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Regional economic effects of revitalization of industrial sites: an input-output approach

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This subject of this paper is the regional economic effects of revitalisation of industrial sites. Market failures make that governments intervene to reduce them and to achieve a socially more desirable situation. Literature shows that the economic effects of revitalization are among the most important inputs for decision making on revitalization. The paper describes a input-output approach for estimating the regional economic effects and discusses some issues that arise when input-output analysis is applied on industrial site. One of the main limitation is the availability of data.

Introduction

The revitalisation of industrial sites attracts a lot of attention of policymakers. In many European countries there are various problems concerning industrial sites, like out-dated infrastructure and production processes, unused space, poor image and environmental problems. In particular older sites are faced with these problems. The total area of sites needing revitalisation can be large; in the thirty largest cities in the Netherlands for example about 10 thousand hectares, which is a quarter of the total business area in these cities, need revitalisation according to the standards of local decision makers (ETIN 2003). In many cases the problems are self-enforcing: well-healed companies leave a deteriorating site, leaving behind companies causing the main problems.

The problems mentioned are often seen as problems of ageing of industrial sites. Ageing does not necessarily refer to the actual age of a site. Ageing can also mean that a site does not meet the demands of firms (economic ageing), conflicts with its surroundings (spatial ageing) or is not in line with actual policy (CPB 2001).

In this paper we focus on the local economic impacts of revitalization of industrial sites. [1] Firstly, we place the revitalization in a context of sustainability, a concept which is often mentioned regarding industrial sites (section 2). In the third section we mention some market failures, which might cause some of the problems and might be a reason for governments to intervene in the market for industrial sites. Also the relevance of estimating local economic impacts is discussed. Then we focus on input-output analysis as a tool to calculate the impacts (section 4) and illustrate this method in a case study for an industrial site in the city of Utrecht in the Netherlands (section 5). In section 6 some conclusions are drawn.

Sustainability of industrial sites

Revitalisation of industrial sites is often related to the concept of sustainability. Two general notions can be mentioned regarding sustainability. The first one concerns the aspect of time. The main contribution to defining sustainability was made by the Brundtland commission (WCED 1987). In the commission's definition the element of time is essential by stating that current production and consumption should not compromise needs of future generations to achieve sustainability. Secondly, three

components of sustainability are generally mentioned (Munasinghe, 1993): the environmental, social and economic component. Policymakers dealing with revitalising industrial sites in general do not pay explicit attention to the aspect of time in terms of intergenerational distribution. Their focus is more on short term effects, where we often see the three components of sustainability. In practice the emphasis in dealing with industrial sites is on the environmental and economic issues. For instance, the Ministry of Economic Affairs in the Netherlands describes a sustainable site as one with 'cooperation between businesses and between business and government, with the aim of improving the commercial result, reducing environmental impact and using space more efficiently' (MEZ, 1998). Key elements in a practical approach of these two elements of sustainable sites are value added, intensity of space use and physical flows, like energy and raw materials. Although the emphasis in the actual discussion about revitalising industrial sites is on environmental and economic issues, the social component is getting more attention. A main social item is the interaction of a site with its social surroundings (Ginter et al., 2003). Safety, health and visual damage caused by industrial sites are examples of social issues. This paper deals with the economic component of sustainable industrial sites, by looking at production, employment and intensity of space use.[2] By that, we choose for a practical approach corresponding to the focus of policymakers.

Market failures and the role of the government

The problems of ageing sites are, at least partly, caused by market failures (CPB, 2001). Firstly, there are negative externalities of industrial sites, like noise, odour and visual damage, caused by the firms located on the site as well as by the traffic they involve. In many cases, as a result of urbanisation older industrial sites become surrounded by residential areas resulting in an increase of negative externalities. Secondly, an industrial site has public elements for the companies located on the site. In fact some elements of a site, like the quality of the site, can be regarded as a common or club good, because in general the benefits of quality for a company do not rival with benefits for other companies, but many other companies are excluded from the 'use' of the quality of the particular site -i.e. companies not located on the site- (Buchanan, 1965). The quality of a site, for example the number common facilities and the sight of the site, which is

important for the image of the site and the companies, is an example of a club good. The problem of free-riding might arise, meaning that there is no incentive for individual companies to invest in the quality of the site. Especially when the benefits of the club goods differ between firms this might be a problem. Companies not benefiting from improvements in for example the quality of the site will not invest in the quality of their lot and bring down the quality of the whole site. Another reason why firms often do not invest in the quality of their property is that the real estate is specific for the firm and often can not be used by other firms. The market value of the real estate is therefore relatively low and firms have no incentive to invest in the quality of the real estate. In fact firms should take into account the lower value of their property. But if they have no plans for moving or only look at the short term, they will not invest in quality of their property. Since the deterioration of the property has external effects on the other firms on the site and on the social environment, investments are below the social optimum. Notice however that since for some of these externalities reducing them goes together with profit making, private investment by the companies might be beneficial for them. Visual damage caused by a site is a good example. Companies tend to pay more attention to representation of a site and their image (Pen, 2000), which means that they expect that the benefits from improving the sight of the site exceed the costs. Thirdly, segmentation of the land market and competition between communities can involve that scarcity of land is not reflected in land prices. If the opportunity costs are not reflected in the price of land on industrial sites, the intensity of land use is suboptimal at the expense of for example open areas. Finally, the markets might lead to a socially undesirable distribution of income and employment between regions or populations.

These notions on the possibly suboptimal outcomes of markets are often a reason for governments to intervene in the market for industrial sites. Reducing the problems caused by the market failures are among the most important goals of local governments, like reducing hinder and preservation of open space (CPB, 2001; RIGO, 2000). Since at least some of the problems are caused by market failures or are supposed to be socially unacceptable intervention seems to be justified. Various instruments for interventions can be used, for example environmental taxes or regulations. We will not discuss here the

efficiency and effectiveness of intervention instruments, but simply assume that intervention results in a change of the composition of firms on a site. In order to judge the desirability of the outcome of the intervention, governments need information about the costs and benefits of the change in composition. From a welfare economic point of view benefits can be expected if unemployment is reduced or if it results in a socially more desirable distribution of income or production. Information about the regional economic effects is therefore needed. Moreover, local governments, who often take the initiative for revitalization (CPB, 2001), are in need of information about the economic impacts of revitalisation on their community to make their own cost-benefit analysis. Notice that from a regional economic point of view the key role of the local government can be discussed, because the economic impact of revitalization is often a matter of regional distribution. Increasing local income and employment are also among important goals of local governments. If the decision whether or not to revitalize a site is made by local governments and partly based on estimates of the economic impacts of revitalization, the impacts are double counted (CPB, 1999). However, also if decisions are made on a regional or national level, information about local costs and benefits is still very relevant, since the regional distribution of costs and benefits is important in the policy process of revitalization (Ginter et al., 2002). Therefore, estimating local economic effects is still relevant.

Estimating regional economic effects by input-output analysis

Probably one of the most used methods in regional science is input-output analysis (Isard, 1998). One of the attractive features of input-output is that it gives a fairly detailed of picture of a national or regional economy, while its mathematics and basic structure, based on input-output linkages between sectors, are rather simple. Here we address the question how input-output analysis can be applied to estimate the regional economic impact of revitalisation of industrial sites. Input-output analysis can be used for estimating economic effects of a certain external shock, like a change in foreign expenditures or consumer preferences, on a national or regional economy. The basis of input-output analysis is an input-output matrix, describing all economic transactions between sectors in an economy as well as imports and final outputs for each sector. By

calculating the inverse matrix sectoral multipliers can be derived to estimate the impacts of an external shock on output, employment or other economic variables. For application on revitalisation of industrial sites, two issues deserve attention. Firstly, input-output analysis is mainly suitable for calculating the effects of a shock in final demand. The change of composition of sectors on the site caused by government intervention can be treated as an external shock. However, the change in composition of the sectors on the site is a shock on the supply side of the economy changing the input-output structure of the regional economy. This problem can be avoided by calculating the direct change in final demand that would cause a change in production of the same size and treating this change as a final demand shock. This causes a bias, though, because multipliers are calculated as if the sectoral structure of the economy has not changed. It might happen that the supply shock, i.e. the first order effect, causes a change in intermediate demand from a sector that is not located on the site anymore.

Secondly, the scale of the analysis deserves attention. Local governments are interested in the impacts of revitalization in their community, which means that an input-output table on the level of a city is needed. Here the problem of availability of data arises. Input-output data on the urban level is normally not available and collecting data to construct an input-output matrix is expensive, which is one of the main limitations of input-output analysis in general (Armstrong and Taylor, 1993). The choice should be made between collecting data by conducting a survey, constructing a matrix based on coefficients of available matrices or a combination of both (Isard, 1998). This choice should be made by the users of the results of analyses taking into account the costs of data collection and differences in the accuracy of the results of different methods.[3]

Thirdly, since the supply impulse is concentrated on a specific location -the industrial site- more accurate estimates can be found if a bi-regional input-output matrix is used. In a bi-regional input-output matrix two regions are distinguished and the origin and destination region is accounted for the economic transactions. Because the input-output relations differ between regions results are more accurate if the location of the impuls is known. For industrial sites this is the case by definition. Notice however that this makes the problem of availability of data even worse.

Application to policy problems: an example

To illustrate the application of input-output analysis on the revitalisation of industrial sites we applied input-output analysis to a policy problem of the city of Utrecht in the Netherlands regarding the industrial site 'Lageweide'. The city of Utrecht is mainly dominated by the service industries, while Lageweide is a location for manufacturing, power supply, construction, transport, wholesale and communication, with a total employment of 24000 jobs. Policy makers of Utrecht formulated economic goals by selecting sectors that are supposed to be of major importance for the city, especially sectors requiring higher skilled people. None of the sectors located at Lageweide, however, belong to the main sectors of the regional economic policy. Especially transport, wholesale and communication, with a relatively large production and a high specialisation, are important sectors in Lageweide and are assumed to have a comparative advantage due to the central location of the Lageweide site in the Netherlands. Manufacturing is also strongly concentrated on the site and is by far the largest sector on Lageweide in terms of production value. But, unlike transport, wholesale and communication, manufacturing is supposed not to be an important sector in the region. Regarding the sector structure Lageweide is a specific, atypical industrial site and has no sectors that the city is aiming at in regional economic policy. The problem of policy makers is the question whether they should use its comparative advantage or implement the regional economic policy in revitalising Lageweide.

To analyse this policy problem we constructed an input-output table for the city of Utrecht in the Netherlands. We used the 1992 bi-regional input-output table for two regions: the province of Utrecht and the rest of the Netherlands (RUG/CBS, 1999) and updated them to the year 1998 using the RAS-method (Isard, 1998). We used input-output data of the province of Utrecht given by the bi-regional table and production data to construct a bi-regional input-output table for the city of Utrecht, in which the industrial site 'Lageweide' and the rest of the city of Utrecht are the two regions. Because there are no input-output data available for the site nor for the city, we assumed that there are no regional differences in the input-output structure. The policy problem was handled by, together with policy makers, formulating two scenario's: one build on comparative advantage of Lagewide and creating a specific character ('multimodal'), the other leaving

the comparative advantage of Lageweide aside, using the supposed comparative advantage of the region and using the site for the policy goals 'urban'). Changes in land use formulated for both scenarios by policy makers were transposed to supply shocks using quotients of land use per employee (CPB, 2002) and production and employment data. Table 1 and 2 show the results for the two scenarios as an illustration of our approach. Since the results are fairly straightforward to interpret and based on many assumptions, we will not discuss them here in detail. The main conclusion is that input-output analysis in principle can be applied to the policy problem and can help them in their decisions.

Table 1 Outcomes Scenario Multimodal

	Extra prod. on site (mln euro)	Extra prod. in rest of city	Extra empl. on site (jobs)	Extra empl. in rest of city
Agriculture	0	-1	0	-5
Manufacturing	-293	-3	-2346	-21
Power/water	1	2	2	5
Consumer services	0	2	1	36
transport/comm/wholesale	345	4	3511	37
Producer services	0	8	6	74
Exploit rental	0	1	0	3
Admistr./non profit	0	0	0	-3
Total	53	13	1175	126

Table 2 Outcomes Scenario Urban

	Extra prod. on site (mln euro)	Extra prod. in rest of city	Extra empl. on site (jobs)	Extra empl. in rest of city
Agriculture	0	-1	0	-6
Manufacturing	-293	-5	-2351	-39
Power/water	0	0	0	-1
Consumer services	18	3	390	59
transport/comm/wholesale	0	1	0	7
Producer services	437	27	7367	253
Exploit rental	0	2	0	5
Admistr./non profit	0	-1	-1	-16
Total	161	25	5405	263

Conclusions

Input-output analysis seems to be an tool which is suitable for application to policy problems concerning restructuring industrial sites. Local policymakers, who are actively involved in the revitalization process, are interested in the different aspects of sustainability of industrial sits, among which the economic effects. Input-output analysis can also give useful information for regional or national policy makers in order to anticipate on market failures, in particular the distribution of income and employment. Some adjustments have to made however to the usual input-output analysis, especially regarding the scale of analysis. Data availability appears to be one of the main obstacles in applying input-output analysis to policy problems on a low regional scale.

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[1] This is a part of the EU-project MASURIN lead by TNO MEP (Environment, Energy and Politics). MASURIN, the Management of Sustainable Revitalisation of Industrial Sites, aims at providing tools and knowledge for policy makers in cities and public bodies. Several institutes and cities participate in this project.

[2] Other parts of the MASURIN project deal with the environmental and social components of sustainable industrial sites.

[3] See Oosterhaven et al. (2003) for a comparison of nonsurvey, semisurvey and full-survey methods.

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