

Lecture 2(a) RELOC (16-02-10)

Multipliers and Output Models



Aim:

- To inform students as to why regional models are used
- To introduce students to the concept of the multiplier
- To introduce students to the different types of multiplier model that are and have been used in regional and local economics and their inherent limitations
- To review a selection of applications of regional and local multiplier analysis

Outcomes:

- Students should be aware of why regional models are used.
- Students should be able to grasp the principle of the multiplier including its main components and reproduce a schematic representation of the multiplier process.
- Students should be able to recognise the different approaches to calculating multipliers and be aware of the strengths and weaknesses of each approach.
- Student should be able to access a range of published studies dealing with the application of multiplier analysis.

The Important Question

Much of the economic analysis in regional and local economic analysis is derived from theories, models and methods or techniques, which were originally developed at the national level to understand and explain how a national economy works. The central question for regional (and local) economic analysis is that given that much of the theoretical material is derived from the national scale, does this constitute a valid approach? The answer is probably yes.

Regional economies (suitably defined) operate in very similar ways to the nation as a whole, especially with regard to the aspects we are interested in and the empirical questions that we will seek to answer. We are particularly interested in output, income and employment determination in a regional economy, all of which are inter-linked, although with some very real caveats. Specifically we seek answers to:

- Why do some regions grow faster than others (Regional Growth)?
- What determines regional income (Economic Base and Structural Change)?
- What determines inter-regional trade (Production and Export Specialisation)?
- What determines regional unemployment and especially disparities in regional unemployment – (traditionally the spur to policy)?
- What determines inter-regional movement (migration) of labour and capital?

Overall

- National performance is linked inextricably to regional performance. If areas at the sub national scale under-perform then the national economy also suffers (efficiency).
- In recession some regions suffer more than others, – why?
- Questions of equity mean that there is a requirement to explain spatial inequality.

The models used to analyse regional employment, output and income are GENERAL MODELS, which offer general explanations of economic performance and can be applied to all regions (we will later contest this assumption). This is in spite of the fact that regions differ in terms of: size, population structure, industry mix, labour force skills, age of plant and machinery, trading links with other regions, consumption patterns and other fundamental characteristics such as endowments. This week we will concentrate on the Keynesian income-expenditure approach.

Regional and Local Economics (RELOCE) Lecture notes – Lecture 3.

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There are two major reasons why economists construct models at the sub-national scale.

1. Large organisations such as utilities (e.g. electricity supply) need to forecast demand for up to 10 - 15 years ahead because their investment projects are usually large. Think of the current debate about nuclear power stations. These plants can be expected to last a long time (30 years or more) and the companies need to be assured that their investment plans will be adequate to cope with expected demand, given the anticipated economic and demographic change in the area.
2. Regional models are also constructed to estimate the impact of possible new industrial developments and/or decline in specific locations. Thus informing public policymakers of the likely knock on consequences for such things as housing, schools and other social expenditure. (Example new car plant, university or call centre, alternatively the closure of a steelworks, military base or textile plant).

What is a multiplier?

The multiplier is a key concept in regional (and local) economic models. The basic idea is that the **cumulative affect** of an injection **is greater** than the **initial impact**. It is based on the notion of an internal feedback through input-output linkages between the main economic agents such as firms and households.

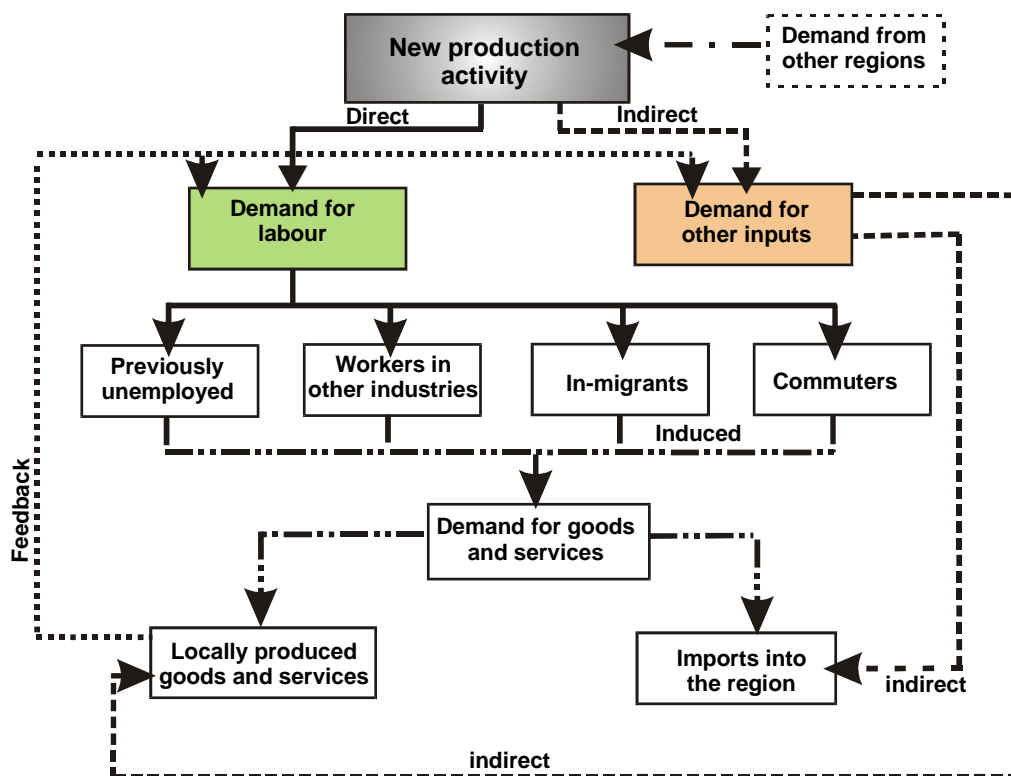
- Firms buy and sell goods and services to other firms.
- Households sell labour services to firms and buy goods from them.

These linkages are found both within and between regions.

If a new factory is to be set-up in a local area, it will require additional labour; this can be obtained from various sources;

- Attracting existing workers from other industries;
- Employing unemployed workers;
- Inducing those not currently in the labour force into jobs;
- Attracting in labour from other areas.

It also requires other direct inputs and some of these will be purchased locally, others will be imported. Thus the impact of the new plant also spreads to other local industries through direct purchase from them and from purchases of locally produced goods and services, which arise from the income derived by the extra employment that is created. Further impacts occur due to feedback effects – where other local firms require more labour and inputs to meet rising demand for their output, which has been stimulated by the initial injection (the new factory). The multiplier process continues until the initial injection has worked its way through the local economy (see Fig 1).



The Multiplier process, resultant from the establishment of a new export plant in the locality
 Figure 1 the multiplier process

There are three effects

Direct Increase in local income/output (wages)
 Increase in local employment

Indirect Increased demand for locally produced inputs: components, transport, and other services. These will also generate further demand for increased inputs by the supplying firms

Induced Effects Those people who are employed in the new plant will spend some of their income on locally produced goods and services.

Feedback loop Local producers of goods and services whose demand has increased because of the 1st round indirect and induced effects will also require more labour and other inputs.

Export base model

Armstrong and Taylor no longer cover the export base multiplier (economic base in some US texts (i.e. McDonald) for details see Armstrong and Taylor (1993) Chapter 1 pp 8 – 11; McCann Chapter 4 pp 139-142; McDonald Chapter 11 pp296 - 298. This was the first attempt at constructing a regional multiplier model and was developed in the 1950s, as a result of research (see Isard 1960). The model is rather simplistic. It suggests that the export sector is the most important factor in determining a region’s economic health. The model distinguishes between the region’s export sector (which sells its output to other regions) and its domestic sector. The domestic sector is assumed to serve the export sector. The basic export base multiplier is given as $1 + d$ where d is some fraction of a job in the domestic sector supporting a job in the export sector.

One of the problems with the economic base model is that it does not take account of other domestic employment supported by income earned outside the region but not from exports alone (e.g. social security payments or wages of migrant workers sent home to support the family). Attempts were made in later versions of the model to deal with this inconsistency resulting in the multiplier equation $(1/1-d_1)$ the multiplier is obtained by dividing the change in total employment in the region over the period by the change in export employment over the same period i.e. Total employment = 10; Export employment = 8 multiplier = 1.25; or 0.25 of a job in the rest of the economy for every extra export job.

A second problem with the export base multiplier is that the export sector is assumed homogeneous but in reality it consists of a number of quite different industries. Therefore, the effect of a given change in export demand can have very different results depending on structure of an industry's inputs. If most inputs are from outside the region a high proportion of the new demand will leak out, if most are from local sources most new demand will remain in the region. The solution is to calculate a set of multipliers for a number of main basic sectors. This is the method employed by Weiss and Golding, *Estimation of Differential Employment Multipliers in a Small Regional Economy*, (1968) where they estimated sectoral employment multipliers for basic (export) industries in Portsmouth USA.

Manufacturing	= 1.78
Naval shipyard	= 1.55
Air-force base	= 1.35

Serious drawbacks

Whilst some of the problems with the basic model can be resolved, there are a number of serious drawbacks, which cannot be. The main ones are:

1. The difficulty of distinguishing between export and domestic industries. For instance if firm (a) sells all its output to firm (b) in the same region it would be regarded as part of the domestic sector. However, if firm (b) sells all its output outside the region then in reality firm (a) should also be regarded as part of the export sector. This becomes even more complicated when an enterprise serves both the domestic and export sectors.
2. In addition, the export base model does not take account of the fact that increased output can be achieved in a number of different ways. The multiplier is maximised if the new enterprise takes on previously unemployed workers, it is minimised if it takes on people who commute in from outside the area.

Whilst the model might be regarded as simple it does give some idea of the forces that drive the multiplier concept and is therefore valuable.

Keynesian Income Expenditure approach

See Armstrong and Taylor (2000) Chapter 1 pp 8 – 15; McDonald Chapter 11 pp 293 - 296. The Keynesian model of the regional economy is basically the simplest version of the open economy version of the national income-expenditure model. The only difference is that all the expenditure variables refer to the region instead of the nation.

Basic income expenditure identity

$$Y = C + I + G + X - M \quad (1)$$

Where

Y = regional income

C = regional consumption

I = regional investment

G = government expenditure in the region

X = regional export

M = regional imports

Investment, government expenditure and exports are all assumed to be exogenously (outside the region) determined.

Therefore: $I = I_0$; $G = G_0$; $X = X_0$ (2)

Consumption and import expenditure are assumed to be partly autonomous and partly dependent on regional disposable income thus:

$$C = C_0 + cDY \quad \text{And} \quad (3)$$

$$M = M_0 + mDY \quad (4)$$

Where disposable income DY is given by

$$DY = Y - tY \quad (5)$$

Where t is the tax rate on income

Substituting equations (2 to 5) inclusive into the regional expenditure identity (1) gives

$$Y = k(C_0 + I_0 + G_0 + X_0 - M_0) \quad (6)$$

Where the regional multiplier k is given by

$$k = \frac{1}{1 - (1 - t)(c - m)} \quad (7)$$

The most important relationship in the multiplier is the marginal propensity to consume locally produced goods ($c-m$)

For instance, for a tax rate of 0.1 and MPC local goods = 0.1

$$k = \frac{1}{1 - (1 - 0.1)(0.1)} = \frac{1}{1 - 0.09} = \frac{1}{0.91} = 1.10 \text{ (a)}$$

Increase tax rate to 0.3 but hold MPC

$$k = \frac{1}{1 - (1 - 0.3)(0.1)} = \frac{1}{1 - 0.07} = \frac{1}{0.93} = 1.08 \text{ (b)}$$

Increase the local MPC to 0.3 hold tax rate at 0.1

$$k = \frac{1}{1 - (1 - 0.1)(0.3)} = \frac{1}{1 - 0.27} = \frac{1}{0.73} = 1.37 \text{ (c)}$$

Note:

The higher the value of the local MPC the higher the value of k thus increasing regional income as a result of increased autonomous expenditure. The higher the tax rate the lower the value of k as increasing amounts of extra income disappear as tax revenue. The effect of varying t is much less than varying $c-m$ (see below)

A grid of multipliers with tax rates ranging from 10 to 50%, and marginal propensities to consume locally produced goods and services ranging from 10 to 50%.

MPC (c-m)	Tax rate (t)				
	0.1	0.2	0.3	0.4	0.5
0.1	1.10	1.09	1.08	1.06	1.05
0.2	1.22	1.19	1.16	1.14	1.11
0.3	1.37	1.32	1.27	1.22	1.18
0.4	1.56	1.47	1.39	1.32	1.25
0.5	1.82	1.67	1.54	1.43	1.33

What factors affect the local MPC?

- The region's size is likely to affect its $c-m$ since small regions will tend to spend a larger share of their income on imports than larger regions. Thus the marginal propensity to import is likely to be larger in small regions (i.e. $c-m$ is small).
- The industry mix of a region is also critical in determining the size of its $c-m$ highly specialised regions will depend heavily on imports because of their specialisation i.e. car towns, chemical towns, steel towns. But in practice most economies rely heavily on trade with the outside world because of the internationalisation of production, markets and the inter-industry linkages.
- Location may also affect a region's $c-m$ especially in relation to other labour markets. An economy dependent on inward commuting will have a smaller multiplier because commuters will spend their earnings in the region where they live rather than where they work. An extension of this principal is shopping, where a regional shopping centre located in a local area reduces the marginal propensity to import but increases it for adjacent areas.

Estimating the regional multiplier

It is almost impossible to estimate a single multiplier that will apply for all regions. They are unique to each

region and may even be unique to each project under examination.

Archibald (1967) used the family expenditure survey to estimate the marginal propensity to consume locally produced goods in the typical region (over time). By isolating expenditure on locally produced goods and regressing the proportion of national income spent locally against personal disposable income he estimated the MPC for local goods and services. He calculated that this was in the region of 0.23; coupled with a tax rate of 0.2 this gives a typical multiplier of 1.2. Most studies use a similar method but they are now regionally specific.

A study of the impact of Nottingham University on the local economy Bleaney et al (1991) found that for students and staff the proportion of income spent locally differed greatly, staff 0.22, students 0.43. *(The main reason for the difference is that the income from student housing (rent) is retained locally (at least in the first round) whereas income from staff housing usually in the form of mortgage payments flows out of the region to the national headquarters of the lender).*

Extending the basic model It is possible to extend the basic model to produce more realistic multipliers. Modifications include the treatment of the government sector. On the expenditure side, allowance can be made for transfer payments i.e. unemployment benefit. This can be written as:

$$G = G_0 - gY \quad (8)$$

Where G_0 is the autonomous component of government expenditure and gY is that part of government expenditure induced by changes in the region's income.

Thus equation (6) modified by (8) becomes

$$Y = \frac{1}{1 - (1 - t)(c - m) + g} (C_0 + I_0 + G_0 + X_0 - M_0)$$

i.e. Equation (c) modified shows that the multiplier reduces because there is a loss of government income 10% for every £1 of extra regional income.

$$k = \frac{1}{1 - (1 - 0.1)(0.3) + 0.1} = \frac{1}{1 - 0.27 + 0.1} = \frac{1}{0.83} = 1.20$$

It is also possible include the effect of expenditure taxes as well as income taxes by modification of the consumption function.

A further extension allows for the interaction between regional economies. One region's imports are another's exports and because of the open nature of regional economies both gain. In the two-region case, region B increases demand for imports from region A. Thus, increased demand for region A's exports will have multiplier effects in region A. The resultant increase in A's income will raise demand for B's exports and thus B's income rises through an injection of export spending and multiplier impacts. In practice however, interregional feedbacks are relatively small and often ignored in regional models.

The multiplicand

Armstrong and Taylor show (pp 12 - 15) that although leakages from the local economy occur after the initial injection, in practice the injection itself is also subject to substantial leakages. Therefore, it is important to find out just how much of the initial injection stays within the region. There are two reasons why the first-round

leakages are important:

1. The first-round expenditure is very large relative to subsequent rounds
2. Leakages may be very large relative to the size of the initial expenditure injection.

They use the example of the construction of two nuclear power stations Dounreay and Torness (South East of Edinburgh) in the former 57% of the inputs for operating the plant each year were imported, in the latter 90% of the construction inputs were imported. There are many other examples. Further, they use work by Brownrigg to demonstrate how a model can be constructed to allow for the impact of the import content on the consumption, investment and export elements of the income-expenditure model.

In the Portsmouth Naval Base example, total output (Direct effect) of the naval base was £1.2billion out of this just £327million was spent in the local economy. Thus around 73% leak out in different ways – much of this is in salaries to sailors who work on Portsmouth based ships but do not live in the local area. Additionally, around 2% of gross salary is lost in the form of tax and NI. Finally, defence contractors only buy around 40% of supplies and services from within the local area.

Armstrong and Taylor show the type of leakages occurring in a simple diagramme, note the difference between the increase in Gross Regional Product (GRP) and Regional Disposable Income (RDI). The difference is the leakage between earning income and receiving it (i.e. income tax national insurance etc.).

Applications of regional multiplier analysis

Armstrong and Taylor use a number of studies to demonstrate multiplier applications.

Study 1. A study by Sinclair and Sutcliff (1984) into the multiplier effects of tourist expenditure in Malaga (Spain) highlights the importance of estimating the first and second round effects separately. They also suggest that the type of income being investigated needs to be defined and show how long it takes the multiplier process to work itself through the economy. Further they demonstrate that the multiplier varies significantly with the type of tourism expenditure. They show that it takes at least 4 years for the effect of tourism expenditure to work its way through to its long-run level in the economy.

Study 2. Armstrong (1988) also estimated income and employment multipliers resulting from local economic development initiatives for different companies in local authority areas. He wanted to determine if the impact varied between different types of firms and different types of authorities¹. He examined Stockport and Lancaster. He found that the leakages were larger in manufacturing firms due to their purchases of material inputs (often imported into the locality). In addition, workers in Stockport were 4 times more likely to commute in from surrounding district and twice as likely to shop in neighbouring districts compared with those in Lancaster. Thus the leakages, although large in both cases, were significantly smaller in the freestanding town, (Lancaster). He states that the lessons for local authorities that are planning to give financial assistance to firms in their area are that:

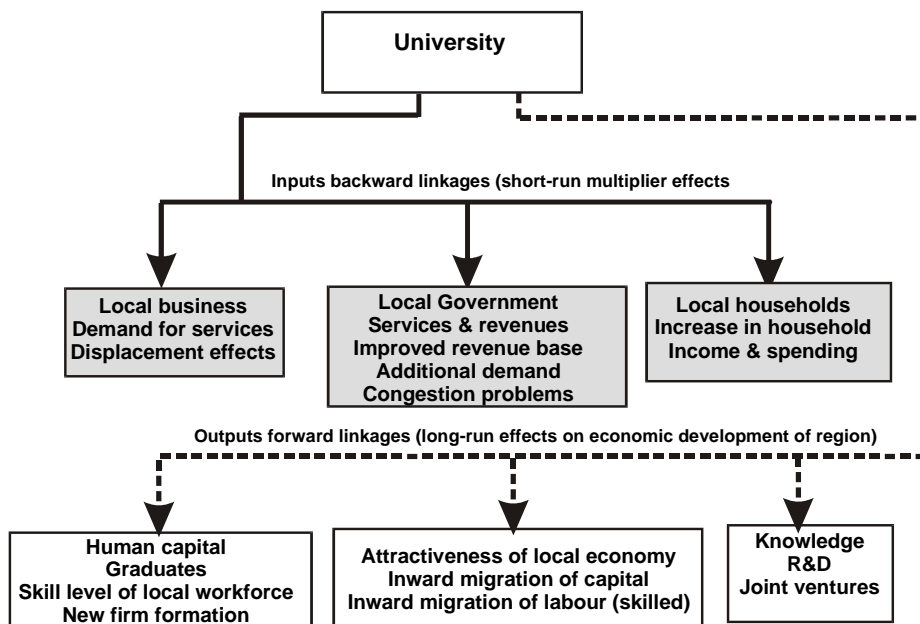
1. Multiplier impacts are likely to be small because of expenditure leakages.
2. Local authorities have little power to influence the size of a company's multiplier other than through the provision of shopping facilities
3. If financial assistance is to be optimised then account must be taken of a recipient firm's propensity to employ local staff and purchase local material inputs, SMEs are more likely to use local inputs than branch plants of multinational corporations.

He concludes that local authorities need to co-ordinate their activities because the impact will spill over boundaries with neighbours also benefiting from the local injection.

Study 3. The third example used by Armstrong and Taylor look at the work of Luger and Goldstein (1996) (*Dilemmas in Urban Development: Issues in Theory and Practice*) on the impact of Universities.

They make the point that universities employ large numbers of staff, occupy large tracts of land and spend a substantial amount of income into the local economy (including money by students). More importantly they also examine the forward and backward linkages associated with institutions such as universities. These include:

1. Improvement in the regional workforce skills base (if graduates remain in the local area)
2. Incentive for firms to expand their activities to take advantage of graduates (or new firms to move in/ set up).
3. Use of university staff as "expert" advisors by local agencies and firms (i.e. marketing, finance, product development)



Weakness of Regional Multiplier Analysis

Despite their widespread use, multipliers do have a number of major weaknesses:

1. They do not take capacity constraints into account

Increases in demand may feed directly through to higher prices rather than output, work may be contracted out to firms in neighbouring regions and in the short-run production bottlenecks may lead to increased imports - in the long run bottlenecks will reduce.

2. They fail to allow for interregional feedback effects

This may be more of a problem in large regions where increased imports to one region become another regions increased exports; these are generally not included in regional multiplier analysis.

3. Time is assumed discrete rather than continuous.

Whereas multiplier effects accrue over time and it may take several years for the full effect to work through the local economy (see the example of the Sinclair and Sutcliffe follow-up study of Malaga). If the time-path of income changes resultant from a major new investment were known it would help local authorities to plan their own investment (e.g. health and education).

Expenditure type	Truncated Income Multipliers (cumulative)				
	1 year	2 years	3 years	4 years	Long-run multiplier
Flats & Villas	0.36	0.40	0.43	0.45	0.49
Campsites	1.16	1.29	1.38	1.45	1.55
All types	0.54	0.60	0.64	0.67	0.72

Source Sinclair & Sutcliffe (1989)

4. They provide a very aggregated picture of the impact of expenditure injections

Policy makers need to know the impact on particular industries rather than on employment and output in general.

5. The ability of the indigenous firms to supply inputs to expanding firms

This will vary between firms and regions highly specialised firms are more likely to import, regions with a broad industrial base are more likely to be able to supply inputs.

6. The role of money

Money is assumed to be neutral with no impediments to its flow across regional boundaries but this is now challenged, peripheral region find it more difficult and expensive to obtain credit, mainly due to lack of information or perceived higher risk.

A simple multi-regional model of income determination

The weakness of the single-region model of income determination (multipliers) is that it does not take account of interregional feedbacks. It is clear that one region's imports are another's exports thus changes in the income of one region are transmitted to all other regions with which it trades. Armstrong and Taylor explore a two-region model, which includes allowing for the effects of the balance of trade (between the regions).

In the model there are two regions (north and south) there are no supply constraints and output is determined by demand for products and services. Demand for output will depend on autonomous demand (within the region itself) and demand for its exports by the other region.

North's output can be expressed as $y_n = \alpha + \beta y_s$ where

α = Autonomous demand for the north's output and β is a measure of the responsiveness of the north's exports to changes in the south's income.

The south's output is expressed in the same way using the parameters γ & δ .

Both regions' output needs to be considered simultaneously to determine the equilibrium output of each region. (

y_s^* And y_n^*) see Figure 4.1 Frame A

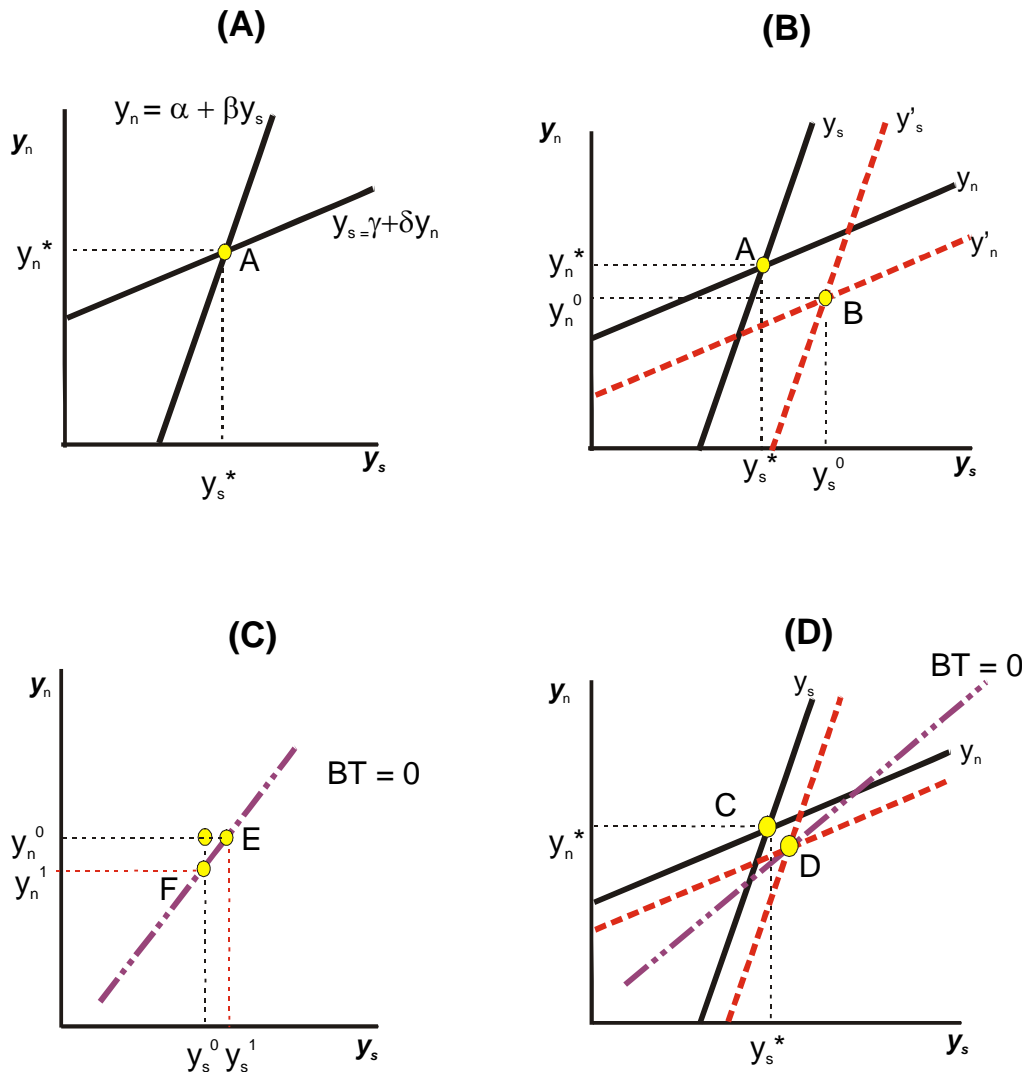
Frame B shows a change in one region's autonomous demand and a compensating increases in the others autonomous demand. Suppose the north's wealth declines and the south's increases (due to the south's assets increasing in value and the north's declining by the same amount. The north's output function shifts downward and the south's moves rightwards to point "B"

If the south's income increases then the north's balance of trade will improve (south imports more from north as income increases). If the balance of trade in both regions is in equilibrium then $BT = 0$ and the slope of the BT function is upwards. Frame "C" shows a position where trade is not in balance; the north has a balance of trade deficit and the south a surplus. Balance will only be regained if the south's income increases (increasing imports

from the north) or the north's income falls (decreases imports from the south).

Frame "D" shows the combination of the BT function and the output/income functions of both regions. Initially a balance of trade deficit exists in the north and an equal and opposite surplus in the south. BT equilibrium is restored as income in the south rises (more imports from the north) and income in the north falls and thus it imports less from the south.

Figure 4.1 - Equilibrium income levels in a two-region model



Source: Armstrong and Taylor *Regional economics and policy* (2000) Figure 1.5

Despite the fact that flows of goods and payments between regions (in the same country) are not recorded there is in reality flows of goods and money between regions. Interregional transactions are substantial and imbalances can have severe effect in the real economy through output, employment and unemployment.

Regions do not possess foreign exchange reserves and the current and capital accounts must sum to zero. Thus if a region suffers a loss on its export trade leading to a trade deficit it has to be paid for in one or more ways:

- Through a net income transfer into the region by Government (unemployment benefit).
- Through a region's residents running down their own savings.
- Through a region's residents borrowing from the banking system (net transfer of cash into the region from elsewhere in the country).
- Through a region's residents selling assets to residents in other regions (bonds etc.).
- Through long-term inward investment by firms located in other regions.

The above implies that either the government must be prepared to fund the deficit indefinitely through transfers,

or the regions stock of wealth will gradually be depleted. If a region runs a persistent trade deficit it will experience a decline in wealth. This will increase the cost of credit and the regions economic fortunes will decline further. The result will be a decline in asset values such as industrial, commercial and housing stock and an increase in out-migration. In the south (in our example) the opposite will occur. However, if the marginal propensity to import falls faster than the marginal propensity to consume local goods and services then the trade gap will narrow and in time reach a new equilibrium. In frame "D" the north's income function shifts down, the south's shifts to the right and a new equilibrium point on the BT function is reached at point "D".

The way to tackle persistent balance of trade deficits is therefore to increase export competitiveness via supply-side policies (such as, training, distribution and improved infrastructure). Armstrong and Taylor use the example of the former East Germany to illustrate their point. Whilst concluding that in the long-run regional imports and exports must balance, they suggest that in the short-run the German economy's loss of competitiveness and the attendant balance of payments difficulties should be off-set against the longer-term threat posed by mass migration (from east to west) leading to congestion, social and political problems.

Further developments in the economic modelling of regions

Despite the fact that regional multiplier models are useful in predicting the effects of investment decisions their major weakness is that they do not allow for the feedback effect, which is driven by the region's labour market. This is because of the assumption that the supply of factors is perfectly elastic. Therefore an increase in demand for labour is met by an increase in supply at the current wage rate. This is, of course, an unreasonable assumption given that we know that in periods of excess demand labour markets become tight and wages rise as a result, these then spill over into areas such as the housing market (evidence in the late 80's boom).

Other approaches deliberately take into account the feedback effect in the labour and factor markets. Thus, we can look at the effect on not just output and employment but also unemployment, net migration, labour participation rates and factor prices. These are answers to real problems such as how will a new production plant effect the job market? What will be the effect on unemployment of closing a plant? Or will labour subsidies push up employment levels?

Regional models vary in their detail and complexity ranging from aggregated demand-driven models based on simple interpretations of the Keynesian macro model, to those, which allow the supply-side to respond to changes in the labour and capital markets. Despite the above comments about the weaknesses of multiplier models the simple model below also contains a number of weaknesses, which we will look at later.

Simple demand-based model of income and employment

Assumptions

The demand-based model is designed to answer the question 'what are the effects of an external demand shock on regional economic activity?'

The model assumes that supply of factor inputs responds to demand increases without an increase in the price of inputs or outputs (factor and product markets) i.e. supply is endogenous. The following assumptions apply:

1. Output responds positively to an external shock
2. Supply of labour is perfectly elastic at current market rates
3. The economy has spare capacity - output can be increased without increasing price
4. Regions are price takers (wages are set nationally, factor prices by the market)

The process

- An external increase in demand leads to increased output.
- Firms increase supply through taking on more labour (from the unemployed) and increasing other factor inputs.
- Higher employment levels raise regional income.
- The increase in regional income stimulates further autonomous demand for regional output via the multiplier.
- See Armstrong and Taylor (2000) Regional Economics and Policy pp 28

Weakness of the model

The model ignores the fact that an increase in demand is likely to affect the price of factor inputs. Factor prices are not entirely exogenous and will be influenced by local demand and supply conditions.

e.g. \uparrow demand for labour = \uparrow wage rate = \uparrow price = \downarrow competitiveness

Wage rate will also \uparrow net migration and \uparrow the participation rate if enough labour comes in from outside the region unemployment may not fall.

Demand-based model of income and employment with the supply-side incorporated

Armstrong and Taylor suggest that a more "realistic" approach is to incorporate at least some aspects of the supply-side.

Features

Supply side is endogenous as demand affects the labour market and the supply of output

Wage rate is determined within the region increasing as the labour market tightens.

Increased regional wage rates induces further supply of labour (participation and migration)

Increased regional wage rates reduce competitiveness (production costs \uparrow)

Process

- Increased demand for goods leads to an increase in employment by reducing unemployment.
- Reduced unemployment raises the wage rate.
- This increases net migration and increases participation. Both increase the labour supply and dampen the pressure on wages.
- As wages rise regional competitiveness falls which reduces demand for the regions goods.

See Armstrong and Taylor (2000) Regional Economics and Policy, pp 30

The overall effect is that employment increases more than the reduction in unemployment

Next lecture – Econometric models and Input-output analysis

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