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Government Fiscal Policies and Redistribution in Asian Countries[1]

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This paper assesses the impact of government fiscal policies on income inequality in Asia. It discusses the role and effectiveness of redistributive fiscal policies and quantifies the effects of taxation and government expenditure on income distributions. Panel estimation for 150 countries with data between 1970 and 2009 confirms international empirical findings for Asia. Tax systems tend to be progressive but government expenditures are a more effective tool for redistributing income. Moreover, the results suggest some distinctive differential distributive effect for government expenditure on social protection in Asia. Social protection spending appears to increase income inequality, whereas it reduces it in the rest of the world. Also adversely affecting the distribution of income in Asia is government expenditure on housing. Some options for improving the effectiveness of fiscal policies in Asia are discussed.

I. Introduction

Asia's rapid economic growth in recent decades has resulted in a substantial reduction in poverty and a dramatic improvement in welfare and the standard of living for a large proportion of the population. Although poverty reduction remains the main challenge for the region, widening income inequality is emerging as a concern. In recent years, Gini coefficients have risen in several developing Asian economies. At the same time, unequal access to basic social services, such as education and health, is seen as a significant problem which may be exacerbating growing income inequality.

A variety of public policies have been used to improve the distribution of income and reduce inequality. These can be grouped into: (a) policies and strategies to make growth patterns more inclusive; (b) public spending (e.g. on education, health and social services) to enhance human capacity and enable everyone in society to participate in higher living standards; (c) taxation and direct income transfers that redistribute income from higher to lower income groups; and (d) governance and institutional reforms to level the playing-field and enable everyone in society to participate in and benefit from development on an equitable basis (such a labor market policy, social protection and safety nets, land distribution, anti-corruption and anti-social exclusion).

The purpose of this paper is to investigate redistributive fiscal policies in Asia and other countries. It examines the impact of taxation and government expenditure and how effective they have been in reducing income inequality.

Section II reviews the literature on the role and the effectiveness of redistributive fiscal policies. Section III discusses the methodology and data used to quantify the impact of taxation and government expenditure on income inequality. The estimation results, which show some striking differences in terms of the impact of fiscal policies in developing Asia and other countries, are presented in Section IV. Section V discusses how the effectiveness of fiscal policies in Asia may be improved and the last section concludes with some policy lessons.

II. Review of the literature on the role and effectiveness of redistributive fiscal policies[2]

A fair distribution of income being one of the most important goals of government policy has meant that a great deal of effort of research in economics has gone into conceptualizing and measuring how the revenue and expenditure sides of government budgets affect the distribution of income among households and individuals and how effective they are in

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[2] Some parts of this section draw on Martinez-Vazquez (2008) and Cuesta and Martinez-Vazquez (2011).

actually helping the poor. Formally, the study of these effects is known as tax and expenditure incidence.

But besides taxes and expenditure programs, governments undertake an array of other policies, including monetary and exchange rate policies, which can have a large impact on income distribution, in particular on the welfare of the poor. Macroeconomic policies can have a significant impact on income distribution, through for example changes in unemployment or inflation.[3] Besides macroeconomic policies, governments use a variety of other policy instruments that have significant direct and indirect impacts on the distribution of income and the welfare of the poor. These instruments include: price controls including on housing rents, minimum wages and interest rate controls on deposits and loans; foreign exchange rationing; import quotas and restrictions on exports. Therefore even though our focus here is on tax and expenditure incidence it is important to keep in mind that several other government policies can have an as large or larger potential impact on the distribution of income and on the welfare of the poor.

Analyzing the incidence of taxes is important because who actually ends up paying the taxes is often quite different from those legally liable to make payment to the tax authorities. For example, a portion of social security contributions may have to be paid legally by employers but it is workers who may finally pay those charges in the form of unemployment or lower real wages. Similarly, establishing the incidence of government expenditures is important because not all expenditures benefit households and individuals of different income levels to the same extent. Even those government expenditures intended to benefit low income households may not do so because poor targeting or difficulties exist for the poor to have access to the public goods and services. For example, higher expenditures in primary education with lower expenditures in college education may tend to benefit the poor, but the effects may be mitigated by the lack of access of the poor in rural areas to schools.

Clearly, incidence analysis is relevant because the impact of taxes and public spending on the distribution of income and the status of the poor is not immediate and general impressions about the impact may be plainly wrong. The analysis typically involves a mix of positive and normative issues. While the question of who pays is a positive one, judging its rightness is a normative question. Even though we should shy away from the analysis, it is important to always keep in mind facts from values. We should generally agree on the former but will need to reach consensus about the latter.

Ultimately, tax and benefit incidence analysis is an effective tool to review whether government tax policies and expenditure programs have the desired impact on income distribution and on the poor. Seen from a proactive perspective, one main goal of fiscal incidence analysis is to contribute to the design of government policy. In this section we

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[3] Several studies have analyzed the impact of inflation and unemployment on income distribution. See for example, Blejer and Guerrero (1990) and Heller et al. (1988).

provide an overview of the conceptual bases of incidence analysis, discuss some of the key measurement issues and main techniques used and summarize the empirical findings in previous studies.

Tax incidence analysis

Tax incidence, as the analysis of who ultimately bears the burden of government taxes in the economy, is covered in a vast literature in economics.[4] Despite this vast literature, establishing firm final evidence on the distributional impact of different taxes remains a difficult activity because of the varying results depending on economic conditions and the sometimes complex feedback effects that operate through the entire economy. Because of this complexity, there has been always a grain of skepticism about the empirical findings in the tax incidence literature (Bird and de Wulf, 1973). However, our knowledge and understanding have improved greatly due to the analytical improvements of key economic issues in incidence analysis, greater data availability, in particular household income and expenditure surveys in many countries, and more powerful computational techniques such as microsimulation models and computable general equilibrium models.

There are several key concepts in tax incidence analysis. First is the distinction between "statutory" (or legal) incidence and "economic" incidence, or those taxpayers who are by law required to pay the tax versus those taxpayers who ultimately bear the tax burden. The latter is what really counts. The "shifting" of taxes happens because the agents statutorily responsible to pay the taxes can alter their economic behavior and transfer or shift the burdens of taxes to other agents via changes in prices charged to consumers, wages paid to workers, or the return paid on investments. The degree of shifting depends on the elasticities of demand, supply and substitution in the use of inputs of production among the economic agents interacting in the activity or market being taxed. Economic agents with lower elasticities, that is, lower ability (or willingness) to react, are more likely to ultimately bear the burden of taxes. Because adapting or reacting to taxes takes time, the economic incidence of taxes will tend to be different in the short and the long runs. For example, capital owners may bear the burden of increased profit taxes in the short run but this burden can be shifted to workers in the longer run as decreased investment leads to lower productivity and wages and higher unemployment.

Second, it is important to realize that taxes impose total burdens that go beyond the amounts actually collected by governments. This difference receives the name of "excess burdens" of taxes, also known as deadweight losses. The excess burdens arise because taxes lead to less efficient uses of economic resources and lower output and income in the economy as taxes

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[4] For classic reviews of tax incidence see for example Newbery and Stern (1987), Shah and Whalley (1991) and Musgrave and Musgrave (1989).

distort the choices by economic agents. For example, income taxes affect labor-leisure choices and saving and investment decisions.[5]

Third, a significant difficulty in measuring the impact of taxes is to figure out what is the appropriate "counterfactual," i.e. the situation before the taxes were implemented, that should be used as the benchmark in the measurement of the impact. Different choices of the counterfactual situation can be made, but there is always a difficulty in approximating the distribution of income that would have taken place in the absence of taxes.[6]

The incidence of tax expenditures, negative income taxes and in-kind transfers

To have a complete view of tax incidence we need to take into account the impact of tax expenditures, negative income taxes and in-kind transfers. Tax expenditures are special tax law provisions pursuing a variety of policy objectives and taking the form of exemptions, rebates, special deductions, tax credits or even special lower tax rates. The most immediate impact of tax expenditures is to reduce government revenues. Typically, by design, tax expenditures break with the principle of horizontal equity, i.e. that taxpayers who have the same income should pay the same amount in taxes. The impact of tax expenditures on vertical incidence, which holds that people with different incomes should pay different amounts of tax, can go either way. Tax expenditure can make a tax system more progressive (i.e. increase income equality) or more regressive (i.e. lower income equality), depending on a variety of public choice issues such as lobbying power. However, an important consideration is that tax expenditures cannot help the poor unless they pay taxes. And many of the poor do not pay taxes. This point highlights some of the limitations of redistributional policies from the tax side of the budget.

However, an important amount of redistribution can be implemented via negative taxes. These cash transfers are targeted to the poor and are by nature highly progressive.[7] However, there are some caveats in their application. To minimize fraud a sophisticated tax administration is required. In addition, stigma among the recipients can lead to low and uneven take-up of benefits, which may affect the assumed progressivity of this type of transfer.

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[5] Excess burden losses tend to be small in the short run but can become significantly large in the longer term when taking into account all the general feedbacks through the economy and on economic growth over time (Fullerton and Rogers, 1991).

[6] Tax incidence can also be studied from a lifetime perspective as opposed to annual perspective (Menchik and David, 1982). In the latter case individuals are classified by annual income grouping together those with similar annual incomes. In the case of lifetime incidence, the analysis groups individuals with the same lifetime regardless of age. Fullerton and Rogers (1991) find that the patterns of lifetime incidence are often quite similar but less pronounced than those from an annual income perspective. If taxes are found to be progressive or regressive from an annual perspective, they tend to remain so from a lifetime perspective but in a less pronounced way.

[7] For a discussion of negative income taxes see, for example, Milanovic (1995).

The analysis of the incidence of in-kind transfers typically allocates to the different income groups receiving these transfers a monetary equivalent to the costs of providing the transfers.[8] Depending on the degree of participation by income group the transfer program will be more or less progressive. In-kind transfer programs such as food stamps tend to be quite progressive. However, not all in-kind transfer programs are progressive. For example, voucher programs for higher education tend to benefit higher income groups more than lower income groups because their uptake of higher education typically is proportionally higher, and so in general voucher programs are regressive.

Three general methodologies for determining the impact of taxes on income distribution

Three approaches have been used to estimate the distributional impact of taxes. The first, and most widely used, is microsimulation analysis using individual household data and conventional assumptions of tax incidence, the second is based on computable general equilibrium models for the entire economy and just a few representative individuals, and the third is based on econometric estimation models with more aggregate data. As we see below there are differences among those approaches in the tools and the type of data that are used, but fortunately the conclusions and findings tend to be in line with each other, although with sometimes significant nuances.

Microsimulation conventional models of tax incidence. These models allocate tax burdens to different income groups, ordered from rich to poor by deciles or quintiles of the population, on the basis of a series of assumptions about who bears the final burden of taxes. For each tax, a portion of the revenues collected is imputed as tax burden to each income group in a way that exhausts the total revenues collected. For example, the revenues from excise taxes on tobacco products are allocated to different income groups in proportion to their relative share in the consumption of tobacco products. To arrive at an estimate of the incidence for the entire tax system, the incidence for each tax is calculated separately for each income group. These results are added up across all taxes for each income group to arrive at the total burden for each income group. Typically, the total burden is expressed as an average total tax rate, that is, the proportion of income paid in taxes by each income group. The information on total income, sources of income and expenditure patterns are typically obtained from data in household or consumer income and expenditure surveys. Taxes collected are obtained from the tax administration authorities.[9]

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[8] But it should be noted that in general the benefits to individuals from in-kind transfer programs may be less than the cost, since the willingness to pay for the product, depending on tastes and the availability already of the product, may be less than the market price or costs.

[9] Other approaches have been used in the estimation of conventional incidence. Perhaps the oldest methodology is the "*representative (or typical) household approach*." Here incidence estimates are made of the basis of computing taxes for a relatively small number of artificial households, whose composition, income sources and expenditure patterns are assumed to represent the rest of the population (Wasylenko,

A critical step in the process is to make explicit the assumptions about shifting and final incidence, which are based on theoretical analyses albeit not always conclusive.[10] Typically there has been wide agreement on the assumptions used for the different taxes and where there is no consensus the usual approach is to conduct sensitivity analysis to check how the results differ under alternative assumptions.[11] What follows are the conventional assumptions for the main types of taxes:[12]

o The individual income tax is typically assumed not to be shifted and thus it is assumed to be paid by the recipients of income.[13] So in the presence of the usual progressive tax rates, this tax usually has a progressive incidence.

o Payroll and social security taxes are typically assumed to be fully shifted to workers regardless of who is legally liable to pay the tax—at least a portion of this tax is typically imposed on the employers. In the presence of a cap on income for contributions—a frequent feature of this tax—its incidence is regressive. However, in developing countries where only workers in the formal sector pay this tax, its final incidence may be less regressive.

o For the corporate income tax a variety of shifting assumptions have been proposed and analyzed for this tax including: (i) no shifting at all so that shareholders pay the full tax; (ii) the shifting to all capital owners through a leveling off or equalization of after-tax rates of return for all capital; (iii) the backward shifting to workers in the form of lower wages; and (iv) the forward shifting to consumers in the form of higher consumer prices in varying proportions depending on the degree of monopoly power assumed to exist in the markets. Perhaps the most commonly used assumption in the past has been that half of this tax burden is paid by all owners of capital and the other half is paid by consumers. More recently, with more open economies and high mobility of capital, there is more evidence that a significant part of this tax is paid by workers; this is generally more so the smaller and more open the economies are.

o Taxes on goods and services, including several forms of sales taxes, value added taxes and excises, are practically all the time assumed to be shifted forward to consumers, i.e. they are assumed to be regressive. However, in the case of value added taxes, regressivity

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1986; Bird and de Wulf, 1973). Conventional tax incidence has also been estimated by: (a) by factor shares in income (labor and capital); (b) calculating effective (average or marginal) tax rates by main economic sectors (agriculture, industry, services); or (c) subnational jurisdiction (OECD, 2000).

[10] See Shah and Whalley (1991) and Browning (1978).

[11] The assumptions used today do not differ much from those derived in the original work by Musgrave (1959). Other important classical pieces on the assumptions are Musgrave et al. (1974), Pechman and Okner (1974) and Gillespie (1980).

[12] These conventional assumptions that follow are subject to some caveats and their effects can be largely modified depending on the level of development, the extent of the underground economy, and the presence of particular government policies outside the tax area such as price controls, import quotas and foreign exchange rationing (Shah and Whalley, 1991).

[13] Most often tax evasion issues are ignored. Tax evasion may not always benefit the evaders themselves. In competitive situations with free entry in the business the benefits of evasion may be shifted in the form of lower prices for the goods and services provided by the evaders (Martinez-Vazquez, 1996).

is reduced when multiple rates (lower for necessities and higher for luxury items) are used or basic goods and necessities are exempted.[14] The incidence of sales taxes is complicated in many countries by the presence of cascading and multiple rates and exemptions.[15] The regressivity conclusion for sales and value added taxes may not be correct for developing countries where only households operating in the formal sector, typically those with higher incomes, may pay those taxes. Furthermore, value added and excise taxes have been found to be considerably less regressive or even neutral when analyzed over a longer time frame or on life time basis rather than on the basis of current income.[16] Excise taxes are also typically assumed to be shifted forward to consumers. Excise taxes can have a progressive impact as in the case of luxury goods (gasoline, cars, expensive liquor, or perfumes) and also a regressive impact (kerosene fuel used for cooking, tobacco products or cheap liquor). Customs tariffs or taxes on imports are typically assumed to have the same regressive incidence as sales and value added taxes for lack of better information regarding which income groups end up consuming the imported goods.

o   Export taxes, still present in some developing countries, have different incidence depending on the degree of monopoly power of exporters in international markets. Where monopoly power is present part of the export tax may be in effect exported to foreign consumers. Without monopoly power, the export taxes are assumed to be paid by the domestic exporters or producers. The final incidence of export taxes is regressive when the producers/exporters are small farmers of traditional export crops, or progressive if the producers/exporters are wealthy farmers or international companies.

o   Property tax incidence is typically more controversial. Some studies assume no shifting with the tax paid by the owners of the property or shifted to all owners of capital, in which case the tax is progressive. Others assume the forward shifting of property taxes to renters or users of the property, in which case they can be regressive.[17]

The conventional approach to tax incidence presents advantages and disadvantages. On the positive side, the methodology is relatively simple and easy to implement, the underlying assumptions are transparent and the implications of alternative assumptions can be easily compared. The analysis can also include large samples of taxpayers. On the minus side, good information on income distribution is not always available and general equilibrium second round feedback effects are typically ignored. More importantly, the shifting assumptions which play a critical role in the results have been criticized for "stipulating" the incidence of various taxes (Devarajan et al., 1980). Moreover, increasing international evidence is finding higher income earners to be substantially more responsive to taxation than lower income

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[14] However, differential rates and exemptions lead to production inefficiencies and raise the administrative and compliance costs (Atkinson and Stiglitz 1976; Kaplow 2007)

[15] Input-output frameworks have been used to establish effective rates in the presence of cascading and multiple rates and exemptions. See for example, Bird and Miller (1991) and Ahmad and Stern (1989).

[16] See, for example, Crawford, Keen and Smith (2011).

[17] See for example Martinez-Vazquez and Sjoquist (1988) and Bahl, Martinez-Vazquez and Youngman (2010).

earners, shifting income across time and sources in response to tax policy changes.[18] Such behavior would suggest less progressivity of the personal income tax system than what is typically assumed in microsimulation models.

General equilibrium models of tax incidence. This approach to tax incidence was pioneered by Harberger (1962).[19] The essence of this approach is to analyze the incidence of taxes within the context of a general equilibrium model of the economy, without making explicit assumptions about the final shifting of taxes. Instead, tax incidence is determined by the initial structure of the economy with the final outcome measured by observing the differences in the vector of equilibrium prices before and after the tax change. One of the greatest insights from this approach is that the final incidence of taxes depends on the values of several critical parameters in the economy, including the capital-labor ratios in different sectors and the elasticity of substitution in production among the different factors. Later on, Harberger's model was operationalized by the development of computable general equilibrium models. These are relatively complex models, which attempt to capture in more detail the general equilibrium responses to taxes in the economy. The models are numerically solved using data from the national income accounts, household expenditure surveys and taxpayers' data.[20] General equilibrium models capture all the parameters that should play a role in final tax incidence among different income groups: different demand patterns, different endowments in resources and variations in capital-labor ratios in different economic sectors.[21]

The general equilibrium approach also has its advantages and disadvantages. On the positive side, it employs an explicit structural model of the economy from first bases with utility/demand functions and production/supply functions. It also offers more transparency in how incidence results are linked to assumptions on fundamental parameters, such as the elasticity of substitution in production and the incidence results include measures of excess burdens. Moreover, general equilibrium models take into account indirect or second round feedback effects of taxation or government expenditure changes. On the minus side, general equilibrium models are operationally intensive and the number of taxpayers represented needs to be small. And even though this approach does not "stipulate" incidence results it does "stipulate" a long list of critical parameters, including elasticities of substitution in production and demand and supply (Fullerton and Rogers, 1991).

Regression based estimates of the impact taxes on income distribution. A limited number of recent studies have used multivariate econometric analysis to investigate the impact of the tax

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[18] For a recent review of the literature see Saez et al. (2011).

[19] Several author including Mieszkowski (1969), McLure (1975) and Bovenberg (1987) added expansions to Harberger's model.

[20] Some of the original models include those in Fullerton et al. (1978, 1979) and Ballard et al. (1985).

[21] For example, Devarajan et al.'s (1980) model consists of 19 industries, which use two inputs, labor and capital, and also outputs of other industries as intermediate inputs, and 16 consumer goods. They also assume and calculate the incidence of taxes for 12 taxpayer groups.

structure on the distribution of income across countries, typically measured via Gini coefficients. For example, Weller (2007) uses cross-country data from 1981 to 2002 and finds positive effects of progressive taxation on income distribution. Gwartney and Lawson (2006) use panel cross-country data on changes in marginal tax rates from 1980 to 2002 to examine their impact on the distribution of income and find that countries with the most significant high tax brackets rate reductions have experienced the largest increases in inequality over the sample period. More recently, Duncan and Sabirianova Peter (2008) derive a complete measure of income tax progressivity and find that inequality in the distribution of income is significantly affected by their measure of progressivity. Similarly, Martinez-Vazquez et al. (2011) find that higher reliance on direct over indirect taxes improves the income distribution over time for a large number of countries.

A disadvantage of the multivariate econometric approach to tax incidence is that the impact of the different elements of the structure of taxes on income distribution cannot be examined in any detail, at least not to the extent allowed by the general equilibrium approach and especially microsimulation models. On the plus side, the econometric approach allows analyzing the impact of large variations in the level and structure of taxes across countries, variations that are unlikely observed within the context of a single economy. In all, the econometric approach should be considered a complement rather than a substitute for the microsimulation and general equilibrium approaches.

Three important lessons on tax induced redistribution

Three important lessons can be extracted from the large number of studies on tax incidence in the past. First, the vast majority of tax incidence studies in the last couple of decades have found that tax systems tend to be progressive or mildly progressive overall, although certain particular taxes within the system can be quite regressive. This finding is in contrast with earlier empirical studies of tax incidence dating back over five decades, which found tax systems to be regressive.[22] Examples of recent studies include Messere (1997) for OECD countries, Shah and Whalley (1991) for several developing countries, Younger (1996) for Ghana, Younger et al. (1999) for Madagascar, Chen et al. (2001) for Uganda, Bahl et al. (1996) for Guatemala and Martinez-Vazquez (2001) for Mexico.

Second, it is important to look at the incidence of the tax system as a whole. Some taxes, such as taxes that are capped, like payroll and social security taxes often are, tend to be by design more regressive and other taxes, such as income taxes, tend to be more progressive. Looking at tax incidence in a piecemeal fashion is likely to lead to inaccurate conclusions about the impact of the tax system on the distribution of income. It may also lead to abandoning or downplaying certain taxes that can play an important role in revenue

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[22] See, for example, Bird and de Wulf (1973), de Wulf (1975), Wasylenko (1986), Shah and Whalley (1991) and Chu et al. (2000) for reviews and summary of findings in the literature.

mobilization with relative efficiency or excess burden cost or that can be more easily administered. Incidence analysis needs to be performed within the big picture even when there are theoretical and practical difficulties in aggregating the results from the incidence of isolated taxes.

Third, tax systems generally do not have a large impact on the distribution of income (Bird and Zolt, 2005; Harberger, 2006; Martinez-Vazquez, 2008).[23] That is, governments' capacity to redistribute income on the revenue side of the budget is limited even in OECD countries (Atkinson, 2000). This limitation may be more pronounced in the case of developing countries because the overall tax effort as a percent of GDP tends to be significantly smaller (Chu et al. 2000).

Estimating the incidence of public expenditures

From the perspective of income redistribution policies it is important to understand the incidence of public spending programs. As we have just seen above, tax policy has a limited ability to implement significant changes in the distribution of income, especially at the lower end of the income distribution. Even though a number of developed countries have implemented a variety of negative income taxes, which are in effect transfers, and provide a variety of tax credits and other favorable treatment to lower income households, the impact on the welfare of the poor still can be quite limited because these groups can be hard to reach and can be completely outside the tax system. More effective redistributional policies, especially vis-à-vis the poor, can be implemented from the expenditure side of the budgets.

Therefore, it is important to understand the incidence of public expenditures programs. But the key difficulty in measuring the impact of public expenditure on individuals and households is that, with some rare exceptions, we are not able to measure output from government expenditures. How public expenditures impact different groups depends among other things on the composition of public expenditures, what programs are being implemented and how much funding is going to each, such as basic education versus university level education, or primary health care versus tertiary hospitals. The impact of public expenditure on the distribution of income depends also on the efficiency of government spending: the cost effectiveness of funds in delivering services and the matching of needs of people.

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[23] This is not to say that large changes in tax structure will not have noticeable effects on income distribution. For example Li and Sarte (2004) find that the Tax Reform Act (TRA) of 1986 in the United States had a significant effect on income inequality, resulting in a 20 to 24 percent increase in the Gini coefficient for that country.

Approaches to measuring the impact of public expenditures on income distribution: Benefit incidence

The basic problem in benefit incidence is how to measure the benefits accruing to individuals from public goods and services. In the case of private goods and services even though marginal private benefits are not directly observable, we can infer them from market prices.[24] In the case of public goods and services, many are provided without direct charges, and even when there is a fee or service charge, this price cannot be interpreted in general as the marginal benefit for individuals, because the supply of most public goods and services is subsidized or rationed, and it does not respond directly to demand.[25]

Three general approaches have been used in the estimation of public expenditure incidence. The first methodology, known as the "benefit incidence" approach, uses the estimated inputs costs or marginal costs of provision for the public expenditure program as the measure for marginal benefits and it allocates those estimates to the different income groups depending on access to the service. The second methodology, known as the "behavioral approach," uses estimates of behavioral demands for publicly provided goods and services to derive willingness to pay for the service by individuals. The third approach uses econometric techniques with aggregate data to analyze their differential impact on income distribution generally measured by Gini coefficients.[26]

The benefit incidence approach. Also known as the classic or the non-behavioral approach, it was pioneered by twin World Bank studies by Selowsky (1979) for Colombia and Meerman (1979) for Malaysia.[27] Formally, benefit incidence measures by how much the income of a household would have to be raised if the household had to pay for the subsidized public goods and services at full cost. The essence of the approach is to use information on the cost of publicly provided goods and services together with information on their use by different income groups to arrive at estimates of the distribution of benefits. Individual beneficiaries are typically grouped by income level but they can also be grouped by geographical area, ethnic group, urban and rural location, gender and so on. Information on individual or household use of the public goods and services is typically obtained from surveys, and it is

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[24] Note that we do not use here the term "expenditure incidence" since this is typically used to measure the income flows government expenditures create in the provision of services, by hiring administrators, renting buildings, and so on. This type of measure has more relevance for interregional analyses but has less relevance in the context of impact on income distribution.

[25] See van de Walle (1998) and Demery (2000) for two excellent and complete reviews of the issues.

[26] Note that there are other methodologies used in economics that could also be used in the measurement of the incidence of public expenditures. The "indirect market technique" uses the indirect valuation of a public service as revealed by consumers with expenditures on private goods complementary to the public good, for example, employing estimates of time and money spent on complementary goods to use public parks (Bradford and Hildebrandt, 1977 and Maler, 1971). A second technique is the "contingent valuation" method employed in environmental economics using direct questionnaires and surveys of consumers or in an experimental lab setting (Mitchell and Carson, 1989).

[27] For more recent studies that have used the benefit incidence approach see, for example, Selden and Wasylenko (1992) and Demery (2000).

fundamental to know how effectively public expenditure programs target the poor. Because of the required information on unit costs in the provision of public goods and services and the rate of use of those services by different individuals, in practice, benefit incidence has been estimated for three main categories of public goods and services: education, health and some types of infrastructure.

The benefit incidence approach has several strengths but also weaknesses. On the positive side, it provides simplicity and transparency of estimation procedures and allows studying which public expenditure programs are most effective in reaching and improving the status of the poor. On the negative side, the cost measures may not be a good enough approximation of true benefits or marginal valuations of the public good or service provided and it cannot incorporate changes in the behavior of individuals in response to changes in public expenditure. For example, we may find that poor households may not send their children to school but benefit incidence does not suggest why nor provide a course of policy action. The scope is limited to public expenditure programs for which private beneficiaries can be identified. The approach can also ignore important interaction effects with the private sector. For example, if the private education sector is able to attract a higher number of richer students, benefit incidence of education becomes more progressive. If the quality of education depends, among other things, on peer pressure, the lower number of children of better educated and wealthier families in public schools may reduce the quality of public education for the poor.

The behavioral approach: marginal willingness to pay. In essence, this approach uses individual preferences to derive marginal willingness to pay as the measure of individual benefits from public expenditures.[28] The methodology consists of using econometric methods to exploit variation in behaviors in the use of public goods and services, prices, incomes and other household characteristics across individuals and time to estimate demand functions for public goods and services. These demand functions generate price elasticities and willingness to pay generally varying by income groups. With that information one can estimate the incidence of public spending programs, in particular whether they have a pro-poor incidence and whether the poor may have a more elastic response to any changes in costs associated with the use of the service. Discerning the behavioral impact of public expenditure programs opens up possibilities for the better design of public policies and in particular for better targeting expenditures to the poor.

The behavioral approach also has several strengths and weaknesses. On the positive side, this approach is more theoretically sound with clear foundations in microeconomics and it allows the estimation of incidence for public expenditures for which specific users cannot be identified. And as we have seen, it incorporates individual behavioral responses and therefore

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[28] This approach was pioneered by Gertler and van der Gaag (1990) and Gertler and Glewwe (1990) and Younger (1999), although demand curves for public goods have been used before to derive willingness to pay for public goods; see, for example, Martinez-Vazquez (1982).

it provides concrete guidance for policy reform. On the negative side, this approach is more data intensive and methodologically more complex.

Behavioral and benefit incidence approaches can be quite complementary. For example, interesting application of benefit and behavioral approaches are employed by Younger (1999) and Ravallion et al. (1995).

Regression based estimates of the impact of government expenditures on income distribution. Even though it is widely acknowledged that a variety of government spending programs can have a positive effect in reducing income inequality, regression based estimates, going as far back as Tanzi (1974), have shown that what in many instances would seemingly be perceived as redistributive government spending may do nothing to improve income inequality and may actually worsen it. The difficulties involved in targeting distributional expenditure policies which has been discussed in many studies (e.g. Aspe and Sigmund, 1984; Aspe, 1993; Birdsall and James, 1993; Harberger, 1998; Schwartz and Ter-Minassian, 2000). Despite this problem, many education and health spending programs have been found to be equalizing and poverty reducing (Paternostro et al., 2007). Others have found that infrastructure spending in some developing countries has resulted in large poverty reduction, for example, Klump and Bonschab (2004) in the case of Vietnam.[29] In the recent literature much more emphasis has been placed on the relationships between growth and income distribution (Dollar and Kraay, 2000) and public spending and growth (Afonso et al., 2005; Herrera, 2007; Moreno-Dodson, 2008; Bayraktar and Moreno-Dodson, 2010; Day and Yang, 2011). It is now quite clear that the quantity and quality of growth is affected by public expenditure and growth in turn affects the distribution of income.

For those few studies that have more explicitly focused on the wide impact of public expenditure on income distribution, either for a particular country or in cross country analyses, the evidence is mixed. For example, de Mello and Tiongson (2006) in a cross-country analysis (the sample running from 27 to 56 countries depending on availability of data) of the impact of government spending on income distribution find the overall effects of expenditures to be un-equalizing. In fact, those countries where redistribution is most needed due to high inequality, they are also less likely to have effective redistributive policies in place. In a country case study for Brazil, Clements (1997) similarly finds that government social expenditures have contributed to exacerbate income inequalities. On the other hand, Jao (2000) finds that in the case of Taipei, China public expenditures on social assistance and social insurance contributed positively in reducing income inequality. In a more recent study, Martinez-Vazquez et al. (2011) using panel data for a large number of countries find that aggregate public expenditures on social welfare, education, health and housing have a positive significant effect on reducing income inequality.

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[29] But here again the rent seeking behavior of the elite can change the outcomes, as identified by Araujo et al. (2008) for Ecuador and Khemani (2010) for India.

The multivariate regression approach to the analysis of public expenditure incidence has some clear advantages but also disadvantages, and therefore should be considered a complement rather than a substitute for the benefit incidence and behavioral approaches. One of the most important advantages is to be able to analyze the impact on income distribution of large variations in levels of expenditures and their composition across countries, variations that are often not observed within the context of country-case studies. Multivariate analysis also allows examining the evolution over time of the impact of different government expenditures on income distribution within countries. On the other hand, the analysis of income distribution at the aggregate country level does not allow the introduction in the analysis of specific details on policies and institutions that can make a significant difference on the effectiveness and overall impact of public expenditure policies. For example, two countries can have similar expenditures on primary education and health but one of these countries can do a much greater effort in targeting the access to these services by poor rural or urban families. This type of information is likely not to be available for a large number of countries and therefore is likely to be ignored in multivariate regression studies. If the information is available, there may be the possibility of using dummy variables to account for those effects. Also, to the extent that institutions and policy approaches do not change over time their impact can be controlled for by using fixed effect panel estimation approaches.

Important lessons from public expenditure induced redistribution

An important conclusion from the review of the empirical literature on the incidence of public expenditures is that spending programs on social welfare and the social sectors have the capability of significantly affecting income distribution. However, the actual impact on reducing income inequality depends crucially on the targeting of those expenditures to the poor and lower income groups in the income distribution (Selowsky, 1979; Meerman, 1979; Gertler and Glewwe, 1990; Selden and Wasylenko, 1992; Younger, 1999).

The methodologies currently available have led incidence studies of public expenditures to concentrate only on a small number of sectors, mainly those of education, health and basic utilities. The incidence of public education expenditures generally varies with the level of education services. Primary and perhaps secondary education tend to be pro-poor and reduce inequality in the distribution of income. On the other hand, public expenditures on higher education or university level typically benefit the rich and lead to higher inequality in the distribution of income; van de Walle and Nead (1995) review the experiences of 13 countries which generally support this conclusion. The incidence of health expenditures tends to be also differentiated depending on the type of programs. Public expenditures on primary care tend to be more pro-poor and improve the distribution of income. Public expenditures on more sophisticated types of health care tend to be pro-rich and make the distribution of income more unequal; evidence on these effect are presented, for example, in Sahn and

Younger (2000). Finally, the incidence of expenditures on utility infrastructure tends to be pro-rich.

As a manner of conclusion

Most tax systems tend to show a mildly progressive incidence impact. However, around the world taxes have not been a very effective means of redistributing income. One reason for this is the potentially large excess burdens or economic losses associated with highly progressive taxation. Riding between revenue and expenditure policies depending on how they get implemented, direct cash transfers and in-kind transfers can be quite progressive unless there are serious targeting problems. The international experience shows that the expenditure side of the budget (including transfers) can have a more significant impact on income distribution. Expenditure programs in the social sectors (education and health) are more progressive the more is spent in relative and absolute terms on those goods and services more frequently used by the poor (basic education and primary health care). However, the effective targeting of lower income groups in expenditure programs is hard to design and to implement.

These general findings and conclusions about the effectiveness of redistributive fiscal policies tend to hold for different methodological approaches in the tools and the type of data that are used. Whether they also hold for Asian countries is investigated next.

III. Estimating the impact of fiscal policies on income inequality: methodology and data

To examine the redistributive impact of fiscal policies in Asia, we derive regression based estimates of the effects of taxation and government expenditures on income distribution. This section discusses the methodology and data. A description of the variables used in the estimation and their sources is contained in Appendix A.

Methodology

To quantify the impact of taxation and government expenditure on income inequality we estimate the following equation

$$\text{gini}_{it} = \alpha\,\text{gini}_{it\text{-}1} + (\,F_{it}'\,,\,\text{Asia}_{it} * F_{it}'\,)\,\gamma + X_{it}'\,\beta + \upsilon_i + \varepsilon_{it} \quad \text{for } i = 1, \ldots, N \text{ and } t = 1, \ldots T\ (1)$$

Equation (1) posits that income inequality, measured by the Gini coefficient, gini_{it}, for country i in year t, is a function of income inequality in the previous year, $\text{gini}_{it\text{-}1}$, the fiscal

variables of interest, F_{it}, which are various tax and government expenditure variables and a set of observable control variables that is commonly used in the literature to explain income inequality, X_{it}. The lagged dependent variable is included because income inequality is persistent over time. To identify Asia specific tax and government expenditure effects, a dummy variable, $Asia_{it}$, which equals one if a country is in Asia and zero otherwise, is interacted with the variables of interest.[30] υ_i are unobserved country fixed effects and ε_{it} are idiosyncratic errors. They are assumed to be independently distributed across and have the following error components structure

$$E\left(\upsilon_i\right) = 0,\ E\left(\varepsilon_{it}\right) = 0,\ E\left(\varepsilon_{it}\,\upsilon_i\right) = 0 \qquad \text{for } i = 1, \ldots, N \text{ and } t = 2, \ldots T \qquad (2)$$

and

$$E\left(\varepsilon_{it}\,\varepsilon_{is}\right) = 0 \qquad \qquad \text{for } i = 1, \ldots, N \text{ and } t \neq s \qquad (3)$$

The estimation of equation (1) raises four potential problems. First, the lagged dependent variable, $gini_{it}$, is correlated with the country-specific fixed effects, υ_i, (Nickell, 1981). Moreover, ordinary least squares (OLS) estimates may be biased if the lagged dependent variable is correlated with other explanatory variables, i.e. the fiscal variables, F_{it}, or the control variables, X_{it}, (Baum, 2006). This bias arises even if the error process is independent and identically distributed (i.i.d.). Second, the tax and public expenditure variables in F_{it} may not be strictly exogenous and correlated with the idiosyncratic errors, ε_{it}. Third, the time-invariant unobserved country fixed effects, υ_i, may be correlated with the explanatory variables, F_{it}, or X_{it}. Fourth, our panel dataset has a relatively short time dimension (T = 30) and a relatively large country dimension (N = 150). When the time period is short, the dynamic panel bias that arises due to the correlation of the lagged dependent variable with the fixed effect in the error term may be significant. In this case, applying a straightforward fixed effects estimator would not be appropriate (Roodman, 2006).

To address the four potential problems we use methodology proposed by Blundell and Bond (1998), which augments the Arellano and Bond (1991) estimator. The Bundell and Bond estimator is designed for small T and large N panel dataset with independent variables that are not strictly exogenous, with fixed effects and heteroscedasticity and autocorrelation within countries. The Arellano and Bond estimator differences all the regressors and uses Hansen's (1982) General Method of Moments as proposed by Holtz-Eakin et al. (1988). The Blundell and Bond (1998) estimator aumgents Arellano and Bond (1991) by assuming that the first differences of instrumenting variables are uncorrelated with the fixed effects. This allows the use of more instruments and improves efficiency. The Blundell and Bond estimator combines two equations, one in levels and one in first-differences. The equation in

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[30] We include the following countries in Asia: Bangladesh, Bhutan, Cambodia, China, Hong Kong, India, Indonesia, Japan, Korea, Laos, Macao, Malaysia, Maldives, Mongolia, Myanmar, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Thailand and Vietnam.

levels uses lagged first-differences as instruments for the endogenous variables (lagged Gini coefficients and fiscal variables), whereas the equation in first-differences uses lagged levels as instruments. The validity of these instruments is tested using the standard Sargan test for over-identifying restrictions.

The Blundell and Bond system GMM estimator helps overcome the four potential problems as follows. First differencing of equation (1) eliminates the country fixed effects because they do not vary over time. This resolves the third problem (fixed effects) and the endogeneity of the lagged dependent variable (first problem) as long as the idiosyncratic errors, ε_{it}, are not serially correlated. In the level equation, differences in the instruments are used to make them exogenous to the fixed effects.[31] Applying GMM overcomes the potential problem of biased OLS estimates due to the lagged dependent variable being correlated with other explanatory variables.

The second problem of the fiscal variables being correlated with the idiosyncratic errors arises if there is reverse causality between income inequality and fiscal policies. A large number of factors likely influence government policies and may include income inequality. For instance, countries with greater income disparity may choose to rely relatively more on direct taxation and/or social expenditures. This means that fiscal policies may affect income inequality but also that income inequality may affect fiscal policies. To address this endogeneity problem, one would usually choose instrumental variables estimation (two stage least squares). However, finding valid external instruments for all the different tax and government expenditure variables is a challenge. The Bundell and Bond system GMM estimator helps overcome the potential endogeneity problem and lack of external instrumental variables by drawing instruments from within the dataset. It instruments differences with levels and levels with differences. The validity of these instruments again depends on the assumption that ε_{it}, are serially uncorrelated.

The system GMM estimator also deals with the fourth problem of relatively small-T large-N.[32] Blundell and Bond (1998) show that it is superior to Arellano and Bond's (1991) difference GMM estimator, which has poor finite sample properties and is downward biased when T is relatively small.

The data used in the estimation (discussed next) is an unbalanced panel dataset where the number of time periods observed is not the same for all countries and even for the same country the number of observations available may differ by the type of variable. The econometric model estimates the objective equation (1) by using all available information

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[31] Tests of serial correlation in the first differenced residuals are consistent with the assumption of no serial correlation in ε_{it}.

[32] In large-T panels, a shock to the country-specific fixed effect declines with time. Similarly, the correlation of the lagged dependent variable with the error term is insignificant (Roodman, 2006). In these cases, using the Blundell and Bond (1998) estimator would not be necessary.

from the sample. The final number of observations and number of countries used in the estimation of a particular specification depends on the number of observations for which all included variables have non-missing values.

Data

The estimation uses data from 150 developed, developing and transition economies, between 1970 and 2009. 22 of the 150 countries are from Asia. However, low data coverage often significantly reduces the number of observations used in each regression.

Income inequality is measured by Gini coefficients from the UNU-WIDER World Income Inequality Database. They are computed on the basis of income/consumption distribution data. Inequality estimates can be based on gross or net income (i.e. income before or after the deduction of taxes and social contributions) or expenditure. To account for this heterogeneity in the Gini coefficients, we include two dummies for gross and net income and the consumption measure is considered as the base category.[33]

We consider the following tax variables: personal income tax (PIT), corporate income tax (CIT), social security contributions (SSC) and payroll taxes, general taxes on goods and services (GTGS), excises and customs duties, all measured as a percent of gross domestic product (GDP). Personal and corporate income taxes are generally thought to be progressive and hence should reduce income inequality. However, when evaluating the impact of personal income taxes on income inequality, it is important to take into account the level of progressivity. For that reason, we interact personal income tax revenue with a personal income tax progressivity measure constructed by Sabirianova Peter et al. (2010). The progressivity measure is based on countries' personal income tax system, including information on statutory tax rates, tax brackets, country-specific tax legislation, basic allowances, standard deductions, tax credits, national surcharges and local taxes. We use Sabirianova Peter et al.'s average rate progression variable, which is derived as follows. Average tax rates are first computed for each country for each year at 100 different levels of pre-tax income, which are evenly spread in the range from 4 to 400 percent of a country's GDP per capita. The average rates (for each country and each year) are then regressed on the log of the 100 income data points that are formed around per capita GDP. A country's tax structure in a particular year is interpreted as progressive, neutral or regressive if the estimated slope coefficient is positive, zero or negative.

When assessing the impact of corporate income tax revenue, it is important to take into account that the progressivity of corporate income taxes may be affected by countries' openness. In his seminal paper on incidence of corporate income tax, Harberger (1962)

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[33] See the UNU-WIDER World Income Inequality Database (WIID) for more information on the concepts of measuring income inequality.

shows that in a closed economy with two perfectly competitive sectors and fully mobile factors of production, imposing a tax on capital in one sector would cause capital to move from the taxed to the untaxed sector, further causing a reallocation of labor among the two sectors and changes in factor and output prices. Using elasticities typical for the U.S. economy, Harberger finds that, in these circumstances, capital bears approximately the full burden of the corporate income tax. In his two more recent papers, Harberger (1995, 2006) revisits the incidence of corporate income taxes in an open economy where capital can flow freely across international borders. In this setting, he finds that the burden of corporate tax more than fully shifts to labor. To account for these effects, we interact the corporate income tax variable with a globalization index.

Social security contributions and payroll taxes are commonly shared between employees and employers. However, employers tend to almost entirely shift the burden to employees in the form of lower wages. Social security contributions and payroll taxes are expected to increase income inequality if there is a cap on income for contribution. The lower is the cap, the more regressive are the taxes.

The evidence on the impact of taxes on goods and services, including value added taxes and excises, on income inequality is mixed. Studies that analyze current income generally find that they are regressive. But this regressivity is reduced substantially and may even become neutral when analyzed over a longer time frame. The sign on the coefficient for general taxes on goods and services and excises could therefore be negative or not significantly different from zero. For lack of better information we expect customs duties to have the same direction of effect on income inequality as general taxes on goods and services.

On the government spending side, we consider four types of expenditure: on social protection, education, health and housing, all expressed as a percent of GDP. Ideally, we would have included subcomponents of these expenditure categories, e.g. basic education versus university level education, or primary health care versus tertiary hospitals, as they are likely to affect income groups differently. However, internationally comparable disaggregated data on government spending is not available. Bearing this in mind, we would expect higher government spending on social protection, education, health and housing to reduce income inequality.

The choice of control variables is based on significance identified in the literature. Previous studies have found that economic and social variables that influence labor supply, labor demand and institutions are important determinants of income inequality (Blejer and Guererro, 1990; Feenberg and Poterba, 1993; Auten and Carroll, 1999; Mocan, 1999). Changes in labor supply and labor demand have an impact on income inequality because they alter wages. Factors that affect labor supply include population size, age structure and education, while labor demand tends to be influenced by technological change, international trade and outsourcing. The quality of institutions is thought to be important because it affects

the allocation of resources. For example, high political corruption allows certain interest groups to influence policy-makers to implement policies that do not necessarily benefit low-income groups.

Based on data availability, we include the following control variables: population growth, youth dependency, old-age dependency, a globalization index, GDP per capita, long-term unemployment, perception of corruption, schooling and size of government. They are expected to have the following impact on income inequality.

An increase in population growth raises labor supply, which lowers wages. A decline in wages in turn is expected to increase income inequality. Higher youth dependency, which is defined as the ratio of the number of persons ages 0–15 to the number of persons ages 16–64, is expected to result in greater income inequality, mainly because higher youth dependency suggests a higher average number of children per household and lower household per capita income. Old-age dependency, on the other hand, which is defined as the ratio of persons ages 65 or over to the number of persons ages 16–64, has generally been associated with relatively lower income inequality. This may be because of a flatter income profile of this age group.

The schooling variable, which measures the average number of years of schooling in countries, captures the potential effect that the level of education of individuals has on income inequality. A higher level of education is expected to increase the income of households and individuals and should reduce income inequality. Similarly, higher, long-term unemployment is associated with an increase in income inequality because it reduces the ability of people to earn income.

Kuznets in his seminal 1955 paper argued that as countries develop, income disparity first increases, peaks and then decreases. To capture these effects, which Kuznets documented using both cross-country and time-series data, GDP per capita and per capita GDP squared are included in the estimation.

Technological progress and globalization of trade and finance have been found to be growth enhancing and poverty reducing, but they have tended to increase income inequality both in advanced and developing countries (IMF, 2007). To capture the potential negative effect of globalization on income inequality, we use the KOF index (Dreher, 2006 and Dreher et al., 2008), which takes values between 0 and 100 (a higher value meaning greater globalization). The globalization index takes into account actual economic flows (e.g. trade, foreign direct investment), economic restrictions (e.g. import barriers, tariff rates), data on information flows (e.g. internet users, trade in newspapers), data on personal contact (e.g. telephone traffic, international tourism) and data on cultural proximity.

Few studies have considered the impact of corruption on income inequality. The rare studies that investigate this relationship find that corruption increases income inequality (Gupta et al.

2002). Corruption distorts the economic and financial environment. This in turn affects people's ability to earn income. We measure corruption with the ICRG's assessment of corruption within the political system. It takes values from 0 to 6 with a higher value indicating more corruption.

In addition, the size of government may matter. Larger governments may be more able to meet the demands of lower income households and individuals through different social programs, leading to better distributional outcomes. The size of government is measured by total revenue as a percent of GDP.[34]

We also include inflation as a control variable. This is because inflation is one of the most regressive taxes that any government can implement. An increase in inflation, measured by annual percent changes in consumer prices, is expected to raise income inequality because of two main effects. First, high and rising inflation typically coincides with low and falling real interest rates of (unindexed) financial securities as prices and inflation expectations, and hence nominal interest rates, only adjust sluggishly. High and rising inflation thus leads to an erosion of the real value of financial assets and gains on debt. Lower income households disproportionately loose because they cannot borrow or borrow as much as higher income households, and the real value of their debt declines by less. Also, they tend to hold less real assets, like houses or land, which can help protect against the adverse effects of inflation and a larger proportion of their assets is in (unindexed) bank and term deposits. Second, higher inflation is expected to raise income inequality because of "fiscal drag". When income tax thresholds are not adjusted for inflation, rising nominal incomes move people into higher income tax rate brackets. Lower income people are more affected by fiscal drag than higher income people in the top income tax bracket, whose marginal tax rate cannot increase any further.

IV. Results

This section discusses the estimation results. Our empirical analysis consists of three parts. In the first part we focus only on the effects of taxation and personal income tax progressivity on income inequality. Similarly, in the second part we investigate only the effects of government spending on income distributions, while in the third part we include both taxation and government expenditure to evaluate their joint effect on income inequality in Asia and other countries.

The estimation results are reported in Appendixes B-D. Column (1) in Appendix B shows the results from including the control variables only. Most of the variables are statistically significant and have the predicted sign. The results for inflation, which is a variable not

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[34] Note that the size of government variable is included when analyzing tax instruments individually and when assessing types of expenditure. It is dropped in the estimations that include all taxes.

typically included in income inequality studies, suggest that rising consumer prices adversely affect income inequality. A one percentage point increase in inflation, on average, raises inequality between 0.033 and 0.132 percentage points.

Taxation and income inequality

Table 1 reports the estimated marginal impact of taxation on income inequality from individually including alternative tax instruments. Personal income tax revenue (PIT) has the expected negative impact on income inequality, and the effect is significantly higher in Asia than in the rest of the world. A one percentage point increase in PIT in Asia reduces income inequality by around 0.573 percentage points compared to 0.041 percentage points in the rest of the world. The finding of a greater redistributive effect of personal income taxation may be due to a larger number of people not paying income tax in Asia because their income is below a tax free threshold. A larger share of informal employment may also be a contributing factor.

The overall impact of progressive income tax scales (personal income tax*progressivity) is small and somewhat smaller in Asia than in the rest of the world. A one percentage point increase in PIT progressivity reduces income inequality by around 0.002 percentage points in Asia compared to 0.005 in the rest of the world.

Table 1: Estimated marginal impact of taxation on income inequality (in percentage points)

	Asia	Rest of the world
Personal income tax	-0.573	-0.041
Personal income tax*progressivity	-0.002	-0.005
Corporate income tax	0.598	-0.338
Corporate income tax*globalization	-0.017	0.005
Social security and payroll taxes	1.324	0.165
General taxes on goods and services	0.666	0.768
Excises	0.609	-0.059
Customs duties	0.174	0.651

Including corporate income tax revenue (CIT) in the estimation suggests that corporate income taxation reduces income disparity in the rest of the world but that it is regressive in Asia.[35] A one percentage point increase in CIT raises income inequality by around 0.598 percentage points. This regressivity of CIT in Asia may be due to larger tax concessions and subsidies for firms. However, interacting CIT with globalization reverses the sign. CIT interacted with globalization lowers inequality, which is the opposite from what is expected

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[35] The correlation coefficient between the Gini coefficient and CIT in Asia is about 0.06.

and what is observed in the rest of the world. The finding may be due to higher effective tax rates for foreign firms in Asia compared to domestic firms and than in the rest of the world.

Theory on the incidence of social security contributions and payroll taxes (SSC+Payroll) suggests that imposing these types of tax results in lower wages and higher unemployment. While these taxes are commonly levied equally between employers and employees, they are typically shifted to employees in the form of lower wages, ultimately resulting in increased income inequality. The results in Table 1 provide support to this hypothesis, especially in Asia where the estimated effect of social security contributions and payroll taxes on income inequality is substantially larger than in the rest of the world (1.324 compared to 0.165).

Empirical evidence regarding the effect of general taxes on goods and services (GTGS) on income inequality is mixed. Our results for Asia and for the rest of the world support the hypothesis that they are regressive. The results suggest that a one percentage point increase in GTGS in Asia increases income inequality by around 0.666 percentage points compared to 0.768 in the rest of the world. Somewhat less regressive general taxes on goods and services could be due to lower tax compliance in Asia. Moreover, Asia may have a greater number of small businesses not charging value added taxes (VAT), for example, because their sales are below VAT registration thresholds. Finally, excises and customs duties are also found to be regressive in Asia. The results in Table 1 show an estimated effect of 0.609 percentage points for excises and 0.174 percentage points for customs duties.

Government spending and income inequality

Next, we examine the effect of government spending on income inequality. Table 2 reports the estimated marginal impact of the different types of government spending on income inequality. Including only social protection expenditure in the estimation reduces the sample size by 35 percent, partly reflecting that many countries do not have social safety nets. The estimates suggest that a one percentage point increase in social protection expenditure raises income inequality in Asia by 0.49 percentage points. In the rest of the world, social protection spending has the expected negative sign, i.e. it reduces income inequality.

Social protection expenditures consist of two large components, namely, (i) services and transfers provided to individuals and households, and (ii) expenditures on services provided on a collective basis (IMF, 2001). Collective social protection services include formulation and administration of government policy, formulation and enforcement of legislation and standards for providing social protection, and applied research and experimental development into social protection services. Asian countries provide relatively few services and transfers and the second component is likely to dominate. The unexpected positive effect of social protection on income inequality suggests that government policies and legislative enforcement etc., the second component of social protection expenditure, may benefit higher

income households and individuals more than lower income people. To test this hypothesis, information on the structure of social protection expenditures would be needed, which, however, is not available. Moreover, the unexpected positive effect of social protection may be due to a narrow benefit coverage and a lack of targeting to the poor for the few services and transfers that Asian countries provide.

For education, the results suggest that government expenditures in Asia have a larger negative effect on income inequality than education spending in other countries. In case of expenditures on health, we find that in Asia this type of expenditure has a somewhat lower negative effect on income inequality than in the rest of the world. On the other hand, the estimates suggest that a one percentage point increase in housing expenditure raises income inequality in Asia by 2.162 percentage points, vis-à-vis the rest of the world where housing spending has the expected negative sign, i.e. it tends to reduce income inequality.

Table 2: Estimated marginal impact of government spending on income inequality (in percentage points)

	Asia	Rest of the world
Social protection	0.490	-0.276
Education	-0.486	-0.034
Health	-0.241	-0.330
Housing	2.162	-0.614

Joint effect of taxation and government spending on income inequality

Finally, we include both taxation and government expenditure to evaluate their joint effect on income inequality in Asia and other countries. Including all the variables accounts for scenarios where governments use all the fiscal instruments to affect income inequality. Appendix D presents the findings. The first column reports the estimates with all the tax variables, the second column with all the government expenditure variables, and the third column includes both all tax and all expenditure variables. The results, however, should be interpreted with caution. In the joint estimation a considerable amount of degrees of freedom is lost due to missing data. Moreover, we had to drop the interaction terms between the tax and dummy variables for Asia in the third estimation (including both all tax and all expenditure variables) because of multicollinearity.

Overall, the results support our earlier finding that social protection expenditure has a distinctive differential distributive effect in Asia compared to the rest of the world. Social protection spending appears to increase inequality, while in the rest of the world it has a negative effect on income distribution. The joint estimations also confirm previous findings that housing policies seem to benefit higher income people in Asia to a larger extent than lower income people compared to the rest of the world. Note however, that housing policies

in the rest of the world are now also regressive, whereas they reduced inequality when included on their own.

In the case of education, we find that when all four government expenditure policies are taken into account, spending on education reduces income inequality in Asia somewhat than in the rest of the world, whereas previously it had a slightly larger impact. The opposite holds true for health expenditure. Health spending lowers income inequality in Asia somewhat more than in the rest of the world in the joint estimation compared to the regression that includes health expenditure only.

For taxation, the results from the joint estimation provide further support to the finding that tax policies may not have a large impact on the distribution of income and this seems to be the case both in Asia and in the rest of the world. The results from including all the tax variables (but not the expenditure variables) show that the tax variables are jointly statistically significant but not individually except for the progressivity measure interacted with personal income tax in the rest of the world. Moreover, the signs on the tax variables reverse in several instances. Based on these results, we are therefore unable to conclude in any reliable manner that taxes are effective in redistributing income. At best, they may have a small impact both in Asia and the rest of the world.

V. Improving the effectiveness of fiscal policies in Asia

The review of the literature and our empirical results suggest that more effective redistributional policies can be implemented with spending programs on social welfare and the social sectors, such as health and education policies, than with taxes. However, taxation is crucial to raise financing for government expenditure to achieve distributional objectives. This section discusses the effectiveness of tax systems and tax administration in collecting tax revenue in Asia. Our focus is on corporate and personal income taxation and value added taxes as payroll and social security taxes are less important in Asian countries and tax revenues from foreign trade taxes, including custom duties, are declining with rising trade liberalization. The section also briefly discusses government spending policies on education, health and social protection to throw more light on the econometric findings presented in the previous section. Housing is excluded from the discussion because of lack of readily available data and information.


Tax systems

Taxes create economic costs because they distort economic behavior. A theoretically optimal tax that minimizes the behavioral impact of taxation is one that taxes activities according to their varying responses to the tax (Diamond and Mirrlees, 1971). In practice, however, such

an approach is not feasible because it is constrained by principles of fairness and simplicity, and because of the difficulties to reliably measure the tax sensitivity of particular activities. Practically speaking, an efficient tax system is one that reduces the disincentive effects of taxation to work, save and invest by using broad bases and low fairly uniform rates. A broad base, low rate system also lowers administration and compliance costs, leaving more resources for productive activities, and is often seen as more fair than a narrow base system because of horizontal and vertical equity considerations (Tanzi, 2011).

Composition of taxes

Corporate income taxation is an important part of countries' tax systems. Figure 1 plots corporate income tax revenue as a percent of GDP and (statutory) corporate income tax rates in Asia compared to three country averages: all countries, OECD countries and developing countries excluding Asia. It shows that Malaysia and Vietnam, at 8.1 and 7.7 percent, have the highest level of corporate income tax, while Indonesia, Cambodia and Bangladesh have the lowest, at 1.0, 0.9 and 0.7 percent respectively. Corporate tax collection is low in Indonesia and Bangladesh despite relatively high tax rates partly because of various tax incentives and concessions that governments often provide for attracting investment and for activities seen as having social or economic merit.
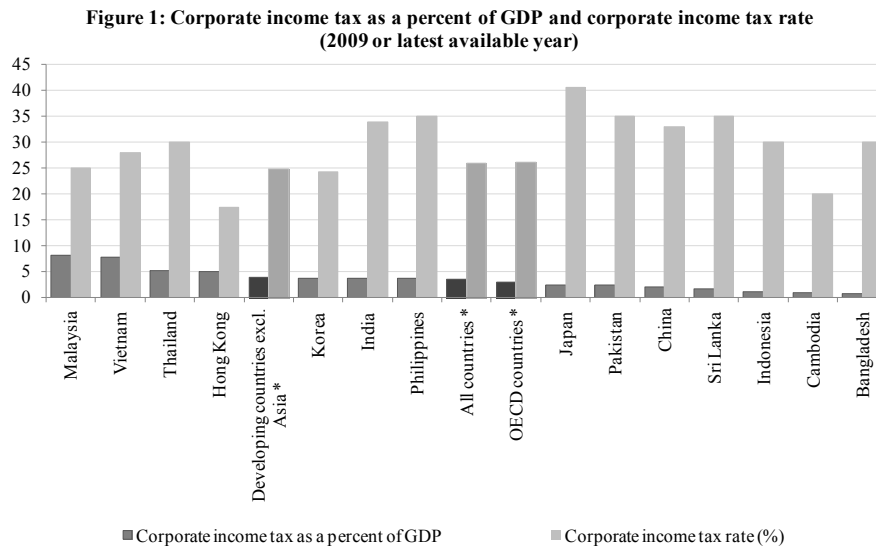
Figure 1: Corporate income tax as a percent of GDP and corporate income tax rate (2009 or latest available year)

Source: IMF GFS Database, OECD Revenue Statistics, CEPAL, KPMG
Note: Sorted from highest to lowest tax revenue as percent of GDP
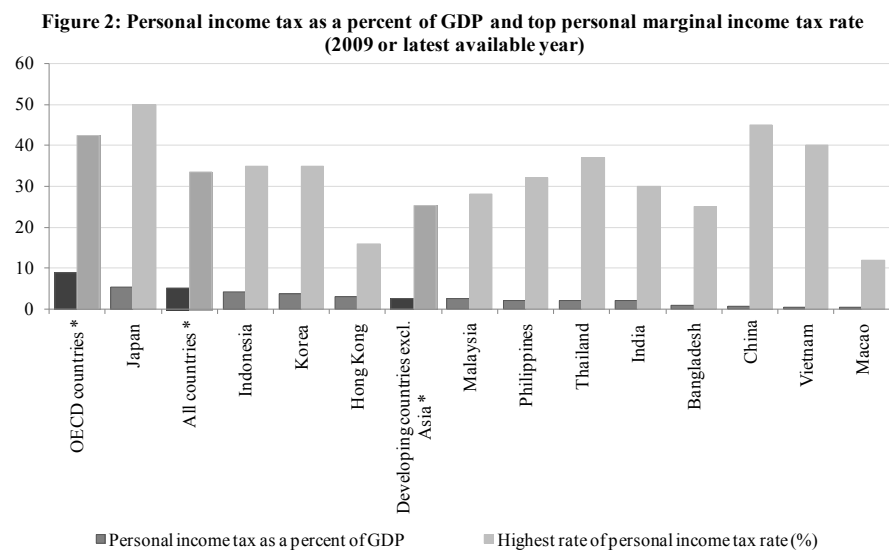* Unweighted average

Besides reducing tax revenue collections, there are other potential costs to tax incentive schemes. Tax incentives often become politicized with resources being captured by interest groups. If lobbying power is concentrated among high income groups, tax incentives and concessions would be expected to reduce the progressivity of corporate income taxation.

Another difficulty with tax incentives schemes is that they are often poorly targeted and to a large extent just subsidize activities that firms would have undertaken regardless of the policies.

Personal income taxation is another important part of countries' tax collection. Figure 2 plots personal income tax revenue as a percent of GDP and the top personal (statutory) marginal income tax rate. It shows that personal income tax collection is low in Asia compared to the rest of the world, OECD countries and developing economies excluding Asia. On average, Asian countries collect about 2.2 percent of personal income tax as a percent of GDP compared to an all country average of 5.2 percent and 8.8 and 2.7 percent in OECD and developing countries excluding Asia. Partly contributing to this relatively low tax take are higher tax free (minimum exempt) thresholds and a higher threshold of income above which the top marginal personal income tax rate applies.

Figure 3 plots the ratio of the tax free threshold / individual allowance or deduction to gross national income per capita. It shows that Nepal and Pakistan, at 3.8 and 3.95, have the highest ratios. Only Korea, Japan and Cambodia have ratios below the average of OECD countries. The higher the tax free threshold, the larger tends to be the number of people exempt from income taxation and the higher the statutory tax rates that are needed to finance government expenditure.

Figure 2: Personal income tax as a percent of GDP and top personal marginal income tax rate (2009 or latest available year)

■ Personal income tax as a percent of GDP   ■ Highest rate of personal income tax rate (%)
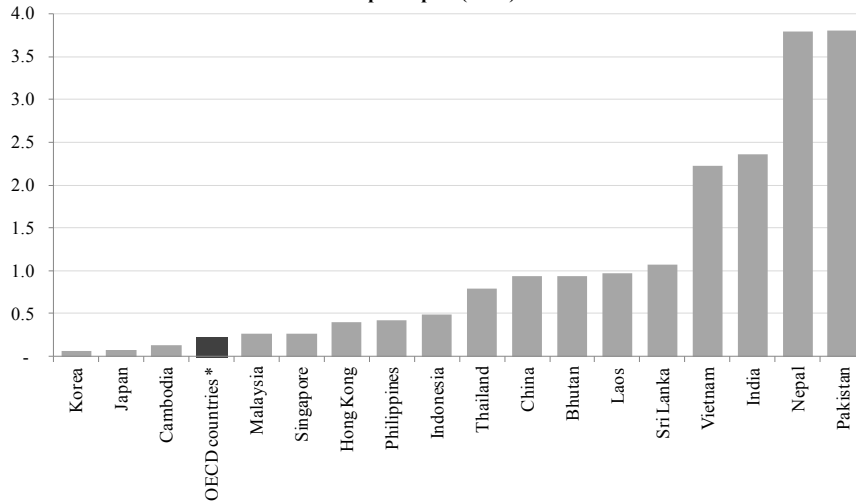
Source: IMF GFS Database, OECD Revenue Statistics, CEPAL, KPMG
Note: Sorted from highest to lowest tax revenue as percent of GDP
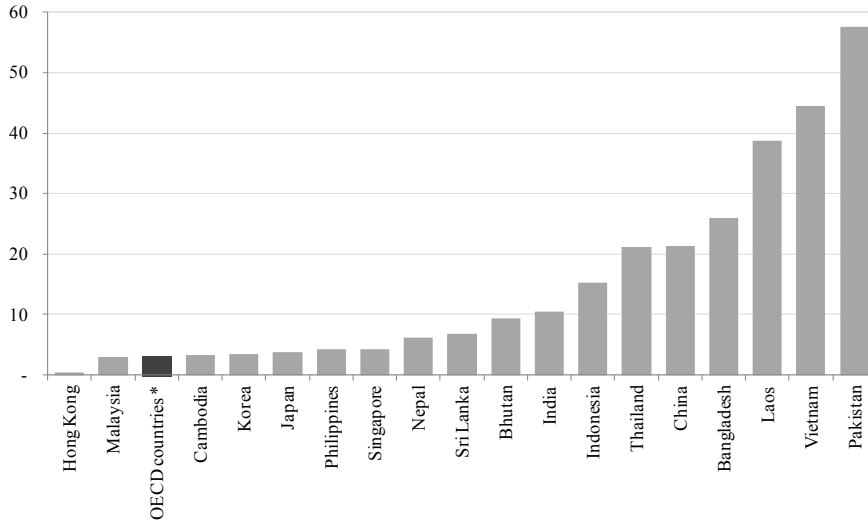* Unweighted average

Figure 3: Ratio of tax free threshold / individual allowance or deduction to gross national income per capita (2012)

Source: IBFD, Asian Development Bank, own calculations
Note: Gross national income per capita for Asian countries is assumed to grow at the 2000 to 2010 rates.
* Unweighted average, data are for 2009 or 2008, no data are available for Turkey

Figure 4 plots the ratio of the top personal income tax threshold to per capita gross national income. At 0.45 Hong Kong has the lowest ratio, while Laos, Vietnam and Pakistan have the highest thresholds, at 388, 444 and 567 percent of per capita gross national income.

Figure 4: Ratio of top personal income tax threshold to gross national income per capita (2012)

Source: IBFD, Asian Development Bank, OECD, own calculations
Note: Gross national income per capita for Asian countries is assumed to grow at the 2000 to 2010 rates.
* Unweighted average, data are for 2009 or 2008, no data are available for Turkey

Also contributing to the relatively low personal income tax take in some Asian countries are narrow personal income tax bases, which exempt certain types of income or tax them at lower rates. In China, for example, only certain listed types of income (eleven categories) are liable to tax. Some of these categories are taxed at progressive rates, while others are taxed at a flat rate. For labor income, wages and salaries are taxed at a progressive rate with a top

marginal rate of 45 percent, but the remuneration of personal services is taxed at a flat rate of 20 percent after a deduction of 20 percent of the payment as deemed expense. Interest is also generally taxed at a flat rate (20 percent), while royalties and rental and lease income are taxed at 20 and 10 percent respectively, with a 20 percent deduction being allowed. Moreover, certain types of income (e.g. monetary awards, interest on government bonds and on savings in a deposit account with Chinese banks) and certain benefits in kind (e.g. provision of or reimbursement for reasonable expenses on accommodation, travel expenses and allowances for children's education) are exempt from personal income taxation altogether.

A further important contributor to countries' tax collection are general taxes on goods and services, which include value added (goods and services) taxes, general sales taxes, and turnover taxes. They are plotted in Figure 5 as a percent of GDP together with countries' indirect tax rate, which generally coincides with the general value added tax (VAT) rate. The figure shows that general taxes on goods and services, similarly to personal income tax, are low in Asia, averaging 3.3 percent of GDP compared to an all country average of 6.4 percent and 6.9 and 6.6 percent in developing countries excluding Asia and OECD economies. This lower tax take partly results from lower indirect tax rates. Among Asian countries, Japan and Singapore, at 5 percent, and Thailand, at 7 percent, have one of the lowest indirect tax rates in the world.
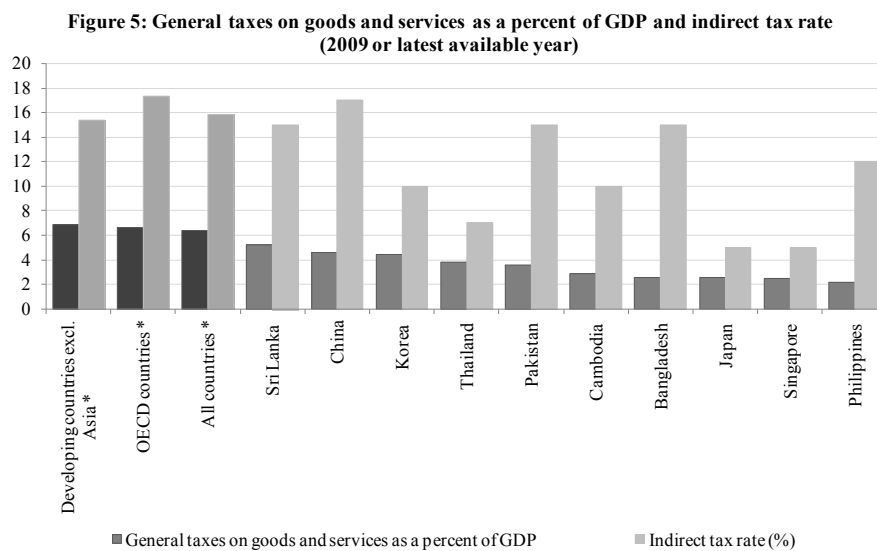
Figure 5: General taxes on goods and services as a percent of GDP and indirect tax rate (2009 or latest available year)

Source: IMF GFS Database, OECD Revenue Statistics, CEPAL, KPMG
Note: Sorted from highest to lowest tax revenue as percent of GDP
* Unweighted average

At 2.2 percent of GDP, the Philippines has the lowest collection of general taxes on goods and services (consisting of value added taxes) despite its 12 percent indirect tax rate. The low value added tax revenues are largely due to the low efficiency of the VAT system. An efficiency ratio, plotted in Figure 6, can be calculated as VAT revenues to GDP divided by

the standard statutory VAT rate (expressed as a percentage). A low efficiency ratio is taken as evidence of erosion by exemptions, reduced rates within the tax law and/or low taxpayer compliance (Ebrill et al., 2001). Bangladesh has the second least efficient VAT system in Asia.

Figure 6: VAT efficiency ratio (2009 or latest available year)
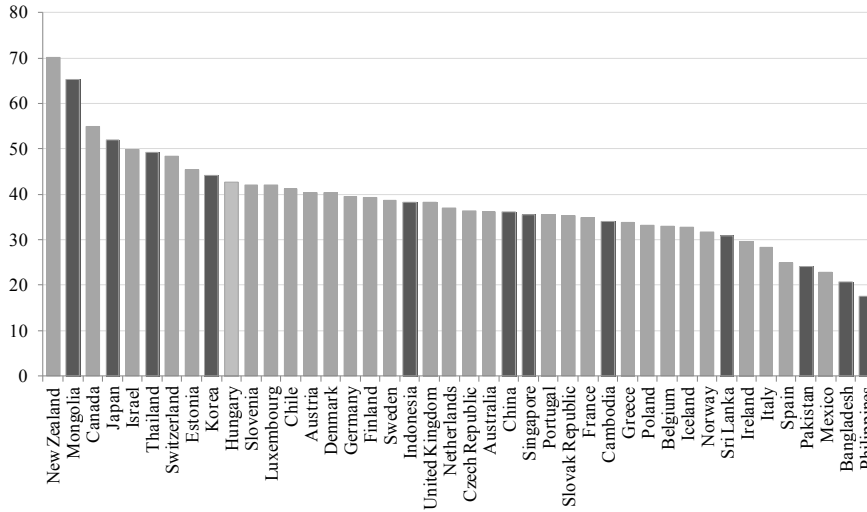
Source: IMF, OECD, KPMG, PWC, Department of Statistics Singapore, own calculations

Singapore also has a relatively low efficiency given the breadth of its VAT base, resulting from an extremely high registration threshold of annual taxable turnover above SGD 1 million or about USD 620,000 (Figure 7).

Figure 7: VAT registration threshold in U.S. dollars (2012)
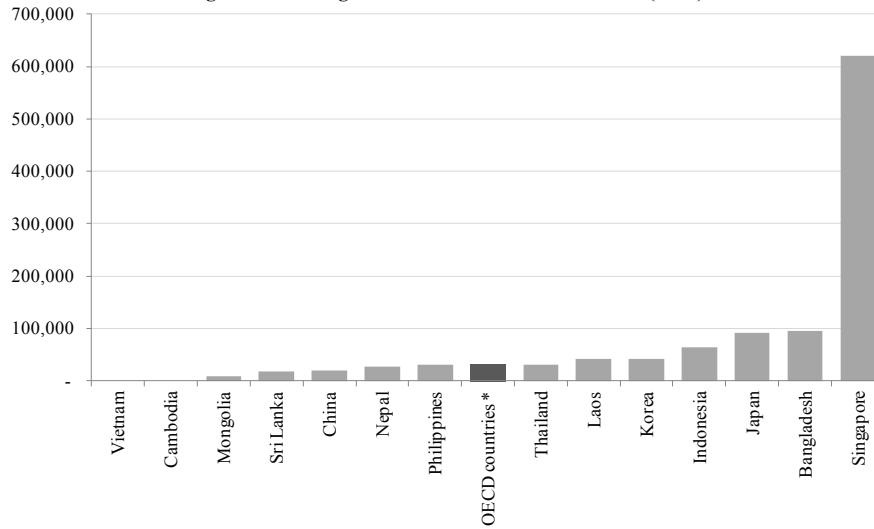
Source: IBFD, Asian Development Bank, OECD, own calculations
Note: Average exchange rates 2000 to 2010 are used.
* Unweighted average, data are for 2011

Although the number of countries with a VAT system has been rising rapidly (Martinez-Vazquez and Bird, 2011), several Asian economies have not adopted a value added tax. They include Bhutan, Hong Kong, Macao, Malaysia, Maldives and Myanmar. India also does not have a value added tax in the traditional sense. A central sales tax is levied on the movement of goods between states and a central value added tax is levied on all goods that are produced or manufactured in India.

Lower reliance on value added taxes in Asian countries is likely to increase the economic costs of taxation as value added taxes are one of the least distortionary taxes (Auerbach 2008; Banks and Diamond 2010). The economic costs of value added taxes are lower because typically, VAT is charged at a uniform, relatively low rate to a (more or less) comprehensive and broad base. This lowers the economic costs of taxation, which tend to increase with higher tax rates and narrower tax bases. Moreover, value added taxes, in theory, do not distort business or export decisions. This is because the tax paid on production inputs and exports is deductible. Also, value added taxes are less distortionary than other taxes because they do not affect savings and investment decisions, i.e. they do not distort between current and future consumption.

Tax administration and compliance costs

Limited information is available on tax administration costs in Asian countries. Figure 8 plots tax administration expenditure as a percent of GDP for six Asian countries, India, Indonesia, Japan, Korea, Malaysia and Singapore, and the OECD economies. It shows that administration costs in Asia are relatively low, at least in the countries for which data are available. This is partly because of less revenue collection. Also contributing to low tax administration expenditure in Indonesia, India, Singapore and Korea is efficient tax administration. This can be seen in Figure 9 which compares the administrative costs of collecting 100 units of revenue. Indonesia has the 7th lowest costs, India the 10th lowest, while Singapore and Korea rank 13th and 14th, respectively.

Figure 8: Tax administration expenditure as percent of GDP (2009)
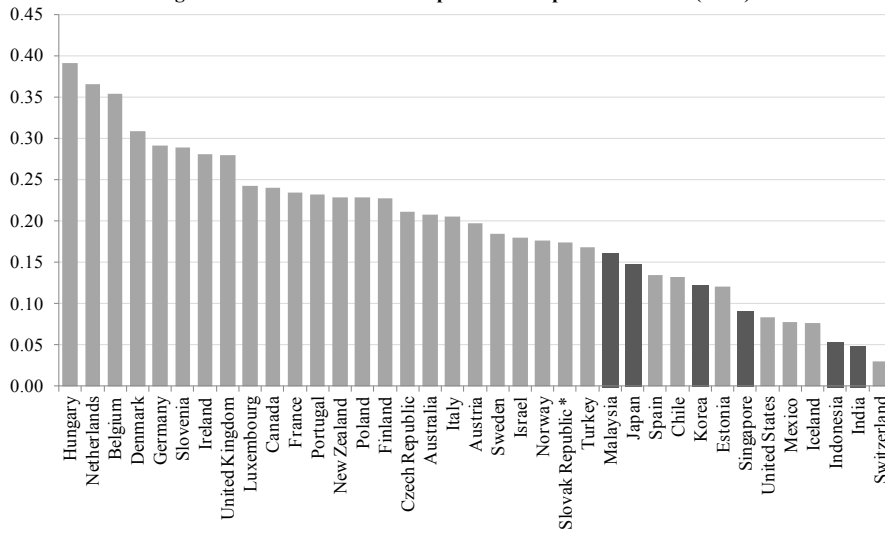
Source: OECD
* Data are for 2007

**Figure 9: Tax administration costs to net revenue collections
(2009, costs per 100 units of revenue)**
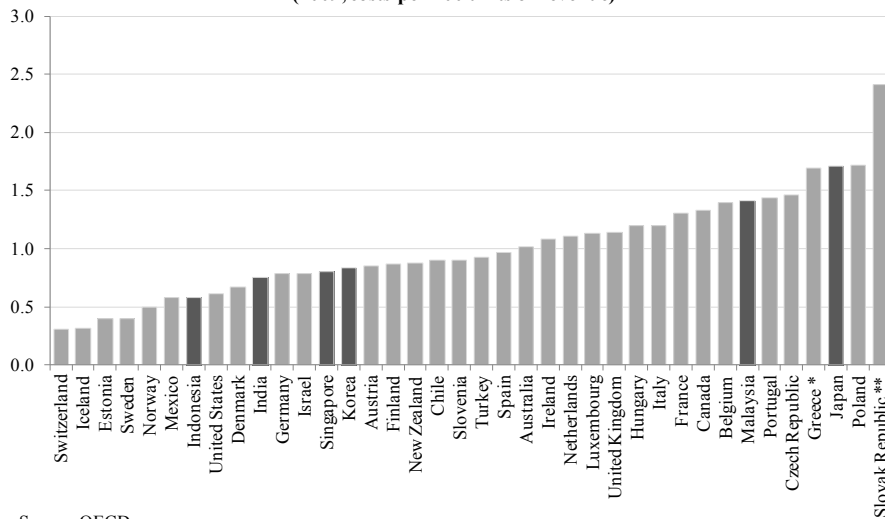
Source: OECD
* Data are for 2004
** Data are for 2007

The ease with which taxpayers are able to comply with the tax system varies across countries. Figure 10 plots the total time to comply with taxes in hours per year. Compliance costs in Asia are lowest in Maldives (largely because Maldives does not levy taxes on goods and services or income taxes other than on the net profit of banks based on their annual financial statements), Hong Kong and Singapore. They are highest in China, Pakistan and Vietnam, partly because of complicated tax systems in these countries.

Figure 10: Total time to comply in hours per year (2012)
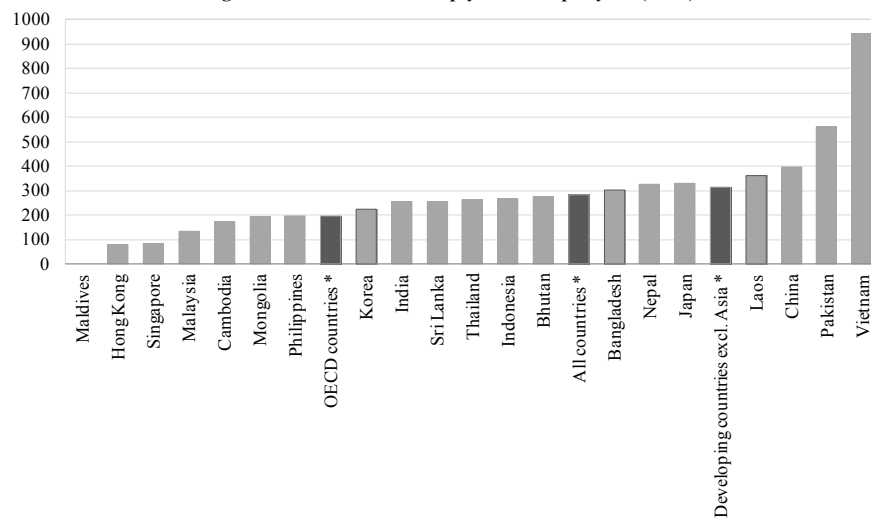
Source: World Bank
* Unweighted average

Complicated tax systems increase tax administration and compliance costs as well as the opportunity for tax planning and tax avoidance. Moreover, narrow base, high rate tax systems are often seen as unfair because higher income taxpayers generally have greater scope and resources to shift income to avoid higher tax rates. Unfair tax systems can reduce people's and businesses' willingness to pay taxes and hence the government's ability to raise financing to fund government expenditure.

The above discussion suggests the following. Some Asian countries have relatively high tax rate and narrow base tax systems. This may reduce the efficiency of tax collection. Moreover, these types of tax system are often seen as unfair. They increase tax administration and compliance costs and may affect governments' ability to raise taxes. In addition, there seems to be greater reliance on corporate income taxation in Asia, which tends to be more distortionary (because of internationally mobile capital) than personal income taxation and value added taxes.

Government expenditure policies

Turning to government expenditures, Asia has made considerable progress in improving education and health outcomes and toward achieving the millennium development goals (MDGs) and targets. The millennium development goals were adopted by world leaders in September 2000 to reduce extreme poverty with a deadline of achieving a series of targets by 2015. The second millennium development goal focuses on education (achieving universal primary education) and goals four to six center on health (reducing child mortality;

improving maternal health; and combating HIV/AIDS, malaria and other diseases). Progress in Asian countries has been substantial particularly in education.

Primary school enrollment and the number of students who start grade one and reach the last grade of primary education have been rising and several countries have achieved or are expected to reach the set goals by 2015. Moreover, literacy rates in Asia are high. Most Asian countries have rates that are above the world average and those economies with rates below (Cambodia, Laos, Nepal, India, Bangladesh and Pakistan) have made considerable progress to raise them. These achievements are likely to be a contributing factor in our finding that education expenditure is reducing income inequality in Asia as government spending on primary education has been found to be progressive.

Progress has also been made toward improving health conditions. Maternal death rates have fallen sharply in Asia with better attendance at birth of trained health professionals and improved antenatal care. Infant and child mortality rates are also falling although only a few countries so far have reached the MDG target. The progress that has been made is likely to have benefitted poor families in particular as infant and child mortality is closely related to household wealth. Infants in poor households are often less than half as likely to survive their first year of life than those in higher wealth households (Asian Development Bank, 2011). Death and incidence rates of tuberculosis also have been declining. But HIV/AIDS remains a problem with the percentage of the population with comprehensive, correct knowledge about the illness and the percentage of the population with advanced HIV infection who have access to antiretroviral drugs being relatively low and only rising slowly in some countries from a low base.

For social protection, overall coverage remains relatively low in Asia and generally is only available to formal sector workers, in the civil service or large enterprises. Moreover, the availability of social protection programs does not necessarily imply that they are well designed, have wide coverage or are financially sustainable (Asher, 2010). Few countries have income support systems for the unemployed (e.g. Korea, Hong Kong, Japan, Mongolia, Thailand, China, Mauritius and Vietnam) with coverage rates in terms of the proportion of unemployed who receive benefits being less than 10 percent on average (International Labor Office, 2010). Effective coverage of work related accidents and diseases is also low with only a proportion of accidents being reported and compensated. In the informal sector, unemployment coverage is virtually non-existent and working conditions and safety are typically poor and work related diseases are widespread.

With regard to income security in old age, although some Asian countries have made efforts to extend coverage beyond the formal sector, the proportion of working age population covered by contributory programs remains low at around 20 percent (International Labor Office, 2010) and few countries have social pensions to provide safety net retirement income for people who were not members of a formal scheme. Moreover, pension systems in Asian

countries, outside the OECD, are often quite generous due to early retirement ages and relatively high pension levels (OECD, 2012). According to OECD estimates, replacement rates, which measure the value of a person's pension as the percentage of their earnings when working, are well above OECD levels for men in Asia, especially in China, Pakistan and Vietnam. The high replacement rates are partly due to nearly all defined-benefit schemes being based on final salaries rather than average earnings. Such schemes tend to be particularly regressive because the higher paid typically have salaries that rise more rapidly with age, while the earnings of lower paid workers generally remain flat or rise less fast. Furthermore, the OECD estimates that the expected amount of time that people spend in retirement, which can be calculated by combining information on national pension ages and life expectancy, is relatively high in Asia. Pension eligibility ages are particularly low for both men and women in Malaysia and Sri Lanka and for women in China and Thailand.

The above discussion offers some potential explanation for our finding that education and health expenditures in Asia have reduced income inequality, while social security spending has mainly benefitted higher income people. Basic education and health services seem to be fairly universally available, whereas social protection spending has been restricted to those already likely to be better off, i.e. people employed in the formal sector. This suggests that labor market reform that moves workers from informal to formal employment, may offer the greatest scope of reducing income inequality in Asia. Higher formal employment should also raise personal income tax collection, which could further assist governments in achieving redistributive objectives.

VI. Conclusions and policy lessons

This paper assessed the impact of government fiscal policies on income inequality in Asia. It discussed the role and effectiveness of redistributive fiscal policies and quantified the effects of taxation and government expenditure on income distributions. Panel estimation for 150 countries with data between 1970 and 2009 confirmed international empirical findings for Asia. Tax systems tend to be progressive but government expenditures are a more effective tool for redistributing income.

Government expenditures on health and education were found to reduce income inequality in Asia and the rest of the world. Moreover, the results suggested some distinctive differential distributive effect for government spending on social protection. Social protection expenditure in Asia appears to increase income inequality, whereas it reduces it in the rest of the world. Also adversely affecting the distribution of income in Asian countries is government expenditure on housing.

For taxation, policies in Asia were found to have a less distinctive differential distributive impact. However, the results provided some evidence that personal income taxes are more

progressive in Asia than in the rest of the world, possibly because of a larger number of people not paying income tax. Corporate income taxes, on the other hand, may be less progressive. This could be due to larger tax incentives, exemptions and concessions for Asian firms.

Although taxes by themselves are less effective in redistributing income, taxation is crucial to raise financing for government expenditure to achieve distributional objectives through spending programs on social welfare and the social sectors, such as health and education policies. The discussion in this paper suggested that taxes could be raised more efficiently in some Asian countries. Practically speaking, an efficient tax system is one that reduces the disincentive effects of taxation to work, save and invest by using broad bases and low fairly uniform rates. A broad base, low rate system also reduces administration and compliance costs and is often seen as more fair than a narrow base system because of horizontal equity considerations (taxpayers who have the same income should pay the same amount in taxes) and vertical equity concerns (people with different incomes should pay different amounts of tax).

The tax systems in several Asian countries are characterized by relatively high tax rates and narrow bases. Moreover, there seems to be greater reliance on corporate income taxation, which tends to be more distortionary (because of internationally mobile capital) than personal income taxation and value added taxes. Tax reform in Asia should therefore focus on lowering income tax rates while broadening the tax base, i.e. abolishing tax incentives, exemptions and concessions. This would reduce the economic, compliance and administrative costs of taxation and likely lead to increases in tax revenue. Increases in tax revenue, in turn, would allow greater government expenditure to achieve distributional objectives. Further gains could be achieved in some countries by shifting the tax burden from income taxation to value added taxes and broadening the value added tax base. Currently, VAT exemptions and/or reduced tax rates for necessities are often used to address the potential regressivity of value added taxes. However, they are costly and not well targeted to the poor. A more effective policy would be direct cash transfer payments to those in need.

With respect to government spending policies, Asia has made substantial progress toward achieving the millennium development goals and targets on education and health. However, social protection policies generally remain limited in Asia and in countries where they exist they tend to have a narrow benefit coverage and lack targeting to the poor. For instance, unemployment benefits are typically restricted to those in formal employment and do not include the large proportion of people in informal work. Pensions are another example. In Asian countries, outside the OECD, pension systems are often quite generous due to early retirement ages and relatively high pension levels but they are typically only available to a privileged minority.

Appendix A: Description of variables and sources

Variable	Description	Source
Gini	Gini coefficient, expressed as a percentage	World Income Inequality Database V2.0c May 2008
Net	Net income Gini concept	World Income Inequality Database V2.0c May 2008
Gross	Gross income Gini concept	World Income Inequality Database V2.0c May 2008
Population growth	Annual population growth rate for year t is the exponential rate of growth of midyear population from year t-1 to t, expressed as a percentage	World Bank Development Indicators
Youth dependency	Ratio of younger dependents (people younger than 15) to the working-age population (those ages 15-64), expressed as the proportion of dependents per 100 working-age population	World Bank Development Indicators
Old-age dependency	Ratio of older dependents (people older than 64) to the working-age population (those ages 15-64), expressed as the proportion of dependents per 100 working-age population	World Bank Development Indicators
Unemployment	Number of people with continuous periods of unemployment extending for a year or longer, expressed as a percentage of the total unemployed	World Bank Development Indicators
Schooling	Average years of total	Barro and Lee (2010)
GDP per capita	Annual GDP per capita (constant 2000 US$)	World Bank Development Indicators
Inflation	Annual percent change in consumer prices	World Bank Development Indicators
Globalization	Globalization index	Dreher (2006) and Dreher et al. (2008)
Corruption	Corruption index	International Country Risk Guide, The PRS Group

PIT	Personal income tax (percent of GDP)	IMF GFS Database, OECD Revenue Statistics, CEPAL
Progress	Average rate progression up to an income level equivalent to four times countries' per capita GDP in local currency	Sabirianova Peter et al. (2010)
CIT	Corporate income tax (percent of GDP)	IMF GFS Database, OECD Revenue Statistics, CEPAL
SSC+Payroll	Social security and payroll taxes (percent of GDP)	IMF GFS Database, OECD Revenue Statistics, CEPAL
GTGS	General taxes on goods and services (percent of GDP)	IMF GFS Database, OECD Revenue Statistics, CEPAL
Excises	Excises (percent of GDP)	IMF GFS Database, OECD Revenue Statistics, CEPAL
Customs	Customs duties (percent of GDP)	IMF GFS Database, OECD Revenue Statistics, CEPAL
Total revenues	Total government revenues (percent of GDP)	IMF GFS Database, OECD Revenue Statistics, CEPAL
Social protection	Government expenditures on social protection (percent of GDP)	IMF GFS Database, OECD Social Expenditure Database, International Food Policy Research Institute (IFPRI)
Education	Government education expenditures (percent of GDP)	IMF GFS Database, OECD Social Expenditure Database, International Food Policy Research Institute (IFPRI)
Health	Government health expenditures (percent of GDP)	IMF GFS Database, OECD Social Expenditure Database, International Food Policy Research Institute (IFPRI)
Housing	Government housing expenditures (percent of GDP)	IMF GFS Database, OECD Social Expenditure Database, International Food Policy Research Institute (IFPRI)

Appendix B: Taxation and income inequality in Asia

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Gini$_{-1}$	-0.071***	0.078*	0.159***	0.005	0.020	0.273***	-0.029*
	(0.009)	(0.043)	(0.019)	(0.023)	(0.015)	(0.012)	(0.017)
Net	4.257***	3.558**	4.768***	3.073**	5.771***	6.079***	3.691*
	(0.494)	(1.517)	(0.676)	(1.217)	(1.794)	(0.588)	(1.950)
Gross	3.829***	6.633***	3.863***	3.580**	5.091***	7.178***	3.981**
	(0.557)	(1.766)	(0.741)	(1.522)	(1.587)	(0.821)	(1.713)
Population growth	-0.084	-0.269	-0.139	0.351**	0.051	0.063	-0.178**
	(0.060)	(0.466)	(0.125)	(0.179)	(0.179)	(0.081)	(0.077)
Youth dependency	-0.015	0.114**	-0.076***	-0.027	0.041**	-0.075***	-0.017
	(0.022)	(0.044)	(0.024)	(0.029)	(0.018)	(0.027)	(0.024)
Old-age dependency	-0.197**	-0.360	-0.238*	-0.290**	-0.512***	-0.278***	-0.511***
	(0.079)	(0.270)	(0.126)	(0.138)	(0.178)	(0.062)	(0.119)
Schooling	-0.481***	-0.094	-0.494***	-0.208**	-0.675***	-0.528***	-0.395***
	(0.028)	(0.125)	(0.064)	(0.081)	(0.105)	(0.059)	(0.070)
Unemployment	0.093***	0.069**	0.067***	0.105***	0.139***	0.089***	0.097***
	(0.010)	(0.029)	(0.019)	(0.013)	(0.017)	(0.009)	(0.012)
GDP per capita	2.410***	1.046	0.671	0.860	3.025***	0.017	4.462***
	(0.710)	(1.800)	(1.095)	(1.014)	(0.838)	(0.409)	(0.942)
(GDP per cap)^2	-0.192***	-0.108	-0.048	-0.083	-0.242***	0.072*	-0.335***
	(0.074)	(0.198)	(0.123)	(0.102)	(0.079)	(0.043)	(0.085)
Globalization	0.101***	0.103***	0.078***	0.103***	0.115***	0.099***	0.102***
	(0.007)	(0.023)	(0.012)	(0.011)	(0.008)	(0.008)	(0.012)
Corruption	0.405***	0.013	0.306***	0.395***	0.328***	0.172***	0.348***
	(0.028)	(0.068)	(0.020)	(0.057)	(0.043)	(0.037)	(0.030)
Inflation	0.094***	0.098***	0.033**	0.069***	0.101***	0.079***	0.068***
	(0.007)	(0.014)	(0.013)	(0.012)	(0.016)	(0.022)	(0.012)
Total revenues	-0.015	0.040**	-0.014	-0.046***	-0.113***	0.000	-0.053***
	(0.011)	(0.018)	(0.015)	(0.018)	(0.012)	(0.007)	(0.013)
PIT		-0.041					
		(0.105)					
PIT*Asia		-0.532**					
		(0.222)					
PIT*Progress		-0.005***					
		(0.000)					
PIT*Progress*Asia		0.003					
		(0.011)					

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
CIT			-0.338*				
			(0.193)				
CIT*Asia			0.936**				
			(0.394)				
CIT*Globalization			0.005**				
			(0.003)				
CIT*Globalization*Asia			-0.022***				
			(0.007)				
SSC+Payroll				0.165			
				(0.145)			
SSC+Payroll*Asia				1.159			
				(0.919)			
GTGS					0.768***		
					(0.134)		
GTGS*Asia					-0.102		
					(0.313)		
Excises						-0.059	
						(0.042)	
Excises*Asia						0.668***	
						(0.228)	
Customs							0.651***
							(0.165)
Customs*Asia							-0.477
							(0.575)
Constant	33.404***	22.215***	30.954***	31.699***	29.774***	25.715***	34.261***
	(1.296)	(4.094)	(2.440)	(2.747)	(3.144)	(1.556)	(1.831)
Number of observations	907	539	822	844	879	804	842
Number of countries	77	53	74	72	76	70	73
Sargan (p-value)	0.785	0.741	0.799	0.789	0.810	0.863	0.885
AR2 (p-value)	0.374	0.349	0.344	0.344	0.418	0.235	0.319

Standard errors are in parentheses; *** $p<0.01$, ** $p<0.05$, * $p<0.1$

To interpret the coefficient estimates the following rule applies: Beta1*Var1+Beta2*Var1*Asia, where Beta1 and Beta2 are the estimated coefficients, Var1 is the variable in question, and Asia is the dummy variable that equals one if the country is in Asia and zero otherwise. Thus, for Asian countries the marginal effect of variable Var1 is equal to (Beta1+Beta2), while for the rest of the world it is Beta1 (since Asia = 0).

Appendix C: Government expenditure and income inequality in Asia

	(1)	(2)	(3)	(4)	(5)
Gini$_{-1}$	-0.071***	-0.102***	-0.048***	-0.048***	-0.158***
	(0.009)	(0.012)	(0.016)	(0.014)	(0.026)
Net	4.257***	7.155***	5.902***	-0.021	6.192***
	(0.494)	(1.991)	(1.411)	(2.340)	(1.348)
Gross	3.829***	6.249***	3.087**	-1.404	4.657***
	(0.557)	(2.298)	(1.483)	(2.213)	(1.336)
Population growth	-0.084	0.038	0.430**	0.510***	2.419***
	(0.060)	(0.232)	(0.170)	(0.191)	(0.648)
Youth dependency	-0.015	0.027	-0.035	0.042	0.141***
	(0.022)	(0.040)	(0.060)	(0.038)	(0.037)
Old-age dependency	-0.197**	-0.244	-0.678	-0.473**	-0.436
	(0.079)	(0.154)	(0.440)	(0.188)	(0.286)
Schooling	-0.481***	0.135	-0.393***	-0.512***	-0.189
	(0.028)	(0.174)	(0.121)	(0.144)	(0.172)
Unemployment	0.093***	0.123***	0.076***	0.119***	0.109***
	(0.010)	(0.022)	(0.014)	(0.012)	(0.021)
GDP per capita	2.410***	2.190	1.562	3.186***	0.106
	(0.710)	(1.540)	(1.705)	(0.973)	(1.605)
(GDP per cap)^2	-0.192***	-0.282	-0.177	-0.288***	-0.150
	(0.074)	(0.182)	(0.152)	(0.102)	(0.135)
Globalization	0.101***	0.080***	0.137***	0.141***	0.239***
	(0.007)	(0.019)	(0.020)	(0.019)	(0.020)
Corruption	0.405***	0.116	0.133	0.211**	0.274**
	(0.028)	(0.113)	(0.112)	(0.105)	(0.128)
Inflation	0.094***	0.096***	0.089***	0.068***	0.003
	(0.007)	(0.019)	(0.015)	(0.023)	(0.022)
Total revenues	-0.015	-0.053**	-0.052**	-0.000	0.019
	(0.011)	(0.023)	(0.022)	(0.012)	(0.018)
Social protection		-0.276***			
		(0.058)			
Social protection*Asia		0.766			
		(0.591)			
Education			-0.034		
			(0.133)		
Education*Asia			-0.452		
			(0.566)		
Health				-0.330***	
				(0.089)	
Health*Asia				0.089	
				(1.474)	
Housing					-0.614***
					(0.144)
Housing*Asia					2.776***
					(0.974)
Constant	33.404***	31.406***	39.847***	35.601***	19.474***
	(1.296)	(3.561)	(7.068)	(4.293)	(4.476)
Number of observations	907	596	625	672	482
Number of countries	77	64	65	70	60
Sargan (p-value)	0.785	0.801	0.731	0.756	0.798
AR2 (p-value)	0.374	0.345	0.307	0.300	0.405

Standard errors are in parentheses; *** p<0.01, ** p<0.05, * p<0.1
See Appendix B for the interpretation of the interaction terms.

Appendix D: Joint effect of taxation and government expenditure on income inequality in Asia

	(1) [+]	(2) [++]	(3) [+++]
Gini₋₁	-0.092*	-0.077	-0.169***
	(0.055)	(0.053)	(0.064)
Net	2.925	7.384***	3.131**
	(3.605)	(0.881)	(1.321)
Gross	5.081	6.053***	8.616***
	(3.361)	(1.083)	(1.855)
Population growth	-0.496	1.632***	1.201*
	(0.837)	(0.533)	(0.715)
Youth dependency	0.073	0.193	0.035
	(0.187)	(0.125)	(0.179)
Old-age dependency	0.896	-0.663**	-0.010
	(0.747)	(0.274)	(0.393)
Schooling	-0.011	-0.401	-0.910
	(0.560)	(0.588)	(0.707)
Unemployment	0.157	0.186**	0.069
	(0.151)	(0.083)	(0.125)
GDP per capita	-3.478	1.362	-5.423
	(4.112)	(3.191)	(3.842)
(GDP per cap)^2	0.331	-0.179	0.357
	(0.423)	(0.289)	(0.357)
Globalization	-0.157	0.152**	0.048
	(0.183)	(0.063)	(0.116)
Corruption	-0.120	0.426	0.267
	(0.265)	(0.265)	(0.321)
Inflation	0.132	0.073	0.094
	(0.269)	(0.078)	(0.261)
PIT	0.580		-0.145
	(0.545)		(0.242)
PIT*Asia	1.792		
	(1.442)		
PIT*Progress	-0.005***		-0.005
	(0.001)		(0.005)
PIT*Progress*Asia	0.119		
	(0.154)		
CIT	-2.342		-2.067
	(3.553)		(1.926)
CIT*Asia	-2.853		
	(3.875)		
CIT*Globalization	0.027		0.026
	(0.045)		(0.024)
CIT*Globalization*Asia	0.066		
	(0.074)		
SSC+Payroll	-0.149		-0.328
	(0.487)		(0.259)
SSC+Payroll*Asia	-0.026		
	(1.916)		
GTGS	0.294		0.180
	(0.849)		(0.347)
GTGS*Asia	0.666		
	(1.380)		
Excises	0.079		0.522
	(0.452)		(0.452)

Excises*Asia	4.467		
	(3.655)		
Customs	-1.009		-1.147
	(1.258)		(0.982)
Customs*Asia	3.634		
	(3.691)		
Social protection		-0.338**	-0.074
		(0.135)	(0.142)
Social protection*Asia		0.845	3.402***
		(0.620)	(1.020)
Education		-0.162	-1.406***
		(0.291)	(0.486)
Education*Asia		0.037	0.161***
		(0.026)	(0.049)
Health		-0.211	-0.023
		(0.268)	(0.412)
Health*Asia		-0.582	-2.263***
		(0.411)	(0.674)
Housing		0.049	0.352
		(0.235)	(0.531)
Housing*Asia		0.274	0.640***
		(0.177)	(0.179)
Constant	26.766*	9.369	0.000
	(16.234)	(13.970)	(0.000)
Number of observations	520	409	258
Number of countries	52	54	41
Sargan (p-value)	0.890	0.751	0.721
AR2 (p-value)	0.389	0.368	0.371

Standard errors in parentheses; *** $p<0.01$, ** $p<0.05$, * $p<0.1$

See Appendix B for the interpretation of the interaction terms.

[+] Tax policy variables are jointly significant at 1% level.

[++] Government spending variables are jointly significant at 10% level.

[+++] Since the interaction terms between the tax variables and "Asia" are dropped in the estimation due to collinearity, estimated coefficients on tax variables refer to the world average (including Asian countries in the sample).

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