -0.006 | 0.028 | 0.044 | -0.075*** | -0.003 |
| ment_1 | (0.007) | (0.006) | (0.017) | (0.009) | (0.087) | (0.047) | (0.015) | (0.010) |
| L | 0.056*** | 0.053*** | -0.214** | -0.093 | 0.070 | 0.057** | 0.036 | 0.026 |
| nconsumption_1 | (0.018) | (0.018) | (0.093) | (0.102) | (0.048) | (0.028) | (0.027) | (0.018) |
| | -0.144* | -0.138 | 0.690*** | -0.085 | -0.849** | -0.433 | 0.271*** | -0.214*** |
| ouipuigap | (0.083) | (0.103) | (0.159) | (0.091) | (0.395) | (0.312) | (0.091) | (0.061) |
| Tax thresholds | | | | | | | | |
| taxinc | - | - | - | - | - | - | - | - |
| taxfirms | - | - | - | - | - | - | - | 6.27% |
| SSC | - | 11.35% | - | - | - | - | - | - |
| taxpayroll | - | - | - | - | - | - | - | - |
| taxprop | - | - | - | - | - | - | - | - |
| taxvat | | | | 9.19% | | | | |
| R ² | 0.476 | 0.481 | 0.717 | 0.730 | 0.171 | 0.180 | 0.360 | 0.366 |
| DW-Stat | 1.124 | 1.127 | 1.034 | 1.095 | 1.692 | 1.665 | n.a. | n.a. |
| Obs. | 529 | 529 | 529 | 529 | 473 | 473 | 529 | 529 |

Notes: *, ** and *** represent statistical significance at levels of 10%, 5%, and 1%, respectively. The robust standard errors are in brackets. The White diagonal covariance matrix is used in order to assume residual heteroskedasticity, with the exception of the RLS technique. The DW-statistic is the Durbin-Watson statistic. The non-bold and bold values express, respectively, maximum and minimum levels of optimal tax items.

Lastly, based on the results presented in table 1, which allow a comparison of the short- and long-term results for each tax item from the econometric regressions, we are also able to conclude that a certain fiscal space exists to raise some taxes. In fact, with the exception of payroll taxes and property taxes, we have found optimal values for the other tax sources. In detail, we derived maximum threshold levels for income taxes, in the short run, and corporate taxes, over the long term, in order to promote higher investment growth rates. In fact, and by comparing the optimal values reached with the mean values of table 4, we can state that we can raise the share of income taxes in GDP, in the short-term, by almost 2 p.p., while we can raise tax revenues from corporate income by 3.5 p.p., in the long-term. Moreover, there is no incentive to change the tax burden in the short-term, since the optimal average value (7.37%) represents a minimizing threshold. Therefore, if fiscal policy intends to raise taxes from firms, it will jeopardize investment decisions in the short-term. This conclusion is also valid for social security contributions, for both short- and long-run analysis, and also for taxes on consumption, only for a short-run perspective. Moreover, as we can observe, as the average value of consumption taxes, as a proportion of GDP, is above the optimal threshold value, there is an incentive for fiscal policy to reduce the tax burden on this tax source to efficiently promote gross fixed capital formation.

Furthermore, and as a concluding reflection exercise, we can obtain optimal tax structures. Indeed, if we sum the values of all the optimal threshold tax items with the historical average recorded for taxes, we conclude that taxation as a share of GDP should be around 46.41% and 37.75% in the short-run and long-run, respectively. Lastly, table 4 summarises our main findings regarding average tax threshold values.

TABLE 4

| | Short-run (%) | Long-run (%) | Mean (%) |
|------------|---------------|--------------|----------|
| taxinc | 10.65 | _ | 8.82 |
| taxfirms | 7.37 | 6.27 | 2.81 |
| SSC | 12.09 | 11.35 | 8.35 |
| taxpayroll | | | 0.37 |
| taxprop | _ | _ | 1.75 |
| taxvat | 14.18 | 9.19 | 10.59 |

Notes: the non-bold and bold values, presented in the short-run and long-run columns express maximum and minimum optimum levels, respectively. The values expressed in italics represent average values.

4 CONCLUDING REMARKS

Investment is a crucial dimension of economic science, as it guarantees not only consumption in the long run, but also a sustainable growth path. However, we are aware that there are many other factors that can influence the dynamics of investment within the various economies under study. One of these factors is taxation: besides the taxes levied on firms' profits, taxes affect several economic aggregates that may impact decisively on investment decisions. Additionally, taxation is recognised *a priori* as being detrimental to investment. Therefore, our goal is to disentangle the relationship between tax systems and investment dynamics.

In detail, it can be seen that in this study we have developed an empirical model to assess both linear and non-linear correlations between tax compositions in terms of GDP, investment, which is proxied by gross fixed capital formation. Additionally, our attempt to uncover possible non-linear impacts of the several tax

sources led us to conclude the existence of optimal tax item revenue thresholds with regard to investment changes. This empirical exercise was carried out with the use of panel data techniques, for both the short- and long-term perspective for all OECD countries, between 1980 and 2015.

The results achieved evidence the existence of certain tax-to-GDP thresholds. Specifically, some optimal values of tax items as a proportion of GDP maximise investment decisions. In particular, regarding the short-run, we found a maximising threshold for the promotion of long-run investment growth of 10.65% for taxes on individual income. On the other hand, we come to the conclusion eventually that maximum threshold levels to promote investment growth exist for taxes on firms' profits and taxes on the consumption of goods and services, of 6.27% and 9.19%, respectively. Furthermore, we found a minimum threshold of 11.35% for social security contributions.

With regards to the short-run, we only found one maximum threshold of 10.65% for taxes on individual income, while a minimum threshold value of 12.09% was found for social contributions. In addition, we found minimum threshold values, on average, of 7.37% and 14.18% for profits and consumption of goods and services taxes, respectively.

These results are of extreme importance. They give new insights into the optimisation of tax systems with respect to investment decisions. Consequently, several research lines could be pursued in the future to study deeper each tax source design in order to efficiently guarantee a tax that could ensure high levels of compliance, without jeopardising investment decisions. Several other analyses could also be carried out with the objective of finding possible complementary or competing roles between taxes and other macroeconomic variables. In sum, our article gives new insights that must be explored for a better understanding of tax systems.

Disclosure statement

No potential conflict of interest was reported by the author.

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The impact of direct and indirect taxes on the growth of the Turkish economy

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Preliminary communication ** JEL: C22, E62, O47 https://doi.org/10.3326/pse.43.3.5

The authors would like to thank to the two anonymous referees for helpful comments on the paper.
 Received: July 9, 2019
 Accepted: July 31, 2019

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Abstract

Governments are able to implement monetary and fiscal policies to achieve economic objectives, such as increasing production, ensuring price stability, improving the balance of payments, and achieving full employment. While central banks carry out monetary policies, governments, in contrast, develop fiscal policies. Fiscal policy instruments can include public expenditures, taxes, and borrowing. In countries that have low savings levels, individuals participate in public expenditures by spending a large part of their income.

Therefore, taxes are effectively used as a major policy instrument. The impact of both direct and indirect taxes on economic growth in Turkey has been analyzed by employing the autoregressive distributed lag (ARDL) approach. Test results suggest a positive and significant impact of indirect taxes on economic growth as well as a negative and significant impact of direct taxes.

Keywords: ARDL, direct taxes, economic growth, indirect taxes, Turkey

1 INTRODUCTION

Governments can implement tax policies as a fiscal policy instrument to make certain expenditures and finance their investments. Tax policies to be implemented may vary depending on targeted objectives. Tax policies may help individual governments raise higher revenues with the aim of financing public expenditures, reducing the balance of payments or trade balance deficits, or encouraging growth and development by granting incentives. Taxes have always been a very popular subject of discussion in the literature on economics. Moreover, the tax rates to be levied and their reflections on the economy have always been a popular topic. Economic doctrines supporting government intervention in the economy have brought forward recommendations on the taxation policies of the state. Keynes's emphasis was on the potential for government spending and taxation to influence aggregate demand. Keynes says that changes in government spending or taxation are multiplied in their effect on the economy. The key element in this multiplier effect is how consumers respond to changes in their incomes. Keynes declared that governments should increase spending and cut taxes to boost their economies (Nelson, 2006:2). The supply-side economist Arthur Laffer stated that an increase in tax rates lowers or only causes a small increase in tax revenue because people avoid taxation, which lowers the tax base (Kazman, 2014). Supply-side economists strongly argue that tax rates should be lowered to increase economic production.

The taxation system currently in force in Turkey is a multiple tax system, taxes being classified as either direct or indirect. The distinction between direct and indirect taxes is based on whether their burden can be shifted from the initial taxpayer to others. Taxes where the burden can be shifted to others are indirect, and taxes where the burden cannot be shifted to any other person are direct. If the taxable event is of a continuous nature, then the consequent taxes are classified as direct. If the taxable event arises occasionally and is not of a continuous nature,

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then the consequent taxes are classified as indirect (Erdem, Şenyüz and Tatlıoğlu, 2012:113-115). The tax bearer pays direct taxes to the government. The government directly levies taxes on people and businesses. An intermediary, on the other hand, collects indirect taxes from the person bearing the ultimate financial burden of the tax. Therefore, the taxpayer and the tax bearer are different in relation to these types of taxes. Taxes levied on revenues and wealth are classified as direct taxes, whereas taxes levied on expenditures on goods and services are classified as indirect taxes. Taxes levied on expenditures, on the other hand, comprise value-added taxes, excise duties, special communication taxes, gambling taxes, customs duties, banking and insurance taxes, stamp duties, fees levied on negotiable instruments, and other fees and charges. The largest share among these taxes is taken by value-added tax. Taxes levied on wealth comprise motor vehicle taxes, estate taxes, and property taxes.

A shift from direct to indirect taxes has advantages and disadvantages. The advantages and disadvantages of indirect taxes are given in table 1 (Özdemir, 2009: 17-18).

TABLE 1

| The | advantages | and | disadvant | ages of | f indirect | taxes |
|------|------------|--------|---|-------------------|------------|---------------|
| 1110 | aaranages | 001000 | 000000000000000000000000000000000000000 | $a_{S}c_{S}c_{J}$ | 1110111001 | <i>venven</i> |

| Advantages | Disadvantages |
|---|--|
| Avoiding taxes on goods and services is almost impossible. The return of value-added tax in export | Reducing income tax in favor of raising value-added tax increases the tax burden on those with lower- and middle-class |
| transactions has a positive impact on foreign trade. | ncomes.Raising indirect taxes curbs the overall |
| - Taxing consumption rather than income | demand for goods and services. |
| in order not to alter total income encourages economic growth. | Focusing on consumption encourages those with upper-class incomes who also |
| Raising indirect taxes also raises capital accumulation in the long term. | consume little to evade taxes. |
| | |

Source: Özdemir (2009:17-18).

The relationship between economic growth and tax revenues is one of the most controversial areas in the literature. Although there are many variables that shape economic growth, tax has a much more pronounced effect on economic growth with its direct and indirect effects. Tax revenues are one of the most important revenues of the Turkish economy. The amount of tax revenues has increased continuously over the years, and in 2018, the amount of tax revenues reached 24% of the Turkish national product. This has motivated the present study, which aims to investigate the relationship between tax revenues and economic growth in Turkey. This study involves an analysis of the impact of direct taxes and indirect taxes on economic growth in Turkey. The following research hypotheses are suggested.

Hypothesis 1: Direct taxes have negative effects on economic growth, affecting GDP negatively. Hypothesis 2: Indirect taxes have positive effects on economic growth, affecting GDP positively.

The remaining part of this study is organized as follows: section 2 overviews related studies. The data and estimation methodology employed are discussed in section 3. Section 4 describes the empirical findings, and finally we present our conclusions.

2 LITERATURE REVIEW

Anastassiou and Dritsaki (2005) noted a unidirectional causal relationship between total tax revenues and economic growth as a result of an analysis conducted on annual data from Greece from between 1965 and 2002. Ferede and Dahlby (2012) by using panel data covering 1977 to 2006 found that a higher provincial statutory corporate income tax rate was associated with lower private investment and slower economic growth. Stoilova and Patonov (2012) using data from 1995 to 2010 examined the major tendencies in 27 European Union member countries in the distribution of the total tax burden. The study found that direct taxes had a more efficient impact on economic growth. Muriithi (2013) found that in Kenya, an increase in value-added tax rates had a positive impact on economic growth between 1992 and 2011. Kesavarajah (2014) noted a unidirectional causal relationship from income taxes, value-added taxes, and international taxes toward economic growth as a result of an analysis conducted on Sri Lankan annual data from between 1980 and 2013.

Dehghan and Nonejad (2015) used the least squares approach to analyze annual data from Iran from between 1981 and 2010. The results of their analyses suggest a negative impact of corporate taxes, business taxes, and indirect taxes on economic growth. Iqbal, Azam and Shinwari (2015) noted a positive impact of general taxation excluding workers' wealth tax on economic growth upon examining statistical data for Pakistan between 1979 and 2010. In studying South Africa, Phiri (2016) noted that the optimal tax rate was 10.27% according to an STR analysis conducted using time series data collected from 1990:Q1 to 2015:Q2. Indirect taxes were positively related to economic growth, while direct taxes adversely affected growth below this threshold. Etale and Bingilar (2016) noted that company income tax and value-added tax had a significant positive impact on economic growth in Nigeria for the period 2005-2014. Ahmad, Sial and Ahmad (2016) applied the ARDL approach to annual data for the period 1974-2010 in Pakistan. The results of the research study suggest that indirect taxes should be reduced and direct taxes should be incremented to increase economic growth.

Babatunde, Ibukun and Oyeyemi (2017) proved that tax revenues had a significant positive influence on economic growth throughout Africa between 2004 and 2013. In examining Croatia from 2000 to 2016, Palić, Žmuk and Grofelnik (2017) noted that personal income taxation had a significant negative impact on economic growth. Geetanjali and Venugopal (2017) used the OLS approach for the period

2000-2016 for India. The researchers concluded that there is a significant impact of direct taxes on economic growth. Kalaš, Mirović and Andrašić (2017) studied American data from 1996 to 2016 and demonstrated that an increase in tax revenues and social security contributions had a significant effect on economic growth, while personal income tax and corporate income tax did not have a significant impact. Nonvide and Amegnaglo (2017) used the OLS approach to reveal that tax revenues had a positive effect on Benin's economic growth. Egbunike, Emudainohwo and Gunardi (2018) examined the economies of Nigeria and Ghana between 2000 and 2016 and showed that tax revenues had a positive effect on economic growth. Using an error correction model for data from 1980 to 2015, Mdanat et al. (2018) demonstrated that consumption and tariffs had a positive effect on per capita gross domestic product (GDP) growth, whereas income taxes negatively influenced this growth measure in Jordan.

3 DATA AND METHODOLOGY

This study investigates the effect of indirect and direct taxes on economic growth in Turkey using the ARDL model. To calculate this relationship, quarterly data series for the period 2006:Q1-2018:Q3 were used. Since the 4th quarter 2018 data have not yet been published, we were unable to use them. All the data used in this study were collected from the Central Bank of the Republic of Turkey (EVDS, 2019). The GDP variable was seasonally adjusted and estimated based on the expenditure approach. All these variables were converted into a natural logarithm for consistent and reliable empirical results (Shahbaz et al., 2016). For empirical estimation, the model was established as follows:

$$LGDP_{t} = \alpha_{0} + \alpha_{1}LIT_{t} + \alpha_{2}LDT_{t} + \varepsilon_{t}$$
(1)

In this equation, GDP, referred to as economic growth, is the dependent variable of the model, LIT is indirect taxes, LDT is direct taxes, α_0 is the constant term, α_1 , α_2 is the cointegrating vector to be estimated, and ε_1 is the classical error term. All variables are expressed in thousand TL. The data description for the model is depicted in table 2, where mean, median, minimum, maximum, standard deviation, skewness, kurtosis, and Jarque-Bera test values show their properties. The skewness and kurtosis values portrayed in table 2 suggest that the dataset does not have any skewed value problems or complications. The Jarque-Bera value is insignificant, which proves that all the variables are normally distributed.

It is imperative to check the stationary conditions of the variables prior to performing a time series analysis to avoid the spurious regression problem (Newbold and Granger, 1974). Hence, we examined the stationary condition of all variables using the augmented Dickey-Fuller (ADF, 1979) and Phillips-Perron (PP, 1988) tests. PUBLIC SECTOR ECONOMICS 43 (3) 311-323 (2019)

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TABLE 2

Descriptive statistics

| Descriptive statistics | LGDP | LIT | LDT |
|------------------------|---------|---------|---------|
| Mean | 19.5805 | 16.5633 | 15.4622 |
| Median | 19.5677 | 16.5482 | 15.4209 |
| Maximum | 19.9026 | 17.3774 | 16.5224 |
| Minimum | 19.2969 | 15.8865 | 14.5990 |
| Standard deviation | 0.2010 | 0.4677 | 0.4942 |
| Skewness | 0.1154 | 0.0344 | 0.1649 |
| Kurtosis | 1.5702 | 1.7247 | 1.9648 |
| Jarque-Bera | 4.5444* | 1.7247* | 2.5577* |

Note: *indicates a significance level of 5%.

According to the econometric methodology, based on stationarity criteria, the long-term association between two or more variables is calculated through the ARDL approach, The ARDL bound-testing approach, as recommended by Pesaran and Shin (1999) and Peseran et al. (2001), was used to establish the long- and short-term dynamics between indirect and direct taxes and economic growth. The ARDL bound-testing approach was preferred over other econometric techniques (e.g. those of Engle and Granger, 1987; and Johansen and Juselius, 1990) because it permits variables to be stationary at different degrees [I(0), I(1)] and regressors to have different optimal lag lengths according to the traditional cointegration procedure (Pesaran, Shin and Smith, 2001; Giles, 2013).

4 FINDINGS

To determine the stationarity of the data, we applied ADF and PP unit root tests, and the results of both tests are presented in table 3. As a few variables were I(0) and the remaining were I(1), the results directed us to opt for the ARDL bound test (Pesaran et al., 2001). The results of both tests revealed that the GDP variable was difference stationary, whereas the variables and indirect and direct taxes were trend stationary.

TABLE 3

| Variable | ADF | PP |
|----------|------------------|------------------|
| LGDP | -2.032 (-4.148) | -1.444 (-4.152) |
| ΔLGDP | -6.963 (-4.152)* | -7.504 (-4.156)* |
| LIT | -4.349 (-4.148)* | -4.245 (-4.148)* |
| LDT | -5.790 (-4.152)* | -5.996 (-4.148)* |

Note: *indicates a significance level of 1%. Figures in parentheses are critical values of test statistics. Schwarz information criterion is used.

The change in economic growth was modeled as a function of the lag of variables and indirect and direct taxes. This is an unrestricted error correction model with a deterministic trend, whereby the ϕ , δ , and Υ coefficients represent the short-term

relationship and the α coefficient represents the long-term relationship. The unrestricted error correction model was established as follows:

$$LGDP = \alpha_0 + \alpha_1 LGDP_{t-1} + \alpha_2 LIT_{t-1} + \alpha_3 LDT_{t-1} + \sum_i^p \Upsilon_i \Delta LGDP_{t-i}$$

+
$$\sum_j^q \delta_j \Delta LIT_{t-j} + \sum_m^r \phi_m \Delta LDT_{t-m} + \beta trend + \varepsilon_t$$
(2)

The hypotheses used to test the existence of cointegration between the variables in the model are as follows:

 $H_0: \alpha_0 = \alpha_1 = \alpha_2 = \alpha_3 = 0$ (There is no cointegration in these series)

$$H_1: \alpha_0 \neq \alpha_1 \neq \alpha_2 \neq \alpha_3 \neq 0$$
 (There is cointegration in these series)

Each hypothesis was tested using an F test. The optimal lag length of the model was calculated as (4,1,0) by considering the AIC information criterion, as shown in table 4. The F-statistics value (14.16) calculated at the 1% significance level was higher than the upper-bound critical value (8.72) at the 5% level of significance. This indicates the existence of a cointegration relationship between Turkey's indirect and direct taxes and its economic growth.

TABLE 4

| ARDL bound-testing | cointegration | results |
|--------------------|---------------|---------|
|--------------------|---------------|---------|

| Estimated model | Optimal lag | F-statistics | Lower bound | Upper bound cointegration |
|------------------|-------------|--------------|-------------|---------------------------|
| | | | 4.38 | 5.35 (10%) |
| LGDP=f(LIT, LDT) | (4,1,0) | 14.16 | 5.24 | 6.30 (5%) |
| Exists | | | | |
| | | | 7.33 | 8.72 (1%) |

The results of the long-term estimation found under the ARDL model framework are presented in table 5. The test results indicate that a 1% increase in direct taxes leads to an 8% decrease in economic growth. Similarly, a 1% increase in indirect taxes leads to a 27% increment in economic growth (shown in table 5 in bold). The fixed variate is statistically insignificant, whereas the trend variable is significant.

TABLE 5

| Variables | Coefficients | t-statistics | p-value |
|-------------|--------------|--------------|---------|
| LGDP_SA(-1) | 0.4419 | 3.1087 | 0.0035 |
| LGDP_SA(-2) | -0.0530 | -0.3567 | 0.7232 |
| LGDP_SA(-3) | 0.0872 | 0.5906 | 0.5582 |
| LGDP_SA(-4) | 0.3035 | 2.2880 | 0.0276 |
| LIT_SA | 0.2795 | 6.1999 | 0.0000 |
| LIT_SA(-1) | 0.1166 | 2.4336 | 0.0196 |
| LDT_SA | -0.0892 | -3.3311 | 0.0019 |
| С | -0.6772 | -0.4504 | 0.6549 |
| @TREND | -0.0064 | -3.2102 | 0.0027 |

ARDL long-term estimation results

Table 6 lists the results of the estimation found by using error correction. The CointEq (-1) coefficient is the long-term equilibrium speed of adjustment. This coefficient is significant and negative at the 1% level. This means that 22% of any disequilibrium occurring in the previous quarter is corrected in the next one. The variables, indirect taxes, and direct taxes are statistically significant. This means that the variables, indirect taxes, and direct taxes have, in the short term, an impact on the GDP. The coefficient of short-term indirect taxes indicates that an increase in indirect taxes has a positive impact on economic growth. Direct taxes, on the other hand, have a negative impact on economic growth.

TABLE 6

| ARDL error correc | ciion approacn | estimates (snort | -term estimation) |
|-------------------|----------------|------------------|-------------------|
| | | | |

| Variables | Coefficients | t-statistics | p-value |
|------------------------|---------------------|--------------|---------|
| LIT_SA | 1.7983 | 2.9701 | 0.0051 |
| LDT_SA | -0.4052 | -2.1865 | 0.0348 |
| CointEq(-1)* | -0.2203 | -6.6839 | 0.0000 |
| $EC = LGDP_SA - (1.7)$ | 7983*LIT_SA -0.4053 | *LDT_SA) | |

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We also checked serial correlation using the Breusch-Godfrey serial correlation LM test and heteroskedasticity using the White test. The diagnostic test results of the model are presented in table 7. The Breusch-Godfrey LM test indicated no autocorrelation in the model. The results of the White test, which is used to detect the presence of heteroskedasticity, indicated no heteroskedasticity.

TABLE 7

Diagnostic test results

| Test | F-statistics | p-value |
|-------------------------|---------------------|---------|
| Breusch-Godfrey LM test | 0.2147 | 0.8077 |
| White test | 0.581 | 0.4796 |

Furthermore, we also found the model to be stable as shown in figure 1. The stability of the regression coefficients was evaluated using the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMSQ) of the recursive residual test for structural stability (Brown, Durbin and Evans, 1975). The regression equation appears stable, given that neither the CUSUM nor the CUSUMSQ test statistics exceed the bounds of the 5% level of significance.

Plots of each test (figure 1) were generated based on the ARDL estimates of our model. The values of residuals are shown in straight lines and their confidence levels are shown in dashed lines on the graph. All residual values are within confidence lines, thus suggesting the consistency of our ARDL model.



4 CONCLUSIONS

Governments collect taxes to fulfill certain public services; tax revenues are used to finance education and health care expenditures as well as public investments. Developing countries use taxes for various purposes. They likewise create taxation policies which are developed to regulate the allocation of resources, support private sector investments through incentives, control inflation, palliate inequality between income and wealth, and create resources for the public sector. Any increase or decrease in the tax rates will significantly affect economic indicators. In Turkey, taxes are either direct or indirect. An increase in direct tax rates will reduce disposable personal income, therefore lowering the overall demand for goods and services which in turn adversely affects economic growth. A decrease in the overall demand for goods and services will consequently reduce indirect tax revenues. The resulting reduction in the level of overall expenditures on goods and services will thus lead to a decrease in value-added tax revenues, which ultimately comprises the largest portion of indirect taxes. Although an increase in tax rates will slow economic growth, it might contribute positively to the solution to another economic problem. An increase in tax rates would reduce the overall demand for goods and services, and result in a decrease in demand-pull inflation in countries struggling with inflation.

This study was motivated by the need for an empirical analysis of the impact of tax rises on the growth of tax revenues which is an important resource for Turkey's economy. In this study we have used the bounds testing approach to cointegration (developed within an autoregressive distributed lag framework) to investigate whether there is a long-run equilibrium relationship between economic growth, direct taxes, and indirect taxes for the period 2006:Q1-2018:Q3. The results of the findings of this study ultimately suggest there is a positive and significant impact of direct taxes on economic growth, and a negative and significant impact of direct taxes both in the short run and the long run. CUSUM and CUSUMQ tests indicate that the model is structurally stable. Personal and

corporate income taxes collected from Turkish taxpayers affect economic growth adversely, given that they reduce individuals' disposable personal income. However, value-added taxes and excise duties, both of which count as indirect taxes, affect economic growth positively by increasing the revenues of the state.

Our findings are strikingly different to others published in the literature, as in studies by Stoilova and Patonov (2012), Dehghan and Nonejad (2015), and Ahmad, Sial and Ahmad (2016). Our findings are similar to those of studies conducted by Muriithi (2013), Phiri (2016), Palić, Žmuk and Grofelnik (2017), and Mdanat et al. (2018). The number of indirect taxes implemented in Turkey dramatically outweighs the number of direct taxes that are implemented; this seems to support our findings. In other words, indirect taxes have a positive impact on growth. Accordingly, we can conclude that growth occurs largely through public investments. In contrast, we found that, over the long run, there was a negative relationship between direct taxes, have a negative impact in that they allow firms and individuals alike to save money and, consequently, also have a negative impact on private investments. Furthermore, we believe that shifting the composition of tax revenues from direct to indirect tax items will in turn significantly decrease the negative impact that direct taxes have on growth.

Our study is limited in terms of the size of the data set. Due to a lack of data at our disposal, we opted to use the period between 2006:Q1 and 2018:Q3.

What we in turn recommend is for the tax burden to be included as a variable in any future study looking at the impact of tax revenues on economic growth. This is important because sharing the tax burden in a fair and balanced manner requires one to first compare and contrast what share of taxes are direct versus indirect. Given that the ratio of direct to indirect taxes in Turkey is extraordinarily high, the amount of money that individuals and firms can save is reduced. This in turn puts a strain on the demand for goods and services. The only solution therefore is for the government to lower tax rates. We are of the opinion that not only will reducing indirect and direct tax rates contribute to the achievement of tax equity, it will also have a parallel positive impact on economic growth.

Disclosure statement

No potential conflict of interest was reported by the authors.

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SUNA KORKMAZ, METEHAN YILGOR, FADIME AKSOY: THE IMPACT OF DIRECT AND INDIRECT TAXES ON THE GROWTH OF THE TURKISH ECONOMY

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Governance Beyond the Law: The Immoral, The Illegal, The Criminal

ABEL POLESE, ALESSANDRA RUSSO and FRANCESCO STRAZZARI (Eds.) Palgrave Macmillan, London, New York, 2019, pp. 367

Book review by PREDRAG BEJAKOVIĆ* https://doi.org/10.3326/pse.43.3.6

* Received: July 15, 2019 Accepted: July 29, 2019

Predrag BEJAKOVIĆ, Ph.D. Institute of Public Finance, Smičiklasova 21, 10000 Zagreb, Croatia e-mail: predrag.bejakovic@ijf.hr ORCiD: 0000-0002-4164-8220 The literature on the informal or illegal economy is relatively abundant, but mostly it is dedicated to one country (or a smaller group of similar countries) or to methodologies for measuring the phenomenon. Furthermore, more attention is directed to the description of the informal economy than to the understanding of its causes and social consequences. The new book published by Palgrave Macmillan entitled *Governance Beyond the Law: The Immoral, The Illegal, The Criminal* edited by Polese, Russo and Strazzari sheds light on the main causes and effects of the immoral, illegal and/or criminal behaviour of citizens in many countries around the world, often caused by inappropriate actions by the state. Without any intention of defending the perpetrators of illegal activities, the authors and the editors in the book try to find out what the main causes of such behaviours are and provide a deeper understanding of their economic and social roles. Briefly, the main message in many situations could be summed up in a single statement: "The system forced me do it: it was the only strategy of survival for my family".

The editors in the Introduction paraphrasing a masterclass in the movie "The Good, the Bad and the Ugly", provide a broad perspective on the outlawed activities. The "informal sector" has been for a long time defined as either unregulated forms of labour directed at providing subsistence and survival in an illegal environment or as actual unlawful activities ranging from unofficial earning strategies and unregistered business to handling contraband and corruption. While seeing informality as part of the survival and coping strategies developed by participants and institutions whose status and positioning regarding the formal law and institutions may vary, this publication tries to avoid the prevailing explanation of informal politics and social practices as obligatory consequences of an underdeveloped economy and weak institutions. The contributions assembled in the book clearly show that the relationship among formal and informal institutions and elements contains significant dissimilarities in various contexts. Formal and informal traits are actually strongly intertwined along processes of economic development and social modernization. Informal activities are undertaken quite often by citizens who perceive certain activities of the state as insufficient or inadequate because there is tacit comprehension that people should take care of things themselves. Therefore the authors and editors in the book try to analyse "the fields of the illegal, illicit, informal and criminal as multiply traversed by overlapping regulatory spaces, governed by routines and rules that organize mobility, borders, actors' inclusion and exclusion... as well as the production and distribution of goods and commodities across societies" (pages 12-13). They very successfully shed new light on actions and processes that happen beyond and against the law that have been recently rediscovered as important factors in shaping different types of governance.

Part I of the book entitled *The Social Morality of Crime* contains eight various contributions. The first, by Giovanni Zanoletti, is dedicated to the criminalization of everyday life and state formation in Mali. The author examines the concept of the criminalization of ordinary life as a mode of existence rather than a systemic dysfunction that enables successful socio-economic development. The aforemen-

tioned negative characteristics are mostly caused by the erratic process of power concentration in the political elite, which demonstrates that the state in Mali is weak, without clear roles and responsibilities, inclined to corruption while its representatives (primarily the police force) resort to violence and the extortion of rents. Therefore, it should be no surprise that citizens do not trust the government and have a relatively benevolent attitude towards the immoral or illegal behaviour of their peers. Consequently, breaking the law is not stigmatized a priori; but people do blame those who do not share what they have appropriated in a legal or illegal way. Handling fraud and dealing with intermediaries in various illegal activities became the unavoidable way to social success and respect. It should not be a surprise that the criminalization of everyday life appears to be an inescapable and a central element in the formation of the national state in Mali.

The unclear role and ambivalent duties of the state are also present in the contribution by Giulia Prelz Oltramonti and Mihnea Tanasescu on the informal practices of residents of the Danube Delta in Romania. The state treats this region as the end of the known world, providing almost no social services or protection. Fishing as the most important occupation for local population is currently regulated by a completely unclear and conflict legal framework that causes legal insecurity, and stimulates disrespect for the law. Moreover, various state agencies, without the needed collaboration and cooperation among them, are responsible for the different business and transport activities that also contribute to the lawlessness in the region. The situation has deteriorated additionally with a recent strong transition from resource exploitation toward environmental protection that also limits the possibilities of the local population to earn their living. The state approves the locals' right to traditional economic activities, but such activities are not clearly defined. There is a huge difference between what the local population deem traditional activity and what the state bodies regulate, de-legitimize, and/or treat as criminal deeds. Consequently, the state is often blamed by the locals for its use of arbitrary power that without any reason demonizes traditional economic activities and forces them to behave illegally.

Gulzat Botoeva, focusing on the process of legitimizing illegal hashish production in a northern Kyrgyz village, further develops the ideas of criminality and criminalization. During the former Soviet Union era, the local population was mostly working in agriculture on the state farms, growing various husbandry products. The collapse of the Soviet Union and the demise of the economy caused mass unemployment so the population was almost forced into hashish harvesting as one of the only ways in which it could earn some money. What is interesting is the self-perception by local population because they do not see themselves as criminals but as honest workers. However, they are fully aware that production and selling of drugs are related to criminal activities. In such a process, they blur the borders between legal and illegal activities and apply various terms that explain such activities. Hence, they form a "grey space" in which multiple different legal and ethical interpretations of hashish production are used. In such a mode, they

enforce strategies to overcome the feelings of guilt caused by earning hashish money. Calling hashish harvesting work was important as the work ethic was accepted in the culture of farmers who were judged according to how well they took care of their land and livestock. This also enables self-reliance in coping with various problems and not waiting for help to be provided by neighbours or state. Comparing the work done by older generations during the former state and the current activities of hashish production contributes to adoption of the latter as ethical, and therefore the question about its illegality is posed.

Luis Rivera Vélez investigates the narratives employed by mothers of sick children to propose cannabis as an alternative medicine to ineffective treatments. Their children suffer from a rare disease, such as refractory epilepsy, which also provokes extreme situations of handicap, very low quality of life, and practically no life expectancy without adequate medical support. In the present condition of unaffordable medical treatment, cannabis is an astonishingly successful aid both to the children and to the mothers. The medicinal cannabis boom in Latin America is the result of the collapse of medical institutions and health services. Despite their deep fear of cannabis, related to the narcotic nature of the substance and its illegality, they use the drug in healing of their children, because they have nothing left to lose. Having discovered the potential positive effects of the substance, they began to argue that even if cannabis could be deemed a psychoactive drug, this does not nullify its positive effects as medicine. The author shows how the mothers organize illicit secret networks to ensure the access to cannabis. They have also been very influential in demanding a more effective approach to drug policy in a recent discussion throughout Latin America and successful in altering the moral conception of the substance. The change in the moral perception of the substance led to a modification in public policy and partially legitimization of the cannabis market in some Latin societies.

Anna Markovska and Yuliya Zabyelina study the impact of the 2009 ban on gambling in Ukraine and its effects. After the ban, the once legal gambling industry moved into the underground and informal sectors. This led to the development of mutually beneficial relations between power holders and banned service providers in ensuring illicit profits. The owners and the management of the gambling club wanted to conduct business legally, but it was not possible. Their business relationships with the state officials, particularly tax inspectors, are very complex. As they operate in various parts of the cities, they have to collaborate with different officials and inspectors. Particularly annoying to them are constant requests for contributions to charity. Therefore, when the tax inspection office is under reconstruction, the owners of the gambling club are usually asked to cover the cost of the refurbishing. The tax administration offices state that they have no financial sources for renovation so they are contrived to seek "sponsors". The illegal behaviour of many state officials is part of the inheritance from the Soviet period that manifested itself in the concepts of flexible legality. During this period, citizens often conducted unsanctioned illegal transactions in order to survive or achieve a

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better quality of life. The establishment of the rule of law in Ukraine is a demanding task that cannot be achieved in a short period.

Levenets, Stepurko, Pavlova and Groot analyse the importance and effects of bribes, gifts, donations and personal connections in the Ukrainian health sector. Informal payments and informal practices have become deeply rooted and widespread coping strategies of many citizens in circumstances of inadequate or inaccessible provision of public services. Coping strategies mostly consist of active coping, transformational problem-focused coping, withdrawal, and denial ...as well as problem- and emotion-focused coping, that is, seeking instrumental social support, behavioural or mental disengagement, praying, and so on (page 128). The distinctive characteristic of coping strategies is that multiple tools, such as bribes, presents, and social relationships, can be applied simultaneously in handling the obstacles in the provision of services. Although such strategies can be useful and help patients receive the needed services, in the long run they can endanger future health care reforms aimed at improving access to services and the quality of services provided as well as the more efficient use of resources. This is particularly threatening having in mind that the health care system of Ukraine is not at all transformed and that there is almost not attempt to improve the efficiency of service provision and quality of health care. Finally, coping strategies can impede patients' trust in both medical professionals and the state.

Regine Schönenberg in her contribution examines the collateral damage caused by global governance at the local level in the Brazilian Amazon. The author shows how rapid social transformation strongly affects all informal survival strategies. Global governance has not achieved regulatory force, primarily due to the weak impact of global policies on the local situation and non-presence of affected social stakeholders that have been expelled from their local environments. Schönenberg underlines two key deficits and gaps. The first one is the institutional or implementation gap: the increase of diffuse governance initiatives has led to unclear roles and responsibilities. There are many good project ideas but they must be realized at various policy levels, where the necessary institutions and required framework conditions often do not exist. The second deficit is the participation gap, which denotes the fact that in governmental policy decision making processes, civil society groups are either frequently not included or else have negligible impact. Instead of current bottom-down initiatives on many governance initiatives, there is a real need to perform global governance from a bottom-up perspective. Since the 1990s, the interests of local populations have become increasingly interwoven with different global interests, like the protection of indigenous populations; the search for acreage to use for agro-industrial production; biodiversity and climate change and so on. Due to new communication technologies and the globalization of financial transactions, illegal operations can with the bribing and the help of local political elites can easily obtain the needed licence and/or exemptions. In such circumstances, they can seriously endanger the social fabric while the existence and security of local inhabitants are often neglected.

The second part of the book studies the antagonism between "us" (the people) versus "them" (the elites, formally representing the state). The authors of six contributions scrutinize the romantic image that tends to be that, by way of revenge against an oppressive and unjust government, a population will often affix to criminals and outlaws. Joseph Nicholson in a very interesting text evaluates the concept of informality in the Russian revolutionary state during the period 1917-1920. Bolshevik revolutionaries conceptualized a new kind of society in which the state and the legal framework would become mere tools for liberating people from oppression, and finally when population achieved life in communist harmony, they would disappear. Revolutionists accepted and implemented radical measures freeing society from the existing state. As the Soviet model of the distribution proved to be disastrously ineffective, the majority of the population was forced to participate in illegal activities and/or to buy contraband goods on the black market for the sake of survival. Although the state organized secret police to arrest and prosecute speculators, its success was limited because informal commerce was accepted and practiced by almost the entire population. The main aim of the Bolsheviks was to eliminate bureaucratisation of the society, but just the opposite happened, society became more and more bureaucratised. Slight traces of the previous nascent rule of law from the former system were systematically ruined, and were replaced with a chaotic world of inconsistency, arbitrariness and flexible and correctible law (meaning, very unpredictable).

The Balkan Peninsula is an excellent example for researching various forms of opposition against intruded legal frameworks and administrative organization. Régis Darques recalls that during history local national heroes were often a combination of smugglers, bandits and resistance fighters whom contributed to the huge disbelief in the government. Therefore, even today, many ordinary people show strong distrust towards any form of higher authority. Such a distrust has often been presented as an indication of underdevelopment in contrast to the modernity accepted in rich Western countries. The author analyses the district of Gjirokastër, a Southern Albanian municipality well known as the birthplace of the celebrated writer Ismail Kadare. This part of the country experienced a huge depopulation after the demise of the communist system. However, the small remote village community of Lazarat is blooming as Europe's biggest producer of illegal drugs. It is Europe's marijuana capital with almost no electricity, running water or respect for the law. Lazarat became a proud pariah, a state in the state. The national government due to the pressure from the international community and the EU membership application decided to call a halt to its defiance. In summer 2014, special police forces seized the village. Official reports have praised the police forces that have succeeded in keeping the place under control and eliminating the well-structured criminal groups, erasing cannabis farming and bringing Lazarat back to its former anonymity and poverty. However, this success was only partial, because cultivation has been relocated to inaccessible fields on the high mountains. The production model has adjusted to the changing threat and therefore the seeming defeat of the village has fostered the emergence of a nation-wide success.

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Fanni Gyurko researches the complexity of informality in the post-socialist Hungarian circumstances using a socio-legal perspective to focus on low-level corruption and informal economic behaviour. Informal economic practices, primarily bribery, are mostly prevalent in the police force and health care and in other daily interactions between state representatives and citizens. Such informal relations can sometimes be perceived quite positively and citizens are grateful to the police officers who demand a small bribe instead of the payment of a huge fine. People are mostly aware of the illegality of such transactions and perceive it as corruption. Furthermore, many citizens are used to small thefts from their offices and factories with the excuse that this is almost their right, because they have very low salaries that are insufficient for a decent life. Citizens also distinguish between their practices and small thefts on one side and government corruption on the other. They categorize their behaviour as less harmful and not real corruption, because they use the obtained resource for something useful, while government misbehaviour constitutes proper corruption. Next to the usual inner relations of citizens and their national state regarding informal activities, in the last 20 years there have been many cases of inappropriate use of available and *free* EU funds. People deem such practices as relatively positive and acceptable, because they are on a smaller scale and often their primary goal is not to achieve private gains. In such attitude citizens forget that these resources derive from taxes collected in other EU countries and disregard the opaque consequences of corruption and the private usurpation of public funds.

The governance of trans-Saharan migration and related immorality, informality and illegality caused by cross-border trafficking are the topic of interest of Luca Raineri. Prevailing in the region is the acceptance of a specific morality that reflects the leaky boundaries between trade, smuggling and migration. Fraud and trade are a basis for the Saharan economy and they are often treated as synonyms. There is a specific relation between fraudsters and local communities. Raineri explains, "fraudsters benefit from the assistance and protection of local communities, because they provide them with cheap supplies of basic goods otherwise unavailable, but also because of kinship bonds" (page 231). The assessment of the organization and protection rackets linked to the migration sustain the patronage networks upon which the Nigerien government depends on. Contrary to the expectations, illegalization does not necessary lead to criminalization; while informal protection enables a decrease in prices and improvement in the safety of migration. Niger in the last 20 years experienced serious instabilities, including political crises, insurgences, and civil wars. The possible disruption of the aforementioned patronage networks would have seriously destabilizing national and international consequences, because Niger is currently deemed a loyal ally of the West in the fight against terrorism in Africa.

Ruth Hanau Santini and Stefano Pontiggia analyze informality in Tunisia in the period after the uprisings in 2010-2011. During colonial times, the country was divided into two parts, one directed to the extraction of primary resources and the

second oriented to trade, industry, and commerce. This imbalance was strengthened during the last decades of the Ottoman Empire and the French rule, primarily through modernization of the infrastructures, the expropriation of the land, and the transformation of the country into a market open for the European industrial products. The population in underdeveloped parts of the country felt economic injustice and social marginalization. The lack of equal opportunities and non-recognition of the population in discriminated regions, create powerful motives for social turbulence and violent outbreaks. This can be surprising because riots in Tunisia were not usual since the country is relatively wealthy and stable in comparison to the other countries in the region. Until now, while movements did succeed in changing the Tunisian political structure and supporting the decentralization of the currently much centralized political decision making, they did not alter the state's institutional framework and its political economy. Therefore, as a prevention of future unrests and any stronger alienation of the population from the state, there is an urgent need to cease the negative discrimination against the underdeveloped regions and to enhance the social inclusion of marginalized population.

"The Emerald Triangle" of mountainous areas around 300 kilometres north of San Francisco in the Northern California is the largest region of cannabis production in the USA. Liza Candidi surveys the undercover practices, organizational forms and rules of the various stakeholders involved in illegal cannabis production as well as their strategies for evading law enforcement. The situation is particularly interesting because marijuana currently has a dual legal status: it is illegal under federal law, but it can be legal at the state level because state governments can accept laws for its decriminalization and regulation. In such circumstances, Candidi impressively analyzes how regulatory powers are capable of changing informal communities and examines how self-managed, counter-cultural and marginal practices may become mainstream and an institutional model. For a long period, in the 1950s, the possession of marijuana could be sanctioned with up to life imprisonment. California, the first state in the USA, legalized the medical use of marijuana in 1996, while even the pot producers were against full legalization of their product. They saw it as a threat to their own interests and supported the anti-legalization campaign with the slogan "Keep pot illegal". However, the complete legalization process could not be deferred and California finally legalized the sale and distribution of cannabis for recreational use in 2016. The clandestine system and its rules, which characterized this district for 50 years, collapsed. Those who a few months ago were criminals now become regular farmers and the price of their product dropped significantly. Therefore, they are forced to orient themselves to other sources for living, which is not always easy or problem-free. Briefly, transition to legality often is very hard and can bring considerable financial losses.

The four chapters in the third part of the book analyse the relation between informal actions and practices, on one side, and the contestation of state structures and institutions, on the other. Resistance against state pressure can achieve various loose forms and can even evolve into a more defined movement with a mutual

PUBLIC SECTOR ECONOMICS 43 (3) 325-335 (2019) ideology. The contribution by Petru Negura contains the result of a study of the first cohort (academic year 1990-1991) of students from the Moldavian and Ukrainian republics, at that time parts of USSR, and their attempts to take advantage of border-crossing liberalization with neighbouring Romania. Once political regimes changed and previous powers and ideologies lost their legitimacy, informal activities very soon attained new social, moral, symbolic, ideological, and identity forms and meanings. Running a small business (in Rumanian *bişnita*), once dishonest if not actually illegal, soon after the transition of 1990, was accepted and respected as an act of innovation and a factor of change. Thus, activities between the formal and the informal economy became very honourable and a generous source of income. Such participation in shadow activities achieved significance that went beyond economics, enabling innovation and profound changes in the lives of people and the society as a whole.

Europe is currently being affected by the immigration tsunami and does not know exactly how to solve this serious problem. The small Italian island of Lampedusa is an entry point for many immigrants in search of a better life in the Old Continent. Annalisa Lendaro after interviews with many stakeholders presents various forms of resistance performed by migrants held in administrative detention located on the island. She explains the emergence of the subtle struggles that lead to the emergence of open protests in public space. Many immigrants refuse the fingerprinting that can hinder their mobility in European countries. Current admission of asylum seekers is based on the non-respect of fundamental human rights, so the concealed protesters nonetheless demonstrate their capacity to act, primarily by refusing to be identified. They also organise open protests and use this disturbance to demand release from the centre. The migrant protests on Lampedusa call the fairness of migration law and related policies into question.

Infrapolitics in political analysis lies beneath (infra) the surface of political struggle and communitarian activism. Infrapolitics is the opposite of grassroots politics and it is a form of anti-political resistance. Infrapolitics is influenced by the state's failure to incorporate large sectors of the population, and the continuity of tradition in the circumstances of modernity's changes. Infrapolitics is illicit, immoral, contrary to prevailing culture and never codified. Applying the infrapolitics approach, Jaime Moreno-Tejada in almost poetic way explains a process of renovating and improving a district (gentrification) in modern Bangkok, where various forms of hidden politics may be found in the dilapidated streets. Here many biketaxies ride recklessly between the dense traffic and if stopped by the police, a taxi-driver usually gives some small payoff. However, there exists a balance between bribes and leniency, which is integral to the moral economy of the society. Even though Thailand has the appropriate legal framework and a range of institutions to prevent corruption, companies and citizens in most sectors regularly encounter bribery or other corrupt practices. Semi-illicit street food producers and proprietors of various stalls on the pavement in particular have always paid their informal dues to the police. However, to curb the corruption, the government has announced its intention of banning such economic activities with the goal of turning the traffic-congested city into a walkable space. The powerless and poor segment of the population can only be cynical and mock such intentions and recourse to anti-political resistance.

Meropi Tzanetakis debates informal practices of recently emerged cryptomarkets - buying and selling illegal drugs through Internet - as a subversive form of deprave the state regulation. This technological innovation enables the easy exchange of high-quality illicit products and allows users to hide their identity and location. Therefore, it increases participants' security and lowers the risk of law enforcement. Cryptomarkets may reduce violence related to drug markets. However, such trade usually causes complications for law enforcement bodies. Closures of numerous anonymous online marketplaces already accomplished did lead to an immediate decrease in total sales, but had no long-term effect. Very soon an increase in revenues after such an operation was recorded. What is particularly surprising, however, is that economically disadvantaged (mostly financial limitations), digitally illiterate, socially excluded and marginalised users and drug addicts, as well as drug producers from the poor countries are systematically excluded from participation in cryptomarkets and they are unable to express their informal resistance to prohibition-based drug policies. Contrary to the very strict previous punishment of drug trade and addiction, more lenient measures – primary needle and syringe distribution and exchange, methadone maintenance, injection rooms, medical use of cannabis, safer use of education and drug-testing services - that started in the early 1980s in the Netherlands and the United Kingdom were quite successful at reducing harm to consumers. The further liberalisation of drug using should also reduce all negative consequences of addition and in the longer period contribute to real progress in this field.

Many authors in this interesting book nicely present the ways in which the whole history of many modern societies has been driven by populations who specialized in breaking regulatory frameworks, always playing with rules, with the tacit collusion of the authorities. Illegality and informality have been very often important drivers of economic growth. In many societies, particularly in the Balkan Peninsula, banditry was positively perceived, whereas criminality had a negative connotation. Furthermore, banditry was a way of challenging external ruling powers while the outlaws were often deemed heroes of independence. The example of revolutionary Russia clearly shows how the administrative and bureaucratic machine of the state frequently operates "in the shadow" and/or informally of its own legal framework, procedural rules and codes. Even when the representatives of the state do not directly violate laws, and policy implementation does not result in cases of corruption, civil servants might act in the small interstitial space between what is formalized and institutionalized, and varying degrees of discretion. Organized crime does not happen in a social and political vacuum; at the local level it may not be deemed irregular, being deeply entrenched in social structures and networks. Therefore, it provides an alternative to formal authority and

PUBLIC SECTOR ECONOMICS 43 (3) 325-335 (2019) formal economic structures. In this atmosphere of constant moral ambiguity, the state is not an obstacle to the informal or unofficial economy but a necessary asset to make it prosper. With various contributions from many societies, the authors and editors provide a new, valuable and interesting insight into the framework of a hybrid order and illegal activities, which represent both a challenger to and an integral part of the state. Briefly, this book is an important and distinctive contribution to the recently burgeoning literature on the informal economy.

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