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Abstract

In network industries, the market reform that is being pursued by national and supranational authorities should lead to an improvement of efficiency, which spills over into a beneficial macroeconomic impact. This paper makes two alternative simulations of the potential impact in Belgium. These simulations give strongly different outcomes, but are still complementary. A macroeconometric approach seems to be more realistic in the short and mid term because it has been built up from observed behavioural relationships. A general-equilibrium approach gives rise to drawing some lessons about the conditions that make the impact more pronounced in the long term.

Table of Contents

I.   Introduction[1]

For the past two or three decades network industries in the world have been in a state of reform. Before, they were in many cases organised as ring fenced national or regional monopolies, mostly operated by public companies. However, this situation resulted in inefficient economic performance. Therefore, many countries have started to reform the organisation of network industries. The reforms essentially consisted of allowing competition in those segments where there is no natural hindrance to competition, and developing efficient and pro-competitive regulation of the segments of the industry that should remain a monopoly. Such reform should improve efficiency in the network industries. Moreover, the impact of improved efficiency should spill over into the rest of the economy and enhance competitiveness, economic activity and employment.

However, the improved efficiency of network industries often implies (significant) losses of profitability and employment in the network industries themselves. For policy makers it is therefore important to judge whether the gains for the rest of the economy are sufficient to compensate the losses for the network industries. This is all the more important since the losses are felt in the short term and by specific categories such as workers in the network industries, whereas the gains are diffused and accrue only in the long term. This has even made policy makers, as was the case in Belgium, somewhat reticent towards reform.

The present paper explores the macroeconomic impact of network industry reform in Belgium and does so by applying two alternative modelling approaches. The one is a macroeconometric approach, the other a general-equilibrium approach. The approaches give significantly different outcomes. The macroeconometric approach shows that there may be a long way to go for the economy to compensate for the losses. The general-equilibrium approach gives a positive impact right from the beginning of the reform. Judging from the properties and mechanisms of the models, the macroeconometric approach seems more realistic, at least in the short and mid term. The general-equilibrium approach, however, gives rise to some lessons about the conditions that make the impact more pronounced in the long term. Therefore, the approaches are complementary rather than conflicting.

The merit of the present analysis is twofold. Firstly, it creates an empirical projection for Belgium; earlier studies did this for other countries or analysed the relationship between reform and performance on a cross-country basis. Secondly, it analyses the usefulness of alternative modelling approaches for studying the economic impact of network industry reform. An exercise using two different kinds of models thus seems useful in understanding the macroeconomic impact of network industry reform and other structural changes in the economy. The paper is a synthesis of the study by Van der Linden (2006). It briefly summarises theoretical and empirical research on network industry reform (§2). It then introduces the Belgian case and the potential microeconomic impact (§3). Finally, it gives the macroeconomic outcomes and discusses the two alternative modelling approaches (§4).

II.   Economic analysis of network industry reform

A. Theoretical framework

Before reform, many network industries were monopolies. When compared to a competitive market, a monopoly may give inefficient performance. If the conduct of the producer is profit-maximising it will set a price that is higher than and sell less than would be the case in a competitive market. This results in allocative inefficiency: there is a loss of social welfare. Moreover, if consumer welfare is valued above producer welfare (the latter being a maximised profit), there is distributive inefficiency: part of consumer welfare is transferred to the producer as an economic rent. A third type of inefficiency is productive inefficiency. This inefficiency is not derived from the profit-maximising conduct of the monopolist. It stems from the fact that there are no competitors to give the monopolist an incentive to adopt the most efficient production technology.

These outcomes hold for a private monopoly without economies of scale. In network industries, however, there often are economies of scale and the company is in public hands. This does not, however, particularly change the incidence of inefficiencies. When there are *economies of scale*, which typically is the case in the infrastructure segments of network industries, profit-maximising conduct results in the three inefficiencies in the same way as it does in the 'standard' case. When the monopolist is a *public company*, goals other than profit maximisation may be pursued. These goals might nevertheless lead to allocative inefficiency if the price is set higher or lower than it would have been on a competitive market. There might also be productive inefficiency as there is no incentive to adopt the most efficient technology. There might, however, be no distributive inefficiency, as any economic rent may become part of the government budget.

The aim of reform is to alleviate these inefficiencies by opening up markets and using adequate regulation. Markets might be opened up in the segments where there is no natural monopoly. Competitive forces may lead to the entry of new suppliers and push prices to the level that optimises allocative efficiency and eliminates distributive efficiency. Even more gains may be achieved when cost competition leads to an increase in productive efficiency, either by a more rational use of labour and capital under the given technology or by innovation and investment in more efficient technology. The latter effect is often labelled as an increase in dynamic efficiency.

In the segments with a natural monopoly market, opening would be inefficient. Instead, adequate regulation would give the monopolist, be it a private or a public company, incentives to achieve allocative, productive and distributive efficiency. This is one of the central issues in the analysis of network industries. Notable contributions to this issue are given by Armstrong *et al.* (1994), Bergman *et al.* (1998), Ilzkovitz *et al.* (1999), IDEI (1999), Newbery (1999) and Laffont & Tirole (2000). A price cap seems to be one of the most suitable ways of regulation. Where possible, yardstick competition and licence auctions could also be effective. Setting a limit on the profit margin proved less effective in practice.

Other conditions for effective market reform are vertical separation and privatisation. Although market reform may be effective without these measures, they help to create a level playing field. A stepwise reform might be useful too. It gives the various parties an opportunity to prepare for the new situation. There must be a mechanism ensuring the production of services of general economic interest when they cannot be produced profitably enough by the market. Finally, some labour market reform may also be needed and it is mostly useful to establish an independent industry regulator for all branch-specific regulatory tasks.

At the microeconomic level network industry reform would thus lead to an increase in economic efficiency. Both the opening-up of some segments for competition and the pro-competitive regulation of others should lead to a fall of profit margins, costs and prices. The impact on employment depends on two forces. On the one hand, the increase in productive efficiency might lead to a fall of employment. On the other hand, the lower prices might boost output and labour demand.

At the macroeconomic level network industry reform might lead to an increase in economic activity. Initially, the fallen profits and employment in the network industries could have a negative impact upon income and expenditures. Investment and consumption may fall and tax revenues may fall as well. The fallen prices, however, have a positive impact. They imply an increase in real income and purchasing power for consumers. Producers face falling costs for network industry services and may pass these on into their own prices, which gives a further boost to real income. In the international markets, domestic competitiveness might increase. Output might increase and demand for labour and capital with it. Hence, there also is a positive impact on investment and consumption.

The negative impact is usually felt as a shock. The positive impact is more gradual and takes place over a longer time period. In the short term the negative impact might thus predominate, whereas in the mid and long term the positive impact could become stronger. Politically, this is complicated because the negative impact is felt by specific groups, such as the workers in the network industries. The positive impact is diffuse and spread over the economy as a whole. The issue is thus whether, and when, the positive impact will outweigh the negative. This partly depends on the adaptability of the economy. Unemployment actually means that part of the labour factor of production is not used. There is no equilibrium in the labour market and certain production opportunities are lost. When the labour market adapts smoothly, there is a tendency towards realising production opportunities so that employment and welfare may increase. In other words, less productive labour from network industries might in the end be turned into productive labour in other industries. This increases the total efficiency of the economy. When the labour market adapts less smoothly, unemployment can prevail for a long period.

B. Empirical studies

Many empirical studies on the economic impact of market reform have been carried out. In general, these studies confirm the impact that has been described above. This section is based on 17 studies, one of which (Gönenç *et al.*, 2001) is itself a survey. The studies can be grouped into three categories. The first category consists of descriptive studies. These studies simply follow the development of key economic performance indicators such as market structure, prices, productivity and employment (for example ECB, 2001; FE, 2002; CEC, 2004). The second category consists of the estimation of statistical relationships. In these studies, economic performance indicators are regressed on reform or regulation indicators and a number of control variables. A central element of such studies is the development of a sensible regulation indicator. In such an indicator, qualitative information on regulation must be transformed into a quantitative score. The qualitative information involves several elements of regulation, such as vertical separation, opening-up of markets, privatisation and market structure. The studies are made at micro- and macroeconomic levels. It is the largest category in terms of number of studies. Some references are given in Table 1, to be discussed below. The third category consists of macroeconomic model simulations. In such simulations the outcomes of microeconomic analyses are introduced into a macroeconomic model as an exogenous shock or a parameter change. The model then estimates the impact on macroeconomic performance of, for example, prices, employment and GDP. Notable studies have been made by OECD (1997), CEC (2002), and very recently CE (2005). Gönenç *et al.* (2001) discuss some older analyses.

A summary of the studies is given in Table 1. It shows whether the relationships found between regulation indicators and performance indicators are positive (+), negative (-), or insignificant or nonexistent (0). The studies adopted and developed many different indicators for regulation and

performance. For convenience they are grouped into a certain number of categories: four for the regulation indicators, six for the performance indicators. They are represented in the columns and rows of Table 1, respectively.

Table 1 – **Relationship between market reform and economic indicators, based on a survey of empirical analyses**

Impact of: on:	Liberali-sation	Market organisation	Privati-sation	Aggregated / Not determined	Aggregated / Not determined (macro-economic)
	(m i c r o – e c o n o m i c)				
Productivity Efficiency Innovation	+ + + 0 + + + + +	+ + +	+ + + + + - + + + + + + +	+ 0 + + +	+ 0 + +
Prices	- - - - - + - - - - - - 0	- - 0 - -	- - + - - 0	- - -	
Employment Labour market	+ + - - + + 0 -	0 0		+ 0 -	+ + + + 0 + + + + + 0
Quality	+ + 0 + + 0	+ +	0		
Investments	+		0	+	+
GDP					+ + + + + + + + +

Sources: OECD (1997), Boylaud & Nicoletti (2001), ECB (2001), Gönenç *et al.* (2001), Steiner (2001), Nicoletti *et al.* (2001), CEC (2002), Scarpetta & Tressel (2002), Alesina *et al.* (2003), Nicoletti & Scarpetta (2003), FE (2002), Griffith & Harrison (2004) and CE (2004, 2005).

Three of the four categories of regulatory indicators are clearly defined. These are liberalisation, market organisation and privatisation. Liberalisation evidently refers to measures that allow entry and competition. Market organisation refers to modifications of the structure and regulation of the industry, such as vertical separation or price regulation. The category of privatisation does not only refer to sales of government shares, but also to differences in public ownership between countries and/or industries. The fourth category refers to aggregated and non-determined measures. Aggregated measures are compiled from several other categories of indicators. Non-determined measures are not or are insufficiently defined by the author(s).

The six categories of performance indicators are productivity, prices, employment, quality, investments and GDP. Productivity concerns a wide category consisting of indicators for the improvement of production techniques and the fall of average costs. The category thus includes indicators for efficiency and innovations as well. Prices speak for themselves; note that a negative sign indicates a price decrease, which is a positive effect of market reform. Employment not only includes quantitative analyses, but also a study that focuses on the impact of reform upon qualitative labour conditions. Quality includes a variety of indicators. Examples from the studies that are discussed are failed connections, telephone disruptions and letters not delivered the day after being mailed. Investments and GDP speak for themselves.

Table 1 gives 107 cases taken from 14 sources. The largest number of these cases comes from the studies discussed in Gönenç *et al.* (2001). It is clear that most of the authors observed a positive impact. In only 7 cases was a negative impact observed, whereas in 16 cases the relationship was not significant or was absent. Note that for employment the negative relationship was mostly observed in

the electricity sector, and the positive relationship was mostly observed in the telecommunications sector.

The analysis of the present paper differs from the analyses of Table 1 in two respects. Empirically, the focus is on Belgium. From the studies listed in Table 1 only CE (2004, 2005) give separate results for Belgium. The present analysis provides a quantitative projection for Belgian policy makers and succeeds the more qualitative policy analysis of Van der Linden (2005). Methodologically, the analysis involves a simulation with two kinds of models: a macroeconometric and a general equilibrium model. Starting from the same input (changes in economic rent and labour productivity) the two models give strongly different outcomes. The analysis thus allows for comparing the two modelling approaches and evaluating their behavioural mechanisms and their applicability to the issue at hand. It seems that both approaches are complementary rather than incompatible, giving a broad view on the economic impact of network industry reform and the conditions from which the economic impact accrues.

III. The microeconomic impact of network industry reform in Belgium

A. Network industry reform in Belgium

The extent of market regulation per network industry can be measured by the index of regulatory reform as developed by the OECD (OECD, 1998; Conway *et al.*, 2005). This index gives a quantitative score to a series of qualitative elements of regulation, such as market structure, vertical integration, state ownership, state control and pricing. The score is given on a scale from 0 to 6. The evolution of the unweighted average of the scores of five network industries in Belgium is given in Figure 1, which is based on Van der Linden (2005).[2] Van der Linden applied the OECD calculation method to the actual situation in Belgium of 1997 and 2004, and made a projection for 2010. The other data were taken directly from the OECD database.

In a time span of twelve years from 1985 the score has gradually decreased from 5.2 to 4.2. Since 1997, reform has accelerated and reached a score of 3.0 in 2004. Based on alternative assumptions for the near future the score may evolve to a range between 2.0 and 2.7 in 2010. Between 1985 and 1997 the Belgian score was more or less exactly in between the highest and lowest scores of the EU-15. Low scores were observed for early reformers such as Sweden and Finland. High scores were observed for Southern European countries such as Portugal and Greece. An index like this may, of course, be challenged since there inevitably is some arbitrariness in processing the qualitative input and it may lead to the over-simple view that no regulation (score = 0) is always best for the economy. Nevertheless, the index gives a sensible indication of the extent and evolution of market regulation. It has been applied as an explanatory variable by, among others, Nicoletti *et al.* (2001), Alesina *et al.* (2003) and Nicoletti & Scarpetta (2003).

Figure 1 – Evolution of market reform of network industries in Belgium, 1985-2010

Average index of regulatory reform in five network industries (0-6)
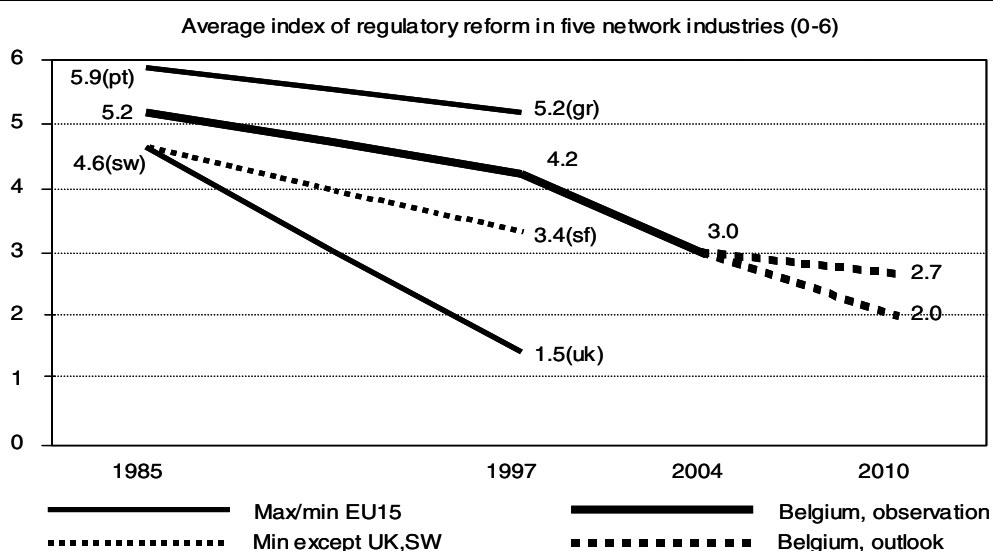
Sources: OECD and Van der Linden (2005).

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[2]   Note that Van der Linden (2005) applied the original 1975-1998 database. An update for 1999-2003 has been published since (Conway *et al.*, 2005).

At present the state of affairs in Belgium is summarised as follows. In most cases the EU directives on market reform are followed strictly. In only a few cases, reform steps are set earlier than required by the EU. In *telecommunications* there has been free entry since 1998. Competition is lively, although the incumbent has a significant market position. Vertical separation is not an issue except for the local loop, where there are still relatively few unbundled lines. The incumbent is floated on the stock exchange, but the federal authorities still own more than 50% of the shares. In *electricity* and *gas* there is legal separation between network operations and other activities. The major player is the French private company Suez, which has stakes in all segments of both industries. Local authorities own a minority share in network operations. The federal government has a 'golden share' in the gas transport network and the sales incumbent. There is free entry for all business customers. For households, free entry is only possible in the Flanders Region, covering 60% of the Belgian population. The other two regions will follow in early 2007. There are about 15 entrants, but the incumbent still has by far the largest market share. For *postal services* there is free entry for letters weighing more than 50 grams or stamped with more than 2½ times the basic tariff, but there is hardly any entry yet. Vertical separation is not an issue. Recently the Danish Post took a 50%-1 share in the incumbent, leaving a 50%+1 share for the federal authorities. For *railways* there is legal separation between network management and train operations, but both activities are tightly linked under a holding company owned by the federal authorities. Free entry is permitted in cross-border freight traffic. There are about five entrants, but most of them have not yet started operations.

Based on the information from a variety of sources, the impact of reform on the allocative and productive efficiency of the Belgian network industries has been explored. The exploration does not provide point estimates, but a margin within which the actual impact might reasonably lay. The potential influence of efficiency improvements on prices for the network industries' services has also been derived.

B. Allocative and productive efficiency

For the exploration of allocative and productive efficiency the focus has been on profitability and labour input. These are the two factors for which the most significant results can be achieved. The analysis starts from the respective columns of the 2000 Belgian input-output table (IOT), which are available for all five industries. Concerning these data, two points should be noted. Firstly, the cost categories as defined in an IOT might not correspond with the theoretical cost categories of the previous section. For example, the 'operating surplus' of the IOT might not be equal to the theoretical 'economic rent'. Nevertheless, the former has been used to approximate the latter. Secondly, for deriving the respective cost structures the diagonal elements of the intermediate costs have not been taken into account. These transactions are both output and purchases of the same industry, and would lead to double-counting in the cost structure.

There is a great deal of uncertainty about the impact on allocative efficiency. It is hard to indicate whether a high operating result demonstrates that there is a monopoly rent. Moreover, part of the monopoly rent may be transferred into labour costs when the monopolist's workers are in a strong bargaining position. The extent of this 'wage premium' is even harder to demonstrate than the monopoly rent itself. Therefore, relatively wide margins have been employed for the impact upon allocative efficiency. On the low end of the margin, it has in most cases been assumed that, despite market reform, no improvement of allocative efficiency can be achieved. The high end of the margin is different for each industry. Both the low and high ends of the margins are based on specific sources. It was, for example, argued by Coppens & Vivet (2006) that the high profitability of electricity generation might not be caused by monopoly rents but by the structure of the generation capacity. On the other hand, OECD (1997) shows that there were very large price differences for electricity and telecommunications between Belgium and the countries that had reformed their markets early. Table 2 gives the potential impact upon allocative efficiency.

Table 2 – Potential impact upon allocative efficiency in Belgian network industries

	Impact upon operating result		Impact upon unit wages	
	Low	High	Low	High
Electricity	0%	- 62.5%	- 15%	- 30%
Gas	0%	- 50%	- 15%	- 30%
Railways	0%	0%	0%	-12.5%
Postal services	0%	0%	0%	0%
Telecommunications	0%	- 100%	0%	- 30%
All goods industries	0%	- 5.2%		
All services industries	0%	- 2.8%		

Source: FPB.

In some industries operating surplus might fall by more than 50%, whereas wage premiums might be up to 30% of the average wages. For the railways and postal services, incumbents' profitability is already low, if not negative, so no impact upon profitability has been assumed. When weighted with all branches of the economy, the operating result of the manufacturing industries might fall by between 0% to about 5%, and the operating result of the services industries by between 0% to about 3%.

The analysis of wage premiums is based on the average level of education per industry. Average wages in electricity, gas and telecommunications are significantly higher than in industries with about the same percentage of workers with a polytechnic or academic education (see Table 3). For railways the difference is smaller. For postal services the average pay is even lower than the trend value.[3] The analysis of Table 3 does not yet prove the existence of wage premiums. On the one hand there may be other factors that determine the observed differences, and there has been no downward trend in average wages since market reform started in the late nineties. On the other hand wage premiums may be non-wage benefits such as civil servants' pension schemes; certain studies (*e.g.* Everaert & Schule, 2005) indeed suggest the incidence of wage premiums in Belgium and other countries. The potential impact is given in Table 2. At the low end it is assumed that there are no wage premiums, except for the energy industries where the labour cost differences with other industries are very large. At the high end the stylised impact as based on an analysis of Table 3.

Table 3 – Potential incidence of wage premiums in Belgian network industries, 2000

	Number of highly educated workers	Labour cost: average	Labour cost: trend value	Labour cost: difference	
Electricity & gas	41%	€ 85,116	€ 48,655	€ 36,461	43%
Railways	28%	€ 58,665	€ 43,410	€ 15,254	26%
Postal services	16%	€ 41,115	€ 35,931	€ 5,184	13%
Telecommunications	17%	€ 31,039	€ 36,157	- € 5,118	- 16%

Source: FPB.

Like the impact on allocative efficiency, the impact on productive efficiency has been derived from several sources, the most important of which were the incumbents' strategic plans and trends in the national accounts. The various sources gave rise to the adoption of margins, although less wide than those applied for allocative efficiency. The productivity improvements, in particular those laid down in the strategic plans, must be interpreted as attempts to defy increasing competition. The potential impact is given in Table 4.

In electricity generation there is already a high level of labour productivity in Belgium. The gain will thus probably be small and is most likely to be achieved in infrastructure activities. For railways and postal services, significant productivity improvements are presently being achieved. The sources for data on the impact are strategic plans, studies and 'rumours' from the market, but the margins

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[3] Logarithmic relationship between the percent of higher educated workers and average labour cost of 42 branches of the Belgian economy. See Van der Linden (2006) for further details.

between weak and strong impacts are not very wide. For telecommunications, the productivity improvement has taken place through the implementation of two strategic plans between 1998 and 2003, so there is no need to assume a margin around the impact of 10,450 jobs. The total impact could thus be between 23,950 and 36,200 lost jobs because of productivity improvements. In practice, however, part of this loss could be regained when reform leads to output growth. This latter phenomenon has in particular been observed in the telecommunications industry, where many of the 10,450 dismissed workers were able to be retrained for new jobs within the industry. When weighted with all branches of the economy, labour productivity in the manufacturing industries might increase between 0% and 0.45%, and labour productivity in the services industries between 0.95% and 1.45%.

Table 4 – Potential impact upon productive efficiency in Belgian network industries

	Impact upon industry employment		Period of impact
	Low	High	
Electricity & gas	0	- 3,750	2002 – 2006
Railways	- 5,000	- 10,000	2003 – 2007
Postal services	- 8,500	- 12,000	2003 – 2009
Telecommunications	- 10,450	- 10,450	1998 – 2003
Total network industries	- 23,950	- 36,200	
Impact upon labour productivity:			
All goods industries	0%	+ 0.45%	
All services industries	+ 0.95%	+ 1.45%	

Source: FPB.

The improved allocative and productive efficiency might give rise to a significant fall in prices. This impact has been derived using data from the 2000 Belgian input-output table. In each of the five network industries' cost structures, the coefficients for labour cost and operating surplus have been decreased according to analyses of Tables 2 and 4. The new column sums, which are smaller than 1, indicate the potential impact upon prices, which is given in Table 5.

Table 5 – Potential impact upon average prices in Belgian network industries

	Decrease of operating result[a] (min – max)	Decrease of labour cost[b] (min – max)	Decrease of average prices[c] (min – max)	Corrected price decrease (min – max)
Electricity	0 – 62.5%	15 – 43%	3 – 21%	3 – 21%
Gas	0 – 50%	15 – 30%	2 – 18%	1 – 6%
Railways	0%	12 – 34%	0%	0%
Postal services	0%	15 – 23%	9 – 13%	12 – 17%
Telecommunications	0 – 100%	23 – 46%	6 – 29%	6 – 29%

Source: FPB.
a) Taken from Table 2.
b) Combined impact of wage premiums and labour productivity.
c) Based on the industries as defined for the Belgian input-output table.
d) Gas: the price of gas itself included; postal services: courier services excluded.

For electricity the range between a weak and a strong impact on prices is rather wide (3-21%). This range, however, has been confirmed by several sources and certainly gives a useful order of magnitude, see Van der Linden (2006). For the gas industry, as defined for the input-output table, the impact is more or less in the same range (2-18%). However, the industry only includes the trade and distribution system. The gas itself is treated as merchandise. When the gas is included, the average end-user price might fall by only 1-6%. For railways no impact on prices is expected. Although labour cost might fall by 12-34%, it is reasonable to assume that these savings will be used to cover the operating losses, leaving the price unchanged. For postal services the impact might be 9-13%. However, the savings only concern national postal services, which constitute about 75% of the sector, and not courier services. The 9-13% impact upon the whole sector therefore implies an impact of 12-17% for national postal services alone. For telecommunications the range between a weak and a strong impact on prices is very wide (6-29%). However, there are indications that the actual impact is closer to the high end than the low end. For example, the incumbent has strongly decreased its prices for national and international fixed telephony, while leaving local prices more or less unchanged.

Via the impact upon prices, the efficiency improvements in network industries should enhance competitiveness. In Belgium, purchasing power should increase because the lower prices imply increases in real income and wealth. Abroad, import from and investment in Belgium (or the EU as a whole, since network industry reform happens at EU level) should become more attractive. However, one also has to take falling income into account because of the negative impact of the increase in productivity on employment.

IV. The macroeconomic impact of network industry reform in Belgium

Two simulations of the macroeconomic impact of network industry reform have been made: one with a macroeconometric model developed by the Federal Planning Bureau (FPB); the other with a general equilibrium model developed by the International Monetary Fund (IMF). Starting from the same input the models give very different outcomes. This is caused by some fundamental differences in the mechanisms on which the models are built. As neither of the models holds nonsensical mechanisms, it is actually enriching to have the two together. An approach using two different kinds of model thus seems useful in understanding the macroeconomic impact of network industry reform and other structural changes in the economy. Moreover, the outcomes have been put into perspective by comparing them to earlier research covering other countries and industries. The result of this latter exercise is given in the Annex to this paper.

A. A macroeconometric simulation: FPB's model HERMES

The model HERMES has been developed by the FPB to develop mid-term forecasts for the Belgian economy.[1] It is a detailed system of the interactions of the Belgian economy and is based on time series analysis. The model is demand driven, although there are also supply-driven elements. It is an inter-industry model with 16 branches. The interdependence among these branches is based on the 2000 input-output table. In the disaggregation of branches, goods and services there is a strong emphasis on the applicability to analyses of transport, energy and environment. The major exogenous variables are foreign economic performance and domestic policy instruments. This allows for analyses of the impact of, respectively, oil price increases (Bogaert *et al.*, 2006) and fiscal measures (Bassilière *et al.*, 2005). Further details are given in Bossier *et al.* (2000, 2004).

Given the nature of the exogenous variables, the analysis of network industry reform is less straightforward than the analyses given above. As shown in the previous section, the input consists of changes in operating result, wages and labour productivity, which are endogenous variables and model parameters in HERMES. Nevertheless a meaningful simulation has been made. For the impact of allocative efficiency the price/cost mark-ups for the following two of the 16 branches have been modified: energy and auxiliary transport services and communication. Furthermore, the price of labour has been modified for these same branches and also for railways. Regarding the impact of productive efficiency, there has been an autonomous decrease in employment in the three branches. Since HERMES is based on the situation of 2005, it was not possible to make a retrospective analysis and follow the periods given in Table 4. It was therefore assumed that the microeconomic impact will gradually become effective in ten years from 2006. Thereby note that there has been no sign of falling operating surplus or wage premiums during the first half of the present decade.

Table 6 gives the simulated macroeconomic impact after ten years of reform. The mid-term impact of reform on the economy is positive but small: GDP should be between 0.12% and 0.23% higher than it would be without reform. The positive impact is basically driven by exports. This is caused by improved competitiveness, since export prices should be 0.5% lower than they would have been without reform. The impact on consumption and investments is negative, but still very small. The three types of microeconomic impact each have their specific contribution to these outcomes.

The impact of eliminating wage premiums on economic activity is almost nil. Eliminating wage premiums leads to some substitution of labour for capital with hardly any impact on economic

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[1] HERMES = Harmonised Econometric Research for Modelling Economic Systems.

activity. This also puts the speculative analysis of the existence of wage premiums into perspective. The decrease of price/cost mark-ups has a relatively strong impact upon investments. Falling profitability would lead to a falling propensity to invest. The productivity increase should have a relatively strong impact upon consumption. The 24,000 to 36,000 workers hit by the increase would become dependent on social benefits and lose purchasing power.

Table 6 – Macroeconomic impact of market reform in Belgian network industries, based on a macroeconometric approach

Measure: % difference to the economic scenario without reform after 10 years	Maximum impact of:			Total: maximum impact	Total: minimum impact
	Price/cost mark-up	Wage premiums	Labour productivity		
G.D.P.	+ 0.05	- 0.00	+ 0.18	+ 0.23	+ 0.12
Private consumption	- 0.11	- 0.01	- 0.26	- 0.38	- 0.17
Public consumption	- 0.08	- 0.00	- 0.08	- 0.16	- 0.05
Investments	- 0.54	- 0.00	+ 0.13	- 0.41	+ 0.09
Exports	+ 0.13	+ 0.00	+ 0.18	+ 0.31	+ 0.12
Imports	- 0.08	- 0.00	- 0.09	- 0.17	- 0.06
Labour market:					
Labour productivity	+ 0.01	- 0.00	+ 0.56	+ 0.57	+ 0.37
Impact on employment	+ 0.03	+ 0.00	- 0.28	- 0.25	- 0.19
Number of jobs	*+ 1,350*	*0*	*- 12,600*	*- 11,250*	*- 8,400*
Wages & prices:					
Gross real wages	- 0.60	- 0.02	- 1.48	- 2.10	- 0.98
Consumption prices	- 0.70	- 0.00	- 1.31	- 2.00	- 0.87
Export prices	- 0.35	- 0.01	- 0.24	- 0.60	- 0.16

Source: FPB.

The impact upon employment is still negative after ten years. It varies between about 8,400 and 11,250 jobs. The decrease of price/cost mark-ups should have a positive impact of up to 1,350 jobs because of the improved competitiveness. The productivity increase should have a negative net impact between 8,400 and 12,600 jobs. This implies that after ten years a significant part of the original loss of 23,950 to 36,200 jobs should have been compensated for by the creation of jobs elsewhere in the economy. In other words, the productivity increase in the network industries might in ten years lead to the creation of between 15,550 and 23,600 jobs elsewhere in the economy.

The impact upon real wages and consumption prices should be about the same and should range between -1% and -2% compared to the price index without reform. Despite the falling prices, a negative impact upon purchasing power would be expected. This might be caused by the negative impact upon real incomes, caused by the increasing supply of labour.

In the first years after reform the negative impact would be strongest, whereas the positive impact would become stronger in a later stage. The maximum impact for GDP and the most important expenditures is given in Figure 2. During the first five years consumption and investments would rapidly fall behind the scenario without reform. They would then stabilise, while the impact upon exports would accelerate. This latter acceleration should have a positive impact on consumption and investments, where the negative impact would start to lessen after about eight years. It might, however, take a long time before they converge to the performance of the scenario without reform. For employment (not shown in Figure 2), a comparable time path should evolve. Initially, employment would rapidly fall behind the scenario without reform. After five to six years the negative impact should lessen because of the creation of new jobs elsewhere in the economy. There might even be a positive impact in the long term.

Figure 2 – Time path of the maximum macroeconomic impact, based on a macroeconometric approach
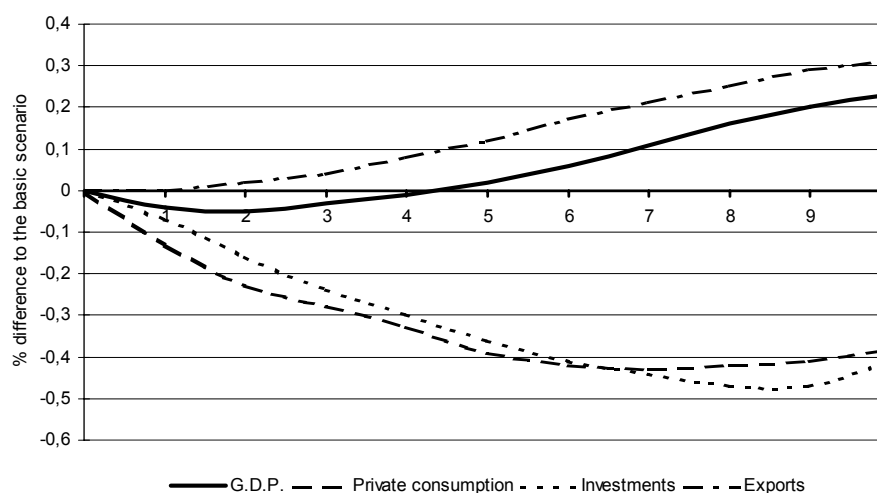
Source: FPB.

B. A general-equilibrium simulation: IMF's model GEM

The GEM model has been developed by the IMF to make policy analyses with an international dimension.[2] It is a general-equilibrium model based on microeconomic mechanisms. Based on utility and production functions and given price ratios, the optimal input of labour and capital is determined, as is the optimal combination of working time and leisure. There is imperfect competition in labour and product markets, which has been modelled by way of price/cost mark-ups. There also is nominal inertia in wages and prices, which is modelled by the introduction of adjustment periods. The stronger the inertia, the slower the adjustment to the steady state. It is not an inter-industry model. There only is a distinction between tradable and non-tradable commodities. These categories can more or less be associated with goods and services, respectively. The model can be calibrated for individual countries or groups of countries. A calibration for Belgium has been made by Everaert & Schule (2005). Further details on GEM are given in Bayoumi (2004) and Bayoumi *et al.* (2004).

For the analysis of the impact of network industry reform, two parameters have been modified: price/cost mark-ups and labour productivity. Both modifications were made for tradable and non-tradable commodities. The parameter changes have already been given in Tables 2 and 4 as aggregate microeconomic impact for goods and services industries, respectively. The impact upon operating result (Table 2) was transferred into an impact upon the price/cost mark-up.[3] As in the HERMES simulation, it has been assumed that the microeconomic impact gradually becomes effective. They are introduced into the model autoregressively. For the price/cost mark-up the period is five years, for labour productivity it is ten years. The economic actors, however, anticipate the changes in mark-ups and productivity. The simulation has given two types of outcome: one is the comparative static 'steady state', the other is a time path. The time path is created by introducing nominal inertia. Only in the very long term does it lead to convergence with the steady state. The outcomes in Table 7 are given as the difference to the scenario without reform in the steady state.

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[2] GEM = Global Economy Model.

[3] Technical note: The price/cost markups of GEM are significantly higher than the aggregate price/cost markups derived from the Belgian IOT. The absolute fall of the price/cost markups, as based on the IOT, has been applied to the GEM price/cost markups as a low-end input. The percentage fall has been applied to GEM as a high-end input.

Table 7 – **Macroeconomic impact of market reform in Belgian network industries, based on a general-equilibrium approach**

Measure: % difference to the economic scenario without reform in the steady state	Maximum impact of:		Total: maximum impact	Total: minimum impact
	Price/cost mark-up	Labour productivity		
G.D.P.	+ 1.13	+ 1.42	+ 2.55	+ 1.09
Private consumption	+ 1.11	+ 1.69	+ 2.84	+ 1.38
Capital stock	+ 1.74	+ 0.87	+ 2.61	+ 0.85
Hours worked	+ 1.08	+ 0.64	+ 1.72	+ 0.76
Number of jobs	*+ 48,600*	*+ 28,800*	*+ 77,400*	*+ 34,200*

Source: FPB.

According to the GEM simulation, the impact of network industry reform upon macroeconomic performance should be positive, relatively small, but significantly stronger than the performance predicted by HERMES. In the long term, GDP should be between 1.1% and 2.6% higher then it would have been without reform. The positive impact is essentially driven by falling prices, which make real income and purchasing power rise. Thus, demand for goods and services increases. This gives rise to increasing output and demand for labour and capital. When labour is scarce there might even be a further rise in real income. In the mid term the impact should be less strong than given in Table 7, but there already is a strong convergence to the steady state. The two types of microeconomic impact each have their specific contribution to the outcomes. The falling price/cost mark-ups should have a relatively strong impact upon the demand for labour and capital. As the partial analysis of price/cost mark-ups does not assume productivity change, the demand for labour and capital should increase proportionally to output. The productivity increase should have a relatively strong impact upon output and consumption. Table 7 clearly shows that this impact is stronger than the impact upon hours worked.

The impact upon employment seems impressive and should in the long term be between 34,200 and 77,400 jobs. Although this is a wide range, it shows that, contrary to the outcomes of HERMES, there could be a positive impact that amounts to tens of thousands of jobs. One might, however, wonder whether the employment loss of the network industries (23,950-36,200) should be subtracted. Although there are arguments for and against such a correction (see Van der Linden, 2006), it would still lead to a positive impact of between 10,250 and 41,200 jobs. Already in the mid term some tens of thousands of jobs would be created.

C. A discussion of the two approaches

As indicated in the introduction to this section, there are fundamental differences between HERMES and GEM, which may explain the differences between the outcomes. Moreover, on the basis of an analysis of the differences a judgement on the likelihood of which outcome would occur in reality can be made. Essential differences are:
1. a difference in the impact upon investments;
2. a difference in the impact upon consumption;
3. a difference in treatment of inter-industry relations;
4. a difference in adjustment mechanisms.

Concerning the impact upon investments, the outcome of HERMES is based on the observation that decreasing mark-ups reduce cash flows. This gives a negative incentive to invest. In contrast, GEM starts from the principle that falling prices lead to rising output and thus to rising demand for labour and capital. The latter reasoning seems attractive because an entrepreneur who faces rising demand but falling cash-flow may very well borrow to finance new investments. Moreover, foreign entrepreneurs might enter the market. Such mechanisms are absent in HERMES. Even so, HERMES, is based on an observed relationship between operating results and investments. Moreover, a relationship between demand and investment is not absent in HERMES, but only starts to predominate in the mid term (see Figure 2). Therefore, the performance predicted by HERMES seems more realistic

in the short and mid term, but there are reasons to assume that it is stronger than the 0.12% to 0.23% given in Table 6. Firstly the logic of borrowing cannot be fully denied. Secondly foreign entrepreneurs could be attracted, which has as indeed been observed in Belgian network industries during recent years. Moreover, the impact might become more positive when regulation is such that network industries retain an incentive to invest. According to Huveneers (2005) this could be achieved when the downward pressure on operating results and prices is not too strong.

Concerning the impact upon consumption, the outcome of HERMES is based on the observation that the same output will be produced by a smaller amount of workers. Therefore, an additional 24,000 to 36,000 persons may become dependent on social benefits and have a lower income to spend. In contrast, GEM starts from the principle that the productivity increase implies an increase in labour supply. The market mechanism would then lead to a new equilibrium without additional unemployment. In other words, more output will be produced by the same amount of workers and a negative impact upon consumption will fail to occur. Therefore, the performance predicted by HERMES seems more realistic, but there are reasons to assume that it is stronger than would seem from Table 6. In most network industries there is a structural trend that stagnates output and allows it to be achieved by fewer and fewer workers. For postal services it is the substitution of written communication with electronic communication. For electricity and gas it is the falling energy intensity of production and consumption, although gas networks may be rolled out further in certain countries. For railways it is the weak competitiveness with respect to other means of transport, although in some countries market reform seems to be improving the competitiveness of rail transport. Only for telecommunications has demand been rising since reform. In the rest of the economy it might take a long time to compensate for the negative impact upon employment, even more so because the adjustment mechanisms are rather sticky in Belgium.

Concerning the inter-industry dimension, HERMES distinguishes 16 branches, each with its own production function. The microeconomic impact for each network industry is branch-specific. Hence, by applying branch-specific production functions, a relatively precise calculation of the macroeconomic impact can be made. In GEM there is no inter-industry dimension, so all relationships are macroeconomic. This may lead to a less precise calculation of the macroeconomic impact.

Concerning the role of adjustment mechanisms, the outcome of HERMES is based on the wage and price rigidities that presently characterise the Belgian economy. One such rigidity is the system of wage indexation. In this system the evolution of wages is determined more by inflation and the evolution in neighbouring countries, than by demand and supply in the labour market. This may give rise to persistent disequilibria in the labour market. In GEM there also are rigidities, modelled by adjustment costs in product and labour markets. These rigidities delay, but do not hamper, the tendency towards market equilibrium in the long term. Hence, the performance predicted by GEM can only be achieved when wages and prices are more flexible in the long term than in the short term. On the one hand this observation has an institutional side: the mitigation of labour market regulation. On the other hand it has a behavioural side: the readiness to accept a job at less favourable working conditions. It may be clear that society is very sensitive to such mitigations. It would only be acceptable when flexibility is coupled with adequate social protection for employed and unemployed people.

Therefore, the impact predicted by HERMES seems to be more realistic in the short and mid term. In the short term a negative macroeconomic impact may be expected because of the negative microeconomic impact upon profitability and employment. In the mid term this negative impact may (partially) be compensated for because of improved competitiveness. From the predictions by GEM, however, two lessons may be drawn. Firstly, in the long term the structure and relationships of the Belgian economy could turn out to be more flexible than as they are modelled in HERMES. Secondly, an adequate framework for more flexible adjustment might be created. This framework could consist of the establishment of sufficient incentives to invest and more flexible adjustment mechanisms of product and labour markets. The impact might then move up to 2.5% of GDP and some tens of thousands of

jobs.

V.   Conclusion

Market opening and pro-competitive regulation of network industries would improve their economic efficiency. This would spill over into real income and competitiveness in the economy, but at the cost of profitability and employment in the network industries themselves. A basic policy issue is thus whether the beneficial impact upon the economy would be able to compensate for the losses for the network industries. This paper has prepared a projection for Belgium by applying two alternative modelling approaches.

The FPB's macroeconometric model HERMES clearly demonstrates the negative impact in the short term, which is followed by compensating forces in the mid term. After ten years GDP should be some 0.1% to 0.2% higher than it would have been were there no reform. Employment, however, would be roughly 10,000 jobs lower. An initial negative impact upon investments and consumption thus heavily weighs on the economy. One might even wonder whether this would ever be fully countered. The IMF's general-equilibrium model GEM gives a positive impact right from the genesis of reform. In steady state, GDP should be between 1.0% and 2.5% higher than it would have been were there no reform. Employment should be between roughly 35,000 and 75,000 jobs higher. Within ten or twenty years the major part of this performance should already have been achieved. The model builds on a tendency towards labour and product market clearing, taking account of an adjustment lag because of nominal price stickiness.

Both models thus give strongly different outcomes although they start from the same exogenous input. Given the thorough modelling of the behavioural and institutional relationships that characterise the Belgian economy the performance predicted by HERMES seems more realistic, at least in the short and mid term. The loss of profitability and employment initially lays a burden on the economy that needs a long time to be countered. However, the simulation by GEM shows that, despite stickiness, market forces could in the end lead to new equilibriums with higher output and employment. This has a behavioural and an institutional side. The behavioural side implies that investments may be attracted when demand-driven opportunities arise, and unemployed persons might accept new jobs at less favourable working conditions. The institutional side implies that flexible functioning markets smooth the adjustment process after an initial shock. An analysis using two different modelling approaches thus seems useful for understanding the economic forces empowered by network industry reform and other structural changes. The approaches are thus complementary rather than conflicting.

VI. References

Alesina, A., S. Ardagna, G. Nicoletti & F. Schiantarelli, 2003, *Regulation and Investment*. Economics Department Working Papers, No.352. OECD, Paris.

Armstrong, M., S. Cowan & J. Vickers, 1994, *Regulatory Reform: Economic Analysis and British Experience*. MIT Press, Cambridge.

Bassilière, D., F. Bossier, I. Bracke, I. Lebrun, L. Masure & P. Stockman, 2005, *Socialezekerheidsbijdrageverminderingen en alternatieve financiering van de sociale zekerheid: simulaties van beleidsvarianten*. Planning Paper Nr.97. Federaal Planbureau, Brussel.

Bayoumi, T., 2004, GEM: *a new international macroeconomic model*. Occasional Paper No.239, International Monetary Fund, Washington.

Bayoumi, T., D. Laxton & P. Pesenti, 2004, *Benefits and spillovers of greater competition in Europe: a macroeconomic assessment*. Working Paper Series, No.341, European Central Bank, Frankfurt am Main.

Bergman, L., C. Doyle, J. Gual, L. Hultkrantz, D. Neven, L.-H. Röller & L. Waterman, 1998, *Europe's Network Industries: Conflicting Priorities*. Centre for Economic Policy Research, London, and Center for Business and Policy Studies, Stockholm.

Bogaert, H., F. Bossier, I. Bracke & L. Dobbelaere, 2006, *Les conséquences économiques du choc pétrolier sur l'économie belge.* Working Paper No.1-06. Bureau fédéral du Plan, Bruxelles.

Bossier, F., I. Bracke, S. Gilis & F. Vanhorebeek, 2004, *Une nouvelle version du modèle HERMES / Een nieuwe versie van het HERMES-model*. Working Paper No.5-04, Bureau fédéral du Plan / Federaal Planbureau, Bruxelles / Brussel.

Bossier, F., I. Bracke, P. Stockman & F. Vanhorebeek, 2000, *A Description of the HERMES II Model for Belgium.* Working Paper No.5-00, Federal Planning Bureau, Brussels.

Boylaud, O., & G. Nicoletti, 2001, *Regulation, Market Structure and Performance in Telecommunications.* OECD Economic Studies, Vol.32, pp.99-142.

Commission of the European Communities (CEC), 2002, *Structural Reforms in Labour and Product Markets and Macroeconomic Performance in the EU. In European Commission*, European Economy, No.6/2002, pp.81-136.

Commission of the European Communities (CEC), 2004, *Horizontal Evaluation of the Performance of Network Industries Providing Services of General Economic Interest:* 2004 Report. Brussels.

Conway, P., V. Janod & G. Nicoletti, 2005, *Product market regulation in OECD countries: 1998 to 2003.* Economics Department Working Paper No.419. OECD, Paris.

Copenhagen Economics (CE), 2004, *Market Opening in Network Industries – Stage 1*. Mimeo, study made for the European Commission, Copenhagen.

Copenhagen Economics (CE), 2005, *Market Opening in Network Industries – Stage 2*. Mimeo, study made for the European Commission, Copenhagen.

Coppens, F., & D. Vivet, 2006, *The Single European Electricity Market: A Long Road to Convergence.* Working Paper No.84, National Bank of Belgium, Brussels.

European Central Bank (ECB), 2001/*Price Effects of Regulatory Reform in Selected Network Industries. Frankfurt am Main*

Everaert, L., & W. Schule, 2005, *Macroeconomic impact of labor and product market reforms*. Mimeo, International Monetary Fund, New York.

Frontier Economics (FE), 2002, *The Impact of Liberalisation on Efficiency: A Survey*. London.

Gönenç, R., M. Maher & G. Nicoletti, 2000, *The Implementation and Effects of Regulatory Reform: Past Experience and Current Issues.* Economics Department Working Papers, No.251. OECD, Paris.

Griffith, R., & R. Harrison, 2004, *The link between product market reform and macro-economic performance.* European Economy, No.209.

Huveneers, C., 2005, *Réforme du Marché de l'Electricité en Belgique: Leçons de l'Espagne, de l'Allemagne et de la Grande-Bretagne*. Working Paper No.9-05. Bureau fédéral du Plan, Bruxelles.

Ilzkovitz, F., R. Meiklejohn & U. Mogensen, 1999, *Liberalisation of Network Industries: Economic Implications and Main Policy Issues*. European Economy, No.4 1999.

Institut d'Économie Industrielle - Université des Sciences Sociales de Toulouse (IDEI), 1999, *Network Industries and Public Services*. European Economy, No.4 1999.

Laffont, J.-J., & J. Tirole, 2000, *Competition in Telecommunications*. MIT Press, Cambridge.

Newbery, D., 1999, *Privatization, Restructuring, and Regulation of Network Industries*. MIT Press, Cambridge.

Nicoletti, G., A. Bassanini, E. Ernst, S. Jean, P. Santiago & P. Swaim, 2001, *Product and Labour Markets Interactions in OECD Countries*. Economics Department Working Papers, No.312. OECD, Paris.

Nicoletti, G., & S. Scarpetta, 2003, *Regulation, Productivity and Growth: OECD Evidence*. Economics Department Working Papers, No.347. OECD, Paris.

Organisation of Economic Co-operation and Development (OECD), 1997, *The OECD Report on Regulatory Reform*. Paris.

Organisation of Economic Co-operation and Development (OECD), 1998, *Performance and Regulation Patterns in OECD Countries*. Mimeo, Paris.

Scarpetta, S., & T. Tressel, 2002, *Productivity and Convergence in a Panel of OECD Countries: Do Regulations and Institutions Matter?* Economics Department Working Papers, No.342. OECD, Paris.

Steiner, F., 2001, *Regulation, Industry Structure and Performance in the Electricity Supply Industry*. OECD Economic Studies, Vol.32, pp.143-182.

Van der Linden, J., 2005, *Markthervorming in Netwerkindustrieën in België / Réforme de Marché dans les Industries de Réseau en Belgique*. Planning Paper Nr.98. Federaal Planbureau / Bureau fédéral du Plan, Brussel / Bruxelles.

Van der Linden, J., 2006, *Hervorming van netwerkindustrieën in België: de macro-economische effecten.* Working Paper Nr., Federaal Planbureau, Brussel.

Annex: earlier research into the macroeconomic impact of network industry reform

Apart from the simulations presented in Section 3 of this paper, a judgment on the economic impact of network industry reform can be made on the basis of earlier studies. These earlier studies of course apply other assumptions, types of models, coverage of industries, and coverage of countries. Nevertheless, their outcomes can be a useful supplement to the simulations discussed in this paper. The impact upon GDP and employment of three notable studies is summarised in Table A1. The three studies first derive the microeconomic impact, and then use it as an input for a macroeconomic simulation. From the several variants and model runs a range between a maximum and a minimum impact can be derived.[4]

Table A1 – Macroeconomic impact derived from earlier research (maximum/minimum)

Measure: % difference to the economic scenario without reform in equilibrium	G.D.P.	Employment	Number of jobs (Belgium)
Copenhagen Economics: CETM	+ 4.7	+ 0.5	*+ 21,000*
	+ 1.8	+ 0.3	*+ 12,600*
EU: QUEST exercise	+ 1.9	+ 0.85	*+ 35,700*
	+ 0.6	+ 0.65	*+ 27,300*
OECD: Regulatory reform	+ 6.8	+ 2.0	*+ 84,000*
	+ 2.4	- 0.6	*- 25,200*

Sources: OECD (1997), CEC (2002), CE (2005) and FPB.

The analysis of the present paper is best covered by a recent study by Copenhagen Economics (2005) for the European Commission. This study covers the EU-15 member states individually, and two more network industries (aviation and local public transport). Firstly, the microeconomic impact is analysed econometrically. Secondly, the macroeconomic impact is analysed by the general-equilibrium model CETM. It was found that significant price decreases would be possible for railways, telecommunications and electricity. Significant labour productivity increases would be possible for telecommunications, while capital productivity increases would be possible for aviation. During 1990-2001 this should have led to an impact upon GDP of 1.8%, and upon employment of 0.3% (shown in Table A1 as the minimum impact). From 2002 onwards the impact upon GDP was predicted to strengthen to 4.7%, and upon employment to 0.5%. The GDP impact would thus be significantly higher than the impact given by GEM. The employment impact would be between the outcomes of HERMES and GEM.

The European Commission (2002) exercise with the macroeconometric model QUEST II results in a weaker impact upon GDP, but in a stronger impact upon employment. These results are for the EU as a whole, but in Table A1 the employment impact has been proportionally applied to the Belgian labour market in order to obtain an indication of the number of jobs involved. The authors emphasise the illustrative nature of the exercise. The minimum impact given in Table A1 is driven by a 0.5% decrease in the macroeconomic price/cost mark-up, which is quite close to the GEM input. For the maximum impact, the impact of an arbitrary 1% increase in total factor productivity (TFP) has been added. The mark-up change should thus have a relatively strong impact upon employment and the TFP change should have a relatively strong impact upon GDP. When the European impact upon employment is proportionally applied to the Belgian labour market, the impact would be around the low-end performance of GEM.

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[4]   The distinction between a maximum and a minimum impact is based on interpretation by the author of the present paper.

The coverage of the study by OECD (1997) is furthest away from the coverage of the present study. OECD (1997) analysed the impact of reform in telecommunications, electricity, aviation, road transport and retail trade in the following countries: the USA, UK, France, Germany and Japan. A detailed microeconomic analysis gave input for a simulation with the macroeconomic model INTERLINK. For each of the countries, five variants were analysed based on, for example, alternative assumptions about the interaction between product and labour markets. Table A1 gives the highest and lowest performance of the five variants for France and Germany (total ten variants), since reform and regulation in these countries most resembles the state of affairs in Belgium. This approach leads to very wide ranges between the maximum and minimum impact. Despite these wide margins the GDP impact should still be significantly higher than the impact given by GEM. When the impact upon employment is proportionally applied to the Belgian labour market, it covers the outcomes of both HERMES and GEM.