

Aizenman, Joshua; Jinjara, Yothin

Working Paper

Income inequality, tax base and sovereign spreads

Working Paper, No. 700

Provided in Cooperation with:

University of California Santa Cruz, Economics Department

Suggested Citation: Aizenman, Joshua; Jinjara, Yothin (2012) : Income inequality, tax base and sovereign spreads, Working Paper, No. 700, University of California, Economics Department, Santa Cruz, CA

This Version is available at:

<https://hdl.handle.net/10419/64492>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Income inequality, tax base and sovereign spreads

by

Joshua Aizenman and Yothin Jinjarak^{*}

This paper investigates the association between greater income inequality, de-facto fiscal space, and sovereign spreads. Using data from 50 countries in 2007, in 2009 and in 2011, we find that higher income inequality is associated with a lower tax base, lower de-facto fiscal space, and higher sovereign spreads. The economic magnitude of these effects is rather large: an increase in the Gini coefficient of inequality by 1 (in a scale of 0-100), is associated in 2011 with a lower tax base of 2 percent of the GDP, and with a higher sovereign spread of 45 basis points.

Joshua Aizenman
Economics, E2
Santa Cruz
CA, 95064
jaizen@ucsc.edu

Yothin Jinjarak
College Buildings, 534
London
UK, WC1H 0XG
yj5@soas.ac.uk

Keywords: Income inequality, tax-base, fiscal space, sovereign spreads

JEL: H20, D63, F41

^{*} We are grateful for the insightful comments of Alfons Weichenrieder and two anonymous referees. Any views presented are those of the authors and not the NBER.

The growing public debt in OECD and developing countries put to the fore the need to rebalance fiscal deficits. This can be done by either raising taxes, or cutting expenditure. The recent experience of the US and other countries vividly illustrate the challenges with raising taxes, suggesting the presence of structural factors accounting for resistance to tax reforms. A possible obstacle may be polarized distribution of income. If all agents are identical, equal burden sharing would be the norm. Greater income inequality may put a drag into efforts to broaden the tax base. A possible mechanism explaining the resistance was modeled by Bénabou (2000), showing conditions under which greater inequality would result in less government spending on redistribution. As broader tax base is a necessary condition for greater redistribution, opponents of redistribution opt to oppose it.¹

In this paper, we investigate the association between income inequalities and the tax base across countries in the 2000s, and link it to the pricing of sovereign debt. We find strong negative association between the two, and that higher inequality is associated with lower tax base, lower *de facto* fiscal space, and with a higher sovereign spreads.² Our *de facto* fiscal space follows Aizenman and Jinjarak (2011), defined as the public debt relative to the *de facto* tax

¹ A vivid example of resistance to broadening the tax base is the reaction to Republican's candidate Herman Cain's 9-9-9 tax reform plan in October 2011. His plan would replace the present income tax with a 9% flat income tax, slash the corporate tax rate to 9%, and would introduce a new 9% national sales tax. The *Wall Street Journal* warn against the ultimate effects of the proposed reform: "European nations began adopting national sales and value-added taxes on top of their income taxes in the 1960s, and that has coincided with the rise of the entitlement state and slower economic growth. Consumption tax rates usually started at less than 10%, but in much of euroland 'the rates have nearly doubled and now are close to 20%' we would see regular campaigns like 'a penny to fight poverty,' or 'one-cent for universal health care' that would be politically tough to defeat." *Wall Street Journal editorial*, 10/10/11).

² Heller (2005) defined fiscal space "as room in a government's budget that allows it to provide resources for a desired purpose without jeopardising the sustainability of its financial position or the stability of the economy." Yet, measuring 'fiscal space' tightly remains a challenge. Ghosh et al. (2011) uses a stochastic ability-to-pay model of sovereign default in which risk-neutral investors lend to a government that displays "fiscal fatigue," because its ability to increase primary balances cannot keep pace with the rising debt. Using data for 23 advanced economies over 1970–2007, they find evidence of a fiscal reaction function with these features, and use it to compute "fiscal space," defined as the difference between projected debt ratios and debt limits. This approach provides operative measures of fiscal space, yet its precision is limited by the inability to predict tightly future growth rates and real interest rates.

base, where the latter measures the realized tax collection, averaged across several years to smooth for business cycle fluctuations. Thus, the *de facto* fiscal space is inversely related to the tax-years it would take to repay the public debt. In practice, the average tax revenue provides a good statistics on the *de facto* taxing capacity, being the outcome of the tax code and its effective enforcement. While the public debt/GDP ratio may increase rapidly at times of peril [see Ireland in the recent crisis, more than doubling its public debt/GDP in one year], the *de facto* taxing capacity changes slowly at times of peril, as parties tend to be locked in a war of attrition, attempting to minimize their adjustment burden [Alesina and Drazen (1991)]. Consequently, the ratio of the outstanding public debt to the *de facto* tax base, or the tax-years needed to repay the public debt, provide information about the relative fiscal tightness of countries. For a given similar unanticipated adverse fiscal shock, a country with lower public debt/average tax revenue may have more room to adjust by reallocating its priorities of using the relatively high tax base.

1. Estimation

We consider a linear equation relating sovereign risk to *de facto* fiscal space:

$$SovRisk_{it} = b_0 + b_1 FiscalSpace_{it-1} + u_{it} + e_{it};$$

where $SovRisk_{it}$ is the market price of sovereign risk of country i at year t , $FiscalSpace_{it}$ is the fiscal space variable(s), and u_{it} represents other factors that affect sovereign risk, such as trade openness, growth, income level, inflation, and foreign reserves, and e_{it} is the error term. As our fiscal space variable, defined as public debt/[average tax revenue], is made of the public debt/GDP in the numerator and the average tax revenue/GDP in the denominator, the interactions between these two variables and other macroeconomic factors imply that the regressor, $FiscalSpace_{it}$, is likely to be correlated with the error term. Including income inequality is our gist of solution to this potential endogeneity of fiscal space as the main variable of interest. We formally address the issue in the as follows.

Income Equality and Fiscal Space

It is plausible that an above-average inequality (i.e. a high Gini coefficient) could impair tax collection and thus reduce the fiscal space at a given public debt level. This conjecture is in line with Bénabou (2000), showing in a model of endogenous redistribution that more inequality may result in less government spending on redistribution because the consensus for ex ante efficient redistributive policies breaks down. This result was confirmed by the findings that more unequal societies do spend less on redistribution [de Mello and Tiongson (2006)]. Our goal is to test directly the association of greater income inequality and the tax base, and to evaluate the ultimate association of income inequality and sovereign risk.

As long as the income inequality does not have a direct effect on the sovereign risk, the correlation between the Gini coefficient and u_{it} would be small. Thus, the Gini coefficient is a potential instrumental variable that is both relevant and exogenous. Figures 1.a and 1.b are scatterplots of the data for 2007 and 2011, respectively, of the tax base - income inequality relationship.³ A look at Figures 1.a and 1.b suggests that developed countries are clustered mainly to the left, while emerging markets are clustered to the right. This suggests other explanations, i.e. the association between the corruption level and tax base. Indeed, Figures 1.c and 1.d support the negative relationship between tax base and the corruption index. Therefore, we also include the Corruption index as an additional right hand variable:⁴

$$FiscalSpace_{it} = a_0 + a_1Gini_{it-1} + a_2Gini^2_{it-1} + a_3Corruption_{it-1} + e_{it}.$$

³ We use the World Bank's "All The GINIS" 2010 data, compiled from 5 primary sources (LIS, SEDLAC, WYD, ECA, and WIID), covering the desirable years for fifty countries. See Milanovic, Lindert, and Williamson (2010), and Haughton and Khandker (2009). We refrained from using Atkinson and the Theil's indexes due to their limited coverage of countries and years.

⁴ We did not include GDP per capita as it is potentially endogenous with respect to the dependent variable. Note that there could also be other explanations, such as an increasingly large informal economy causing more inequality due to falling tax revenues and weakened social safety nets; and increasing inequality causing more informal activity as social solidarity and trust decline (see Rosser et al. 2000).

Note that because sovereign risk, fiscal space, and income inequality are likely driven by political economy considerations, we use the lagged Gini coefficient so that it affects the sovereign risk only indirectly through the fiscal space variable(s). We base our econometric analysis on the 50 countries that have comprehensive records of the key variables; Gini coefficient, tax base, fiscal space, and market pricing of sovereign risk, up to year 2011. Using data for the 50 countries in 2007 and in 2011, Table 1 reports the quadratic regression of fiscal space variable and its components on the Gini coefficient and the Corruption level.

Columns (i) and (ii) show that higher inequality is associated with lower tax base over the sample period; and that the inequality effect has increased from 2007 to 2011. The quadratic term, $Gini_i^2$, suggests that a negative association between inequality and tax collection flattens out when inequality is high. The relationship between tax base and corruption is negative and statistically significant. The R^2 of these regressions are 55-65%, so the variation in inequality and corruption explains a significant variance of tax collection across countries. On the other hand, the associations between Gini coefficient and the public debt/GDP variable (columns (iii) and (iv)), the Gini and the public debt/[average tax revenue/GDP] (columns (v) and (vi)), as well as the fiscal balance to GDP (columns vii and viii) and the fiscal balance to tax base (columns ix and x) are insignificant. So the influence of inequality on fiscal space operates through the tax base denominator. Based on the regression estimates of Table 1 columns (i) and (ii), a one standard deviation increase of Gini (10.4 in 2007 and in 2011) is associated with a lower average tax base by -15.6 %GDP in 2007 [$10.4*(-1.71) + 108.16*(0.02) = -15.6$]; and by -21.4 %GDP in 2011. This back-of-the-envelope calculation is consistent with the patterns observed in the plots of Figure 1.

2. Application to the Sovereign Risk Equation

We estimate the association between sovereign risk and fiscal space leaves with the two-stage least square estimation, summarized as

$$(1) \quad SovRisk_{it} = b_0 + b_1 TaxBase_{it-1} + X_{it}'b + c_i + \varepsilon_{it}$$

$$(2) \quad TaxBase_{it} = a_0 + a_1 Gini_{it-1} + a_2 Gini_{it-1}^2 + a_3 Corruption_{it-1} + X_{it}'a + c_i + e_{it};$$

where $TaxBase_{it}$ is a single endogenous regressor, a and b are two sets of unknown regression coefficients, with X_{it} a set of exogenous variables, c_i are the unobserved characteristics that vary across countries but do not change overtime, and $Gini_{it}$ and $Gini_{it}^2$ are the two instruments in the reduced form of $TaxBase_{it}$. We can now undertake a thorough evaluation of inequality effect on both the fiscal space and the sovereign risk.

To deal with the presence of c_i , we ask first: why do some countries have higher sovereign risk than others? One reason might be variation in macroeconomic factors across countries, including public debt/GDP, [exports+imports]/GDP, real GDP growth, consumer price inflation, foreign reserves/external debt ratio, volatility of GDP (three-year standard deviation), and time-specific effects -- we add these variables to X_{it} so they are not part of the error term. Another reason is that there are historical factors influencing the sovereign risk. For example, fragile states have higher sovereign risk than other states. This could possibly be related to inequality and corruption, suggesting that an omitted factor in sovereign risk - whether the country is inherently fragile - could be correlated with the Gini coefficient and the corruption level.

To eliminate the influence of unobserved variables that vary across countries but do not change over time, such as the state fragility and historical conditions, we make use of years 2007, 2009 and 2011 data.⁵ Table 2 provides results from three empirical specifications. All

⁵ We chose this particular time period due to the dramatic changes for several European countries that may confound the estimation. There is evidence that the pricing behavior of the credit markets of the Euro Area sovereign bonds was different before and after 2007. Arghyrou and Kontonikas (2010) find that while prior to July 2007 the borrowing costs of the Euro Area countries were converging and

regressions have the same regressors, and all coefficients are estimated using two-stage least squares, with the functional form of the dependent variable, CDS prices, in log term, and various plausible assumptions on the unobserved characteristics c_i . The causal variable of interest, *TaxBase*, is instrumented by Gini, $Gini^2$, and corruption level.

Firstly, if $E(X_{it}, c_i) = 0$ and $cov(TaxBase_{it}, c_i) = 0$, then we could directly apply a pooled two-stage least squares method to the panel data of 2007, 2009 and 2011 (3 data points) based on the specification above. Column (i) applies the pooled two-stage least squares to the panel sample, 50 countries * 3 years = 150 observations. The results of these pooled two-stage least squares are consistent with the results of the time-specific estimation of columns (ii) to (iv); respectively, years 2007, 2009, and 2011. For all specifications, the estimated effects of *TaxBase* and other macroeconomic controls have the expected sign and are mostly statistically significant at 1 percent level.

Column (v) applies the lagged-dependent two-stage least squares estimation to the data, including the lagged CDS prices. This is like saying that there is a persistency in sovereign risk; what makes CDS price in this period high is the CDS price in periods ago. The results suggest that higher tax base and lower public debt are associated with lower CDS prices. To check the validity of Gini coefficient as the instrument for *TaxBase*, Table 2 also reports the first-stage F-statistics (equation (2)). For the regressions in column (v), the p-value of the first-stage statistics is 0.000, so the Gini coefficients and corruption level are not weak instruments for *TaxBase*. Because both regressions are overidentified, the Sargan test for overidentifying restriction has a p-value of 0.0143 for column (v), suggesting that the null hypothesis that both the Gini, $Gini^2$, and corruption instruments are exogenous cannot be rejected at 1% significance level.

Alternatively, if $E(X_{it}, c_i) \neq 0$ and $cov(TaxBase_{it}, c_i) \neq 0$, we could handle the fixed unobserved effects by constructing data on the changes in the variables between year 2007 and year 2009, and between year 2009 and year 2011, and focusing on the medium-term period. Specifically, the change in sovereign risk, $SovRisk_{i,2011} - SovRisk_{i,2009}$, and $SovRisk_{i,2009} -$

macroeconomic fundamentals did not play an important role, since August 2007, the markets began to price in country-specific macro fundamentals.

$SovRisk_{i,2007}$, are regressed against the change in tax base %GDP, $TaxBase_{i,2011} - TaxBase_{i,2009}$, $TaxBase_{i,2009} - TaxBase_{i,2007}$ and the change in macroeconomic factors, $x_{i,2011} - x_{i,2009}$, and $x_{i,2009} - x_{i,2007}$ where each $x_{i,t}$ is the variable in X_{it} . Three instruments are used: the change in the inequality over the period, $Gini_{i,2011} - Gini_{i,2009}$, the change in quadratic term of inequality over 5 years, $Gini^2_{i,2010} - Gini^2_{i,2005}$, and the change of corruption level. The results of this before-and-after specification are in column (vi). The effect of the TaxBase variable is now larger, positive, and insignificant. It is known that if the lagged-dependent model (column (v)) is correct, but we use fixed effects as in column (vi), estimates of TaxBase influence will tend to be too big.⁶

We summarize the economic significance of our econometric findings in Figure 2. For each variable, the corresponding bar in the figure is its coefficient estimate of column (iv), multiplied by the sample standard deviation. Given that the sample standard deviation of CDS prices is 1176.2 basis points in 2011, we find that our controls capture a significant variation in the sovereign risk data. Our key factors of interest, the fiscal space variables (tax base and public debt) – together account for more than 351.5 basis points of sovereign risk as measured by the CDS prices, which is about a third of sovereign risk in 2011. This estimate indicates that sovereign risk is responsive to the tax base, and hence the Gini coefficient, though this association is estimated using changes over the period, so it is a medium-run relationship. Other macroeconomic variables, including growth, volatility, and inflation are also economically large and significant in the sovereign risk equation. Overall, the estimation suggests that increased inequality, and thus decreased tax base and fiscal space, is associated with a significant worsening impact on sovereign risk, at least in the medium run. Applying our estimates, with the standard deviation of the tax base being 10.2 %GDP in 2011 (10.9% in 2007), a one standard

⁶ While the pooled 2sls in column (i) and the lagged-dependent 2sls in column (v) are not straightforwardly comparable, a simple F test based on the same 150 observations suggests that the estimation of (v) has significantly lower sum squared residuals (RSS) at the 5 percent level, consistent with its having higher R^2 ($0.8 > 0.6$). The first-differenced 2sls in column (vi) is the worst performing estimation, due to the loss of variability in the data as a result of first differencing (can also be seen from the low R^2 in the first-stage estimation).

deviation increase of the Gini coefficient is associated with a rise of 469 ($= [21.4/10.2] * 223.6$) basis points of the sovereign spread in 2011, and 723 basis points in 2007 ($= [15.6/10.9] * 504.9$).

3. Concluding remarks

This note identified the large negative effects of income inequality on the tax base, and on the *de-facto* fiscal space. The *de-facto* fiscal space plays a key role in accounting for sovereign spreads [Aizenman, Hutchison and Jinjark (2011)], and explains the patterns of fiscal stimuli in the aftermath of the crisis [Aizenman and Jinjark (2011)]. The results suggest that more polarized societies would find it harder to adjust to crises by raising taxes at times of peril, as parties tend to be locked in a war of attrition, attempting to minimize their adjustment burden. Thus, the *de facto* tax base is hard to change overnight, as it reflects a social contract. This contract depends on the tax enforcement capacities of a country, which are anchored in the public's perception of tax fairness and the gains from public sector expenditure, factors that are hard to change at times of peril. This view is consistent with recent empirical literature finding that tax compliance and the individual's willingness to pay taxes are affected by perceptions about the fairness of the tax structure. An individual taxpayer is influenced strongly by his perception of the behavior of other taxpayers [see Alm and Torgler (2006), and the references therein]. If taxpayers perceive that their preferences are adequately represented and they are supplied with public goods, their identification with the state increases, and thus the willingness to pay taxes rises [Frey and Torgler (2007)]. Thereby, greater income inequality limits the ability to conduct a counter fiscal policy, and increases the downside risk of a given debt/GDP.

These results also suggest that the uniform fiscal guidelines of the Maastricht treaty, recommending a public debt/GDP below 60%, were too lenient for peripheral countries with a low tax base. The focus of the discussions on the Euro crisis has been on the inequality between rich and poor member states, and whether it has contributed to the crisis. Our analysis suggests that another income inequality -- within countries -- could be responsible for the inability to conduct tax reforms. The Maastricht Criteria put too much emphasis on capping public

debt/GDP below a threshold as a measure of fiscal prudence, instead of encouraging countries with a low tax base to broaden their tax base *and* adopt policies aiming at reducing income inequality. The combination of the two would increase overtime the fairness perception of the tax structure, reduce polarization, improve the adjustment capacity at times of peril, and reduce the sovereign risk associated with a given public debt/GDP. Accomplishing these tasks is challenging, yet the history of Brazil during the last two decades illustrates vividly the feasibility of these reforms. The tax revenue in Brazil as a percent of the GDP rose from 25 percent to 37 percent between 1993 and 2005. Intriguingly, Brazil's GINI coefficient in 2001, 60, has decreased to 54 in 2009. While Brazil remains challenged by inequality and fiscal deficiencies [see Melo et al. (2010)], the reforms of the last two decades provide useful lessons for all emerging markets, including Europe's periphery countries.⁷

⁷ The record of the Euro Periphery has been mixed: the GINI coefficients of Greece was overall stable, 33 in 1999 and 32.9 in 2009, while its tax/GDP dropped from 35.4% in 1999 to 32.8% in 2009; for Portugal, the GINI declined from 36 in 1999 to 33.7 in 2009, while its tax/GDP increased from 33.4% in 1999 to 34.4% in 2009; for Spain, the GINI went from 32 in 1999 to 33.9 in 2009, while its tax/GDP dropped from 34.8% in 1999 to 31.6% in 2009; for Italy, the GINI went from 29 in 1999 to 31.2 in 2009, while its tax/GDP increased from 42.4% in 1999 to 43.1% in 2009; for Ireland, the GINI went from 30 in 1999 to 33.2 in 2009, while its tax/GDP dropped from 32.8% in 1999 to 29.8% in 2009.

Appendix A: Data Sources

Gini Coefficients are based on the World Bank database:

http://siteresources.worldbank.org/INTRES/Resources/469232-1107449512766/AllTheGinis_explanation.pdf. See also Milanovic et al. (2011) for further discussion on the data and historical comparisons across countries.

Corruption Index ranges from -2.5 (low corruption) to +2.5, based on the compilation of the World Bank's Worldwide Governance Indicators (WGI) project.

Tax Base is calculated as the ratio of tax divided by GDP, averaged over the period of previous five years to account for business cycle fluctuations. The data are taken from the World Bank's WDI, IMF Article IV Consultation documents, OECD, and Eurostat.

Public Debt/GDP data are based on the IMF Fiscal Affairs Department, Article IV Consultation documents, and World Economic Outlook.

Sovereign CDS prices are 5-year tenor and based on the CDS pricing is based on London closing values collected from a consortium of over thirty swap market participants. The data are taken from the CMA Datavision. See Aizenman et al. (2011) for further discussion on the CDS prices and related studies.

Trade/GDP, Inflation (consumer price, %), Real GDP Growth and Volatility (three-year standard deviation), Real GDP/capita (in US\$), and Foreign Reserves/External debt are based on the data from WDI and the Economist Intelligence Unit.

Appendix B: Country List (* denotes OECD countries)

ARGENTINA(ARG), AUSTRALIA(AUS*), AUSTRIA(AUT*), BELGIUM(BEL*),
BULGARIA(BGR), BRAZIL(BRA), CHILE(CHL*), CHINA(CHN), COLOMBIA(COL),
CZECH REPUBLIC(CZE*), GERMANY(DEU*), DENMARK(DNK*), SPAIN(ESP*),
FRANCE(FRA*), GREECE(GRC*), CROATIA(HRV), HUNGARY(HUN*),
INDONESIA(IDN), IRELAND(IRL*), ICELAND(ISL*), ISRAEL(ISR*), ITALY(ITA*),
JAPAN(JPN*), KAZAKHSTAN(KAZ), KOREA), SOUTH(KOR*), LEBANON(LBN),
LITHUANIA(LTU), MOROCCO(MAR), MEXICO(MEX*), MALAYSIA(MYS),
NETHERLANDS(NLD*), NORWAY(NOR*), PANAMA(PAN), PERU(PER),
PHILIPPINES(PHL), POLAND(POL*), PORTUGAL(PRT*), QATAR(QAT),
ROMANIA(ROM), RUSSIA(RUS), SLOVAKIA(SVK*), SLOVENIA(SVN*),
SWEDEN(SWE*), THAILAND(THA), TUNISIA(TUN), TURKEY(TUR*), UKRAINE(UKR),
VENEZUELA(VEN), VIETNAM(VNM), SOUTH AFRICA(ZAF)

References

- Aizenman, Joshua, Michael M. Hutchison, Yothin Jinjarak, 2011, "What is the risk of European sovereign debt defaults? Fiscal space, CDS spreads and market pricing of risk," NBER Working Paper No. 17407.
- Aizenman, Joshua and Yothin Jinjarak, 2011, "The fiscal stimulus of 2009-10: Trade openness, fiscal space and exchange rate adjustment," NBER Working Paper No. 17427, forthcoming, *NBER International Seminar on Macroeconomics 2011*.
- Alesina, Alberto, and Allan Drazen, 1991, "Why are Stabilizations Delayed?" *American Economic Review* 82, 1170-1188.
- Argyrou, Michael G. and Alexandros Kontonikas, 2010, "The EMU sovereign-debt crisis: Fundamentals, expectations and contagion," Cardiff Economics Papers No. E2010/9.
- Bénabou, Roland, 2000, "Unequal societies: Income distribution and the social contract," *American Economic Review*, 90: 96-129.
- de Mello, Luiz and Erwin R. Tiongson, 2006, "Income inequality and redistributive government spending," *Public Finance Review*, 34 (3): 282-305.
- Frey S. B. and B. Torgler (2007) "Tax morale and conditional cooperation" *Journal of Comparative Economics* 35: 136–159.
- Ghosh, A., Kim, J., Mendoza, E., Ostry, J., and Qureshi, M. (2011), "Fiscal Fatigue, Fiscal Space and Debt Sustainability in Advanced Economies," NBER Working Paper No. 16782.
- Haughton, Jonathan and Shahidur R. Khandker, (2009), "Chapter 6: Inequality Measures," in Handbook on Poverty and Inequality, pp. 101-120, published by World Bank, Washington, DC, ISBN: 978-0-8213-7613-3.
- Heller, S. P. (2005) "Back to Basics -- Fiscal Space: What It Is and How to Get It," *Finance and Development*, 42 (2), June.
- Melo, M., C. Pereria and S. Souza (2010), "The political economy of fiscal reform in Brazil," IDB Working paper 117.
- Milanovic, Branko, Peter H. Lindert, and Jeffrey G. Williamson, 2011, "Pre-industrial inequality," *Economic Journal*, 121: 255-272.
- Rosser, J. Barkley Jr., Marina V. Rosser, and Ehsan Ahmed, (2000) "Income inequality and the informal economy in transition economies," *Journal of Comparative Economics*, 28 (1): 156-171.

Table 1: Income Inequality and Fiscal Space.

This table reports a cross-country OLS estimation.

The dependent variable is the fiscal space variable ($FiscalSpace_i$) and its component of country i .

The lagged Gini coefficient takes a value of 0-100 (where 100 = perfect inequality). The Corruption index ranges from -2.5 (low) to +2.5.

Heteroskedasticity-robust standard errors are in parentheses, with *** (**,*) denoting statistical significance at 1 (5,10) level.

	<u>average tax revenue</u>		<u>public debt</u>		<u>public debt</u>	
	%GDP		%GDP		[average tax revenue]	
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
	year = 2007	year = 2011	year = 2007	year = 2011	year = 2007	year = 2011
	b s.e.	b s.e.	b s.e.	b s.e.	b s.e.	b s.e.
lagged Gini _{<i>i</i>}	-1.71 (0.98) *	-2.27 (0.95) **	-3.18 (5.82)	-4.60 (5.36)	-0.20 (0.29)	-0.13 (0.23)
lagged Gini _{<i>i</i>} ²	0.02 (0.01)	0.02 (0.01) *	0.04 (0.07)	0.05 (0.06)	0.00 (0.00)	0.00 (0.00)
lagged Corruption _{<i>i</i>}	-5.07 (1.07) ***	-3.41 (1.11) ***	-2.08 (6.60)	-4.87 (6.17)	0.49 (0.35)	0.18 (0.26)
constant	66.43 (19.48) ***	79.36 (19.02) ***	104.97 (122.50)	151.82 (112.66)	5.13 (5.99)	4.30 (4.70)
R ²	0.65	0.55	0.02	0.07	0.19	0.05
countries	50	50	50	50	50	50

Table 2: Estimates of Sovereign Risk Equation Using Panel Data for 50 Countries.

This table reports two-stage least squares estimation.

The dependent variable is the log of CDS prices (in basis points, $\ln(SovRisk_{it})$).

The endogenous regressor is *TaxBase*, with the lagged, lagged squared Gini coefficients, and lagged Corruption index as the instruments.

Standard errors are in parentheses (s.e.^a for clustered by country heteroscedasticity robust; s.e.^b for unadjusted standard error; s.e.^c for GMM-bootstrap).

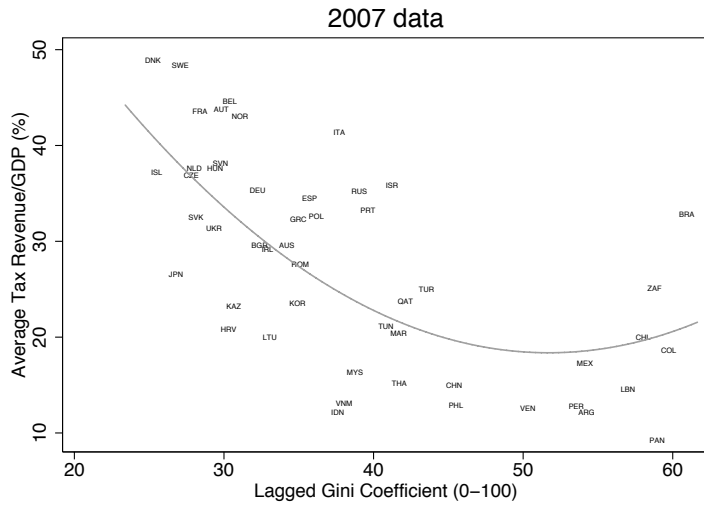
*** (**,*) denote statistical significance at 1 (5,10) level.

The first-stage statistics are from the regression of *TaxBase* on Gini, Gini², Corruption index, and all other exogenous controls in the *SovRisk* equation.

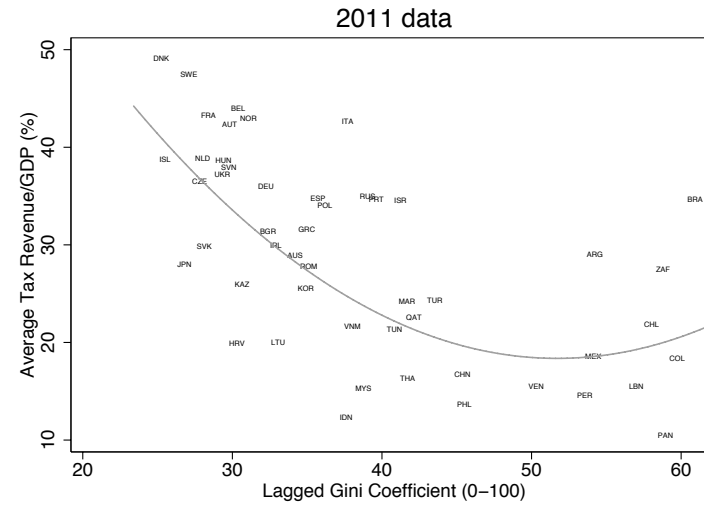
	<u>Pooled Two-Stage Least Squares (2sls)</u>						<u>Lagged-Dependent 2sls</u>		<u>First-Differenced 2sls</u>	
	(i) 2007, 2009, 2011 ln(CDS prices) b s.e. ^a	(ii) 2007 ln(CDS prices) b s.e. ^a	(iii) 2009 ln(CDS prices) b s.e. ^b	(iv) 2011 ln(CDS prices) b s.e. ^b	(v) 2007, 2009, 2011 ln(CDS prices) b s.e. ^c	(vi) 2007 v. 2011 ln(CDS prices) b s.e. ^c				
<i>TaxBase</i>	-0.062 (0.013) ***	-0.097 (0.015) ***	-0.046 (0.016) ***	-0.046 (0.017) ***	-0.005 (0.012)	0.814 (0.865)				
Public Debt	0.003 (0.003)	-0.002 (0.005)	0.002 (0.003)	0.007 (0.004) *	0.003 (0.001) **	0.062 (0.024) ***				
Trade Openness	-0.044 (0.191)	-0.209 (0.226)	-0.084 (0.207)	0.117 (0.205)	0.148 (0.109)	-0.801 (1.974)				
Real GDP Growth	-0.063 (0.022) ***	-0.090 (0.060)	-0.037 (0.021) *	-0.111 (0.035) ***	-0.031 (0.016) **	0.056 (0.055)				
Inflation	0.091 (0.027) ***	0.158 (0.040) ***	0.078 (0.021) ***	0.073 (0.041) *	0.046 (0.012) ***	-0.067 (0.164)				
Reserves/Ext. Debt	-0.002 (0.001) **	-0.002 (0.002)	-0.002 (0.001) ***	-0.000 (0.001)	-0.000 (0.001)	-0.004 (0.008)				
Volatility of Real GDP	0.178 (0.105) *	0.028 (0.145)	0.220 (0.167)	0.197 (0.130)	0.079 (0.064)	-0.135 (0.343)				
2009 dummy variable	0.701 (0.137) ***				0.463 (0.121) ***					
2011 dummy variable	1.485 (0.204) ***				0.594 (0.183) ***	-0.947 (0.761)				
Lagged dependent					0.589 (0.079) ***					
constant	5.473 (0.548) ***	6.714 (0.951) ***	5.800 (0.702) ***	6.292 (0.774) ***	1.823 (0.631) ***	1.632 (0.299) ***				
R ²	0.646	0.695	0.497	0.389	0.813	n.a.				
observations	150	50	50	50	150	100				
First-stage F-stat. p-value	0.000	0.000	0.000	0.000	0.000	0.813				
First-stage R ²	0.641	0.690	0.664	0.594	0.660	0.101				

Figure 1: Tax Base, Inequality, and Corruption in 50 countries, 2007-11.

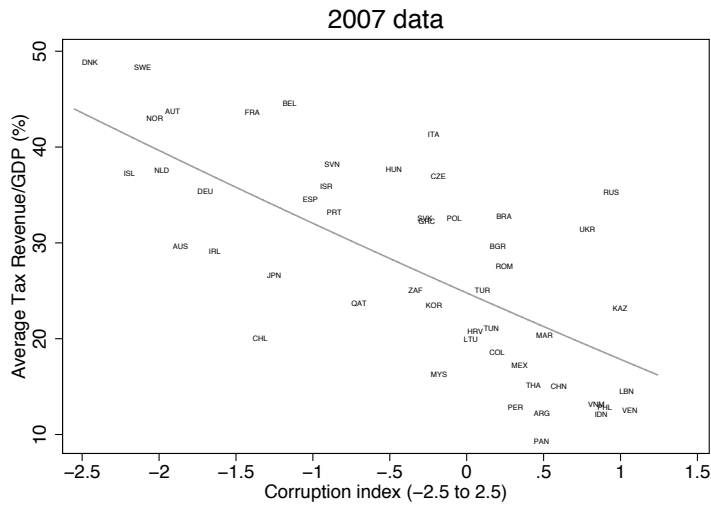
1a. Correlation = $-.64$



1b. Correlation = $-.61$



1c. Correlation = $-.72$



1d. Correlation = $-.63$

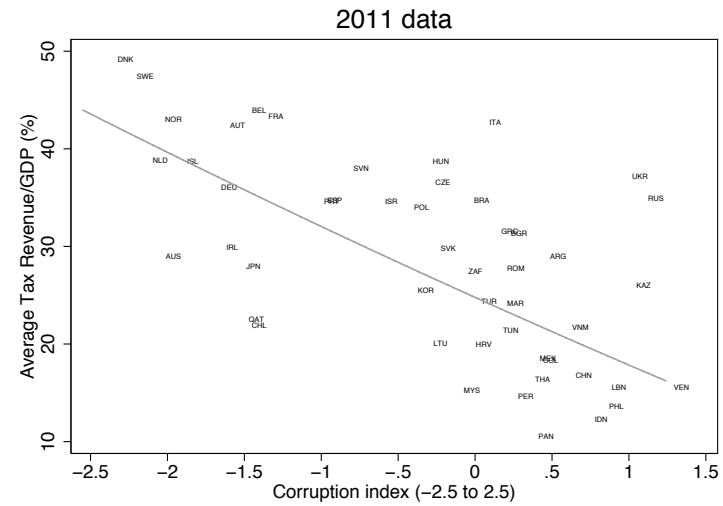


Figure 2: Economic Significance on Sovereign Risk, in basis points of CDS prices.

This figure reports the economic significance of each variable based on the estimation results of Table 2, column (iv).

The height of each bar is equal to the coefficient estimate multiplied by the 2011 sample standard deviation of the variable.

