Using Surveys of Business Perceptions as a Guide to Growth-Enhancing Fiscal Reforms

Florian Misch, Norman Gemmell and Richard Kneller

WORKING PAPER 04/2014
January 2014

Working Papers in Public Finance

VICTORIA
UNIVERSITY OF WELLINGTON
TE WHARE WĀNANGA
O TE ŪPOKO O TE IKA A MĀUI

Chair in Public Finance
Victoria Business School

The Working Papers in Public Finance series is published by the Victoria Business School to disseminate initial research on public finance topics, from economists, accountants, finance, law and tax specialists, to a wider audience. Any opinions and views expressed in these papers are those of the author(s). They should not be attributed to Victoria University of Wellington or the sponsors of the Chair in Public Finance.

Further enquiries to:
The Administrator
Chair in Public Finance
Victoria University of Wellington
PO Box 600
Wellington 6041
New Zealand

Phone: +64-4-463-9656
Email: cpf-info@vuw.ac.nz

Papers in the series can be downloaded from the following website:
http://www.victoria.ac.nz/cpf/working-papers

Using Surveys of Business Perceptions as a Guide to Growth-Enhancing Fiscal Reforms

Florian Misch[a,*], Norman Gemmell[b,c,†] and Richard Kneller[b,‡]

[a]Centre for European Economic Research, Mannheim, Germany

[b]School of Economics, University of Nottingham, Nottingham, UK

[c]Victoria University of Wellington, Wellington, New Zealand

Abstract

This paper assesses the merits of using business perceptions of growth constraints as a guide to growth-enhancing fiscal policy reforms. Using endogenous growth models in which the government levies an income tax to provide public inputs to the production of private firms, the paper demonstrates that such perceptions of growth constraints may be misleading from a policy perspective. In particular firms can be expected to systematically overestimate the growth-enhancing effects of lower tax rates relative to public services and public capital, and underestimate the growth-enhancing effects of greater provision of public capital relative to taxation and public services. In addition, we show that firms rank different public services and different types of public capital according to the actual costs they impose on firms. It is then shown that these theoretical predictions regarding how firms rank constraints correspond closely to the observed ranking of constraints by firms in the World Bank's Enterprise Surveys.

JEL: D20, E62, O12

Keywords: Economic Growth, Fiscal Policy, Business Perceptions, Diagnostics

*Corresponding author. E-mail address: misch@zew.de

†E-mail address: norman.gemmell@vuw.ac.nz

‡E-mail address: richard.kneller@nottingham.ac.uk

1 Introduction

The seminal contributions of Barro (1990) and Devarajan et al. (1996) provided the foundation for what has become a 'standard' theoretical framework to analyze the impact of fiscal policy on long-run growth. Broadly, this involves modelling the distortionary effects of taxation via impacts on the private marginal product of capital, and the productivity-enhancing effects of different types of public spending.[1] Such models capture fiscal externalities in the form of private firm-level productivity effects from public spending and the deadweight costs of taxation. While such frameworks are helpful for thinking at a fairly high level about potential growth effects of fiscal policy, in practice, they provide only limited guidance to policy advisers seeking to identify which particular fiscal reforms (changes in individual tax rates or changes to specific categories of public spending for example) are likely to be growth-enhancing or have the smallest/largest impact. Recently a related but largely separate strand of research has begun to focus on specific policy-based and other constraints on growth; see, for example, Dixit (2007) and Hausmann et al. (2008b) and Rodrik (2010). This conceptual 'growth diagnostic' approach focuses on identifying the most binding constraints on growth in practice and thereby goes beyond the more abstract predictions and policy implications of highly stylized conceptual models.[2] However, good policy advice, in addition to requiring sound theoretical frameworks to identify growth-enhancing fiscal reforms, also needs a reliable evidence base. The objective of this paper is therefore to examine whether, and when, subjective perceptions of firms may be a useful source of information to help identify growth-enhancing fiscal reforms.

Much of the evidence base for policy advice to promote growth has traditionally come from applications of econometric methods to various fiscal aggregates. However, concerns have recently been raised over the merits of

[1] For recent contributions see, for example, Turnovsky (2004), Semmler et al. (2007), Agénor (2008a), Agénor (2008b), Monteiro and Turnovsky (2008).

[2] This strand of the literature argues that removing the most binding constraint of an economy has the largest growth effects; Misch et al. (2010) show that this proposition is indeed optimal under certain conditions in a more formal growth framework.

this type of evidence for policy reform advice in practice; see, for example, Carlin et al. (2010), Rodrik (2005), Hausmann et al. (2008a).

It seems appropriate therefore to question whether business perceptions, such as those provided by the World Bank (World Bank Enterprise Surveys, WBES), are a useful additional source of information to guide policy makers' choices. These surveys contain ratings of various factors regarded as 'obstacles' or 'constraints' on firms' growth performance as identified by firm owners or managers. With firms' investment decisions likely to be an important driver of aggregate economic growth, and these investment decisions likely to be affected by firms' perceptions, such perception indicators could potentially be a valuable source of information on actual growth constraints.

Recognizing the potential value of these data does not imply that these data necessarily always provide 'useful' information to policy makers, nor that they should never be used. Rather, the appropriate balance between such views should be based on a framework through which to interpret these data. Indeed, a number of authors have recently argued over the merits of such business survey information as a reliable identifier of *actual* constraints, and the policy reforms that might follow. We summarize that discussion in the next section.

Our approach differs from existing papers. We adopt the standard theoretical framework for the analysis of fiscal policy and long-run growth of both the aggregate economy and a representative firm dating back to Barro (1990). This allows us to demonstrate that firms' perceptions, in particular the ranking of *different* fiscal policy-related constraints by the *same* firm, can be expected to be misleading from a policy perspective in specific ways. The essence of our argument is that, in part because of the way business survey questions are constructed, firms' responses are likely to focus on the *direct* effects of policies alleviating particular constraints that they see as obstacles, while ignoring the externalities, or indirect effects, of these policies. Endogenous growth models with public finance involve a direct theoretical counterpart to this: private agents ignore the externalities that arise via the government budget constraint. For instance, they ignore positive externalities from private investment in the sense that increasing output raises

public revenue which in turn gives rise to higher productive public spending. We exploit this assumption to model firm perceptions of fiscal policy-related constraints including taxation and public expenditures taking two different forms: flows of public *services* and stocks of public *capital*.

The paper makes two contributions. The first is to evaluate, based on a class of endogenous growth models, whether business perception data could be useful in identifying the optimal direction for fiscal policy reform. We show that it is likely that firms perceive the (distortionary) tax rate as a more severe constraint than public *service*-related constraints, which in turn are likely to be perceived as more severe than public *capital*-related constraints. Firms view fiscal constraints in this order even when taxes and spending are set at their optimal, growth-maximizing values (i.e., where changes to any fiscal parameters would result in declines of the growth rate). However, this framework also predicts that for comparisons of fiscal constraints involving similar types of public spending (between two public service-related, or two public capital-related, spending categories for example), business perception data do not suffer from such systematic biases vis-à-vis optimal policy responses. Therefore, the perceived ranking of constraints may or may not be correlated with the actual severity of constraints. We show that our conclusions hold for a variety of model parameters such as those that determine the firms' reliance on public services and public capital; we thereby take into account that firms are heterogenous.

The second contribution is to compare actual business perception data from the World Bank Enterprise Surveys, and in particular how firms rank fiscal policy-related constraints, with the ranking predicted by the endogenous fiscal-growth framework. The WBES, covering a wide range of businesses in many countries, provides comprehensive information on how firms rate alternative fiscal instruments in terms of the severity of the constraints imposed on their (growth) performance. We find that the WBES rankings of fiscal policy-related constraints closely match those predicted by the theoretical models. While based on the data we cannot rule out that the observed WBES ranking may in fact reflect the actual severity of constraints, we nevertheless argue that in the absence of the biases we identify in the model,

such an average ranking would be unlikely to arise across a large number of firms.

This framework is based on a restrictive set of assumptions. Nevertheless, we argue that it is particularly well suited to model and assess firms' perceptions of growth constraints, in part due to its simplicity and the resulting clarity of the analysis. We show that these biases can be expected to be important for the evaluation of some fiscal policy reform options, but not for others. This suggests that it is important to distinguish between the specific contexts in which such business perception information is likely to offer reliable or unreliable guidance to growth-enhancing policy reforms.

The paper is organized as follows. Section 2 reviews the relevant literature. Sections 3 and 4 develop the models, derive the equilibrium of the market economy, and identify the growth-maximizing policies. Section 5 models business perceptions, assesses their merits for policy making, and derives theoretical predictions regarding firms' ranking of fiscal policy-related constraints. Section 6 tests the latter against the ranking of constraints by firms in the WBES. Section 7 concludes.

2 Overview on the Use of Business Perceptions in the Literature

Since recently, an increasing number of papers recognizes or discusses the potential merits of using business perceptions of the costs of obstacles for policy analysis. Carlin et al. (2012) discuss the potential advantages of business perception data compared to objective indicators at the aggregate level in detail. First, they argue that business perceptions may provide more relevant measures of infrastructure-related constraints. For example, transition economies score relatively well in terms of physical indicators that measure the extent of the railway network; however, such indicators poorly reflect the value of the rail network for the economy, if the railway was designed to primarily serve large state-owned enterprises. Second, they also argue that aggregate indicators give little – if any – clues about the relative importance of constraints of firms. In principle, business perceptions facilitate the com-

parison between the severity of different constraints such as the rule of law and electricity supply for instance. While in this paper we argue that such perceptions-based rankings may of course be misleading, objective indicators are typically not comparable at all.

Hausmann et al. (2008a) provide an overview of the general principles needed to identify the most binding constraint on the economy using different sources of data including business perceptions. They suggest that a careful use of such perception data is potentially helpful. Hallward-Driemeier and Aterido (2009) find that the ratings of a range of obstacles by firms correlate positively with objective measures of the same constraint; by contrast, Clarke (2010) finds that the rating of specific obstacles is affected by the managers' overall business confidence undermining the potential value for policy of business perceptions.

Carlin et al. (2006, 2010) are the only other existing papers that propose a framework through which business perceptions can be interpreted. In their framework, firms' assessments of various obstacles correspond to the costs that they incur from these obstacles. Underlying this framework is the assumption that private output is produced using private and public inputs. Using this framework, they analyze the determinants of the firms' perceptions of obstacles; the key Carlin et al. result is that firms with higher productivity tend to perceive a given obstacle as more severe compared to firms with lower productivity that face the same obstacle. In addition, the reported costs of a constraint vary with other firm-level characteristics which determine the importance of various obstacles to a particular firm.

The implication of their framework is that perceptions of the same obstacles across firms and countries cannot be readily compared. On the one hand, differences in terms of average productivity across countries mean that the perceived costs of obstacles in richer countries are systematically higher even if the level of provision was identical. On the other hand, such comparisons are distorted by differences in firm characteristics and sample compositions across countries. However, cross-country comparisons are especially important to uncover the relative importance of alternative obstacles to firms.

From a policy perspective, this is therefore unfortunate, as firm ratings

of the same obstacle across countries potentially provide important insights. In order to still draw sensible conclusions about the severity of constraints in transition and non-transition economies from business perception data, Carlin et al. (2012) proceed in two steps. In the first step, they calculate country-specific means of the perceived costs of each obstacle conditional on the firm characteristics. In the second step, these conditional means are regressed on GDP per capita to control for differences in aggregate productivity that result in different valuations of the costs of obstacles to firms. They also include a dummy which indicates whether the country in question is a transition economy.

The results of their analysis indicate that there are systematic differences in terms of the types of obstacles which firms face between transition and non-transition economies. They show that firms in transition countries are more constrained by poorly functioning institutions such as customs and courts, compared to non-transition economies. In addition, they show that firms in poor transition economies are relatively less constrained by physical infrastructure and access to skilled labor compared to firms in non-transition economies.

3 The Modelling Framework

The public finance growth framework we adopt in the paper is an extension of the well known model developed by Devarajan et al. (1996). We assume that there is a large number of infinitely lived households and a large number of firms that are both normalized to one, that population growth is zero, and that there is no entry or exit of firms.

Given that we are not analyzing interactions between firms and focus on the ranking of different constraints by the *same* firm in subsequent sections, we only consider a single representative firm. However, by considering the robustness of the results under a variety of technology parameters, we account for the fact that firms are heterogeneous. The representative firm produces a single composite good using private capital (k) which is broadly defined to encompass physical and human capital, and two public inputs, G_1 and G_2,

based on Cobb-Douglas technology:

$$y = k^{\theta} G_1^{\alpha_1} G_2^{\alpha_2} \tag{1}$$

where $\theta = 1 - \alpha_1 - \alpha_2$. The productivity of private capital used by the individual firm therefore positively depends on G_1 and G_2 which are provided free of charge by the government at the point of consumption. For instance, private vehicles can be used more productively when the quality of the road network increases.[3]

G_1 and G_2 are delivered via two different productive public spending categories, g_1 and g_2, and the government finances total public expenditure, $g_1 + g_2$, by levying a flat tax, τ, on income. Thus the government budget, which is assumed always to be balanced, is:

$$g_1 + g_2 = \tau y \tag{2}$$

Let ϕ_1 and ϕ_2 denote the share of the budget that is allocated to g_1 and g_2 so that

$$g_1 = \phi_1 \tau y \tag{3}$$

$$g_2 = \phi_2 \tau y \tag{4}$$

with $\phi_1 + \phi_2 = 1$.

The households own the firms and therefore receive all their output net of taxation which they either reinvest in the firms to increase their capital stock or which they use for consumption depending on their preferences and the returns on private capital.[4] Investment by the representative household can therefore be written as

$$\dot{k} = (1 - \tau)y - c \tag{5}$$

[3]Obviously, most public services and types of public capital are subject to congestion which reduces the amount available to the individual firm. Given that modelling congestion complicates the analysis considerably and may prevent long-run growth from arising, we implicitly assume for simplicity, that G_1 and G_2 are non-rival and non-excludable. However, our results would continue to hold with some congestion effects.

[4]Alternatively, we could assume that firms and households are one entity commonly referred to as household producers in the literature.

The instantaneous utility function of the household is

$$u(c) = \frac{c^{1-\sigma}}{1-\sigma} \tag{6}$$

We develop three versions of the model to understand the robustness of the key result of the ranking of various fiscal policy constraints. These accord with different views about whether the productive public inputs (G_1 and G_2) are stocks or flows. In particular, there has been some debate in the literature regarding whether private output is likely to be affected by the flow of public services (miles of highway constructed per year for example) or the stock of public capital (total miles of highway in existence).[5] In Model 1, which coincides with the Devarajan et a. (1996) model,

$$G_{1,2} = g_{1,2} = \phi_{1,2}\tau y \tag{7}$$

implying that G_1 and G_2 are two different productive public services which are derived from the flow of public expenditure.

In the second version of the model referred to as Model 2, G_1 denotes public services as above so that

$$G_1 = g_1 = \phi_1\tau y \tag{8}$$

whereas G_2 denotes the stock of public capital implying that g_2 represents public investment:

$$\dot{G}_2 = g_2 = \phi_2\tau y \tag{9}$$

This version corresponds to the model developed in Tsoukis and Miller (2003) for example.

In the third version of the model referred to as Model 3, G_1 and G_2 represent two different types of public capital so that

$$\dot{G}_{1,2} = g_2 = \phi_{1,2}\tau y \tag{10}$$

As shown below, all results derived for Model 1 apply equally to Model 3. Table 1 includes a summary of the key features of the models described above.

[5] See for example Barro (1990) and Futagami et al. (1993).

Table 1: Model summary

Model	G_1	G_2
1	public service	public service
2	public service	public capital
3	public capital	public capital

Alternatively, we could develop a single, more complex model with two types of public services together with two types of public capital. However, this would yield essentially the same insights compared to the use of the three models, whilst making the model exposition harder to follow.

The assumption of Cobb-Douglas technology is convenient because it allows for closed-form solutions of optimal policies as shown below, but arguably, it may not be very realistic. In particular, factors of production may be complements, in part because public inputs provided by the government fundamentally differ from private inputs, such that it may be very costly for firms to substitute for them. For example, poor performance of public law enforcement may require firms to install costly security and property protection systems. Therefore, in the Appendix, we show that the results also hold for the more general case of CES technology when the elasticity of substitution is smaller than one.

The representative household maximizes lifetime utility U given by

$$U = \int_0^\infty u(c(t))e^{-\rho t}dt \tag{11}$$

subject to the respective production function of the model as well as the household's resource constraint given by (5) taking the initial capital stock $k_0 > 0$ as well as τ, G_1 and G_2 as given.[6] The latter assumption, namely that private agents take all aspects of fiscal policy as given, is crucial for the remainder of the paper and directly follows from the fact that the model economy is populated by a large number of firms and households. From the first-order conditions, the growth rate of the household's consumption and

[6]The time subscript is omitted whenever possible. A dot over the variable denotes its derivative with respect to time. In Models 2 and 3, the initial stock of public capital must also be greater than zero.

of the economy can be written in familiar form as

$$\gamma = \frac{\dot{c}}{c} = \frac{1}{\sigma}\left((1-\tau)y_k - \rho\right) \tag{12}$$

The representative household computes the marginal product of private capital (which represents the returns on private capital) from (1) while holding constant the quantity of public inputs to private production that the representative firm it owns receives. Here we are assuming that when there are a large number of tax-paying firms, the impact of raising the stock of the private capital and output of an individual firm on the level of total public spending is likely very small and can therefore safely be ignored. Hence, the marginal product of private capital is

$$y_k = \theta\left(\frac{G_1}{k}\right)^{\alpha_1}\left(\frac{G_2}{k}\right)^{\alpha_2} \tag{13}$$

so that from (12), the growth rate can be written as

$$\gamma = \frac{1}{\sigma}\left((1-\tau)\theta\left(\frac{G_1}{k}\right)^{\alpha_1}\left(\frac{G_2}{k}\right)^{\alpha_2} - \rho\right) \tag{14}$$

In order to ensure that the transversality condition holds and does not constrain the choice of τ and $\phi_{1,2}$, it is assumed that $\sigma > 1$.[7] In Model 1, there are no transitional dynamics, and the economy is always on the balanced growth path. The Appendix shows that the equilibrium of Models 2 and 3 is saddlepoint stable within relevant parameter ranges, and that the balanced growth path is unique. Along the balanced growth path, c, k, G_1, G_2 and y all grow at the same rate. Obviously, in this class of models, long-run growth at the aggregate level is a result of the nature of the firms' production function: the firms' output grows in the long-run due to constant returns to scale in private capital and public inputs which expand in parallel to the firms' capital stock. The growth rate of the representative firm, $\frac{\dot{y}}{y}$, in turn corresponds to (12) and depends on the net return to private capital, $(1-\tau)y_k$, and on the owner's (i.e. the households') preferences represented by σ and ρ.

[7] The transversality condition can be written as $\lim_{t\to\infty}[\lambda k] = 0$ where λ is the costate variable of the current-value Hamiltonian.

4 Optimal Fiscal Policy

This section derives the growth-maximizing tax rate, τ^*, and the growth-maximizing share of public resources allocated to each public input to private production ($G_{1,2}$), $\phi^*_{1,2}$. These growth-maximizing policies provide the benchmark against which business perceptions of policy are then compared below. For simplicity, we assume that the objective of the government is to maximize growth. We recognize that growth- and welfare-maximizing policies may differ in these models, although differences in outcomes are often relatively small as shown by Misch et al. (forthcoming). Firms only consider growth outcomes; for that reason we leave the consideration of welfare maximization to future analysis. In order to find the growth-maximizing policies, $\frac{G_{1,2}}{k}$ must be expressed in terms of the fiscal policy parameters in each model version.

Model 1 (two public services)

Using (7) to substitute for $G_{1,2}$ in (1) and rearranging yields

$$\frac{y}{k} = \tau^{\frac{\alpha_1+\alpha_2}{\theta}} \phi_1^{\frac{\alpha_1}{\theta}} \phi_2^{\frac{\alpha_2}{\theta}} \tag{15}$$

so that $\frac{G_1}{k}$ and $\frac{G_2}{k}$ can be written as

$$\frac{G_1}{k} = \tau^{\frac{1}{\theta}} \phi_1^{\frac{1-\alpha_2}{\theta}} \phi_2^{\frac{\alpha_2}{\theta}} \tag{16}$$

$$\frac{G_2}{k} = \tau^{\frac{1}{\theta}} \phi_1^{\frac{\alpha_1}{\theta}} \phi_2^{\frac{1-\alpha_1}{\theta}} \tag{17}$$

Using (16) and (17), the growth rate given by (14) can be re-written as

$$\gamma = \frac{1}{\sigma}((1-\tau)\theta\tau^{\frac{\alpha_1+\alpha_2}{\theta}} \phi_1^{\frac{\alpha_1}{\theta}} \phi_2^{\frac{\alpha_2}{\theta}} - \rho) \tag{18}$$

Maximizing (18) with regard to τ and ϕ_1 and taking into account that $\phi_2 = 1 - \phi_1$ yields the growth-maximizing tax rate, τ^*, the growth-maximizing share of public resources allocated to G_1, ϕ^*_1, and the growth-maximizing share of public resources allocated to G_2, $(1 - \phi^*_1)$:

$$\tau^* = \alpha_1 + \alpha_2 \tag{19}$$

$$\phi_1^* = \frac{\alpha_1}{\alpha_1 + \alpha_2} \tag{20}$$

$$\phi_2^* = \frac{\alpha_2}{\alpha_1 + \alpha_2} \tag{21}$$

Model 2 (public services and public capital stock)

Using the condition along the balanced growth path:

$$y = \dot{y}/\gamma \tag{22}$$

to substitute for y in (9), and integrating, yields

$$G_2 = \frac{\tau\phi_2}{\gamma} y \tag{23}$$

Further, using (8) and (23) to substitute for G_1 and G_2, respectively, in (1), and rearranging yields:

$$\frac{y}{k} = \tau^{\frac{\alpha_1+\alpha_2}{\theta}} \phi_1^{\frac{\alpha_1}{\theta}} \left(\frac{\phi_2}{\gamma}\right)^{\frac{\alpha_2}{\theta}} \tag{24}$$

Finally, using (24), (22), and (23) in combination with (14), it can then be shown that the growth rate in Model 2 has to satisfy the following equation:

$$\gamma = \frac{1}{\sigma}\left((1-\tau)\theta\tau^{\frac{\alpha_1+\alpha_2}{\theta}} \phi_1^{\frac{\alpha_1}{\theta}} \left(\frac{\phi_2}{\gamma}\right)^{\frac{\alpha_2}{\theta}} - \rho\right) \tag{25}$$

which differs from Model 1 because γ appears on the RHS. However, using implicit differentiation, it can be shown that the growth-maximizing tax rate and the growth-maximizing spending share of G_1, τ^* and ϕ_1^*, respectively, are identical to Model 1 when Cobb-Douglas technology is assumed.

Model 3 (two public capital stocks)

In Model 3, G_1 and G_2 denote the stock of two different types of public capital and can be expressed by analogy to (23) as:

$$G_i = \frac{\tau\phi_i}{\gamma} y \tag{26}$$

such that the growth rate satisfies the following equation:

$$\gamma = \frac{1}{\sigma}\left((1-\tau)\,\theta\tau^{\frac{\alpha_1+\alpha_2}{\theta}} \left(\frac{\phi_1}{\gamma}\right)^{\frac{\alpha_1}{\theta}} \left(\frac{\phi_2}{\gamma}\right)^{\frac{\alpha_2}{\theta}} - \rho\right) \tag{27}$$

The growth-maximizing policies can then be derived in a similar manner to Model 2. With Cobb-Douglas technology, they are also identical to Model 1.

In all models, τ^* and $\phi^*_{1,2}$ can be considered as optimal policies in a situation where the government is unconstrained and maximizes growth. However, governments are typically constrained in their ability to change various elements of fiscal policy due to legal requirements or commitments such as interest payments that depend on previous accumulated public debt, which generate 'budget rigidities'. More importantly, governments are inevitably imperfectly informed about the production technology parameters required to set τ and $\phi_{1,2}$ to their optimal values. Rather, governments generally face the challenge of identifying growth-enhancing policy changes or reforms that take existing policy as its starting point. The next section considers how far business (firms') assessments of fiscal policy-related constraints to growth can be expected to serve as a reliable guide to identify the direction of fiscal policy parameter changes that enhance growth.

5 Firms' Perceptions of Constraints: Theoretical Predictions

5.1 Modelling Business Perceptions

This sub-section models business perceptions of fiscal policy-related constraints to growth, and in particular the ratings of obstacles provided by firms in the Enterprise Surveys. This will allow us to assess whether the fiscal policy adjustments they suggest raise or lower the long-run growth rate and thereby align with the first-best policy option chosen by a perfectly informed government that maximizes the growth rate. As part of the Enterprise Surveys, business owners or top managers are typically asked: "Please tell us if any of the following issues are a problem for the operation and growth of your business." Respondents were then asked to rate the severity of each item on a five-point scale.[8] The list of items that firms are presented

[8]This is the question asked in the standard survey design which was used until 2005 and only in some surveys carried out in 2006. From 2006 onwards, depending on the obstacle, various versions of questions were asked, but typically they all contain the word

includes tax rates, various types of public service-related obstacles including skills and education of available workers, crime, theft and disorder and, to a lesser extent, tax administration, as well as transport which directly relates to infrastructure as a type of public capital.

In our model, taxation τ, and public services and public capital represented by G_1 and/or G_2 depending on the version of the model all affect private investment. Taxation crowds out investment, whereas the level of public services and public capital are required for private production and raise the returns to private investment. In this sense, we interpret taxation, public services and public capital as constraints to firm-level investment which are exogenous to the individual firm. In a dynamic setting, a natural measure of the cost associated with each constraint is the increase in output growth or investment growth (which coincide along the balanced growth path) as a result of marginally alleviating them. This is also a natural way to model the firms' assessment of the severity of these obstacles in the surveys because as Carlin et al. (2010) argue, the questions asked in the surveys are implicitly in relative terms, rather than in absolute, monetary terms. Considering the change in the growth rate is a relative measure and therefore seems appropriate and also closely related to the terms used in the question.[9]

We further assume that firms take the public inputs to private production, G_1 and G_2, as given. This assumption follows directly from the positive investment externality described above and thereby ensures consistency because firms are also assumed to ignore these externalities when they 'compute' the returns on their investment. It is justified in the presence of a large number of firms: individual firms are unlikely to internalize the posi-

'obstacle'. One commom question is: "As I list some of many factors that can affect the current operations of a business, please look at this card and tell me if you think that each factor is No Obstacle, a Minor Obstacle, a Major Obstacle, or a Very Severe Obstacle to the current operations of this establishment." Surveys in some countries may also differ from the standard questionnaire design.

[9]We could also alternatively consider the increase in current output or lifetime utility as a result of relaxing constraints. The different measures can yield different results, especially where the models imply that growth- and welfare-maximizing policies differ. In Model 1, for example, the growth- and welfare-maximizing fiscal policies coincide under Cobb-Douglas technology because public capital is not included (see Futagami et al., 1993, for comparison).

tive externalities of private investment, where the latter arise because higher levels of private output result in higher public revenue, which in turn enables higher levels of productive public spending and thereby higher returns to all firms' private capital. In addition, since the way the survey question is framed makes no provision for the existence or the relevance of the government budget constraint, it might be expected to encourage firms to ignore the government budget constraint in the context of the survey.[10] Finally, this assumption is also consistent with the fact that the type of constraints that firms are asked to assess are not equivalent to the policy parameters that the government sets, namely τ, ϕ_1 and ϕ_2. This assumption implies that business respondents do not internalize the government budget constraint when they are asked to rate fiscal policy-related constraints.

Below, we show that this assumption leads to a potential bias in business perceptions from a policy perspective. Obviously, if the government charged prices for the use of public services and public capital, then firms would internalize the externalities associated with their provision. This would imply that taxation is no longer necessary, and that this type of bias in the firms' assessment of the costs of underprovision of public services and public capital would not arise. However, in practice, it is not always feasible to charge user prices, especially, if the public good in question is non-excludable, and, if it is, then prices are often not high enough to ensure full cost-recovery for political reasons, especially in developing countries.

We therefore model the firms' assessments of the severity of taxation and underprovision of public services and public capital as the change in the growth rate that the representative firm *expects* as a result of raising G_1 and G_2 and lowering τ. We therefore use the derivatives of the growth rate with respect to G_1, G_2 and τ (denoted by μ_1^B, μ_2^B, and μ_τ^B, respectively) as simple

[10]Though this assumption seems reasonable in the context of responses to business surveys questions, the political economy literature assessing individuals' or voters' fiscal policy preferences has egun to examine the case where they recognize the government budget constraint; see, for example, Creedy (2008).

measures of the firms' rating of the severity of the constraints; hence:[11]

$$\mu_{1,2}^{B} = \frac{\partial \gamma}{\partial G_{1,2}} \tag{28}$$

$$\mu_{\tau}^{B} = -\frac{\partial \gamma}{\partial \tau} \tag{29}$$

where, based on our assumptions, firms perceive the growth rate, γ^B, as:

$$\gamma^{B} = \frac{1}{\sigma}\left((1-\tau)\theta\left(\frac{G_1}{k}\right)^{\alpha_1}\left(\frac{G_2}{k}\right)^{\alpha_2} - \rho\right) \tag{30}$$

which corresponds to (14).

Our framework to model and interpret business perceptions is similar to the framework proposed by Carlin et al. (2006, 2010). We also assume that various public services and types of infrastructure are inputs to private production. In addition, in the Carlin et al. framework, the firms' assessment of the severity of constraints is modelled as the loss in output that arises relative to an ideal situation where the obstacle is absent. As Carlin et al. (2012) note, for small changes in the severity of the constraint, their expression is the first derivative of the output / profit function which is very similar to our approach.

However, we nevertheless extend their framework in several ways. First, we model the differences of various obstacles in greater detail. On the one hand, we explicitly include tax rates in the model. On the other hand, by using a dynamic model, we are able to capture the differences between public services derived from the flow of public spending and the benefits derived from the stock of public capital accumulated over time. Second, we use a general equilibrium framework by considering the government budget constraint. This is important, given that removing obstacles is typically associated with some type of costs and therefore gives rise to trade-offs. Both features of our model are critical for our analysis.

[11] When we compute the partial derivatives, we implicitely ignore the subsequent change in the capital stock that is a consequence of the second-order response to a change in the change of the capital stock (i.e. a change in the rate of investment). These effects are likely to be small and qualitatively unimportant for our results.

5.2 Assessing Business Perceptions

Business perceptions of constraints can be assessed by evaluating the preferred fiscal policies they imply. If, for instance, $\mu_1^B > 0$, then business perceptions imply that increasing ϕ_1 or τ, in order to raise G_1, has a positive effect on the growth rate. Note that μ_τ^B is defined above as the negative of $\frac{\partial \gamma^B}{\partial \tau}$, such that if $\mu_\tau^B > 0$, businesses perceive that lowering τ has a positive effect on the growth rate. Clearly then, business perceptions will suggest the direction of the appropriate policy response, but will not indicate the magnitude of the change necessary to reach the growth-maximizing point. While this is a limitation of the information that can be gained from business perception data compared to that found from calculating where the growth-maximizing point lies, in practice, budget rigidities and other information limitations often mean that fiscal policy adjustments require recognizing the correct direction, rather than end-point, of reform.

When all fiscal policy parameters are set at their growth-maximizing levels then, in the absence of any systematic bias, firms should perceive none of the constraints as binding, that is: $\mu_{1,2}^B = 0$ and $\mu_\tau^B = 0$. However, it is obvious from equation (30) that firms always perceive that $\mu_{1,2}^B > 0$ and $\mu_\tau^B > 0$ so that the policy suggestions arising from business perceptions may conflict with 'correct' first-best policy advice. Other things equal, firms always want more spending on productive public inputs and lower taxation.[12] The 'true' effects of changing $\phi_{1,2}$ or τ obviously depend on whether their current values are at, below, or above their growth-maximizing values, $\phi_{1,2}^*$ and τ^*. The source of this systematic bias of business perceptions from a policy perspective relates to our assumption that firms ignore the government budget constraint: firms do not consider the negative effects (positive effects) of lowering taxes in terms of lower productive public spending (or increasing spending on public services and public capital in terms of higher taxation). From the models, this is not surprising, given that the expression for the perceived growth rate (30) differs from the growth rates in the three

[12]The only exception is of course the unrealisitc case when $\tau = 0$ so that $\mu_\tau = 0$ or when G_1 and G_2 are so large so that $\mu_{1,2}^B \approx 0$. Alternatively, $\mu_{1,2}^B \approx 0$ when α_1 and α_2 are very small.

models considered as assessed by a perfectly informed government - in (18), (25) and (27). By contrast, a fully informed government essentially assesses the severity of constraints associated with fiscal policy by computing the first derivatives of (18), (25) and (27), depending on the model, with respect to τ, ϕ_1 and ϕ_2. Where policy parameters are already set at their growth-maximizing levels, a fully informed government would not perceive them as binding, so that $\partial\gamma/\partial\phi_{1,2} = \partial\gamma/\partial\tau = 0$.

Comparing the optimal, i.e. first-best policy choices, with those suggested by business perceptions is in essence an analogy to comparisons between investment decisions taken by a central planner and by private agents in a decentralized economy. In both cases, differences arise because of positive investment externalities that are ignored by private agents: private investment raises the stock of private capital resulting in higher output and therefore higher public revenue. Given that the government budget is always assumed to be balanced, increased public revenue leads to higher levels of productive public expenditure which in turn increases private productivity. Ignoring this externality obviously distorts private investment.

We now attempt to correct business perceptions for this bias: instead of considering business perceptions in *absolute* terms, the policy implications of business perceptions are instead evaluated in *relative* terms; i.e. we compare perceptions of different obstacles, by the same firm. If constraint i is perceived as more binding than constraint j (so that $\frac{\mu_i^B}{\mu_j^B} > 1$ with $i, j = 1, 2, \tau$ and $i \neq j$), the policy implication is that removing constraint i raises the growth rate whereas alleviating constraint j enhances the growth rate less or may even lower the growth rate. The underlying rationale is that this may 'cancel out' the systematic bias due to ignoring the government budget constraint inherent in the perception of *all* obstacles. In particular, ignoring the government budget constraint essentially implies that firms ignore the indirect effects of alleviating fiscal policy constraints. In principle, if the indirect effects are approximately similar or are alternatively negatively correlated with the direct growth effects that result from alleviating constraints and that firms perceive (so that the observed direct effects are sufficient to determine the ranking of the constraints), this is a useful strategy. However,

we show in subsequent sub-sections that while our strategy to correct for the bias of business perceptions proves successful for similar types of constraints, some systematic bias may remain when different types of constraints are compared.

5.3 Firms' Comparisons of Different Types of Public Services or of Public Capital

We first turn to 'successful' cases and evaluate the policy implications of business perceptions of similar public spending-related constraints in relation to each other in Model 1 (two different public services) and in Model 3 (two different types of public capital). From (28), $\frac{\mu_1^B}{\mu_2^B}$ can be written as

$$\frac{\mu_1^B}{\mu_2^B} = \frac{G_2\alpha_1}{G_1\alpha_2} \tag{31}$$

A comparison of the perceptions of two types public services or two types of public capital eliminates the potential bias inherent in subjective firm data from a policy perspective due to the firms ignoring the government budget constraint. To show this, we use (7) for the case of two public services (Model 1) and (26) for the case of two types of public capital (Model 2) to re-write (31) as

$$\frac{\mu_1^B}{\mu_2^B} = \frac{\alpha_1(1-\phi_1)}{\alpha_2\phi_1} \tag{32}$$

For the case where spending shares are set at the growth maximum ($\phi_1 = \phi_1^*$), it can be shown that:

$$\frac{\mu_1^B}{\mu_2^B} = 1 \tag{33}$$

That is, firms perceive both constraints as equally binding when the allocation is growth-maximizing in Models 1 and 3. If, on the other hand, $\phi_1 < \phi_1^*$, then $\frac{\mu_1^B}{\mu_2^B} > 1$ which suggests that G_1 is a greater constraint than G_2 (or vice versa). The conclusion from business perceptions would be to increase ϕ_1 which is obviously growth-enhancing, irrespective of the parameter values of the model. In this case, firm perceptions always align with that which would be suggested by a fully-informed government and therefore business perceptions are of value in this regard and the perceived ranking is correlated with

the actual ranking of growth constraints. Here, the strategy to eliminate the bias inherent in business perceptions from a policy perspective by considering them in relative terms is hence successful. This analysis also shows that $\frac{\mu_1^B}{\mu_2^B}$ is determined by actual public spending allocation so that the ranking of two public service- or two public capital-related constraints differs by context.[13]

5.4 Firms' Comparisons of Public Services and Public Capital

This sub-section evaluates the policy implications of business perceptions of the public spending-related constraints in relation to each other in Model 2 (one public service and one type of public capital). In this case, comparing the perceptions of both types of constraints fails to correct the bias in business perceptions. The intuition is that public capital is accumulated over time and grows even in the absence of fiscal policy adjustments. By ignoring the government budget constraint, firms do not take into account these differences.

To show this formally, we substitute for G_1 and G_2 in (31) using (7) and (26):

$$\frac{\mu_1^B}{\mu_2^B} = \frac{\alpha_1(1-\phi_1)}{\gamma\alpha_2\phi_1} \tag{34}$$

That is, compared to (32), in Model 2 γ is added to the denominator of (34). In this model there is no closed-form solution of γ, so that (34) cannot be evaluated analytically. However, using numerical examples, it can be shown that in most instances, the policy preferences arising from business perceptions in this case can be expected to be growth-reducing. Suppose for instance $\alpha_1 = \alpha_2$ and $\phi_1 = \phi_1^* = 0.5$. Given that $\gamma < 1$, it can be seen that in this case, $\frac{\mu_1^B}{\mu_2^B} > 1$. This falsely suggests that the government should increase ϕ_1 further above its growth-maximizing value ϕ_1^*. The Appendix provides additional numerical examples with CES production technology that give rise to the same result.

[13] Using numerical examples, the Appendix shows that these results continue to hold when the elasticity of substitution between private and public inputs is smaller than in the case of Cobb-Douglas technology.

Using numerical examples, it is also possible to assess the likelihood that firms perceive public services as a greater constraint than public capital and vice versa by determining where in the fiscal policy space $\frac{\mu_1}{\mu_2} > 1$. The fiscal policy space is defined in terms of all possible combinations of both fiscal policy parameters, τ and ϕ, within certain ranges. Figure 1 displays the fiscal policy space for different exogenous parameter values. It is assumed that $0.05 \leq \phi_1 \leq 0.95$ and that $0.05 \leq \tau \leq 0.94$. The region where $\frac{\mu_1^B}{\mu_2^B} < 1$ is shaded, whereas in the remainder of the policy space, $\frac{\mu_1^B}{\mu_2^B} > 1$. The likelihood can be assessed in terms of the combinations of τ and ϕ where $\frac{\mu_1^B}{\mu_2^B} > 1$ and $\frac{\mu_1^B}{\mu_2^B} < 1$, respectively, and then corresponds to the share of the policy space where $\frac{\mu_1^B}{\mu_2^B} > 1$ which has been approximated numerically.[14] Figure 1 shows that the likelihood that firms perceive public service-related constraints as more severe than public capital-related constraints is relatively high, and in relative terms, the share of instances where this is the case is significantly greater than 0.5. This holds even though the output elasticity of public capital, α_2, is three times larger than the output elasticity of public services, α_1, in our simulation.[15] While these numerical simulations cannot be regarded as representative, they nevertheless demonstrate that in many cases, it can be expected that $\frac{\mu_1}{\mu_2} > 1$ except for relatively high values of ϕ_1.

Now suppose the opposite (and unlikely) case, namely that

$$\frac{\mu_1^B}{\mu_2^B} < 1 \tag{35}$$

implying that firms perceive G_2 (public capital) as more binding than G_1 (public service). From (34), this implies that

$$\frac{\alpha_1(1-\phi_1)}{\gamma\alpha_2\phi_1} < 1 \tag{36}$$

Rearranging (36) yields

$$\phi_1 > \frac{\alpha_1}{\alpha_1 + \gamma\alpha_2} \tag{37}$$

[14] The area where $\frac{\mu_1^B}{\mu_2^B} > 1$ can be approximated by using the Trapezoidal Rule with an interval length of 0.001 and then divided by the total area of the policy space.

[15] When considering fiscal policy changes around the growth-maximizing values, it is even more *unlikely* that $\frac{\mu_1^B}{\mu_2^B} < 1$.

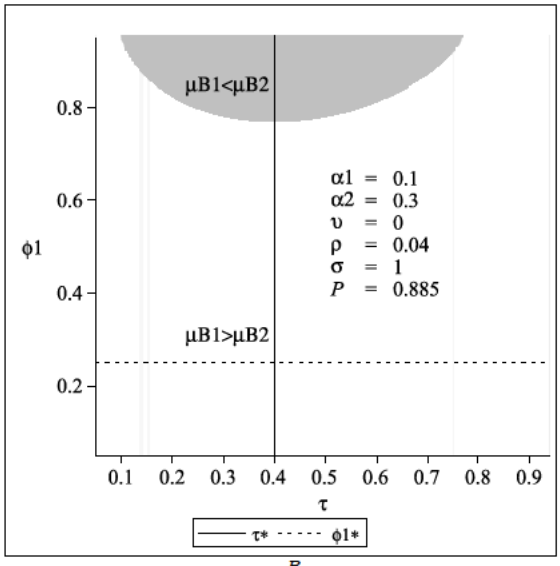

Figure 1: Model 2 - $\frac{\mu_1^B}{\mu_2^B}$ in the policy space

In turn, if the RHS of (37) is larger than ϕ_1^* so that

$$\frac{\alpha_1}{\alpha_1 + \gamma\alpha_2} > \frac{\alpha_1}{\alpha_1 + \alpha_2} \tag{38}$$

then $\phi_1 > \phi_1^*$. Again, assuming that $0 < \gamma < 1$, then (38) is fulfilled.

In other words, when firms perceive that G_2 (public capital) is a greater constraint than G_1 (public service), then the policy implications of business perceptions of the public service-related constraint in terms of the public capital-related constraint (namely to lower ϕ_1) are growth-enhancing. It follows that when public services are ranked as a more severe constraint to growth than public capital, then according to our model business perception data are not a reliable guide to policy, whereas if public capital is identified as the more severe constraint they are.

5.5 Firms' Comparisons of Taxes and Public Spending-Related Constraints

This sub-section evaluates the policy implications of business perceptions of the tax-related constraint in terms of the public spending-related constraints.

From (28) and (29), $\frac{\mu_\tau^B}{\mu_i^B}$ with $i = 1, 2$ can be written as

$$\frac{\mu_\tau^B}{\mu_i^B} = \frac{G_i}{(1-\tau)\alpha_i} \tag{39}$$

This clearly illustrates the problem of comparing the perceptions of the tax-related and the public services-related constraints: the comparison is essentially between the growth effects of an increase in the tax rate by one percentage point with those resulting from an increase in G_i by one unit. As we model the responses of firms in existing business surveys and have to take the questionnaire design as given, normalizing the constraints and measuring them on identical scales as done in Misch et al. (2010) and then asking firms to assess their severity is desirable but not feasible for us.

In order to more rigorously evaluate the merits of this comparison, we substitute for G_i using (7) according to which $G_i = \tau\phi_i y$:

$$\frac{\mu_\tau^B}{\mu_i^B} = \frac{\tau\phi_i}{(1-\tau)\alpha_i} y \tag{40}$$

Suppose that the level of taxation is set at the growth-maximizing level ($\tau = \tau^*$), but that the public resource allocation is suboptimal such that $\phi_i = \frac{1}{2}\phi_i^*$. It is clear that in this case, raising ϕ_i and keeping τ constant would be growth-enhancing. However, according to the business perception

$$\frac{\mu_\tau^B}{\mu_i^B} > 1 \tag{41}$$

if

$$y > \frac{(1-\tau)\alpha_i}{\tau\phi_i} \tag{42}$$

This condition is likely to hold true within endogenous growth models regardless of the composition of public spending and the level of taxation and regardless of the unit of measurement of y because y (which constantly grows) is on the LHS. As a result, it is uncertain whether $\frac{\mu_\tau^B}{\mu_i^B}$ provides the 'correct' (first-best) policy prescriptions. Business perceptions of the appropriate policy response, to lower taxation, may match the first-best policy prescription, but firms support this policy response even when it is not optimal. Separating the occasions in which firm perceptions are correct and when they are

incorrect is not possible in this case; hence perception data are not a reliable guide to policy when $\mu_\tau^B > \mu_i^B$.

Given that comparing the tax- and the public services-related constraints to correct for the bias in business perceptions which arises from a policy perspective is not feasible due to differences in measurement, an obvious alternative would be to use business perceptions to compute perceived growth elasticities with respect to τ and G_i because elasticities are unit-free. Using (29), (28), and (39) to compute the perceived growth elasticities and dividing yields

$$\frac{\mu_\tau^B}{\mu_i^B}\frac{\tau}{\gamma}\frac{\gamma}{G_i} = \frac{\tau}{(1-\tau)\alpha_i} \tag{43}$$

When the level of taxation is set at the growth-maximizing level ($\tau = \tau^*$), (43) can be rewritten as

$$\frac{1}{(1-\alpha_i)} > 0 \tag{44}$$

which is again greater than zero falsely suggesting that lowering taxation raises the growth rate. The bias which arises from a policy perspective therefore remains even in case when perceived elasticities are compared. This implies that the underlying source of the bias is therefore primarily related to firms ignoring the government budget constraint which cannot be corrected by considering business perceptions relative to each other when the constraints are measured on different scales.

Now again suppose the opposite (and unlikely) case, namely that

$$\frac{\mu_\tau^B}{\mu_i^B} < 1 \tag{45}$$

so that

$$y < \frac{(1-\tau)\alpha_i}{\tau\phi_i} \tag{46}$$

Rearranging (46) yields

$$\tau < \frac{\alpha_i}{\phi_i y + \alpha_i} \tag{47}$$

In turn, if the RHS of (47) is smaller than τ^* so that

$$\frac{\alpha_i}{\phi_i y + \alpha_i} < \tau^* \tag{48}$$

then $\tau < \tau^*$. Provided that τ^* is not extremely small, (48) is likely to hold if $\frac{\mu_\tau^B}{\mu_i^B} < 1$. The reason is that the LHS of (48) is decreasing over time (since y which grows indefinitely is in the denominator). (48) together with (47) then implies that $\tau < \tau^*$ is likely. Rearranging (46) yields

$$\phi_i < \frac{(1-\tau)\alpha_i}{\tau y} \tag{49}$$

Again, provided that ϕ_i^* is not extremely small, the RHS of (49) is likely smaller than ϕ_i^* since y, which grows over time, is in the denominator so that

$$\frac{(1-\tau)\alpha_i}{\tau y} < \phi_i^* \tag{50}$$

Therefore, if $\frac{\mu_\tau^B}{\mu_i^B} < 1$, $\phi_i < \phi_i^*$. In other words, the policy implications of $\frac{\mu_\tau^B}{\mu_i^B} < 1$ (i.e. firms perceive that G_i is a greater constraint than τ) are likely to be growth-enhancing in most cases. If public services are ranked as a more severe constraint than taxation, the business perception of the appropriate policy response is identical to the one suggested by a perfectly informed government which maximizes growth. Business perception data contain therefore useful information when $\mu_\tau^B < \mu_i^B$. All results presented here also hold for Models 2 and 3.

5.6 Summary

Table 2 summarizes the assessment of business perceptions of different constraints in relative terms across all models and shows in which cases imperfectly informed governments may regard them as consistent with first-best advice. Perceptions-based rankings of similar types of constraints (i.e. different public services or different types of public capital) give growth-enhancing policy suggestions, whereas perceptions-based rankings of different types of constraints (tax-related constraints and public spending-related constraints, or public service-related constraints and public capital-related constraints) may give rise to growth-reducing policy suggestions depending on how firms rank them.

The last column of Table 2 summarizes the key predictions regarding how firms rank constraints. In summary, it is likely that firms perceive the tax-

related constraint as more binding than public service-related constraints, which, in turn, are perceived as more binding than public capital-related constraints ($\mu_{\tau}^{B} > \mu_{ps}^{B} > \mu_{pc}^{B}$). Firms perceive the tax rate as a more severe constraint than public spending-related constraints because whereas public services and public capital enter the expression of the growth rate (14) as absolute values, the tax rate enters (14) as a relative value (i.e. from (2), $\tau = (g_1 + g_2)/y$). The intuition to explain the prediction that firms perceive public service-related constraints as more binding than public capital-related constraints is that public capital grows over time so that the stock of public capital will typically be larger than the flow of public services (i.e. $G_2 > G_1$ in Model 2). With decreasing marginal returns and when $G_2 > G_1$, it is therefore clear that $\mu_{ps}^{B} > \mu_{pc}^{B}$.

Business perceptions may have misleading policy implications because firms ignore the government budget constraint. In contrast, no specific predictions can be made about the relation between two public service-related constraints and two public capital-related constraints. Table 2 shows, for example, that the likelihood of firms *falsely* ranking tax constraints as a greater growth constraint than public service or public capital constraints, is high. At the same time, in the unlikely case that firms perceive public services or public capital as a greater constraint than the tax rate, the policy implications of the firms' ranking are likely 'correct' (i.e. growth-enhancing).

6 Firms' Ranking of Constraints: Empirical Observations

This section compares the theoretical predictions of how firms rank fiscal policy-related constraints with the World Bank Enterprise Surveys to identify the extent to which these data contain information of use to policy makers. This allows us to assess whether the systematic bias in the ranking of growth constraints by the same firm appears to be present in the data. The WBES dataset we use is based on cross-section, firm-level data that covers 118,933 firms in 139 countries. We exclude firms that do not rate any of the obstacles we consider. Each of the countries included in the dataset was surveyed up

Table 2: Evaluation of business perceptions and model predictions with respect to the ranking of constraints

Model	Constraint i	Constraint j	Firm's ranking of i and j	Policy implication of ranking	Ranking likelihood
1,2	tax	public service	$\mu_i^B > \mu_j^B$	possibly false*	high
			$\mu_i^B < \mu_j^B$	correct**	low
2,3	tax	public capital	$\mu_i^B > \mu_j^B$	possibly false*	high
			$\mu_i^B < \mu_j^B$	correct**	low
1	public service	public service	$\mu_i^B > \mu_j^B$	correct	policy dependent
			$\mu_i^B < \mu_j^B$	correct	policy dependent
2	public service	public capital	$\mu_i^B > \mu_j^B$	possibly false***	high
			$\mu_i^B < \mu_j^B$	correct	low
3	public capital	public capital	$\mu_i^B > \mu_j^B$	correct	policy dependent
			$\mu_i^B < \mu_j^B$	correct	policy dependent
* assumes that (42) holds; ** assumes that (48) and (50) hold; *** for most plausible numerical values					
(Model 1: two public services; Model 2: one public service and one type of public capital; Model 3: two types of public capital)					

to five times between 2002 and 2013 giving a total of 268 different surveys.[16]

The Enterprise Surveys provide a potentially useful testing ground against which the model predictions with respect to the behavior of private agents can be compared. The data includes a subjective rating of different fiscal policy-related constraints: firm representatives were presented a list of obstacles which they had to evaluate on a scale that ranges from 0 (no obstacle) to 4 (very severe obstacle). Some of the items in the list of obstacles are closely related to fiscal policy. They include transportation, skills and education of available workers, crime, theft and disorder, tax rates, and, to a lesser extent,

[16]The data was downloaded from www.enterprisesurveys.org on October 2nd 2013. It should be noted that apart from the World Bank, other organizations are also involved in providing the data. The Enterprise Surveys implemented in Eastern Europe and Central Asian countries are also known as Business Environment and Enterprise Performance Surveys (BEEPS) and are jointly conducted by the World Bank and the European Bank for Reconstruction and Development. Enterprise Surveys in Latin America are jointly funded with the Inter-American Development Bank (IDB) and surveys in the Caribbean are jointly funded with IDB and COMPETE Caribbean. Enterprise Surveys in South Asia are jointly funded with the UK's Department for International Development (DFID).

tax administration. Governments undertake public investment to built up transportation infrastructure.

Recurrent public spending to provide public services in the education sector determines to a considerable extent the skills and the education level of available workers[17], and law enforcement by public agencies (which likewise requires especially recurrent spending and only to a lesser extent public investment) determines crime rates. The quality of the tax administration depends to some extent on recurrent public spending, but other factors are also likely to play an important role. In the models, transportation infrastructure which requires relatively little recurrent spending and depreciates very slowly is represented by public capital. Education services, law enforcement and to a lesser extent tax administration may be represented by public services which both require a large share of recurrent public spending. Obviously, the WBES does not contain actual information on deviations of fiscal policy from the growth-maximizing level of taxation, public services and public capital. We turn to this issue at the end of this section.

By contrast, we exclude electricity which is also included in the list of obstacles presented to the interviewees. While in some countries, the government builds up electricity generation capacity using public revenue, the role of the government is typically more that of a regulator, and electricity providers are often semi-autonomous entities. Moreover, firms are charged for electricity usage, and the prices of electricity typically correspond much more to the actual cost of electricity generation and provision compared to prices charged for the provision of other public services, if any. By contrast, in our framework, we assume that firms may access public services and use public capital free of charge so that it is not straight forward to extend our analysis to the firms' perceptions of electricity. In addition, whether electricity is a major obstacle is also to a larger extent determined by exogenous shocks such as droughts than in the cases of the other obstacles. For these reasons, we do not consider electricity generation capacity as a fiscal policy related obstacle which could be adequately modelled in our framework.

[17] We assume that the evaluation of the skills of available workers includes an implicit evaluation of public education services.

In general, there are several difficulties involved in the use of subjective data including the reference point bias (i.e. respondents may use different benchmarks against which obstacles are assessed), differences in the overall tendencies to complain, and the performance bias (i.e. whether ratings actually reflect the firm's performance in the environment rather than the environment in which it operates) (Hallward-Driemeier and Aterido, 2009, and Clarke, 2010). We address these concerns in two ways. First, we divide the rating of the obstacles of every firm by the mean rating of all obstacles we consider by the same firm. Second, we do not analyze the ratings in absolute terms, but only consider their ranking, i.e., the rating in relative terms.

The converted mean ratings across all firms and countries are displayed in Figure 2. As anticipated by the model it shows that transport is ranked lower than constraints that require a relatively high share of recurrent spending in order to be alleviated (education, crime and tax administration) which in turn are ranked lower than tax rates. Note also that the three public service categories are rated similarly.

While the mean rankings suggest that taxation is usually ranked as the most severe obstacle to growth of the six considered, of greater interest is the distribution of mean rankings across countries. Figure 3 compares the average ranking of the five fiscal policy-dependent constraints (transportation, crime, education, tax administration and tax rates). It shows that in almost 60 percent of the countries, tax rates are ranked first, and in over 50 percent of the countries, transport is ranked last. In contrast, there are only a few countries where tax rates are among the three least important obstacles, and transportation is rarely ranked among the first three obstacles. It can also be seen that, as we would predict, there is no clear rank order between the public service-related constraints: education, crime and tax administration. Note that to compile the underlying data for Figure 2, we have pooled data from all surveys available for a given country.

Carlin et al. (2010) also report that tax rates are typically rated as the most severe obstacle in most countries. Based on the endogenous growth models considered above we anticipated that the tax-related constraint would be perceived as more binding than the public service-related constraints

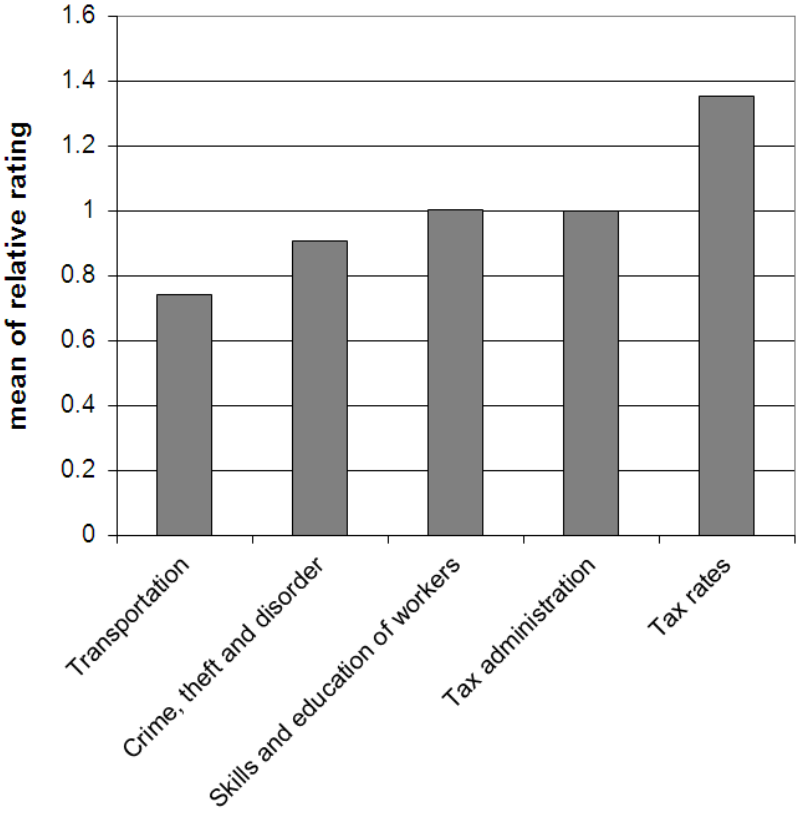

Figure 2: Mean business perception of fiscal policy-related obstacles

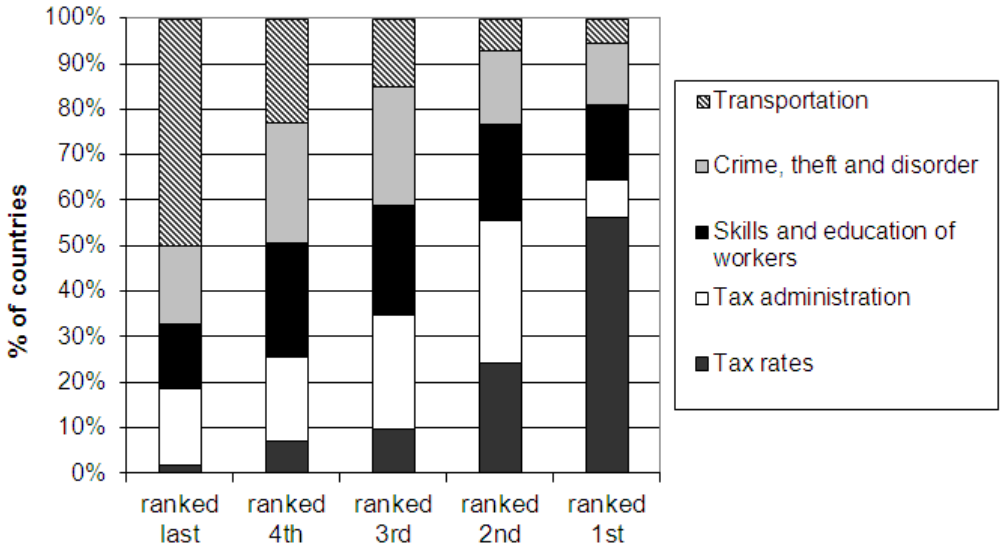

Figure 3: Ranking of fiscal policy-dependent constraints by country

(crime and disorder, education and skills), which, in turn, would be perceived as more binding than public capital-related constraints (transportation). Figures 2 and 3 show that on average, the observed patterns follow these predictions, and it is likely that these patterns are not mainly driven by actual fiscal policies but rather by a bias in the perception of firms. For these observations the model suggests that there is little reliable information for policy makers. There are however a sufficiently large number of occasions in which fiscal constraints are not in that order to suggest that there is some information within the data. At the simplest level there are for example around 40 percent of countries in which taxation is not ranked as the most severe constraint. Or focusing on transportation which is closely related to the stock of public capital, in roughly 50 percent of countries, this is not ranked as the least important obstacle on growth. The model also suggests that the rankings across different types of public service or different types of public capital are informative.

Given that we are only able to assess the firms' ranking based on the model predictions but not based on objective data on deviations of actual fiscal policy parameters from their growth-maximizing values, we cannot fully rule out that the observed average ranking pattern is driven by the actual severity of constraints. However, this seems unrealistic: on the one hand, if one assumes for simplicity and in the absence of other information that the severity of constraints is equally distributed across constraints (i.e. that on average, the severity of each constraint is identical), such a ranking would not emerge. On the other hand, many policy documents, for instance by international development banks, routinely identify infrastructure as a bottleneck to economic growth, or recommend increasing infrastructure investment. Assuming that on average, this analysis is correct, firms should perceive transport infrastructure as a much more severe constraint if their views were unbiased. However, this is not the case, which makes us confident that our model-based conclusions are correct.

7 Conclusions

This paper has modelled business perceptions of alternative fiscal policy-related growth constraints using an endogenous growth model with public finance. It has then considered the merits of these perceptions as a guide for policy making in practice, and compared the ranking of constraints by firms in the World Bank's Enterprise Surveys with the predictions of the model.

The models demonstrate that a 'careful' use of business perceptions of different constraints relative to each other to identify growth-enhancing fiscal policy reforms is possible. According to the endogenous growth framework, business perceptions are not useful to infer the optimal level, optimal composition and optimal *magnitude* of policy adjustments. However, due to various budget rigidities, it is the *direction* of the policy change which is often most important for policy in practice. In this case, business perceptions can provide some useful information.

The models examined suggest that firms may be expected to be better at distinguishing the growth-enhancing or retarding effects of similar public spending categories (different public *services* or different types of public *capital*). However, the models demonstrate that business perceptions may be misleading when firms are asked to compare taxes, public services and public capital with each other. They may be misleading in the sense that the fiscal policy prescriptions these perceptions imply need not be growth-enhancing in the long run. One exception is that the policy implications from the comparison of different aspects of fiscal policy are likely to be growth-enhancing when they are ranked contrary to the general prediction that taxes are ranked as a more severe constraint than public expenditures, and that public services are likely to be ranked as more severe than public capital.

The theoretical predictions regarding how firms are most likely to rank fiscal policy-related constraints appear to correspond fairly well to empirical observations. While we cannot directly observe the actual ranking of constraints, and are therefore unable to compare this to the perceived ranking, we argue that it is likely that the overall pattern we observe is driven by the biases which arise from a policy perspective and which we identify in

our models. When constraints are ranked according to the predictions of the model, business perceptions are not reliable for policy analysis. However there is a sufficiently large number of observations for which the model suggests that business perceptions are a useful guide. Therefore, the analysis implies that business perceptions sometimes contain useful information.

The results of this paper may also help to interpret findings of empirical papers that use business perception data as explanatory variables. For instance, Balchin and Edwards (2008) find that business perceptions of infrastructure are mostly not a significant determinants of export participation even though they find that objective infrastructure indicators are significant to some extent. Our results suggest that those findings are not surprising because on average, and in comparisons to other constraints, firms do not perceive infrastructure as an important obstacle irrespective of the actual contribution of the infrastructure.

The results here also suggest possible options for the re-design of investment climate surveys. In particular, they suggest that the firms' may rank tax-related constraints excessively highly. In addition, they suggest that it would be useful to ask firms to compare different types of public capital, and, in a separate question, asking firms to compare different types of public services. This would provide firms with a more refined list of obstacles, and make their resulting comparisons more meaningful.

Our results have been derived within the standard modelling framework we use and the assumptions upon which it is based. One implication of this framework is that firms do not learn from past mistakes and revise their perceptions accordingly. Nevertheless, this may correspond to firm behavior in practice since 'learning' would require firms to systematically record their perceptions and fiscal policy changes and compare them to their own growth and investment behavior. Such learning seems unlikely, at least systematically, since this would entail some cost but with no benefits in terms of better firm performance.

While we recognize that alternative frameworks to interpret business perceptions data may be available, we believe that endogenous growth models with public finance are a natural 'framework' to provide first steps to un-

derstand the value of perception data. Establishing the robustness of those conclusions to alternative frameworks is an obvious next step. The models examined here, when compared observed with business perceptions, are limited to relatively simple public service/capital distinctions and the channels by which they impact on growth. Possible extensions could for instance include adding further channels that affect the growth-maximizing fiscal policy.

We have shown that business perceptions in absolute terms do not contain useful information for governments. However, we have compared the rating of *different* constraints by a single firm and have shown that such a ranking may be useful for governments. Future research could therefore usefully discuss other types of comparisons. For instance, our framework could be used to compare the rating of the *same* constraint across firms in different sectors or countries more in the spirit of Carlin et al. (2010). This would require models with at least two sectors of production that are affected by productive public services as in Monteiro and Turnovsky (2008). A final extension would be to include other types of business perceptions in the discussion which would require a more complex modelling framework.

References

[1] P.-R. Agénor, "Fiscal policy and endogenous growth with public infrastructure," *Oxford Economic Papers*, vol. 60, no. 1, pp. 57–87, 2008a.

[2] ——, "Health and infrastructure in a model of endogenous growth," *Journal of Macroeconomics*, vol. 30, no. 4, pp. 1407–1422, 2008b.

[3] N. Balchin and L. Edwards, "Trade-Related Business Climate and Manufacturing Export Performance in Africa: A Firm-Level Analysis," *Journal of Development Perspectives*, vol. 4, no. 1, pp. 32–64, 2008.

[4] R. Barro, "Government spending in a simple model of economic growth," *Journal of Political Economy*, vol. 98, no. 5, pp. 103–25, 1990.

[5] W. Carlin, M. Schaffer, and P. Seabright, "Where are the real bottlenecks? evidence from 20,000 firms in 60 countries about the shadow

costs of constraints to firm performance," *IZA Discussion Papers*, no. 3059, 2007.

[6] W. Carlin and P. Seabright, "Bring me sunshine: which parts of the business climate should public policy try to fix?" in *Annual World Bank Conference on Development Economics, Global: Private Sector and Development*. World Bank Publications, 2009, pp. 99–145.

[7] W. Carlin, M. Schaffer, and P. Seabright, "A Framework for Cross-Country Comparisons of Public Infrastructure Constraints on Firm Growth," *CEPR Discussion Paper (7662)*, 2010.

[8] ——, "Soviet power plus electrification: What is the long-run legacy of communism?" *Explorations in Economic History*, 2012.

[9] G. Clarke, "Are Managers' Perceptions of Constraints to Growth Reliable? Evidence from a Natural Experiment in South Africa," *Unpublished manuscript. Available at http://ssrn.com/paper=1538034*, 2010.

[10] G. Clarke, J. Habyarimana, D. Kaplan, and V. Ramachandran, "Why isn't South Africa growing faster? Microeconomic evidence from a firm survey," *Journal of International Development*, vol. 20, no. 7, 2008.

[11] J. Creedy, S. M. Li, and S. Moslehi, "The Composition of Government Expenditure in an Overlapping Generations Model," *The University of Melbourne, Department of Economics, Research Paper (1043)*, 2008.

[12] S. Devarajan, V. Swaroop, and H.-f. Zou, "The composition of public expenditure and economic growth," *Journal of Monetary Economics*, vol. 37, no. 2, pp. 313–344, 1996.

[13] A. K. Dixit, "Evaluating Recipes for Development Success," *The World Bank Research Observer*, vol. 22, no. 2, pp. 131–157, 2007.

[14] K. Futagami, Y. Morita, and A. Shibata, "Dynamic Analysis of an Endogenous Growth Model with Public Capital," *The Scandinavian Journal of Economics*, vol. 95, no. 4, pp. 607–625, 1993.

[15] A. Gelb, V. Ramachandran, M. K. Shah, and G. Turner, "What Matters to African Firms? The Relevance of Perceptions Data," *World Bank Policy Research Paper (4446)*, 2007.

[16] S. Ghosh and U. Roy, "Fiscal Policy, Long-Run Growth, and Welfare in a Stock-Flow Model of Public Goods," *Canadian Journal of Economics*, vol. 37, no. 3, pp. 742–756, 2004.

[17] M. Hallward-Driemeier and R. Aterido, "Comparing Apples with.... Apples: how to make (more) sense of subjective rankings of constraints to business," *World Bank Policy Research Paper (5054)*, 2009.

[18] R. Hausmann, B. Klinger, and R. Wagner, "Doing Growth Diagnostics in Practice: A Mindbook," *CID Working Paper (177)*, 2008a.

[19] R. Hausmann, D. Rodrik, and A. Velasco, "Growth Diagnostics," in *The Washington Consensus Reconsidered*, N. Serra and J. E. Stiglitz, Eds. Oxford University Press, 2008b.

[20] F. Misch, N. Gemmell, and R. Kneller, "Growth and welfare maximization in models of public finance and endogenous growth," *Journal of Public Economic Theory*, forthcoming.

[21] ——, "Binding Constraints and Second-Best Policy Strategies in Endogenous Growth Models with Public Finance," *Journal of Globalization and Development*, vol. 1, no. 2, 2010.

[22] G. Monteiro and S. J. Turnovsky, "The composition of productive government expenditure: Consequences for economic growth and welfare," *Indian Growth and Development Review*, vol. 1, no. 1, pp. 57–83, 2008.

[23] D. Rodrik, "Why We Learn Nothing from Regressing Economic Growth on Policies," *Unpublished manuscript. Available at http://www.hks.harvard.edu*, 2005.

[24] ——, "Diagnostics before prescription," *The Journal of Economic Perspectives*, vol. 24, no. 3, pp. 33–44, 2010.

[25] W. Semmler, A. Greiner, B. Diallo, A. Rezai, and A. Rajaram, "Fiscal policy, public expenditure composition, and growth theory and empirics," *World Bank Policy Research Paper (4405)*, 2007.

[26] J. Temple, "The New Growth Evidence," *Journal of Economic Literature*, vol. 37, no. 1, pp. 112–156, 1999.

[27] C. Tsoukis and N. J. Miller, "Public Services and Endogenous Growth," *Journal of Policy Modeling*, vol. 25, no. 3, pp. 297–307, 2003.

[28] S. Turnovsky, "The Transitional Dynamics of Fiscal Policy: Long-Run Capital Accumulation and Growth," *Journal of Money, Credit, and Banking*, vol. 36, no. 5, 2004.

A Appendix

A.1 The Models with CES technology

With CES technology, the production function is

$$y = (\theta k^{\upsilon} + \alpha_1 G_1^{\upsilon} + \alpha_2 G_2^{\upsilon})^{\frac{1}{\upsilon}} \tag{A.1}$$

where θ, α_1 and α_2 are share parameters with $\theta = 1 - \alpha_1 - \alpha_2$. The elasticity of substitution, s, is determined by υ:

$$s = \frac{1}{1-\upsilon} \tag{A.2}$$

With $\upsilon = 0$, the production technology is Cobb-Douglas. To capture the notion that factors of production are complements rather than substitutes, it is assumed that $\upsilon \leq 0$.

A.2 Uniqueness and Stability in Model 2 with CES Technology

Let $x = \frac{c}{k}$ and $z = \frac{G_2}{k}$. Together with the transversality condition, $\lim_{t\to\infty}[\lambda k] = 0$, and with the initial conditions, $x_0 > 0$ and $z_0 > 0$, the dynamics of the market economy can be expressed as a system of two differential equations:

$$\frac{\dot{x}}{x} = \frac{\dot{c}}{c} - \frac{\dot{k}}{k} \tag{A.3}$$

and

$$\frac{\dot{z}}{z} = \frac{\dot{G}_2}{G_2} - \frac{\dot{k}}{k} \tag{A.4}$$

From (12), (5) and (9), respectively,

$$\frac{\dot{c}}{c} = \frac{1}{\sigma}\left((1-\tau)y_k - \rho\right) \tag{A.5}$$

$$\frac{\dot{k}}{k} = (1-\tau)\frac{y}{k} - x \tag{A.6}$$

$$\frac{\dot{G}_2}{G_2} = \phi_2 \tau \frac{y}{G_2} \tag{A.7}$$

Setting $\frac{\dot{x}}{x} = 0$ in (A.3) and solving for x yields its steady state value, $\tilde{x}$:

$$\tilde{x} = (1-\tau)\frac{y}{k} - \frac{1}{\sigma}\left((1-\tau)y_k - \rho\right) \tag{A.8}$$

Using (A.8) to substitute for x in (A.6), and using (A.6) and (A.7) to substitute for $(\frac{\dot{k}}{k})$ and $(\frac{\dot{G}_2}{G_2})$ in (A.4) yields

$$F = \phi_2 \tau \frac{y}{G_2} - \frac{1}{\sigma}(1-\tau)y_k + \frac{\rho}{\sigma} \tag{A.9}$$

where F is a function. From (8) and (23),

$$\frac{G_1}{G_2} = \frac{\phi_1}{\phi_2}\gamma \tag{A.10}$$

From (A.1) and (A.10),

$$\frac{y}{G_2} = (\alpha z^{-\upsilon} + \alpha_1 \left(\frac{\phi_1}{\phi_2}\gamma\right)^{\upsilon} + \alpha_2)^{\frac{1}{\upsilon}} \tag{A.11}$$

Differentiating (A.1) for k, using (8) to substitute for G_1 and replacing $\frac{G_2}{k}$ by z yields

$$y_k = \left(\theta + \alpha_1 \left(\tau\phi_1 \frac{y}{k}\right)^{\upsilon} + \alpha_2 z^{\upsilon}\right)^{\frac{1}{\upsilon}-1} \theta \tag{A.12}$$

From (1) and (8),

$$\frac{y}{k} = \left(\frac{\theta + \alpha_2 z^{\upsilon}}{(1 - \alpha_1 \phi_1^{\upsilon} \tau^{\upsilon})}\right)^{\frac{1}{\upsilon}} \tag{A.13}$$

After using (A.13) to substitute in (A.12), and (A.11) and (A.12) to substitute in (A.9), it can be seen that if $\upsilon \leq 0$, $\frac{dF}{dz} < 0$ implying that F is

a monotonically decreasing function of z so that there is a unique positive value of $\tilde{z}$ that satisfies $F = 0$. From (A.8), there is a unique positive value of $\tilde{x}$ as well. Thus, the growth path is unique.

To investigate the dynamics in the vicinity of the unique steady state equilibrium, equations (A.3) and (A.4) can be linearized to yield

$$\begin{bmatrix} \dot{x} \\ \dot{z} \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} x - \tilde{x} \\ z - \tilde{z} \end{bmatrix} \tag{A.14}$$

where $\tilde{x}$ and $\tilde{z}$ denote the steady state values of x and z. From (A.3) and (A.4), $\dot{x}$ and $\dot{z}$ can be rewritten as follows:

$$\dot{x} = \left(\frac{\dot{c}}{c} - \frac{\dot{k}}{k} \right) \tilde{x} \tag{A.15}$$

and

$$\dot{z} = \left(\frac{\dot{G}_2}{G_2} - \frac{\dot{k}}{k} \right) \tilde{z} \tag{A.16}$$

with $\frac{\dot{c}}{c}$, $\frac{\dot{k}}{k}$ and $\frac{\dot{G}_2}{G_2}$ defined according to (A.5), (A.6) and (A.7). Saddlepoint stability requires that the determinant of the Jacobian matrix of partial derivatives of the dynamic system (A.14) must be negative:

$$\det J = a_{11}a_{22} - a_{12}a_{21} \tag{A.17}$$

Given the complexity of the matrix, it is easier to verify numerically that this condition holds. For most sensible examples with sensible parameter values that we used, this condition is satisfied.

A.3 Uniqueness and Stability in Model 3 with CES Technology

With $x = \frac{c}{k}$, $z = \frac{G_2}{k}$ and $w = \frac{G_1}{G_2}$, the dynamics of the market economy can be expressed as a system of three differential equations:

$$\frac{\dot{x}}{x} = \frac{\dot{c}}{c} - \frac{\dot{k}}{k} \tag{A.18}$$

$$\frac{\dot{z}}{z} = \frac{\dot{G}_2}{G_2} - \frac{\dot{k}}{k} \tag{A.19}$$

$$\frac{\dot{w}}{w} = \frac{\dot{G}_1}{G_1} - \frac{\dot{G}_2}{G_2} \tag{A.20}$$

From (26), w can be written as

$$w = \frac{\phi_1}{\phi_2} \tag{A.21}$$

Therefore, as long as $\phi_{1,2}$ are constant, $\dot{w} = 0$ and $\frac{\dot{w}}{w} = 0$. This means that in terms of its dynamic properties, Model 3 is identical to Model 2, and it can be shown in the same way as for Model 2 that Model 3 has likewise a unique and saddlepath stable steady state equilibrium.

A.4 Business Perceptions of Public Spending-Related Constraints with CES Technology

When the elasticity of substitution is smaller than in the case of Cobb-Douglas technology ($\upsilon < 0$), there are mostly no closed-form solutions of the growth-maximizing policies, τ^* and ϕ^*. Therefore, this appendix evaluates the policy implications of $\frac{\mu_1^B}{\mu_2^B}$ in Models 1, 2 and 3 using numerical examples. Figure A.1 which refers to both, Models 1 and 3, confirms that with $\upsilon < 0$, the policy implications of $\frac{\mu_1^B}{\mu_2^B}$ are growth-enhancing when policies are not set at the growth maximum. In contrast, Figure A.2 provides a numerical example with CES technology which shows that business perceptions of the public service- and public capital-related constraints in relation to each other may be misleading (Model 2). Consider the case where $\phi_1 > \phi_1^*$. Figure A.2 shows that in this case, it is possible that $\frac{\mu_1^B}{\mu_2^B} > 1$ which suggests increasing ϕ_1 even further.

A.5 The Ranking of Public Service- and Public Capital-Related Constraints with CES Technology

This appendix presents numerical examples to analyze the likelihood that $\mu_1^B > \mu_2^B$ in Model 2, namely that firms perceive public services as a greater constraint than public capital, in analogy to Figure 1. In Figure A.3, the production technology is CES (with $\upsilon = -1$) which requires that $\tau \geq 0.3$ in

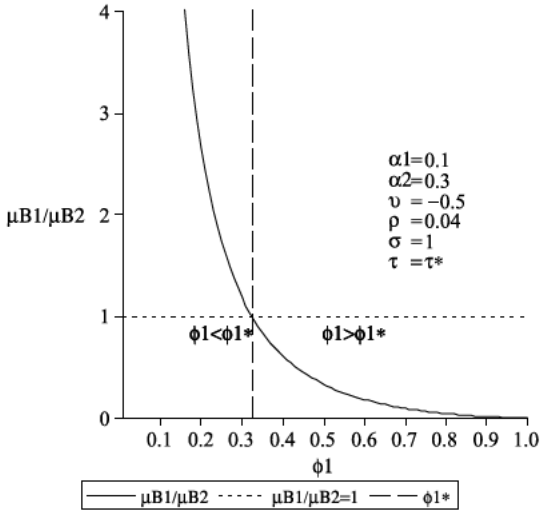

Figure 4: Models 1 and 3 - $\frac{\mu_1^B}{\mu_2^B}$ as a function of ϕ_1

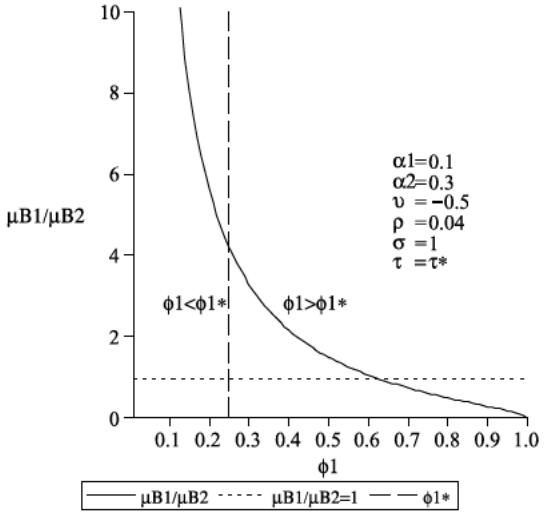

Figure 5: Model 2 - $\frac{\mu_1^B}{\mu_2^B}$ as a function of ϕ_1

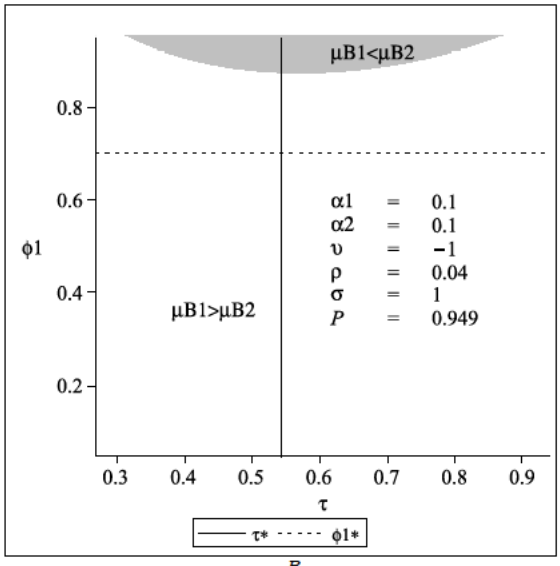

Figure 6: Model 2 - $\frac{\mu_1^B}{\mu_2^B}$ in the policy space

order that output is positive. It shows that the likelihood that $\mu_1^B > \mu_2^B$ is likewise very high.

A.6 Details of Dataset and Robustness Checks

This Appendix presents the details of the dataset used and robustness checks. Table 3 displays the number of countries, number of surveys and percentages of firms by geographical region and country income group (both are based on the most recent World Bank classifications). Over a third of the surveys were carried out in Europe and Central Asia, more than in any other geographical region. 31.5 percent of the firms in the dataset are located in Europe and Central Asia. The majority of firms (close to 70 percent) are located in middle income countries. Table 4 lists all countries included in the data, together with the classification of the level of their per capita income.

In Table 5, 6 and 7, we examine the robustness of our results. In Table 5, we displays the mean rating of obstacles across firms by geographical region and country income group. In addition, given that the design of the questionnaire slightly changed over time where the 'old' survey instrument was replaced in 2006, we separately report the ratings for both survey instruments to check wether these differences affect our results. Table 5 shows

that in all regions, in all country income groups and under both survey instruments, taxation is always ranked as the most severe obstacle. Transport is ranked last in four out of seven regions considered including Europe and Central Asia. It is also ranked last across all country income groups except in low income countries, and under both survey instruments.

Instead of considering mean ratings across firms, Table 6 presents the shares of firms that rank taxation as the most or second most severe obstacles and that rank transport as the least or second least obstacle, respectively. Table 6 shows that in all subsamples considered, the vast majority of firms ranks taxation first or second, and that more than 50 percent of the firms ranks transport last or second last, except in Subs-Saharan Africa and in low income economies, where this share is slightly lower. We therefore consider our results as robust in this respect. Finally, in Table 7, we omit the education-related obstacle as education is sometimes privately provided, at least partially. Qualitatively, the results are identical to Table 5.

Table 3: Dataset - overview

	no. of countries	**no. of surveys**	**% of firms**
Geographical Region			
East Asia and Pacific	16	23	12.0%
Europe and Central Asia	34	101	31.5%
Latin America and Caribbean	31	58	25.7%
Middle East and North Africa	10	10	4.0%
South Asia	7	12	10.1%
Sub-Saharan Africa	41	64	16.7%
Country income group			
High income	23	47	18.0%
Low income	30	52	13.5%
Lower middle income	42	79	31.2%
Upper middle income	44	90	37.3%
Total			
All	139	268	100.0%

Table 4: Countries and survey years

Country	**Years**	**Income group**
Afghanistan	2008	Low income
Albania	2002, 2005, 2007	Upper middle income
Algeria	2002	Upper middle income
Angola	2006, 2010	Upper middle income
Antigua and Barbuda	2010	High income
Argentina	2006, 2010	Upper middle income
Armenia	2002, 2005, 2009	Lower middle income
Azerbaijan	2002, 2005, 2009	Upper middle income
Bahamas	2010	High income
Bangladesh	2002, 2007	Low income
Barbados	2010	High income
Belarus	2002, 2005, 2008, 2013	Upper middle income
Belize	2010	Upper middle income
Benin	2004, 2009	Low income
Bhutan	2009	Lower middle income
Bolivia	2006, 2010	Lower middle income
Bosnia and Herzegovina	2002, 2005, 2009	Upper middle income
Botswana	2006, 2010	Upper middle income
Brazil	2003, 2009	Upper middle income
Bulgaria	2002, 2004, 2005, 2007, 2009	Upper middle income
Burkina Faso	2006, 2009	Low income
Burundi	2006	Low income
Cambodia	2003	Low income
Cameroon	2006, 2009	Lower middle income
Cape Verde	2006, 2009	Lower middle income
Central African Republic	2011	Low income
Chad	2009	Low income
Chile	2004, 2006, 2010	High income
China	2002, 2012	Upper middle income
Colombia	2006, 2010	Upper middle income
Congo	2009	Lower middle income
Costa Rica	2005, 2010	Upper middle income
Cote d'Ivoire	2009	Lower middle income
Croatia	2002, 2005, 2007	High income
Czech Republic	2002, 2005, 2009	High income
Democratic Republic of the Congo	2006, 2010	Low income
Dominica	2010	Upper middle income
Dominican Republic	2005, 2010	Upper middle income
Ecuador	2003, 2006, 2010	Upper middle income

continued on next page ...

. . . continued from previous page

Country	Years	Income group
Egypt	2004	Lower middle income
El Salvador	2003, 2006, 2010	Lower middle income
Eritrea	2002, 2009	Low income
Estonia	2002, 2005, 2009	High income
Ethiopia	2002, 2011	Low income
Fiji	2009	Upper middle income
Gabon	2009	Upper middle income
Gambia	2006	Low income
Georgia	2002, 2005, 2008	Lower middle income
Germany	2005	High income
Ghana	2007	Lower middle income
Greece	2005	High income
Grenada	2010	Upper middle income
Guatemala	2003, 2006, 2010	Lower middle income
Guinea	2006	Low income
Guinea-Bissau	2006	Low income
Guyana	2004, 2010	Lower middle income
Honduras	2003, 2006, 2010	Lower middle income
Hungary	2002, 2005, 2009	Upper middle income
India	2002, 2006	Lower middle income
Indonesia	2003, 2009	Lower middle income
Iraq	2011	Upper middle income
Ireland	2005	High income
Jamaica	2005, 2010	Upper middle income
Jordan	2006	Upper middle income
Kazakhstan	2002, 2005, 2009	Upper middle income
Kenya	2003, 2007	Low income
Kosovo	2009	Lower middle income
Kyrgyz Republic	2002, 2003, 2005, 2009	Low income
Laos	2006, 2009, 2012	Lower middle income
Latvia	2002, 2005, 2009	High income
Lebanon	2006	Upper middle income
Lesotho	2003, 2009	Lower middle income
Liberia	2009	Low income
Lithuania	2002, 2004, 2005, 2009	High income
Macedonia	2002, 2005, 2009	Upper middle income
Madagascar	2005, 2009	Low income
Malawi	2005, 2009	Low income
Malaysia	2002	Upper middle income
Mali	2003, 2007, 2010	Low income

continued on next page . . .

. . . continued from previous page

Country	Years	Income group
Mauritania	2006	Lower middle income
Mauritius	2005, 2009	Upper middle income
Mexico	2006, 2010	Upper middle income
Micronesia	2009	Lower middle income
Moldova	2002, 2003, 2005, 2009	Lower middle income
Mongolia	2004, 2009	Lower middle income
Montenegro	2003, 2009	Upper middle income
Morocco	2004	Lower middle income
Mozambique	2007	Low income
Namibia	2006	Upper middle income
Nepal	2009, 2013	Low income
Nicaragua	2003, 2006, 2010	Lower middle income
Niger	2005, 2009	Low income
Nigeria	2007	Lower middle income
Oman	2003	High income
Pakistan	2002, 2007	Lower middle income
Panama	2006, 2010	Upper middle income
Paraguay	2006, 2010	Lower middle income
Peru	2002, 2006, 2010	Upper middle income
Philippines	2003, 2009	Lower middle income
Poland	2002, 2003, 2005, 2009	High income
Portugal	2005	High income
Romania	2002, 2005, 2009	Upper middle income
Russia	2002, 2005, 2009, 2012	High income
Rwanda	2006, 2011	Low income
Saint Kitts and Nevis	2010	High income
Saint Lucia	2010	Upper middle income
Saint Vincent and the Grenadines	2010	Upper middle income
Samoa	2009	Lower middle income
Senegal	2003, 2007	Lower middle income
Sierra Leone	2009	Low income
Slovak Republic	2002, 2005, 2009	High income
Slovenia	2002, 2005, 2009	High income
South Africa	2003, 2007	Upper middle income
South Korea	2005	High income
Spain	2005	High income
Sri Lanka	2004, 2011	Lower middle income
Suriname	2010	Upper middle income
Swaziland	2006	Lower middle income
Syria	2003	Lower middle income

continued on next page . . .

. . . continued from previous page

Country	Years	Income group
Tajikistan	2002, 2003, 2005, 2008	Low income
Tanzania	2003, 2006	Low income
Thailand	2004	Upper middle income
Timor	2009	Lower middle income
Togo	2009	Low income
Tonga	2009	Upper middle income
Trinidad and Tobago	2010	High income
Turkey	2002, 2004, 2005, 2008	Upper middle income
Uganda	2003, 2006	Low income
Ukraine	2002, 2005, 2008	Lower middle income
Uruguay	2006, 2010	High income
Uzbekistan	2002, 2003, 2005, 2008	Lower middle income
Vanuatu	2009	Lower middle income
Venezuela	2006, 2010	Upper middle income
Vietnam	2005, 2009	Lower middle income
Westbank and Gaza	2006	Lower middle income
Yemen	2010	Lower middle income
Yugoslavia	2002, 2003, 2005, 2009	Upper middle income
Zambia	2002, 2007	Lower middle income
Zimbabwe	2011	Low income

Table 5: Ranking of the obstacles - robustness

	Taxation	**Tax administration**	**Skills**	**Crime**	**Transport**
		Geographical Region			
East Asia and Pacific	1.12	0.90	1.27	0.80	0.91
Europe and Central Asia	1.66	1.08	0.96	0.74	0.54
Latin America and Caribbean	1.14	0.92	1.11	1.08	0.75
Middle East and North Africa	1.49	1.12	0.95	0.71	0.56
South Asia	1.26	1.10	0.91	0.87	0.84
Sub-Saharan Africa	1.27	0.93	0.78	1.06	0.96
		Country income group			
High income	1.61	0.96	1.11	0.72	0.61
Upper middle income	1.31	1.00	1.09	0.94	0.66
Lower middle income	1.26	0.98	0.93	0.98	0.83
Low income	1.32	1.08	0.78	0.88	0.93
		Survey instrument			
Old	1.45	1.14	0.97	0.85	0.58
New	1.28	0.90	1.02	0.94	0.85

Table 6: Ranking of the obstacles - robustness

	% of firms that rank taxation first or second	% of firms that rank transport last or second last
Geographical Region		
East Asia and Pacific	85.2%	55.6%
Europe and Central Asia	92.4%	66.8%
Latin America and Caribbean	81.5%	58.4%
Middle East and North Africa	92.2%	58.3%
South Asia	84.3%	52.5%
Sub-Saharan Africa	82.6%	45.1%
Country income group		
High income	90.6%	63.8%
Upper middle income	86.8%	61.8%
Lower middle income	83.8%	55.2%
Low income	84.7%	45.6%
Survey instrument		
Old	89.1%	66.1%
New	84.3%	52.2%

Table 7: Ranking of the obstacles (education-related obstacle omitted)

	Taxation	**Tax administration**	**Crime**	**Transport**
		Geographical Region		
East Asia and Pacific	1.18	0.96	0.87	0.99
Europe and Central Asia	1.64	1.06	0.75	0.54
Latin America and Caribbean	1.17	0.94	1.12	0.77
Middle East and North Africa	1.46	1.10	0.72	0.57
South Asia	1.22	1.07	0.86	0.84
Sub-Saharan Africa	1.19	0.87	1.02	0.92
		Country income group		
High income	1.61	0.96	0.72	0.61
Upper middle income	1.31	1.00	0.94	0.66
Lower middle income	1.26	0.98	0.98	0.83
Low income	1.32	1.08	0.88	0.93
		Survey instrument		
Old	1.45	1.14	0.85	0.58
New	1.28	0.90	0.94	0.85

About the Authors

Florian Misch is deputy head of the ZEW (Centre for European Economic Research) Research Department "Corporate Taxation and Public Finance" in Mannheim, Germany.
Email: misch@zew.de

Norman Gemmell is Professor of Public Finance at Victoria Business School, Victoria University of Wellington, New Zealand.
Email: norman.gemmell@vuw.ac.nz

Richard Kneller is Research Fellow in the Centre for Globalisation and Economic Policy and a professor of Economics at the University of Nottingham, UK.
Email: richard.kneller@nottingham.ac.uk

VICTORIA
UNIVERSITY OF WELLINGTON
TE WHARE WĀNANGA
O TE ŪPOKO O TE IKA A MĀUI

Chair in Public Finance
Victoria Business School

Working Papers in Public Finance