Occupational Choice, Public Sector Motivation and Development

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Abstract

This paper analyzes a simple model of occupational choice between the public and private sectors in which individuals are heterogeneous in terms of wealth and public service motivation. The model predicts multiple equilibria: motivated civil servant are not sufficient to escape corruption. Paradoxically cheap labor to hire in the public sector may be a cause of corruption, the model thus underline the two way causality between poor bureaucratic performance and developmental failures. The multiple equilibria are not Pareto ranked: this opens further perspectives on the political economy of the relationship between bureaucratic structures and economic performance. This simple framework provides a rationale for a non-monotonic relationship between monetary rewards and corruption and a justification for different organizational forms of the public sector.

Keywords: Public Sector Motivation, Institutions, Development, Corruption, Multiple Equilibria

JEL Codes: H10, O11, P49.

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1 Introduction

Understanding the role played by the state in fostering economic growth and development is a crucial question for economists (see e.g. Amsden (1989), Wade (1990) and Evans (1998)). Much attention has been paid to the study of the determinants of corruption (Treisman (2000)), its effects on economic performance (Mauro (1995)) and the organizational features associated with a high quality public service (Evans and Rauch (1999, 2000). The WDR (WorldBank (1997)) for instance paid attention principally to the provision of incentives on the job (according to standard efficiency wage arguments) and to the selection of talented people (motivated agents would authomatically be attracted by meritocratic recruitment). On the other hand, empirical evidence shows that the wage premium in the public sector is not a good predictor of the level of corruption, that there is huge cross countries disperison in public sector wage premium and that cultural and historical variables seems to play an important role. Lastly, no precise channel has been identified for the reverse causality, i.e. how exactly the level of development affects the level of corruption and public sector quality[1]. A further common theme in the literature is that countries that for cultural or historical reasons are endowed with a class of agents motivated to serve the interest of their country will succeed in promoting growth and economic development.

This paper, while emphasizing a joint analysis of public sector bureaucracies and economic performance, takes a different perspective. It considers a simple model of occupational choice in which agents differ in terms of wealth and public service motivation. While still not considered by most of the current economic analysis, the notion of public service motivation frequently appears in sociological and administrative studies of public bureaucracies. In Rainey and Steinbauer (1999) for instance, PSM is perceived as being a "general, altruistic motivation to serve the interests of a community of people, a state, a nation, or humankind..."[2]. This view thus emphasizes that the well documented differences in incentives based payment between public and private sector managers is thought to be compensated by a non-pecuniary benefit for the public employees, e.g. meeting their altruistic goals. According to Wilson (1989), public sector agencies are build around the idea of "mission". He identifies the mission of a public sector agency with the culture

[1] Leaving aside the standard argument according to which reacher countries can afford higher wages discouraging corruption for public servants.

[2] Quoted in Francois (2000).

embedded in the preferences of its boss. The process of identi¯cation with the mission often motivates agents to perform their tasks more e®ectively than monetary incentives. The comparative study on IT sectors policies in three developing countries in Evans (1998), provides a good example of how PSM agents can positively impact the functioning of state bureaucracy. Writing about the Department of Electronics in India, Evans reports that this agency "had always been dominated by technically oriented managers with a strong substantive interest in the sector for which they were responsible... DOE technocrats were immersed in a project of transformation that was of greater interest than minor individual perquisites". He reports similar experiences for the Commission for the Coordination of Electronic Processing Activities (CAPRE) in Brazil, and for the equivalent agency in Korea. Wade (1989) reports similar evidence for top economic bureaucracies in Taiwan. Among economists, Francois (2000) emphasizes that the public sector can indeed be more e®ective in exploiting the public service motivation of employees and therefore achieve higher e±ciency in the provision of public good. Besley and Ghatak (2003) present a model emphasizing the role of matching between principal and agents with similar preferred missions as an important source of e±ciency in mission oriented organization. Hart and Holmstrom (2003) present a model of ¯rm scope in which boss preferences may be speci¯c to a particular activity. By choosing the appropriate manager, shareholders can commit to ¯rm activities that increase the motivation and welfare of workers in the ¯rm. Mission speci¯c preferences entail the cost of disregarding global pro¯ts in the group, but allows the ¯rm to reduce the wages bill: motivated workers will be partially paid in "dreams".

I will follow this emerging literature by modelling PSM as an exogenous non monetary payo® that employees receive by working in the public sector[3]. I assume that motivated agents will be relatively less corrupt. This assumption is consistent with the vision of public service motivation as described above, but is inconsistent with interpretations linking the non monetary payo® to stable careers, insurance, or other in kind bene¯ts normally associated with public sector jobs. I take a perspective in which everybody, if the temptation is strong enough, can be corrupt.

The main intuition goes as follows: suppose a bureaucracy composed only

[3] In Francois (2000) the non pecuniary bene¯ts are an increasing function of the provided level of public service. All our results would be preserved if the private bene¯ts were endogenous and increasing in the level of public good provision.

by highly motivated agents and such that wages in the bureaucracy are (below those prevailing in the labor market, but still) high enough to deter corruption: this will generate efficient state intervention and high returns of being entrepreneur. These high returns in turn will generate a high demand for labor in the private sector. Due to the endogenously determined high wage in the private sector it will be easier to screen out non motivated applicants in the bureaucracy. This justifies the initial assumption that the bureaucracy is of high quality. It is easy to construct the opposite vicious circle leading to low wages in the private sector and poor bureaucratic performance. The intuition above thus suggest that multiple equilibria can exist over some range of the parameters.

The model also predicts that the relationship between public sector wages and corruption may be non-monotonic. This result follows from the interplay of ex-ante (adverse selection) and ex-post (moral hazard) incentive constraints and the endogenously determined outside option for the public sector, i.e. the equilibrium wage in the labor market. This result is consistent with cross country empirical evidence (see for instance Panizza (2000), Treisman (2000) and Van Rijckeghem and Weder (1996)).

The multiple equilibria of the model are Pareto Ranked. The result can thus be reinterpreted as arising from a pure coordination failure. If non motivated agents believe that other non motivated agents will join the public sector in order to extract rents, they will find optimal to join the public sector too. This is so because the low quality of the public good worsens their position in the labor market. The Pareto rankness result is easily lost when one allows the rents that can be extracted in the public sector to be equilibrium dependent. It is possible that in a public sector composed prevalently by motivated and honest individuals the benefits from corruption will be lower: good social norms, supervision, and peer pressure will discourage corruption.

The main implication derived from the model is that, somewhat paradoxically, it is not necessarily a good thing to have cheap labor to hire in the bureaucracy. This is so because with cheap labor, it is more difficult to screen honest individuals. Moreover it turns out that motivated agents are not sufficient to escape corruption. The literature recognize that a good public service can be obtained only with sufficient pecuniary incentives or with personnel motivation. While empirical evidence exists shading some doubts on the first view, this paper shows that the latter one may not be sufficient. In order to isolate in the most transparent way the economic mechanism behind the results, the analysis will treat variables that are likely determined

by some form of political process as parameters. These variables are the public sector size and wages, and the rents that can be extracted through corruption.

The rest of the paper is organized as follows. Section 2 presents a simple model of occupational choice and bureaucracy. The equilibrium in the private and public sectors is derived. Section 3 characterizes the equilibria in the economy, and presents the main results. Section 4 presents some extensions that deal with the organizational features of the public sector. Section 5 discusses the endogenous determination of public sector size and wages, and rents that can be extracted from corruption. Section 6 o®ers some concluding remarks.

2 The Model

2.1 Set Up

We consider an economy in which returns in the private sector depend on the quality of a public good provided by the bureaucracy. Infrastructures and law enforcement are common examples of this sort of public good. In general, one may think of these public goods as the "Governance's quality" of the country.

The economy is populated by a continuum of mass one of individuals that live only one period. Individuals di®er along two dimensions: a privately observed characteristic (public service motivation) and personal wealth. A motivated agent enjoys a nonmonetary payo® μ if she works in the bureaucracy. The proportion of motivated agents at each level of wealth is $\alpha > b$, where b is the exogenously given size of the bureaucracy. If $\alpha < b$ there qre not enough motivated agents to ¯ll the public sector, an underdevelopment trap would be authomatically obtained.

Wealth is distributed according to a continuous and strictly increasing cumulative function $F(a)$, $a \in [0, 1)$: At the beginning of the period each agent decides her occupation. She could become an entrepreneur, a bureaucrat or a worker in the private sector. A subsistence technology is available that absorbs the excess labor supply. The set of occupations in the economy is therefore given by $o \in \{s, w, b, e\}$ (subsistence, workers, bureaucrats and entrepreneurs). Everybody can choose to work in the subsistence sector

earning a wage $\underline{w}$: A worker earns a wage w which is endogenously determined in the labor market. A bureaucrat earns a wage w^b which is exogenously given and will be the main parameter of the equilibrium analysis. The payo® for a corrupt public servant is discussed below. To become an entrepreneur an agent has to invest k units of capital employing n workers at a wage w, in order to get a return equal to $R + G(b_m; c; b)$; where $G(b_m; c; b)$ is the quality of the public good o®ered by the bureaucracy and is increasing in b_m and decreasing in c (the proportion of motivated and corrupt agents working in the bureaucracy respectively). Pro¯ts are therefore given by $¼(G(b_m; c; b); w) = R + G(b_m; c; b) ¡ k ¡ nw$: For given w^b and b, the two endogenous variables in the model are w and $G(b_m; c)$: I now turn to the equilibrium determination of these two variables.

2.2 Private sector and equilibrium on the labor market

Credit markets are competitive, but not perfect. A borrower taking a loan of size B will repay if and only if $Br \cdot ¸¼(G(b_m; c); w)$ where r is the interest rate, $¼(G(b_m; c); w)$ are pro¯ts and ¸ is a constant determined by the extent of credit market imperfection due to enforcement problems. Given that there is no need to invest more than k, an agent will be able to become entrepreneur if and only if she has wealth $a ¸ a^e = k ¡ \frac{¸¼(G(b_m;c);w)}{r}$: From now on we assume for simplicity that wealth can be invested in a storage technology that gives a return equal to one, that implies r = 1.

We assume that a credit unconstrained agent will always prefer to be entrepreneur than entering the public sector, i.e. $¼(G(b_m; c); w) ¸ w^b + µ$. Moreover, we focus the analysis on situations in which the labor market clears at a wage $w \cdot w^b + µ$: This is because, otherwise, the bureaucracy is not able to recruit enough civil servants[4]. While this can certainly be a relevant case, the government will have to react, and we leave this outside

[4]Properly speaking, these are not assumptions. Equilibrium level of pro¯ts and wages in the private sector depends on G(¢): $¼(G(b_m; c); w) ¸ w^b + µ$ is not necessary: suppose that it is not veri¯ed, then the labour demand would be reduced: many entrepreneurs prefer to go in the public sector. This would reduce w and increase again pro¯ts, restoring a new equilibrium. This e®ect has already been analyzed elsewhere (Acemoglu and Verdier (2000) and Baumol (1990)), and it is omitted here in order to present the analysis in a lighter way. The assumption that $w \cdot w^b + µ$ should be again derived as an equilibrium condition. If nobody wants to go in the public sector, either w^b is increased, or at least

the scope of the present paper. The focus of the model is on low and middle income countries. It is rarely the case that the public sector is o®ering so poorly paid jobs, that nobody wants to work there: these assumptions while therefore reasonable, are further discussed below (for empirical evidence on the relative wage in the public and private sector see e.g. Schiavo-Campo et al. (1997) and Gregory and Borland (1999)).

A better bureaucracy increases the return of being entrepreneurs allowing for more projects being ¯nanced, this in turn increases the aggregate labor demand. For future reference we will call *good* an equilibrium in which labor demand and labor supply equalize, and *bad* an equilibrium in which the excess labor supply is absorbed in the subsistence sector and thus $w = \underline{w}$.

Lemma 1

For each level of the public good, the equilibrium in the labor market is unique. The wage in the labor market w is a weakly increasing function of $G(b_m; c)$:

To simplify, we count entrepreneurs among the labor supply, i.e. each ¯rm requires $n + 1$ workers. The supply of labor is $1 ¡ b$ if $w \cdot w^b + \mu$: After this threshold everybody prefers to be employed in the private sector, and therefore the labor supply jumps at one. The labor demand is continuous and downward sloped, and it is given by $(n + 1)[1 ¡ F(k ¡ ¸(R + G(b_m; c) ¡ nw))]$: If the labor demand is su±ciently low, then the equilibrium will always occur at a wage equal to $\underline{w}$. Increasing the quality of the public good shifts the labor demand upward.

Fixing a level of public good at $G(¢)$; it is not possible to have multiple equilibria. As it will become clear in the following analysis multiple equilibria can arise along a di®erent dimension, i.e. for the same public sector wage w^b: Multiple equilibria thus come directly from the general equilibrium interaction between the public and the private sector.

$G(b_m; c; b)$ should be reduced. Fixing b avoid us to specify the precise way this occurs (and deal with the corresponding cases), at the cost of somewhat misspecifying the equilibrium payo®s. Moreoever, in this model the equilibrium correspondence will be determined as a function or the parameter w^b; it is therefore natural to impose some boundaries on w^b: These boundaries arise naturally in this occupational choice model, and are given by the subsistence wage and the equilibrium level of pro¯ts. The limit case in which there is no credit rationing in the economy, implies $w_u = ¼_u = \frac{R+G}{n+1} = w^b + \mu$ and will not be analyzed here.

The equilibrium in the labor market depends on the level of public good quality $G(b_m; c)$: In order to close the model, we have to verify that, given w^b; the equilibrium wage in the labor market is indeed consistent with the level of $G(b_m; c)$ justifying the original labor demand in the private sector. In other terms, we have to see how the economic conditions feed back into the set of "feasible" bureaucracies.

2.3 The endogenously determined quality of the bureaucracy

We now turn to the equilibrium determinants of G: We start analyzing a bureaucracy that recruits its employees by screening through wages: this is the natural way to proceed given that motivated agents are cheaper to buy, and also more productive.

If there were no problems in providing incentives to avoid ex-post opportunistic behavior, a government could always achieve an high quality bureaucracy setting $w^b = w - \varepsilon$; $\varepsilon > 0$: Only motivated agents will accept a job in the public sector. Now let assume that each public sector employee controls an exogenously given amount of resources g and that she can divert these resources increasing her payo®s by an amount equal to g: If she is caught (which occurs with exogenously given probability q), she looses her job, and wage. Even motivated agents will let temptation win, if temptation is strong enough. A trade-o® arises in a clear way: to prevent opportunistic behavior the bureaucracy has to pay high wages, i.e. give rents to the o±cers. These rents attract non motivated agents. De¯ne the value of a public sector career as $V^b(w^b; \mu) = \max\{w^b + \pi(\mu); w^b + \pi(\mu) + g - \phi(1-q)g\}$; where $\pi(\phi)$ takes value μ for motivated agents and zero otherwise, then to prevent an agent from being corrupt the wage in the bureaucracy must satisfy

$$w^b \geq \hat{A}g - \pi(\mu)$$

with $\hat{A} = \frac{1-q}{q}$. The rents that one can extract through corruption are given by $g = g(1-q)$. These rents can be endogeniezed through internal or external mechanisms. For instance, the probability of being caught taking bribes could depend on the motivation of supervisors, or the amount of money that one can divert could depend on the level of economic development of the country.

Depending on the wage prevailing on the labor market, a pooling ($V^b(w^b;0) > w$) or a separating ($V^b(w^b;0) \cdot w$) equilibrium will arise. Depending on the composition of types in the public sector, the proportion of corrupt agents will be equal to either zero, $1 - \theta$ or one: four different cases are therefore possible[5]. The bureaucracy could be composed only by motivated and honest agents producing a public good $G(1;0) = \overline{G}$: We could than have a bureaucracy with motivated and non motivated agents, respectively in proportion θ and $1 - \theta$: In turn, this bureaucracy can have all the public servants honest ($G(\theta;0) = G^{00}$), only the non motivated agents being corrupt ($G(\theta;1-\theta) = G^0$), or all the employees being corrupt, no matter the composition of the pool ($G(\theta;1) = G(1;1) = \underline{G}$): We assume that the quality of the public good satisfies:

Assumption
$\overline{G} = G^{00} > G^0 \geq \underline{G}$

This assumptions simply says that a non motivated, but honest public servant, is more productive than a motivated but corrupt one[6]. Letting w being the equilibrium wage in the labor market associated with a given G; we can establish the following

Lemma 2
In any good equilibrium, profits are equal, i.e. if the good equilibrium exists we must have $G^0 - G^{00} = n(w^0 - w^{00})$ and $\overline{G} - G^0 = n(\overline{w} - w^0)$:

This is an immediate consequence of the equalization of L^d and L^s in a good equilibrium. Given that b is exogenously given , $F(a^e(\phi))$, and therefore $a^e(\phi)$ must be the same in each good equilibrium. jj

This lemma has three important consequences for the analysis. From a political Economy perspective, it means that the coalition supporting the re-

[5] All the analysis remains valid if μ is distributed according to a continous cumulative $F(\mu)$ with at least some range such that the density $f(\mu)$ is decreasing (this would be necessary for the result in Proposition 3). While this formulation will avoid the tedious analysis of the four cases, the results would depend on the distribution function in a less clear way. All the results can be generalized to the case in which μ and wealth a are correlated at the cost of notational complexity without altering any of the results.

[6] $G(\delta b_m(1-c_m) + (1-b_m)(1-c_{nm}); g; b)$; with c_m and c_{nm} being respectively the fraction of corrupt motivated and non motivated agents, and $\delta \geq 1$: Clearly c_i is either equal to 1 or 0 for $i \in \{m; nmg\}$; and $b_m \in \{\theta; 1g\}$ is a specification consistent with these assumptions. We will assume thet $G(0; g; b) > 0$:

form for a better public sector will depend on the equilibrium (entrepreneurs in a bad equilibrium, workers in the good one). Second, it completely characterizes the equilibrium levels of w(G) as a function of the parameters of the model. Third, it clari¯es that the participation constraint for entrepreneurs is the same in any good equilibrium However, given the further simpli¯cation we introduce below, this result will not be used in the proof of propositions 1 and 2.

3 Results

From now on we will focus on the case in which $F(a^e(\underline{G};\underline{w})) > F(a^e(G^0;w^0)) > \frac{n+b}{n+1}$ (when there is some corruption the labor demand is so low than the labor market clears at a wage $\underline{w} = w^0$) and in which there exist a $\overline{w}$ with $\underline{w} < \overline{w} < w^b + \mu$ such that $F(a^e(\overline{G};\overline{w})) = \frac{n+b}{n+1}$ (a good equilibrium with a completely honest bureaucracy exists)[7]. The following propositions carries out the equilibrium correspondence in terms of the parameter w^b:

Proposition 1

For a given w^b a good separating equilibrium at $\overline{G}$ exists if $\overline{w} \geq \hat{A}g - \mu(1 - q)$. A good pooling equilibrium always exist if $w^b \geq \max\{\hat{A}g; \overline{w} - \mu g$:. A bad equilibrium exists if $\underline{w} \leq \hat{A}g$:

Proof: see Appendix jj

The equilibrium correspondence is depicted in ¯gure 1. This ¯gure immediately give us

Proposition 2

If $\underline{w} \leq \hat{A}g$ and $\hat{A}g - \mu(1 - q) \leq \overline{w} \leq \hat{A}g + \mu$; multiple equilibria exist for $w^b \in [\max\{f; \hat{A}g - \mu; V^{-1}(\underline{w}; 0); V^{-1}(\overline{w}; \mu)g; \min\{f\hat{A}g; V^{-1}(\overline{w}; 0)g]$.

Proof: see Appendix jj

[7] Assuming that $F(a^e(\underline{G};\underline{w})) > \frac{n+b}{n+1}$ and $F(a^e(\overline{G};\overline{w})) = \frac{n+b}{n+1}$ traces out the relvant cases. If one of these two were not satis¯ed, then, any level of corruption would be consistent with either a good or a bad equilibrium. The assumption that $F(a^e(G^0;w^0)) > \frac{n+b}{n+1}$ instead allow us to reduce the number of equilibrium wage in the private sectorimplying that $w^0 = \underline{w}$: None of the result is a®ected by this condition, it only allows us to reduce the number of cases to deal with. This sempli¯cation is indeed in the same spirit than positing $\overline{G} = G^{00}$; which ensures $w^{00} = \overline{w}$: Given the descreteness of our framework this will enable us to present the result in a much lighter way. Lastly $\overline{w} < w^b + \mu$ has been discussed above.

It is relatively easier to provide incentives to prevent corruption while screening when the wage in the private sector is relatively high: the equilibrium level of G is an increasing function of the wage prevailing in the labor market. On the other hand the equilibrium wage in the labor market is a weakly increasing function of G: The combination of these two equilibrium relationships, naturally leads to multiple equilibria. Therefore, a given level of wage paid in the bureaucracy can be consistent with either an high, or a low wage in the private sector. Remember that the proportion of motivated agents ® is bigger than the size of the bureaucracy b. Surprisingly the model says that it is not enough to have motivated agents in order to escape corruption. Moreover it is not necessarily good to have cheap labor to be hired in the public sector: cheap labor makes more difficult to screen out non motivated and corrupt agents.

Corollary
When multiple equilibria exist they are Pareto Ranked.

It is possible to reinterpret the multiplicity of equilibria as a form of coordination failure. Suppose that a non motivated agent think that other non motivated agents will go in the public sector looking for rents to extract through corruption. Given these beliefs, she will find optimal to go in the public sector, this is so because she correctly anticipates that the wage in the private sector will be quite low. This reasoning is appealing because it relates the issue of corruption to the culture of a given country. Indeed, Tresiman (2000) finds that history matters for corruption more than the current economic and political situation[8]. To see why the two equilibria are necessarily Pareto Ranked, note that in a good equilibrium entrepreneurs and workers in the private sector (motivated or not) are (weakly) better off and motivated public servant are indifferent with respect the bad equilibrium. The only issue is thus to compare the situation of corrupt public servant in the bad equilibrium with workers in the private sector in the good one. By construction, in a good / separating equilibrium we have that $\overline{w} > V(w^b; 0)$; while in a bad / pooling equilibrium $V(w^b; 0) > \underline{w}$: The Pareto Rankness thus

[8] Beliefs about the PSM and probity of public sector employees vary significantly across time and countires. This is coherent with the fact that what is critical in the model are the beliefs of non motivated agents (motivated agents have a weakly dominant strategy: always applying for a job in the bureaucracy). Tirole (1996) provides a partial equilibrium model with multiple equilibria on the persistence of corruption.

comes from the de¯nition of good and bad equilibrium in terms of separation versus pooling, and from the fact that the rents of being corrupt are identical in the two equilibria. The fact that the two equilibria are Pareto Ranked means that sooner or later the political process will be likely to choose the high wage equilibrium.

Although very stylized, the public sector in this model combine two incentives problems: on one hand paying a lower wage is used to attract only motivated agents (adverse selection); on the other hand it is possible that some rents have to be paid in order to deter corruption and ex-post opportunistic behavior (moral hazard). The equilibrium interaction of the incentive compatibility constraints associated with these informational problems, give us the following

Proposition 3

Assume $\underline{w} \in [V(w^b;0); \hat{A}g)$ and $\overline{w} \cdot \hat{A}g$ then the level of corruption is not monotonic in the wage paid in the public sector w^b:

Proof: immediate from inspection of ¯gure 1jj

The intuition for this result goes as follow. Suppose the economy start with a relatively low (but still higher than $\hat{A}g - \mu$) wage paid in the public sector. This wage is su±ciently high to deter corruption for motivated agents, and it is still relatively low in order to attract only motivated agents. The country will be characterized by a low (in this model equal to zero) level of corruption, despite the low wage in the public sector. Assume now that the wage in the bureaucracy raises for exogenous reasons. These additional rents will start attracting non motivated agents, but may well be not enough to deter their corruption. The level of corruption will jump at $1 - \Re$; the proportion of non motivated agents in the bureaucracy. Clearly further increases in the wage paid in the public sector will not change the composition of the bureaucracy, but may well be lowering again the level of corruption, following the standard e±ciency wage argument. In other terms, the endogenously determined outside option of the agents (the wage in the labor market) determines which constraints are binding when we change w^b.

The role played by inequalities in the distribution of wealth and credit market imperfections is also relevant. A very unequal country may su®er the lack of people having enough wealth to become entrepreneurs. As in standard model of occupational choice, inequalities in the distribution of wealth and credit market imperfections tend to lower wages in the private sector (see

e.g. Banerjee and Newman (1993) and Ghatak and Joung (2002)), and therefore will make more difficult to screen applicants for public office positions, extreme inequalities thus reinforce the perverse mechanism explored above. Panizza (2001) presents an analysis of the puzzle of high wage premium in the public sector and poor public sector performances in Latin America, a region notoriously characterized by high inequalities. It could also be possible that for cultural reasons motivated rich people prefer to go in the bureaucracy rather than starting their own business. If this effect is strong enough, this could potentially reduce the number of entrepreneurs, destroying the good equilibrium. This perverse effect is more likely when richer classes are favored in the rationing process that shapes entry in the bureaucracy, or when there are strong social stigma against entrepreneurship. Similar considerations are reported in Acemoglu (1995) and Baumol (1990).

Summarizing, multiple equilibria comes from the general equilibrium approach adopted in this model. The non monotonicity comes from the interaction between ex-post and ex-ante incentives constraints.

4 On the internal organization of the public sector

In this section we provide some microfoundations for the public sector to analyze some general equilibrium effects on the organizational form of the bureaucracy. These extensions suggest a number of results and raise a number of issues of great relevance from a positive and normative point of view.

Signalling

When $\overline{w} \cdot Âg - \mu(1 - q)$ a good equilibrium with $\overline{G}$ fails to exist. The wage in the private sector is so low that in order to screen out non motivated agents the bureaucracy should set a wage w^b that would cause endemic corruption. In order to avoid chronic corruption, the bureaucracy has to pay some rents that attract non motivated agents. In this context, it could be useful to sell public sector employments in order to reduce the rents attracting non motivated agents. Instead of selling public officer positions, a bureaucracy could start recruiting looking at educational levels. The main insight is that the cost of acquiring the level of education which is necessary to signal the agent's motivation would compensate the rents that are paid

to prevent total corruption. We assume that there is no credit market at the signalling stage (i.e. agents can not post bonds in order to acquire an higher level of education[9]). The equilibria of this game (identical to the one analyzed in Esteban and Ray (2003)) are derived in the Appendix The signalling procedure will not necessarily succeed in separating motivated agents from non motivated ones: in order to deter entry of non motivated agents, the educational expenditures could be so high that there are not enough rich and motivated agents able to pay such a signalling cost; the results will thus depend on the precise shape of the distribution.

Proposition 4

Under some additional assumptions on the shape of $F(¢)$, if there exists an x such that $[F(¼^g) ¡ F(x)] > \frac{µ}{®}$ and $x > Âg ¡ µ ¡ \overline{w}$ then there exists a range of possible values of w^b such that the signalling separating equilibrium is obtained.

Proof: see Appendix jj

It is therefore possible to improve the selection mechanism of the bureaucracy only under some further conditions on the shape of the wealth distribution. Ideally, one would like to map the recruitment process into di®erent bureaucratic structures. There is scattered evidence that the selection process is crucial in de¯ning the quality of bureaucratic intervention(see Evans and Rauch (2000) and Panizza (2000)). Although suggestive, the result above should be complemented by a more microfounded analysis in order to shed further light on the institutional arrangements adopted in the public sector and their e®ects on economic development. The investment in education moreover is unlikely to be entirely a monetary cost. More motivated agents can compensate their scarcer resources by increasing their e®ort, however this additional e®ort can still come at some monetary costs in the form of foregone earnings.

Internal monitoring

From now I assume that the bureaucracy is composed by a continuum of agencies, and that each agency employs a large number of civil servants. Civil servants in the bureaucracy are divided into two tasks: agents and supervisors. I assume for simplicity that each agent is matched with a supervisor.

[9] This assumption is certainly not resctrictive at this stage given that $µ$ are nonmonetary payo®s. For simplicity, we focus only on the monetary costs of acquiring education.

The agent now controls the amount of resources g necessary to carry out the production of the public good. The supervisor has to exert some e®ort, which is non observable by third parties, in order to monitor the possible misuse of resources in the lower level of the hierarchy. With an e®ort cost of $\frac{q^2}{2^3}$ the supervisor ¯nd out if the agent is corrupt with probability q. While the corruption of an agent is veri¯able by a third party, I assume here for simplicity that the outcome of the project can not be contracted upon. I assume that the supervisor has to be paid a ¯xed wage w^m[10]. The agent receive as before a ¯xed wage w^b: Agents and supervisors are recruited from the same pool of applicants: workers in the private sector. No educational investment is required to become either supervisor or agent. With respect to the previous section, and for the pure sake of simplicity, I assume that a motivated civil servant will enjoy the non monetary pay-o®, $\mu > g$, if and only if the public project succeeds The project succeeds if the agent does not misuse public resources or if in the case of corruption he is caught. A motivated agent thus, will never be corrupt. Once the recruitment process is completed, public servants are randomly assigned to an agency, they then observe the type of their colleagues within the agency, and they forms supervisor-agent pairs. In equilibrium, these pairs maximize the surplus of workers within the agency.

Lemma 3

Public servants surplus within each agency is maximized with assortative matching, i.e. motivated supervisors monitor motivated agents and non motivated supervisors monitor non motivated agents.

Proof: see appendix jj

Letting a non motivated supervisor monitor a motivated agents does not produce corruption, it would be therefore optimal to allocate the motivated supervisor to the monitoring of a non motivated agents. This negative sorting allocation has two costs with respect the positive one: assuming an interior solution for the Nash Equilibrium, the non motivated agents would randomize, choosing a probability of being corrupt strictly lower that one, i.e. she

[10] Indeed the supervisor could be given some incentives by conditioning her payment on the report about corruption (which is veri¯able). Relaxing this assumption would not change the main intuition of the analysis: all that is needed is that a motivated supervisor has more incentives to monitor, and that a non motivated supervisor allows some rents to the agent,which occurs when the Nash equilibrium is at a corner, i.e. if ^{3} is low enough. Moreover, the provision of incentives may become very costly if collusion is allowed between the supervisor and the agent. On this point, see also the considerations reported below.

will be loosing a rent equal to g. The motivated manager will with strictly positive probability loose the non monetary pay-o®. Moreover she exert some e®ort to monitor, which is costly.

Proposition 5

When multiple equilibria exist, they are not necessarily Pareto Ranked.

Proof: because of the assortative matching result supervisor never monitor: motivated supervisors are matched with motivated agents, therefore they do not need to monitor. Non-motivated supervisors have no incentives to monitor. In the pooling equilibria thus, non motivated agents are earning $w^b + g$: Note moreover that in the good equilibrium, a small measure " of non motivated agents has no incentives to deviate and try to enter the public sector: the probability that they will earn rents in the public sector is indeed close to zero (they will almost never be matched with a non motivated supervisor). The condition for the existence of a good equilibria is $\min\{w^b + \mu; w^s + \mu g > \overline{w} > \max\{w^b; w^s g$: The condition for the existence of a bad equilibrium is $\min\{w^b + g; w^s g > \underline{w}$: It is possible that $w^b + g > \overline{w}$, non motivated agent prefer to be employed in the public sector in the bad equilibrium than in the private one in the good equilibrium jj

The intuition for this result goes as follows. In the previous section, the rents that one can acquire through corruption are exogenously given (both g and q were exogenous). Clearly, by the very de¯nition of a pooling and a separating equilibrium, nobody (not even corrupt agents) can be better o® in the bad equilibrium than in the good one. Introducing this simple hierarchy allows the endogeneization of the probability of being caught q, determining the rents that one can extract through corruption. In particular in a good equilibrium, the bureaucracy will be composed by motivated agents that will have high incentives to monitor. Therefore, a non motivated agent has no incentives to come into an honest bureaucracy. In the pooling equilibrium on the other hand, the bureaucracy is populated of supervisors that are in the public sector just to earn an higher wage, the pressure to punish corruption are lower, and a non motivated agent will be willing to enter the public sector. The endogenously higher rents from corruption in the bad equilibrium, more than compensate the increase in the wage in the private sector.

None of the modelling assumptions above is important to get the results: what is really needed is that motivated supervisors will have more incentives to monitor than non motivated supervisors, and that the presence of enough

non motivated supervisors attracts non motivated agents into the public sector. Allowing for collusion[11], could be a way of giving incentives even to non motivated supervisors to monitor. If they can extract some of the rents that an agent is getting out of corruption they will have incentives to monitor. In equilibrium, this will in turn reduce the probability that the agent itself is corrupt. On the other hand allowing for collusion spread the rents of corruption on multiple levels of the hierarchy making screening even more difficult. Again, a trade off between the provision of incentives on the job and selection is obtained.

The recruitment processes at different levels of the hierarchy are inherently linked. It is in fact the presence of (enough) non motivated supervisors that creates the rents attracting non motivated agents and which therefore foster corruption. This top-down mechanism, can be coupled by a bottom-up dynamic in the case in which the bureaucratic procedures allow for collusion: in this case, the presence of corrupt agents at lower levels create rents for the supervisors. This implies that reforms at specific levels of the hierarchy can have important effects on the whole bureaucracy. For instance, targeting good supervisor can be a relatively cheap way of improving the performance of the entire public sector. The fact that in the model supervisors and agents are selected from the same pool, prevents us from properly comparing wage compression in the public and in the private sector. However, the fact that having motivated agents at the top of the bureaucratic hierarchy is particularly important suggests that, wages at the top of the hierarchy should be lower (with respect to their counterparts in the private sector) than at the bottom. This is consistent with strong evidence of wage compression in the public sector.

Delegation of Authority

There is a further potential trade-off whose analysis helps in tracing a further line between the set of appropriate and the set of feasible institutions. It can be thought that motivation is fostered by delegation of real authority. As already emphasized in Aghion and Tirole (1997), delegating authority may well relax the participation constraint of agents. On the other hand decentralization, at least to the extent to which it is accompanied by a relaxation of controls can also foster corruption at lower levels of the hierarchy. Consider the case of a separating equilibrium: the optimal policy

[11] I.e. the possibility that, once a supervisor discover the corruption of the agent, she can ask bribes, extracting at least a part of the rents from corruption.

may consist in delegating as much authority as it is possible to lower levels of the hierarchy. This will foster initiative of motivated agents, further relaxing their participation constraints. It would be even easier to separate out non motivated agents, given that the relaxation of the participation constraint will allow further reductions in the wage paid to public servants. On the other hand, in a pooling equilibrium, depending on the proportion of motivated and non motivated agents, the optimal policy may be centralization. In order to avoid corruption at lower levels of the hierarchy, the optimal organization of the bureaucracy may require rules strictly determining the procedure of control and responsibility assignments at different levels of the hierarchy. The optimal bureaucracy in the pooling equilibrium may well entail a significant centralization with respect to the optimal bureaucracy in the separating equilibrium. Once again, the selection incentives may put constraints on the way the government can deal with this ex-post incentives constraints. The optimal degree of delegation in the separating equilibrium may in facts attract non motivated agents that will now enjoy a substantial increase in the amount of rents from corruption. Even more surprisingly, if the centralization process entails a significative loss of motivation, the optimal strategy in the pooling equilibrium may cause motivated agents to leave. This time, a countervailling incentive effect puts constraints on the feasible policies / institutions that can be achieved by the planner[12].

5 Discussion

The equilibrium correspondence in the model is determined with respect to w^b: we can therefore ask if the main results of the model are robust to endogeneizing w^b through political economy mechanisms[13]. Multiple equilibria exist when w^b is neither too high nor too low with respect to the wage that

[12] With respect to the model presented above, the analysis of the optimal degree of decentralization can be thought as a way of endogeneizing μ: This can be done in many other ways. Any mechanism that implies an higher level of motivation in a good equilibrium would be an additional source for multiple equilibira. By omitting these forces, the model more transparently underlines a different source for multiple equilibria.

[13] As emphasized in Borland and Gregory (1999) it is not clear which political economy mechanism determines the wage in the bureaucrcay. Moreover, if political institutions are endogenous, the political mechanism deciding over w^b should be itself an endogenous variable. To focus on the precise economic mechanism descrbed in the model, the model omitted these considerations.

prevails in the private market. We argue that it is likely that wages in the public sector will indeed be in this range even after controlling for political economy considerations. Wages in the public sector can not be much higher than the highest possible wage in the private sector: the wage bill for the public bureaucracy would be too high, and taxpayers will not support it. Wages in the public bureaucracy may be very low instead generating endemic corruption. However, while it has been shown elsewhere (see Acemoglu and Verdier (2001) for a theoretical argument and Van Rijckeghem, K. and B. Weder (1996) for an empirical one) that the complete eradication of corruption may be very costly, it is unlikely that endemic corruption would be a best response[14].

The government may (sometime) want to reduce w^b in order to select only motivated agents. This reforms will likely be opposed by civil servants. This opposition may be accompanied by a reduction in μ; eliminating the initial beneficial effect it was aimed to obtain[15].

An important exogenous parameter is $\theta = g(1 - q)$; the rent that it is possible to acquire through corruption. How θ can be endogeneized through internal mechanisms has been somewhat discussed in the previous section, I now turn to external factors influencing θ: Acemoglu and Verdier (2000) relate the amount of money a bureaucrat can control to the level of economic development. Although g could be increasing in w or $\pi(\phi)$ (a richer private sector representing a bigger temptation), q is likely to increase too with the level of development. The net effects on $\theta = g(1 - q)$ is thus ambiguous and reasonably omitted here.

An interesting extension would be to look at the effects of corruption on the organizational form of firms: if contract and law enforcement are subjected to widespread corruption, firms may have the incentives to adopt technologically suboptimal organizational forms as vertical integration or group diversification. Contracts can still be enforced through networks or repeated relationship, however these informal mechanisms are still likely to entail some efficiency costs, because of the additional constraints of self-enforceability. Moreover, big business can have important scale economies

[14] As emphasized in Acemoglu and Verdier (2000) public servant may want to self restrain their corruption in order to avoid voters reaction (e.g. downsizing of the public sector).

[15] The wage bill often represent the biggest expenditure of the public sector in developing countires; w^b is thus typically reduced to redress government's finances. Campo et al. (1997) discusses cross countries empirical evidence on public sector wages, employment and reform which are consistent with what noted above.

in dealing with the bureaucracy. There is indeed evidence that larger ¯rms in developing countries tend to be more capital intensive (see e.g. Tybout (1998)). Moreover, while at the plant level the two organizational forms may be equivalent, they may well have radically di®erent aggregate consequences because of credit constraints. If this alternative organizational forms reduce aggregate labor demand, the mechanism described in the model would still be at work, and a correlation between the level of development, the internal organization of the public sector and ¯rms, would be obtained.

Lastly, our results importantly depend on the exogeneity of b: In a sense the results are striking exactly if one neglect any kind of clienteralism that raises b: The model says that having enough motivated agents is not enough to ensure a good bureaucracy in equilibrium. A government would have the incentives to increase b to reduce the labor supply, and therefore increase wages in the private sector. For a ¯xed budget a clear trade o® arises: by expanding the size of the bureaucracy the government increases aggregate labor demand, and therefore wages in the private sector. This allows the government to perform a better screening on motivated agents. On the other hand, this has to entail a reduction in w^b, which in turns may reduce motivation and encourage corruption. Empirical evidence exists suggesting a negative correlation between public sector wages and unemployment for developing countries (see e.g. Panizza (2000) and Schiavo-Campo et al. (1997))[16].

6 Conclusions

This paper presented a simple model of occupational choice in the public and private sector analyzing the trade-o® between selecting motivated people in the public bureaucracy, while providing incentives to avoid corruption. The model naturally displays multiple equilibria characterized by di®erent levels of aggregate income, these equilibria may be not Pareto ranked. Political economy considerations are useful to complement the analysis. The interplay between the adverse selection and moral hazard incentive compatibility con-

[16] Clienteralism may be a substitute for redistribution in less developed countries. The cost of going for this clienteralistic policies is lower, the lower the wage in the private sector: it will be cheaper to buy votes when the wage in the private sector is low. To the extent that clienteralism reduces G the reasoning above still apply. Clienteralism is cheaper when w is low, on the other hand the more clienteralism is widespread the lower will be w; and multiple equilibria are again obtained.

straints, gives the possibility that the equilibrium level of corruption is not monotonic in the level of public sector wages.

Somewhat surprisingly, the model suggest that it may not be sufficient to have enough motivated agents willing to work in the public sector. Moreover, cheap labor to hire in the bureaucracy, may indeed be a further cause, and not only a consequence, of corruption. The model thus identifies a precise channel through which the level of development is an endogenous variable in the cross countries regression explaining the quality of governance and corruption.

The entire model could have been written in terms of effort. Presenting it in terms of corruption allows for a more direct link with the empirical cross countries literature on corruption and avoids the formalization of the moral hazard problem in the private sector. However the results above can be reinterpreted in terms of the relative strength of incentives between the public and the private sector. The model also emphasizes the distinction between feasible and appropriate institutions for the case of public sector bureaucracies.

The model is simple, and it could be extended in many interesting directions. The relationship between bureaucratic structures and organizational form of firms in developing countries is particularly promising. A more complete theory must moreover account for heterogeneity in talent. Introducing some form of heterogeneity in workers tasks and wages would permit a detailed analysis of important institutional arrangements such as 1) the relative compression of wages in the public and private sector, 2) the recruitment process, 3) the provision of implicit and explicit incentives in the public versus the privates sector, 4) the optimal career profile in the public bureaucracy in an equilibrium context, 5) the endogenous determination of a stigma for corruption and social status, 6) the analysis of the "appropriate bureaucracy", and its effects on economic development. We let the exploration of such equilibrium interplay of incentives between the private and public sector for future research.

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7 Appendix

7.1 Characterization of Equilibria

The labor demand is increasing in G. We focus on the case in which a bad equilibrium exists at $\underline{G}$ and G^{0} and thus $w(\underline{G}) = w(G^{0}) = \underline{w}$: A good equilibrium exists with $\overline{G} = G^{00}$ with $w(\overline{G}) = w(G^{00}) = \overline{w}$: Clearly, $\overline{w} > \underline{w}$:

Existence of a bad equilibrium

To see why a bad equilibrium exists if and only if $\underline{w} < Âg$; suppose instead $\underline{w} \, ¸ \, Âg$:Then, if $w^{b} \, 2 \, [0; \underline{w} \, ¡ \, \mu)$ nobody wants to work in the public sector. If $w^{b} \, 2 \, [\underline{w} \, ¡ \, \mu; \underline{w}]$, then only motivated agents will be in the private sector, but given that $\underline{w} > Âg$ we have that $w^{b} > Âg \, ¡ \, \mu$; and thus motivated agents are honest. Lastly, if $w^{b} \, 2 \, (\underline{w}; 1)$ everybody will be willing to work in the bureaucracy, and everybody will be honest. Thus, for a bad equilibrium to exist it must be $\underline{w} < Âg$ ¥

Existence of a good equilibrium

To see why a good separating equilibrium exists if and only if $\overline{w} > (Âg \, ¡ \, \mu + g)(1 \, ¡ \, q) = V(Âg \, ¡ \, \mu; 0)$ assume instead that $\overline{w} \cdot V(Âg \, ¡ \, \mu; 0)$:Then for $w^{b} \, 2 \, [0; Âg \, ¡ \, \mu)$ a pooling or a separating equilibrium may occur, but every agent will be corrupt. If $w^{b} \, 2 \, [Âg \, ¡ \, \mu; Âg)$ then a pooling equilibrium must occur, with non motivated agents being corrupt. If $w^{b} \, 2 \, [Âg; 1)$; clearly a good equilibrium will be obtained but it will not separate agents ¥

Existence of multiple equilibria

To see why multiple equilibria exists if $\overline{w} < Âg + \mu$; note that when a bad equilibrium exists, it will exists over a range $w^b \in (V^{-1}(\underline{w}; 0); Âg)$. Call this set E_p: If $\overline{w} \geq Âg + \mu$ only a good pooling equilibrium exists for $w^b \in [V^{-1}(\overline{w}; \mu); 1)$; where $V^{-1}(\overline{w}; \mu) > Âg$: Call this set E^p: When $\overline{w} < Âg + \mu$ instead, good separating equilibria exists for $w^b \in (\max\{V^{-1}(\overline{w}; \mu); Âg - \mu g; V^{-1}(\overline{w}; 0))$: Call this set E^s: It is clear that $E^p \cap E_p = ;$; while $E^s \cap E_p = ME$, ME de¯ned as $w^b \in [\max\{Âg - \mu; V^{-1}(\underline{w}; 0); V^{-1}(\overline{w}; \mu)g; \min\{Âg; V^{-1}(\overline{w}; 0)g]$ ¥

7.2 Signalling Equilibrium

This section basically recall the results in Esteban and Ray (1999). They proved that there are at most three kinds of equilibria in this game: separating, semi-pooling with two and three levels of revelation. We focus on the existence of separating equilibria. A separating equilibrium will be characterized by only motivated agents bidding at h. Non motivated agents will not bid, and will go for an occupation on the labor market. The "Bureaucratic selection"condition for this equilibrium is

$$\frac{®}{b}[G(a^e) - G(h)] \geq 1$$

and $h = \frac{b}{®}\frac{1}{[G(a^e) - G(h)]}a^¤$; where $a^¤ = \max\left\{0; V(w^b; ¶(\mu)) - \bar{w}\right\}$.Here we are interested in ¯nding, for each possible $\overline{w} \in [\underline{w}; Âg - \mu]$ the values of w^b that are consistent with the existence of a separating equilibrium in the signalling game. The existence of the separating equilibrium boils down to check if there exists a level of expenditure in education h that satis¯es the following two restrictions:

$$h = \frac{b}{®}\frac{1}{[F(a^e) - F(h)]}\left[V(w^b; ¶(\mu)) - \overline{w}\right]$$

$$\text{and } \frac{V(w^b; ¶(\mu)) - \overline{w}}{h} \geq 1$$

In equilibrium it must be that $F(a^e) = \frac{n+b}{n+1}$; calling $¤(h) = h¢[F(a^e) - F(h)]$ we start noting that, if f(a) start decreasing at relatively low levels of a; $¤'(a) = \frac{n+b}{n+1} - F(h) - hf(h) << 1$: Let assume that $\frac{f(x)}{x} > -\frac{f'(x)}{2}$(Assumption 4), then there must exists a unique a such that, for a bigger than this threshold $¤(¢)$ starts decreasing. If assumption 4 holds, if a solution exists, it must

be that for any w^b lower than a given threshold, the separating equilibrium of the signalling game exists. If assumption 4 is not satis¯ed over some range (but note that it has to be satis¯ed over some range), it could happens that the interval of w^b for which a separating equilibrium exists is bounded away from $\overline{w}$: i.e. strictly positive rents must exists. The boundary in the plane w^b £ w will be given by a line with slope $45^{\pm}$:

7.3 Internal organization of the bureaucracy

Let us denote $q_j^+(\P(\mu))$ the monitoring e®ort of a manager $j \in \{0;\mu\}$ when she is matched with an agent of type $\P(\mu) \in \{0;\mu\}$ in a positive assortative matching equilibrium; $q_j^i(\P(\mu))$ will be the corresponding equilibrium monitoring e®ort in a negative sorting equilibrium.

Let us ¯rst consider the surplus generated by positive assortative matching. A motivated agent will never be corrupt, and thus the project will succeed with probability one. The motivated manager, observing that the agent is motivated, and therefore will never be corrupt, has no incentives to exert monitoring e®ort: $q_\mu^+(\mu) = 0$: The surplus generated by a pair of motivated agents - supervisor is $w^s + w^b + 2\mu$: A non motivated supervisor will never have incentives to monitor: $q_0^+(0) = 0$: Knowing this, a non motivated agent will be corrupt with probability one. A non motivated pair thus generates a surplus $w^s + w^b + g$: De¯ning W^+ the surplus generated within an agency with positive sorting, we have $W^+ = 2(w^s + w^b + \mu) + g$:

Let us now consider the case of negative sorting. A motivated agent again will never be corrupt, thus the project is realized successfully with probability one. The non motivated supervisor does not exert any e®ort, and thus $q_0^i(\mu) = 0$: The pair motivated agent - non motivated supervisor thus generates a surplus of $w^m + w^b + \mu$: The motivated supervisor has incentives to monitor, and, given the probability c that the non motivated agent is corrupt, she will optimally set $q_\mu^i(0) = {}^3c\mu$: If ${}^3\mu > \frac{g}{g+w^b}$ the equilibrium will be in mixed strategy. It will thus be given by $q_\mu^i(0) = \frac{g}{w^b+g}$ and $c = \frac{g}{w^b+g}\frac{1}{{}^3\mu}$: The non motivated agent is randomizing, she is thus indi®erent between being corrupt or not, and she is therefore having a surplus equal to w^b: The utility of the motivated supervisor will be $w^m + \mu - \frac{1}{{}^3}\frac{g}{w^b+g}(1 - \frac{1}{2}\frac{g}{w^b+g})$: The total surplus generated by negative sorting will be $W^i = 2(w^s+w^b+\mu) - \frac{1}{{}^3}\frac{g}{w^b+g}(1 - \frac{1}{2}\frac{g}{w^b+g})$: Finally, we note that $W^+ - W^i = g + \frac{1}{{}^3}\frac{g}{w^b+g}(1 - \frac{1}{2}\frac{g}{w^b+g}) > 0$ ¥: