ASSESSING THE IMPACT OF DOING BUSINESS INDICATORS ON THE GDP GROWTH IN EGYPT

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ABSTRACT

There are many factors that affect the growth in a country’s GDP. This paper will empirically investigate the impact of selected Doing Business Indicators (DBIs) on economic growth in a sample 183 countries. The sample was chosen on the basis of cross sectional data, to assure that there are no missing observations and therefore assure consistency of the estimators. The variables were chosen on the basis of the significance for the ease of doing business.

This paper analysed the Egyptian performance on the doing business since 2004 to 2010, and compared it to the performance in the investment and economic growth during the same period.

The paper found that measures rules affecting the scope, accessibility and quality of credit information available through either public or private credit registries is positively correlated with GDP increase, which means that a country’s credit markets improve the availability, quality and/or scope of information, will positively affect the growth of that country’s GDP. The amount of taxes and mandatory contributions payable by the business in the second year of operation, expressed as a share of commercial profits was found to be negatively correlated. Accordingly, increasing the tax rate would cause an increase in GDP; however one would expect that increasing the tax rate would negatively impact the incentive of doing business within a country. An explanation of the regression result may be that an increase in the tax rate increases government revenues that channels back to the economy via government expenditure. This in turn would eventually positively affect the ease of doing business. Moreover, bureaucratic measure of the affect of an increase or decrease in the average number of documents required to export goods was found negatively correlated. This implies that if a country were to increase the number of documents required to export good by 1 would cause ln(GDP) of the country to decrease by 18.16. Finally, the paper also found a positive correlation between an increase in the average number of days it takes to complete a procedure to get a permit. The coefficient says that a day increase in the average number of days it takes to complete a procedure will increase the growth in GDP.

KEYWORDS: Growth Domestic Product (GDP), Doing Business Indicators (DBIs), Organization for Economic Co-operation and Development (OECD), World Bank, Small and Medium Enterprises (SMEs).
1- INTRODUCTION

The Doing Business project was launched 10 years ago¹. DB looks at domestic small and medium-size companies (SMEs) and measures impact of regulatory developments applied through their life cycle. Doing Business and the standard cost model initially developed and applied in the Netherlands are, for the present, the only standard tools used across a broad range of jurisdictions to measure the impact of government rule-making on business activity.

The first Doing Business Report, published in 2003, covered 5 indicators sets in 133 economies. In 2009 it covered 10 indicator sets in 183 economies. The project has benefited from feedback from governments, academics, practitioners and reviewers.

The initial goal remains: to provide an objective basis for understanding and improving the regulatory environment for business.

Doing Business functions as a kind of test for the regulatory environment for domestic businesses. One way to test whether Doing Business serves as a proxy for the broader business environment and for competitiveness is to look at correlations between the Doing Business rankings and other major economic benchmarks. The indicator set closest to Doing Business in what it measures is the Organization for Economic Co-operation and Development’s indicators of product market regulation; the correlation here is 0.75.

The World Economic Forum’s Global Competitiveness Index and World Competitiveness Yearbook are broader in scope, but these too are strongly correlated with Doing Business.

Doing Business sheds light on how easy or difficult it is for a local entrepreneur to open and run a small to medium-size business when complying with relevant regulations. It measures and tracks changes in regulations affecting 10 areas in the life cycle of a business: starting a business, dealing with construction permits, getting electricity, registering property, getting credit, protecting investors, paying taxes, trading across borders, enforcing contracts, resolving insolvency and employing workers.

In a series of annual reports Doing Business presents quantitative indicators on business regulations and the protection of property rights that can be compared across 185 economies, from Afghanistan to Zimbabwe, over time. The data set covers 46 economies in Sub-Saharan Africa, 33 in Latin America and the Caribbean, 24 in East Asia and the Pacific, 24 in Eastern Europe and Central Asia, 19 in the Middle East and North Africa and 8 in South Asia, as well as 31 OECD high-income economies. The indicators are used to analyze economic outcomes and to identify what reforms have worked, where and why.

¹ The International Bank for Reconstruction and Development / The World Bank full report 2010
2- THE IMPACT OF DOING BUSINESS INDICATORS ON ECONOMIC GROWTH

Rankings and the 5-year measure of cumulative change (DB change score) are still only indicative. Few would doubt the benefit of reducing red tape for business, particularly for small and medium-size businesses. But how do business regulation reforms affect the performance of firms and contribute to jobs and growth? A growing body of empirical research has established a link between the regulatory environment for firms and such outcomes as the level of informality, employment and growth across economies.

The broader economic impact of lowering barriers to entry has been especially well researched. But correlation does not mean causality. Other country-specific factors or other changes taking place simultaneously—such as macroeconomic reforms—may also have played a part. Some studies have been able to test (How do we know whether things would have been any different without the regulatory reform?) by investigating variations within a country over time, as when Colombia implemented a bankruptcy reform that streamlined reorganization procedures. Following the reform, viable firms reorganized than liquidated, and firms’ recoveries improved. Other studies investigated policy changes that affected only certain firms or groups.

By using the unaffected group as a control, they found that reforms easing formal business entry in Colombia, India and Mexico led to an increase in new firm entry and competition. While, still other promising results are emerging. Using panel data from enterprise surveys, new research associates business regulation reforms in Eastern Europe and Central Asia with improved firm performance. Moreover, factors as macroeconomic reforms, technological improvements and firm characteristics may also influence productivity, the results are encouraging.

The region’s economies were the most active in improving business regulation over the past 6 years, often in response to new circumstances such as the prospect of joining the European Union or, more recently, the financial crisis. Some 93% of its economies eased business start-up, and 20 economies established one-stop shops.

In Georgia a 2009 survey found that the new start-up service centre helped businesses save an average of 3.25% of profits—and this is just for registration services. For all businesses served, the direct and indirect savings amounted to $7.2 million.

Egypt introduced a one-stop shop in 2005. Further reforms included incorporating more agencies in the one-stop shop, introducing a flat fee structure and reducing and then abolishing the paid-in minimum capital requirement. The time and cost of incorporation were reduced in both 2005 and 2006, and by 2007 the number of registered companies had increased by more than 60%. Reductions of the minimum capital requirement in 2007 and 2008 led to an increase of more than 30% in the number of limited liability companies.

Business registration reforms in Macedonia made it one of the easiest places to start a business today. In 2006 company registration was changed from a judicial process to an administrative one, and a one-stop shop combined company, tax and statistics registrations. The publication requirement in the official gazette was replaced with automatic registration on the registrar’s website. In the year following these first changes, new firm registrations increased by about 20%.

The Doing Business Indicators, Economic Growth and Regulatory Reform, Marek Hanusch 2011, The World Bank Group’s
Doing Business Indicators (DBIs) have become an important guide and benchmark for investment climate reform. This article discusses the role of the DBIs in the reform process and informs this discussion with an empirical analysis of the impact of individual indicators and their components on economic performance.

It is argued that the political economy of the policy environment has to be conducive for reforms. Reforms can then either be aimed at improving the doing business indicators ranking to enhance the visibility of a government’s general reform efforts; or they can be aimed at maximizing the impact of reform on economic growth. The author analysis suggests that focusing on doing business indicators relating to credit and the enforcement of contracts are the most important. Doing business indicators components focusing on cost have the largest potential for fostering growth.

Promoting private sector-led growth is at the heart of the development agenda. Many developing countries have come to the conclusion that jobs and prosperity are best created by unleashing the potential of the private sector. Central government bodies, such as advisory councils to the head of government or divisions within ministries of finance or trade have been established to focus on making the private sector flourish. The World Bank has a specially-dedicated Vice-Presidency focusing on Finance and Private Sector Development and many other development organizations have equivalents. Creating an ‘enabling environment’ for businesses to thrive has become a new mantra in international development.

However, as countries try to make their regulatory environments leaner and more efficient, what guidance is there for them to determine priorities? Should licensing procedures be streamlined? Is tax administration too laborious? How easy is it for small and medium sized enterprises (SMEs) to obtain credit? These are important questions that government officials as well as advisors in the donor community have to grapple with.

The World Bank Group’s Doing Business Indicators (DBIs) capture the quality of business environments in currently over 180 countries. Although the number of individual indicators fluctuates slightly, there are presently nine such indicators rating countries on the ease of doing business given the regulatory regime in place. The DBI ranking has some clout: it can instil a sense of competition among governments as countries with the greatest reform effort are singled out in the annual DBI publications; the results are published online and widely reported in the media. It appears that some countries have engaged in a race to become the annual top-reformer.

However, whilst the word ‘reform’ generally resonates well, what is the true impact of regulatory form to improve a country’s DBI ranking? This is the question this article aims to answer. It will especially focus on the effect of individual rankings on economic growth.

3- LITERATURE REVIEW

Macroeconomic variables incorporating aggregate consumption, aggregate investment and other variables incorporated in the national income identity have been consistently used in cross country growth and development regressions as an attempt to interpret determinants of economic growth. Private investment has been identified as the main source of economic growth and development in least development countries including Egypt. Ministry of Planning and Economics Development showed that during 2000 – 2009 private investment accounted for more than 60% of economic growth. While econometrically, cross-country growth and development regressions that build on investment data to interpret growth in per capita GDP as a proxy for economic
development, not much work used doing business indicators to interpret growth in per-capita incomes and hence economic development.


Djankov, McLiesh, Ramalho and Shleifer (2010), used measures of business regulations in 135 countries; they establish that countries with better regulations grow faster. Improving from the worst quartile of business regulations to the best implies a 2.3 percentage point increase in growth annual. They tried to solving the puzzle of why some countries grow faster than others is one of the most important questions in economics. Solving this puzzle has the obvious appeal of improving the living standards for a significant proportion of the world population. They go further towards answering this question by studying a major determinant of growth: regulations governing business activity.

Their results indicated that government regulation of business is an important determinant of growth and a promising area for future research. The relationship between more business-friendly regulations and higher growth rates is consistently significant in various specifications of standard growth models, and more consistently so than other determinants commonly used in the growth literature.

Moreover, the impact of improving business regulations was compare with another commonly used determinant of growth: primary school enrollment. Improving from the second worst to the best quartile of countries on primary school enrollment is associated with a 0.9 percentage point increase in growth rates, lower than the effect of business regulations. The effects of improvements in secondary education, inflation, and government consumption are also significantly lower than the effect of business regulations.

Ardagna and Lusagi (2009), used doing business surveys to construct a cross-national harmonized micro data from a broad sample of developed and developing countries and investigated the heterogeneity of the effect of entry, contract enforcement regulation, and financial development on both the decision to become an entrepreneur and the level of employment of newly created businesses.

They focused on the interaction between the level of regulation and financial development and some individual characteristics that are important determinants of entrepreneurship, such as gender, business skills, and social networks.

They found that entry regulation moderates the effect of business skills, while accentuating the effect of gender, even after accounting for the level of financial development.

Mary Hallward-Driemeier and Lant Pritchett 3 (2010) presented working paper about how Business is done and the 'Doing Business’ Indicators: The Investment Climate when Firms have Climate Control.

2 The distribution of resources between individuals is a crucial determinant of welfare. Unfortunately, while detailed breakdowns exist for firms, National Accounts only publish aggregate economic data for households. These aggregates are then simply divided by the number of individuals or households in an economy (e.g.: GDP per capita). Distributional issues are not taken into consideration. Barro 1991 provide a foundation for this approach (http://www.hec.unil.ch/ocadot/ECODEV/docs/barro-robert.pdf).

3 Mary Hallward-Driemeier and Lant Pritchett, CID Working Paper No. 211 Copyright 2010
Mary Hallward-Driemeier, Lant Pritchett and the President and Fellows of Harvard College
“Doing Business” (DB) provides measures of the time and costs associated with fully complying with an array of business regulations. Enterprise Surveys (ES) ask a wide range of firms about their actual experiences in doing business. We use three comparable indicators in both:
1. Time to get an operating permit.
2. Time to get a construction permit.
3. Time to import goods, to compare these distinct de jure (DB) and de facto (ES) approaches to assessing the “investment climate” in over 100 countries. Four patterns emerge in each of the three indicators.

First: while the DB, of necessity, reports a single estimate of the days for compliance for each indicator, firms in the same country report wildly different times to complete the same transaction. For instance, the DB indicators says it takes 65 days to start a business in Ecuador, whereas the distribution of the 265 firms who reported getting an operating license was between a 10th percentile reporting 1 day while the 90th percentile reporting 60 days.

Second: regulatory compliance appears to be “under water” as firms report actual times much less than the DB reported days. For instance, the median DB time to obtain a construction permit across all countries is 210 days, while the mean of the days firms reported was 59, the median DB-ES “under water” gap was 145 days.

Third: cross-nationally there is very little association between the ES distributions and DB numbers. A naïve view of “full compliance” might suggest that actually reported days would rise one for one with DB days, but the patterns are much more complex. The de jure environment appears to only affect some firms. For instance, as the de jure DB time to get a construction permit rose across countries by 524 days (from 77 to 601) the predicted time reported by the 25th percentile “favored” firm rose by just 2.7 days. In contrast, the time reported by the “disfavored” 90th percentile firm rose by 130 days, but all of this rise comes in the lower range of the DB. Fourth, for those countries with multiple ES surveys we find little association over time, with reductions in DB days as likely to be accompanied by increases in ES days. Comparing these two measures suggests very different ways of thinking about policy versus policy implementation, about what “climate” means, and what the options for “policy reform” really are.

4- EGYPT IN THE DOING BUSINESS REPORT

This economy profile presents the Doing Business indicators for Egypt, Arab Republic. To allow useful comparison, it also provides data for other selected economies (comparator economies) for each indicator. The data in this report are current as of June 1, 2012. The Doing Business methodology has limitations. Other areas important to business—such as an economy’s proximity to large markets, the quality of its infrastructure services (other than those related to trading across borders and getting electricity), the security of property from theft and looting, the transparency of government procurement, macroeconomic conditions or the underlying strength of institutions—are not directly studied by Doing Business. The indicators refer to a specific type of business, generally a local limited liability company operating in the largest business city. Because standard assumptions are used in the data collection, comparisons and benchmarks are valid across economies. The data not only highlight the extent of obstacles to doing business; they also help identify the source of those obstacles, supporting policy makers in designing regulatory reform.

5- CRITERIA OF THE COMPANIES/ BUSINESSES CHOSEN BY THE REPORT
- Companies working in the economy’s largest business city (Cairo in the Egyptian case).
- Limited liability company (or its legal equivalent) of a specified size.
- Companies completely owned by Egyptian investors.
- Small and medium companies.
- Companies working in industrial or commercial Fields.
- Companies do not enjoy any investment incentives nor special incentives, and are not working in Free zones, Industrial Zones, nor Qualified industrial Zones.

Table (1): Top 10 Reformers in 2010

<table>
<thead>
<tr>
<th>Closing a Business</th>
<th>Enforcing Contracts</th>
<th>Trading Across Borders</th>
<th>Paying Taxes</th>
<th>Protecting Investors</th>
<th>Getting Credit</th>
<th>Registering Property</th>
<th>Employing Workers</th>
<th>Dealing with Construction permits</th>
<th>Starting a Business</th>
<th>Country</th>
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<td>✓</td>
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<td>✔</td>
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<td>✔</td>
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<td>✓</td>
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<td>✓</td>
<td>✔</td>
<td>Macedonia, FYR</td>
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<td>Belarus</td>
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<td>✓</td>
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<td>United Arab Emirates</td>
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<td>Egypt</td>
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<td>✓</td>
<td>✔</td>
<td>Liberia</td>
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</table>

Source: Doing Business Report 2010
Table (2): Egypt’s Ranking in Doing Business (2007-2010)

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<tbody>
<tr>
<td>59 +</td>
<td>10 +</td>
<td>106</td>
<td>116</td>
<td>125</td>
<td>165</td>
<td>Doing Business</td>
</tr>
<tr>
<td>102+</td>
<td>17 +</td>
<td>24</td>
<td>41</td>
<td>55</td>
<td>126</td>
<td>Starting a business</td>
</tr>
<tr>
<td>9+</td>
<td>9 +</td>
<td>156</td>
<td>165</td>
<td>163</td>
<td>165</td>
<td>Dealing with construction permits</td>
</tr>
<tr>
<td>14-</td>
<td>13 -</td>
<td>120</td>
<td>107</td>
<td>108</td>
<td>106</td>
<td>Employing workers</td>
</tr>
<tr>
<td>60+</td>
<td>2 -</td>
<td>87</td>
<td>85</td>
<td>104</td>
<td>147</td>
<td>Registering property</td>
</tr>
<tr>
<td>85+</td>
<td>13 +</td>
<td>71</td>
<td>84</td>
<td>102</td>
<td>156</td>
<td>Getting credit</td>
</tr>
<tr>
<td>32+</td>
<td>3 -</td>
<td>73</td>
<td>70</td>
<td>84</td>
<td>105</td>
<td>Protecting investors</td>
</tr>
<tr>
<td>12+</td>
<td>4 +</td>
<td>140</td>
<td>144</td>
<td>151</td>
<td>152</td>
<td>Paying taxes.</td>
</tr>
<tr>
<td>57+</td>
<td>5 -</td>
<td>29</td>
<td>24</td>
<td>21</td>
<td>86</td>
<td>Trading across borders</td>
</tr>
<tr>
<td>2-</td>
<td>3 +</td>
<td>148</td>
<td>151</td>
<td>152</td>
<td>146</td>
<td>Enforcing contracts</td>
</tr>
<tr>
<td>8-</td>
<td>4 -</td>
<td>132</td>
<td>128</td>
<td>128</td>
<td>124</td>
<td>Closing a business</td>
</tr>
</tbody>
</table>

Source: Doing Business Report 2010
6- METHODOLOGY OF THE RESEARCH

There are many factors that impact the growth in a country’s GDP, such as population, poverty level, education, etc. This paper will study how the ease of doing business impacts a country’s growth in GDP. My hypothesis is that the easier it is to start and run a business the greater the incentive is to do so. This will in turn, promote entrepreneurship within the country and is therefore expected to increase GDP growth.

The data is of 164 countries during 2008. The regression is a log-linear model with dependent variable, \((GDP)\), regressed against 8 variables “For example”.

Table (3) Regression Model

<table>
<thead>
<tr>
<th>Variables Used</th>
<th>Description</th>
<th>Variable</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Log of GDP of a country.</td>
<td>Regressand (continuous)                                                    (GDP)_current_i</td>
<td>(GDP)_current_i</td>
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<tr>
<td>Percentage of the economy’s income per capita.</td>
<td>Regressor (continuous)                                                     cstSB_i</td>
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<td>Reflects the average amount that the entrepreneur</td>
<td>Regressor (continuous)                                                     Min_capitalSB_i</td>
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<td>needs to deposit in a bank or with a notary before</td>
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<td>registration and up to 3 months following</td>
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<td>incorporation recorded as a percentage of the</td>
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<tr>
<td>economy’s income per capita.</td>
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<tr>
<td>The median duration that is necessary to complete</td>
<td>Regressor (continuous)                                                     daysConstP_i</td>
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<tr>
<td>a procedure in practice, recorded in calendar</td>
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<tr>
<td>days.</td>
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<tr>
<td>Measures rules affecting the scope, accessibility</td>
<td>Regressor (index 0-6)                                                      credGetCred_i</td>
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<tr>
<td>and quality of credit information available through</td>
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<td>either public or private credit registries.</td>
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<td>The average extent of disclosure index between</td>
<td>Regressor (index 0-10)                                                     investproPthinv_i</td>
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<td>the extent of director liability index and the</td>
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<td>ease of shareholder suits index.</td>
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<tr>
<td>The amount of taxes and mandatory contributions</td>
<td>Regressor (continuous)                                                     taxrt_i</td>
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<td>payable by the business in the second year of</td>
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<td>operation, expressed as a share of commercial</td>
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<td>profits.</td>
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<tr>
<td>The average number of documents required per</td>
<td>Regressor (continuous)                                                     exdocsTraAcBrdr_i</td>
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<td>shipment to export the goods.</td>
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<tr>
<td>Measures the cost of advance notice requirements,</td>
<td>Regressor (continuous)                                                     redundanceEmpWork_i</td>
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<td>severance payments and penalties due when</td>
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<td>terminating a redundant worker, expressed in</td>
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<td>weeks of salary.</td>
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<td>The disturbance term which is normally distributed</td>
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<td>mean zero and constant variance.</td>
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7- GENERAL REGRESSION MODELS (GRM)

This topic describes the use of the general linear model for finding the "best" linear model from a number of possible models. A detailed discussion of university and multivariate ANOVA techniques can also be found in the ANOVA/MANOVA topic; a discussion of multiple regression methods is also provided in the Multiple Regression topic. Discussion of the ways in which the linear regression model is extended by the general linear model can be found in the General Linear Models topic.

7.1- Basic Ideas: The Need for Simple Models:

A good theory is the end result of a winnowing process. We start with a comprehensive model that includes all conceivable, testable influences on the phenomena under investigation. Then we test the components of the initial comprehensive model, to identify the less comprehensive submodels that adequately account for the phenomena under investigation. Finally from these candidate submodels, we single out the simplest submodel, which by the principle of parsimony we take to be the "best" explanation for the phenomena under investigation.

We prefer simple models not just for philosophical but also for practical reasons. Simple models are easier to put to test again in replication and cross-validation studies. Simple models are less costly to put into practice in predicting and controlling the outcome in the future. The philosophical reasons for preferring simple models should not be downplayed, however. Simpler models are easier to understand and appreciate, and therefore have a "beauty" that their more complicated counterparts often lack.

The entire winnowing process described above is encapsulated in the model-building techniques of stepwise and best-subset regression. The use of these model-building techniques begins with the specification of the design for a comprehensive "whole model." Less comprehensive submodels are then tested to determine if they adequately account for the outcome under investigation. Finally, the simplest of the adequate is adopted as the "best."

7.2- Model Building in GSR:

Unlike the multiple regression model, which is used to analyze designs with continuous predictor variables, the general linear model can be used to analyze any ANOVA design with categorical predictor variables, any ANCOVA design with both categorical and continuous predictor variables, as well as any regression design with continuous predictor variables. Effects for categorical predictor variables can be coded in the design matrix $X$ using either the over parameterized model or the sigma-restricted model.

Only the sigma-restricted parameterization can be used for model-building. True to its description as general, the general linear model can be used to analyze designs with effects for categorical predictor variables which are coded using either parameterization method. In many uses of the general linear model, it is arbitrary whether categorical predictors are coded using the sigma-restricted or the over parameterized coding. When one desires to build models, however, the use of the over parameterized model is unsatisfactory; lower-order effects for categorical predictor variables are redundant with higher-order containing interactions, and therefore cannot be fairly evaluated for inclusion...
in the model when higher-order containing interactions are already in the model.

This problem does not occur when categorical predictors are coded using the sigma-restricted parameterization, so only the sigma-restricted parameterization is necessary in general stepwise regression.

**Designs which cannot be represented using the sigma-restricted parameterization.** The sigma-restricted parameterization can be used to represent most, but not all types of designs. Specifically, the designs which cannot be represented using the sigma-restricted parameterization are designs with nested effects, such as nested ANOVA and separate slope, and random effects. Any other type of ANOVA, ANCOVA, or regression design can be represented using the sigma-restricted parameterization, and can therefore be analyzed with general stepwise regression.

7.3- Types of Analyses:

A wide variety of types of designs can be represented using the sigma-restricted coding of the design matrix \( X \), and any such design can be **Model building for designs with multiple dependent variables.** Stepwise and best-subset model-building techniques are well-developed for regression designs with a single dependent variable (e.g., see Cooley and Lohnes, 1971; Darlington, 1990; Hocking Lindeman, Merenda, and Gold, 1980; Morrison, 1967; Neter, Wasserman, and Kutner, 1985; Pedhazur, 1973; Stevens, 1986; Younger, 1985). Using the sigma-restricted parameterization and general linear model methods, these model-building techniques can be readily applied to any ANOVA design with categorical predictor variables, any ANCOVA design with both categorical and continuous predictor variables, as well as any regression design with continuous predictor variables. Building models for designs with multiple dependent variables, however, involves considerations that are not typically addressed by the general linear model. Model-building techniques for designs with multiple dependent variables are available with **Structural Equation Modeling.**

analyzed using the general linear model. The following topics describe these different types of designs and how they differ. Some general ways in which designs might differ can be suggested, but keep in mind that any particular design can be a "hybrid" in the sense that it could have combinations of features of a number of different types of designs.

**Between-subject designs:**

- Overview
- Simple regression
- Multiple regression
- Factorial regression
- Polynomial regression
- Response surface regression
- Mixture surface regression
- One-way ANOVA
- Main effect ANOVA
- Factorial ANOVA
- Analysis of covariance (ANCOVA)
- Homogeneity of slopes
**7.4-Overview:**

The levels or values of the predictor variables in an analysis describe the differences between the \( n \) subjects or the \( n \) valid cases that are analyzed. Thus, when we speak of the between subject design (or simply the between design) for an analysis, we are referring to the nature, number, and arrangement of the predictor variables.

Concerning the nature or type of predictor variables, between designs which contain only categorical predictor variables can be called ANOVA (analysis of variance) designs, between designs which contain only continuous predictor variables can be called regression designs, and between designs which contain both categorical and continuous predictor variables can be called ANCOVA (analysis of covariance) designs.

Between designs may involve only a single predictor variable and therefore be described as simple (e.g., simple regression) or may employ numerous predictor variables (e.g., multiple regression).

Concerning the arrangement of predictor variables, some between designs employ only "main effect" or first-order terms for predictors, that is, the values for different predictor variables are independent and raised only to the first power. Other between designs may employ higher-order terms for predictors by raising the values for the original predictor variables to a power greater than 1 (e.g., in polynomial regression designs), or by forming products of different predictor variables (i.e., interaction terms). A common arrangement for ANOVA designs is the full-factorial design, in which every combination of levels for each of the categorical predictor variables is represented in the design. Designs with some but not all combinations of levels for each of the categorical predictor variables are aptly called fractional factorial designs.

These basic distinctions about the nature, number, and arrangement of predictor variables can be used in describing a variety of different types of between designs. Some of the more common between designs can now be described.

**Simple Regression.** Simple regression designs involve a single continuous predictor variable. If there were 3 cases with values on a predictor variable \( P \) of, say, 7, 4, and 9, and the design is for the first-order effect of \( P \), the \( X \) matrix would be

\[
\begin{bmatrix}
X_0 & X_1 \\
1 & 7 \\
1 & 4 \\
1 & 9
\end{bmatrix}
\]

and using \( P \) for \( X_i \) the regression equation would be

\[Y = b_0 + b_1 P\]

If the simple regression design is for a higher-order effect of \( P \), say the quadratic effect, the values in the \( X_i \) column of the design matrix would be raised to the 2nd power, that is,

\[
\begin{bmatrix}
X_0 & X_1 \\
1 & 49 \\
1 & 16 \\
1 & 81
\end{bmatrix}
\]

squared and using \( P^2 \) for \( X_i \) the regression equation would be

\[Y = b_0 + b_1 P^2\]

In regression designs, values on the continuous predictor variables are raised to the desired power and used as the values for the \( X \) variables. No recoding is performed. It is therefore sufficient, in describing regression designs, to simply describe the regression equation without explicitly describing the design matrix \( X \).

**Multiple Regression.** Multiple regression designs are to continuous predictor variables as main effect ANOVA designs are to categorical predictor variables, that is, multiple regression designs contain the separate simple regression designs for 2 or more continuous predictor variables. The regression equation for a multiple regression design for the first-order effects of 3
continuous predictor variables $P$, $Q$, and $R$ would be

$$Y = b_0 + b_1P + b_2Q + b_3R$$

A discussion of multiple regression methods is also provided in the *Multiple Regression* topic.

**Factorial Regression.** Factorial regression designs are similar to factorial ANOVA designs, in which combinations of the levels of the factors are represented in the design. In factorial regression designs, however, there may be many more such possible combinations of distinct levels for the continuous predictor variables than there are cases in the data set. To simplify matters, full-factorial regression designs are defined as designs in which all possible products of the continuous predictor variables are represented in the design. For example, the full-factorial regression design for two continuous predictor variables $P$ and $Q$ would include the main effects (i.e., the first-order effects) of $P$ and $Q$ and their 2-way $P$ by $Q$ interaction effect, which is represented by the product of $P$ and $Q$ scores for each case. The regression equation would be

$$Y = b_0 + b_1P + b_2Q + b_3P\times Q$$

Factorial regression designs can also be fractional, that is, higher-order effects can be omitted from the design. A fractional factorial design to degree 2 for 3 continuous predictor variables $P$, $Q$, and $R$ would include the main effects and all 2-way interactions between the predictor variables

$$Y = b_0 + b_1P + b_2Q + b_3R + b_4P\times Q + b_5P\times R + b_6Q\times R$$

7.5- **Building Models via Stepwise Regression:**

Stepwise model-building techniques for regression designs with a single dependent variable are described in numerous sources (e.g., see Darlington, 1990; Hocking, 1966; Lindeman, Merenda, and Gold, 1980; Morrison, 1967; Neter, Wasserman, and Kutner, 1985; Pedhazur, 1973; Stevens, 1986; Younger, 1985). The basic procedures involve (1) identifying an initial model, (2) iteratively "stepping," that is, repeatedly altering the model at the previous step by adding or removing a predictor variable in accordance with the "stepping criteria," and (3) terminating the search when stepping is no longer possible given the stepping criteria, or when a specified maximum number of steps has been reached. The following topics provide details on the use of stepwise model-building procedures.

**The Initial Model in Stepwise Regression.** The initial model is designated the model at *Step 0*. The initial model always includes the regression intercept (unless the *No intercept* option has been specified.). For the *backward stepwise* and *backward removal* methods, the initial model also includes all effects specified to be included in the *design* for the analysis. The initial model for these methods is therefore the whole model.

For the *forward stepwise* and *forward entry* methods, the initial model always includes the regression intercept (unless the *No intercept* option has been specified.). The initial model may also include 1 or more effects specified to be *forced* into the model. If $j$ is the number of effects specified to be *forced* into the model, the first $j$ effects specified to be included in the *design* are entered into the model at *Step 0*. Any such effects are *not eligible to be removed* from the model during subsequent *Steps*. Effects may also be specified to be *forced* into the model when the *backward stepwise* and *backward removal* methods are used. As in the *forward stepwise* and *forward entry* methods, any such effects are *not eligible to be removed* from the model during subsequent *Steps*.

**The Forward Entry Method.** The *forward entry* method is a simple model-building procedure. At each *Step* after *Step 0*, the *entry statistic* is computed for each effect eligible for entry in the model. If no effect has a value on the *entry statistic* which exceeds the specified
critical value for model entry, otherwise stepping is terminated. The effect with the largest value on the entry statistic is entered into the model. Stepping is also terminated if the maximum number of steps is reached.

The Backward Removal Method. The backward removal method is also a simple model-building procedure. At each Step after Step 0, the removal statistic is computed for each effect eligible to be removed from the model. If no effect has a value on the removal statistic which is less than the critical value for removal from the model, then stepping is terminated, otherwise the effect with the smallest value on the removal statistic is removed from the model. Stepping is also terminated if the maximum number of steps is reached.

The Forward Stepwise Method. The forward stepwise method employs a combination of the procedures used in the forward entry and backward removal methods. At Step 1 the procedures for forward entry are performed. At any subsequent step where 2 or more effects have been selected for entry into the model, forward entry is performed if possible, and backward removal is performed if possible, until norrther procedure can be performed and stepping is terminated. Stepping is also terminated if the maximum number of steps is reached.

The Backward Stepwise Method. The backward stepwise method employs a combination of the procedures used in the forward entry and backward removal methods. At Step 1 the procedures for backward removal are performed. At any subsequent step where 2 or more effects have been selected for entry into the model, forward entry is performed if possible, and backward removal is performed if possible, until neither procedure can be performed and stepping is terminated. Stepping is also terminated if the maximum number of steps is reached.

Entry and Removal Criteria. Either critical $F$ values or critical $p$ values can be specified to be used to control entry and removal of effects from the model. If $p$ values are specified, the actual values used to control entry and removal of effects from the model are $1 - p$.
subset multiple *R*-square statistic allows direct comparisons of the "best" subsets identified using each approach.

The number of possible submodels increases very rapidly as the number of effects in the whole model increases, and as subset size approaches half of the number of effects in the whole model. The amount of computation required to perform all-possible-subset regression increases as the number of possible submodels increases, and holding all else constant, also increases very rapidly as the number of levels for effects involving categorical predictors increases, thus resulting in more columns in the design matrix $X$. For example, all possible subsets of up to a dozen or so effects could certainly theoretically be computed for a design that includes two dozen or so effects all of which have many levels, but the computation would be very time consuming (e.g., there are about 2.7 million different ways to select 12 predictors from 24 predictors, i.e., 2.7 million models to evaluate just for subset size 12). Simpler is generally better when using all-possible-subset regression.

8- SOURCE OF DATA

The search use data on economic growth from the World Bank database on World Development Indicators.

Data on the doing business was obtained from the World Bank’s database on Doing Business. This includes indices that were conducted for different procedures of doing business. This is in addition to recourses and the Ministry of Investment.

A multivariate regression analysis will be conducted to test the hypothesis whether different procedures are of statistical significance for economic growth. The estimated coefficients will represent the quantitative impact of the procedure on economic growth.

9- RESEARCH HYPOTHESIS

The study suggests that the following factors have impacts on economic growth:

- Reflects the average amount that the entrepreneur needs to deposit in a bank or with a notary before registration and up to 3 months following incorporation recorded as a percentage of the economy’s income per capita.
- The median duration that is necessary to complete a procedure in practice, recorded in calendar days.
- Measures rules affecting the scope, accessibility and quality of credit information available through either public or private credit registries.
- The average extent of disclosure index between the extent of director liability index and the ease of shareholder suits index.
- The amount of taxes and mandatory contributions payable by the business in the second year of operation, expressed as a share of commercial profits.
- The average number of documents required per shipment to export the goods.
- Measures the cost of advance notice requirements, severance payments and penalties due when terminating a redundant worker, expressed in weeks of salary.

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10- STUDIED MODEL

This paper will study how the ease of doing business impacts a country’s growth in GDP. The data is of 69 companies during 2012. The regression is a log-linear model with dependent variable, ln(GDP) code Ln (GDPcurrent) , regressed against 8 variables:

1- Percentage of the economy’s income per capita. (cstSB)
2- Reflects the average amount that the entrepreneur needs to deposit in a bank or with a notary before registration and up to 3 months following incorporation recorded as a percentage of the economy’s income per capita. (Min_capitaSB)
3- The median duration that is necessary to complete a procedure in practice, recorded in calendar days. (daysConstPer)
4- Measures rules affecting the scope, accessibility and quality of credit information available through either public or private credit registries. (credGetCred)
5- The average extent of disclosure index between the extent of director liability index and the ease of shareholder suits index. (investproPthn)
6- The amount of taxes and mandatory contributions payable by the business in the second year of operation, expressed as a share of commercial profits. (taxr)
7- The average number of documents required per shipment to export the goods. (exdocsTraAcBrd)
8- Measures the cost of advance notice requirements, severance payments and penalties due when terminating a redundant worker, expressed in weeks of salary. (redundancEmpWork)

And The disturbance term which is normally distributed with mean zero and constant variance. (ε)

Table (4): OLS Regression

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>Number of obs = 164</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>608.448698</td>
<td>8</td>
<td>76.0560872</td>
<td>F( 8, 155) = 28.51</td>
</tr>
<tr>
<td>Residual</td>
<td>413.442224</td>
<td>155</td>
<td>2.66736919</td>
<td>Prob &gt; F = 0.0000</td>
</tr>
<tr>
<td>Total</td>
<td>1021.89092</td>
<td>163</td>
<td>6.26926946</td>
<td>R-squared = 0.5745</td>
</tr>
</tbody>
</table>

| lnGdpcurrent | Coef. | Std. Err. | t     | P>|t| | [95% Conf. Interval] |
|--------------|-------|-----------|-------|-------|----------------------|
| cstSB        | -.0040308 | .0013555 | -2.97 | 0.003 | -.0067084 - .0013533 |
| Min_capita-B | .0008959 | .0003722 | 2.41  | 0.017 | .0001607 - .0016311 |
| daysConstPer | .0042093 | .0009926 | 4.24  | 0.000 | .0022485 - .0061701 |
| credininfoC-t | .6808025 | .0629046 | 10.82 | 0.000 | .5565415 - .8050634 |
| investpro-v | .2805244 | .0945181 | 2.97  | 0.003 | .0931847 - .4672342 |
| taxr         | .0066611 | .0037801 | 1.76  | 0.080 | -.0008061 - .0141283 |
| expdocsTra-r | -.1815838 | .0664163 | -2.73 | 0.007 | -.3127818 - -.0503859 |
| redundancy-k | .0132231 | .005987 | 2.21  | 0.029 | .0013964 - .0250497 |
| _cons        | 20.4712  | .7970929 | 25.68 | 0.000 | 18.89663 - 22.04576 |
For the assumption of (F1)–(F4) * to hold there must not be presence of hetero-skedastic errors. If there is no presence of hetero-skedasticity, then the variance of the estimated coefficients are reliable and converge to the population variance. A visual inspection can be done by looking at Graph 1 which plots the regression results against the dependent variable’s fitted values. Visual inspection would deny the presences of hetero-skedastic residuals; however, a more rigorous process is achieved formally by conducting a White’s as well as a Konker’s test, which is shown via table 5 and 6 respectively.

*{F1} \text{Rank}(X) = K 
(F2) \ E(e) = 0 
(F3) \ E(e|X) = E(e) 
(F4) \ \text{var}(e|X) = \sigma^2 I 

Chart (1)

Table (5): White’s Test

<table>
<thead>
<tr>
<th>Source</th>
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<th>df</th>
<th>MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>347.294382</td>
<td>44</td>
<td>7.89305413</td>
</tr>
<tr>
<td>Residual</td>
<td>1181.08539</td>
<td>119</td>
<td>9.9250873</td>
</tr>
<tr>
<td>Total</td>
<td>1528.37977</td>
<td>163</td>
<td>9.37656301</td>
</tr>
</tbody>
</table>

The White’s Test is conducted by regressing the square of the estimated residuals, \( e_i^2 \), derived from the OLS regression, against the distinct elements of the \( X_i, X' \) matrix (i.e., the ones, levels, squares and cross products). The test is conducted under the null hypothesis of

\[ H_0 : E(e_i^2|X_i) = \sigma^2 \forall i \text{ vs. } H_A : \text{Not } H_0. \]

The decision rule is to reject \( H_0 \) at \( \alpha = 0.05 \) and \( q = 44 \) (df in Table 2), if the test statistic, \( nR_{e_i}^2 > \chi^2_{\alpha,q} \), where \( \chi^2_{\alpha,q} = 60.5 \). The test
the variation in the $q$-th variable. Therefore, this implies a failure to reject $H_0$ of homoskedastic errors.

Table (6): Konker’s Test

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>70.5908488</td>
<td>8</td>
<td>8.8238561</td>
</tr>
<tr>
<td>Residual</td>
<td>1457.78892</td>
<td>155</td>
<td>9.40508982</td>
</tr>
<tr>
<td>Total</td>
<td>1528.37977</td>
<td>163</td>
<td>9.3765301</td>
</tr>
</tbody>
</table>

The test statistic is $nR^2_{\varepsilon_i} = 37.3$, which implies a failure to reject $H_0$ of homoskedastic errors. Because of the large number of regressors in the White’s test, it is possible that there may be an issue with the power of the test. With the large number of regressors, which implies large degrees of freedom, it is possible to fail to reject the null when in fact the alternative is true (Type 2 error). A Konker’s test can be run to deal with this issue. This test is run in much the same manner as the White’s test; however, instead of regressing $\varepsilon_i^2$ against all distinct elements of the $X_i'X_i$ matrix, in the Konker’s test the regressors are just the top row of the $X_i'X_i$ matrix (i.e., one and the levels). This will give a lower degree of freedom, q=8, as well as a lower critical value, $\chi^2_{\alpha,q} = 15.5$. The null and alternative hypotheses are the same as above.

The test statistic is $nR^2_{\varepsilon_i} = 7.6$, which again implies a failure to reject the null of homoskedastic errors.

Because both tests provide no evidence of heteroskedastic errors, finite sample conditions hold, which implies, through the Gauss-Markov theorem, that the estimated coefficients, $\beta$, are the Best Linear Unbiased Estimators (BLUE) of the actual $\beta_i$ (i.e., $\hat{\beta}_i \rightarrow \beta_i$). Therefore, this assumption allows the use of the estimated variance, $\text{var}(b) = s^2 (X'X)^{-1}$, is reliable and can be used in the Wald and t-tests below.

A Wald test can now be run to check if the overall model is significant. (F1)-(F4) allows for $W^a \sim \chi^2_{q}$ under the null. The hypothesis is, $H_0: \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_9 = 0$ vs. $H_A: \text{NOT } H_0$. At $\alpha = .05$ and q=8, the accept criteria is that W < 2.75. The test statistic is $W = F * q = (28.51) * 8 = 228.08$ (F is found in Table 1), which is much larger then the critical value. Therefore the null is rejected, which implies that the model is statistically significant. The overall fit of the model ($R^2$) says that 59.54% of the variation in the dependent variable $\ln(GDP_{current})$ is explained by the model.

Next, a t-test is run to see if the coefficients are individually different from zero. Under the assumption of (F1)-(F4) it can be said that $t^a \sim N(0,1)$ under the null. The hypotheses are stated as such, $H_0: \beta_i = 0$ vs. $H_A: \beta_i \neq 0$ (i = 1,...,9). The critical value at $\alpha = .05$ is $|t| < 1.979$. The test statistic is $t = \frac{\hat{\beta}_i - 0}{se(\hat{\beta}_i)}$, the table shows that all regressors are significant at an $\alpha$-level of .05 with the exception of (taxrt), which is significant at an $\alpha$-level of .1.
9- INTERPRETING THE REGRESSION RESULTS

Results show that $credGetCred_t$ is positively correlated to the model. This says that increasing the indexed variable, which means that a country’s credit markets improve the availability, quality and/or scope of information, will positively affect the growth of that country’s GDP. Also, the variable $(exdocsTraAcBrdr_t)$ is negatively correlated to the overall regression. It is a bureaucratic measure of the effect of an increase or decrease in the average number of documents required to export goods. It implies that if a country were to increase the number of documents required to export goods by 1 would cause ln(GDP) of the country to decrease by 18.16.

There are a few of the coefficients that seem to give a counterintuitive result, one of which is the $(taxrt_t)$ variable. The model is saying that increasing the tax rate would cause an increase in GDP; however one would expect that increasing the tax rate would negatively impact the incentive of doing business within a country. An explanation of the regression result may be that an increase in the tax rate increases government revenues that channels back to the economy via government expenditure. This in turn would eventually positively affect the ease of doing business. Also, the $(daysConstPer_t)$ variable shows positive correlation between an increase in the average days it takes to complete a procedure to get a permit. The coefficient says that a day increase in the average number of days it takes to complete a procedure will increase the growth in GDP.

10- CONCLUSION

The study of assessing the impact of DBIs on the GDP growth in Egypt has ended up that $credGetCred_t$ is positively correlated to the model. This says that increasing the indexed variable, which means that a country’s credit markets improve the availability, quality and/or scope of information, will positively affect the growth of that country’s GDP. Also, the variable $(exdocsTraAcBrdr_t)$ is negatively correlated to the overall regression. It is a bureaucratic measure of the effect of an increase or decrease in the average number of documents required to export goods. It implies that if a country were to increase the number of documents required to export goods by 1 would cause ln(GDP) of the country to decrease by 18.16.

There are a few of the coefficients that seem to give a counterintuitive result, one of which is the $(taxrt_t)$ variable. The model is saying that increasing the tax rate would cause an increase in GDP; however one would expect that increasing the tax rate would negatively impact the incentive of doing business within a country. An explanation of the regression result may be that an increase in the tax rate increases government revenues that channels back to the economy via government expenditure. This in turn would eventually positively affect the ease of doing business. Also, the $(daysConstPer_t)$ variable shows positive correlation between an increase in the average days it takes to complete a procedure to get a permit. The coefficient says that a day increase in the average number of days it takes to complete a procedure will increase the growth in GDP.

11- RECOMMENDATIONS

According to the study of this paper which found that DBIs impacts a country’s growth in GDP, the study will also suggest some recommendations for Egyptian government on how the ease of doing business as follows:

11.1- Establishment
- Completing and implementing the stages of e-establishment
- Reducing the number of procedures from seven to one

11.2- Issuing Licenses
- Effectuating the one-stop shop system for building permits

11.3- Property Registration
- Reducing the time needed for property registration (adding one article in the law stipulating a maximum period for finalizing registration)

11.4- Access to Credit
- Issuing a law on moveable guarantees including the creation of collateral registry

11.5- Investor Protection
- Enforcing companies to increase disclosure in their annual reports
- Increasing small shareholders' capacity to review a company's information and financials

11.6- Tax Payment
- Changing the frequency of tax statements to quarterly instead of monthly
- Replication of electronic submission of statements and providing incentives to encourage this step

11.7- Cross-Border Trade
- Creating trade nets to exchange information inside ports

11.8- Contract Enforcement
- Reducing the time needed to finalize judicial disputes
- Reducing judicial fees
- Mechanization of judicial procedures

11.9- Market Exit
- Issuing the law on bankruptcy and protective reconciliation
- Providing the legal framework to address insolvencies outside courts.

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