



TAMPERE ECONOMIC WORKING PAPERS
NET SERIES

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UNDER FREE MIGRATION

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Working Paper 59
August 2007

<http://tampub.uta.fi/econet/wp59-2007.pdf>

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ISSN 1458-1191
ISBN 978-951-44-7047-9

Efficiency of Local Policy Programmes under Free Migration

30.8.2007

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Abstract: *A Neo-Keynesian macroeconomic model is constructed to examine the efficiency of a local tax-transfer programme under free migration. An application of the Adaptive Expectations Hypothesis is used to describe people's perceptions of the programme. It is shown that fair programmes with no effects on local welfare have no effect on migration either thus being efficient in the long term. In the short term, false perceptions concerning the repayments make the programme unfair. Migration enforces the excess burden of an unfair programme, but gradual correction of the perceptions eventually mitigates the effects to zero.*

Key words: AEH, fair/unfair policy plan, tax competition

JEL classification: F22, H73

1 Introduction

It is a well known fact that taxation affects economic incentives thus eroding the tax base and causing inefficiency in the economy. Another fact is that the incentive effects concern also migration, which is a key determinant of local welfare. The interplay of taxation and migration can ultimately lead to the so-called race-to-the-bottom tax competition, which draws the public programmes to the minimum everywhere.

The above vision, broadly based on microeconomic partial equilibrium analyses, can be completed by considering also the expenditure sides of local policy programmes and by approaching the issue from the aggregate point of view. A first-hand intuition from this perspective is that if the taxes are fully compensated by public provision so that local welfare remains unaffected, the policy should be efficient and there should thus be no effects on migration either.

This paper investigates the efficiency of local policy in a neo-Keynesian macroeconomic model with migration. A general tax-transfer programme is introduced, and its effects on local market conditions, migration and welfare are studied. The analysis focuses on the short-term adjustment caused by the introduction of an actually fair policy programme. The Adaptive Expectations Hypothesis (AEH) type rationale concerning the anticipated nature of the programme is applied.

The paper proceeds as follows. Section 2 presents the model of a local macroeconomy, called henceforth a locality, and describes the tax-transfer programme. Section 3 presents the graphical treatment of the effects of the programme with AEH interpretations and Section 4 adds the possibility of free migration. Section 5 concludes.

2 The model

The basic model is an elaboration of the seminal neo-Keynesian macroeconomic model (Brown & Jackson, 1978, p. 286-294; Heijdra & van der Ploeg, 2002, p. 8-12; Laurila, 2004). In the model, output is given by the production function

$$(1) q = f(L, K),$$

where the capital stock K is constant in the short term and production depends on the use of labour, measured in terms of labour time units L . The standard neoclassical assumptions apply, namely constant returns to scale and $f_L > 0$, $f_{LL} < 0$, $f_{LK} = f_{KL} > 0$. Define the short-run profits in the firm sector as $\pi = pq - wL$, where p is the market price and w is the market reward for labour time. Recalling (1), competitive profit maximization with respect to labour use yields

$$(2) w = pf_L$$

for the demand for labour in the locality, written in terms of nominal wages. Function (2) says that the demand for labour equals the market value of the marginal product of labour and, following from the assumptions of (1), the demand curve is unambiguously downward sloping. Labour supply derives from the households' utility maximization problem

$$(3) \text{Max } U(q, 1-L) \text{ s.t. } (1-t)wL = (1-s)pq,$$

where the budget constraint is affected by a local tax-transfer programme that imposes a proportional tax t , $0 < t < 1$, on labour income and yields transfers to the consumers as a price subsidy of rate s , $0 < s < 1$. Literally, the subsidy is received in monetary terms so that the local government

pays s to the producer, but it can as well be given in kind to the taxpayers so that they receive free public goods against the real value of s . If so, the programme reflects the share of local public provision while the firms take care of the remaining private part. In any case, the net nominal wage for the workers is $(1-t)w$, and the net consumption price level is $(1-s)p$. Solving problem (3) with respect to time use yields implicitly the following labour supply function:

$$(4) \quad w = \frac{1}{\alpha} pg(L),$$

where $g(L)$ describes the valuation of time. Assuming that $g' > 0$ is to say that the substitution effects dominate the income effects thus making the labour supply curve upward sloping.

In the function (4), $\alpha = (1-t)/(1-s) > 0$ is the implicit rate of return (or the repayment rate) of the programme. In a *fair tax-transfer programme* the wage taxes are fully compensated to the taxpayers so that $t=s$ and $\alpha=1$. Thus, the repayment rate of the programme is one-to-one, and the workers' real wage $\omega = (1-t)w/(1-s)p$ remains unaffected. The social justification for a fair policy programme may well be questionable, but the question is quite irrelevant as to the purposes of this paper.

Under a *sub-fair tax-transfer programme* $t > s$ and $\alpha < 1$ so that the repayment rate of the programme is less than one-to-one. A programme may be sub-fair because of redistributive aims or other such policy goals, or because it creates negative externalities to the workers. The programme can also end up sub-fair because of administrative or other transaction costs or due to inefficient public procedures. Furthermore, people may be myopic and have false short-term expectations concerning the repayment rate of the programme. On the longer run, though, the expectations may be gradually corrected in the spirit of the AEH. The last explanation is taken here into closer consideration.

In a *super-fair programme* $s > t$ and $\alpha > 1$ saying that the repayment rate is higher than one-to-one. This might be reasoned again by redistribution, by positive externalities from the policy or by over-optimistic expectations regarding the repayment rate. Technically, the case is a mirror image of the sub-fair case, but some stability problems in the goods market may arise. The original AEH explanation does not consider this case at all (Heijdra & van der Ploeg, 2002, p. 31-35).

Given the constant capital stock, the production function and the labour market determine the equilibrium output (aggregate supply) of goods in the economy. Under a fair programme with $\alpha = 1$ equations (2) and (4) say that aggregate supply is invariant to prices so that the long-term aggregate supply curve is vertical in q - p space. Exogenous changes, say, in the capital stock shift the vertical curve horizontally.

On the short term, when α may differ from 1, the aggregate supply curve is not vertical. This can be seen by totally differentiating functions (1), (2) and (4) and evaluating at $\alpha = 1$. The effect of the programme on employment $\partial L / \partial \alpha = -g(L) / (f_{11} - g') > 0$ says that a rise/fall in the repayment rate makes the labour market equilibrium shift outwards/inwards along the labour supply curve. The respective effect on production $\partial q / \partial \alpha = f_1 \partial L / \partial \alpha > 0$ says that, for a given capital stock, the higher/lower the repayment rate of the programme the higher/lower the short-term output of the economy. The effect on workers' real wage is obvious. The effect on the employers' real wage $\partial \omega / \partial \alpha = f_{11} \partial L / \partial \alpha < 0$ says that the employers face a fall/rise in the real wages because of the induced rise/fall in labour supply. Note that the aggregate supply schedules are somewhat unconventional in this model, because the firms and the workers face different market parameters.

The demand side conditions of the economy are determined by the Keynesian IS-LM model. The equilibrium of the real side of the economy, the IS curve, is given by

$$(5) \quad q = c(q^D) + i(r),$$

where c is consumption determined by consumers' disposable income q^D , and i denotes investment determined by the market interest rate r . By assumption, $c' > 0$ and $i' < 0$ so that the IS curve declines in q - r space. By the budget constraint in (3), $q^D = \alpha Lw/p$ implying that a rise/fall in the repayment rate α shifts the IS curve outwards/inwards. The monetary equilibrium of the economy, the LM curve, is given by the money market equation

$$(6) \quad m/p = l(q, r),$$

where the left side is the real supply of money (the amount of nominal money m deflated by the price level), and the right side is the demand for money deriving from transaction use determined by q , and from inter-temporal use determined by the market interest rate r . By assumption, $l_q > 0$ and $l_r < 0$ so that the LM curve is upwards sloping in q - r space. Changes in nominal money and/or in prices affect the amount of money, manifesting in outwards and inwards shifts of the LM curve.

Totally differentiating (5) and (6) and manipulating yields the following expression for the AD curve:

$$(7) \quad \frac{dq}{q} = \frac{1}{q} \frac{l_r}{l_r + i'l_q} \left[c' q^D \left(\frac{dL}{L} + \frac{dw}{w} - \frac{dp}{p} + \frac{d\alpha}{\alpha} \right) + \frac{i'}{l_r} \frac{m}{p} \left(\frac{dm}{m} - \frac{dp}{p} \right) \right].$$

Expression (7) states, first, that the AD curve is falling in q - p space. Second, exogenous increases in employment, real wages and real money supply shift the AD curve outwards and vice versa. Third, since $d\alpha/\alpha = ds/(1-s) - dt/(1-t)$, higher/lower taxes shift the AD curve inwards/outwards, whereas the effects of changes in the transfers are read rightwards/leftwards along the AD curve.

3 The effects of the programme

The macroeconomic equilibrium is produced by the simultaneous price adjustment in the goods and labour markets. Figure 1 illustrates the adjustment. Panel I includes the labour market in the northeast quadrant, the production function in the southeast quadrant, the aggregate goods market in the southwest quadrant and the real wage in the northwest quadrant. Panel II includes the IS-LM model with its connection to the aggregate demand curve on the right side quadrant, which replicates the southwest quadrant of Panel I of the Figure.

(Figure 1 about here)

In Panel I of Figure 1, the labour market equilibrium e_0 corresponds to nominal wages w_0 and prices p_0 , which give $w_0/p_0 = \omega_0$ for the equilibrium real wage. Employment is L_0 and production is q_0 . The aggregate supply is presented by the vertical graph AS_0 in Panels I and II. Note that it is the aggregate demand curve AD_0 that sets the equilibrium price level at p_0 so that the goods market is initially in equilibrium at point ε_0 .

Introduction of the programme imposes a tax wedge tw in the labour market, and splits labour demand into two curves D_0 and D_1 . The former depicts the gross wages for the firms determined by the marginal physical product of labour, and the latter gives the net wages for the workers. The D_1

curve is flatter than D_0 because the tax wedge tw is a constant proportion of the available gross wages. Therefore, the tax wedge becomes narrower in absolute terms as L increases.

The new market equilibrium depends on the reaction of labour supply. Start with the short-term case of an utterly unfair programme with $t > 0$, $s = 0$ and $\alpha = 1 - t$. This can also be called the case of *pure taxation*. As consumer prices remain unchanged, labour supply is not affected. The tax wedge makes labour supply be determined at e_1 and labour demand at e_2 in Panel I of Figure 1. The gross nominal wage rises to w_1 and the net wage falls to w_2 . Prices being p_0 for both firms and workers, the firms' real wage rises to ω_1 and the workers' real wage falls to $\bar{\omega}_1$. In consequence, employment falls to L_1 and production to q_1 . The aggregate supply curve AS_1 is horizontal (or Keynesian) in shape. On the demand side, taxation shifts the IS and AD curves inwards to IS_1 and AD_1 . The IS-LM equilibrium shifts from E_0 to E_1 and the interest rate falls from r_0 to r_1 due to the fall in consumption demand caused by taxation. The goods market equilibrium shifts consequently to ε_1 .

For another polar case, assume that the tax payments are fully compensated, $s = t$, so that the programme is actually fair, $\alpha = 1$. Therefore, the real wage of the workers remains unaltered at ω_0 . Taxation makes the labour demand curve shift inwards to D_1 , and the fall in prices shifts the labour supply curve outwards to S_1 . The new labour supply equilibrium is at e_0' horizontally below the demand equilibrium e_0 separated by the tax wedge. Employment and production remain at L_0 and q_0 . The aggregate supply curve AS_0 being of classical shape, the fall in the consumer prices from p_0 to p_1 causes the goods market equilibrium to slide along the aggregate demand curve AD_1 from ε_1 to ε_2 . The fall in consumer prices shifts the LM curve outwards from LM_0 to LM_1 . The money needed in purchases of private goods is reduced by the share of public provision. The equilibrium is at E_2 and the nominal interest rate falls to r_2 . The real interest rate remains unchanged.

Between the upper polar cases of Figure 1 is the case of an unfair programme with partial repayments, $0 < \alpha < 1$. Supposing that the workers perceive a partial fall in consumer prices, say from p_0 to p_2 , they are induced to work less than under a fair system, but more than under pure taxation. Their labour supply curve thus settles at S_2 implying that the real wage is $\bar{\omega}_2$ for workers and ω_2 for firms. As a result, employment is L_2 , and production is q_2 . Viewed from the supply side, the q_2 - p_2 combination shows that the aggregate supply curve AS_2 has turned upward sloping. The corresponding goods market equilibrium is at ε_3 , the intersection of the AS_2 and AD_1 curves. The IS-LM equilibrium is at E_3 , and the equilibrium interest rate is r_3 . The AEH interpretation of the model says that the workers gradually adapt to the fair programme. If the programme is actually fair so that the tax revenue is not used to promote other policy goals or to cover transaction costs and inefficiencies, the workers receive new information of the transfers and change their perceptions of the repayment rate of the programme. The path to the long-term solution can be described by the gradual turn of the AS curve from horizontal to vertical position. In the long run, labour supply and production converge to L_0 and q_0 , respectively.

The long-term solution of the fair programme is efficient. The tax revenue collected by the programme is measured by the area $w_0'w_0e_0e_0'$ in the northeast quadrant and the equivalent value of public provision is measured by the area $\varepsilon_0 p_0 p_1 \varepsilon_2$ in the southwest quadrant in Panel I of Figure 1. The local economy remains unchanged in real terms. On the other end, the short-term case of pure taxation is inefficient, because employment, production and welfare are all distorted. The excess burden of the tax is given by the formula $EB = 0.5\eta w L t^2$, where $\eta = w dL/L dw$ is the wage elasticity of labour supply, and it is measured by the area $e_1 e_0 e_0'$ in the northeast quadrant of Panel I. The tax revenue is $w_2 w_1 e_2 e_1$, which may be smaller or larger than $w_0'w_0e_0e_0'$ of the fair programme because the tax wedge becomes broader although the tax base erodes. Between the polar cases, under the adjustment path, the excess burden is mitigated until it falls to zero in the long term optimum.

4 The effects of migration

Assume that the local fixed capital stock is immobile and that there is no trade between localities, but allow for labour migration in response to inter-locality differences in real wages. Assume that people are perfectly aware of possible real wage differentials and that migration is costless. Assume also that the locality is of atomistic size so that migration does not change the circumstances in the competitive total-economy labour market.

Start again from the pre-policy market equilibrium, and assume that the local real wage is initially equal to that in the rest of the economy, $w_0/p_0 = \omega_0^*$. The effects of the introduction of the local tax-transfer programme under the constraint of free migration are examined in Figure 2. The IS-LM model is ignored for simplicity.

(Figure 2 about here)

In Figure 2, the initial labour market equilibrium is e_0 and the goods market equilibrium is ε_0 . In the very short run (*pure taxation*, $t>0$, $s=0$), as the policy splits the labour demand curve to D_0 and D_1 in the north-east quadrant, the workers perceive a fall in real wages to $\bar{\omega}_1$. Since they can now be employed elsewhere for the constant real wage ω_0^* , the result is emigration. Reading at p_0, w_0 emigration amounts to $L_0 - L_2$, which equals the distance between points e_0 and e_1' at w_0 . Local employment falls to L_2 , and production falls to q_2 along the Keynesian AS_1 curve. Because of the exogenous shock in employment, the aggregate demand curve shifts to AD_2 . The shift of the curve (beyond AD_1) is fostered by the emigration effect. The goods market equilibrium is at ε_3 for the unchanged consumer price level p_0 . The local nominal wage paid by the employers rises to w_0' so

that their real wage rises to ω_l , but the workers' real wage is equalized to ω_0^* so that the short-term equilibrium is stable in front of migration.

At this point, turn to the other extreme end, the long run case of a *fair programme*, $t=s$, $\alpha=1$. Suppose that, in the above short-term equilibrium, the transfers are instantly anticipated correctly so that the consumer prices fall from p_0 straight to p_1 . Recalling that migration has already restored the real wage ω_0^* , the fall in prices improves the local real wage thus motivating immigration, which nullifies the previous emigration effect. On impact, the labour supply curve shifts back to S_0 and the aggregate demand curve shifts to AD_1 . Furthermore, as the workers also respond to the price fall by increasing their labour supply, the market labour supply curve shifts further to S_1 . The labour market equilibrium shifts to e_0' , and the goods market equilibrium to ε_2 . The tax revenue collected again equals the transfers received, $w_0'w_0e_0e_0' = \varepsilon_0p_0p_1\varepsilon_2$.

The AEH type adjustment path (*partial repayments*, $\alpha < 1$) goes between the upper polar cases. The workers correct their expectations about the prices step by step and adjust their labour supply within and between the local markets in response to the perceived changes in real wages. The result is that the adjustment gradually ends to the long-term equilibrium described above. Thus, the AS curve turns counter-clockwise from horizontal to vertical position and the AD curve shifts from AD_2 to AD_1 so that the goods market equilibrium slides from ε_3 to ε_2 in Figure 2. The final outcome is the same as in the previous case but the path involves temporary movements of labour.

The welfare effects of the programme are evident from Figure 2. In the very short term, as the labour supply curve shifts backwards to S_0' due to migration, the area of the local excess burden is now $e_1'e_0''e_0'$, which is clearly bigger than $e_1e_0e_0'$ without migration. It must be recalled, however, that the lower part of the triangle $e_1'e_0e_0'$ is not lost since it is carried with the emigrants to be

experienced elsewhere in the total economy so that the net loss is $e_1'e_0''e_0$, which still is bigger than $e_1e_0e_0'$. The effect on the tax revenue remains again ambiguous, since it cannot be said if $w_0w_1'e_3e'$ is bigger or smaller than $w_2w_1e_2e_1$ or $w_0'w_0e_0e_0'$.

Migration enforces the local welfare losses in the short term. As the adaptation to the true nature of the programme goes on, the welfare loss is again mitigated until it falls to zero in the long term. The long-term optimum of the fair programme is efficient because the local economy remains unchanged in real terms even with free migration.

5 Conclusions

The paper takes an aggregate view on public provision by applying a Neo-Keynesian macroeconomic model. The income and expenditure sides of a local policy programme are treated simultaneously and the welfare effects of fair and unfair programmes are compared with and without migration. The AEH interpretation of the model puts the focus of the analysis on the adjustment path from the introduction of the programme to its full maturity.

In general, the analysis describes what happens to the local economy if it is partly 'socialized' so that a part of the consumption demand is served publicly against the tax payments. The tax wedge in the labour market can be interpreted as the share of public labour and the corresponding price wedge on the goods market can be interpreted as the share of public goods from total production.

The effects of the policy programme depend on whether the scheme is fair or unfair, which again depends on if the tax payments are fully compensated or not. A fair and correctly perceived policy programme does not affect local welfare and migration and it is thus efficient. A fair system leaves

the local real wage unchanged having no effects on inter-locality welfare comparisons. The result holds in a perfect foresight type world, around a market solution that is long-term in nature.

Even an actually fair policy programme may be anticipated sub-fair in the short term, during the AEH type adaptation of the expectations concerning the nature of the programme. Sub-fair programmes have short-term effects that cause inefficiency as such and they also encourage migration. An important finding is that the migration effect boosts the excess burden – a programme is more inefficient in the presence of free migration than without it.

The distortion is the stronger the farther away the short-term equilibrium is from the long-term equilibrium. A pure tax system with no (anticipated) repayments quite intuitively has the strongest welfare effect both without and with migration and even partial(ly anticipated) repayments from the system undermine emigration. New programmes may markedly increase migration, but the effect is eventually mitigated, and the long-term effect converges to the zero effect of a fair programme

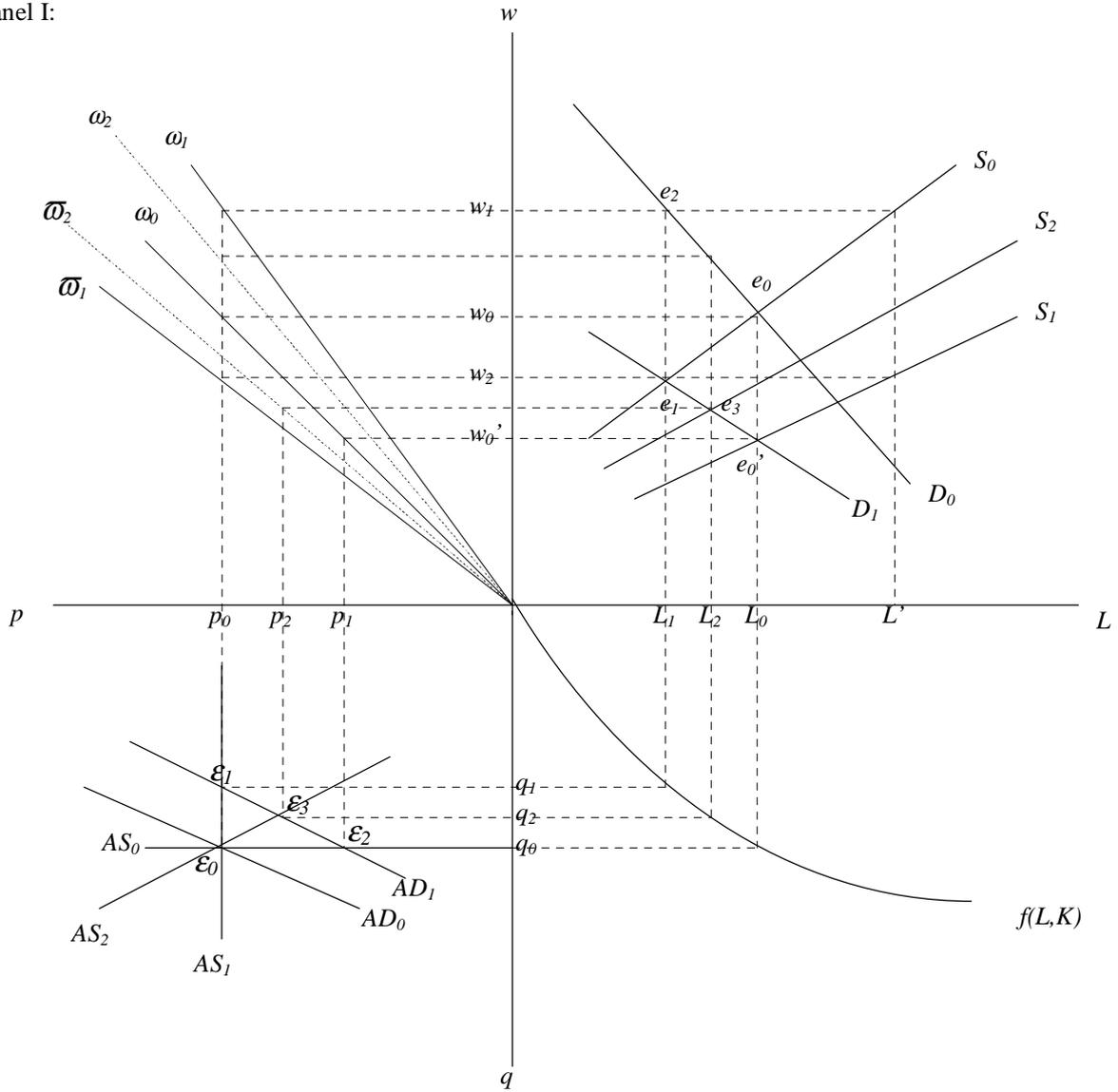
The general conclusion is that if the local policy does not change the real economic conditions in the long run, the policies may well differ between localities. The conclusion of course necessitates that there are no inter-locality externalities, and that administrative costs, inefficient conduct of the program etc. do not press the repayment rate below one-to-one. The concept of a fair program may be simplistic in practice, because policy programmes often are intentionally unfair due to the policy goals. Still, there is good reason to believe that the effects of non-redistributive programmes on welfare and migration are quite insignificant. Free migration thus does not automatically lead to policy equalisation between localities, and tax competition does not necessarily accelerate a race-to-the-bottom of local public expenditures.

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Figure 1: Short-term and long-term effects of a tax-transfer programme

Panel I:



Panel II:

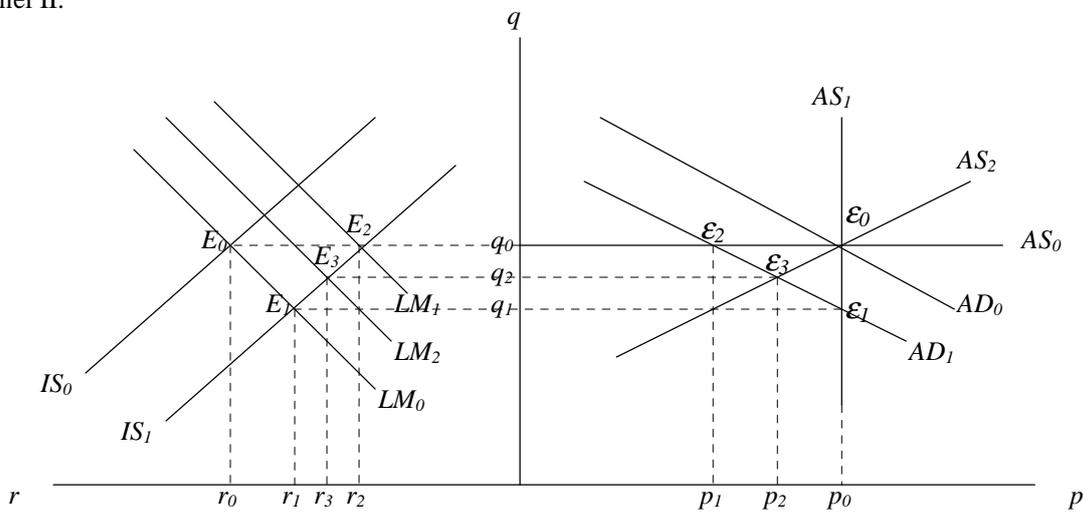


Figure 2: Effects of a tax-transfer programme under free migration

