Public Investment, Taxation and Transfer of Technology

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Abstract

A low wage developing economy (South) is interested in accessing and attracting superior technology from a high wage developed economy (North) with firms having heterogeneous quality of technology. To improve upon the initial market equilibrium, which shows that relatively inefficient technologies will move to the South, the host government invests in infrastructure financed through taxing the foreign firms. We discuss the problem of existence of such a tax-transfer mechanism within a balanced budget framework. We argue that such a policy can increase tax revenue as well as instigate the transfer of better quality technology. It turns out that this policy is more likely to be successful when the production concerns high value, high price products in low wage economies. Our results improve upon the conventional strategy of a tax break.

Keywords: public investment, tax, high-low wage economy, technology transfer, model

JEL Classifications: D42; H21; O33`

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1. Introduction

The use of tax-policies by the developing nations in order to invite better quality technology and greater innovation is a well recommended strategy. UNCTAD (2005) elaborates various schemes which potentially help such an objective and tax strategy is an important policy determining issue. In October 2015, China's Ministry of Finance (MOF) and State Administration of Taxation (SAT) jointly published a circular related to the policy of taxation on income from technology transfer. International technology transfer through FDI continues to be a major concern for the developing world. The main purpose of our work is to reflect on this particular issue with a view to the question of how a low wage economy can guarantee receiving relatively efficient technologies through FDI by pursuing a policy of tax-financed public investment in production enhancing infrastructure. Such a policy is shown to be more successful when it is put forward in a low wage economy involving the production of high price products.

Our paper is related to the voluminous and ever increasing work on international technology transfer as a significant component of the process of development. A representative set of papers explaining related issues are Saggi (2002), Singh and Marjit (2003), Kabiraj and Marjit (2003), Mukherjee and Pennings (2006), and Hong et al. (2016). However, the use of tax and tax-financed public investment in pursuit of advanced technologies is a new idea, Michelacakis (2014), which has not been discussed adequately in the literature. The idea of the policy circle has always been how tax exemptions or relaxations can lure FDI along with advanced technologies into transferring production to the host countries. We raise the question whether the use of tax-financed public investment in infrastructure can be a fruitful policy and whether there is a balanced budget solution to the problem.[2]

We look for conditions under which not only can the host country attract foreign firms but also with better technologies at their disposal. The wage difference between the developed and developing countries explains

[2]Interestingly substantial FDI into China had to do with massive infrastructural development in that country. Roads and power are two areas where the Chinese government has been investing at a considerable pace and that has delivered results. Financing such investment has been a welcoming strategy towards foreign investment. A representative sample of papers highlighting the role of FDI in technology transfer could be Findlay (1978a), Findlay (1978b), Hines (1995), UNCTAD (2010).

why relatively inefficient technologies will be located in the developing countries. A series of papers starting with Vernon (1966) and Krugman (1979) followed by Marjit (1988), Kabiraj and Marjit (1993) and more recently by Beladi et al. (2016) have dealt with such an outcome. We argue that a tax cum investment mechanism may provide an answer to this problem. We characterise the exact condition which can assure a balanced budget solution to the problem. The main objective of the host country is to receive relatively efficient technologies beyond what market determines. By opting to tax the firms that would relocate anyway, in a way that would not deter them from doing so, the government of the South reaps a double benefit, namely the ability to attract better technologies while making tax revenue at the same time. Further, taxing revenue instead of profit promotes the transfer of even better technologies. Interestingly, such a policy is more effective when the selling price of the product is high or when the wage difference between North and South is important.

The paper is laid out as follows. Section 2 describes the basic model, Section 3 deals with the existence of a balanced budget outcome and the last Section concludes.

2. The market equilibrium

We consider a scenario where northern firms are heterogeneous in terms of their level of technology and each faces a common world price for their product. The product itself is homogenous. We could, as well, consider a set of multinational companies producing a homogeneous good. Firms and (or) technologies are both parameterized by z in the unit interval $[0,1]$.

The total cost function for producing x units with $z-$th technology, where $z \in [0,1]$, is given by

$$C(z) = \frac{1}{2} W a(z) x^2(z), \tag{1}$$

where $a(z)x(z)$ is the labour requirement, per unit, for producing x units using $z-$th technology. The assumption made is that $a'(z) > 0$ implying $a(z)$ is strictly increasing. Therefore, the higher the value of z, the less efficient the firm is. Note that as far as the model is concerned the simple linear function $a(z)=z$ could be used without loss of generality. The marginal production cost using technology z is

$$MC(z)=\frac{dC(z)}{dx(z)}=Wa(z)x(z)>0 \tag{2}$$

with $MC(z)$ increasing in z.

For a given technology, z, and a common product price, P, given exogenously, solving the profit maximisation problem

$$\underset{x(z)}{\text{Maximise}}\ \pi(z)=Px(z)-\frac{1}{2}Wa(z)x^2(z)$$

implies that

$$x(z)=\frac{P}{Wa(z)} \text{ with } x'(z)<0 \tag{3}$$

as a result of the assumption that $a'(z)>0$. Equation (3) says that a more efficient firm will produce a higher level of output. The profit in equilibrium, $\pi(z)$, is given by

$$\pi(z)=Px(z)-\frac{1}{2}P\frac{P}{Wa(z)}=\frac{1}{2}\frac{P^2}{Wa(z)} \tag{4}$$

Hence, as expected, $\pi'(z)<0$ as $a'(z)>0$. The firms contemplate to locate to the southern country where, and in fact because, they will enjoy cheaper labour, $w<W$, but suffer a uniform production cost surcharge τ due to adverse production conditions, for example, due to increased transportation costs. This surcharge would increase the labour requirement for the transferred technology $\alpha(z):=(a(z)+\tau)x(z)$ and could further be attributed to the efficiency lag between the two economies. The welfare effects of the transportation cost reduction on the importing country have been extensively studied. Brander in Brander (1981) started a line of papers whose more recent addition is Marjit and Mukherjee (2015).

Therefore, for a given z, firms compare their profit at home and abroad. Let Z_0 denote the firm (or technology) indifferent between locating in the North or in the South. This generates (6) and eventually (7).

$$\frac{1}{2}\frac{P^2}{Wa(Z_0)}=\frac{1}{2}\frac{P^2}{w\left(a(Z_0)+\tau\right)}\Rightarrow \tag{6}$$

$$\frac{W}{w}=1+\frac{\tau}{a(Z_0)} \tag{7}$$

Thus, for all $z>Z_0 \Leftrightarrow 1+\frac{\tau}{a(Z_0)}<\frac{W}{w}$, i.e., all relatively bad technologies will be transferred[3]. This inequality is proposition 1 in Marjit (1988). What we have shown so far is that without government intervention relatively inefficient technologies will be transferred to the South.

3. Tax to Invest in the South

It is clear from the above analysis that better technologies give greater output $x(z)=\frac{P}{Wa(z)}$ and though we do not model here, may have positive external effects. In this section we investigate the feasibility of a tax financed public investment policy that improves productivity in the South. Foreign activities are taxed and the funds collected are invested to improve infrastructure reducing $a(z)$ for all z in a way proportionate to the labour requirement. If G denotes the invested sum, then the new labour requirement would be

$$b(z)=i(G)(a(z)+\tau), \tag{8}$$

where $i(G)$ is a positive, decreasing, differentiable function bounded above by $i(0)=1$. Furthermore, $\lim_{G\to+\infty} i(G)=\varepsilon>0$ implying $\lim_{G\to+\infty} i'(G)=0$ i.e. $i(G)$ will eventually flat out at a small level $\varepsilon>0$. Further,

[3] Note that even for a generalised surcharge function where the transfer cost is partly fixed and partly proportional, i.e. $\alpha(z)=\tau_1 a(z)+\tau_2$ with $\tau_1>1,\tau_2>0$ only $z>Z_0$, for a corresponding Z_0, will be transferred. Here we assume $\tau_1=1$.

we may assume that no pathologies occur for $i(G)$ which is approaching ε from above and thus, for large values of G, $i''(G) > 0$. Two possible forms of $i(G)$ are provided in Figures 1 and 2 below

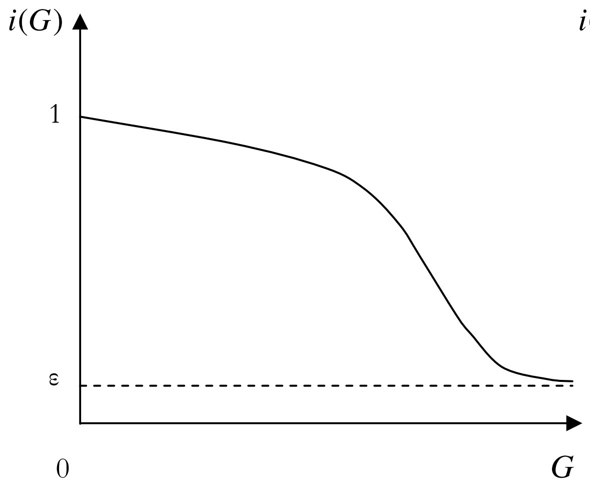

Figure 1

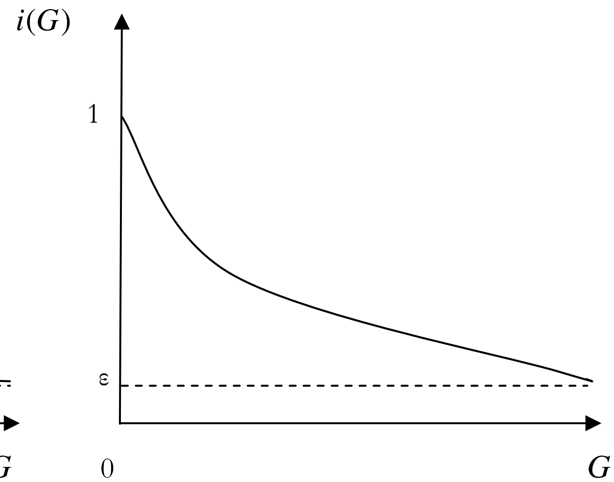

Figure 2

Figure 1 represents a more plausible behavior for $i(G)$ as it suggests a smoother reduction in labor requirements following a small increase in investment starting from $G = 0$. Hence, by investing G, $a(z) + \tau$ is reduced to $i(G)(a(z) + \tau)$. The southern government is expected to be able to finance G by taxing corporate profit from those who locate in the South from the North in a kind of entry fee proportionate to the business cycle. Therefore, the budget balancing requirement will take the form

$$t\int_{Z}^{1} \frac{P^2}{2wi(G)\big(a(z)+\tau\big)} dz \geq G \tag{9}$$

Inequality (9) captures the fact that it would be desirable to have a surplus revenue as well. We shall return to this point later. The main objective is to succeed in transferring more technologies than before i.e.

$$Z_0(t=0, G=0) > Z_t(t>0, G>0) \tag{10}$$

To state the objective function we need to determine the indifferent firm, Z_t, in the case where a tax t is imposed and an amount G is being invested. The cut-off technology Z_t will satisfy the equation

$$\pi_b(Z_t)(1-t) = \pi(Z_t),$$

where $\pi_b(z)$ is the maximum profit of firm (or technology) z producing in the South following the implementation of a tax-invest package (t, G) by the southern government. This amounts to

$$\frac{1}{2}\frac{P^2}{wi(G)\left(a(Z_t)+\tau\right)}(1-t) = \frac{1}{2}\frac{P^2}{Wa(Z_t)}$$

or equivalently

$$\frac{a(Z_t)}{a(Z_t)+\tau} = \frac{w}{W}\frac{i(G)}{1-t}. \tag{11}$$

Notice that

condition (7) is recovered for $t = 0, G = 0$

$$\frac{a(Z_0)}{a(Z_0)+\tau} = \frac{w}{W}$$

Therefore, the objective of the southern government is to set up a tax rate t such as to

$$\text{Maximise}_{(t)} Z_0 - Z_t \text{ such that } t\int_{Z_t}^{1} \pi_b(z)dz \geq G \tag{12}$$

Let us denote the left hand side of equation (11) by

$$f(z) := \frac{a(z)}{a(z)+\tau}.$$

Differentiating with respect to z yields

$$f'(z) = \frac{\tau a'(z)}{[a(z)+\tau]^2} > 0,$$

which implies that $f(z)$ is a strictly increasing function because $a'(z) > 0$.

It now becomes evident that if $\frac{i(G)}{1-t} < 1$ then $Z_t < Z_0$. In fact, $Z_t < Z_0$ if and only if

$$i(G) < 1-t. \tag{13}$$

From equation (9) we need $\frac{t}{2}\frac{P^2}{wi(G)}Q(Z_t) \geq G$, where

$$Q(Z) = Q(Z;\tau) := \int_Z^1 \frac{1}{a(z)+\tau}dz \tag{14}$$

which is equivalent to

$$tA(Z_t) \geq i(G)G \text{, with } A(Z) = A(Z;P,w,\tau) := \frac{1}{2}\frac{P^2}{w}Q(Z;\tau) \tag{15}$$

Note that if $Z_t < Z_0$ we need to guarantee the inequality at a given Z with $Z_t < Z < Z_0$. We fix, therefore, $A(Z)$ to $A(Z_0)$. Equation (15) now becomes

$$t \geq \frac{i(G)}{A(Z_0)}G \tag{16}$$

This last equation expresses the necessary and sufficient condition for financing the investment G exclusively through taxing the profits of all firms $z > Z_0$ at a tax rate t.

Equation (16) together with inequality (13) and condition (7) prove that if

$$\frac{G}{A(Z_0)} < \frac{1}{i(G)} - 1 =: \beta(G) \tag{17}$$

then a tax-and-invest scheme may be implemented so that more and better technologies get transferred to the South and the whole exercise can be exclusively financed through tax collected money. Note that fixing G and choosing a $t \in (0,1)$ such that the double inequality

$$i(G)G \leq tA(Z_0) < (1 - i(G))A(Z_0)$$

holds, equation (13) is automatically satisfied and we may solve equation (11) to find $Z_t < Z_0$. The total tax revenue for the government in the South is

$$t\frac{P^2}{2w}\int_{Z_t}^{1}\frac{dz}{a(z)+\tau}.$$

Suppose the central planner chooses, ex ante, $t = \dfrac{i(G)G}{A(Z_0)}$ so that his government's investment G be financed by taxing the companies that would relocate anyway without deterring them from doing so. The, ex post, gain for his government is twofold: (1) better technologies get transferred, $Z_t < Z_0$ and (2) there is a tax profit for the southern government amounting to $t\dfrac{P^2}{2w}\displaystyle\int_{Z_t}^{Z_0}\frac{dz}{a(z)+\tau} =: H(t)$.

The left hand side of inequality (17) is a straight line with slope $\dfrac{1}{A(Z_0)}$ as in Figure 3

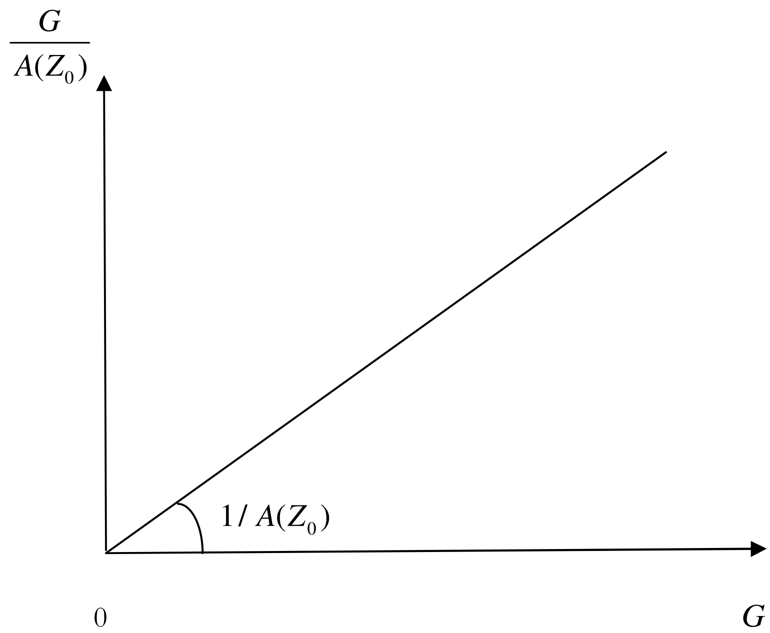

Figure 3

while the right hand side of inequality (17), the $\beta(G)$ index, is effectively a measure of the efficiency of the administration of the low wage country. For a given expenditure, G, a high value of $\beta(G)$ indicates a relatively efficient, in investing (tax) money, government compared to a government which displays a low $\beta(G)$ index. A brief study of the properties of the function $\beta(G)$, reveals that $\beta(0)=0$, $\beta'(G)>0$ with $\lim_{G\to+\infty}\beta'(G)=0$ [4] and $\beta''(G)$ is negative for large values of G [5]. Thus, $\beta(G)$ is an increasing function which starts at $(0,0)$ eventually becoming a concave curve whose slope tends to zero.

Let us first state a counter-positive result,

Proposition 3.1 Let

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[4] $\beta'(G)=-\dfrac{i'(G)}{[i(G)]^2}>0$ and by our assumptions $i'(G)<0$.

[5] $\lim_{G\to+\infty}\beta''(G)=\lim_{G\to+\infty}\dfrac{2[i'(G)]^2-i(G)i''(G)}{[i(G)]^3}<0$ and $\lim_{G\to+\infty}\beta'(G)=0$.

$$A_0(P,w,\tau) := \frac{P^2}{2w}\int_0^1 \frac{1}{a(z)+\tau}dz$$

Then, if for all G

$$\beta(G) < \frac{G}{A_0}$$

no tax cum investment can improve on the market equilibrium.

Proof A_0 is the lowest possible slope the line in the left hand side of inequality (17) can reach and it is realized when all technologies migrate from North to South. If the hypothesis of the Proposition is true then (17) fails globally completing the proof.

Proposition 3.2 If $\beta'(0) > \frac{1}{A(Z_0)}$ there exists a t such that $Z_t < Z_0$ allowing for more and better technologies to be transferred to the South.

Proof The condition of the proposition along with the properties of $\beta(G)$ imply that $\beta(G)$ will intersect $\frac{G}{A(Z_0)}$ from above at $\hat{G}$. It is clear that for all G in the open interval $(0,\hat{G})$ inequality (17) is satisfied allowing the government to choose some t that will implement better technology transfer[6]. Once t is chosen, $Z_t < Z_0$ can be optimally determined solving for z equality (11). This completes the proof.

The following figures provide different possibilities regarding the shape of $\beta(G)$. Clearly, Figures 4 and 6 give no solution.

[6] Technically speaking for any such G the government may choose any t in $(\frac{i(G)G}{A(Z_0)}, 1-i(G))$ where the lower values of t allow for lower Z_t, i.e., better technologies to be transferred.

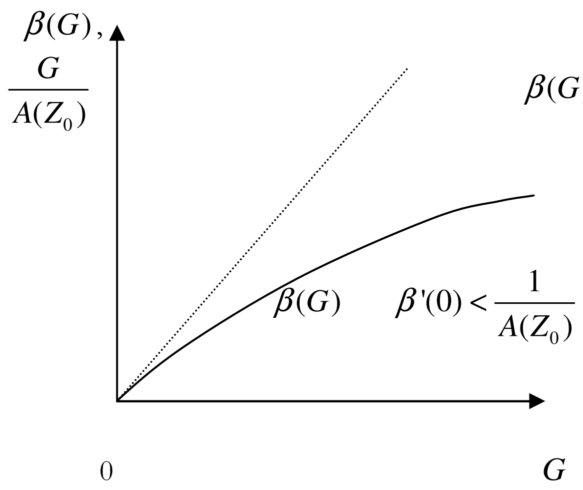

Figure 4

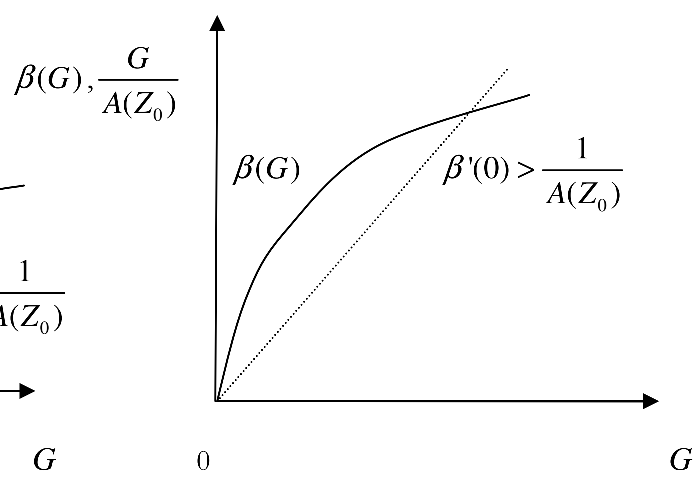

Figure 5

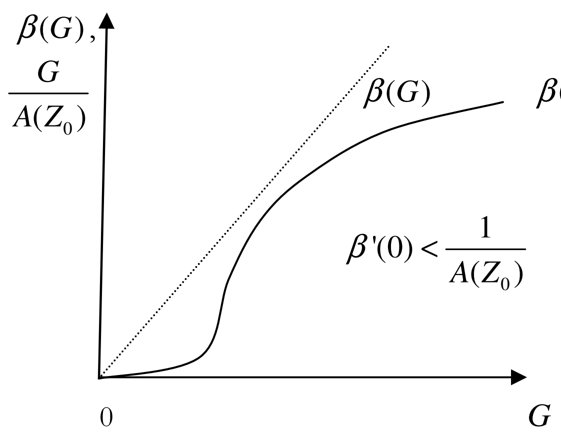

Figure 6

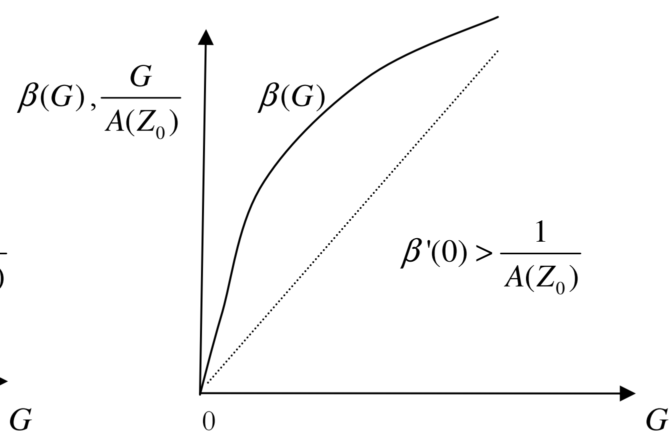

Figure 7

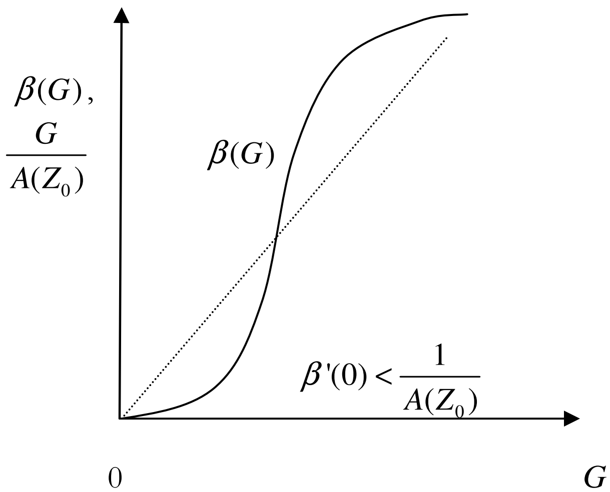

Figure 8

It is then straightforward to argue that if the government is slow in returning the invested money, $i'' < 0$, Figure 1, the public investment is more productive only at higher values of G, i.e., G needs to be high enough for better quality technology transfer. One can easily check that $i'' < 0$ is a sufficient condition for $\beta'' > 0$. For large values of G the convexity of $\beta(G)$ follows by the remark in footnote (5). This means that if $\beta'(0)$ is high enough to outweigh $\frac{1}{A(Z_0)}$ it will eventually come down. If $\beta'(0)$ is low enough to start with it must eventually pick up. It is not clear though whether it will exceed $\frac{G}{A(Z_0)}$ as we may be in either of the situations described by Figures 6 and 8. The existence of G, however, guarantees also that the government. can choose a tax rate such that it makes net revenue as well as causes the transfer of better technology.

The government has to invest in an open interval (G_1, G_2) to implement better quality technology transfer. For any $G \in (G_1, G_2)$ and t in $(\frac{i(G)G}{A(Z_0)}, 1 - i(G))$ the central planner chooses, the government earns net tax revenue and also guarantees that $Z_0 > Z_t$ where the cut-off technology Z_t satisfies equation (11) for these choices of G and t. The higher the choice of t in $(\frac{i(G)G}{A(Z_0)}, 1-i(G))$ the more money the government makes but the closer to the market equilibrium Z_t is. The lower the tax rate, the less money the government earns as net tax revenue but the more important the improvement on the market equilibrium is. Reasoning similarly after observing carefully Figures 4-8 particularly focusing on Figures 6 and 8 one realizes that given the government's performance in investing (tax) money which is the right hand side of equation (17), i.e., the function $\beta(G)$, an alternative way to make the desired result happen is by lowering the slope of the line on Figure 3. Let $A(Z;P,w,\tau)$ as defined in (14) and (15) above express the dependency of A for a given Z on P, the exogenously given price of the product, w, the labour cost of the technology importing country and τ, the common efficiency lag between the two economies, i.e.,

$$A(Z;P,w,\tau) := \frac{P^2}{2w}\int_Z^1 \frac{1}{a(z)+\tau}dz$$

Remark 3.1 Notice that if τ is small $A(Z;P,w,\tau)$ is large forcing the left hand side of inequality (17) to approach the horizontal axis making the tax cum investment more likely to be successful. In fact, the smaller the efficiency lag between the two economies, the more likely it is to have a balanced budget solution to the problem of tax-financing investment in infrastructure. The same is true if the labour cost reflected by w is small or the price P is large. This implies that the production of higher value products, with a high price, are more likely to draw better technologies from the North to the low wage South. Furthermore, given that Z_0 depends on w, there is a double effect linked with a lower wage rate. In fact, the second effect arises because a lower wage rate w implies a smaller lower limit for the integral which, in turn, implies a greater value for A. Both effects related to w are in the same direction, i.e., both support an increase in the value of A.

Proposition 3.3 Taxing revenue instead of profit will expand the range of investment (G_1, G_2) implementing higher quality technology transfer.

Proof: Since $\pi(z)$ is less than the revenue, $A(Z;P,w,\tau)$ is higher under revenue taxation. As Figure 9 shows, the intersecting region along $\frac{1}{A(Z;P,w,\tau)}$ will expand relative to the case with profit taxation. This completes the proof.

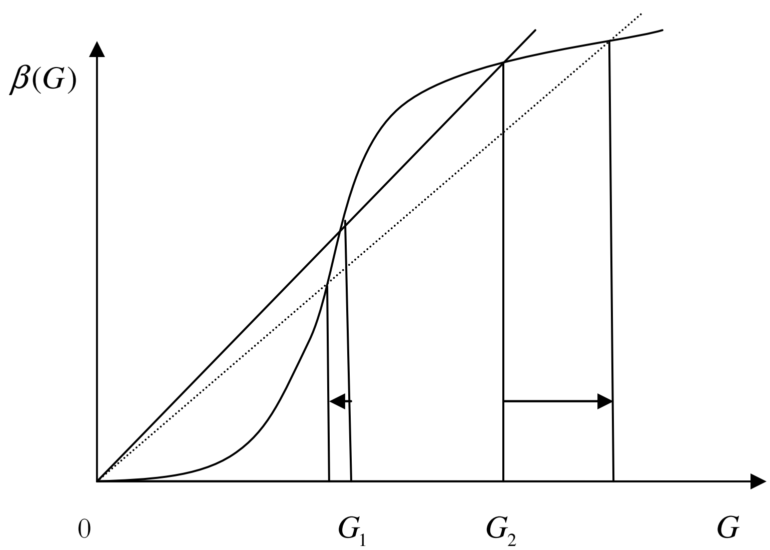

Figure 9

The intuition is straightforward. Since revenue taxation gives more tax revenues, $A(Z;P,w,\tau)$ increases when the tax base is revenue, decreasing the slope of the line on the left hand side of (17). As shown on Figure 9 the new interval of effective investment contains the old one. As a result, the government is less constrained to choose t. Also note that (11) does not change as Z_t continues to be determined through equalizing profits. It is clear that for $G \in (G_1, G_2)$, the government can choose some t that will implement better technology transfer. The exact level of t, as already explained in the proof of Proposition 3.2 and the footnote 6 will be guided by further specification of the government objective function. The true meaning of Proposition 3.2 is that the government can improve the equilibrium allowing for better technologies to be transferred even if it requires that its investment be financed by the companies that would move to the South either way.

Suppose the government does not care about the revenue but is instead interested only on the best technology to be transferred. For a fixed G, the best tax rate choice to implement the maximum transfer of technologies to the South will be $\frac{i(G)G}{A(Z_0)} =: t_b$. The profit the government makes in this case, taxing technologies $z > Z_0$ at rate t_b after financing its investment G is given by $H(t_b) = t_b \frac{P^2}{2w}\int_{Z_{t_b}}^{Z_0} \frac{dz}{a(z)+\tau}$

However, as the choice of effective expenditure G varies in the interval (G_1, G_2), to optimise technology transfer, the government will choose t so that it generates an expenditure close to G_2. The alternative will be tax revenue maximisation. Specifically we prove

Proposition 3.4 The more the government of the South invests, within (G_1, G_2), the better the technologies it can attract.

Proof As mentioned above, for a fixed G this result is obtained at a tax rate $t_b(G)$. The aim is to investigate how $Z_{t_b(G)}$ depends on G. To this end, distinguish between two cases depending on the elasticity, $\varepsilon_{i(G)}$, of $i(G)$. Consider first $\varepsilon_{i(G)} \le -1$, then $t_b(G)$ is a non-increasing function of G which together with our assumption that $i(G)$ is decreasing implies that $\frac{i(G)}{1-t_b(G)}$ is a non-increasing function of G. This together with (11) guarantees that as G increases better and better technologies will be transferred to the South. If $\varepsilon_{i(G)} > -1$, then we compare the rates of change of the numerator and denominator of the fraction $\frac{i(G)}{1-t_b(G)}$. Observe that

$$\varepsilon_{i(G)} + 1 > 0 > -A(Z_0)\frac{i'(G)}{i(G)}$$

which is equivalent to

$$i'(G) > -\frac{1}{A(Z_0)}\left[i'(G)G + i(G)\right]$$

proving that the numerator decreases at a smaller pace than the denominator guaranteeing once again that

$\frac{i(G)}{1-t_b(G)}$ is a decreasing function of G . This completes the proof.

Conclusion

In this paper, we have constructed a simple model to reflect upon conditions under which a low wage economy can invite greater innovation by attracting better quality technologies. We have knowingly put aside a number of factors such as asymmetry of demand between the North and South, transfer costs, etc. to better focus on the main question we have set which is whether a tax-financed investment policy can be used effectively in the hunt for more advanced technologies. Opposite to common belief, we prove that, provided the administration of the low wage economy is sufficiently efficient, taxation is not such an evil thing and may prove conducive to allowing more and better quality technologies to relocate to the developing South. In fact, we prove that tax cum public investment in infrastructure shifts the bar beyond the limit determined by the market and provides the exact condition required for a balanced budget solution to the problem. It is an outcome of our analysis that such a policy is even more effective when the price of the product is high or, the wage rate in the South is low. As a side-result we get that in doing so the government can also make a revenue out of taxation.

References:

1. Beladi, H., Dutta, M., & Kar, S. (2016). FDI and Business Internationalization of the Unorganized Sector: Evidence from Indian Manufacturing. *World Development*, **83**, 340-349.

2. Brander, J. A. (1981). Intra-industry trade in identical commodities. *Journal of International Economics*, **11**(1), 1-14.

3. Findlay, R. (1978)a. Relative backwardness, direct foreign investment, and the transfer of technology: a simple dynamic model. *The Quarterly Journal of Economics*, **92**(1), 1-16.

4. Findlay, R. (1978)b. Some aspects of technology transfer and direct foreign investment. *The American Economic Review*, **68**(2), 275-279.

5. Hines Jr, J. R. (1995). Taxes, technology transfer, and the R&D activities of multinational firms. In *The effects of taxation on multinational corporations* (pp. 225-252). University of Chicago Press.

6. Hwang, H., Marjit, S., & Peng, C. H. (2016). Trade liberalization, technology transfer, and endogenous R&D. *Oxford Economic Papers*, gpw034.

7. Kabiraj, T., & Marjit, S. (1993). International technology transfer under potential threat of entry: A Cournot-Nash framework. *Journal of Development Economics*, **42**(1), 75-88.

8. Kabiraj, T., & Marjit, S. (2003). Protecting consumers through protection: The role of tariff-induced technology transfer. *European Economic Review*, **47**(1), 113-124.

9. Krugman, P. (1979). A model of innovation, technology transfer, and the world distribution of income. *Journal of Political Economy*, **87**(2), 253-266.

10. Marjit, S. (1988). A simple model of technology transfer. *Economics Letters*, **26**(1), 63-67.

11. Marjit, S., & Mukherjee, A. (2015). Endogenous market structure, trade cost reduction, and welfare. *Journal of Institutional and Theoretical Economics JITE*, **171**(3), 493-511.

12. Michelacakis, N. (2014). A model of technology transfer under taxation. *MPRA paper* **58632**.

13. Mukherjee, A., & Pennings, E. (2006). Tariffs, licensing and market structure. *European Economic Review*, **50**(7), 1699-1707.

14. Saggi, K. (2002). Trade, foreign direct investment, and international technology transfer: A survey. *The World Bank Research Observer*, **17**(2), 191-235.

15. Singh, N., & Marjit, S. (Eds.). (2003). *Joint ventures, international investment and technology transfer*. Oxford University Press, USA.

16. UNCTAD (2005) *Taxation and technology transfer: Key issues Sales No. E.05.II.D.24* United Nations publication, New York and Geneva.

17. UNCTAD (2010) *Foreign direct investment, the transfer and diffusion of technology and sustainable development.* United Nations publication, New York and Geneva.

18. Vernon, R. (1966). International investment and international trade in the product cycle. *The Quarterly Journal of Economics*, 190-207.