Seminar Paper

A Network Economic Approach to Cross-alpine Transit Traffic

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Tables and Figures

1. Introduction

One of the founding principles and aims of the European Economic Community is the common market for goods and services. Therefore the „four liberties“ aiming for the free flow of humans, products, services, and of capital and payments have been written down in the Article 7a of the EC-Treaty. One main purpose of the European Commission is to guarantee these liberties and to enforce an European dialogue among all members pulling down the still existing barriers.

The Alps are a barrier for the trade flows in the European Community. A mountainous geography, highly populated valleys, sensitive micro-climate, etc. conjure up (and amplify) a lot of negative externalities caused by transit traffic on the roads. New, innovative, and market near solutions should be developed soon in order to guarantee all people living in the Alps fair conditions of living and quality of life. It is evident that all member states of the European Union reap a lot of benefits. Nevertheless the current situation is suboptimal, respectively not sustainable (nor system-optimised).
The „Transit Treaty“[1] (a treaty under international law and incorporated into the „Acquis Communautaire“ in 1994/95[2]) aimed to reduce the cross-alpine transit traffic through Austria. But it is rather toothless, too bureaucratic, and the current commission doesn’t like it and obstructs their tasks – probably against law. Therefore Austria instituted several proceedings against the European Commission at the European Court of Justice (and vice versa). But the Court works slowly and in the meanwhile the population suffers along the roads. The Transit Treaty will run out in 2003, new negotiations already have been taking place, but the Austrian government lacks both ambition and feasible alternative proposals.

Network economics could deliver reasonable qualitative and quantitative arguments for a farsighted sustainable traffic network connecting Europe‘s most vivant regions of economic activity. My proposal is to establish an allocation regime of traffic flows based on the one hand on tradable permissions to use the cross-alpine links, giving incentives to use alternative links and modes of transportation, and on the other hand I propose internalising negative externalities by a flexible link toll policy.
A sustainable solution for the whole Alps would do best.

[1] Legal source: BGBl. Nr. 823/1992, Agreement between The Republic of Austria and the European Economic Community according to the transit traffic on railways and roads.

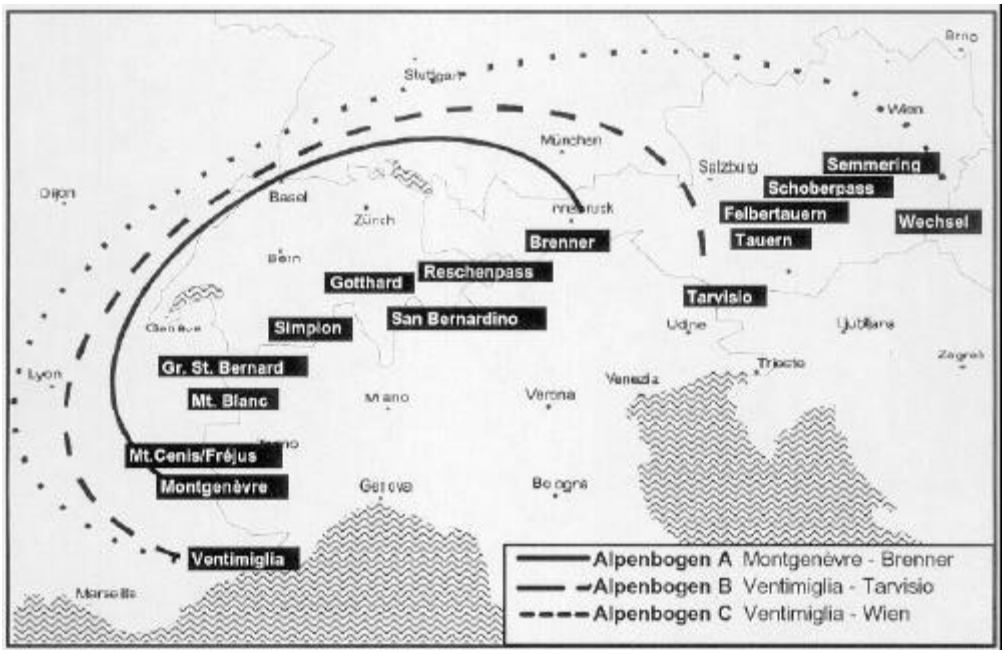
[2] Legal source: EC-Directive Nr. 3298/94

2. Status Quo

2.1 Descriptive Analysis

What are the links used for cross-alpine transportation?

Figure 1: Arc of the Alps from Ventimiglia to Vienna



There are 17 major links for the cross-alpin transportation which connect Europe‘s most vivant regions of economic activity.
Source: Bundesamt für Raumplanung, Verkehrskoordinatio (ed.) Alpinfo 1999, Bern 2002, p. 2
http://www.admin.ch/gvf/inhalte/grundlagen/gueter_g.html

The 17 major links for the cross-alpin transit traffic are:

- France: Ventimiglia, Montgenèvre, Mont-Cénis, Fréjus, Mont Blanc.
- Switzerland: Great St. Bernhard, Simplon, Gotthard, San Bernadino.
- Austria: Reschen, Brenner, Felbertauern, Tauern, Schoberpass, Semmering, Wechsel, and Tarvisio.

But the key connections crossing the arc of the alps are

- Gotthard and Simplon in Switzerland,
- Ventimiglia, Mt. Cènis, and Frèjus in France, and
- Brenner, Tauern and Semmering in Austria.

How big are the flows on the links and on the different modes ?

Table 1: Cross-alpine Flows of Goods on Roads and Railways, 1999[3]

	total flows, mio. tons			transit flows, mio tons			relative share in transit			**modal split**	
	road	railway	**total**	road	railway	**total**	road	railway	**total**	road	railway
France	40,2	10,2	**50,4**	16,5	3,2	**19,7**	31,7%	10,1%	23,5%	84%	16%
Switzerland	8,4	18,4	**26,8**	4,3	15,7	**20,0**	8,3%	49,7%	23,9%	21,5%	78,5%
Austria	58,8	27,7	**86,5**	31,3	12,7	**44,0**	60,1%	40,2%	52,6%	71%	29%
Arc of the Alps	107,4	56,3	**163,7**	52,1	31,6	**83,7**	100%	100%	100%	62%	38%

Source: Bundesamt für Raumplanung, Verkehrskoordination (ed.) Alpinfo 1999, Bern 2002, p. 1
http://www.admin.ch/gvf/inhalte/grundlagen/gueter_g.html

For almost 50 percent of the flows from and to Italy the shortest path would be through Switzerland. But bans and limits are massive constraints to hamper these flows and causing a lot of detouring traffic via the Austrian and French road links. Unbiased flows can be observed on the railway. From 31.6 million transit tons transported across the alps, 15.7 million tons flows through Switzerland, 12.7 million tons through Austria and the rest (3.2 millions tons) passed through France. (Alpinfo 1999, p.1)
The main burden of transit on the road was beard by Austria. 31.3 million tons of goods (60.2%) were carried through Austria in 1999, especially over the Brenner (23.3 million tons or 74.4% of the Austrian share). In France the link load amounted to 16.5 million tons and in Switzerland the transit link load was only 4.3 million tons. (Alpinfo 1999, p. 1)

The modal-split between road and railway equals 21:79 in favour of the “cleaner“ railway in Switzerland. In France (84:16) and Austria (71:29) the situation is just the other way round (Alpinfo 1999, p. 1).

The existing modal split is the consequence of a biased framework especially in Austria and France. Transportation costs on the roads are biased downwards because they do not reflect total social costs. Past transportation policies in Austria and France aimed to improve the road network. Average user link costs on the road network decreased which attracted more flows and lead to even more congestion. As a result we can diagnose a historical lock in of investments in favour of investments in the infrastructure of roads.
Another obstacle for the switching of modes were poorly developed logistic systems, which once caused longer travel time on the railway. But over the past decade the supply of logistics increased significantly both in quality and quantity (VCÖ, 1996).

[3] One can find the complete table in the appendix, table 5.1 at page 13.

The Federal Department of Traffic (Bundesamt für Verkehr) of Switzerland forecasts that the transit flows could double during the next decade (Herausforderungen 1999-2003, 1998, p.52; Friedeli, 1995, p. 54). The main reasons, discussed in the scientific literature, are the development of the European Union to an ever closer union, as well as the entry of new members into the European Union.

Before closing this section I want to give a closer look onto the Brenner (Tyrol).
The figures indicate an incredible increase of goods shipped over the Brenner over the last 40 years (Verkehrsbericht 1999, enclosure 32).[4] The flows have been mainly absorbed by the road.[5] The increase was bigger than all expectations. 1996 a forecast of the BMWuV (Austrian Federal Ministry of Science and Traffic) forecasted that the total amount of goods shipped over the Brenner would reach 25.14 million tons on the road and 10.32 million tons on the railway in the year 2005. In 1999, only three years later, those numbers turned out to be reality. (Molitor/Wiederin,1997, p.41)
On the Brenner the average annual growth rate of goods shipped on the roads was 7.88 percent for the period 1991 to 1999. This is equivalent to plus 63 percent over the entire period. (Verkehrsbericht 1999, p. 13)

We can conclude from this empirical data, that traffic network policies are a mighty tool. I will discuss this point and the underlying traffic network policy strategies more detailed in section 2.3. But all efforts to make the railway more attractive are in vain as long as cargo service providers calculate their offers at false (indirectly subsidised) prices.

[4] The quoted chart can be found in the appendix as Figure 5.3 at page 14.
[5] To proof this one may have a look on figure 5.2 depicted in the appendix at page 13.

2.2 Problems and Costs associated with the Transit Traffic

Total economic costs consist of (Sedlacek, 1994, p. 14ff):

- Direct costs of the vehicle (fixed, variable, economic depreciation)
- Infrastructure costs – building and repairing, safety, etc. – a current directive of the EU calls them „*Wegekosten*".
- Environmental costs – air pollution, ozone, noise, hazardous goods, ...
- Social costs – accidents, congestion, and side costs
- Other externalities – Radio time, landscape, ...

} externalities

Definition: "[...] an *externality* is present when the action of some economic agents affect the utility or production set of another without that person's consent or compensation." (Nagurney, 2000, p. 13)
This paper focuses especially on externalities caused by congestion and pollution.

The uncompensated impacts of these externalities are huge and serious. The European Law and the common policy of the European Union lack both – will and instruments to internalise at least a reasonable amount of these externalities. The „Wegekostenrichtlinie" (EC-directive) allows only the „Wegekosten" as a basis for national toll policies.

The inequality of private marginal costs versus social marginal costs leads to

- too cheap transportation costs which implies a bias in demand prices,
- too high demand for transport on roads,
- biased transportation costs for competing modes,
- more congestion on the roads,
- too much investment in the infrastructure of roads, too less for alternative modes of transportation.

The policymakers of Austria, France and Switzerland reacted rather differently to these economic and environmental challenges. The following section will give a condensated overview of the policy strategies actually implemented.

2.3 Policy instruments

France collects tolls on some links and introduced bureaucratic regulations. Since the catastrophe (24.3.1999) in the Mont Blanc Tunnel the awareness for the environmental impact of the transit is just awakening.

Switzerland was the first nation which evolves a traffic policy orientated on principles of sustainability. Switzerland cleverly limits the gross weight of trucks to 28 tons, which causes a lot of detouring traffic. The „Alpeninitiative", a mandatory direct-democratic decision of the population of Switzerland, bans a further expansion of the road network for transit purposes and recommends to enforce a modal switching to meet future transportation needs. (e.g. NEAT – new high speed transalpine railway net)

Austria collects tolls on some links, introduced a vignette for cars and trucks (flat fee) as well as bureaucratic regulations and a ban on some links. The heart of the Transit Treaty is the "Ökopunkteregelung" for transit flows and an additional absolute ceiling for transit flows.

Since 1.1.1993 the Transit Treaty[6] aims to reduce the environmental impact of the transit traffic on Austrian roads. The formal aim is the reduction of NOx Emissions of minus 60 percent from 1991 to 2003.
The instrument is rather "toothless" because the initial values have been fixed much too high. According to total emissions the actual aim won't be achieved. Of course, most trucks on Austrian roads use a better and cleaner technology today but a lot more trucks on the road are compensating the gains.[7]

The main source of nitrogen oxide emissions (NOx) are the trucks although cars have a much higher share of total flows. *„Die Auswirkungen des PKW-Verkehrs auf die NO-Belastung sind also insgesamt wesentlich geringer als die Auswirkungen des Straßengüterschwerverkehrs."* (Verkehrsbericht Tirol 1999, p.29)
In June 1999 the average utilisation of the highway A12 „Inntal Autobahn" at Vomp amounted to 51.200 vehicles. The total number consisted of 36.400 cars and buses (71%)

[6] Legal sources: BGBl. Nr. 823/1992, Agreement between the Republic of Austria and the European Economic Community according to the transit traffic on railways and roads, and the EC-Directive Nr. 3298/94.

[7] To proof this one may have a look onto figure 5.4 depicted in the appendix at page 15.

and 14.800 trucks (29%). The cars caused 23 percent of the total emissions of NOx but the trucks emitted 77 percent. (Verkehrsbericht Tirol 1999, p.29)

In 1999 an EC Directive imposed a new standard to protect citizens against too much NO_2 inhalation, precisely the ceiling has been fixed at 0.040 mg/m^3. For the same year the average annual value (0.062 mg/m^3) measured at Vomp (highway A12) exceeds this limit significantly. (Verkehrsbericht Tirol 1999, p.28)

Albeit the “White Book” of the Common European Policy promises the implementation and pursuit of strategies attaining environmental standards and sustainability, the concrete outcomes and legal norms (policies) torpedo these goals. In my perception the member states (and lobbies) of the European Union seem to agree rather fast on topics to force down barriers to the free flow of goods, especially on roads. Whereas decisions concerning the necesarry innovation of the institutional framework for the “free flow” seem to be delayed frequently. In the following section I will present the cornerstones of an alternative transportation network policy.

3. My Proposal

A farsighted and sustainable traffic policy should focus onto the following goals:

- A sustainable transportation network ought to enable efficient mobility of people and goods. According to network economic criteria the future equilibrium link load pattern should be both user-optimised and system-optimised.
- A sustainable transportation network must meet high environmental requirements which take specific regional circumstances into consideration. More precisely, I propose to introduce responsive mechanisms (bounds, bans, etc.) to guarantee a minimal level of quality of living and a ceiling for burdens caused through traffic on the roads.
- Finally this network should not only guarantee high quality of living, even more it can foster a common market without biased prices.

Transportation Network Economics could be a tool to help to reach these economic, environmental and social aims.

3.1 Road Pricing

Road pricing is not only a toll for congestion management but also a tool for environmental management. In this case it can be introduced to pursue the following two goals.

- The first goal refers to the internalisation of negative externalities. Road pricing ought to lead to sustainable system-optimised behaviour.
- The second goal reflects rather a precondition for a fair competition among different modes of transportation. Road pricing may reduce current biases of total marginal costs among different modes.

The concept of user-optimisation states that users act unilaterally, in their own self interest, in selecting their routes. The system-optimised flow pattern is one that minimises the total cost over the entire network. A toll policy can guarantee that the user-optimised flow pattern is also system-optimising. In the case of pollution tolls, as a variant of a Pigouvian tax, they can be imposed in order to make a system-optimising solution also user-optimising. Tolls serve as a means for modifying the travel cost as perceived by the individual travellers thus they are considered a powerful pricing policy instrument. (Nagurney, 2000, p.21)
This system-optimising economic-incentive instrument is a particular form of a pollution tax and aims to internalise the external costs imposed by the polluting source onto the victims. It is set equal to the marginal social damage at the optimal level of emissions. (Nagurney, 2000, p.35)
Different tolls reflect specific regional differences of the environmental impact of the transit on the roads.

I recommend implementing this kind of Pigouvian tax for all users of all links regardless whether it is transit or not. The current Transit Treaty distinguishes transit traffic from transports which have their origin or destination or both in Austria. But every truck causes environmental damage not only transit traffic.
But there is still an unsolved problem: How to determine the true costs, respectively the marginal social damage, precisely. The same holds for the determination of the optimal level of emissions.

The Austrian government has already taken some important steps in introducing a road pricing system. But lobbying and technical problems cause the introduction of the truck -

road pricing to be delayed.[8] Nevertheless this toll won't equal total social marginal costs per kilometre. It will incorporate the "Wegekosten" and an extra fee for future investments in the road infrastructure network.

3.2 Tradable permits for the usage of links in the case of transit

Tradable permits for the usage of links in the case of transit shall pursue a fiscal aim. The revenues collected should be used for infrastructure investments for alternative modes of transportation.

Justification: All members of the European Union profit from free trade and as a consequence all should contribute. Infrastructure projects should be financed partly through national budgets (Austria, France, Confederatio Helvetica, Germany, Italy), partly via the general EU-Budget[9]), and finally through revenues from annual IPO's[10] of permissions to use cross-alpine links for the purpose of transit.
Also, in order to meet both principles of taxation: The ability to pay principle (realized in the shape of negotiated contributions) as well as the principle of equivalence (The need for buying a permission is similar to a flat consumption tax).

Advantages of tradable permissions:
First of all it is a market near instrument.[11] Tradable permits implemented with a cleverly designed institutional framework will guarantee efficiency of allocation. For the IPO the Government fixes the total amount of permissions emitted for any period. This constitutes a flexible upper bound on link or path flows, which allows periodical adjustments according to new expertise and environmental quality requirements. Moreover it allows responding to traffic congestion and capacity constraints on roads and railways as well.

[8] More details can be found in the "Annual Report 2000" (ASFINAG) and in the law concerning the financing of federal state roads "Bundesstraßenfinanzierungsgesetz in der aktuellen Fassung" BGBl. I Nr. 142/2000 from 16.1.2001.

[9] The Common Policy already consists of a strategy to foster "Trans-European Networks" (TEN). Co-operation will be intensified in planning and financing of infrastructure investments, especially in the case of high speed and high capacity networks of transportation and communication.

[10] IPO is the abbreviation of Initial Public Offering which means the emission of new certificates, shares, bonds, etc. on the primary capital market.

[11] For a detailed discussion of pros and cons of tradable permits in this context I would recommend Eisner (1994). A rigorous theoretical application of Network Economics onto tradable permits gives Anna Nagurney (2000).

3.3 Beyond environmental considerations

I want to mention another consequence of the redistribution of flows in order to realise sustainability in the traffic network.

At last higher transportation costs will be translated in higher prices for consumers as we know from tax incidence analysis (Homburg, 2000) as well as from the Spatial Price Equilibrium Theory (Nagurney, 1999). This will result in fair conditions for competing goods on the common market. “Realistic“ social costs reflected in the demand prices may be an advantage for locally produced goods. It leads to reallocations, rethinking of spatial decisions in production, may give an incentive for moving closer to consumer-markets, which could slow down the driving force of increasing returns to scale. This coincides with the findings of the New Economic Geography literature.[12]

Therefore the introduction of an emission policy leads not only to a switching of paths and a switching onto different modes. Moreover it implies a reallocation of origins and destinations both in time and space, especially in the long run. The redistribution of transportation flows influences the spatial decision of several actors within the entire economic network – where to produce and live.[13]

4. Conclusion

The brave and farsighted decision of the population of Switzerland for the “Alpeninitiative” could be a beacon for hesitating European politicians. People are much more reasonable than populist usually concede. Data, facts and theoretical argumentation is overwhelming in favour of a new sustainable traffic network policy for the entire European Union. High growth rates in traffic and transportation force us to set a course now. We are to decide by which modes of transportation, and on which links, and at which costs the future load of goods (and people) would be shipped. This is really a challenging task, but quite of that kind the European Union is meant for.

If the redesigned framework won’t give a strong signal in favour of the railway (or other alternative modes) the pressure to expand the road network will inevitably grow - with all the negative effects I discussed above. But these “social“ costs are real costs, and won’t disappear even if we ignore them. The best way to handle negative externalities is just to avoid them.

[12] I am referring to Paul Krugman (1991, 1996, 1998), and Armin Schmutzler (1999).

[13] A consequence which is thoroughly discussed by Telkämper, Brückel and Molt (1995).

5. Appendix

Table 5.1: Cross-alpin Flows of Goods on Roads and Railways, 1999

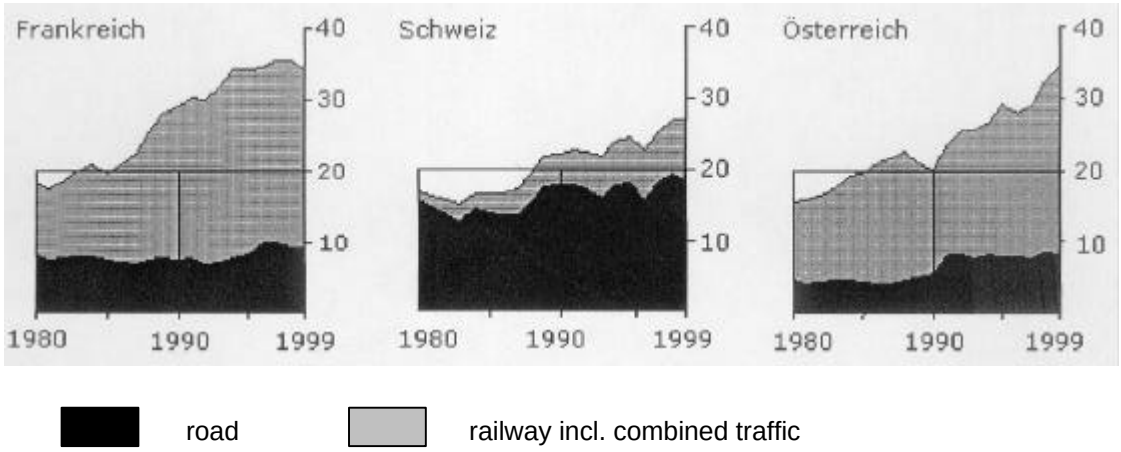
	total flows, mio. tons			transit flows, mio. tons			relative share in transit			modal split	
	road	railway	**total**	road	railway	**total**	road	railway	**total**	road	railway
France											
Ventimiglia	12,9	1,0	13,9	7,9	0,0	8,0	48,5%	1,5%	40,6%	99,4%	0,6%
Montgenèvre	1,6		1,6	0,4		0,4	2,4%	0,0%	2,0%		
Mont-Cénis		9,2	9,2		3,2	3,2	0,0%	98,2%	16,2%		
Fréjus	22,8		22,8	6,9		6,9	41,8%	0,0%	35,0%		
Mont Blanc	2,9		2,9	1,2		1,2	7,3%	0,0%	6,1%		
Switzerland							100%	100%	100%		
Gr. St. Bernhard	0,4		0,4	0,1		0,1	3,0%		0,7%		
Simplon	0,2	3,5	3,7	0,0	2,9	2,9	0,9%	18,5%	14,7%	1,4%	98,6%
Gotthard	7,0	14,9	21,9	3,9	12,8	16,7	90,7%	81,5%	83,5%	23,4%	76,6%
San Bernardino	0,8		0,8	0,2		0,2	5,3%		1,2%		
Austria							100%	100%	100%		
Reschen	1,2		1,2	0,7		0,7	2,2%		1,6%		
Brenner	25,2	8,3	33,5	23,3	7,7	31,0	74,4%	60,6%	70,5%	75,2%	24,8%
Felbertauern	0,7		0,7	0,0		0,0	0,0%	0,0%	0,0%		
Tauern	8,2	5,5	13,7	3,7	2,1	5,8	11,8%	16,5%	13,2%	63,9%	36,1%
Schoberpaß	11,2	4,6	15,8	2,1	0,1	2,1	6,6%	0,5%	4,8%	97,2%	2,8%
Semmering	4,0	9,3	13,3	0,1	2,9	3,0	0,3%	22,8%	6,8%	3,3%	96,7%
Wechsel	8,2	0,0	8,2	1,4	0,0	1,4	4,5%	0,0%	3,2%	100%	0%
Tarvisio	13,0	4,4	17,4	4,5	0,2	4,7				96,8%	3,2%
							100%	100%	100%		
France	40,2	10,2	**50,4**	16,5	3,2	**19,7**	31,7%	10,1%	**23,5%**	84%	16%
Switzerland	8,4	18,4	**26,8**	4,3	15,7	**20,0**	8,3%	49,7%	**23,9%**	21,5%	78,5%
Austria	58,8	27,7	**86,5**	31,3	12,7	**44,0**	60,1%	40,2%	**52,6%**	71%	29%
Arc of the Alps	107,4	56,3	**163,7**	52,1	31,6	**83,7**	100%	100%	**100%**	62%	38%

- As a result of the catastrophe in the Mont Blanc Tunnel (24.03.1999) the value is biased downwards heavily. The majority of the detouring traffic flows took the link over Fréjus.
- The Tauern Tunnel was closed between 31.05.1999 and 28.08.1999.
- The dark grey fields indicate that there exists no supply for this mode of transportation on that link.
- The Value 0.0 indicates that the amount of goods shipped was less than 0.05 million tons in 1999.
- The aggregated values of Austria exclude the link Tarvisio.
- The values for the modal split have been computed by the author.

Source: Bundesamt für Raumplanung, Verkehrskoordination (ed.) Alpinfo 1999, Bern 2002,
http://www.admin.ch/gvf/inhalte/grundlagen/gueter_g.html

Figure 5.1: Modal split of Cross-alpin Flows of Goods, 1980-1999

In million tons per year



France 1999:

For the three (!) links Mont Cénis, Fréjus and Mont Blanc the modal split between road and railway was 73% to 27%. The total amount of goods shipped was 34.9 million tons.

Switzerland 1999:

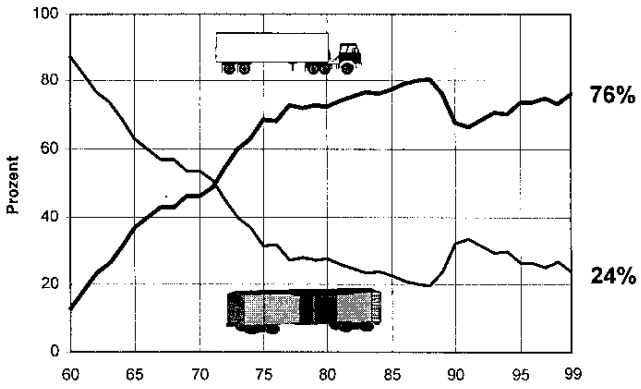
The modal split between road and railway was 21.5% to 78.7%. The total amount of goods shipped was 26.8 million tons.

Austria 1999:

For the two (!) links Brenner and Reschen the modal split between road and railway was 76.1% to 23.9%. The total amount of goods shipped reached 34.7 million tons.

Source: Bundesamt für Raumplanung, Verkehrskoordination (ed.) Alpinfo 1999, Bern 2002
http://www.admin.ch/gvf/inhalte/grundlagen/gueter_g.html

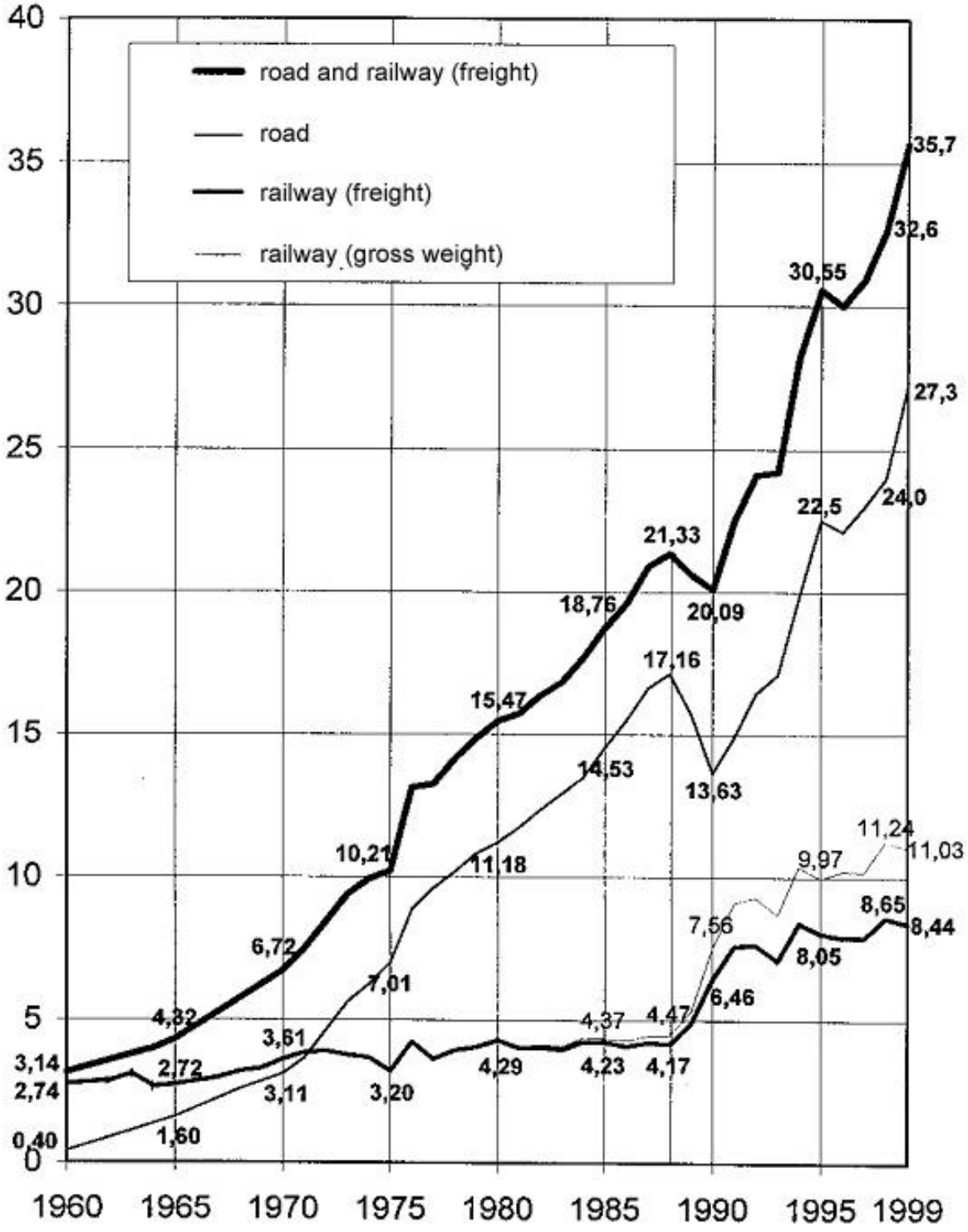
Figure 5.2: Modal split road/railway, Brenner 1960-1999



Source: Verkehrsbericht 1999 (2000)
ed.: Amt der Tiroler Landesregierung,
p. 39

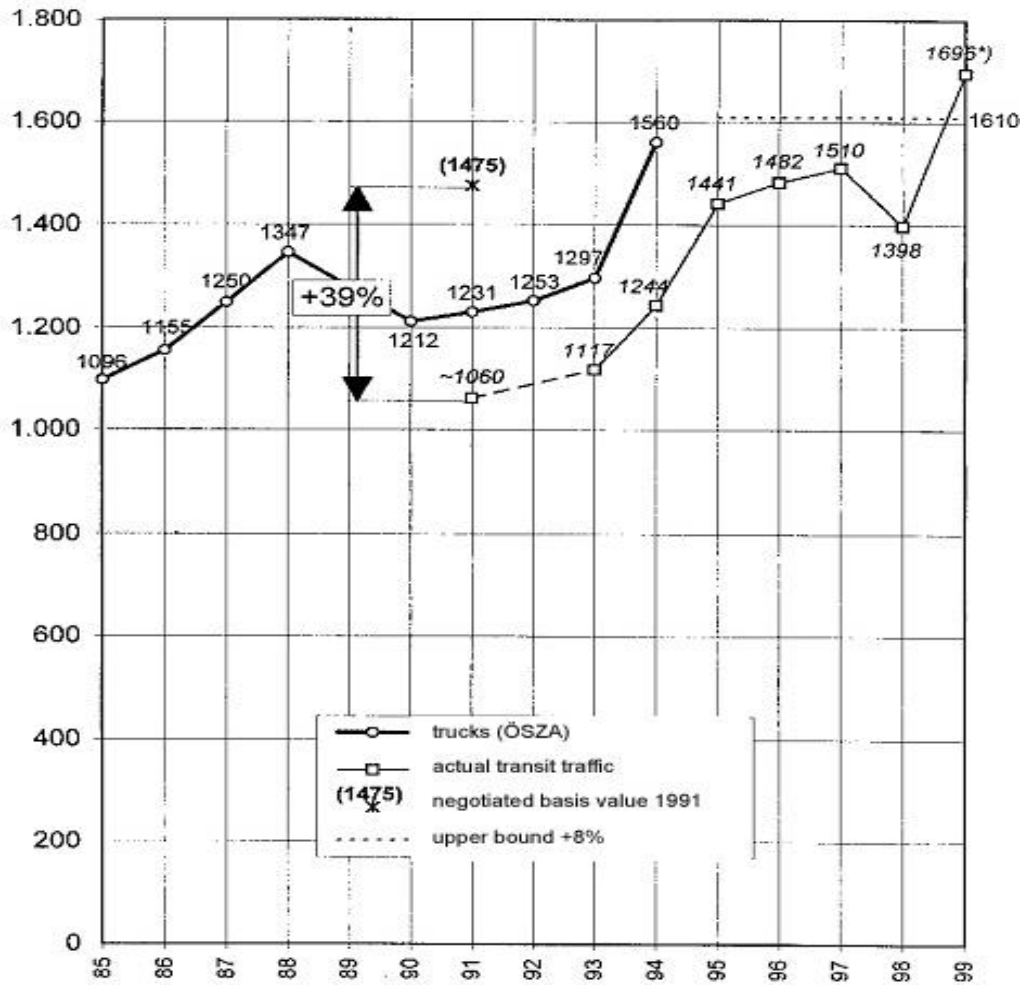
Figure 5.3: Transportation of Goods over the Brenner 1960-1999

In million tons per year



Source: Verkehrsbericht 1999 (2000) ed.: Amt der Tiroler Landesregierung, enclosure 32

Figure 5.4: Transit flows according to the legal norms of theTransit Treaty Austria 1985-1999, in thousand trucks per year



icht Source: Verkehrsbericht1999 (2000) ed.: Amt der Tiroler Landesregierung, enclosure 19

The aim of the Transit Treaty is to reduce nitrogen oxide (NOx) emissions, caused by the transit traffic through Austria, by 60 percent. The Republic of Austria and the European Community agreed on a basis value of NOx emission which was fixed equal to the total amount of NOx exhaustion of the transit traffic in 1991. Additionally, an upper bound for total annual transit flows was introduced at the level of 1991 plus eight percent. But the negotiated basis value exceeded the actual value by 39 percent, mostly because of biased forecast and massive lobbying. In 1999 this ceiling was broken through for the first time but the European Commission refused to reduce the „Ökopunkte“ (permissions). (EC Directive Nr.3298/94, and BGBl. 823/1992, especially Protocol 8, article 11)

6. References

Alpinfo 1999 (2002) ed.: Bundesamt für Raumplanung. Verkehrskoordination, Bern http://www.admin.ch/gvf/inhalte/grundlagen/gueter_g.html [May 2002]

Annual Report 2000 (2001) ed.: ASFINAG. Autobahnen und Schnellstraßen Finanzierungs-AG, Wien http://www.asfinag.at/GB_00_E.pdf [May 2002]

EISNER, Christian (1994) Finanzwirtschaftliche Aspekte der Verteilung von Emissionszertifikaten im Zusammenhang mit dem Transitvertrag, Innsbruck: *Universität Innsbruck*

ERHARD, Rudolf / SOUCEK, Branimir (ed.) (1989) Transit zwischen Überleben und Überrollen. Verkehr und Umwelt im Alpenraum, Thaur in Tirol: *Österreichischer Kulturverlag*

FRIEDELI, Max (1995) Transit durch die Schweiz: Was geschieht nach Annahme der Alpeninitiatve?, in: ZAHORKA, Hans-Jürgen / RAILE, Marcello (ed.) (1995) Zukunftsaspekte des Alpentransit: Kombinierter Verkehr Deutschland – Schweiz/Österreich – Italien, Sindelfingen: *Libertas*

Herausforderungen 1999-2003 (1998) ed.: Bundesamt für Statistik / Schweizerische Bundeskanzlei, Neuchatel and Bern

HOMBURG, Stefan (2000) Allgemeine Steuerlehre, Munich: Vahlen, 2nd Edition

KOCH, Helmut / LINDENBAUM, Hans (ed.) (1991) Überrolltes Österreich. Zukunft unter dem Transitvertrag, Wien: *Verlag für Gesellschaftskritik*

KRUGMAN, P. (1991), Increasing Returns and Economic Geography, *Journal of Political Economy*, vol. 99, no. 3, pp. 483-499

KRUGMAN, P. (1996), How the Economy Organizes Itself in Space: A Survey of the New Economic Geography, A Working Paper for the SFI Economics Research Program, Santa Fe Institute

KRUGMAN, P. (1998), What's new about the New Economic Geography? *Oxford Review of Economic Policy*, vol. 14, no. 2, pp. 7-17

MOLITOR, Romain / WIEDERIN, Stefan (1997) Forschungsarbeiten aus dem Verkehrswesen: Güterverkehr in den Alpen (Endbericht), Wien: *Bundesministerium für Wissenschaft und Verkehr BMWuV*, Band 73

NAGURNEY, Anna (1999) Network economics. A variational inequality approach, Boston, Mass.: Kluwer Academic Publ., 2. ed.

NAGURNEY, Anna (2000) Sustainable transportation networks, Cheltenham: Elgar

SCHMUTZLER, A. (1999), The New Economic Geography, *Journal of Economic Surveys*, vol. 13, no. 4, pp. 355-379

SEDLACEK, Sabine (1994) Der Gütertransit am Beispiel der Inntal-Brenner-Route. Ein systemtheoretischer Ansatz zur Simulation der modalen Aufteilung, Seibersdorf (Austria): *Österreichische Forschungszentrum Seibersdorf*, Nr. 4716,

TELKÄMPER, Wilfried / BRÜCKL, Stephan / MOLT, Walter (ed.) (1995) SLOW: Nachhaltiges Wirtschaften, Verkehrsvermeidung und Entschleunigung – eine alternative Perspektive für Europa, Augsburg: *Süddeutsches Institut für nachhaltiges Wirtschaften und Öko-Logistik*

VCÖ Verkehrclub Österreich (ed.) (1996) Alpentransit – Güterzüge statt LKW-Kolonnen, Wien: *Wissenschaft und Verkehr*, Vol. 1

Verkehrsbericht 1999 (2000) ed.: Amt der Tiroler Landesregierung, Abteilung Gesamtverkehrsplanung, Innsbruck (March 2000)

ZAHORKA, Hans-Jürgen / RAILE, Marcello (ed.) (1995) Zukunftsaspekte des Alpentransit: Kombinierter Verkehr Deutschland – Schweiz/Österreich – Italien, Sindelfingen: *Libertas*, (Deutsch-italienische Schriftenreihe Recht und Wirtschaft; Heft 1)

7. Internet Resources

ASFINAG (Autobahn und Schnellstraßen Finanzierungs-AG)

www.asfinag.at

Austrian Bureau of Statistics (Statistik Austria)

www.statistik-austria.at

Austrian Institute of Economic Research (Wirtschaftsforschungsinstitut Österreich)

www.wifo.ac.at

Databank for Austrian and European Law (Rechtsinformationssystem)

www.ris.bka.gv.at

Department of the Tyrolean Government (Amt der Tiroler Landesregierung)

www.tirol.gv.at/verkehr

Federal Department of Traffic of Switzerland (Bundesamt für Verkehr)

www.admin.ch/gvf

Organisation of Economic Co-operation and Development

www.oecd.org