CORE Discussion Paper #2006/114

Do rent-seeking and interregional transfers contribute to urban primacy in sub-Saharan Africa?*

Kristian Behrens† Alain Pholo Bala‡

December 5, 2006

Abstract

We develop an economic geography model in which mobile skilled workers choose between working in the production sector or becoming part of an unproductive political elite. The elite sets tax rates on skilled and unskilled workers to maximize its own welfare by extracting rents, thereby influencing the spatial allocation of production and changing the available range of consumption goods. We show that such behavior increases the likelihood of agglomeration and of urban primacy. In equilibrium, the elite may tax the unskilled workers but will never tax the skilled workers, and there are rural-urban transfers towards the agglomeration. The size of the elite and the magnitude of the tax burden that falls on the unskilled is shown to decrease with product differentiation and, via the tax rates, with the expenditure share for manufacturing goods.

Keywords: economic geography; rent-seeking; interregional transfers; urban primacy; developing countries

JEL Classification: D58; D72; F12; R12

*We thank Luisito Bertinelli and Pierre M. Picard for very detailed and useful comments on a previous version of this paper. We also thank Yasusada Murata, Dominique Peeters, Debraj Ray, Frédéric Robert-Nicoud, Yasuhiro Sato, and Jacques Thisse for helpful comments and discussions. Kristian Behrens gratefully acknowledges financial support from the European Commission under the Marie Curie Fellowship MEIF-CT-2005-024266. The usual disclaimer applies.

† *Corresponding author*: CORE, Université catholique de Louvain, 34 voie du Roman Pays, 1348 Louvain-la-Neuve, Belgium. Office: (+32)10474305. Fax: (+32)10474301. Email: behrens@core.ucl.ac.be

‡CORE, Université catholique de Louvain, Belgium. Email: pholobala@core.ucl.ac.be

"*It seems to be the thinking that Africans obtain an education in order to enter the government bureaucracy so as to be able to share the wealth of the nation rather than create wealth for the nation.*" (Bassey, 1999, p.106)

1 Introduction

There is a persistent debate about whether urbanization in developing countries favors economic development and growth. On the one hand, casual inspection of the available evidence suggests that, throughout history, cities played a lesser role in the economic development of the developing world than in that of now developed countries (Bairoch, 1988; De Long and Shleifer, 1993). This claim has been based on the observation that the urbanization process in most developing countries, and especially in sub-Saharan Africa (henceforth, SSA), seems to be one without much industrialization, without significant increases in agricultural productivity, but with a pronounced hypertrophia of the small tertiary sector, the governement sector, and the shadow economy.[1] Put differently, urbanization does not seem to have allowed to reap the fruits of economic development and growth. On the other hand, one may argue that the real question to be asked in assessing the role of urbanization on growth is a counterfactual one: what would the current situation be like had the urbanization process not taken place? Several studies indeed suggest that the 'urbanization without industrialization' scenario has been exaggerated, that urbanization has led to some growth, even in SSA, and that it is not radically different from city growth in the past of developed nations (Williamson, 1988; Moomaw and Shatter, 1996).

Two fundamental, and highly intertwined, reasons for city growth in developing countries may be put forth: *politics and economics*. On the political side, the hypertrophia of the tertiary sector is likely to be driven by the concentration of political and economic power in cities. Many leaders in the developing world are quite sensitive to urban unrest, which threatens their political (and often physical) survival. The inflation of the tertiary sector, especially government administration, in a few big cities to accomodate the discontent and politically excluded part of the intellectual elite, is a convenient device for them

[1] According to World Bank data presented by Mbeki (2005, p.4), the percentage of the labor force working in the industrial sector in selected African countries changed as follows between 1970 and 1990: it stayed at 2% in Ethiopia; it increased from 5 to 7% in Kenya; it fell from 11 to 7% in Nigeria; and it rose from 9 to 16% in Gabon. At the same time, the corresponding changes in the service sector were all increasing: from 7 to 12% in Ethiopia; from 9 to 13% in Kenya, from 19 to 50% in Nigeria, and from 12 to 33% in Gabon. See Schneider (2004) for recent estimates of the size of African shadow economies.

to minimize the yearning for political changes. Ades and Glaeser (1995) claim that such political factors are the most important ones explaining urban centralisation and primacy in the developing world: politics directly affects urban concentration, because rent-seeking agents have to be spatially close to the political power. The rents they reap, together with the government's net transfer of ressources from the country-side to the cities to run the state, further raise city population by attracting economic activities to the main centers of purchasing power.[2] The net result is that still more agents and activities are attracted by these transfers, which draws ressources from the hinterland and makes cities in the developing world absorb a disproportionate fraction of overall economic activities. Eventually, the process becomes self-reinforcing and leads to the formation of very large urban cores as emphasized by the so-called 'new' economic geography (see Fujita *et al.*, 1999; Fujita and Thisse, 2002; Baldwin *et al.*, 2003).

The agglomeration process described in the above highlights that economical, political, and spatial factors should be jointly taken into consideration when trying to explain the formation of large urban agglomerations in the developing world. Stated differently, *political rent-seeking, rural-urban transfers, migration, increasing returns and geography* should be an important part of the whole story.[3] The main objective of this paper is to present a new economic geography (henceforth, NEG) framework that combines these ingredients to shed some light on agglomeration and urban primacy in developing countries. Although the NEG literature has been rapidly growing these last years there are, to the best of our knowledge, only few contributions dealing with political factors and issues specific to the developing world. Robert-Nicoud and Sbergami (2004) present a model that analyzes the impacts of political factors, increasing returns, and economic integration on agglomeration. Their main objective is to explain how and why the regional integration process of the European Union leads to important transfers of resources from the 'core regions' to the 'peripheral regions'.[4] Using a probabilistic voting model, the authors endogenize regional policy and

[2]Similar mechanisms, leading to the formation of 'parasitic' cities due to the transfers of resources, have already been vividly depicted by Cantillon (1730, ch. I.V, in paragraph I.V.2) and Bairoch (1988). Note that, as shown by Dascher (2000), income transfers which violate Ohlson's principle of 'fiscal equivalence' also seem to play a role in explaining the growth of regional capitals in Germany.

[3]Increasing returns to scale are likely to be important in explaining agglomeration in SSA. Indeed, specialization of labor already prevailed in traditional cities of this region (see, e.g., Cocquery-Vidrovitch, 1993) and it is even more important in modern Black African cities, which experienced some industrialization and the development of a large informal service sector (Bairoch, 1988). Increasing returns and the importance of market size are, therefore, surely realistic features of Black African cities.

[4]The so-called 'Objective 1 regions' of the EU, defined as those with a per capita GDP of less than 75% of the EU average, benefit from Structural Cohesion Funds, which amount to a total of 18 bil-

transfers which are determined by the swing voters of the ideologically most homogeneous group. As the latter is predominantly located in the country-side, the peripheral regions can obtain transfers because of their relative political homogeneity. By contrast, the large region will keep the 'core' only if its relative economic size overcomes its political weakness due to ideological heterogeneity. Robert-Nicoud and Sbergami's (2004) main result, namely that the political process leads to a more even distribution of economic activities than the market mechanism, is quite opposite to what we seem to observe in many developing countries, namely transfers of resources from the hinterland to the cities, which increases agglomeration. Furthermore, a democratic process, as encapsulated in the probabilistic voting model, does not adequately characterize the political environment of most developing countries, especially in regions like SSA. We thus propose an alternative model in which the 'political process' consists in agents deciding on whether or not to enter a political elite in order to extract rents to maximize their own welfare. In such a setting, rent-seeking behavior leads to transfers from the country-side to the city, which shows that the nature of the political process matters for the direction of net transfers and the degree of agglomeration:

> "*When farmers form a majority of the population, they tend to subsidize the urban minority. When farmers form a minority, the urban majority subsidizes them.*" (Friedman, as quoted by Mbeki, 2005, p.5)

Our model builds on the analytically solvable NEG model by Ottaviano and Forslid (2003) and features three types of agents: (i) immobile unskilled workers, who can choose to work in the formal sector or in the shadow economy; (ii) mobile skilled workers, who produce differentiated goods under monopolistic competition and increasing returns to scale; and (iii) an unproductive political elite, who taxes the other agents to maximize its own welfare. In accord with empirical evidence, this elite endogenously emerges from the skilled population when the expected rents are large enough to make it profitable.[5] Yet, the potential size of the elite constrains it in its tax choices, because an inflation of the elite leads to an erosion of the per capita tax shares and a reduction in the range of consumption goods

lion Euro over the period 2000–2006 (for additional information see, e.g., `http://europa.eu.int/comm/regional_policy/objective1`).

[5]As Bassey (1999, p.3) put it: "the life chances of an individual in Africa for achieving political elite status are enormously enhanced if he or she belongs to, or can rise into, the upper level of the stratification system [...] education is about the only major determinant for moving into elite status in Africa." Higher education is at a premium in SSA since, according to Barro and Lee (2001, Table 3), it remains the region with the lowest percentage of highly educated people: 2.4% in 2000.

through the diversion of productive resources (see, e.g., Krueger, 1974, for international trade considerations). Both features penalize the elite, since they reduce its income and the range of available consumption goods.[6]

Previewing our main results, we show that the presence of a tax-setting elite leads to interregional transfers of resources which raises the likelihood of agglomeration of production. Stated differently, agglomeration may take place because of rent-seeking, whereas the space-economy would be dispersed in the absence of such rent-seeking. In equilibrium, the unproductive elite will be larger the less differentiated the consumption goods are, and the higher the tax rates it sets are. The reason for the first effect is that when the returns to productive work are too low, rent-seeking constitutes a profitable alternative to production, whereas the second effect directly stems from higher rents. Focusing on the fully agglomerated equilibrium, we show that the equilibrium tax rate on skilled workers is zero, which allows to keep the size of the elite small. Rents are then extracted from the unskilled workers, provided that varieties are not too differentiated and that the expenditure share on manufacturing goods is small enough. When the latter two conditions are not met, there will be no elite formation in equilibrium since the returns to rent-seeking are too low when compared with the returns that can be secured in the productive sector.

The remainder of the paper is organized as follows. Section 2 presents some stylized facts about urban primacy, regional income transfers, and corruption. In Section 3, we develop the model and discuss the market outcome. Section 4 then investigates the spatial equilibrium and shows that rural-urban transfers make the emergence of agglomeration more likely. Section 5 deals with the issues of elite formation and tax setting, and derives the equilibrium taxes and the equilibrium size of the elite. Section 6 finally concludes.

2 Some stylized facts

To guide intuition, we start by isolating a few stylized facts on urban primacy based on a descriptive analysis of a 149 country sample.[7] This will allow us to establish results which suggest that rent-seeking and interregional income transfers are likely to be key drivers for

[6]Our model features 'love-of-variety', a characteristic of preferences often used in modeling developed economies. Yet, it is also appealing for investigating urbanization in the developing world since the fact that cities offer a larger assortment of consumption goods and services is one of the great incentives for rural-urban migration (Stahl, 1983, p.1).

[7]The full list of countries is provided in Appendix A, where we also give more detail on the different variables and data sources. Note that some variables are not available for some countries. In this case, we use smaller sample sizes.

urban primacy in SSA countries.

Table 1: Summary statistics (full sample)

Variable	Obs.	Min	Max	Mean	Std. dev.
% of urban population in the largest city	149	2.8	81	31.13	15.03
Ratio of largest to second-largest city	130	0	20.60	4.07	3.19
Food expenditure share	99	9.73	73.51	35.99	16.78
Non-corruption index	149	1.70	9.70	4.02	2.15
Top income tax rate	139	0	65.00	33.10	13.82
Top corporate tax rate	139	0	58.00	29.66	8.71
Size of the shadow economy (% GDP)	125	8.40	68.30	35.34	13.87
Central government expenditures	83	9	86	40.48	18.61
GDP per capita	133	91.06	48084.48	7096.11	11273.49

Table 1 provides some summary statistics for the full sample.[8] As one can see, there is a large degree of variation in all variables, including urban primacy as measured by either the share of the urban population living in the largest city or by the ratio of the largest to the second largest city.

Table 2: Comparing the full sample means with the SSA and OLM subsamples

Variable	Full sample mean	SSA subsample	OLM subsample
% of urban population in the largest city	31.13	34.97	31.39
Ratio of largest to second-largest city	4.07	4.31	4.43
Food expenditure share	35.99	47.34	46.22
Non-corruption index	4.02	2.78	2.94
Top income tax rate	33.10	39.52	29.39
Top corporate tax rate	29.66	34.15	29.49
Size of the shadow economy (% GDP)	35.34	43.70	40.10
Central government expenditures	40.48	60.27	45.23

[8]Note that the number of observations per variable varies due to missing observations.

Table 2 contrasts the full sample with the SSA subsample. At first sight, it suggests that there is a pattern specific to SSA countries. Indeed, these countries seem to have larger primate cities (as measured either by the urban population in the largest city or the ratio of the largest to the second-largest city), seem to be more corrupt, have a larger food expenditure share, and a bigger shadow economy than the remaining countries of the sample. Furthermore, top tax rates, both for personal and for corporate income, also seem to be higher in those countries. To get a clearer idea on the SSA specificity we also compare, in Table 2, the SSA subsample with the subsample of 'other low and lower middle income countries' (OLM) countries.[9] We see that the SSA and OLM samples are roughly similar in terms of the non-corruption index, the food expenditure shares, and the size of the shadow economies. Yet, SSA countries have higher top tax rates, higher central government expenditures on goods, services, and compensation of employees, and larger shadow economies. They are also characterized by a higher share of the urban population living in the largest city, though the gap is relatively small.

Since the full sample and the OLM subsample include countries from different continents (and also at various development stages), there is a great deal of heterogeneity. This prompts for a more detailed comparison between SSA and other geographical areas. According to the mean comparision test summarized in Table 3, SSA countries have a significantly larger urban primacy than European countries. However, *there is no significant difference, at the 5% significance level, between SSA and other developing regions in terms of urban primacy.* Put differently, urban primacy is not a criteria according to which SSA is likely to differ significantly from other developing regions. Yet, the mean comparison tests on the non-corruption index and on central government expenditures on goods, services and compensation of employees, reveal that SSA differs in other fundamental respects from the remaining developing countries in the sample. Indeed, given the significantly lower non-corruption index mean than in any other region of the world, SSA stands out as the region facing the highest degree of corruption. Furthermore, central governement expenditures on goods, services and compensation of employees are significantly higher in SSA than in any other region of the world, expect North-Africa. If these expenditures are mostly financed by general taxes, yet spent locally in large cities under the form of administrative payrolls, they would lead to more rent-seeking and imply a regional redistribution of purchasing power that may drive the agglomeration of mobile firms and workers, thereby leading to

[9]The classification for OLM countries is that from the World Bank.

Table 3: Mean comparison tests between SSA and other regions

SSA versus	Mean comparison test	p-value
	% of urban population in the largest city	
Europe	$\mu_{SSA} > \mu_{EU}$	0.0005
Latin America	$\mu_{SSA} \neq \mu_{LA}$	0.3737
Asia	$\mu_{SSA} \neq \mu_{AS}$	0.1968
North Africa	$\mu_{SSA} \neq \mu_{NA}$	0.2032
SSA versus	Mean comparison test	p-value
	Non-corruption index	
Europe	$\mu_{SSA} < \mu_{EU}$	0.0000
Latin America	$\mu_{SSA} < \mu_{LA}$	0.0139
Asia	$\mu_{SSA} < \mu_{AS}$	0.0134
North Africa	$\mu_{SSA} < \mu_{NA}$	0.0466
SSA versus	Mean comparison test	p-value
	Central government expenditures	
Europe	$\mu_{SSA} > \mu_{EU}$	0.0000
Latin America	$\mu_{SSA} > \mu_{LA}$	0.0025
Asia	$\mu_{SSA} > \mu_{AS}$	0.0473
North Africa	$\mu_{SSA} \neq \mu_{NA}$	0.0872

the formation of very large urban centres.[10]

The results of the mean comparison tests are quite consistent with the results given by an analysis of the pairwise correlation matrix. As can be seen from Table 4, the non-corruption index and GDP per capita are quite naturally strongly and positively correlated, thus implying that highly corrupt countries rank among the poorest in the world. Furthermore, GDP per capita is significantly negatively correlated with central government expenditures on goods, services, and compensation of employees. In other words, countries with high values of central government expenditures are, therefore, among those with the weakest economies.

Table 4 and Figure 1 reveal that urban primacy is significantly correlated with central government expenditures. Furthermore, as can be seen from Table 4, it is also significantly

[10]Unfortunately, we have no information on how and where tax revenues are levied and on how and where they are ultimately spent in developing countries.

Table 4: Pairwise correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)
(1) % of urban population in largest city	1.00					
(2) Central government expenditures	0.4726*	1.00				
(3) Food expenditure share	0.1045	0.4712*	1.00			
(4) Non-corruption index	-0.1591*	-0.3989*	-0.7826*	1.00		
(5) Size of the shadow economy	0.2647*	0.2966*	0.6179*	-0.6969*	1.00	
(6) GDP per capita	-0.2110*	-0.5272*	-0.7408*	0.8785*	-0.6737*	1.00

Note: Correlations with * are significant at the 5% level.

correlated with the non-corruption index. Put differently, corrupt countries with large central government expenditures on goods, services, and compensation of employees, generally have larger primate cities than the remaining countries. Hence, even if there is no specificity in observed urban primacy in SSA, this primacy may stem from other factors than in the rest of the developing world: high corruption which leads to a redistribution of purchasing power from the country-side to the cities, where it is spent by the elite. With the highest corruption level and the largest central governement expenditures on goods, services, and compensation of employees, SSA may be the developing region where politics has the strongest impacts on regional imbalances and urban primacy.

3 The model

We now present an economic geography model that formalizes the interactions between the existence of an elite (corruption), the redistribution of purchasing power across regions (interregional income transfers), and agglomeration (urban primacy). To do so, we build on the analytically solvable model of Ottaviano and Forslid (2003). We consider a country with two regions, labeled 1 and 2, respectively. Variables associated with each region will be subscripted accordingly. The population consists of an exogenously given mass $\overline{U}$ of unskilled and $\overline{S}$ of skilled workers, respectively. The skilled are geographically mobile, and they may be either production workers or part of an *unproductive elite*. The unskilled are geographically immobile, and always work in the production sector. Yet, contrary to the skilled workers, they may choose between working in the formal and in the informal sector (e.g., because they are harder to monitor and to tax than the skilled workers).[11]

[11]We assume that the unskilled cannot become skilled. Adding such a possibility is formally equivalent to endogenizing the wage elasticity of labor supply from agriculture to manufacting, as in Puga (1998).

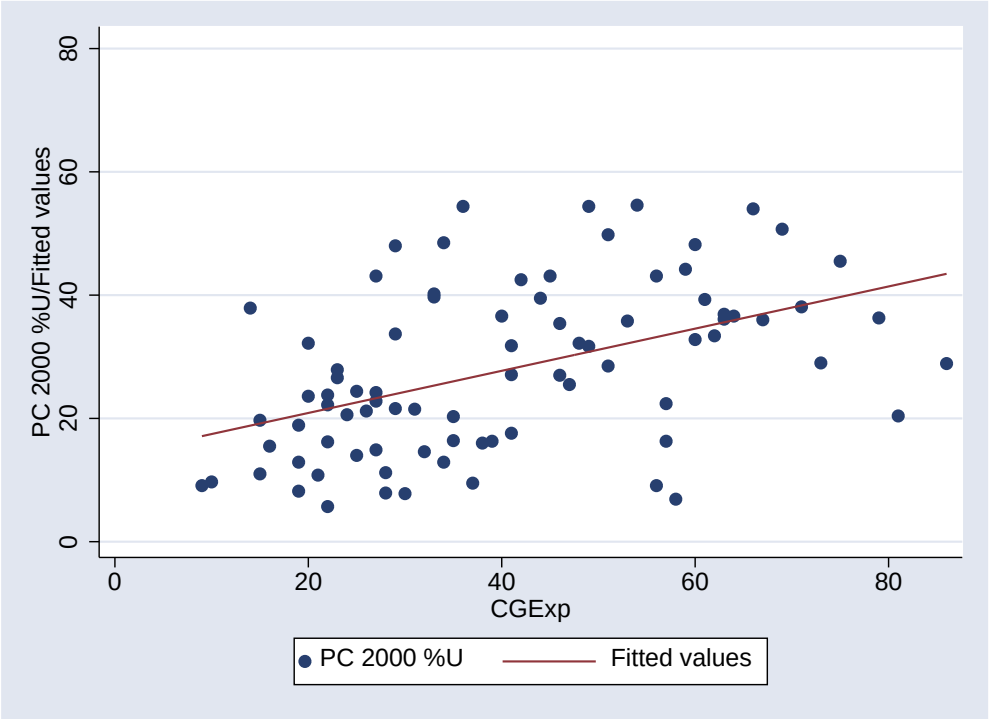

Figure 1: Central government expenditures (`CGExp`) and urban primacy (`PC2000%U`)

For simplicity, we assume that the unskilled are evenly distributed across the two regions, each of which accomodates a mass $\overline{U}/2$ of them. Stated differently, no region has an initial advantage in terms of the size of its immobile demand. All agents spend their incomes locally only and work in their region of residence. Skilled workers are mobile across regions ('geographical mobility') and they may become part of the political elite ('social mobility'). In what follows, we denote by S the mass of skilled workers in the productive sector and by E the mass of unproductive skilled constituting the political elite. Note that both S and E are endogenously determined, with $S + E = \overline{S}$. Furthermore, we denote by $\lambda \in [0, 1]$ the share of productive skilled S living in region 1. We assume that the political elite is clustered into a historically determined center of power, which we henceforth refer to as the *capital* of the country (e.g., the historical capital).[12] Without loss of generality, we assume that region 1 is the capital. Our model may be viewed as a game with four stages:

This in turn is equivalent to allowing the geographically mobile population to increase, which would only reinforce our agglomeration results. We also assume, for simplicity, that the total population is fixed. Yet, one should keep in mind that strong population growth and the associated pressure on scarce resources in the countryside are important factors which explain why large streams of migrants are 'pushed' from rural areas to cities. Adding such considerations would, again, reinforce our results.

[12]We do not attempt to endogenously determine where this center is located. Although this is an interesting question, it is secondary to the aspects we are interested in.

1. the elite sets the tax rates t^U and t^S on unskilled and skilled;

2. skilled workers decide whether to enter the elite or not;

3. skilled production workers choose the region they live and work in;

4. firms maximize profits, and production and consumption takes place.

We solve the game by backward induction.[13]

3.1 Preferences

A representative consumer in region $i = 1, 2$ (whether he belongs to the skilled, to the unskilled, or to the elite) has Cobb-Douglas upper-tier preferences over agricultural and manufactured goods, with a CES sub-utility over a continuum of horizontally differentiated varieties. Formally, he solves the following consumption problem:

$$\max_{A_i,\, q_{ji}(\omega)} \quad A_i^{1-\mu} \left(\int_{\Omega_i} q_{ii}(\omega)^{\frac{\sigma-1}{\sigma}} \mathrm{d}\omega + \int_{\Omega_j} q_{ji}(\omega)^{\frac{\sigma-1}{\sigma}} \mathrm{d}\omega \right)^{\frac{\mu\sigma}{\sigma-1}}$$
$$\text{s.t.} \quad p^A A_i + \int_{\Omega_i} p_{ii}(\omega) q_{ii}(\omega) \mathrm{d}\omega + \int_{\Omega_j} p_{ji}(\omega) q_{ji}(\omega) \mathrm{d}\omega = y_i$$

where A_i is the consumption of agricultural good; $q_{ji}(\omega)$ and $p_{ji}(\omega)$ stand for the consumption and the price of variety ω in country i when it is produced in country j; Ω_i stands for the set of varieties produced in country i, with measure n_i; y_i stands for the agent's income, which depends on the social group he belongs to (skilled, unskilled, or elite); $0 < \mu < 1$, and $\sigma > 1$ are parameters; and $p_i(\omega)$ is the price of variety ω in country i. Since preferences are homothetic, we obtain the following aggregate demand for firm ω in region i when it is located in region j:

$$D_{ji}(\omega) = \frac{p_{ji}(\omega)^{-\sigma}}{\mathbb{P}_i^{1-\sigma}} \mu Y_i \tag{1}$$

where Y_i is the total income of agents in region $i = 1, 2$ and $\mathbb{P}_i$ is the CES price aggregate. We assume that all varieties produced in each region are symmetric, which allows us to

[13] As always, timing of the stages is crucial to the game. One may, e.g., consider the case in which tax setting and the formation of the elite take place simultaneously. Yet, we believe that our timing is relevant since for agents to decide on tax rates they must already have chosen to be part of the elite. Furthermore, since our game is one-shot, we disregard the fact that the elite wants to remain elite in the long run, which would necessitate an analysis within a repeated games framework.

alleviate notation by dropping the variety index ω. The price aggregate $\mathbb{P}_i$ then reduces to

$$\mathbb{P}_i = \left(n_i p_{ii}^{1-\sigma} + n_j p_{ji}^{1-\sigma}\right)^{\frac{1}{1-\sigma}} . \tag{2}$$

3.2 Technology, taxes, and transportation

There are two factors of production, skilled and unskilled labor, and two sectors, manufacturing and agriculture. The agricultural sector produces a homogeneous good using unskilled labor only. We assume that this good is costlessly tradable across regions and we normalize, without loss of generality, the unit input coefficient in this sector to one. Perfect competition and costless trade then imply that the unskilled wages w^U are equalized across regions: $w_1^U = w_2^U = p^U = 1$, where the last equality comes from our choice of numéraire.[14] All unskilled workers are a priori free to work in the agricultural sector, and this sector is informal (untaxed) because hard to monitor.

Skilled workers face the choice to remain in the productive sector to earn a wage w_i there, or to get involved in politics and become part of the elite. The benefit of belonging to the elite is to participate in running the country. Among other things, we assume that it is the elite which determines the tax rates the different groups of agents face. To keep things simple, we suppose that the elite levies a *proportional income tax rate* t^S (resp., t^U) on the incomes of skilled (resp., of unskilled) workers. [15] While the skilled can evade taxation only by becoming part of the elite, the unskilled face the choice of working either in the formal manufacturing sector (hence paying taxes), or of working in the agricultural shadow economy (hence evading taxation). Put differently, the unskilled tax base is not perfectly inelastic but generally shrinks with the level t^U of taxation. This observation fits well with the empirical fact that all African countries have large shadow economies (i.e., fiscal evasion seems to be fairly easy due to the lack of enforcement). Recent estimates using a sample of 37 African countries indeed reveal that the mean average size of the shadow economy is about 43.2% of GDP (Schneider, 2004, Figure 3.1.1).

Manufacturing firms produce varieties of a horizontally differentiated consumption good using both skilled and unskilled labor. More precisely, each firm requires F units of skilled labor as a fixed input requirement and m units of unskilled labor per unit of output as a variable input requirement. The unskilled are willing to work in the formal sector if

[14] Strictly speaking, such factor price equalization only holds when the mass of unskilled workers is large enough for some agricultural production to take place in both regions in equilibrium. In what follows, we assume that this condition holds. Formally, $\mu < \sigma/(2\sigma - 1)$ (see Forslid and Ottaviano, 2003).

[15] Since tax revenue is spent unproductively, we may interpret $1 - t^S$ and $1 - t^U$ as proxies for the 'degree of property rights enforcement' for skilled and unskilled workers, respectively (Ades, 1995).

and only if their net income is equal to the one they can secure in the informal sector, which implies that firms have to pay $1/(1-t^U)$ per unit of unskilled labor. Put differently, taxing the unskilled raises firms' production costs because workers have the outside option of going into the shadow economy. Total production costs for producing a quantity Q in region $i = 1, 2$ are then given by

$$\mathrm{TC}_i(Q) = \frac{m}{1-t^U}Q + Fw_i,$$

where w_i stands for the skilled wage in region i. Given the fixed cost requirement, skilled labor market clearing then requires that the masses of firms in the two regions are as follows:

$$n_1 = \frac{\lambda S}{F} \qquad \text{and} \qquad n_2 = \frac{(1-\lambda)S}{F}. \tag{3}$$

To ship one unit of any variety between the two regions entails an iceberg trade cost of $\tau > 1$. Taking into account this resource waste effect, the profit of a representative firm in region i is given by

$$\Pi_i = \left(p_{ii} - \frac{m}{1-t^U}\right) D_{ii} + \left(p_{ij} - \frac{m\tau}{1-t^U}\right) D_{ij} - Fw_i,$$

where the demands are evaluated at (1). Because firms face an isoelastic demand, the profit-maximizing prices display a constant mark-up over marginal cost:

$$p_{ii}^* = \frac{\sigma m}{(\sigma-1)(1-t^U)} \qquad \text{and} \qquad p_{ij}^* = \frac{\sigma m \tau}{(\sigma-1)(1-t^U)}.$$

Substituting these prices into (2), letting $\phi \equiv \tau^{1-\sigma}$ stand for the freeness of trade between the two regions, and using the skilled labor market clearing conditions (3), the price indices can be expressed as follows:

$$\begin{aligned} \mathbb{P}_1 &= \frac{\sigma m}{(\sigma-1)(1-t^U)} \left(\frac{S}{F}\right)^{\frac{1}{1-\sigma}} \left[\lambda + (1-\lambda)\phi\right]^{\frac{1}{1-\sigma}} \\ \mathbb{P}_2 &= \frac{\sigma m}{(\sigma-1)(1-t^U)} \left(\frac{S}{F}\right)^{\frac{1}{1-\sigma}} \left[\lambda\phi + (1-\lambda)\right]^{\frac{1}{1-\sigma}} \end{aligned} \tag{4}$$

Note that, contrary to other NEG models (Krugman, 1991; Ottaviano *et al.*, 2002) in which the total mass of varieties is proportional to the exogenously fixed skilled population S, there are two distinct 'price index effects' in our model:

- for any given value of S, the price index in a region decreases with the share of firms located in that region ('regional market crowding effect'); and

- for any given distribution of firms, *the price indices in both regions decrease with the mass S of productive skilled workers* ('global market crowding effect').

This second effect, which implies that a smaller mass of productive skilled workers decreases welfare by reducing variety and increasing consumer prices, will be important in the subsequent analysis of the elite's behaviour.

Product market clearing for each variety requires that a firm located in region i produces the total quantity

$$X_i = D_{ii} + \tau D_{ij} = \frac{\mu(\sigma-1)(1-t^U)}{m\sigma}\left(\frac{Y_i}{n_i+\phi n_j} + \frac{\phi Y_j}{\phi n_i + n_j}\right). \tag{5}$$

Since firms price above marginal cost, there exist pure operating profits which are competed away by firms' bidding for skilled labor. Therefore, in equilibrium the skilled wages absorb all operating profits:

$$w_i = \frac{mX_i}{F(\sigma-1)(1-t^U)} = \frac{\mu}{\sigma F}\left(\frac{Y_i}{n_i+\phi n_j} + \frac{\phi Y_j}{\phi n_i + n_j}\right), \tag{6}$$

which using (3), can finally be expressed as follows:

$$w_1 = \frac{\mu}{\sigma S}\left[\frac{Y_1}{\lambda+\phi(1-\lambda)} + \frac{\phi Y_2}{\phi\lambda+(1-\lambda)}\right] \tag{7}$$

$$w_2 = \frac{\mu}{\sigma S}\left[\frac{\phi Y_1}{\lambda+\phi(1-\lambda)} + \frac{Y_2}{\phi\lambda+(1-\lambda)}\right]. \tag{8}$$

3.3 Rent-seeking and elite formation

As stated before, skilled workers' only way to evade taxation is to become a member of the elite. When they do so, we assume that the skilled spend their time in an 'unproductive' way, which de facto reduces the amount of skilled labor available for the production of differentiated varieties. Although this is a strong assumption, it partly captures the fact that in many African countries political participation essentially stems from a rent-seeking motive, which is time intensive (e.g., because of lobbying) and therefore reduces the productive labor supply of agents involved in this kind of activities.[16] A skilled worker will become a member of the elite if and only if the rent he can secure from doing so exceeds the skilled wage he can secure in the productive sector.[17] Formally, a skilled worker will

[16] We focus on unproductive rent-seeking only. See, e.g., Baumol (1990) for historical case studies of periods during which rent-seeking was even 'destructive'.

[17] There is a long-standing tradition which assumes that there are some fixed entry costs for becoming a member of the elite (see, e.g., Ades, 1995, for further references). For simplicity, we disregard these costs in this paper. Adding them would reinforce our results but make the algebra more involved.

enter the elite if his rent r exceeds $(1-t^S)w_i$, where the rent satisfies

$$\begin{aligned} rE &\equiv m[n_1X_1+n_2X_2]\frac{t^U}{1-t^U}+S\left[\lambda w_1+(1-\lambda)w_2\right]t^S \\ &= S\left[(\sigma-1)t^U+t^S\right]\left[\lambda w_1+(1-\lambda)w_2\right], \end{aligned} \tag{9}$$

the right-hand side being the elite's total tax revenue. Note that we assume, for simplicity, that the elite *does spend all the tax revenue unproductively*. This captures the idea that "in those African countries in which corruption has become quite pervasive, the cost of public goods and services is highly inflated, usually to provide additional income for the individuals whose job it is to serve the public" (Mbaku, 2003, p.317). Adding some partial tax spending on the provision of public goods and services is not likely to weaken our results if this "social overhead" is largely allocated to cities and financed from general taxes instead of urban ones.

3.4 Market outcome

We first analyze the market outcome for any *given* allocation of skilled between the production sector and the elite, and for any given spatial distribution λ of skilled production workers across regions. Furthermore, t^U and t^S are considered as fixed at this stage.

Since the elite is, by assumption, fully agglomerated in region 1, the net aggregate incomes accruing to the agents in both regions are given by

$$\begin{aligned} Y_1 &= \frac{\overline{U}}{2}+\lambda S w_1(1-t^S)+Er \\ &= \frac{\overline{U}}{2}+\lambda S w_1(1-t^S)+S\left[(\sigma-1)t^U+t^S\right]\left[\lambda w_1+(1-\lambda)w_2\right] \qquad (10) \\ Y_2 &= \frac{\overline{U}}{2}+(1-\lambda)S w_2(1-t^S). \qquad (11) \end{aligned}$$

The market outcome is a solution to the four equations (7), (8), (10) and (11) in the four unknowns w_1, w_2, Y_1 and Y_2. The unique solution in w_1 and w_2 to this linear system is given by:[18]

$$\begin{aligned} w_1^* &= \frac{(1-\lambda)(\mu+\sigma)\phi^2+2\lambda\sigma\phi+(1-\lambda)(\sigma-\mu)+(1-\lambda)\mu\left(1-\phi^2\right)\left(2t_S+(\sigma-1)t_U\right)}{D(t^S,t^U)}\mu\bar{U} \\ w_2^* &= \frac{2\sigma\phi+\lambda(1-\phi)(\sigma-\mu-(\mu+\sigma)\phi)-\lambda\mu(\sigma-1)\left(1-\phi^2\right)t_U}{D(t^S,t^U)}\mu\bar{U}, \end{aligned}$$

[18]Because Y_1^* and Y_2^* are complicated terms that are not required for the subsequent analysis, we do not provide their analytical expressions in this paper.

where

$$\begin{aligned} D(t^S, t^U) \equiv\ & 2S[(1-\lambda)\lambda(\mu+\sigma)\phi^2 + (2(\lambda-1)\lambda+1)\sigma\phi + (\lambda-1)\lambda(\mu-\sigma) \\ & +(\lambda-1)\lambda\mu\left(\phi^2-1\right)t_S]\left(\sigma-\mu-\mu(\sigma-1)t_U\right) > 0. \end{aligned}$$

It is readily verified that the expressions of w_1^* and w_2^* reduce to the ones in Forslid and Ottaviano (2003) in the no-tax case ($t^U = t^S = 0$).

Note that both w_1^* and w_2^* are *decreasing* in S, which will itself be endogenously determined later in our analysis. The reason for this is that more skilled production workers increase the mass of competing firms, which leads to global product market crowding and, therefore, lower equilibrium wages. Such an effect does not arise in standard NEG models where the mass of firms is usually proportional to the exogenously fixed mass of skilled workers (Krugman, 1991; Ottaviano *et al.*, 2002). Furthermore, straightforward but longer calculations show that w_2^* is decreasing in t^S, whereas w_1^* is increasing in t^S. Stated differently, increasing taxation of the skilled shifts nominal wages in favor of the capital region and away from the periphery. The reason is that as t^S increases, the elite spends proportionally more tax revenues on varieties produced in the capital region, thereby raising demand and wages there. As we show later, the widening interregional wage gap induced by taxation increases the tendency for agglomeration of the mobile sector.

4 Spatial equilibrium

As usual in NEG models, we assume that the mobile skilled workers employed in the productive sector migrate to the region offering them the highest indirect utility. Let ΔV^* stand for the indirect utility differential between region 1 and 2, which is a function of tax rates and given as follows:

$$\Delta V^*(t^S, t^U) = \mu^\mu(1-\mu)^{1-\mu}(1-t^S)\left(\frac{w_1^*}{\mathbb{P}_1^\mu} - \frac{w_2^*}{\mathbb{P}_2^\mu}\right).$$

Some straightforward calculations, using the equilibrium expressions of w_1^*, w_2^*, and the two regional price indices (4), allow us to rewrite ΔV^* as follows:

$$\begin{aligned} \frac{\Delta V^*(t^S, t^U)}{K(t^S, t^U)} =\ & \frac{(1-\lambda)(\mu+\sigma)\phi^2 + 2\lambda\sigma\phi + (1-\lambda)(\sigma-\mu) + (1-\lambda)\mu\left(1-\phi^2\right)\left(2t_S + (\sigma-1)t_U\right)}{\left[\lambda+\phi(1-\lambda)\right]^{\frac{\mu}{1-\sigma}}} \\ -\ & \frac{2\sigma\phi + \lambda(\phi-1)(\mu-\sigma+(\mu+\sigma)\phi) + \lambda\mu(\sigma-1)\left(\phi^2-1\right)t_U}{\left[\phi\lambda+(1-\lambda)\right]^{\frac{\mu}{1-\sigma}}} \end{aligned} \tag{12}$$

where

$$K(t^S, t^U) \equiv \frac{(1-t^S)\bar{U}(1-\mu)^{1-\mu}\mu^{\mu+1}}{D(t^S, t^U)} \left[\frac{m\left(\frac{S}{F}\right)^{\frac{1}{1-\sigma}}\sigma}{(1-t^U)(\sigma-1)}\right]^{-\mu} \tag{13}$$

is a strictly positive bundle of parameters, parametrized by the tax rates t^S and t^U.

A *spatial equilibrium* is such that no skilled worker has an incentive to change location, conditional upon the fact that the product markets clear at the equilibrium prices, while the skilled labor market clears at the equilibrium wages. Formally, a spatial equilibrium arises at $\lambda^* \in (0,1)$ when $\Delta V^*(\lambda^*) = 0$, or at $\lambda^* = 0$ if $\Delta V^*(0) \leq 0$, or at $\lambda^* = 1$ if $\Delta V^*(1) \geq 0$. Following Fujita *et al.* (1999), an interior equilibrium is said to be stable if and only if the slope of the indirect utility differential ΔV^* is negative in a neighborhood of the equilibrium, whereas the two agglomerated equilibria are always stable whenever they exist.

4.1 The benchmark case

Let us start with the case where $t^S = t^U = 0$, which is the benchmark case of Ottaviano and Forslid (2003). In this case, ΔV^* reduces to

$$\begin{aligned}\frac{\Delta V^*(0,0)}{K(0,0)} &= \frac{2\lambda\sigma\phi + (1-\lambda)\left[\sigma\left(\phi^2+1\right) - \mu\left(1-\phi^2\right)\right]}{\left[(1-\lambda)\phi + \lambda\right]^{\frac{\mu}{1-\sigma}}} \\ &\quad - \frac{2(1-\lambda)\sigma\phi + \lambda\left[(\mu+\sigma)\phi^2 + (\sigma-\mu)\right]}{\left[\lambda\phi + (1-\lambda)\right]^{\frac{\mu}{1-\sigma}}}.\end{aligned} \tag{14}$$

As shown by Ottaviano and Forslid (2003), full agglomeration may be sustained as an equilibrium if and only if

$$\frac{\Delta V^*(0,0)}{K(0,0)}\Big|_{\lambda=1} = -\frac{\Delta V^*(0,0)}{K(0,0)}\Big|_{\lambda=0} = 2\sigma\phi - \frac{(\mu+\sigma)\phi^2 + (\sigma-\mu)}{\phi^{\frac{\mu}{1-\sigma}}} > 0, \tag{15}$$

which implicitly defines the sustain point ϕ^s as the value of ϕ that equates the above expression to zero. Full agglomeration can be sustained for all $\phi \geq \phi^s$. Additionally, there are at most three interior equilibria in the no-tax case (Robert-Nicoud, 2005), of which the symmetric one ($\lambda^* = 1/2$) always exists. The stability of the equilibrium $\lambda^* = 1/2$ depends on the sign of the derivative of the indirect utility differential, whereas the other two interior equilibria are always unstable. Computing $\partial(\Delta V^*)/\partial\lambda$ and evaluating it at $\lambda = 1/2$, the break-point is such that

$$\phi^b \equiv \frac{\sigma-\mu}{\sigma+\mu}\frac{\mu-\sigma+1}{1-\mu-\sigma}.$$

Hence, $\lambda^* = 1/2$ is a stable spatial equilibrium for all $\phi \leq \phi^b$. Note, finally, that both types of equilibria occur for values $\phi^s \leq \phi \leq \phi^b$, in which case both full agglomeration and full dispersion are stable spatial equilibria.

In what follows, we assume that agglomeration forces are sufficiently weak for dispersion to prevail as an equilibrium outcome for some parameter values. In other words, we assume that the 'no-black-hole' condition $\mu < \sigma - 1$ holds.

4.2 The tax case

Assume now that the elite levies taxes ($t^U > 0$ and/or $t^S > 0$). In this case, some longer calculations show that

$$\begin{aligned} \frac{\Delta V^*(t^S, t^U)}{K(t^S, t^U)} &= \frac{\Delta V^*(0,0)}{K(0,0)} \\ &+\mu\left(1-\phi^2\right)\left[\lambda\frac{t^U(\sigma-1)}{[\lambda\phi+(1-\lambda)]^{\frac{\mu}{1-\sigma}}}+(1-\lambda)\frac{2t^S+t^U(\sigma-1)}{[\lambda+\phi(1-\lambda)]^{\frac{\mu}{1-\sigma}}}\right], \end{aligned} \tag{16}$$

where the first term on the right-hand side corresponds to Ottaviano and Forslid's (2003) indirect utility differential, as given by (14). Since the second term on the right-hand side of (16) is unambiguously positive for all $t^U > 0$ and/or $t^S > 0$, and since what matters for the spatial equilibrium is the sign of ΔV^*, we have the following result.

Proposition 1 (taxation and agglomeration) *When compared with the no-tax case,*

1. *the capital hosts a larger share of the mobile skilled population under positive taxes, i.e., $\lambda^*(t^S, t^U) \geq \lambda^*(0,0)$ when $(t^S, t^U) > 0$;*

2. *full agglomeration in the capital is more likely under positive taxes, i.e., $\phi^s(t^S, t^U) < \phi^s(0,0)$ when $(t^S, t^U) > 0$.*

Proof. In both cases, let λ_0^* denote the value of λ such that $\Delta V^*(0,0)\,\big|_{\lambda=\lambda_0^*} = 0$. Evaluating (16) at this value yields

$$\frac{\Delta V^*(t^S, t^U)}{K(t^S)}\,\big|_{\lambda=\lambda_0^*} = \mu\left(1-\phi^2\right)\left\{\lambda_0^*\frac{t^U(\sigma-1)}{[\lambda_0^*\phi+(1-\lambda_0^*)]^{\frac{\mu}{1-\sigma}}}+(1-\lambda_0^*)\frac{2t^S+t^U(\sigma-1)}{[\lambda_0^*+\phi(1-\lambda_0^*)]^{\frac{\mu}{1-\sigma}}}\right\}$$

which is strictly positive. This shows that: (i) when there is a dispersed equilibrium without taxes, the equilibrium with taxes must involve more agglomeration since the utility differential at that no-tax equilibrium is strictly positive; and (ii) when there is full agglomeration without taxes, there is also full agglomeration with taxes since

$$\frac{\Delta V^*(t^S, t^U)}{K(t^S)}\,\big|_{\lambda=1} = \frac{\Delta V^*(0,0)}{K(0,0)}\,\big|_{\lambda=1} + \mu(1-\phi^2)t^U(\sigma-1)\phi^{\frac{\mu}{\sigma-1}} \tag{17}$$

is strictly positive because $\Delta V^*(0,0)/K(0) \mid_{\lambda=1} > 0$ (since full agglomeration is sustainable without taxes). Finally, since the second term in (17) is strictly positive we see that: (iii) there are parameter values for which full agglomeration is sustainable with taxation, whereas it is not in the absence of taxation.

When taken together, conditions (i), (ii), and (iii) show that taxation cannot make the economy less agglomerated in the capital, which establishes Proposition 1. ■

Proposition 1 shows that taxation increases agglomeration in the capital. This is because of the redistribution of purchasing power to the capital ('urban bias'), which entices firms and agents to locate there: "*The political power [induces] the government to transfer resources to the capital, and these transfers will attract migrants*" (Ades and Glaeser, 1995, p.199).[19]

Before proceeding, a few remarks are in order. First, although taxation by the elite increases agglomeration, we cannot compute the (partially agglomerated) stable interior equilibrium analytically. Indeed, the indirect utility differential is a transcendental function, which does not allow for explicit solutions in λ in the general case. By consequence, it is also impossible to explicitly characterize the break point for $\lambda \neq 1/2$, since this requires the evaluation of the sign of the derivative of ΔV^* at the interior equilibrium, which we do not know. In this respect, our analysis faces similar problems than the ones encountered by Ottaviano and Forslid (2003) and Baldwin and Krugman (2004). Yet, these authors have shown that exogenous size differences or differential taxation favor the degree of agglomeration in the region having the larger market (in terms of consumption expenditure), and this result continues to hold true in our model.

Second, contrary to Ottaviano and Forslid (2003) and Baldwin and Krugman (2004), the value of S will be endogenously determined by the process of elite formation in our model. Because what matters in the CES model are the expenditure share μ and trade costs τ, the size of the elite is not of fundamental importance for the spatial equilibrium, despite its endogeneity (see expression (12)). Yet, one should keep in mind that the size of the elite may influence tax-setting, which has itself an impact on the spatial equilibrium which is the focus of our analysis. Furthermore, the spatial equilibrium would depend on S if skilled workers and members of the elite had different expenditure shares for differentiated goods.[20]

[19]Note that the conditions for full agglomeration in the other region are no longer symmetric, due to the asymmetries in regional spending induced by the presence of the elite (see also Ottaviano and Forslid, 2003, pp. 237-239).

[20]Note also that the size of the elite is likely to influence the spatial equilibrium in more 'demand-side' oriented modeling frameworks that allow for variable demand elasticities and pro-competitive effects (e.g.,

Last, note that the degree of agglomeration increase monotonically with the taxation of the unskilled:

$$\frac{\partial\left(\Delta V^{*}/K\right)}{\partial t^{U}}=\mu(\sigma-1)(1-\phi^{2})\left\{\frac{1-\lambda}{[(1-\lambda)\phi+\lambda]^{\frac{\mu}{1-\sigma}}}+\frac{\lambda}{[\lambda\phi+(1-\lambda)]^{\frac{\mu}{1-\sigma}}}\right\}>0.$$

The reason is, as in the foregoing, the higher elite expenditure in the capital which attracts mobile firms and agents.

5 Elite formation and taxation

In this section we focus on the dual issues of *elite formation* and *tax setting* by this elite.

5.1 Elite formation

Only the skilled have the opportunity of entering the political elite of the country. Each skilled worker therefore faces the binary choice of: (i) staying in the productive sector, earning an after-tax wage of $w_i(1-t^S)$ when he is located in region i; or (ii) leaving the productive sector to become part of the political elite, thereby securing a claim to the revenues generated by taxation.

Let E stand for the mass of elite agents. Since the total mass of skilled $\overline{S}$ is fixed, the mass of productive skilled workers is given by $S=\overline{S}-E$. As pointed out in Section 3.3, we assume that skilled workers do not incur any cost other than the forfeit of their productive wage when entering the elite. The benefit of doing so is to secure a claim to an equal share of tax rents levied by the elite. More formally, skilled workers will choose to enter the elite if doing so yields a higher indirect utility than staying in the productive sector.

In what follows we focus, for analytical tractability, on the case with full agglomeration of all skilled into the capital region 1 only (i.e., $\lambda^{*}=1$).[21] We know from Proposition 1 that the presence of an elite reinforces agglomeration, which implies that we can focus on the case in which there is dispersion in the absence of an elite, whereas there is full agglomeration in its presence (numerical examples are easy to construct). Although this scenario is a special case, our results are likely to extend to the cases with partial agglomeration.

Ottaviano *et al.*, 2002; Behrens and Murata, 2007).

[21] This assumption can be justified by the fact that the elite always wants to implement full agglomeration in its region of residence because this maximizes its access to product variety (see also Charlot *et al.*, 2005, Prop. 3). A convenient by-product of letting $\lambda^{*}=1$ is that it is impossible to obtain analytical results for the case with partial agglomeration, because ΔV^{*} is transcendental in λ (see also Baldwin and Krugman, 2004, who face similar problems and focus on the case with full agglomeration only).

We start with the question of how the unproductive political elite is formed, and how it sets taxes as to maximize its well-being. Let

$$\Delta W^* = \mu^\mu (1-\mu)^{1-\mu} \left(\frac{r^*}{\mathbb{P}_1^\mu} - \frac{w_1^*(1-t^S)}{\mathbb{P}_1^\mu} \right), \tag{18}$$

stand for the indirect utility differential between a member of the elite and a productive skilled in the capital region 1. Elite formation will take place until indirect utilities are equalized. Using the elite members income r^*, given by (9), the value of E will be determined such that

$$S \frac{(\sigma-1)t^U + t^S}{E} [\lambda w_1^* + (1-\lambda) w_2^*] - w_1^*(1-t^S) = 0.$$

Letting $\lambda^* = 1$ and using $S \equiv \bar{S} - E$, the mass E of the elite will be determined such that

$$(\bar{S} - E) \frac{(\sigma-1)t^U + t^S}{E} - (1-t^S) = 0. \tag{19}$$

The unique solution E^* to (19) is such that:

$$E^* = \bar{S} \left[1 - \frac{1-t^S}{1+t^U(\sigma-1)} \right], \quad \text{and hence} \quad S^* = \bar{S} \frac{1-t^S}{1+t^U(\sigma-1)}. \tag{20}$$

Expression (20) shows that there is no political elite when there is no taxation ($t^S = t^U = 0$), whereas when rent-extraction from the skilled is complete ($t^S = 1$) all skilled workers want to be part of the elite. Furthermore, taxation reduces the mass of productive skilled by inflating the unproductive elite, *thereby decreasing product variety and consumption benefits*. This latter aspect may be quite important in practice but has, to the best of our knowledge, not really been highlighted in models of agglomeration and rent-seeking until now.

Some straightforward calculation furthermore shows that $(\partial E^*)/(\partial \sigma) > 0$. These results may be summarized as follows:

Proposition 2 (size of the elite) *Under full agglomeration in the capital, the size of the unproductive elite decreases with the degree of product differentiation (smaller σ) and increases with both tax rates t^S and t^U.*

Note that a smaller degree of product differentiation (higher σ) tends to inflate the size of the unproductive elite. The intuition underlying this result is that when firms in the manufacturing sector have little market power they pay lower wages, which raises the payoff to political rent-seeking when compared to productive activity. Everything else equal, this fosters entry into the elite.

5.2 Tax setting

The final stage involves tax setting by the elite, taking into account how its decision influences subsequent 'entry into the elite' by skilled workers.[22] In what follows, we assume that the elite sets tax rates such as to maximize its indirect utility and not necessarily its tax revenue. Stated differently, the elite takes into account the fact that higher taxes and the subsequent 'entry into the elite' reduces product variety and welfare by diverting productive resources.[23]

Dropping the positive constant, the indirect utility of a member of the political elite is given by $V_E^* = r^*/P_1^\mu$, where the subscript E refers to the elite. Letting $S^* = \overline{S} - E^*$, $\lambda^* = 1$, and using r^* as given by (9), we then obtain:

$$V_E^*\big|_{\lambda^*=1} = \left[\frac{(\sigma-1)(1-t^U)}{\sigma m}\right]^\mu \left(\frac{\overline{S}-E^*}{F}\right)^{\frac{\mu}{\sigma-1}} \frac{(\overline{S}-E^*)[(\sigma-1)t^U+t^S]}{E^*} w_1^*.$$

Substituting the expression of E^* as given by (20), and using w_1^*, we finally get

$$V_E^*\big|_{\lambda=1} \quad = \quad \kappa(1-t^S)^{\frac{\mu}{\sigma-1}}\xi(t^U), \tag{21}$$

where

$$\xi(t^U) \equiv \frac{\left(1-t^U\right)^\mu \left[(\sigma-1)t^U+1\right]^{1-\frac{\mu}{\sigma-1}}}{\sigma-\mu-(\sigma-1)t^U\mu} \tag{22}$$

and where $\kappa > 0$ is a bundle of parameters. The elite maximizes (21) with respect to the taxes t^U and t^S. Since $\mu/(\sigma-1) > 0$, we see that V_E^* is always decreasing in t^S. Stated differently, the elite sets $t^{S*} = 0$. This suffices to establish the following result:

Proposition 3 (optimal skilled taxation) *At any spatial equilibrium with full agglomeration, the elite will set a zero tax rate on the skilled ($t^{S*} = 0$).*

[22] It is worth emphasizing that our results are likely to depend on the timing of the game. Indeed, in our model the elite sets taxes by anticipating how its choice will affect further entry into the elite (and, therefore, the respective payoffs of being either elite or productive skilled). In a game where entry and elite formation occur simultaneously, results may be different.

[23] In public economic terms, the elite is not a 'leviathan' but a welfare maximizer (for itself). Note that the 'leviathan' case is likely to lead to an even larger elite as it disregards the negative variety effect. Note also that the 'variety constraint' faced by the elite, which constrains its ability to extract rents, may be less stringent nowadays because imports can supplement the needs of the elite. Stated differently, international trade may be a driver for agglomeration in a setting where unproductive elites maximize their welfare since it increases their extractive capacity. Though interesting, we disregard this possibility in what follows.

The intuition underlying Proposition 3 is that $V_E^* = V_S^*$ by arbitrage, so that the objective of maximizing the welfare of the elite is congruent with the objective of maximizing the welfare of the skilled. Consequently, the skilled will not be taxed.[24]

Results with respect to the unskilled tax rate t^{U*} are more complicated to establish. Yet, we can show the following:

Proposition 4 (optimal unskilled taxation) *At any spatial equilibrium with full agglomeration, there exists a threshold*

$$\sigma^t \equiv \frac{1}{2} + \mu + \frac{1}{2}\sqrt{1 + 4(1-\mu)\mu} < 2$$

such that

1. $t^{U*} = 0$ *and there is be no entry into the elite* ($E^* = 0$) *when* $\sigma \leq \sigma^t$;

2. *there is a unique* $0 < t^{U*} < 1$ *with entry into the elite* ($E^* > 0$) *when* $\sigma > \sigma^t$.

Proof. See Appendix B. ■

Proposition 4 shows that when products are sufficiently differentiated and firms have enough market power, there will be no elite formation in equilibrium, even if it is a priori possible. The intuition underlying this result is that since it is profitable enough to work in the productive sector, agents cannot win by pursuing unproductive rent-seeking. This finding suggests that a strong reliance on relatively homogeneous products, as often observed in developing countries, may be a strong driver for elite formation as the payoff of unproductive to productive activity rises.

Entry of skilled into the elite both erodes per capita rents in a standard way and, by taxing agents and thus raising production costs, increases wages in the modern sector. Both effects are penalizing and may be strong enough to prevent elite formation in equilibrium. Panel (i) of Figure 2 illustrates this case where no elite emerges in equilibrium, whereas there is a strictly positive tax rate and elite in equilibrium in the case depicted in panel (ii).[25] The former case occurs for a low elasticity of substitution, whereas the latter case occurs for a high elasticity of substitution.

Note that t^{U*} is strictly decreasing in μ when $\sigma \leq 2$, whereas it is first decreasing and then increasing in μ when $\sigma > 2$ (see panel (i) in Figure 3).[26] The intuition underlying

[24] We thank Pierre M. Picard for pointing out this interpretation.

[25] The parameter values underlying Figure 2 are set as follows: panel (i) $\mu = 0.2$ and $\sigma = 1.2$; and panel (ii) $\mu = 0.2$ and $\sigma = 1.5$.

[26] The parameter values underlying Figure 3 are set as follows: panel (i) $\sigma = 2.7$ and μ varies from 0 to 1; and panel (ii) $\mu = 0.2$ and σ varies from 1.4 to 2.4.

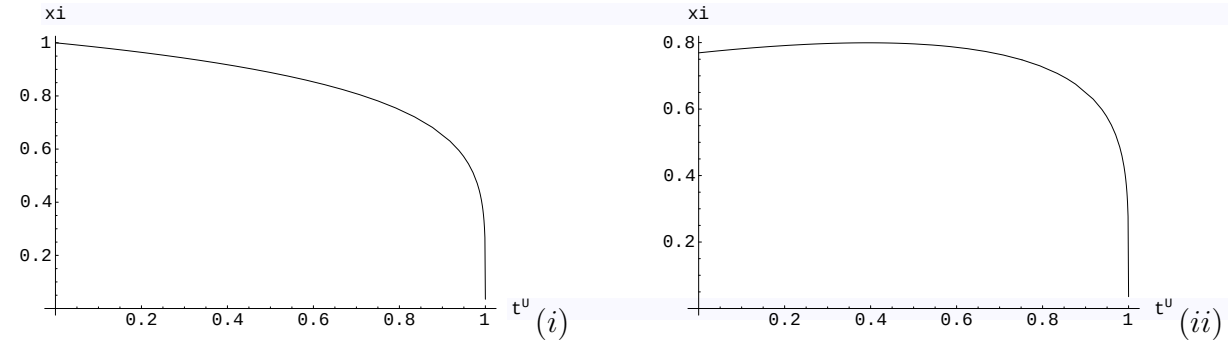

Figure 2: ξ as a function of the unskilled tax rate t^U

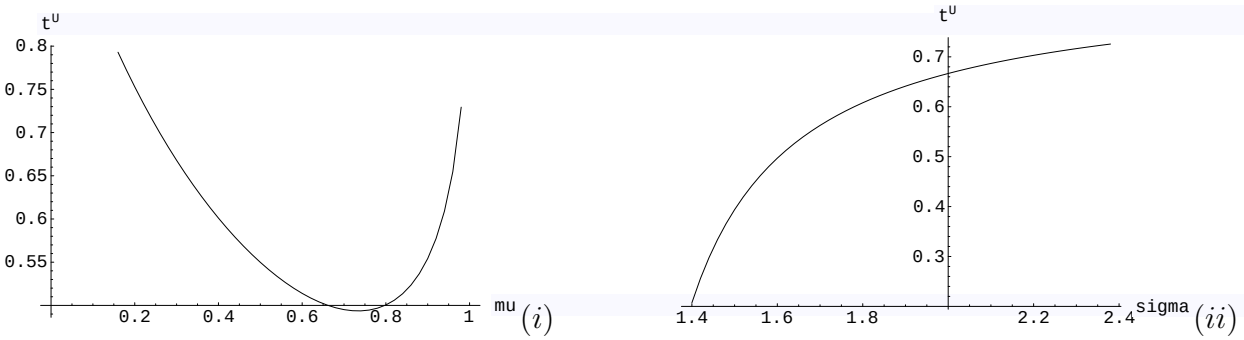

Figure 3: Equilibrium tax rate t^{U*} as a function of parameters

the second effect is that when expenditures on the modern sector account only for a small part of the budget, consumers are willing to buy even when the price is high, which allows for a higher taxation of the unskilled without reducing tax revenues and product variety. Finally, clear-cut comparative static results with respect to σ are not easily derived since the various thresholds are parametrized by σ. Yet, numerical examples suggest that, as expected, t^{U*} is increasing in σ (see panel (ii) in Figure 3). The less differentiated the goods are, the lower the unskilled tax rate. The reason is that higher unskilled taxes raise production costs in the differentiated sector, thereby eroding profits and triggering skilled entry into the elite.

To summarize our main findings, both a large expenditure share on the agricultural good and little product differentiation in the manufacturing sector are drivers for high tax rates on unskilled and a large elite, as they erode the return to productive activity. Both of these features seem to be largely prevalent in the developing world and may, therefore, serve to explain the presence of a sizeable unproductive elite.

6 Conclusion

Our results suggest that rent-seeking behavior fuels the formation of large urban agglomerations in developing countries, via mechanisms of interregional income transfers. Stated differently, even if increasing returns and the freeness of trade are too low for agglomeration to occur in equilibrium, spatial concentration may arise because of the additional purchasing power generated by transfers from the country-side to the capital cities. Our findings may thus serve to explain a seemingly paradoxical aspect of urban development in SSA: *agglomeration despite high trade costs*. Indeed, the NEG literature roughly predicts a positive and monotone relationship between freeness of trade and the degree of agglomeration, whereas most SSA countries are characterized by high values of interregional trade costs.[27] Rent-seeking behavior may serve to explain why agglomeration nevertheless occurs in such a context.

We have shown that rent-seeking will always lead to the formation of an elite provided that goods are not too differentiated. Furthermore, we have shown that the elite sets zero tax rates for skilled workers when maximizing its own welfare. This result is consistent with the well-acknowledged fact that the economic and political power of rich taxpayers often allows them to prevent fiscal reforms which would otherwise increase their tax burdens, so that the main bulk of taxation falls heavily on the poor (Tanzi and Zee, 2001; Howard, 2001). The smaller the elite, the higher the incentives for skilled to engage in rent-seeking behavior because the payoff in doing so rises. If we proxy the share of skilled by that of people having benefitted from higher education, we see that SSA (with only 2.43% of enrollment in higher education; Barro and Lee, 2001) has one of the worst performances in this respect. Hence, when combined with the low returns to private investment, the payoff to skilled workers of entering the political elite may be quite large in this region of the world. Other factors also contribute to increase the size of the elite in SSA. Indeed, we have shown that in equilibrium the size of the elite can be expected to be inversely related to the share of manufacturing expenses in national income (via the equilibrium tax rates) and to the degree of product differentiation. As a matter of fact, low product differentiation is likely to be a feature of SSA, because economic development is positively correlated with product

[27] A particularily illuminating example is detailed in the article "The road to hell is unpaved" of the December 19, 2002, print edition of The Economist (available online at `http://www.economist.com/PrinterFriendly.cfm?Story_ID=1487583`). Due to administrative hassle, 47 road-blocks and poor infrastructure, a 500km trip by truck from Douala to Bertoua took the authors four days, with only two-thirds of the original load arriving at its destination. Bad infrastructure and high transaction costs therefore add substantially to total shipping costs.

diversity (Falkinger and Zweimüller, 1996; Frensch and Gaucaite-Wittich, 2004). Moreover, most of the countries in this region are characterized by small manufacturing sectors and small expenditure shares on manufactured goods. SSA was in 2002 the region exhibiting the lowest ratio of manufacturing value added to GDP (13.6% versus 15.8%, 18.2%, 20.1% and 33.1% for Latin America, Europe and Central Asia, the European Union, and East Asia and Pacific, respectively). Looking only at SSA countries is even more informative: of the 43 SSA countries, 23 have ratios lower than 10% and 9 have ratios of even less than 5%.[28] This point suggests that the payoff to productive work is quite low, enticing skilled workers to engage in rent-seeking activities, which might drive urban primacy.

Finally, the presence of a rent-seeking elite also reduces the range of available goods because it diverts productive resources. In an endogenous growth setting à la Grossman and Helpman (1991), where varieties also serve as intermediate inputs, the reduction of variety due to the presence of the elite may damage long-run growth, which may shed light on the relatively bad growth performance of SSA. Indeed, this region has experienced an urban growth rate outpacing its economic growth rate. From 1980 to 1990 and from 1990 to 1999, the average GDP growth rate in that region was respectively 1.7% and 2.4%, but from 1980 to 1990 and from 1990 to 2000, its average urban growth rate was 4.71% and 4.49%, i.e., 277% and 187% of the corresponding GDP growth rate, respectively.[29]

References

[1] Ades, A. (1995) Economic development with endogenous political participation, *Economics and Politics* 7, 93-117.

[2] Ades, A. and E.L. Glaeser (1995) Trade and circuses: Explaining urban giants, *Quarterly Journal of Economics*.

[3] Bairoch, P. (1985) *De Jericho à Mexico: Villes et économie dans l'histoire*. Paris: Gallimard. English translation *Cities and Economic Development. From the Dawn of History to the Present* (1988), London: Mansell Publishing Ltd.

[28] Figures are from World Bank Development Indicators, 2005, available online at the following address: `http://devdata.worldbank.org/data-query`.

[29] The figures for urban growth rates were computed from the Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (2004); from the World Urbanization Prospects: The 2003 Revision; and from UNWUP2003 (POP/DB/WUP/Rev.2003/Data set 1/File 6), data set in digital form. The figures for the GDP growth rates were obtained from the World Development Report 2000–2001.

[4] Baldwin, R.E., R. Forslid, Ph. Martin, G.I.P. Ottaviano and F. Robert-Nicoud (2003) *Economic Geography and Public Policy*. Princeton: Princeton Univ. Press.

[5] Baldwin, R.E. and P.R. Krugman (2004) Agglomeration, integration and tax harmonization, *European Economic Review* 48, 1-23.

[6] Barro, R. J. and J.-W. Lee (2001) International data on educational attainment: updates and implications, *Oxford Economic Papers* 3, 541-563.

[7] Bassey, M.O. (1999) *Western Education and Political Domination in Africa. A Study in Critical and Dialogical Pedagogy*. Westport: Bergin & Garvey.

[8] Baumol, W.J. (1990) Entrepreneurship: Productive, unproductive, and destructive, *Journal of Political Economy* 98, 893-921.

[9] Behrens, K. and Y. Murata (2007) General equilibrium models of monopolistic competition: a new approach, *Journal of Economic Theory*, forthcoming.

[10] Cantillon, R. (1730) *Essai sur la Nature du Commerce en Général*. Full english version available online at `http://www.econlib.org/library/NPDBooks/Cantillon/cntNTContents.html`

[11] Charlot, S., C. Gaigné, F. Robert-Nicoud and J.-F. Thisse (2006) Agglomeration and welfare: the core-periphery model in the light of Bentham, Kaldor, and Rawls, *Journal of Public Economics* 90, 325-347.

[12] Coquery-Vidrovitch, C. (1993) *Histoire des Villes d'Afrique Noire: Des Origines à la Colonisation*. Paris: Albin-Michel.

[13] Dascher, K. (2000) Are politics and geography related? Evidence from a cross-section of capital cities, *Public Choice* 105, 373-392.

[14] De Long, J.B. and A. Shleifer (1993) Princes and merchants: European city growth before the industrial revolution?, *Journal of Law and Economics* 36, 671-702.

[15] Falkinger, J. and J. Zweimüller (1996) The cross-country Engel-curve for product diversification, *Structural Change and Economic Dynamics* 7, 79-97.

[16] Frensch, R. and V. Gaucaite-Wittich (2004) The benefits from product differentiation in modern economies. Forost Arbeitspapier #19.

[17] Fujita, M., P.R. Krugman and A.J. Venables (1999) *The Spatial Economy: Cities, Regions, and International Trade*. Cambridge, MA: MIT Press.

[18] Fujita, M. and J.-F. Thisse (2002) *Economics of Agglomeration: Cities, Industrial Location, and Regional Growth*. Cambridge: Cambridge Univ. Press.

[19] Grossman, G.M., and E. Helpman (1991) *Innovation and Growth in the Global Economy*. Cambridge, MA: MIT Press.

[20] Howard, M. (2001) *Public Sector Economics for Developing Countries*. Barbados: Univ. of The West Indies Press. Available online at `http://www.questia.com/`

[21] Krueger, A.O. (1974) The political economy of the rent seeking society, *American Economic Review* 3, 291-303.

[22] Mbaku, J.M. (2003) Corruption and economic development. In: Nnadozie, E. (ed.) *African Economic Development*, Academic Press, San Diego, pp. 313-349.

[23] Mbeki, M. (2005) Underdevelopment in sub-Saharan Africa: the role of the private sector and political elites, CATO Institute Foreign Policy Briefing #85.

[24] Moomaw, R.L. and A.M. Shatter (1996) Urbanization and economic development: a bias toward large cities?, *Journal of Urban Economics* 40, 13-37.

[25] Ottaviano, G.I.P., T. Tabuchi and J.-F. Thisse (2002) Agglomeration and trade revisited, *International Economic Review* 43, 409-436.

[26] Ottaviano, G.I.P. and R. Forslid (2003) An analytically solvable core-periphery model, *Journal of Economic Geography* 3, 229-240.

[27] Puga, D. (1998) Urbanization patters: European vs less developed countries, *Journal of Regional Science* 38, 231-252.

[28] Robert-Nicoud, F. and F. Sbergami (2004) Home-market vs. vote-market effect: Location equilibrium in a probabilistic voting model, *European Economic Review* 48, 155-179.

[29] Robert-Nicoud, F. (2005) The structure of simple 'New Economic Geography' models (or, On identical twins), *Journal of Economic Geography* 5, 201-234.

[30] Schneider, F. (2004) The size of the shadow economies of 145 countries all over the world: First results over the period 1999-2003, IZA Discussion Paper #1431.

[31] Stahl, K. (1983) A note on the microeconomics of migration, *Journal of Urban Economics* 14, 318-326.

[32] Tanzi, V. and H., Zee (2001) *Tax Policy for Developing Countries.* International Monetary Fund: available online at `http://www.imf.org/external/pubs/ft/issues/issues27/`.

[33] Williamson, J. G. (1988) Migration and Urbanization. In: Chenery, H. and T.N. Srinivasan (eds.) *Handbook of Development Economics, vol. 1*, North-Holland: Elsevier Science Publishers, pp. 424-465.

Appendix A: Sample and data

The dataset consists of 149 countries and is available from the authors upon request. It draws on publicly available data only.

Country list (full sample): Afghanistan, Albania, Algeria, Angola, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahrain, Bangladesh, Belarus, Belgium, Belize, Benin, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Chad, Chile, China, Colombia, Congo (Democratic Republic), Congo (Republic), Costa Rica, Côte d'Ivoire, Croatia, Cuba, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Fiji, Finland, France, Gabon, Georgia, Germany, Ghana, Greece, Guatemala, Guyana, Haiti, Honduras, Hungary, Iceland, India, Indonesia, Iran, Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kuwait, Kyrgyzstan, Laos, Latvia, Lebanon, Lesotho, Liberia, Lithuania, Luxembourg, Macedonia, Madagascar, Malawi, Malaysia, Mali, Malta, Mauritius, Mexico, Moldova, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Palestine (Occupied territories), Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russia, Rwanda, Saudi Arabia, Senegal, Serbia and Montenegro, Slovakia, Slovenia, Somalia, South Africa, South Korea, Spain, Sri Lanka, Sudan, Suriname, Swaziland, Sweden, Switzerland, Syria, Tajikistan, Thailand, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, United Arab Emirates, United Kingdom, Uruguay, USA, Uzbekistan, Venezuela, Vietnam, Yemen, Zambia, Zimbabwe.

Variables:

1. *Urban primacy* is defined as the percentage of urban population living in the country's largest city. This data is taken from the UN Populations Division "World Urbanization Prospects Population Database: The 2003 Revision" for the year 2000, available online at `http://esa.un.org/unup/`.

2. *Ratio of largest to second-largest city* is computed from the UN Populations Division "World Urbanization Prospects Population Database: The 2003 Revision" for the year 2000, available online at `http://esa.un.org/unup/`.

3. *Food expenditure share* in consumption is taken from ERS, United States Department of Agriculture, available online at `http://www.ers.usda.gov/Data/International FoodDemand/`. It covers the year 2004.

4. *Non-corruption index* is the "2005 Transparency International Corruption Perceptions Index". It ranges from 1 (most corrupt) to 10 (least corrupt). It "[...] focuses on corruption in the public sector and defines corruption as the abuse of public office for private gain. The surveys used in compiling the CPI ask questions that relate to the misuse of public power for private benefit, with a focus, for example, on bribe-taking by public officials in public procurement." It is available online at `http://www.transparency.org/policy_and_research /surveys_indices/cpi/2005`.

5. *Top income tax rate* and *top corporate tax rate* are taken from the "2004 Index of Economic Freedom", available online at `http://cf.heritage.org/ index2004test/`.

6. *Size of the shadow economy* in 2002/2003 as percentage of GDP is taken from Schneider (2004, Table 5.4).

7. *GDP per capita* in 2003 $US is taken from the "2005 World Development Indicators", available at `http://www.devdata.worldbank.org/wdi2005/cover.htm`.

8. *Central government expenditures on goods, services, and compensation of employees* in % of central government expenditures in 2003 are from the "2005 World Development Indicators", available online at `http://www.devdata.worldbank.org/ wdi2005/cover.htm`.

Appendix B: Proof of Proposition 4

To prove our claim, we need to analyze the function ξ, as given by (22). First, note that ξ is continuous in t^U and non-negative on the interval $[0,1]$. Furthermore, when $\mu < \sigma - 1$ holds (the 'no black hole condition'), we have

$$\lim_{t^U \to 1} \xi(t^U) = 0 \qquad \text{and} \qquad \lim_{t^U \to 0} \xi(t^U) = \frac{1}{\sigma - \mu} > 0. \tag{23}$$

Stated differently, prohibitive taxation leads to zero tax revenues and zero utility for the elite, whereas sufficiently low taxation yields positive utility. Second, one can check that $\partial \xi / \partial t^U = 0$ if and only if

$$t^U = \frac{(4-3\sigma)\mu^2 + (\sigma-2)\sigma\mu + \sigma\left[\sigma \pm \sqrt{(1-\mu)(\sigma-\mu-1)(\sigma+\mu(\mu+3\sigma-4)-1)} - 1\right]}{2\mu^2(\sigma-2)(\sigma-1)}$$

It is readily verified that the larger of the two roots exceeds 1 and, therefore, does not belong to the range of admissible values. Consequently, ξ is either monotonously decreasing on $[0,1]$, or admits a unique maximum (the existence of an interior minimum is ruled out by (23) and because $\xi \geq 0$; see Figure 2 for the two cases).

Some straightforward computations show that

$$\lim_{t^U \to 0} \frac{\partial \xi(t^U)}{\partial t^U} = \frac{2\mu^2 - 2\sigma\mu + (\sigma-1)\sigma}{(\mu-\sigma)^2}.$$

Equating this expression to zero, the two roots in σ are such that the smaller one is less than 1 and must be ruled out, whereas the larger one is given by:

$$\sigma^t = \frac{1}{2} + \mu + \frac{1}{2}\sqrt{1 + 4(1-\mu)\mu} < 2.$$

Hence, when $\sigma < \sigma^t$ the function ξ si strictly decreasing for all tax rates and the elite's best choice is to not tax the unskilled. Obviously, there will be no elite in this case. When $\sigma > \sigma^t$, the elite chooses $0 < t^{U*} < 1$ and there will be elite formation. The optimal tax rate is therefore given as follows:

$$t^{U*} = \begin{cases} 0 & \text{if} \quad 1 < \sigma < \sigma^t \\ \frac{(4-3\sigma)\mu^2 + (\sigma-2)\sigma\mu + \sigma\left(\sigma - \sqrt{(1-\mu)(\sigma-\mu-1)(\sigma+\mu(\mu+3\sigma-4)-1)} - 1\right)}{2\mu^2(\sigma-2)(\sigma-1)} & \text{if} \quad \sigma^t < \sigma,\ \sigma \neq 2 \\ \frac{1-\mu}{1+\mu} & \text{if} \quad \sigma = 2 \end{cases}$$

which establishes Proposition 4.