Since 2006, PwC has been working with the World Bank and IFC to measure how burdensome the tax system is in different economies using three simple indicators: the Total Tax Rate of a case study company as a percentage of profits; the number of different payments which businesses need to deal with; and the time spent by businesses dealing with tax compliance. This Appendix describes the statistical analysis we have carried out into the relationship between these measures of the impact of the tax system in different economies and their economic growth and ability to attract overseas investment.

Relatively high rates of taxation on business activity, and the time and effort which companies need to spend on dealing with tax matters both have a potentially negative impact on economic growth and the ability to attract overseas investment. Avoiding these negative impacts is a major driver for tax reform.

The Paying Taxes database allows us to analyse these effects over a number of years and make some provisional estimates of how strong the boost to growth and investment from tax reforms might be affecting business taxation. We now have eight years’ of data, covering the period 2004 to 2011.

For this purpose we have analysed the experience of 166 economies in our study and examined the impact of both the level of taxation on businesses in these economies and its complexity on their rate of growth and the growth of inward investment. The results are very striking.

**Regression analysis of taxation, economic growth and foreign direct investment**

Andrew Sentance, Senior Economic Adviser, PwC (UK)

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**Taxation and economic growth**

In our regression analysis, we looked at the relationship between the GDP (gross domestic product) growth rate in the 166 economies and the three main tax variables measured in the Paying Taxes survey. In terms of the impact on economic growth, we considered the possibility that the average burden of tax – as measured by the three Paying Taxes measures over the period 2004 to 2011 - might have had a negative impact on the rate of economic growth. This allows us to analyse the potential benefit to economic growth when economies which are actively taking steps to reduce the burden of the tax system on businesses.

There were therefore six potential explanatory variables from the Paying Taxes survey – the average level of the three tax measures and the change in each of these measures. In addition we sought to control for the starting level of GDP/head in each economy as poorer economies have more scope for higher growth from their ability to catch up with the richer ones. This created an additional seventh explanatory variable in our analysis.

The results of our analysis are shown in Table A1. Variables which did not have a significant impact, using the standard “t-ratio” were excluded from the analysis. We also combined the change in the payments and time tax measures into a single weighted measure capturing the change in the complexity of the tax system. The economic growth data and GDP per capita was drawn from the IMF (International Monetary Fund) World Economic Outlook database, which means that some of the GDP growth figures are estimates, where economies are slow to compile their GDP estimates.

www.pwc.com/payingtaxes
Our analysis supports the view that the tax system creates a drag on economic growth, through three main channels – the absolute size of the tax rate faced by companies; the burden of the number of tax payment systems which a business is required to deal with; and changes in the complexity of the tax system – which reflects a weighted aggregate of the time and payments measures in the Paying Taxes survey.

The elasticity of economic growth in relation to changes in the Total Tax Rate is just below 0.01%. This would imply that a 10% reduction in the tax rate on business profits could create a 0.1% boost to economic growth. Though this effect does not appear to be large, it could be significantly reinforced by changes that made the tax system more efficient and less complex, as the other coefficients in the estimated equation show.

We need to exert caution in interpreting our results, as changes in the tax system may well be correlated with other changes which improve the business climate in an economy and hence raise growth. On the other hand, we have only sought to analyse the effects of these tax variables over a relatively short period. Changes in the tax system and the business environment more generally may take decades to be fully reflected in the rate of economic growth.

### The tax system and inward investment

We also carried out a similar analysis for changes in the stock of inward FDI (foreign direct investment). This data was derived from the UNCTAD (United Nations Conference and Trade Development) statistical database and is measured in dollars. Our analysis suggests that the administrative aspects of the tax system did not have a noticeable effect on inward investment, but the total tax burden as a percentage of profits had a bigger impact. A 10% cut in the Total Tax Rate could boost the growth of inward investment by 0.7% per annum according to our analysis. Again, while this effect looks small, it suggests that over two decades, a 10% tax rate cut could cumulatively raise the stock of inward direct investment by around 15%.

The fact that inward investment appears to be more sensitive to the overall tax rate and less sensitive to the administrative tax burden may reflect the fact that a complex and time-consuming tax system has a bigger negative impact on small and medium-sized enterprises who are less involved with flows of international investment. Larger companies have the management systems to cope with complex tax systems, but will still tend to shift their investment flows to locations where the overall tax burden – as measured by the PwC Total Tax Rate measure – is lower.

### Table A1: Impact of tax variables on economic growth and investment, 2004-11 (% per annum)

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>GDP growth, 2004–11 (%)</th>
<th>Growth in stock of foreign direct investment, 2004-11 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>12.4 (9.3)</td>
<td>39.4 (7.7)</td>
</tr>
<tr>
<td>Total Tax Rate (%)</td>
<td>-0.008 (1.8)</td>
<td>-0.07 (3.1)</td>
</tr>
<tr>
<td>Number of tax payments</td>
<td>-0.03 (2.6)</td>
<td>-</td>
</tr>
<tr>
<td>Change in tax complexity*</td>
<td>-0.028 (3.0)</td>
<td>-</td>
</tr>
<tr>
<td>GDP per capita in 2004 (natural log)</td>
<td>-0.89 (6.6)</td>
<td>-2.4 (4.2)</td>
</tr>
<tr>
<td>R-squared (%)**</td>
<td>22.4</td>
<td>11.6</td>
</tr>
</tbody>
</table>

* Weighted average of change in tax payments (96%) and tax time measures (4%). Note that the tax time measures are much larger in absolute size, hence the substantially reduced weighting.

** The R-squared statistic captures the amount of the statistical variation explained by the variables in the equation. Given all the factors which can potentially affect the rate of growth and inward investment across different countries, these relatively low figures are not surprising for a cross-sectional analysis of this sort.

Note: Figures in brackets are the absolute value of the T-statistics on the estimated coefficient. A T-statistic of around two or above carries a 95% probability or less that the estimated effect is significantly different from zero.