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Coordination of public expenditure in transport infrastructure: analysis and policy perspectives for Latin America

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Abstract

Multinational transport infrastructure (MTI) projects are fraught with coordination issues. This paper contributes by identifying the key issues necessary for effective MTI coordination, analyzing them using economic theory and putting them into perspective within the framework of major ongoing coordination efforts for MTI in Europe and Latin America. Specifically, this paper carries out the following. First, after mentioning the importance of transport infrastructure for growth and integration, we describe the characteristics of transport networks that make coordination essential. Second, we motivate the need for public funding of MTI projects. Third, we analyze interaction between countries in MTI projects using game theory, highlighting how coordination problems arise in both static and dynamic settings, focusing on the Stag Hunt and iterative-move coordination games under perfect information. Fourth, we evaluate the experience of the Trans-European Transport Networks (TEN-T), a key element of European transport policy, trying to identify lessons that might be useful for ongoing coordination efforts in Latin America. Fifth, we review the Initiative for the Integration of Regional Infrastructure in South America (IIRSA), describing how it works and how it has contributed to coordination of MTI projects. Sixth, we present policy implications derived from our analysis of economic theory and both the European and South American coordination experiences, specifically proposing how the coordination solutions that have been put in place in IIRSA could be improved through better evaluation and selection of MTI projects, measures aimed at easing the binding financial constraints, and closer coordination between governments. Finally, we conclude with a discussion that brings together the main results and implications of the paper, and suggests avenues for future work.

I.   Introduction

Regional integration efforts in Latin America have a long history. However, after the wave of agreements which delivered an increase in intra-regional trade in the 90's, integration efforts in the region have lost momentum.

These days, the perceived attractiveness of regional integration efforts based only on trade preferences towards members has decreased. First, Latin America lowered its trade protection significantly during the 90's (IADB, 2000), reducing the margins of preference vis-à-vis regional partners. Second, several Latin American countries have signed bilateral trade deals with the United States (e.g. Chile, Colombia, Peru) and others, thereby reducing the importance of preferences within sub-regional groupings like the Andean Community. Third, China has emerged as a manufacturing powerhouse of increased importance as a low-cost supplier of manufactured goods to the world, putting major pressure on countries exporting goods, especially those with significant labour contents. All these reasons, among others, have made it exceedingly important for Latin American countries to look beyond trade preferences to fully grasp the advantages of regional integration: increased competitiveness via real productivity gains and reduction in costs.

Regional integration has the potential to spur growth by harnessing economic gains that can come from coordination between countries, with the purpose of taking advantage of the externalities involved in mutual interaction among countries of a sub-region. Previous research on policy coordination in Latin America, while

focusing on monetary policy, fiscal policy and exchange rate issues (e.g. Ghymers, 2005, Sanchez-Gómez, 2006), has succeeded in identifying the need for and advances so far on the institutional side of macroeconomic coordination initiatives. However, concrete identification of areas where coordination is taking place and where deeper analysis is necessary has been largely missing in the literature.

The analysis of potential fiscal policy coordination requires special attention, since coordinating public expenditure at the sub-regional level in Latin America presents severe challenges. This occurs because a significant amount of Central Government expenditure is allocated to items like wages, social security transfers, interest on public debt and transfers to sub-national levels of government; items that are generally inflexible (at least, downwards) and thereby difficult to coordinate with other countries, even if there is the political will to do so. For example, Almeida, Gallardo and Tomaselli (2006) find that 92% of the budget of the Central Government in Ecuador can be considered inflexible, and that the lack of flexibility is made even worse due to the existence of significant revenues (such as earmarked taxes) and expenditures that are not registered in the budget. Therefore, if there is to be coordination of fiscal expenditure, necessarily it has to apply to its "flexible" part, namely, the expenditure in public capital formation. This leads to our interest in this paper in analysing coordination of public expenditure in transport infrastructure at the sub-regional level in Latin America. Within capital expenditure, investment in transport infrastructure constitutes a non-negligible part of the total. Moreover, transport infrastructure facilitates deep integration and can help to spur growth in Latin America's sub-regional groupings.

But policy coordination among countries is a complicated and analytically challenging process (Cárcamo-Díaz, 2005). As we will show in this paper, the rationale behind the need for actively coordinating public investment in transport infrastructure rests on the fact that this aspect of fiscal policy has all the ingredients needed for coordination failure to occur: spillovers, strategic complementarities, uncertainty and a dynamic framework. In particular, public finance has a key role to play in funding multinational transport infrastructure (from now on, MTI). This occurs because MTI presents network externalities and other spillovers which are difficult to measure and capture by private firms investing independently in different parts of a network. Therefore, private firms investing in one country might not find it profitable to invest enough in interconnection if they cannot capture (as revenue) a sufficient amount of the increased welfare derived from it.[1]

In recent years the European Union has made headways in the direction of fostering an institutional approach to coordination of investment in transport infrastructure, aiming at using the existence of a supranational institution like the European Commission as a tool for catalysing cooperation among national authorities[2] in the area. In this paper, we will briefly review that experience, trying to grasp what policy implications emerge for Latin America, especially in terms of mechanisms for fostering coordination.

Finally, in the last few years the "Initiative for the Integration of Regional Infrastructure in South America" (IIRSA) has introduced elements to institutionalise cooperation in the area. We will review and analyse the public expenditure coordination aspects of that initiative,[3] with three aims. First, we will interpret how its contribution to policy coordination in South America fits the theory of coordination; second, we will make proposals that, taking stock of our analysis of the

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[1] One example of a way of capturing this value of interconnection in telecommunications (another network industry) is the "termination" charges that mobile phone companies charge when a customer calls somebody who is subscribed to another network.

[2] Even though a supranational entity can contribute significantly to coordination, it requires the countries to be willing to coordinate. As Short and Kopp (2005) put it: "*The supranational level has no authority to impose a 'top-down' vision and this largely explains why international planning at present is more of a bottom-up bargaining process than an analytical planning one. Within a Europe of nation states, international planning will remain a matter of cooperation based on mutual interest*" pp. 364.

[3] However, we will not address the related issues of regulation, standard-setting, and all the other institutional dimensions of networks that can significantly affect the private and social value of investments in them.

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European experience, may contribute to the strengthening of IIRSA's role in coordination; and third, we will put forward a series of proposals so that investment in transport infrastructure can be coordinated within the region, especially given the key role that public funding has for multinational projects in that area. The paper concludes with a discussion that brings together the motivation for the paper, the theoretical analysis, the findings about both the trans-European Transport Networks (TEN-T) and IIRSA coordination experiences and the policy implications that emerge.

II. The importance of regional transport infrastructure

Infrastructure, defined as the set of engineering structures, equipment and facilities with a long-term useful life employed by households and the different productive sectors of the economy (IADB, 2000), is essential for economic growth (Easterly and Servén, 2003) and integration. As pointed out by IADB (2002), there is a positive relationship across countries between income levels and the quality of infrastructure. According to Tanzi (2005), the implicit assumption about the direction of causation goes from infrastructure to growth, although this issue is still debated in the literature.[4] Investment in cross-border transport infrastructure in Europe has been credited with the establishment of a true pan-European market, linking peripheral regions to the core of the EU, opening up the European market to accession countries, and in general, fostering social cohesion and job-creation (PriceWaterhouseCoopers, 2004).

The argument in favour of increasing investment in transport infrastructure (both domestic and cross-border) to reduce trade costs is one of the most recurring in the literature (e.g. Fujimura 2004). In developing countries, lack of adequate infrastructure explains at least 40 percent of transport costs (IADB, 2002), something that would indicate the need for improving the quantity and quality of infrastructure available in order to foster value-added trade. Additionally, Tanzi (2005) lists the following benefits conveyed by investment in transport infrastructure: it raises welfare by saving time and facilitating contacts and movements, it enlarges the size.

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[4] For example, see IMF (2004) for a list of econometric studies conducted on the subject, their methodologies and results.

of labour, goods, and services markets by reducing transport and communication costs, and it allows the exploitation of economies of scale, as agents can choose with more freedom where to locate.

Deficiencies in infrastructure negatively affect exchanges with neighbours and the rest of the world. The role of MTI is very important for "deep integration" within Latin American sub-regions like the Andean Community and for each sub-region's capacity to attract Foreign Direct Investment aimed at serving the regional market and being integrated in global production and supply networks. As trade between neighbouring countries grows, the demands placed on the transport infrastructure connecting supply and demand in different countries also grows, and therefore a natural evolution of deepening regional integration normally leads to greater needs for investment in transport infrastructure serving the region. In most of Latin America, where geography requires infrastructure to deal with vast territorial expanses and topographic features such as mountain ranges, forests, swamps, rivers, and other natural obstacles to the movement of goods, investment in transport infrastructure is particularly important. An additional challenge comes from the density of population. Table 1 shows that South America has a population density of 22 inhabitants per square kilometre, while in the European Union the density is much higher: 119 inhabitants per square kilometre. As population density and the economic benefits of infrastructure are related, this gives an indication of the challenges faced by MTI projects in Latin America.

SURFACE AREA, POPULATION AND POPULATION DENSITIES IN SOUTH AMERICA AND THE EU

| Country	Land Surface (Sq.Km)	Population	Population per sq.Km
South America	**17 432 050**	**374 823 000**	**22**
Ecuador	276 840	13 228 000	48
Colombia	1 038 700	45 600 000	44
Rep.Bol.Venezuela	882 050	26 577 000	30
Brazil	8 459 420	186 405 000	22
Peru	1 280 000	27 968 000	22
Chile	748 800	16 295 000	22
Uruguay	175 020	3 463 000	20
Paraguay	397 300	6 158 000	15
Argentina	2 736 690	38 747 000	14
Bolivia	1 084 380	9 182 000	8
Guyana	196 850	751 000	4
Suriname	156 000	449 000	3
European Union (25)	**3 850 640**	**459 376 000**	**119**
Malta	320	404 000	1 263
Netherlands	33 880	16 329 000	482
Belgium	30 280	10 471 000	346
United Kingdom	241 930	60 203 000	249
Germany	348 950	82 485 000	236
Italy	294 110	57 471 000	195
Luxemburg	2 590	457 000	176
Czech Republic	77 270	10 196 000	132
Denmark	42 430	5 418 000	128
Poland	306 240	38 165 000	125
Portugal	91 500	10 557 000	115
Slovakia	48 080	5 387 000	112
France	550 100	60 743 000	110
Hungary	92 090	10 088 000	110
Austria	82 450	8 211 000	100
Slovenia	20 140	1 998 000	99
Cyprus	9 240	835 000	90
Spain	499 210	43 389 000	87
Greece	128 900	11 089 000	86
Ireland	68 890	4 151 000	60
Lithuania	62 680	3 415 000	54
Latvia	62 050	2 300 000	37
Estonia	42 390	1 345 000	32
Sweden	410 330	9 024 000	22
Finland	304 590	5 245 000	17

Source: Authors' elaboration based on World Bank World Development Indicators and CIA World Factbook.

However, trading with neighbouring countries is neither the only nor always the main justification for investment in regional infrastructure. Such investment is also the key to open up trade with overseas

markets. Such a factor has already been considered by the European Union in its analysis of the importance

of trans-European transport infrastructure, but in the case of Latin America it might be even more important. For historical reasons (which reflect a degree of path-dependence in transport investment), the infrastructure of many Latin American countries was designed and built to transport primary goods from the interior of the country towards seaside (or inland waterway) ports, in order to export those resources to overseas markets in the United States and Europe. For example, the share of trade of the Andean Community with the US and Europe remains high to this day, accounting for 50% of total commercial flows in 2003, and the relative importance of these trade partners is much greater for certain goods. In this paper, we will refer to the case of the Andean Community when providing examples about Latin America, as the former has the most developed institutional framework of all the integration efforts in Latin America.

Figure 1
GLOBAL TRADE OF THE ANDEAN COMMUNITY BY TECHNOLOGY INTENSIVENESS (1992 AND 2003)
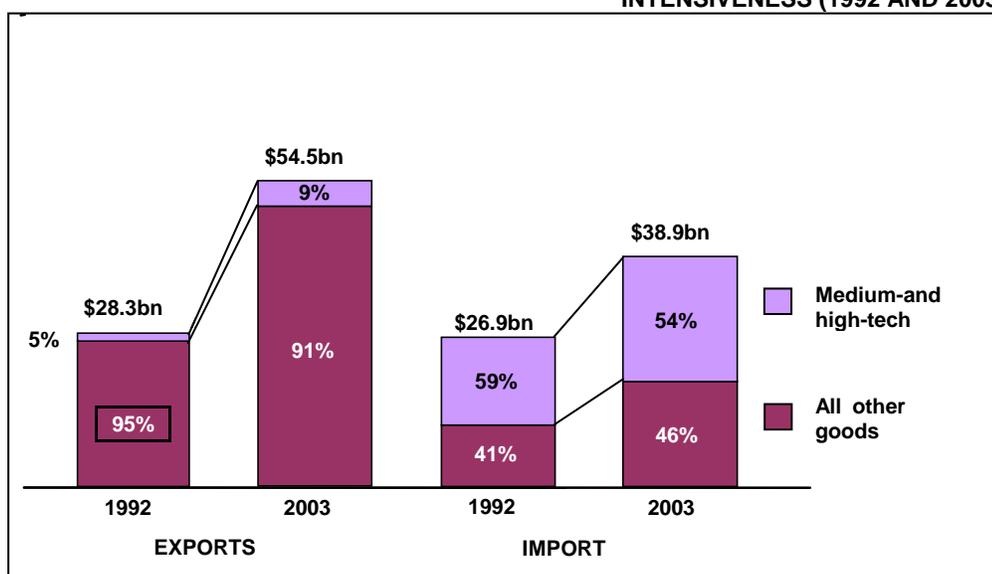
Source: Authors' elaboration using ECLAC data.

In the last two decades, commercial exchanges in the Andean Community show several trends, which tend to both reinforce established trade patterns, putting pressure on existing infrastructures, and create demands for transport links to serve new markets. Overall, the Andean Community has experienced a rapid expansion in trade volumes, as shown in Tables 2 and 3. In a period characterised by higher-than-average global growth, the exports from the Andean Community (including Venezuela)[5] doubled in level, climbing from 28.3 billion USD in 1992 to 54.5 billion USD in 2003, meaning they increased from 17.1% to 20.9% of GDP. Imports rose from 26.9 to 38.9 billion USD in the same ten-year period, which as a percentage of GDP translates in a reduction from a level of 16.3% to 14.9%. Trade "quality", as measured by the proportion of medium- and high-technology products in total trade, remains unchanged, with a value of 30% in 1992 and 28% in 2003. It is worth mentioning that the quality of exports improves over this period, rising from 5% to 9%, whereas the quality of imports decreases from 59% to 54%, which is a positive development in terms of innovation and technological absorption.

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[5]   Venezuela was a member of the Andean Community of Nations until it denounced the Cartagena Accord on April 22nd, 2006.

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Table 2

ANDEAN COMMUNITY + VENEZUELA: COMPOSITION OF TRADE IN GOODS ACCORDING TO COUNTRY OF ORIGIN, COUNTRY OF DESTINATION,AND PRODUCT CLASSIFICATION (1992)

(in thousands of US dollars and percentages)

	Region		United States		European Union		Asia Pacific -10		China		Japan		Other countries		The world	
	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%
Exports																
Primary Products	2 180 676	*38.3*	7 454 266	*58.6*	3 696 899	*72.2*	574 784	*67.6*	250 952	*97.4*	390 024	*42.7*	1 785 168	*64.4*	16 332 769	*57.7*
Industrial Goods	3 425 161	*60.2*	5 170 747	*40.7*	1 317 822	*25.7*	274 121	*32.3*	6 812	*2.6*	523 205	*57.2*	907 135	*32.7*	11 625 003	*41.1*
Based on natural resources	1 577 822	*27.7*	4 150 758	*32.6*	880 500	*17.2*	204 827	*24.1*	4 258	*1.7*	492 344	*53.9*	773 301	*27.9*	8 083 811	*28.5*
Low technology	877 164	*15.4*	729 666	*5.7*	275 360	*5.4*	32 799	*3.9*	287	*0.1*	15 345	*1.7*	94 924	*3.4*	2 025 545	*7.2*
Medium technology	872 928	*15.3*	261 875	*2.1*	156 623	*3.1*	35 907	*4.2*	2 246	*0.9*	15 403	*1.7*	34 081	*1.2*	1 379 064	*4.9*
High technology	97 247	*1.7*	28 447	*0.2*	5 340	*0.1*	588	*0.1*	20	*0.0*	113	*0.0*	4 829	*0.2*	136 584	*0.5*
Other Transactions	83 736	*1.5*	88 422	*0.7*	107 074	*2.1*	1 080	*0.1*	0	*0.0*	1 009	*0.1*	79 238	*2.9*	360 559	*1.3*
Total	5 689 573	*100.0*	12 713 435	*100.0*	5 121 795	*100.0*	849 985	*100.0*	257 764	*100.0*	914 238	*100.0*	2 771 541	*100.0*	28 318 330	*100.0*
Imports																
Primary Products	983 231	*16.8*	856 264	*8.1*	226 176	*4.1*	177 782	*19.8*	1 151	*1.8*	2 427	*0.1*	386 148	*22.1*	2 633 179	*9.8*
Industrial Goods	4 814 625	*82.1*	9 590 809	*91.1*	5 143 383	*92.9*	717 387	*79.8*	63 590	*98.1*	2 151 359	*93.2*	1 351 580	*77.5*	23 832 732	*88.4*
Based on natural resources	1 755 794	*30.0*	1 762 188	*16.7*	1 007 513	*18.2*	74 713	*8.3*	21 550	*33.2*	70 147	*3.0*	509 896	*29.2*	5 201 801	*19.3*
Low technology	979 450	*16.7*	787 390	*7.5*	536 196	*9.7*	218 049	*24.3*	20 033	*30.9*	126 107	*5.5*	144 108	*8.3*	2 811 332	*10.4*
Medium technology	1 789 935	*30.5*	5 524 646	*52.5*	2 665 908	*48.1*	317 751	*35.4*	16 448	*25.4*	1 598 562	*69.3*	515 442	*29.6*	12 428 692	*46.1*
High technology	289 447	*4.9*	1 516 585	*14.4*	933 766	*16.9*	106 874	*11.9*	5 559	*8.6*	356 543	*15.5*	182 134	*10.4*	3 390 908	*12.6*
Other Transactions	64 525	*1.1*	83 172	*0.8*	169 205	*3.1*	3 280	*0.4*	84	*0.1*	153 887	*6.7*	6 046	*0.3*	480 199	*1.8*
Total	5 862 381	*100.0*	10 530 245	*100.0*	5 538 765	*100.0*	898 449	*100.0*	64 825	*100.0*	2 307 673	*100.0*	1 743 773	*100.0*	26 946 111	*100.0*

Source: Based on official figures.

Note: Products classified according to the incorporate technological intensity (CUCI Rev.2). The sum of primary produts, industrial goods and other transactions does not correspond perfectly with the total owing to differences in how the data is reported by different countries.

Table 3

ANDEAN COMMUNITY + VENEZUELA: COMPOSITION OF TRADE IN GOODS ACCORDING TO COUNTRY OF ORIGIN, COUNTRY OF DESTINATION, AND PRODUCT CLASSIFICATION (2003)

(in thousands of US dollars and percentages)

	Region		United States		European Union		Asia Pacific -10		China		Japan		Other countries		The world	
	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%
Exports																
Primary Products	4 717 876	39.5	15 827 849	71.2	5 613 537	66.9	843 349	67.3	640 468	67.6	548 814	66.0	7 306 313	82.0	35 498 206	65.1
Industrial Goods	6 993 592	58.6	5 490 219	24.7	1 776 435	21.2	409 087	32.6	307 409	32.4	282 375	34.0	730 019	8.2	15 989 136	29.3
Based on natural resources	3 011 017	25.2	2 804 245	12.6	929 829	11.1	205 339	16.4	165 248	17.4	233 805	28.1	376 252	4.2	7 725 734	14.2
Low technology	1 540 467	12.9	1 533 216	6.9	286 887	3.4	35 189	2.8	38 922	4.1	17 002	2.0	142 150	1.6	3 593 834	6.6
Medium technology	2 001 216	16.8	1 019 231	4.6	543 867	6.5	166 744	13.3	102 347	10.8	31 375	3.8	166 431	1.9	4 031 211	7.4
High technology	440 892	3.7	133 526	0.6	15 852	0.2	1 815	0.1	893	0.1	193	0.0	45 186	0.5	638 357	1.2
Other Transactions	225 259	1.9	922 948	4.1	996 168	11.9	1 372	0.1	1	0.0	96	0.0	871 853	9.8	3 017 697	5.5
Total	11 936 727	100.0	22 241 017	100.0	8 386 140	100.0	1 253 808	100.0	947 877	100.0	831 286	100.0	8 908 184	100.0	54 505 040	100.0
Imports																
Primary Products	2 536 263	18.5	1 143 586	11.5	214 809	3.6	159 640	7.1	42 744	2.1	3 302	0.2	624 038	18.8	4 724 383	12.2
Industrial Goods	10 924 201	79.8	8 737 499	87.7	5 689 824	95.0	2 044 007	91.5	2 018 446	97.5	1 580 355	98.7	2 671 762	80.5	33 666 094	86.6
Based on natural resources	3 709 036	27.1	1 750 218	17.6	1 185 497	19.8	234 113	10.5	217 817	10.5	114 397	7.1	474 176	14.3	7 685 254	19.8
Low technology	1 889 966	13.8	801 221	8.0	610 420	10.2	368 465	16.5	734 083	35.4	97 626	6.1	329 842	9.9	4 831 623	12.4
Medium technology	3 661 604	26.7	3 971 413	39.9	2 523 791	42.1	956 910	42.8	637 207	30.8	1 201 198	75.1	1 181 082	35.6	14 133 204	36.4
High technology	1 663 595	12.1	2 214 647	22.2	1 370 117	22.9	484 519	21.7	429 339	20.7	167 134	10.4	686 662	20.7	7 016 013	18.0
Other Transactions	234 128	1.7	81 491	0.8	83 750	1.4	31 011	1.4	9 735	0.5	16 779	1.0	23 748	0.7	480 641	1.2
Total	13 694 592	100.0	9 962 576	100.0	5 988 383	100.0	2 234 658	100.0	2 070 925	100.0	1 600 436	100.0	3 319 547	100.0	38 871 117	100.0

Source: Based on official figures.

Note: Products classified according to the incorporate technological intensity (CUCI Rev.2). The sum of primary products, industrial goods and other transactions does not correspond perfectly with the total owing to differences in how the data is reported by different countries.
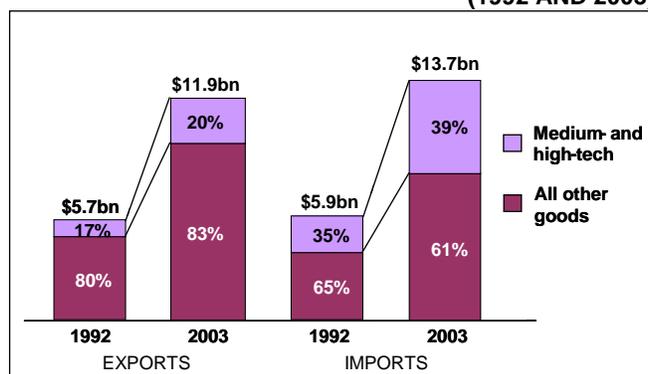
Source: Authors' elaboration using ECLAC data.

Underlying this expansion are two new trade patterns. Intra-regional commercial exchanges are becoming more important: between 1992 and 2003 they increased from 11.6 to 25.6 billion USD, implying a rise from 7% to 9.8% of GDP. The robust trade observed within the Andean Community means that its participation in overall trade increased from 21% to 27%. Given the efforts towards regional integration, this figure is still modest since it is well below the 60.3% intra-regional trade ratio in the EU-15 and about 44.5% share in NAFTA in 2003 (Iwao, 1995). Compared to the technological intensity of its global trade exchanges, the technological intensity is significantly higher for exports within the Andean Community and significantly lower for imports. As one of the characteristics of value-added trade is that it normally requires access to fluid and highly reliable multimodal transport networks, in view that logistics (e.g. distribution networks) are one of the essential components of microeconomic competitiveness of firms selling diversified products, the previous result underscore the importance of MTI for regional integration in Latin America. However, the very different composition of trade in terms of technological intensity could also pose challenges for the development of regional transport infrastructure, as it is necessary to properly address the dual needs of intra-regional and extra-regional trade. For example, manufacturers of high value-added textiles that need to respond quickly to market conditions via differentiation must adopt a "speed to market" approach which imposes additional requirements in terms of having non-congested, sophisticated transport networks (Devlin et al., 2006); this is less important for mining producers, who require low-cost bulk transport instead.

A second trend is that South America has benefited from the increased appetite of China for the commodities exported by the region (ECLAC, 2005), and China has simultaneously become a major supplier of manufactured goods for the region. Trade with China shows the highest percentage increases, with a ten-fold multiplication in commercial exchanges.[6] from being virtually negligible in 1992, they account for 4% of the region's international trade by 2003. This has led to increased interest by countries on the Atlantic coast to diversify export routes so as to lower the cost of exporting to China, while countries already exporting through sea ports in the Pacific could benefit from having additional export routes for their trade. While Venezuela and Bolivia (the

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[6]   ECLAC's yearly publication *Latin America and the Caribbean in the World Economy* (available at www.eclac.org) examines the international insertion of the Latin American economies. Its most recent number (ECLAC, 2006) finds a continued increase in Latin American exports to China, which in 2005 reach $19 billion, of which 15.5% is by Andean Community countries (including Venezuela, which alone accounts for 9.4% of Latin American exports), and are to a large extent responsible for the growing surplus in the trade balance. See this document for further details, and also a recent report published by the IADB, which examines the opportunities and challenges for Latin America as a result of China's dynamic economic performance and its increasing role as a motor of global growth (IADB, 2005).

latter, a landlocked country) belong in the first category, Colombia, Ecuador and Peru belong in the second. In particular, the large geographical extension of countries in the region and the often difficult terrain that needs to be crossed imply that seaports in one country could (abstracting from transaction costs such as cumbersome customs, etc) be more advantageous to producers located in a different country. This does not mean, however, that constructing such infrastructure would by itself make economic sense, as road transport is more costly than sea transport and there are additional costs such as crossing borders, security risks, etc., that are not present in sea transport. The justification of building transport infrastructure needs to follow the best possible multi-criteria project evaluation, including an opportunity cost test that compares the ranking of suitable projects with the many alternative uses (e.g. education, health, domestic transport, etc).

Therefore, the mentioned developments in international trade patterns strengthen the arguments in favour of increasing investment in MTI: not only can the latter bolster regional trade, but also potentially contribute to fostering trade with new markets such as China and, eventually, India. In certain cases, trade within a region might be strengthened thanks to the reduction in transportation costs and times that follows the increased investment in transport networks in countries that aim to export to Asia. Acknowledging the importance of trade with world markets for investment in infrastructure that simultaneously helps to connect neighbouring countries in Latin America could play an important role in securing adequate funding and justifying costly maintenance of the infrastructure.

III. Transportation as a Network

As the IADB (2000) indicates, trade flows need to be enabled by developing appropriate infrastructure networks, as the latter provide the physical channels through which these flows circulate in the global economy. Transport, energy and communications are by definition network industries that connect different points. In the economic literature and policy circles, it has long been advocated that increasing investment in infrastructure projects gives rise to network effects, yet these tend to be ignored or miscalculated at the planning stage. These network effects, however, need proper identification and measurement to effectively assess the true benefits of a project.

As pointed out by Laird et al. (2005), a transport network is an interconnected set of links and nodes with the following characteristics: it has sunk costs and presents economies of scope or density on the supply side, it is congestible, and presents positive consumption externalities. Therefore, investment in the network that increases capacity results in a reduction in unit costs. Economies of scope are present because a single new connection to the network allows the provision of a multitude of new services, namely, the connections between each existing node of the network and the new node or nodes incorporated as a result of building the new capacity. Additionally, connecting two networks (or improving existing links) provides additional traffic to the existing network, thereby increasing the density of traffic going through the network and reducing the average cost (up to the point where this new demand provokes congestion at bottlenecks or for the network as a whole). In Europe, the existence of missing links in accession countries provided. one of

the incentives for the Trans-European Networks transport initiative, and is now a driving reason for the extensions that are planned towards neighbouring regions (EC, 2005a).

Another characteristic of transportation networks is that they can become congested: if a certain asset is used too intensively, the average total cost of transportation increases. Congestibility also has the capacity to generate network effects, as congestion in one network segment affects the usage of some or even all of its other segments (Laird et al., 2005). This is the reason why reducing notorious bottlenecks of transport networks (the idea behind implementing IIRSA's "anchor projects") can provide substantial positive network effects. In general, congestion as a source of network effects seems to be more of a concern in the European Union than in Latin America, as the transport density in the former is substantially higher than in the latter.[7] The gravity of congestion in Europe's networks is such that, according to the European Commission, the "external costs of road traffic congestion alone amount to 0.5 % of Community GDP" and are estimated to rise to 1% of GDP by 2010 (EC, 2001). The bottlenecks due to congestion are concentrated in central areas of Europe, particularly near urban areas and where local traffic meets long-distance traffic. Congestibility is closely related with the fact that investment in infrastructure is usually lumpy, that is, it must be deployed in discrete amounts due to technological reasons. Lumpiness often results in transportation fixed facilities being operated below capacity, sometimes for large periods of time. This eventuality needs to be factored in, because it is common that ex ante traffic estimates are overestimated, as was the case with the Channel Tunnel below the British Channel (NAO, 2005).[8] Under-usage of transport infrastructure implies a worrisome waste of scarce public resources that should be minimised.

In any case, the network effects most frequently discussed in the literature are those arising on the demand side. Those effects occur because the value of the services of a network increase with the number of users or segments of the network, and this additional value of using the network is obtained at no extra cost. For example, the road/rail networks of two neighbouring countries become much more valuable to producers and consumers if they are interconnected, as both old and new users have wider accessibility to new locations. According to the well-known *Metcalfe's Law*, the value to a consumer of the services produced by a network of size n is roughly[9] proportional to the square of n. The increase in value to consumers and producers of a radical increase in the availability of destinations[10] is then an important source of network effects. If we abstract from capacity constraints, connecting two previously separated networks with a single link (e.g., a bridge connecting two previously separated national road networks in neighbouring countries) is equivalent to having each node (or destination) of a network connected to each other node.

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[7]   Congestion is a pervasive issue in Europe, yet a more localised problem in Latin America instead. In the latter, congestion affects facilities such as the Foz do Iguacu (Brazil) – Ciudad del Este (Paraguay) bridge (see IIRSA (2003), Chapter II "Infraestructura Vial", pp. 30), but is less important as a general reason for building transport infrastructure than in the European Union. Congestion appears as a critical problem in the European Commission's White Paper on transport policy: "*If most of the congestion affects urban areas, the trans-European transport network itself suffers increasingly from chronic congestion: some 7 500 km, i.e. 10 % of the road network, is affected daily by traffic jams. And 16 000 km of railways, 20 % of the network, are classed as bottlenecks. A total of 16 of the Union's main airports recorded delays of more than a quarter of an hour on more than 30 % of their flights.*" (EC 2001, p. 11).

[8]   The UK National Audit Office concludes that Eurostar "*...passenger volumes and revenues forecasted in 1998 and in 2001 have proven overall to be too optimistic to date. Because a PPP formula was used, this created a serious threat to the financial sustainability of the project: [London & Continental Railways Limited] proposed to fund the construction of the Link from private finance (debt and equity) raised on the back of future revenue from Eurostar UK and from direct Government grants. By the end of 1997, actual Eurostar UK revenues indicated that LCR's forecasts were overly optimistic. Consequently, LCR abandoned its plans to raise private finance and approached the Department for additional grants in return for a share of future profits*" (NAO 2005, p. 1). The same report estimates that the future call on the taxpayer to cover cash flow shortfalls will be £260 million (at 1997 prices) in the most likely scenario.

[9]   Actually, the number of connections between nodes in a network is given by $\dfrac{n(n-1)}{2}$

[10]   To illustrate the value of a new connection between two previously separated networks, imagine that the network of a country connects 10 cities and the network of another one, a further 5. The total number of connections existing is 45 in the first country plus 10 in the second one, a total of 55. If both countries are connected, however, the network's size is 105.

However, this does not apply to transport networks, as the latter are congestible. Therefore, in transport networks not only the number of nodes that can be reached are important, but also the number of segments connecting those nodes and the capacity and utilisation of those segments.

Therefore, network characteristics are an essential element in analysing the value of transport infrastructure, and neglecting the measurement of network effects might dramatically affect the perceived value of an MTI project. In practice, however, modelling of network effects is often less thorough than desired (Laird et al., 2005) due to funding, administrative, informational and other binding constraints. In particular, arbitrarily restricting the size of the network that is being scrutinised might lead to underestimating the benefits of a certain project arising from network effects. This is particularly critical when assessing MTI projects, as limited information about transport demand in other countries is usually the rule rather than the exception. One of the lessons that Latin America can extract from the European experience is that, according to Van Exel et al. (2002), unfortunately most of the initial priority projects in Europe were assessed using national evaluation procedures that took little or no account of cross-border effects.

So far, our discussion of the characteristics of transport networks has assumed a static framework, which left to one side the issues of historical constraints and institutional considerations. However, investments in MTI are also affected by a time dimension, because networks are characterized by **durability**, **irreversibility** and **interrelatedness**, each of which carries important implications for coordination. There is also an institutional dimension, which regulates the intensity of the network effects and as a consequence has a bearing on all the foregoing network characteristics.

It is clear that transport networks evolve over time according to the history of investments in infrastructure. What is more interesting is to recognize that, once an investment is implemented, it changes the economic value of future extensions or connections in a network. Durability and irreversibility are tied together in the case of transport networks, and imply that without coordination it is likely that there will be a substantial cost to connecting national or regional networks that evolved independently from each other. This has proved especially challenging for integrating adjacent railway networks that were developed using different technological standards, because costly conversion was needed to ensure interoperability. In the U.S., for example, the conversion of railway tracks to the "Stephenson gauge" in parts of the Midwest was necessary before a continental East-to-West Coast network could be developed in the 19th century (Puffert 2000, 2002). Although road and motorway specifications are similar in most countries,[11] mismatches in the geographical layout of the networks can call for expensive connections crossing difficult terrains. This can be seen in one of Europe's TEN-T priority projects, which plans to build a motorway over the Kresna Gorge, a 17-km long valley in Bulgaria, to link Greek and Bulgarian road networks.

Transport networks deteriorate over time, and this fact entails a number of dynamic considerations. The construction of a network segment creates a liability for its owner or operator, as maintenance costs need to be incurred recurrently in the future. In environments where there is a great deal of wear-and-tear of infrastructures, whether this is because of climatic conditions or because usage is more intense, maintenance costs can be substantial and essential for the network to remain functional. This has two implications. First, coordination of investment is not enough. Since a network is only as effective as its weakest links – in a linear network each section needs to be working for the network to be of any use, and in more complex networks a damaged link causes longer journeys and delays – there needs to be effective coordination to fund the upkeep on different sides of national boundaries. This suggests that coordination of international transport

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[11]   There might be, however, heterogeneity in facilities such as bridges, for example, in terms of the tolerance of the bridges to different weights; or in tunnels' heights or widths.

networks needs to look far beyond the periods of conception and construction of infrastructure. The second implication is that the larger the extant commitments to maintain existing infrastructure, the less financial freedom governments have to carry out additional transport infrastructure investment.

Technical interrelatedness is a characteristic of transport networks that requires special coordination. Take for example the interrelatedness between railway track and the wheel sets of rolling stock, or that between container terminals in docks and vessels, or also that between tunnels and trucks of different heights. For a network that is built in sections, there needs to be agreement regarding all the relevant technical specifications, so as to ensure compatibility of the transport system as a whole. Even when the network is built in one go, it will usually be necessary to coordinate public investment decisions about infrastructure with those of private agents buying complementary equipment and vehicles to use on that infrastructure. This will usually require more than a public announcement as to the infrastructure specifications: setting technical standards can create certainty, foster investment, and limit wasteful decisions. In the aforementioned examples, the standards would be for the width of the track gauge, container sizes and payload, and the dimensions of tunnels or trucks.

More generally, technical standards are just one type of transport regulation, and other norms and institutions play an important role in the formation of transport networks. For example, the strength of demand-side network effects is positively related to institutional variables such as the ease in obtaining cross-border permits for road transport shipment or existing open skies agreements for air transport. Bad regulation can result in connected segments of a whole not being a true network. In general, relationships between physical and institutional infrastructures means that additions or new links in transport networks may well call for a co-evolution of the relevant national regulations in order to maximize the benefits for users, which come from the true degree of connectivity of the network. Such a co-evolution may be in the direction of a harmonization of national rules, or may be effectuated through the creation of bi-national working groups to design and implement the appropriate rules.

IV. Public Financing of Transport Infrastructure: What is Special about Multinational Projects?

According to the IMF (2004), government involvement in financing infrastructure needs to be justified by the existence of some type of market failure. Market failures in MTI projects arise from multiple sources, including the network characteristics mentioned in section III, the existence of economies of scale and scope, the substantial financing requirements for largely sunk and lumpy investment in the presence of credit shortages (e.g., due to the absence of deep and liquid domestic capital markets), the non-monetary nature of certain types of social benefits derived from the projects, and large levels of revenue uncertainty (especially related to estimates of cross-country future traffic and risks impinging on that traffic volume) that is very difficult to hedge against, among others. The presence of market failure adds weight to the need for Government intervention, which can take several forms, including (but not limited to) direct financing of MTI projects.

According to Tanzi (2005), there are several alternative ways of financing a transport infrastructure project that has been decided will be implemented.[12]

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[12] As Tanzi (2005) points out, if there is significant uncertainty about the economic justification of a project being implemented at time x (instead of waiting until x + T, for example), it is not evident when a project should be implemented. If a policy maker invests, it is foregoing the "real option" value of waiting until more uncertainty has been dissipated. As shown by Dixit, A. and Pindyck, R. (1994), *Investment Under Uncertainty* (Princeton: Princeton University Press, 1994), waiting in an uncertain environment is valuable if an investment is (at least partially) irreversible. Similarly, it might not be clear that the project should be implemented at all, unless there is clear evidence that its execution is the most efficient use of resources.

- The Government finances it using ordinary revenue or earmarked taxes, while the use by the public remains free of charge.

- The Government finances it with debt while the use by the public remains free of charge.

- The Government or the private sector operating the transport infrastructure charge a toll or fee for using the infrastructure and this covers partially or totally the cost of building and operating the infrastructure (the rest can be covered with taxes, debt, etc.).

- If the private sector builds and operates the infrastructure, the Government often provides a guarantee, which constitutes a contingent liability. If the toll mentioned in the previous entry is not enough to cover funding requirements, the Government can provide a subsidy to the private operator.

- The Government pays a fee to the private sector according to infrastructure use, while use by the public remains free.

Financing transport infrastructure projects with public funds, especially those projects with large cross-border implications, is difficult for at least four reasons.

A first reason is simply the existence of budget constraints: given the multiplicity of demands on the State purse, governments all over the world are finding it difficult to make the necessary financial commitments to finance large-scale infrastructure projects. This is particularly problematic in countries where current expenditure has grown to become the lion's share of total expenditure, reducing budgetary flexibility in the event of negative shocks to revenue. As shown in Figure 3 below, current expenditures have increased substantially as a percentage of GDP in four out of five Andean countries between 1990 and 2004 (the exception being Peru), with Bolivia and Colombia registering the largest increases. Meanwhile, as shown by Figure 4, capital expenditures have also increased during the period, but in none of the countries has the increase been larger than 2.5% of GDP. In Latin America, the low flexibility of public finances is also compounded by the high level of earmarking of revenue, part of which is channelled automatically to assorted government bodies and autonomous entities (e.g. sub-national governments, the Armed Forces, regional development entities, universities, etc), independently of the relative merit of these expenditures in terms of social return.

CURRENT EXPENDITURE ANDEAN COMMUNITY 1990/2004 IN % OF GDP

Source: Authors' elaboration using ECLAC and country data.

CAPITAL EXPENDITURE OF ANDEAN COMMUNITY 1990/2004 IN % OF GDP
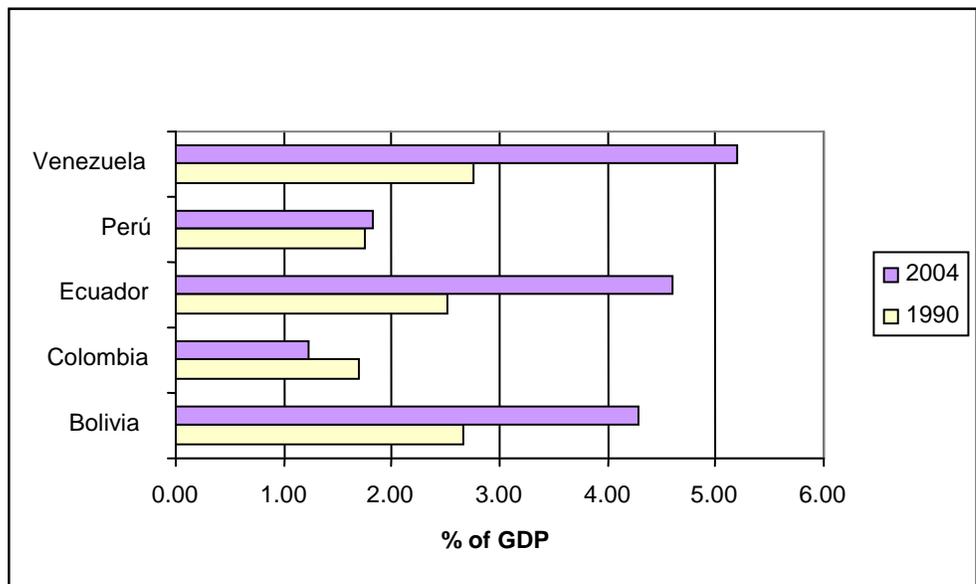
Source: Authors' elaboration using ECLAC and country data.

Second, for political economy reasons, infrastructure projects are often not considered a priority if more pressing demands arise. This is typically the case when wage demands by the public sector are intense, when there are problems with the health, education, or pension system, or any other politically sensitive area that might endanger the incumbent government's political prospects. Rogoff (1990) presents an interesting game theoretic model where voters have to infer from pre-election current expenditure and taxation levels the level of "competence" of the incumbent leader vis-à-vis the probable "competence" of an opponent. Rogoff shows that, in order

to signal its privately known degree of competence, the incumbent leader will cut investment and taxes and raise current expenditure before elections. His model provides a credible explanation of why cash-constrained governments in Latin America and elsewhere have resorted to curtailing capital expenditure in favour of current expenditure as a result of the political cycle. Additionally, the IMF (2004, 2005b) and Easterly and Servén (2003) show that in the past infrastructure has been cut in Latin America in periods of distress, sometimes even bearing the brunt of adjustments. Investment and other non-priority expenditures have been cut whenever the economic cycle, exogenous shocks, or political pressures have resulted in an increase in budget deficits. From a political economy perspective, this is not surprising given the long-term benefits of infrastructure versus its short-term costs, especially in terms of opportunity costs (e.g., striking hospital workers demanding better pay). Also, current expenditure might be more difficult to rein in at short notice than investment due to legal reasons and contractual rigidities, as well as the characteristics of the price-setting and wage-bargaining process.

Third, but related to the previous argument, government authorities might prefer to give infrastructure a lower priority than more clearly vote-winning projects such as education or health care investments, even in the absence of crises or elections. This might occur because the benefits of transport projects are spread over time, the beneficiaries are many and difficult to identify and the costs normally involve a substantial up-front charge. In the case of MTI, this problem is probably more acute, given that project evaluation at the national level generally ignores potential international spillovers. There might therefore be a downward bias in multinational project evaluation of benefits vis-à-vis costs,[13] which would justify assigning these projects a lower priority than other (national) ones. As a result, in the presence of cutbacks to infrastructure spending, multinational projects might be among the first to be axed.

Finally, countries in Latin America have often found it difficult to finance investment in infrastructure using public funding because of the remaining high levels of public debt in several countries and the (related) high cost of issuing new debt in financial markets where elevated risk premium are required (IADB, 2002), particularly in view that transport infrastructure projects can take a long time to start paying off.

To sidestep the mentioned limitations in the capacity of the public sector to finance transport infrastructure, private sector participation has been advocated in the building, operation and maintenance of transport infrastructure (European Commission, 2001, PriceWaterhouseCoopers, 2004). During the 90's, the private sector started to play an increasing role, building, operating, and financing infrastructure in Latin America, although its involvement in transport was less significant than in the cases of energy and telecommunications (IADB, 2000). Despite increasing private sector involvement in transport infrastructure at the national level, its participation in multinational projects has so far proved limited. In particular, private sector involvement is normally confined to high traffic, large projects where private, directly collectable returns are likely to be forthcoming. The private sector is unlikely to get involved in secondary connection roads, regional airports, and other infrastructure whose levels of traffic, cost, or risk would demand higher rates of private return to justify investing. In the case of Latin America, some anecdotal evidence indicates that national planning institutions charged with designing and evaluating transport infrastructure projects face serious drawbacks.[14] If this problem were severe enough so as to, for example, put forward projects

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[13] As we mentioned already, this has allegedly occurred in Europe's TEN-T initiative: "*A key issue with any cross-border investment is how to evaluate the resulting benefits to the adjacent country or the wider EU. **In many cases these benefits are not evaluated at all**. This can result in an investment appearing to have a poor cost:benefit ratio, or even being dismissed altogether, solely because the full benefits are not being taken into account*" PWC (2004), pp. 11.

[14] For example, see the multiple and repeated references in IIRSA's meetings (available online at www.iirsa.org) between government officials and multilateral organization representatives about the limitations in the capacity of the public sector in many South American countries to adequately design and evaluate transport infrastructure projects, due to human resources, financial and institutional limitations.

without an adequate cost-benefit analysis that incorporates accurate estimates of economic impacts, financing costs, and sustainability, then private financing could be reasonably expected to demand even higher returns to compensate for the additional risk that projects are not economically viable. What this means is that projects that, correctly evaluated, would be viable and eligible for private sector participation, might be rendered unviable due to sloppy design and evaluation.

In Europe, ready availability of long-term funding via capital markets has facilitated investment in infrastructure in the past, for example, in the construction of the Channel Tunnel between France and the UK. Institutional investors such as pension funds or insurance companies in search of reasonable returns over long periods of maturity fuel the demand for this type of asset. In most of Latin America (with the exception of Chile), capital markets are still in their infancy: the available assets are mostly issued by the public sector, maturities are short, issues are often denominated in dollars, demand by institutional investors is limited, etc. Access to international capital markets is also difficult, as international investors' appetite for infrastructure projects does not seem to be strong.[15] All of this reduces the likelihood that the private sector can find sources of funding that are less costly (or subject to less conditionality) than private bank loans or loans from international institutions for building transport infrastructure, which has knock-on negative consequences for the capacity of the private sector to fund transport infrastructure projects, especially in multinational settings.

The problems of access to private and public funding affect both national and MTI projects. However, MTI projects have at least two special characteristics that make them even more difficult to finance, and have so far resulted in most projects being funded by public funds both in Europe and Latin America, with external support mostly from regional or international financing institutions. In the first place, the availability of private funding for MTI projects is often limited, as perceived risk is commensurably higher than in national projects (CAF, 2004).[16] In the second place, projects including several countries mean complying with different legislation, jurisdiction, and rules in general, including approaches to price-setting that can significantly delay and complicate the project design and assessment phase. Therefore, for private firms to invest in MTI projects, it is necessary to reach what is usually a difficult balance of risk and return.

For all of the above reasons, and without denying the need for mobilising private sector resources as much as possible, we agree with Tanzi (2005) that governments will continue to bear the brunt of the financing effort of MTI in Latin America in the near future, even if the type of public funding commitment changes.[17]

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[15] Evidence for this lack of interest can be found in a recent World Bank publication, which states that: "Since 1998, private investment levels have collapsed, with the conclusion of major divestiture programs and weaker investor interest. Total investment in infrastructure projects with private participation dropped from $71 billion in 1998 to $16 billion in 2003" (Fay and Morrison 2005, p.13). Moreover, the shift from public to private investment has not been as successful as expected: "While public funding dropped from 3.1% of GDP for 1980-1985 to 0.8% of GDP for 1996-2001 in the seven major Latin American countries considered [...], private investments increased on average only from 0.6% to 1.4%. As a result, the overall level fell from a weighted average of 3.7% of GDP in 1980-85 to 2.2% in 1996-2001. Only Colombia and Chile were exceptions, witnessing a substantial expansion over the last decade" (*Ibid*)

[16] "*Ahora bien; si bien la utilización de modalidades de PPP representan una alternativa muy interesante y ventajosa para la ejecución de grandes proyectos de inversión de carácter transnacional, no es menos cierto que tratándose de proyectos de dichas características, las dificultades y obstáculos para su instrumentación aumentan; especialmente cuando se pretende aplicar formulas calificadas de "financiación íntegramente privada" (como por ejemplo, a través de concesiones instrumentadas en sus versiones más tradicionales) y de inversiones de gran envergadura. En estos casos, experiencias como las del Eurotúnel […] ha puesto de manifiesto inequívocamente dicha circunstancia*", pp 283.

[17] For example, if PPPs become more important, in high-risk scenarios like Latin America, it is very likely that public guarantees (contingent public liabilities) will continue to be required, while debt might become less important.

V. Multinational Transport Infrastructure: Projects as Coordination Games

When analysing the implementation of MTI projects, it can be useful to do so using a game theory framework. In the majority of the literature (e.g. Tanzi 2005), when the authors talk about governments "coordinating" their actions, either explicit or implicit references are made to the role of a supranational institution (such as the European Commission) in helping a group of countries to achieve the "cooperative solution", namely, that situation where the actions of each and every country maximise the joint welfare of the group, independently of the allocation of those benefits within the group. In Europe, that supranational institution exists, but its role in this area, as will be seen in the section describing the European experience with transport infrastructure coordination, has been largely circumscribed to providing a "focal point"[18] to help countries coordinate independent national actions, or that of lending support to multinational bargaining processes among national governments. Since fiscal policy remains for the most part in the hands of national governments even in Europe, the role of the European Commission is not that of a joint optimiser imposing a cooperative solution that maximises the joint benefits and transfers welfare from winners to losers in the presence of asymmetric

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[18] See Cárcamo-Díaz (2005) and the multiple references therein about coordination games and "focal points."

gains and costs of project implementation.[19] Of course, there is nothing resembling the latter anywhere in Latin America, not even in the most institutionalised of sub-regions, the Andean Community. Therefore, in this paper we acknowledge that fact and start analysing the situation from a non-cooperative coordination game perspective in order to make proposals about coordination mechanisms (in Section VIII).

An important assumption that we will make in this section is that a Government can act as a single rational entity with a precise and well-defined objective: the maximisation of its expected payoff. We will not delve into the (clearly very realistic) complexities of within-government strategic interaction. It is true that a Government action is normally the end result of a complex series of interactions[20] between coalitions with different objectives (e.g. lobby groups, firms, sub-national governments, Ministry of Infrastructure officials, Ministry of Finance officials, environmental groups, indigenous communities, Congressmen, just to name a few). However, we can think of such bargaining[21] behaviour within a country, and which we will be abstracting from, as leading to the "preferences and constraints" that determine the feasible payoffs of the players in our non-cooperative models below, where each player is a national Government. Since the bargaining power and coalition formation within a country might vary over time for a multitude of factors (e.g. the changing political fortunes of different political parties or factions), this leads to countries being of different "types"[22] as times go by. Such a situation reinforces the role of coordination mechanisms that try to extract information about the "types" of the counterparts that each Government interested in participating in an MTI project faces at each moment of time. Another, less important assumption is that we will ignore the bargaining that takes place between countries about project specifications such as the exact geographical location of a project. We chose not to model that bargaining because it would increase the complexity of the models without providing substantial further insights about the role of coordination and the tools to foster it. Additionally, it is not clear that country officials have a large number of degrees of freedom to bargain over design details at the project selection stage, as projects are often constrained by existing infrastructure (path dependency), geographic and technical considerations.

1. MTI Projects as a Stag Hunt Game

Consider a hypothetical bi-national transport infrastructure project that is being evaluated by the authorities[23] of two countries. Both countries are aware that if investment on the network does not occur on the other side of the border, the full benefits of the project will not materialise and they would be better off by not investing. A simple way of modelling a situation like this is to think of a one-shot Stag Hunt-type of coordination game like the one shown in Figure 5 (see Cárcamo-Díaz 2005 for a description and applications of this class of games, and a list of references).

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[19] The "coordination" nature of the role of the EC is pointed out in the literature, as country involvement is essential and not guaranteed ex ante, which means that even in Europe the "cooperative solution" would likely be appropriate in exceptional circumstances. For example, as pointed out by PWC (2004) "...*it is no coincidence that the most positive results* [in terms of multinational project execution] *have occurred where domestic and TEN-T requirements are aligned*" pp. 9.

[20] The World Bank (2005, chapter 3), describes just how complex interactions for infrastructure provision can be.

[21] The standard bargaining models used to analyse these problems can be found in any game theory textbook, such as Camerer (2003) or Osborne and Rubinstein (1994).

[22] The notion of "type" of a player refers to situations where a player A does not know with certainty the payoffs of player B. If A has a probability distribution over each of the possible payoffs B might have, each possible payoff of B can be thought of as a different "type" of player B that A would be facing. For more about this and asymmetric information games, see Fudenberg and Tirole (1991).

[23] In this section, we will refer to the Governments coordinating their investment, ignoring the possibility that it might be private firms, hired by national Governments, who are the ones coordinating the project. We do so because multinational projects are largely financed with public funds, often with the support of regional or international lending institutions. We discussed the possibilities for private funding of transport infrastructure projects in section IV above.

		Column				Column	
		Don't Invest	Invest			Don't Invest	Invest
Row	Don't Invest	0 , 0	X , W - C	Row	Don't Invest	0 , 0	Low , Loss
	Invest	W - C , X	P+W+ X-C , P+W+X-C		Invest	Loss , Low	High , High
		Stag Hunt Game				Stag Hunt Game Example	

Source: Authors' elaboration.

In this game, which assumes symmetric payoffs for simplicity, two Governments have to decide whether they will simultaneously invest in a road that connects two main cities, one in each country. Each country has two possible actions: to invest in their planned segment of the road (action *Invest*) or not to invest (action *Don't Invest*). The cost of building the road segment in their own country is C. Also, building their section of the road produces a payoff of size W for *each* country, independently of what the other country does. This represents the benefits that the newly connected border regions of a country will enjoy, even if the section of the road in the other country is not built.. The benefit of country **Row** (**Column**) if only country **Column** (**Row**) builds its section of the road is X, which accrues independently of whether country **Row** (**Column**) builds its own section of the road. X is the value of the positive spillover[24] that country **Column** (**Row**) building its road section generates for country **Row** (**Column**). Each country gets an additional benefit if and only if they both build their corresponding section of the road, and this has a value of P, which can be related to the increased value of the enlarged network to each country due to network effects (see Section IV). The size of P is related to factors such as the size of the network enabled by the new connection, the expected increases in traffic induced, and others. In our framework, the spillovers X correspond to the positive or negative external effects that occur in addition to network effects P and which, unlike network effects, only depend on the other country investing. For coordination to be an issue in the game in Figure 5, we make two assumptions. First, we assume that W is smaller than the cost of building the road for each country ($W - C < 0$) and second, we assume that the netwok effects are positive and larger than the cost of the domestic segment of the road, net of the purely domestic benefits ($P + W - C > 0$).[25] The point to keep in mind is that if both countries invest, both will be better off. But if they don't believe *ex ante* that the other country will invest, each of them may decide not to invest, out of concern of incurring the cost of their section of the road for no gain.

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[24]   Transport infrastructure projects can also translate into *negative* spillovers for neighbouring countries. One very plausible reason why this might happen is if the new infrastructure duplicates existing non-congested infrastructure in another country without adding new connections. As an example, consider the problem of two ports being built by neighbouring countries. In such a case, the construction of a port close to both borders can result in neither of them being economically viable, if the impact of one port on the demand of the other port is significant, as they now compete head-to-head – clearly, this presupposes a road across the border, connecting the two markets. Another reason (less plausible in Latin America but not in Europe is if the new infrastructure connecting with another country's transport network introduces severe congestion and negative environmental effects in the other country. If sufficiently severe, these negative externalities X could overcome the positive network effects P and positive domestic effects W of building the infrastructure in the other country.

[25]   If the first condition is not met but the second is, both countries would build their section of the road simply for the national benefits of doing so (in game theory language, playing *Invest* is then a dominant strategy), ignoring spillovers. In such cases, countries would be interested in "international coordination" only as a way of removing financing constraints for the construction of roads that would be welfare-improving even in the absence of spillovers and network effects. If the second condition is not met but the first is, playing *Don't Invest* is the dominant strategy for both players. Both conditions need to hold for the game in Figure 5 to be a coordination game with two Nash Equilibria that can be Pareto-ranked.

This is a static game with two pure strategy Nash equilibria[26] that can be Pareto-ranked: (*Invest, Invest*) and (*Don't Invest, Don't Invest*) , both shown in grey in Figure 5. The equilibrium in which both invest generates larger payoffs in each of the countries. The question of equilibrium selection in games with multiple equilibria, such as the coordination games analysed here, is an interesting one, albeit not the focus of this paper (see Cárcamo-Díaz, 2005 and references therein for more on this). Particularly interesting is the fact that the (*Don't Invest, Don't Invest*) equilibrium has been shown to be preferred in certain experimental situations (Straub, 1995), something that has been attributed to the idea that the mentioned equilibrium can be "risk dominant", if it is less risky than (*Invest, Invest*) and therefore, it is chosen by both players.[27] In the present context, if the equilibrium (*Don't Invest, Don't Invest*) is *risk dominant*, it would mean that, in the absence of other factors, the two Governments would prefer to "play it safe" and not execute an MTI project with this payoff structure, especially given other profuse and urgent demands on their budgets.

Figure 6
COORDINATION GAME WITH ASYMMETRIC NETWORK EFFECTS

Source: Authors' elaboration.

MTI coordination games leading to coordination failure need not have symmetric payoffs. MTI projects are more likely to present asymmetries in the costs and benefits to the different countries involved. One such case could involve differences in the relative economic sizes of countries. As the volume of traffic that circulates is typically related to the size of the economy, an interconnection between a large and a small country often benefits countries in an asymmetric way. A small country would in general be expected to receive more benefits from interconnection than the larger one in terms of access to new markets (Gómez-Ibañez and Strong, 2003). However, that might change if the small country is a transit country towards other markets for the larger country, for in that case the benefits of interconnection for the latter might be significant (as the new accessible network is not only that of the transit country, but also that of the ultimate destination country). For example, imagine a game such as the one in Figure 6 below, where now Row receives network effects from the project that are larger than those of Column by some arbitrary magnitude (kappa). In this game, there is a large benefit for one of the countries (i.e. **Row**) of finishing the project, but the other one (**Column**) stands to gain much less if the project is actually finished, while risking the same amount of money if the project is not finished due to the other country not

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[26] Game theory literature normally proposes that play will lead to a Nash Equilibrium, as otherwise at least one of the players would have an incentive to deviate. A nice definition of Nash Equilibrium can be found in Rasmusen, E. (2001), Games and Information. An Introduction to Game Theory (Third Edition), (Oxford: Blackwell Publishing, 2001), pp 26: "*The strategy combination s* is a Nash Equilibrium if no player has an incentive to deviate from his strategy given that the other players do not deviate*". The question of how equilibrium arises leads to concepts of evolution or learning in the more recent literature (e.g. Camerer, 2003).

[27] In the two-player coordination games with two strong Nash Equilibria, risk dominance is found by calculating the Nash Product of each equilibrium. This is "*…the product of the opportunity costs of unilaterally deviating from that equilibrium for each player. […] The pure-strategy Nash equilibrium with the greater Nash product is risk dominant*" Straub (1995, p. 341). For the Pareto-inferior Nash Equilibrium (*Don't Invest, Don't Invest*) in the *Stag Hunt* game in Figure 5 to be *risk dominant*, the condition $(C - W)^2 > (P + W - C)^2$ has to hold. This implies that, $2 (C - W) > P > (C - W)$, for $(C - W) > 0$.

investing.[28] Figure 6 also presents a numerical example of this game, where the payoff parameter values are $X = 2$, $W = 1$, $C = 3$, $P = 3$ and $\kappa = 2$.

Similarly, it is possible that investment costs are asymmetric, illustrated in Figure 7 below where **Row** has costs C and **Column** has an additional cost ε (epsilon) over the cost C paid by **Row**. In a similar way as in the previous example, differences in costs of investment make it more risky and less profitable for **Column** to invest.[29] Figure 7 also shows a numerical example of this, with $P = 4$, $C = 3$, $X = 2$, $W = 1$ and $\varepsilon = 1$. Therefore, it can be concluded that asymmetric gains and costs can add to the "riskiness" of the (*Invest, Invest*) Pareto-superior equilibrium and result in the inferior (*Don't Invest, Don't Invest*) being played, even though both countries would be better off by coordinating.

Figure 7
COORDINATION GAME WITH ASYMMETRIC COSTS

Source: Authors' elaboration.

If payoffs and costs are very asymmetric, a binational MTI project might not have two strong pure-strategy Nash Equilibria, as in the Stag Hunt game above, but only one: (*Don't Invest, Don't Invest*). For example, consider the case of an MTI project between a country with a large economy and a well-developed infrastructure and a small one with deficient infrastructure but which is a transit country towards other large markets. The small transit country would have to invest significantly to upgrade its network, but if the expected domestic and network effects of investing were low, it might be better off by not investing. This would amount to combining the asymmetric benefits and costs cases. In such a case we would have the game in Figure 8, where we assume that the condition $P + W > C + \varepsilon$ is not satisfied for the **Column** country.

Figure 8
GAME WITH BOTH ASYMMETRIC NETWORK EFFECTS AND COSTS

Source: Authors' elaboration.

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[28] For any $\kappa \geq 0$, for the Pareto-inferior Nash Equilibrium (*Don't Invest, Don't Invest*) to be *risk-dominant*, the condition $(P + \kappa + W - C) \times (P + W - C) < (C - W)^2$ must be satisfied.

[29] For any $\varepsilon \geq 0$, and for the game in Figure 7 to be a Stag Hunt game it is necessary that the network effects P and the purely domestic gains from the MTI project W are larger than the cost C plus the additional cost ε (i.e. $P + W > C + \varepsilon$). Also, for the Pareto-inferior Nash Equilibrium (*Don't Invest, Don't Invest*) to be *risk-dominant*, the condition $(P + W - C) \times (P + W - C - \varepsilon) < (C - W) \times (C + \varepsilon - W)$ must be satisfied.

In this example, the strategy *Invest* is strongly dominated for **Column**, who would therefore never invest, and there is only one Nash Equilibrium: (*Don't Invest, Don't Invest*). A numerical example of this game, shown in Figure 8, assumes payoffs $X = 2$, $W = 0$, $C = 3$, $P = 3$, $\kappa = 3$ and $\varepsilon = 1$. In this case, if a supranational institution were capable of transferring a sufficient part of the gains from **Row** to **Column** (in our numerical example a transfer of 2 units would be sufficient), both countries would gain from investing in the project.

Up to now, we have discussed coordination between Governments assuming that they were not constrained in their actions. In reality, however, countries face significant financial constraints that, when binding, limit their capacity to invest in transport infrastructure, including MTI. Such constraints can be included in game theoretic models in several ways. For example, in the Stag Hunt game above, financial restrictions can enter via reductions in the number of available actions (e.g., if there were financial constraints, the *Not Invest* action would be the only one available and the game would break down) as the action set is discrete. In games with continuous action sets, the constraint limits the values that actions can take. Therefore, such financial constraints play an important part in the coordination of public investment in MTI projects. In fact, the role of financial institutions such as regional development banks has often been identified with eliminating binding financial constraints,[30] and in this respect their participation can be essential for the gains of the project to be harvested.

As pointed out by Fujimura (2004), unbalanced costs and benefits, together with the need for front-end, lumpy investments, can make the execution of cross-border transport infrastructure projects difficult. The author argues, however, that the existence of a "dominant" partner that would be willing to incur the costs of enforcing the agreement to invest among countries can help coordination. In Latin America, the inexistence of a supranational authority capable of subsidising the execution of cross-national transport infrastructure projects reduces the likelihood of implementing MTI projects where spillovers are large, gains and costs are very asymmetric (with the most difficult hypothetical case being when the largest gains accrue to the country paying the lowest costs), and countries face financial constraints. Such an example is found when there is a "bridge" infrastructure installation, which connects two countries through a third. If the "bridge" country does not benefit enough from investing (e.g., due to a high cost/benefit ratio) or if it faces severe financial constraints (e.g., Heavily Indebted Poor Countries, which in South America include Bolivia), coordination failure is likely to occur in the absence of mechanisms to channel some of the gains from other countries to the "bridge" country in order to raise the payoffs of investing or by removing binding financial constraints affecting the latter.

Additionally, and even though on occasions cross-border infrastructure investments benefited from the existence of a "dominant" partner, unless the latter has a very large amount of welfare at stake in such a project, it is not clear that better coordination would result. One case in which the existence of a "dominant" partner could foster coordination would be if the main problem to the execution of the project is removing a financial constraint rather than selecting a Pareto superior outcome. For example, during the construction of the Bolivia-Brazil gas pipeline in 1999, the key element that allegedly allowed the execution of the project was not the benefit to both parties (the payoffs), but the fact that Petrobras (owned by the Brazilian Government), signed a ship-or-pay contract that assured financiers of the pipeline that a minimum stable income would flow from the project, thereby allowing it to go ahead.[31]

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[30] While it is straightforward that development banks play a liquidity role in dealings with a solvent Government, an interesting issue is whether development banks can and should play a financing role when there are concerns about a country's financial position. As solvency is only measured with noise, the answer is not as clear as it might seem. See (IMF 2004) for more on the issue.

[31] For more information, see Law, P. and De Franco, N. (1998), "International Gas Trade. The Bolivia-Brazil Pipeline", in *Public Policy for the Private Sector* Note No. 144, The World Bank, May 1998.

2.   Introducing Uncertainty and Multi-period Interaction

Coordination problems can become more complex in the presence of multi-period, iterative investment stages across borders when there is some risk that one or both parties will run into financial difficulties (or lose political will) to finish the project, even in the *absence* of asymmetric information. For example, imagine that a certain MTI project has three investment periods, after which the project is finished. In the first investment period, country *A* decides whether to invest on its section of an MTI project, which (assumed for simplicity) would require paying half the total cost of its section. In the second investment period, country *B* decides whether to invest or not. If it does, it pays all the cost of its section of the project. In the third investment period, country *A* again has to decide whether to invest or not, finishing its remaining section of the road. Now, imagine that there is a certain probability at the end of the first investment period of an event happening that prevents country *A* or *B* (or both) from continuing to invest in the project, and that at the end of the second investment period there is also a probability that country *A* won't be able to finish the project. The underlying reason could be any event having a dramatic impact on the capacity or willingness to finish the project, such as a shift in government priorities, a dearth of financing (e.g., if the country does not fulfil conditionality requirements), fiscal revenue reductions, or anything that might interrupt the project during implementation. We model this risk of (exogenous) interruption of the project as a move by *Nature* (or Chance), that can interrupt the project either after the first or the second investment stage. The conditional probability that the project is interrupted at the end of the first investment stage is denoted **α**, and the conditional probability that the project is interrupted at the end of the second stage is **β**. This game in represented in Figure 9.

<div align="right">

Figure 9
</div>

<div align="center">

INTERACTIVE DECISIONS WITH A POSSIBILITY OF BREAK-UP
</div>

<div align="right">
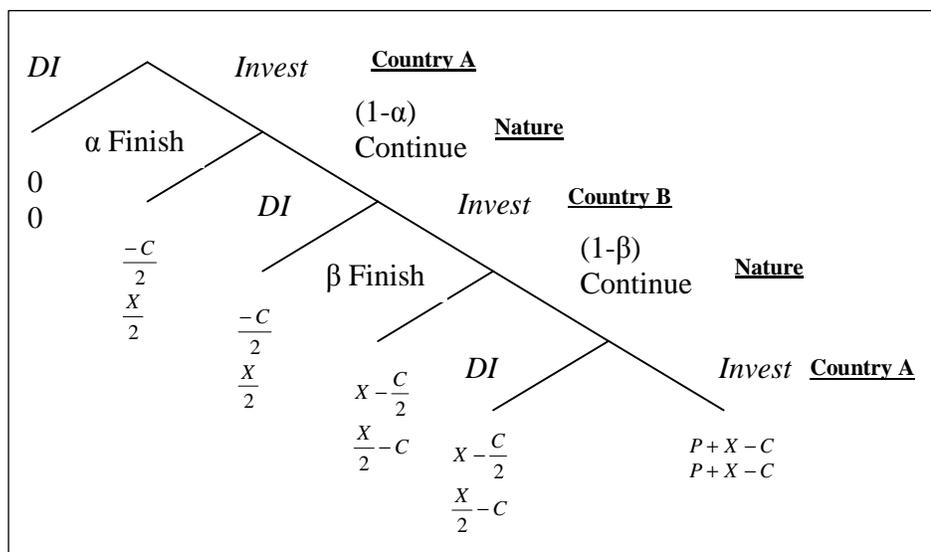
Source: Authors' elaboration.
</div>

Assuming that both countries invested in the two investment periods and that *Nature* did not interrupt the game (i.e., *A* is indeed given the choice of investing in the final stage of construction of the MTI), then country *A* will definitely invest in the last period if the network effects are sufficiently large with respect to the cost.[32] In this case, the payoffs for both countries will be high, consisting of the full network effects *P* plus the externalities effects *X* minus the investment costs

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[32]   In this example, the necessary condition for dominance is $P > \dfrac{C}{2}$

C.[33] In the second investment period, if **B** is allowed to decide whether to go ahead, it turns out that investing is not a dominant strategy for that country. This is because if it invests, it runs the risk of the game finishing afterwards, whereas if it doesn't invest, it still captures some benefits from country **A**'s investment in stage I. So, **B** will invest only if the risk of the game ending at the end of the second investment period (indicated by **β** in our example) is low enough and the expected payoff is more advantageous than simply profiting from the spillovers of *A*'s investment in stage I for **B**, which it receives at no cost. In stage I, *A* will make a similar calculation. *A* knows that **B** will invest in the second investment period if **β** is sufficiently low, but it is also necessary that the probability **α** that the game ends before **B** can decide to invest is low enough. In Annex I, we present the minimum values that the exogenous **α** and **β** need to have for coordination to occur on the (*Invest, Invest, Invest*) outcome[34] and provide a numerical example for illustrative purposes.

The central message that can be extracted from this simple example of an iterative MTI project is that the dynamic nature of decision-making and implementation brings about additional difficulties to the coordination process that we presented in the last section, where we discussed the Stag Hunt, one-shot simultaneous-move game. And all of this occurs *without* asymmetric information. In particular, the mere suspicion that the other country will not invest in a later stage can be enough to prevent an MTI project from ever entering into its execution phase. As pointed out by Fujimura (2004), synchronising project phases in different countries can be difficult, due to heterogeneous internal political and economic conditions. In this dynamic environment, even if ex ante the probabilities of exogenous interruption **α** and **β** are low enough, the project might not be finished for long periods of time, on the occasion that see a negative shock by Nature occurring, thereby "terminating" the project before its conclusion. So both Government constraints and the likelihood that they might be binding in the future can stop MTI projects from being carried out. Given the delays in implementing cross-border projects in Latin America so far, despite profuse political declarations about the stern will to implement such projects, models such as the one discussed can add some light to the causes (and possible remedies, see section VIII) of multinational infrastructure deficiencies in the region.

The need to maintain MTI also leads to repeated interaction over time. In its simplest form, that interaction can be modelled as a repeated game. As is well known,[35] and has been documented in the experimental literature (e.g., see Camerer, 2003), repeated play among the same two agents can lead to coordination when the game is repeated indefinitely. See Cárcamo-Díaz (2005) and the references cited therein for more.

So far, we have discussed the problems of coordinating expenditure in transport infrastructure when decisions are taken only once or in an iterative way, but always in the absence of asymmetric information. We have seen that coordinating a MTI project is not trivial, as the structure of the interactions and chance events can result in several possible outcomes.[36] However, things become much more complicated if other real-world characteristics are introduced into the model. To finish this section, we will briefly mention one additional real-world complication that can be introduced in the analysis, namely, the fact that information about the potential payoffs if both countries invest, i.e., the values of *P* and *X* in our examples above, are difficult to calculate for

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[33] For simplicity, we assume that investing in its section of the road does not produce any benefit for the country investing if the other country doesn't invest (i.e. *W* = 0), and we assume that while externalities *X* accrue partially as investments take place (i.e. if half the road is built, half of *X* accrues to the other country), the network effect *P* only accrues when the MTI project is finished.

[34] (*Invest, Invest, Invest*) and (*Don't Invest, Don't Invest, Invest*) are the sub-game perfect Nash equilibria of this game, depending on the values of the probabilities of interruption **α** and **β,** with the former being the equilibrium for low values of **α** and **β** and the latter being the equilibrium for high values.

[35] The theoretical justification behind this result is known as the "Folk Theorems" for infinitely repeated games. Those theorems "*…assert that if the players are sufficiently patient then any feasible, individually rational payoffs can be enforced in equilibrium. Thus, in the limit of extreme patience, repeated play allows virtually any payoff to be an equilibrium outcome*" Fudenberg & Tirole (1991, p. 150).

[36] The outcomes might or might not be Nash Equilibria in practice. See Camerer (2003).

one or both countries. For example, country **A** might know less than **B** about the spillovers generated through **B**'s investment in its section of the road (the value of its **X**). The value of the network effects **P** might also be different for each country and also privately known. For example, determining future revenue **P** and **X** (but probably not future revenue **W**, which are the domestic benefits of the MTI project if only the national section is in place) requires assessing elements such as: the increases in traffic, its type, whether there is seasonality, the willingness and capacity of that traffic to pay tolls and taxes, the increases in economic activity in both countries resulting from the new transport infrastructure (and which sub-national regions benefit, something particularly important in federal or decentralised administrations), etc. In this setting, each country might be willing to use this private information strategically: if the costs to be borne by each party are conditional on the benefits to be extracted from the project (although that doesn't need to be so), both country authorities may willingly downplay their payoffs or overstate their costs. Such incentives have been reported in Europe (Sichelschmidt, 1999).[37]

One limitation of game theory is that different methods for modelling imperfect information can lead to diametrically different outcomes, even in situations that are otherwise strategically identical. As explained in Cárcamo-Díaz (2005), countries more often than not play dynamic games of imperfect information, where each player only has a probability distribution about the possible "types" of the authorities in other countries. An important aspect of uncertainty is that during the construction and operation stages of the project government changes (in elections and cabinet reshuffles and other modifications to the political balance of power) can cause the government's payoff function to change significantly. This eventuality can contribute to making the *ex ante* decision by a country about whether to invest or not substantially more complex. This seems particularly relevant for MTI, because the future stream of revenues and welfare that a certain cross-national project is expected to produce depends not only on whether the project is *built*, but also on whether enough funds will be allocated in the future by counterparts on *maintaining* (or expanding, if necessary) the transport infrastructure sections in their territory. Therefore, the likelihood that future governments in partner countries will give importance to maintenance, in the face of binding financial constraints is of extreme relevance, as the future income stream of the project depends to a large degree on it.

Despite the complexity of the issue, which involves discussions about the different implications of lack of common knowledge (Geanakoplos, 1992), it is worth mentioning that another way to enrich the analysis is to consider that different countries employ different methods for assessing costs and benefits of MTI projects. Countries doing a cost-benefit analysis (as we mentioned, this is unfortunately not always the case) often use different assessment methods, even if they have access to the same information (i.e., if there is no private information), which leads to divergences in estimates about payoffs. Moreover, it is often unclear what forecasting methods, modelling assumptions, objective functions, or even models were used (Short and Kopp, 2005). This problem is particularly important if *ex ante* estimates of the cost of projects are systematically under-estimated (e.g. due to a negative bias in estimation models) and spillovers on partner and third countries are ignored, as it has been claimed is often the case (PWC 2004). For the purposes of understanding the specific coordination issues involved, the problem is that game theory tools generally assume that all players have the same probability distributions regarding unknown information, something that reduces the usefulness of such a tool in situations of uncertainty. Also, there is usually uncertainty as to the spatial extent of spillovers such as environmental impacts, population flows, changes in transit patterns for goods, and so on, not least because they are not exogenous factors. But including or excluding these considerations in the analysis may considerably affect the perceived overall benefits and as well as

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[37] Sichelschmidt (1999, p. 178) writes: "*Hence, governments of Member States may have submitted projects for the TEN programme not primarily because of their importance in a really Union-wide context but simply because they wished to attract from the common treasury as many financial resources as possible*".

their distribution among the countries. Related to the estimation problem, cross-national projects also have to surmount the problem of operating under more than one legal environment, something that can affect payoffs. Such a situation is of special concern to private firms willing to build or operate a cross-national transport infrastructure asset, but can also be a problem when the project is built with public funds.

Including other real-world difficulties of coordination, especially those related to uncertainty and asymmetric information, escape the reach of the present paper for reasons of length (see Cárcamo-Díaz, 2005 for a longer discussion of these issues). Notwithstanding this, it would be worthwhile to take them into account when analysing coordination efforts of MTI projects. For example, there is the possibility that even if total costs of a multinational project are fixed by technological (or other) conditions, the costs incurred to each country are not fixed but variable (and negotiable) instead. In any case, the discussion in this section suggests that economic theory has provided us with a substantial number of theoretical tools to design and analyse MTI coordination, especially when governments can be expected to finance investment. It is now up to policymakers in Latin America and supranational institutions supporting them to make the substantial effort necessary for those tools to be put to proper use in the analysis and implementation of MTI projects in the region

VI. The European Experience with Multinational Transport Infrastructure Coordination

1. Brief History of the Agreements and Instruments of MTI Coordination in Europe

The initial efforts made by the European Commission (EC) to identify and fund transport projects with cross-border implications during the 80's led to an increasing awareness among EU politicians and officials about the significance of coordination for investments in regional transport infrastructure (EC 2003, Sichelschmidt 1999). In the 1990 action plan on Trans-European Networks adopted by the EC, there was an explicit recognition about the need for coordination, and by 1993 the Treaty of Maastricht gave the EC competencies and instruments to develop a European transport policy.

With this broad political agreement in place, the conception and implementation of a common transport policy accelerated in the period from 1993 to 2001. Among the policy milestones in this period, the most important is considered to be the Essen European Council's endorsement of a list of 14 "specific" projects selected by the Christophersen Group. This was a special group of personal representatives of the Heads of State or Government chaired by an EC

Commissioner who, on the basis of existing national priorities, selected26 major priority projects.[38] A list of 14 among these priority projects was endorsed by the Essen European Council in 1994, providing a "roadmap" that would complete major trans-European transport axes, although questions were subsequently raised about how effectively the projects balanced national planning interests and a regional perspective (European Commission 2001, 2003). The Essen list included conversions of rail links, airport extensions, and upgrading and construction of high-speed railway lines and motorways.

Building on this consensus about what transport projects were of "European" interest, the EC went on to produce a set of complementary guidelines that aimed at establishing a coherent trans-European transport network (TEN-T). On the basis of these guidelines, the EC proposed many more projects of common interest that should be completed by 2010. In the 1996 guidelines, we find the first attempt to codify a *framework promoting the cohesion, interconnection, and interoperability of TEN-T by identifying priority projects on major transport corridors*. TEN-Ts were defined broadly to include transport infrastructure of all kinds (road, rail, and inland waterway networks; seaports, inland waterway ports, and other interconnection points), traffic management systems, and positioning and navigation systems. The process through which specific projects proposed by each State were selected for priority support was anchored in a "corridor analysis" that considered a number of overarching priorities. These included the projects' contribution to: completing transport corridors; extending major corridors towards "island, landlocked and peripheral regions"; and integrating distinct transport modalities.[39] The projects that were finally selected revealed an underlying preference for investing in railways, as this modality was thought capable of producing a gradual shift away from roads, which were perceived to be more congestible and damaging to the environment (Sichelschmidt, 1999).[40] Additionally, traffic growth in road transport, maritime transport and aviation is as high as or higher than GDP growth; in contrast, the market share of rail freight is falling, and the volume of freight carried by railways is stagnating.

By the time the EC published its White Paper on Transport Policy in 2001, it was clear that most projects were seriously delayed: only 3 out of the 14 projects in the Essen list had been completed thus far, and the remainder were unlikely to be completed by 2010 due to their magnitude and (sometimes) complexity. Moreover, the completed projects were small in comparison with those outstanding. A High Level Group headed by Karel van Miert, the EC Commissioner for transport, was formed to find the likely reasons for these problems and recommend solutions. They found that delays were especially long for cross-border projects, or

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[38] The selection criteria that were agreed on beforehand by the Christophersen Group to guide the inclusion or not of projects in the priority list were: "(i) projects had to be projects of common interest in accordance with the criteria which were meanwhile set in the Community guidelines for the development of a trans-European transport network; (ii) they had to be of exceptional size, bearing in mind the type of project and the relative size of the Member States directly concerned; (iii) they had to pass the economic viability test, including improvements of competitiveness and the technological performance of the Union; (iv) they had to allow for the possibility of private financing; (v) they were ought to be mature enough in order to be carried out quickly; (vi) they had to avoid the public financing of infrastructure which would lead to distortions of competition contrary to the common interest; (vii) and to respect Community legislation, in particular concerning environmental protection." (EC 2003, pp. 26-27).

[39] The full list of priorities specified by the guideline in Decision No 1692/96/EC was: "*(a) establishment and development of the connections, key links and interconnections needed to eliminate bottlenecks, fill in missing sections and complete major routes; (b) establishment and development of infrastructure for access to the network, making it possible to link island, landlocked and peripheral regions with the central regions of the Community; (c) the optimum combination and integration of the various modes of transport; (d) integration of environmental concerns into the design and development of the network; (e) gradual achievement of interoperability of network components; (f) optimization of the capacity and efficiency of existing infrastructure; (g) establishment of and improvement in interconnection points and intermodal platforms; (h) improved safety and network reliability; (i) the development and establishment of systems for the management and control of network traffic and user information with a view to optimizing use of the infrastructures; (j) studies contributing to improved design and better implementation of the trans-European transport network.*" (Article 5).

[40] This underlying priority was incorporated by a High-Level Group in 2003, which argued that "*the objective of sustainable development requires a shift in modal balance to be operated in favour of transport modes which are alternatives to road, namely rail, inland waterways and short-sea shipping.*" (EC 2003, p. 6).

sections thereof, which was attributed to disagreements about routes and the division of costs among countries, differences in political and administrative approval processes, and difficulties in setting up management contracts for cross-border sections. The Group also recognised that plans to implement cross-border transport infrastructure had fallen victim to asymmetries in costs and benefits, one of the sources of coordination problems we discussed in section V. As a result, MTI projects which made most sense from a national perspective[41] were progressing most rapidly, while others stagnated. This indicated the existence of coordination problems in the execution of priority projects. Moreover, the Group found the design and selection phases to be subject to similar problems. In particular, they criticized the selection process, noting that some: "…*Essen projects reflect a national planning desire which does not show any strong synergy with the remainder of the trans-European network. Others take the form of packages including many disparate projects*" (EC 2003).

This diagnostic led the Group to propose new guidelines and methodologies for project selection. A two-stage process was then put forward. The purpose of the first stage was to pre-select projects by removing those that were:

(i)   not essential to a main trans-European axis;

(ii)   too small (a minimum threshold of 500 million euro is established);

(iii)   lacking evidence about feasibility/benefits and the commitment by the concerned member states for making impact assessments in the appropriate times.

The second stage selected the priority projects based on expected:

(i)   European value added, in terms of facilitating exchanges;

(ii)   strengthening of cohesion regarding accession countries, peripheral and less developed regions;

(iii)   contribution to sustainable transport development, as regards safety, the environment and modal transfer.

Specific quantitative targets were associated to each qualitative criteria. European value added with respect to exchanges was to be measured by "…*the share of intra-Community traffic (i.e. concerning at least two Member States) in percentage terms of the total traffic on the sections concerned, or on the increases in net capacities on the route concerned, or by the number and length of networks which become interoperable*".[42] Contribution to cohesion would be measured by the "…*population of an 'isolated' region served by the infrastructure in question, and in the number of hours saved for the peripheral regions, or the cost savings for the transportation of goods*".[43] Sustainable transport development was to be measured by the "…*number of passenger-kilometres or of tonnes-kilometres transferred towards more "sustainable" modes of transport, such as rail or waterways.*"[44] The implementation of the priority projects identified is expected to reduce road congestion and improve rail performance (with an estimated value of 8 billion euro per year in benefits just for inter-regional traffic), induce a modal transfer of long-distance traffic away from roads to other modalities, especially rail, cut CO_2 emissions (by approx. 17 million tonnes per year for inter-regional traffic), and lift economic growth by 0.2-0.3% of GDP.

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[41]   This is particularly true of projects that contain improvements in infrastructure in individual countries rather than just connecting existing, fully-operational transport infrastructures. In this case, pre-existing government incentives for upgrading national sections of transport networks are reinforced by EC support. Examples provided by PWC (2004) include the North-South and West-East links in Italy.

[42]   EC (2003, p. 26).

[43]   *Ibid.*

[44]   *Ibid*.

The EU experience appears to confirm that the more a project's payoff to a country depends on actions taken by other countries (i.e., the more the network effects **P** and spillovers **X** weighs in the payoff function), the more difficult[45] it will be for such a project to be undertaken by national authorities, in comparison with national projects. The fact that investment in infrastructure (including its planning, financing, and evaluation) is ultimately a national issue has been pointed out by many authors, as we indicated before. This confirms the theoretical conclusion that a project needs to be incentive-compatible for *all* parties involved to be viable, in particular lending support to our focus on coordination games where every participant has something to gain by coordinating their actions, rather than "cooperative solution" games that either require redistribution from winners to losers or are not self-enforceable (i.e., at least some participant has an incentive to deviate).[46] If the incentive-compatibility condition is fulfilled, then dialogue-promoting instruments – by establishing a focal point and allowing communication among the countries– may contribute substantially to secure implementation.[47]

In this respect, the recent designation of European Coordinators is another mechanism introduced by the EC which can help in projects with hard-to-resolve coordination problems. The Coordinators will aim to "*facilitate the implementation of certain projects in a coordinated manner between Member States,*" (EC, 2005d) in an effort to overcome the difficulties arising from the fact that investment decisions in transport infrastructure are largely national, as well as to resolve non-financial disagreements about routes, timetable for completion, and official procedures. Up to now, six coordinators have been designated, all of them for railway projects. The Coordinators' mission includes coordinating expectations and actions of participants through consultation and to contribute their knowledge about European institutions and project management, with the view to promoting a synchronised and opportune implementation. They do not, however, have the authority to make commitments on behalf of the EC without the latter's prior agreement.

European Coordinators are meant to solve coordination issues that delay the execution of key cross-border projects, and therefore have a precise and short-lived role, and now an Executive Agency is being established with the objective of coordinating TEN-T in more general terms over the coming years. The EC's view is that the multiplicity of financial instruments available (e.g. Structural Funds, European Investment Bank, etc.; see next sub-section) is a potential source of coordination problems, and that the Agency can serve as a one-stop shop for national governments and other participants. Furthermore, a specialised Agency is expected to be more efficient and flexible in managing and monitoring TEN-T projects, as compared to in-house management by EC officials. This is particularly important if the large proposed increase in the level of EU funding goes ahead, as this would create new demands in terms of administering priority projects. It is estimated that the agency will be fully-operational in 1-2 years, with a projected staff increase from around 70 in 2006 to 96 by 2013 (EC 2005b,c).

One of the most important dimensions where coordination problems have been identified relates to informational imperfections and asymmetries surrounding MTI projects, which in Europe as elsewhere require special attention. As we pointed out in section V, excluding network effects when computing the impact assessment of a multinational transport project can lead to seriously underestimating its benefits. Van Excel et al. (2002) present cases where the inclusion of cross-border effects changes the results of project evaluation in the TEN-T. For example, in the construction of a new freight rail link between Rotterdam (Netherlands) and Antwerp (Belgium),

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[45] A PricewaterhouseCoopers report observed that "*where projects are discrete and not dependent on actions in adjacent countries to realize their benefits, for example the Cork-Stranraer link and Malpensa airport, this has made it easier for countries to justify investment*" (PWC 2004, p. 6).

[46] "*Within a Europe of nation states, international planning will remain a matter of cooperation based on mutual interest*". Short and Kopp (2005, p. 364).

[47] For more about how dialogue contributes to equilibrium selection in the presence of multiple equilibria, see Cárcamo-Díaz (2005).

they estimate the benefits to Belgium of constructing the *Netherlands* section to be 42.8 million euro. This positive spillover for Belgium (denoted as *X* in the stag hunt game of section V) represents 50.4% of the benefits the Netherlands gains from constructing its own section. Similarly, the economic returns of the Paris-Brussels-Koln-Amsterdam-London high-speed rail link are far greater when calculated as a single network than when aggregating evaluations for national sections.[48]

In an effort to measure the impact of TEN-T priority projects more accurately, the EC is sponsoring numerous data-collection and analysis projects, something that facilitates the coordination effort for the design and execution of projects, as mentioned in Section V. TEN-STAC is an interesting example of these research-oriented projects. Its aim is to develop and apply a uniform and consistent framework for assessing the expected future impacts of priority projects based on detailed traffic data and a "corridor approach". Two available results from this analysis are worth mentioning. First, the analysis found systematic differences between national and TEN-STAC estimates about the impact of projects. Specifically, the modal shift away from roads seems to be significantly overestimated in individual country assessments. Second, they found that some priority projects are rival (i.e., there are substitution effects at play) but overall there is evidence for increasing returns to scale from implementing TEN-T, implying the existence of positive network effects. Forty other projects included in the European Transport policy Information System investigate different aspects of TEN-T in more detail (ETIS 2005). The heavy weight of political considerations in the selection of the initial Essen projects has been criticised by transport economists (Sichelschmidt, 1999), who find an absence of well-grounded cost-benefit analysis taking into account international spillovers. Arguably, political decisions for speeding MTI projects could be explained by the desire to jumpstart TEN-T policy in a context where there are substantial information gaps and other difficulties to making proper cost-benefit project assessments (e.g., appropriate methodologies had not yet been developed). But it was owing to the serious delays in the implementation of the projects, which resulted from a lack of coordination in the execution phases, that a revision of the selection process was deemed to be necessary. Therefore, the turn towards a less politicised selection based on solid economic and environmental assessments has benefited from the observed shortcomings of politically-motivated coordination.

Finally, one characteristic of Europe that is absent in Latin America is the existence of a supranational institution such as the European Commission, which can use subsidies drawn on its own funds to alter the distribution of payoffs and thereby facilitate non-cooperative coordination. But note that as these funds are obtained from the budget (that is, from all European countries, rather than only the ones participating in the MTI projects) and do not constitute extracting welfare from the "winners" to give it to the "losers", the EC is not reallocating costs and benefits. Additionally, the EC does not have the capacity to oblige countries to construct their sections of the infrastructure, so the EC cannot enforce a "cooperative solution" that is not a Nash Equilibrium. We saw in Section V that transfers can potentially help countries to coordinate on the Pareto superior Nash Equilibrium of coordination games in the presence of asymmetries in benefits and costs. For this reason, besides the need for lifting binding financial constraints that we will address in the next sub-section, payoff modifications using European funds by the EC has the potential to facilitate coordination among countries. However, an important question that needs to be answered is whether the use of regional funds in cross-national transport infrastructure will lead to moral hazard on the part of the countries, a possibility that has been pointed out in the literature on regional transport investments (Sichelschmidt 1999, IADB 2002). The reason is that countries can have incentives to deliberately overestimate the network effects and spillovers of a cross-national

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[48] There can be negative spillovers too, related to the negative environmental effects from the new transport networks, and the EC has been criticized by NGOs for not calculating these with care.

project, in order to secure low-cost funding from regional authorities.[49] Specifically, it is worth asking whether the "policy shift" in EC financing will exacerbate the tendencies towards moral hazard for projects with smaller spillovers. A 50% maximum rate might act as a "convoy policy",[50] in which projects that would have been implemented without external support will now be subject to hold-up by individual countries due to the availability of cheap Community funds and, perhaps, higher overall costs. This underlies the need for striking a delicate balance between aligning incentives for the countries and minimising the total cost to the supranational institution.

2.   Addressing Binding Financing Constraints in Europe

As of late 2005, the TEN-T network envisaged building and upgrading 89,511 km of roads; 3,741 km of railways, a significant fraction of which are high-speed lines; 330 airports; 270 international seaports; 210 inland ports; and traffic management systems, navigation and user information systems (EC-DG TREN 2005). The estimated investment needs in 2004-20 add up to 600 billion euro, of which priority projects (in the process of completion, or starting before 2010) will take 232 billion euro. Additionally, there is the set of initiatives related to the extension of transport networks to support the enlargement process of the European Union and looking beyond Europe's borders. The PAN-European Corridors and the TINA transport infrastructure network were agreed in the mid-1990's to develop transport links with accession countries in Central and Eastern Europe.[51] Now, the "Networks for Peace and Development" proposes applying many of the principles of TEN-T towards improving transport axes with 26 neighbouring countries. The High-Level Group chaired by Loyola de Palacio has published a report that presents the priority transnational axes and projects that will "*extend and complement the major axes of the trans-European transport network by interconnecting them with the networks of neighbouring countries*," to help promote "*international exchanges and traffic as well as enabling regional cooperation and integration*" (EC 2005a).

With the perspective of securing the massive amount of funds needed to finance investments of this magnitude, and in order to solve the finance-related problems upsetting the execution of cross-border and bottleneck projects, the Karel Van Miert Group came up with an answer: increase EC funding for MTI projects. Up to 2004, the financial rules for TEN-T allowed EU funds to pay for up to 10% of the budget in cross-border projects. In response to the Group's recommendation, the maximum share of EU co-financing was raised to 20% in 2004 (Regulation 807/2004/EC), and a proposal is on the table to increase this rate to 50% for the financial perspective 2007-13 (EC-DG TREN 2005).

Of course, the effectiveness of the new financing rules will be proportional to the level of funding allocated to TEN-T. The EC would like to see this grow substantially: whereas the TEN-T budget amounted to 4.170 billion euro in the period 2000-6, the proposed budget for 2007-13 is 20.350 billion euro. However, in a context of widespread and severe budgetary restrictions, the EC's arguments have so far met with a rebuff from national governments.[52] At the end of 2005, the European Council proposed 6 billion euro, which would curtail the scale of leverage funding for

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[49]   There is a related set of issues regarding private participants that construct and/or operate transport infrastructures. Depending on how the procurement in organized (and, specifically, how much competition exists at the procurement stage), firms may have a tendency to inflate cost estimates in order to make excessive profits, but can also underestimate costs if they are subject to a risk and optimism bias. In the former case, the project will be executed but with a disproportionate public expenditure; in the latter case, there is the risk that the firm will not be able to complete the project; and in either case, regulation could be needed to curb prices for users.

[50]   The origin of the term comes from wartime allied convoys of merchant ships that were escorted by naval units which traveled between the US and Europe. Each convoy traveled at the speed of its slower ship.

[51]   See Annex III of the document "EU Common Transport Policy: Trans-European Networks".

[52]   See the interventions at the Conference "Mid-term review of the White Paper on European transport policy," Brussels, 1 December 2005.   http://ec.europa.eu/transport/white_paper/mid_term_revision/2005_12_01_conference_en.htm

transport. To put the previous figures into context, notice that the 30 priority projects selected by the Group (which include the original Essen list) call for an investment of 140 billion euro in 2007-13. Consequently, even if it is the case that funds are concentrated on key sections of projects, the 6 billion euro are unlikely to go very far in terms of financing. However, those funds can play an important role in funding pre-investment studies and other activities that can significantly assist coordination.

Figure 10
EC FUNDING FOR ACTIONS SUPPORTED UNDER TEN-T (1983-2004)
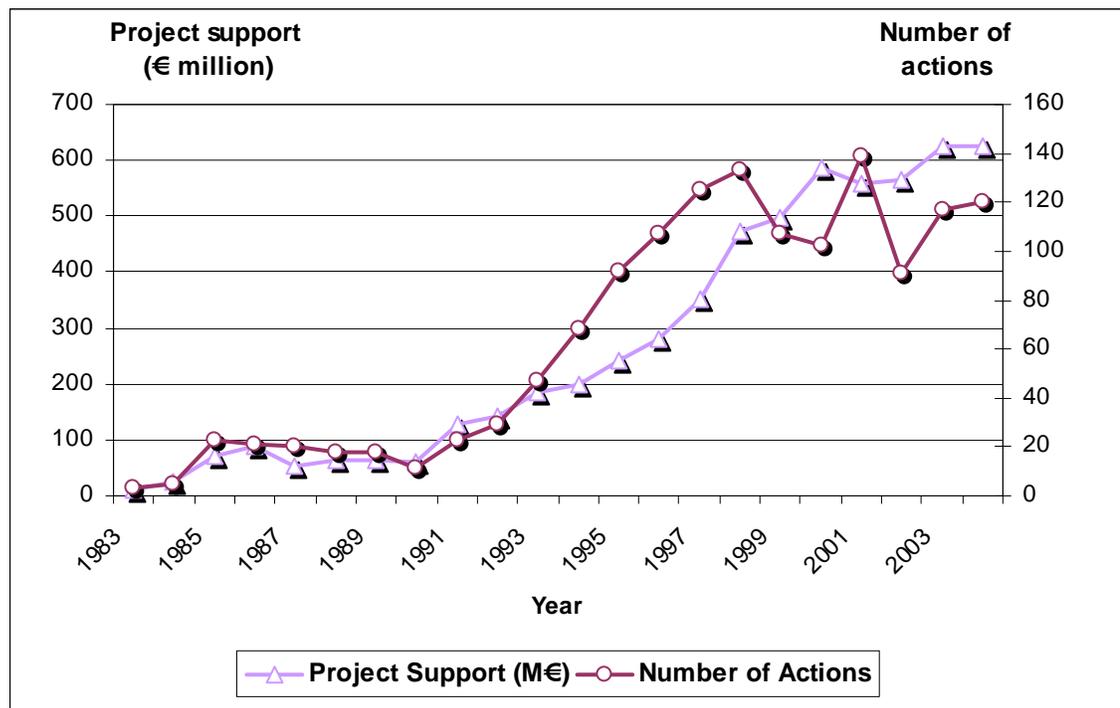
Source: Authors' elaboration based on the EC's List of Actions Supported under TEN-T 1983-2004.[53]

In Europe other funding sources are available, such as the Structural Funds and Cohesion Funds, which contribute resources for projects in specific regions. European pre-accession instruments such as ISPA, the ERDF and the Cohesion funds have evolved from funding approximately 11.5 billion euro in 1994/6-99 to 23 billion euro on 2000-6, and are expected to fund 42 billion euro in 2007-13 (EC 2005e). European Investment Bank (EIB) loans are historically another important funding source for TEN-T: 23 billion euro in 1994/6-99, 44 billion euro in 2000-6 (EC 2005e, p. 8). Towards the future, the EIB expects to increase lending for TEN-T; a ballpark figure of 50 billion euro is expected in 2004-10.[54] At the end of the day, however, in Europe as in other regions of the world, the leading amounts required to develop transport networks have been and will continue to be allocated by national governments: 73 billion euro in 1994/6-9, 175 billion euro in 2000-6, rising to 200 billion euro for the financial perspective 2007-13 (EC 2005e).

It is probably fair to say that the consensus view of EC officials and private sector actors is that a hike in EU support of about +80% and an increase in EIB lending of +20% compared to

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[53]   This list is available at http://ec.europa.eu/ten/transport/actions/doc/1983_2004_supported_actions_en.pdf
[54]   "Financing European Transport Infrastructure", Presentation by European Investment Bank Vice-President Wolfgang Roth, at the European Federation of Railways Trackworks Contractors, Amsterdam, 2 December 2005, available online at: http://www.efrtc.org/htdocs/newsite/events/Genassy_2005_Presentation_Roth.ppt

present levels is unlikely by itself to rectify TEN-T's implementation record.[55] This view reflects the fact that delays occurred *despite* even larger growth rates in EC financial commitments over the last two decades (see Figure 10). From 1990 onwards, there was already a five-fold increase in EU support and in the number of projects, which went hand-in-hand with the development of political agreements during the period. To leverage-in funding for the cross-border sections that are holding back priority projects, and more generally to reduce the uncertainty for private participants that could commit resources through PPP's, a bold financial solution –such as that proposed by the EC– is needed. Yet this tension between national and supranational levels, and between public and private actors, suggests that a debate is needed to substantiate the claims that an injection of EU funds is an efficient way to ensure that the "right" projects will be completed in time.

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[55] See, for example, the views expressed by Loyola del Palacio in an interview published in [JGG TO INCLUDE SOURCE]…; and those expresses by the CER-UNIFE in its "Fact Sheet: TEN-T budget for 2007-2013: Modern infrastructure is key to European competitiveness."

VII. Coordinating Public Expenditure in Infrastructure in Latin America: The Initiative for the Integration of Regional Infrastructure in South America (IIRSA)

In this section, we will revise and analyse the coordination experience of the Initiative for the Integration of Regional Infrastructure in South America (IIRSA).

1. Brief Description, Aims and Characteristics

IIRSA "...is a forum of dialogue among the authorities responsible for transport, energy and telecommunications in the twelve South American countries".[56] Created as a result of the Summit of South American Presidents held in Brasilia in the year 2000, it has the objective of fostering the development of transport, energy and communications infrastructure with a regional perspective, contributing to the physical integration of the twelve South American countries and fostering equitable and sustainable development. It

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[56] See www.iirsa.org. In this section, we draw heavily from the information available in that website about the initiative. Quotes have been translated by the authors from the original Spanish in IIRSA's website.

includes mechanisms of coordination and information exchange among Governments and three multilateral regional financial institutions (namely, the Andean Financial Corporation (AFC), the Inter-American Development Bank (IADB) and the Plata Basin Financial Development Fund (FONPLATA)).

IIRSA uses the concept of "Integration and Development Axes" (EIDs in Spanish) to organise its vision of physical integration. According to IIRSA's website: "*In line with the geo-economic view of the region, space is organised around multinational areas that concentrate current and potential trade flows, where the aim is to establish a minimum standard of quality of infrastructure services in transport, energy and telecommunications, with the purpose of supporting production activities specific of each area or EID. The supply of these infrastructure services aims at fostering the development along these axes of businesses and productive linkages with large economies of scale, either for consumption within the region or for export to global markets. EIDs represent a territorial reference for the wide sustainable development of the region. This ordering and harmonic development of South American space will improve access to areas of high productive potential that find themselves currently isolated or under-used due to the deficient provision of basic transport, energy or telecommunication services*". Ten EIDs have been defined in South America.

IIRSA structures its work at three levels. First, its direction level is based around the Executive Direction Committee (CDE in Spanish), formed by the Infrastructure or Planning Ministers of South American countries. Their role is that of deciding the strategic lines of work and approving action plans. Second, the executive level is structured around Technical Executive Groups (GTEs in Spanish), which are integrated by senior officials and experts named by the countries. There is one GTE for each Integration and Development Axis (EID),[57] with the purpose of analysing specific topics among countries and carrying out concrete actions at the multinational level. A third level is integrated by representatives from the Andean Financial Corporation, the Inter-American Development Bank and the Plata Basin Financial Development Fund, the Technical Coordination Committee (CCT in Spanish) provides financial and technical support to countries, coordinates joint activities, and acts as the custodian of the "institutional memory" of the Initiative.

In addition, each country has a National Coordinator. According to IIRSA's website,[58] the National Coordinator is: "…responsible of articulating the participation of the different Ministries and government institutions involved in IIRSA and, eventually, that of other relevant sectors of society (private sector, sub-national governments, academia, NGOs, etc)". National Coordinators are charged with important tasks that include: representing IIRSA within their countries; identifying problems and articulating the participation of the public and private sector in the different GTEs; evaluating the Terms of Reference of the Technical Assistance that the CCT carries out, when the Assistance involves their countries; registering information on the Strategic Management Information System (see below); following up on the process of elaboration and execution of a project; periodically meeting to analyse and monitor the advance of the yearly action plans and setting the agenda and documents for the CDE meeting jointly with the CCT.

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[57] And for each Sectorial Integration Process.
[58] See the document "Anexo 10" of IIRSA's 7th meeting of the CDE, held in Asunción, Paraguay on December 1st-2nd 2005, about the Institutionalisation of National Coordination in IIRSA.

2. IIRSA and Coordination

IIRSA fosters coordination of public expenditure in MTI at two stages of the program and project cycle:

- for the definition of the groups of projects to be considered, their ranking according to a series of criteria, and the selection of projects that will be prioritized,

- for the execution of the projects.

Coordination in the first stage is fostered by holding meetings among the above mentioned groups of government officials and experts,[59] and by seeking consensus on the groups of projects and their priority that are to be implemented by the countries. According to IIRSA's website, by June 2005 the Initiative has identified 335 infrastructure projects, including transport (289 projects), energy (40 projects) and communications (6 projects). The estimated necessary investment for all those projects totalled 37,470 million US dollars as of 2005, of which 17,376 million corresponded to transport projects.

In November 2004, the Executive Direction Committee (CDE) approved a group of 31 integration projects (see the full list in Annex II) out of the total project portfolio identified, which were considered to be of "high impact" for physical integration in South America. Those 31 projects, 28 of which are transport projects totalling 5,401 million dollars of required investment as of June 2006, became the "Implementation Agenda Based on Consensus 2005-2010" (AIC in Spanish), which was presented during the South American Presidents' summit held in December 2004.

IIRSA has a methodology to analyse and classify the projects identified within each EID. This is important because identifying those projects with the largest potential impact (in terms of the strategic objectives of IIRSA) allows countries and multilateral financial institutions to concentrate their scarce resources in those projects considered to be of high priority. According to IIRSA's documents,[60] the analysis process can be divided into four:

1) grouping of the projects of each Axis of Integration and Development.

2) establishing the factors of analysis.

3) preparing and consolidating the information about groups of projects.

4) evaluating the resulting groups of projects.

A "Business Vision" for each EID and a portfolio of projects supplied by the countries, together with a series of guiding principles for the effort, known as "Strategic Vision for the Physical Integration of the Region", were the basic elements with which work on project ranking and selection started. According to official IIRSA documentation, the criteria for grouping projects is the existence of "spillovers" or "synergy", explained as the possibility that a group of investments can generate more benefits than the summation of individual component projects.[61] Using our framework of section V, clearly the most important MTI projects would have substantial network effects P and (positive) externalities X In IIRSA, projects are grouped around a project called "anchor project" (or "existing anchor project" if it already exists) for the group, which justifies the creation of a group of projects around itself. These anchor projects are often

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[59] These meetings are known as "Grupo Técnico Ejecutivo" (Executive Technical Group) meetings.
[60] Obtained mainly from their website: www.iirsa.org.
[61] "*El agrupamiento de proyectos de inversión se basa en la posibilidad de explotación de las externalidades positivas de un conjunto de inversiones que puede generar beneficios más grande que la suma de los efectos de los proyectos individuales que lo componen. A este beneficio adicional le llamamos sinergia*" IIRSA. Análisis de la Cartera de Proyectos, document available online at www.iirsa.org.

bottlenecks or "missing links" in infrastructure networks. These missing links are precisely the key to unlocking positive network externalities in an MTI project. The grouping process led to organising the total portfolio of IIRSA projects into 40 groups of projects, which became IIRSA's Project Portfolio 2004.[62] Project grouping was carried out by a multinational work group.

In order to compare the different groups of projects that have been defined, IIRSA defines a series of analysis factors, around two dimensions: first, the impact of each grouping on sustainable development through physical integration and, second, the likelihood that each grouping can be implemented. The impact on sustainable development is measured along three dimensions:

    (1) An economic dimension that considers the capacity of the group of projects to:

        (a) increase the trade flow of goods and services,

        (b) generate investment opportunities in the relevant geographic area,

        (c) increase competitiveness in the relevant geographic area by lowering costs (e.g., transport).

    (2) A social dimension that considers the capacity of the group of projects to:

        (a) generate income and employment in the area of influence,

        (b) improve the quality of life of the population (e.g. access to health services, education, mobility, etc), considering different income segments.

    (3) An environmental dimension that considers the capacity of the group of projects to:

        (a) improve on the usage of natural resources,

        (b) maintain or improve the environmental quality in the relevant geographic area.

The likelihood that each group of projects can be implemented is analysed along three dimensions:

    (i) Risks faced by the group of projects, including:

        (a) whether there is an adequate regulatory and institutional framework in the sectors and countries where the projects are located;

        (b) whether the present and future level of demand, justifies the group of projects, identifying risks about the projections of future demand;

        (c) how high is the environmental risk associated with the group of projects (e.g. whether environmental impacts can be mitigated, etc); and,

        (d) how much risk exists owing to the equipment and technology that will be used, the construction process, and other risk factors associated with project execution and operation.

    (ii) The financing constraints, including:

        (a) what is the capacity of the group of projects to attract private investment in infrastructure, given the expected returns;

        (b) the investment capacity of the public sector, given fiscal conditions and constraints; and,

        (c) the likelihood of attracting the private sector to Public-Private Partnerships in infrastructure, given the existing regulatory framework.

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[62] See the minutes of IIRSA's 6th meeting of the CDE, held in Lima, Perú on November 23rd-24th, 2004.

(iii) The political dimension, including:

    (a) the degree of political accord and commitment of the countries in terms of the implementation of transnational projects,[63]

    (b) the degree of alignment of the group of projects with public policy and existing national investment priorities; and,

(iv) the possibility of overcoming potential opposition to the projects due to political, social or environmental reasons.

According to IIRSA documents, projects are ranked using "Multicriteria Analysis" (MCA) rather than a pure Cost-Benefit Analysis (CBA). This means that the previous factors are weighted, with weights being jointly determined by the members of GTEs using a software platform that uses a decision making criteria called Analytic Hierarchy Process.[64] The process starts by comparing each factor in groups of two, leading to a certain "weight" of each factor and ranking them using an ordinal scale. Then, each group of projects is evaluated with regards to each factor and ranked accordingly (e.g., group A might improve the quality of life of the population more than group B). Having both the ranking of factors and the ranking of each group of projects for each factor, a comparison can be carried out that assigns a certain ranking to the groups of projects within a certain EID.

Also, to facilitate coordination at the project design level, the multilateral institutions (IADB, AFC) that constitute the CCT can finance studies in order to facilitate the coordination process. For example, in early 2006 the AFC approved a "Fund for the Promotion of Sustainable Infrastructure Projects" (PROINFRA),[65] with 50 million dollars for the period 2005 – 2010 to finance studies of feasibility, environmental impact, etc., giving priority to regional integration projects and projects that introduce innovative financing schemes; while the IADB has constituted an "Integration Fund,[66] a non-reimbursable fund that has 20 million dollars available to finance integration infrastructures studies. In the domain of financing, the fact that the IADB and the AFC both participate actively in IIRSA via the CCT can also assist coordination[67] as the projects are normally financed with an important component of debt.

Coordination at the project execution level is fostered by introducing common information-sharing and monitoring mechanisms.[68] In order to facilitate and monitor the effective execution of AIC projects, IIRSA implemented a Web-based information system called SIGE (standing for Strategic Management Information System)[69] that allows the compilation of information about the AIC projects in a central repository. Among the information gathered are critical stages of the projects, current situation, potential solutions to restrictions and problems, estimated investment and financing sources, as well as data about the projects, such as technical documents, pictures of the work in progress, actors, etc. In

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[63] When there are projects that are part of an accord between countries, political commitment can be considered higher.

[64] The software in question is called Expert Choice.

[65] Its official name in Spanish is "Fondo de Promoción de Proyectos de Infraestructura Sostenible". See the news for April 20th, 2006 at www.caf.com

[66] Its official name in Spanish is "Fondo para el financiamiento de operaciones de cooperación técnica para Iniciativas para la Integración de Infraestructura". See www.iirsa.org

[67] The role of multilateral banks along these lines can be complex. On the one hand, if projects analysed as part of the IIRSA initiative were to have a higher probability of obtaining multilateral financing, that could improve welfare. The condition is that other equally welfare-enhancing projects in infrastructure or other areas are not crowded out by being artificially "lowered in ranking", as the capacity of indebtedness of Latin American countries is limited. As projects in other areas might also be measured with significant noise, ex ante it is difficult to conclude on the welfare implications of this.

[68] Interviews with senior country officials and multilateral bank staff indicates that funding and monitoring of country sections in terms of financing are bilateral affairs between multilateral banks and national Ministries of Finance. However, Tanzi (2005) comments about the monitoring role of the latter: "*Decisions on public projects are often made by spending ministries that have less concern about the efficiency and the financial implications of these projects. Perhaps, the move away from tax financed to debt financed projects, may have reduced the power of the Finance Ministry. The reason is that the spending ministries often negotiate directly with the lenders and the Finance Ministry has limited political power to prevent spending that is externally financed*" p. 10.

[69] Its official name in Spanish is "Sistema de Información para Gestión Estratégica". See more details about the SIGE at: http://www.iirsa.org/BancoConocimiento/N/noticia_sige/noticia_sige.asp?CodIdioma=ESP

addition to the SIGE, monitoring includes sharing progress reports every two and six months. In coordinating execution, the role of the National Coordinators is probably key.[70]

Bad regulation can undermine coordination efforts, as it can result in the underutilisation of an existing network. An extreme case would be when border controls are so complex and time consuming as to render the cross-border passage uneconomical. In general, the close relationship between physical and institutional infrastructures means that additions or new links in transport networks may well call for a co-evolution of the relevant national regulations in order to maximize the benefits to users, which come from the true degree of connectivity of the network. Such a co-evolution may be in the direction of a harmonization of national rules, or may be effectuated through the creation of bi-national working groups to design and implement the appropriate rules.

In Section III we posited that the size of the costs and benefits of MTI projects can also be affected by institutional factors such as the ease with which cargo and people can cross borders. This is particularly important in South America, where a study funded by IIRSA found that crossing times at the borders can be very slow and therefore reduce the benefits of better infrastructure. For example, at the Aguas Verdes (Perú) – Huaquillas (Ecuador) border crossing, the importing process on the Ecuadorean side alone was estimated to take 24 to 48 hours, and if the cargo required fitosanitary intervention, the delays could add two or more days to the journey.[71] To diagnose and analyse how to tackle these issues, IIRSA has carried out a series of studies and analysis about Border Crossings in South America.[72]

To sum up, in order to explain IIRSA's contribution to coordination using our theoretical framework, several things can be said. First, at the project selection (decision) and execution levels the Initiative acts as a focal point to coordinate the execution of those projects considered to be "of the highest ranking". That emerges from our description above of IIRSA's efforts in getting the individual countries to agree on the AIC (through the work of the CDE, the CCT, the National coordinators and after having held several GTE meetings) and in setting up the Strategic Management Information System to monitor the implementation of those projects. Second, IIRSA meetings convey both "cheap talk" messages (when information exchange among countries is costless) and allows countries to send costly signals (via their iterative cooperation process and repeated interaction) about their willingness (political objectives and priorities) and capacity (political and financial constraints) to coordinate public expenditure in transport infrastructure projects. This signalling process will result from the actual implementation of the AIC and the different Sectorial Integration Processes, such as the one regarding Border Crossings. Additionally, IIRSA constitutes a bold attempt to jointly (i.e. cooperatively) solve the multiple problems described in project design when it involves several countries and interest groups. By structuring information exchange, bargaining and decision making within the Initiative, it is expected that better coordination on Pareto superior outcomes will result. Having said that, however, we will see in Section VIII that in all of these positive roles there is substantial room for further improving the Initiative's coordination work.

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[70] The role of the national coordinators is claimed to be one of "articulating the work of the different actors within and outside governments in a country": "*Las coordinaciones nacionales de IIRSA son el mecanismo encargado de coordinar la participación del país que representan en las distintas instancias que surjan en el proceso de ejecución del Plan de Acción de la Iniciativa, articulando la participación de los sectores del gobierno nacional y subnacional, así como de otros sectores relevantes de la sociedad, involucrados en los diversos Grupos Técnicos Ejecutivos (GTEs)*" Anexo 10 document of IIRSA's 7th meeting of the CDE, held in Asunción, Paraguay on December 1st-2nd, 2005. Unfortunately, it is not clear what this has implied in practice in different countries.

[71] IIRSA (2003), Facilitación del Transporte en los Pasos de Frontera. Síntesis, Conclusiones y Recomendaciones, pp. 36. Available online at http://www.iirsa.org

[72] See IIRSA's website at http://www.iirsa.org/SecPFrontera.asp?CodIdioma=ESP for more on this.

VIII. The Road Ahead: Policy Implications for the Region

A series of policy implications emerge from the theory and the empirical evidence of coordination in both Europe and Latin America.

1. Information and Measurement Issues: Improving the Appraisal of Costs and Benefits of Multinational Projects at the Regional Level

In the previous sections, we have emphasized the importance of evaluating MTI projects[73] using methods and models that adequately incorporate spillovers into other countries, including negative environmental impacts, and the manifold effects of investing in transport infrastructure for the overall economy. Incorporating spillovers in project evaluation is particularly necessary to reduce the risk that multinational projects are artificially discriminated against due to underestimation of potential benefits. Unfortunately, recent evidence (IMF 2005a, 2005b) points to serious shortcomings in the way that Latin American countries (including Andean ones) design and measure the expected costs and benefits of transportation projects

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[73] If there are network effects, economies of scale and other externalities in transport infrastructure project, as claimed by IIRSA, a "project" might actually be a group of projects with large enough spillovers to justify their being considered a single entity. Of course, that requires a cut-off point (which is often arbitrary) for deciding which projects are included and which aren't within a certain group.

even national ones. Given the additional difficulties that multinational projects present, there is a pressing need to strengthen the institutions that generate the information and models that will later be used to evaluate and rank different infrastructure projects in the region, especially taking into account cross-national spillover effects. This challenge has been identified in IIRSA[74] as important for strengthening the way projects are designed, prepared and evaluated.[75]

The efforts to improve the quantity and quality of information available about costs and benefits in multinational projects need themselves to be coordinated among different countries, to progressively move towards harmonised practices that conform to international benchmarks. Common (or at least, compatible) statistical standards need to be developed and applied to ensure the comparability of data collected by national agencies, as this input is essential for an unbiased estimate of costs and benefits. The heterogeneity problem is not exclusive of Latin America, it is also pervasive in Europe[76] as shown by Grant-Muller et al. (2001). In the absence of such coordination, sophisticated estimation methodologies will to some degree reflect the biases and/or omissions of the base information, and can at best provide limited guidance to policymakers for identifying and solving coordination failures, as discussed in Section V.

Moreover, the need for more sophisticated models has to be balanced with the costs associated with the increasing complexity of the modelling activities and of interpreting the results. In the first place, increasing model sophistication imposes additional demands on the human resources allocated by Governments to evaluate projects, increasing the cost of evaluation (e.g., by requiring more extensive staff training) and increasing the probability that mistakes will be made (e.g. if the complexity of the models fosters specialization in the evaluation team of experts, leading to little mutual monitoring and revision of work). This is likely to be a serious problem in developing countries, due to the limited resources that can be allocated to statistical collection and processing, and is certainly a problem in Latin America in the infrastructure area (IMF 2005a, 2005b).

In the second place, more sophisticated evaluation models often require extensive data inputs, which are either not available or are imprecise. This is certainly the case for cost-benefit analyses that call for assigning monetary values to hard-to-measure variables. If the necessary data is not available, in terms of frequency, length of the series, quality, disaggregation of the different types of indicator, etc., increasing the sophistication of the model might actually be counterproductive, even in the absence of the first problem mentioned above. It can be argued that information availability is partially endogenous, since the demand for detailed information required by these models leads to more resources being assigned to generating it, but there is nevertheless a risk that attempts could be made to use sophisticated models even without having the essential information available.

In the third place, but related to the previous argument, it is likely that increasing model sophistication would impose more demands on the need for information comparability among the countries involved. If increasing the level of detail of data would lead to more significant discrepancies in methodologies (e.g., if data collection at aggregate levels or for specific population groups follows well-established international best practices, while more detailed data does not), increasing sophistication might also be costly and potentially harm coordination efforts.

As a result, a suitable balance should be attempted between improving the measurement of potential investment benefits, with the costs of improving measurement capacity. For this reason, it

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[74] For example, see the presentations "Una Nueva Etapa de Planificación" and "Avances y Limitaciones del proceso de Planificación" during IIRSA's seminar "Taller sobre experiencias de planificación", Asunción (Paraguay), November 8th, 2005.

[75] See the minutes of the 7th meeting of the CDE, held in Asunción, Paraguay on December 1st-2nd, 2005.

[76] "*Infrastructure planning and investment remains essentially a national matter. Infrastructure has always been and still is planned, debated, evaluated, decided and financed mainly at national level*" (Short and Kopp, 2005) p. 363.

emerges that successful MTI projects, especially when they are large or complex, require a supporting policy of building up information provision services at the regional level as well as making sure that sufficient (human and material) resources will be available to process the necessary information. Because building-up expertise at governmental agencies and domestic research institutions is a prolonged process, multilateral institutions can currently play an important role by fostering information exchange and providing technical assistance when required.

Beyond the need for balancing the advantages and drawbacks of increased model sophistication, countries need to ensure that costs and benefits are estimated in the same way by each party of a MTI project. That would likely imply agreement on the models used and the assumptions about the state of the world, as well as access to the same information. A major challenge is to have a harmonized methodology that takes into account country-specific structural conditions, and particularly market imperfections such as market power, network effects, and other externalities. These specificities of countries mediate the relationship between improved infrastructure and its economic benefits; consider, for example, the reduction of transport costs for users, which is a key transmission mechanism for delivering economic benefits: if the transport sector is characterised by a high degree of market power, then a fraction of the improved benefits can be "captured" by transport companies by maintaining prices above their pure competition level, but this is at the cost of limiting the effective utilisation of the infrastructure and thereby reducing overall social welfare.[77] Whether or not the fundamental imperfections can be solved by government, it is important to factor them into the modelling of potential benefits of MTI projects.

In the same way that expected benefits should be measured adequately, it is important to consider all the costs of alternative financing sources. This is particularly so in Latin America, where most of the public expenditure in transport infrastructure has historically been financed with debt, especially from multilateral sources. For this reason, coordination between Ministries of Public Works and Planning and Ministries of Finance is crucial. Coordination will become even more important in the future, as the need to increase the role of the private sector in transport infrastructure grows, for such participation will in general require public guarantees and explicit or implicit Government commitments to the Public-Private Partnerships that are set up. Accurate estimations of future costs are often missing in infrastructure projects,[78] and this lack of foresight has been widely observed to be a source of (sometimes unexpected and large) future fiscal costs, which worsen the fiscal difficulties at the time of funding a project to achieve its timely completion.

We can make a preliminary assessment of the extent of cost underestimation in IIRSA's AIC by comparing cost estimates made at two moments of time for the same projects, from two different IIRSA sources. At the time of writing this paper (October 2006), there was a discrepancy between the cost estimates of AIC projects available in IIRSA's "Información Específica" document last updated on June 2005[79] and the June 2006 update of the AIC status.[80] In the most updated version of the AIC costs, 18 out of the 28 transport projects listed had higher costs comparing 2006 to 2005, three had lower cost estimates and 7 presented no changes. It is also worth noting that out of the 18 that had higher reported costs in 2006 vis-à-vis 2005, 11 were in the "in tendering/concession" or "in execution" stages; of the 7 projects without changes in the cost estimates, 6 were still in the "in preparation" stage by June 2006. This reinforces, for the case of

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[77]   NERA (1999) surveys the alternative approaches that the literature has taken in tackling this specific issue, but there are others that have to be considered, because there are other mechanisms whereby infrastructure contributed to development besides transport costs, such as the integration of previously isolated regions, the increased security which reduces accidents, etc.

[78]   Short and Kopp (2005, p. 366) also claim that there is evidence in Europe indicating capture of the planning process by interest groups, which contributes to cost underestimation (or benefit overestimation).

[79]   See: http://www.iirsa.org/BancoMedios/Documentos%20PDF/fs_informacion_especifica.pdf

[80]   See:http://www.iirsa.org/BancoConocimiento/A/agenda_de_implementacion_consensuada_2005-2010/agenda_de_implementacion_consensuada_2005-2010.asp?CodIdioma=ESP

South America, the prior belief that cost estimates in project design are substantially and systematically underestimated, and that costs increase when projects are actually tendered and executed. Table 4 shows that the cost estimates for the 28 transport projects as a whole were 62.9% higher in 2006 than in 2005, with 11 projects having costs at least 50% higher in 2006. On average, each transport project had cost estimates that were 75.5% higher in 2006 than in 2005.

As we explained in Section III, investment in new MTI implies that Governments are acquiring a future liability in terms of the stream of future maintenance expenditures. Therefore, estimating fiscal outlays should include, not only the expected cost of explicit guarantees provided by the Government to private sector operators, but also maintenance and upkeep costs. Given the importance of maintenance to the realisation of the project's benefits, including the documented contribution they can make to growth (Rioja, 2003; Kalaitzidakis and Kalyvitis, 2004), assessing and budgeting future maintenance outlays is key to the correct assessment and design (on the cost side) of a multinational transport project. However, there is evidence that many countries register significant shortages of maintenance funds, and that maintenance costs are often underestimated. For example, this was the case in the EU accession countries in Central and Eastern Europe (CEMT, 2001); Short and Kopp (2005) claim that in Germany the required annual maintenance expenditures are estimated at 40 euros for every 100 euros invested in rail transport projects, something that is often disregarded.

Table 4

COST ESTIMATES OF AIC TRANSPORT PROJECTS IN 2005 AND 2006

	TRANSPORT PROJECTS	AXIS	COUNTRIES	COST ESTIMATE JUNE 2005 IN MILLIONS OF US$	COST ESTIMATE JUNE 2006 IN MILLIONS OF US$	% DIFFERENCE 2006/2005	STATUS IN JUNE 2006
	Projects with higher cost estimates in 2006						
1	Recovery of the Navigability of the Meta River	Andean	CO-VE	12	108	**800.0%**	in tendering-concession
2	Francisco de Orellana Port	Amazon	EC	20	105.3	**426.5%**	in preparation
3	Duplication of Palhoça-Osorio Tranche (Mercosur Rodovia)	MERCOSUR-Chile	BR (AR-UY)	283	800	**182.7%**	in execution
4	Pasto-Mocoa Motorway	Amazon	CO	71	183	**157.7%**	in preparation
5	Lima-Tingo María-Pucallpa Highway, Ports and Logistic Centres	Amazon	PE (BR)	296	589	**99.0%**	in tendering-concession
6	Adjustment of Branco River-Montevideo-Colonia-Nueva Palmira Corridor	MERCOSUR-Chile	UY (AR-BR)	90	176.8	**96.4%**	in execution
7	Construction of Pailón-San José-Puerto Suárez Motorway	Central Interoceanic	BO (BR-CH-PE)	245	435.3	**77.7%**	in execution
8	International Rute 60 CH (Valparaiso-Los Andes sector)	MERCOSUR-Chile	CH (AR)	165	286	**73.3%**	in execution
9	Boa Vista-Bonfim-Lethem-Georgetown Motorway (1st stage: studies)	Guiana Shield	GY-BR	2	3.3	**65.0%**	in preparation
10	Paving of Iñapari-Maldonado Port-Inambari, Inambari-Juliaca/Inambari-Cusco	Peru-Brasil-Bolivia	PE (BR)	700	1 055	**50.7%**	in execution
11	Desaguadero's Frontier Centre (CEBAF)	Andean	BO-PE	5	7.5	**50.0%**	in preparation
12	Duplication of Rute 14	MERCOSUR-Chile	AR (BR)	270	370	**37.0%**	in preparation
13	Paita-Tarapoto-Yurimaguas Motorway, Ports and Logistic Centres	Amazon	PE (BR)	248	338	**36.3%**	in execution
14	Infante Rivarola-Cañada Oruro Border Crossing	Central Interoceanic	BO-PY	1	1.2	**20.0%**	in preparation
15	Bridge over the Acre River	Peru-Brasil-Bolivia	BR-PE	10	12	**20.0%**	in execution
16	Improvements in the Nieuw Nickerie Via-Paramaribo-Albina and International Crossing over the Marowijne River	Guiana Shield	SU-GY	90	105	**16.7%**	in preparation
17	Los Andes-Mendoza Railroad Project	MERCOSUR-Chile	AR-CH	224	251	**12.1%**	in tendering-concession
18	Toledo-Pisiga Motorway	Central Interoceanic	BO (CH)	75	76	**1.3%**	in execution
	Projects without cost estimate changes between 2005 and 2006						
19	Construction of Jaguarão-Branco River International Bridge	MERCOSUR-Chile	BR-UY	12	12	**0.0%**	in preparation
20	Construction of Salvador Mazza-Yacuiba International Bridge	Capricorn	AR-BO	10	10	**0.0%**	in preparation
21	President Franco-Porto Meira new bridge and Frontier Centre (CEBAF)	Capricorn	PY-BR	55	55	**0.0%**	in preparation
22	São Paulo Railroad Ring (North and South)	Central Interoceanic	BR	300	300	**0.0%**	in preparation
23	Construction of the Cañada Oruro-Villamontes-Tarija-Abaroa Station Motorway (1st stage)	Central Interoceanic	BO (PY)	60	60	**0.0%**	in tendering-concession
24	Rehabilitation of El Sillar Tranche	Central Interoceanic	BO (BR-CH-PE)	30	30	**0.0%**	in preparation
25	Cúcuta-San Antonio del Táchira Border Crossing	Andean	CO-VE	2	2	**0.0%**	in preparation
	Projects with lower cost estimates in 2006						
26	Rehabilitation of Iquique-Colchane Motorway	Central Interoceanic	CH (BO)	20	19.2	**-4.0%**	in execution
27	Bridge over the Takutu River	Guiana Shield	GY-BR	18	10	**-44.4%**	in execution
28	Venezuela (Guiana City)-Guiana (Georgetown)-Suriname (Paramaribo) Motorway (1st stage)	Guiana Shield	VE-GY-SU	2	0.8	**-60.0%**	in preparation
	TOTAL			**3 316**	**5 401**	**62.9%**	
	AVERAGE			**118.4**	**192.9**	**75.5%**	

Source: Authors' elaboration using data from IIRSA's website at www.iirsa.org

2.   Analysis and Decision-making: Improving Joint Evaluation and Ranking of Multinational Projects

Before countries agree on coordinating actions, they need to coordinate how projects are evaluated. As IIRSA uses a type of Multicriteria Analysis (MCA) to analyse and rank alternative projects, it is important to acknowledge that MCA methodologies normally must overcome a series of issues (Grant-Muller et al, 2001), including:

- Identifying and defining the impacts that will be considered in the project.

- Clarifying the measurement method and specifying how each impact will be assigned a value.

- Deciding how weights will be obtained for the impacts.

In multinational infrastructure projects, these prerequisites present a tough challenge, as participating countries need to reach an agreement despite their differences in experiences and expectations, institutional frameworks and resource (human, financial, etc.) constraints.

In spite of the success achieved by IIRSA in addressing this challenge, it has been acknowledged[81] at IIRSA meetings that the analysis and decision-making process need to be substantially improved along several dimensions, including the methodology of project analysis, the process whereby projects are grouped together and what complementary actions need to be carried out to strengthen the positive impact of regional transport infrastructure projects. In particular, it has been acknowledged that the evaluation process needs to be based on detailed numerical estimates of costs and benefits of each group of projects. According to IIRSA's documents, the classification and ranking of the groups of projects for the EIDs was, despite the presence of numeric elements, "qualitative and based on the convergence of the opinions of experts".[82]

One important issue at the evaluation and ranking stage is how to ensure that the projects chosen for regional implementation are actually "regional", rather than "national", in the sense that they have significant positive spillovers on neighbouring countries. This is closely related to the need for "political support" in implementing infrastructure projects. IIRSA includes a qualitative assessment about the "priority" of projects in their multi-criteria analysis, which refers to the degree of alignment of each project with national (and sub-national) investment priorities. While it is important that MTI projects respond to national developmental interests, putting too large a weight on this dimension at the time of prioritising projects in IIRSA could lead to selecting projects that will yield mostly national benefits (i.e., low regional spillovers) for implementation. This outcome might be in the interest of countries even if inclusion in IIRSA does not provide financing in advantageous terms. For instance, governments can extract political capital from executing "regional" projects that would have been carried out even for strictly national reasons. What is more, if projects chosen by IIRSA as "regional" projects are more likely to receive financing from multilateral financial institutions (whether for design, planning and evaluation, or actual implementation) than strictly "national" ones, countries could have an incentive to propose as "regional" projects some which are not. This potential problem was identified early on in IIRSA (see Gomez-Ibañez and Strong, 2003), but it is not clear whether the initiative is immune to it or

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[81]   See the presentation "Una Nueva Etapa de Planificación", during IIRSA's seminar "Taller sobre experiencias de planificación", Asunción (Paraguay), November 8th, 2005.

[82]   "*A pesar de los elementos numéricos, el proceso de evaluación sigue siendo cualitativo y basado en la convergencia de opiniones de expertos*" p. 6, Informe del CCT al CDE Anexo 1, document presented in the 5th Meeting of the CDE, held in Santiago de Chile, December 4th-5th 2003.

not. In Europe, where funds from a supranational institution are available to support "regional" transport infrastructure projects, this problem has been repeatedly documented.[83]

Setting up effective dialogue mechanisms, not only among participating countries, but also with the parties concerned by MTI projects within countries, can be helpful for setting in motion a participatory process behind MTI. This was identified by IIRSA early on.[84] In particular, it is important to align the incentives of the sub-national entities (governments, local civil groups, NGOs, etc.) who have the capacity to advance (or hinder) the execution of the projects. Nevertheless, although dialogue is an important necessary condition to ascertain the manifold interests of the different actors within countries, the effective alignment of incentives (or misalignment, in the case of failure) will probably be the result of a bargaining process among the different interested parties and the National government. That could require the Government making use of its limited tax and spending capabilities to re-assign payoffs resulting from the MTI project to interested parties within the country. As we mentioned in Section VII, IIRSA has charged "national coordinators" with coordinating the efforts within countries related to the Initiative. At this point in time, however, it is unclear how this process takes place and how successful those efforts have been in South America.

As we highlighted above, incorporating future maintenance expenses in multinational projects is important at the design stage. Funding for maintenance and upkeep is also a difficult dimension to coordinate at the analysis and implementation stage, as we have mentioned that in Latin America[85] the resources available for road maintenance are often less than those that are required. Crucially, maintenance and upkeep in IIRSA projects (and in any bilateral project) remain the exclusive domain of national governments, and their willingness and capacity to assign resources for this purpose is not assured. This issue is raised in IMF (2005b), which argues that at least some Latin American countries including Brazil,[86] Perú[87] and Colombia[88] have considerable maintenance deficiencies in their road network. Given this reality, it is likely that *ex ante* evaluation overestimates the returns from every type of road infrastructure project (including multinational ones), since proper funding for maintenance is less than certain to be forthcoming in the future. Even worse, it is possible that countries come to confront a dilemma regarding investment and maintenance resembling that in the dynamic coordination game we outlined above: if facing uncertainty about whether a neighbouring country will invest in maintenance, each country is likely to choose not to invest in the first place, leading to infrastructure deficiencies on both sides of the border. For this reason, another policy implication that emerges from this study is the need for bilateral projects and IIRSA to take coordination in maintenance as seriously as that in design and construction of the project.

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[83] The Karel van Miert Group that proposed the reforms to TEN-T guidelines and new projects in 2003 remarked that: "*The coherence of the trans-European network suffers from the actions of the past. The transport infrastructure networks in the various Member States were developed above all according to a national logic, giving priority to the development of radial routes serving major cities, thus affecting overall balance*." (EC 2003, p. 21)

[84] See, for example the Minutes of the Fourth meeting of the CDE, held in Caracas on July 2nd, 2003.

[85] If that were not the case and all countries dedicated, in their own interest, adequate resources to maintain their own sections of a road network that connects with other countries, explicit coordination would not be necessary. In game theory terms as explained in Section V above, we could think that although social payoffs only would indicate that maintenance is a "dominant" strategy, models like Rogoff (1990) show how private payoffs could lead to maintenance losing its strict dominance status as a strategy for a Government, independently of what other countries do, and creating a maintenance coordination game.

[86] "*Road transport dominates the Brazilian transport system, but only 25 percent of the paved federal road network is in good condition, and the last rehabilitation expenditures for more than 80 percent of the network occurred 10 or more years ago*" IMF (2005b) p. 5.

[87] "*…about a third of the national road network is said to be in poor condition (with only one-quarter being in good state of repair)*" IMF (2005b, p. 43).

[88] "*The World Bank has noted in particular the deterioration in recent years of the paved road network, due to shortfalls in maintenanc*e" IMF (2005b, p. 15).

The fact that most regional transport infrastructure projects receive financing from multilateral financial institutions who also evaluate the economics of the projects adds an additional layer of control to the analysis of the desirability of the project (IMF 2004). An external and independent evaluation based on standard and verifiable criteria also strengthens the analysis about the absolute cost-benefit merits of projects selected among the IIRSA portfolio (i.e. the AIC) using non-numeric criteria based on expert opinions, and this exercise is especially important in terms of the project financials, which are subject to inflexible rules. However, there is a risk that such evaluation substitutes (at least partially) the analysis carried out by the countries, rather than complements it. This could be dangerous because multilateral financial institutions cannot compare the projects proposed against alternative projects that were not presented and which might be more beneficial, namely, other transport infrastructure projects that could be Pareto superior in terms of social welfare, or other projects in health, education, water, etc., which are critical for checking the balance between potential benefits and the opportunity cost of government resources and debt.

One element that will be important for future coordination efforts in the area is that countries need to evaluate *ex post* the accuracy of the assumptions, projections and models made *ex ante* to assess and evaluate MTI projects. The importance of *ex post* impact assessments should not be underestimated, for in an environment displaying significant informational problems, improving the accuracy of project assessment and evaluation is probably the best way of maximising the chances that multinational projects constitute an efficient allocation of public resources. Unfortunately, this iterative learning from (both successful and unsuccessful) past experiences to update assumptions and models, and possibly to introduce corrective mechanisms, is often missing in multinational projects everywhere, including Europe (Short and Kopp, 2005).

Finally, it is worth adding a few words about institution-building for regional transport coordination. While in South America the idea to create a South American Infrastructure Authority so far seems to have lost steam,[89] the debate on the need to further institutionalise coordination of MTI projects in the region will continue and merits a comment drawing on the European experience. Specifically, the experience of the trans-European transport networks suggests that a gradual approach is necessary to foster a consensus among governments, primarily about which projects to finance, but also about the optimal mechanisms for private sector participation. Although very early (even before TEN-T was formalised in the Maastricht Treaty) the Commission proposed the establishment of a specialised agency employing a permanent staff, this delegation of responsibilities was not acceptable to governments until broad political agreements were in place about the desirability and feasibility of alternative projects and there was a track record showing the strengths and weaknesses of TEN-T. This implies that a commitment to a permanent, costly and independent coordination mechanism such as the new Executive Agency (EC 2005b) only proved preferable after more informal and political arrangements had been exercised to solve the coordination problems faced by regional transport policy.

3.   Addressing binding financial constraints in Latin America

An important point of contention in the debate about coordination of public expenditure in MTI is about the desirability of alternative solutions to the problem of financial capacity facing Latin American governments, and in particular about what form of financing to resort to ("genuine" income like taxes, debt, or contingent liabilities such as guarantees for PPPs) in order to fund the large requirements left over after factoring in available multilateral loans.

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[89]   The topic was last discussed in a meeting among Vice-Ministers of Economics, Finance and others held in Lima, Perú on October 27th, 2004.

As we pointed out in section IV, countries in sub-regions like the Andean Community and in most of Latin America have few or no degrees of freedom to use tax money to fund infrastructure. To increase this flexibility on the expenditure side, a first alternative is to generate higher public savings,[90] for example via State reform. However, increasing expenditure flexibility remains a serious challenge, as increased de-centralisation in some countries has led to more rather than less inflexibility in budgets; at the same time, social security reforms that were carried out with the hope of reducing fiscal commitments have led in countries like Bolivia[91] to recurrent very high budget deficits, reducing the fiscal degrees of freedom even more in the short run; and poverty continues to be pervasive in most countries in the region, which translates into high opportunity costs for government expenditures in infrastructure. On the revenue side, the incidence of poverty and inequality narrows the tax base and continuing problems with high tax evasion rates are compounded by widespread earmarking of income in countries like Ecuador. Doing away with or at least cutting back earmarking in the region is difficult, above all owing to political economy reasons (the assorted interest groups that benefit from the *status quo*).

In section V we mentioned that it was difficult for political reasons to channel some of the payoffs of a multinational transport project to countries that do not benefit enough to want to participate, or are financially constrained and prevented from doing so, and that this constraint might result in a coordination failure that prevents a valuable multinational project from being carried out. In view of the absence of supranational institutions in Latin America capable of solving the issue by transferring welfare from the "winners" to the "losers" of an MTI project,[92] an alternative that has been proposed is to create multinational guarantee funds and special purpose vehicles (Gomez-Ibañez and Strong, 2003), which could have a "solidarity" (i.e. transfer) component.

The fact that most MTI projects in Latin America are overwhelmingly financed with multilateral debt (CAF, IADB) might act as an effective "ring fencing" of the project's funds. When external financing and domestic project decisions are closely associated, it might prevent these projects being abandoned in favour of purely domestic projects, even if the returns are lower, because international treaties compel governments to implement approved projects and external monitoring of the progress of loan agreements puts pressure on ministries and private subcontractors to respect the commitments to complete the works in a timely manner. This is particularly important for larger projects, where the timeframe for implementation will generally exceed the domestic business cycles and election cycles, because then the multilateral institutions can provide an anchor that steadies the progress of the project, and also continuity in terms of financial disbursements and oversight. The welfare implications of this, however, are positive only conditional on the MTI project in question remains the Pareto-superior alternative allocation of resources.

It is also important that project financing adequately considers the implications for debt sustainability of using public debt (explicit or contingent) to finance multinational infrastructure projects (IMF, 2004). Even though we have mentioned above that PPPs are unlikely to be very important in the near future in Latin America as sources of financing for MTI, due to the plethora of difficulties (informational, risk, etc.) specific to multinational projects, if some of those PPP

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[90] IMF officials have publicly proposed that financing for higher public expenditure in infrastructure should come mainly from higher public savings. See the presentation "Inversión Pública y Política Fiscal", during the IIRSA meeting of October 25th-26th, 2004 in Lima, Perú, available online at www.iirsa.org, as well as IMF (2004, 2005a and 2005b). In particular, the IMF has proposed that structural (or cyclically-adjusted) fiscal targets could protect public expenditure in infrastructure from endogenous and exogenous shocks to fiscal revenues (see IMF 2004).

[91] According to ECLAC's *Economic Survey of Latin America and the Caribbean* 2004-2005 issue, 84% of the global deficit of the Non Financial Public Sector in Bolivia during 2004 was due to pensions.

[92] As the EC funds TEN-T from country contributions to the EC budget rather than from resources extracted from TEN-T "winners", this indicates that the type of transfer (i.e. within-MTI-project transfer) that we are discussing here is not available in Europe either.

projects involve government guarantees, it is important to account for them as part of (contingent) debt and to include this item in debt sustainability calculations. Of course, forecasting such contingencies is an exercise riddled with uncertainty, since the possible outcomes are highly endogenous, depending for example on the levers included in the PPP contracts to ensure coordination of investments and insurance provisions that transfer a subset of the risks to financial institutions.

One "solution" to overcome binding financing constraints faced by countries that appears repeatedly in IIRSA's meetings[93] relies on relaxing existing public expenditure ceilings to expenditure in infrastructure, while maintaining limits on current expenditure. IMF (2004) presents a series of reasons for and against lifting the investment expenditure cap, concluding that the risks of such a move probably dominate the benefits. Among the reasons against this proposal, they mention that "*... in reality public investment projects are not necessarily of high quality. In the absence of appropriate screening and monitoring mechanisms, governments may incur large borrowing costs to finance investments with low rates of financial or even social return, in some cases undermining the prospects for debt sustainability. Conversely, other uses of public funds – namely to restructure revenue and expenditure-may have a higher rate of return than public investment*" (IMF 2004, p. 15). The shortcomings of public evaluation systems as regards infrastructure projects in Latin America were documented in IMF (2005b), where an analysis of a few countries including two Andean countries (Colombia and Perú) found that, not only is there wide heterogeneity in the quality of project design and assessment, but that in those cases where evaluation is "adequate", there is still substantial room for improvement. Given the specific complexities of evaluating multinational projects and the reality of heterogeneity, this argument is particularly important for IIRSA and other integration transport infrastructure projects.

Multi-year budgets or medium-term expenditure planning in Latin America can also contribute to ring-fencing expenditure in MTI, including maintenance expenditure. Of course, this budgeting device will only work if the available resources are forthcoming. Therefore, multi-year budgets can be seen more as a planning tool rather than a way of solving binding financial constraints. However, multi-year budgets and plans can contribute to reducing the deleterious impact on coordination of the high volatility in authorities (and, sometimes, midlevel officials with relevant technical capabilities and responsibilities for project design and assessment) that Latin American countries in general have experienced.

In terms of the organization of the IIRSA initiative, an aspect that could be improved upon concerns the current lack of connections between project assessment/evaluation/ranking and its financing. This largely replicates the disconnection that exists within countries regarding investment and financing, with investment assigned to planning and public works Ministries and financing to the Ministry of Finance. As pointed out by World Bank (2005), this disconnection is pervasive in East Asia as well, with frequent duality of budgeting: responsibility for investment is assigned to the Planning Ministry and responsibility for recurrent expenditure (that can include maintenance) assigned to the Ministry of Finance. Current practice in IIRSA divorces project evaluation, ranking and selection (which take place first) and securing funding for the projects; an important example of this is the procedure followed to identify the 31 priority projects that constitute the "Implementation Agenda Based on Consensus 2005-2010" defined in November 2004.[94] One of the potential risks of such a separation is that projects that are approved for

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[93] For example, see the minutes of the Fifth Meeting of the CDE, items 4.5.b) and 5.9, held in Santiago de Chile, on December 4th-5th, 2003.

[94] There's evidence of the divorce between the portfolio of projects (including the "Implementation Agenda based on Consensus 2005-2010" (AIC)) and their financing in IIRSA documents. For example, the minutes of the 7th meeting of the CDE, held in Asunción, Paraguay on December 1st-2nd, 2005, when discussing IIRSA's Action Plan for 2006, note the "*Incorporación del tema IIRSA al diálogo bilateral de las instituciones financieras del CCT y otras instituciones financieras pertinentes con los países y relevamiento de los requerimientos de financiamiento de los proyectos de la AIC – la Cartera IIRSA*", point 7.1, p. 4.

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implementation can be stalled for a long time awaiting funding, something that might result in *ex post* revisions of project costs and benefits, which could have a detrimental effect on the former, even if the *ex ante* project evaluation was accurately conducted. This was one of the problems identified during the consultation projects carried by IIRSA with civil society.[95]

As part of the solution, it would be useful to have representatives of Finance Ministries in the technical meetings where projects are chosen, as well as increasing the involvement of Finance Ministers in the decision-making process carried out by the CDE. Given that the costs of the financing options (e.g., internal debt, different multilateral institutions, and guarantees to the private sector) are an essential part of the cost-benefit analysis that needs to be carried out (which is multinational in nature), they should be considered from the beginning in the process. By moving in this direction, IIRSA has the opportunity not only to assist in securing finance for projects and subsequent maintenance, but also to improve coordination within countries in the area of transport policy. Improving coordination within countries between planning and financing of infrastructure could potentially result in additional benefits, such as a concerted interest in reducing revenue and expenditure earmarking, so as to generate the necessary degrees of freedom to fund multinational infrastructure investment without incurring excessive public debt.

Another alternative for countries in Latin America that are large exporters of non-renewable resources such as petroleum (Ecuador, Venezuela), natural gas (Bolivia), or minerals (Chile, Perú) is to use income from mining royalties and similar income streams captured by the State to fund productive transport infrastructure, including multinational infrastructure. Given that the extraction of non-renewable resources implies the consumption of an asset, using part of the proceeds from the sale of these resources to increase the capital stock of the country can make economic sense. Further, by converting a non-productive natural asset into a productive asset (capital stock) during a period characterised by historically high prices of commodities, the government can fulfil two roles, in addition to the mentioned roles of increasing economic growth, fostering trade, and improving integration with its neighbours. First, the Government would be smoothing inter-temporal consumption via a stabilisation of government revenues.[96] Second, by investing in MTI the Government would contribute to diversify the economy away from an excessive reliance on a single source of foreign reserves and government revenue, because of the positive effects on competitiveness that reduced transportation costs generate for all economic sectors, especially value-added tradable goods.

One way to ground this proposal would be to establish bi-national or multinational funds that could be used, for example, to provide guarantees for multinational Public-Private Partnerships, thereby making multinational projects sufficiently attractive for private finance. Still, such a proposal would need to be researched and analysed, and this task is well beyond the scope of this paper, as it would be critical to address several implementation difficulties, including the governance of such funds, the resources committed, the mechanisms of participation by countries, the scope of projects that can be funded, etc.

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[95] See the document "Anexo 6" of the Regional Seminar on the Strategic Vision of South American Physical Integration, held in Asunción, Paraguay on November 30th, 2005.

[96] Assuming, of course, that the MTI assets financed had a positive private return to its owner, the Government. As we pointed out repeatedly above, even in the presence of attractive private returns, the private sector would be unlikely to participate in these projects due to perceived risk and other factors.

IX. Discussion and Conclusions

Coordination of public expenditure in Multinational Transport Infrastructure (MTI) projects in Latin America constitutes a significant challenge, not only because the fiscal constraints faced by the countries of the region make it difficult to finance projects with public funds, but also due to the multiplicity and complexity of the coordination issues that need to be addressed.

In this paper we carry out an analysis based on theory and a comparative review of the European and Latin American experiences regarding coordination of MTI projects, with the aim of offering policy perspectives for improving coordination of public expenditure on MTI projects in Latin America. The motivation behind our work can be summarized in a few points as follows. First, developing MTI networks at the sub-regional level is critical for enabling deeper integration within and across Latin America and meeting the challenges of expanding global trade, especially with Asia. Second, implementing new MTI projects will call for effective coordination, mainly between national governments, but also involving other important actors such as multilateral financial institutions and the private sector, so a thorough understanding of the challenges of coordination is sorely needed. Third, coordination efforts also face the difficult task of easing the binding financial constraints that limit investment in MTI projects, acknowledging the fact that fiscal expenditures have been and are expected to be the main source of financing for MTI at least in the near future. This is so due to the higher perceived and real risks of MTI projects vs. national ones, including different jurisdictions, information problems, assessment and regulatory risk, etc.

Finally, both in Europe (the Trans-European Networks-Transport), South America (IIRSA), Central America (Puebla-Panama Plan) and other regions,[97] active efforts have been carried out to foster coordination among countries for building MTI projects and implementing the set of complementary policy measures that are necessary for maximising network effects at the regional or sub-regional level. For all these reasons, this paper was directed at identifying the key issues necessary for effective MTI coordination, analysing them using economic theory and putting them into perspective within the framework of both European and Latin American MTI ongoing coordination efforts.

In our revision of game theoretic models dealing with coordination, we shift the focus from the cooperative solutions advocated by much of the previous literature in the area to non-cooperative (i.e. self-interested) interaction that often leads to multiple equilibria. The reason behind our shift in focus is that the conditions necessary for the successful implementation of a cooperative solution are currently absent in Latin America.[98]

Our non-cooperative approach to analysing coordination problems helps to identify potential explanations for coordination failures in static and dynamic interactions between national Governments involved in an MTI project, as well as provide answers about how those coordination failures can be minimised.

Coordination problems in MTI projects can arise because each country takes investment decisions autonomously, something that introduces "strategic uncertainty"[99] for each country about whether or not the other countries will truly invest. Because of the existence of important network effects, if one country does not invest, then the other countries participating in the MTI project will see their payoffs from investing significantly reduced. Therefore, this strategic uncertainty often leads to a coordination failure outcome where a Pareto-superior MTI project is not implemented. Such coordination problems are less likely to arise if countries receive a large domestic payoff from building their own section of the MTI project, or if network effects generated by linking the transport networks in each country are greater, as the benefits of investing then increase.[100] For this reason, if it is possible to influence the size of the domestic benefits of investing in MTI projects at the design stage of an MTI project, the likelihood of coordination failure decreases. As a future possible extension of this paper, international financial institutions that can help to reduce binding financial constraints could be included in the model as players with their own payoffs, thereby enriching the models under analysis.

Another implication of the game theoretic models we examine is that coordination problems can be worsened by asymmetries in costs and benefits. We show that, in the limit, if asymmetries are large enough, a coordination game can become a "Prisoner's Dilemma"-type of game where the

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[97] For example, the Greater Mekong Sub-region (integrated by Cambodia, the People's Republic of China, Lao People's Democratic Republic, Myanmar, Thailand, and Viet Nam) has dedicated substantial efforts to fostering sub-regional cooperation in different areas, including transport. This effort, carried out by the country member-composed Subregional Transport Forum, receives support from the Asian Development Bank. Although the GMS differs from both Europe and South America, the focus of analysis in this paper, preliminary review of some of the work carried out in the GMS seems to indicate substantial parallels with the issues identified and addressed in this paper.

[98] Specifically, there is no supranational institution with the capability to: (a) decide on and see to the implementation of joint country-level investment decisions that maximize welfare for the region as a whole, and (b) implement a transfer mechanism that reallocates costs and benefits among the parties so as to ensure the implementation of the socially-optimal outcome.

[99] See Crawford, V.P. (1995), "Adaptive Dynamics in Coordination Games", *Econometrica* Vol.63 (1), p 104.

[100] If domestic benefits (measured as *W* in our model of Section V) are larger, the strategy "Invest" becomes more attractive to a country independently of what the other country does, while an increase in network effects (i.e. a larger P in our model) makes the Pareto inferior Nash Equilibrium of the investment Stag Hunt game less attractive (the likelihood that the inferior equilibrium is risk dominant is reduced). The size of the cross-border spillover effect (which we denoted a *X)* does not affect the degree of risk dominance of any of the equilibria.

only self-enforcing outcome is not to implement the MTI project.[101] Such asymmetries are related to project design features (for example, the density of population and economic centres across the borders) that affect the size of projects' localised geographical spillovers and external effects, and also country characteristics connected to the size of network effects (a relevant example is when a smaller, less-developed country will gain access to the larger market of its wealthier neighbour with an MTI project). Whereas country characteristics can be assumed to be exogenous at a given point in time, project design features are always endogenous to some extent, which means that the design stage is a crucial one in terms of the viability of MTI projects.

We also show that the staging of an MTI project is far from innocuous. Instead, it can be decisive in terms of whether or not a certain project that is carried out in successive, iterative steps is executed. This is because a staged investment process introduces additional needs for coordination over the whole investment cycle, and strategic uncertainty increases due to the presence of uncertainty about the willingness or capacity of one or more countries to invest in the MTI project. This dynamic aspect does not only affect large MTI projects with long evaluation and construction periods, it is in fact central to any infrastructure project for which maintenance outlays are significant in size, essential for the transport network to operate effectively, and if these costs cannot be recovered from users. Additionally, asymmetric information, lack of common knowledge, and other real-world complexities make dynamic coordination of MTI projects and their maintenance a complex and challenging issue that requires deliberate efforts on behalf of Governments for it to be addressed. Such is the challenge faced by regional coordination initiatives such as IIRSA.

The game theoretic analysis not only leads immediately to a set of implications about coordination. It is also a powerful tool for analysing the major ongoing multilateral efforts to coordinate MTI projects more effectively in Europe (the trans-European transport networks, TEN-T) and South America (the Initiative for the Integration of Regional Infrastructure in South America, IIRSA). These two initiatives are very important because the former is the centrepiece and flagship of European transport policy, and the latter is the most important and comprehensive plan implemented to date in South America to improve regional transport networks. By carrying out a comparative analysis, we have sought to show that there are common issues in terms of coordination of MTI projects, especially regarding their design, assessment and funding.[102]

The definition of politically and economically acceptable objectives, and how these translated into building and upgrading MTI projects, was a long-drawn out process in Europe, which began in the 1980's with a growing recognition of the need for a European perspective "solution" to coordination of MTI projects that went beyond the funding available for transport projects from European Commission (EC) funds and by the European Investment Bank (EIB). A crucial outcome was an agreement about a first round of large priority projects that would receive institutional and financial support. Unfortunately, the economic fundamentals of priority projects were sometimes weak, because costs and benefits were not a prime consideration in the design, assessment, and evaluation of some MTI projects, and this flaw inevitably and rapidly produced problems at the implementation stage, which manifested themselves in delays and cost-overruns.

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[101] The reason is that asymmetry exacerbates the opportunistic incentives of one of the countries to free-ride on the other's investment: the country with less to gain from an MTI project (or more to lose if it invests and the other partner countries do not) is less likely to invest, increasing the likelihood of coordination failure.

[102] Beyond arguing for a much more inclusive approach to measuring economic costs and impact, we have not addressed in depth the important social and environmental dimensions of MTI projects. The issues of changing mobility as transport corridors connect or circumvent specific areas, with its ramifications for employment, regional income distribution, poverty incidence, and access to education and health, are too large to treat within this paper, and require special thought about the wider coordination of infrastructure and social programs, and considering social costs and benefits that could be connected to the extension of environmental hazards, migration, or even conflict.

The European experience shows that failures in design and assessment are compounded by difficulties with measuring project benefits at the regional level (i.e., including network effects and spillovers) and including all relevant costs (factors such as uncertainty and maintenance). Solving these coordination issues therefore requires a broad set of actions that raises the quality of available information about regional transport, uses assessment models that recognise the special features of transport networks (i.e. spillovers, network effect, etc.), comes up with more appropriate frameworks for selecting MTI projects, and promotes a more interactive interaction and feedback between design, assessment, and evaluation.[103] Nevertheless, it can be claimed that the *interaction* between design, assessment, and evaluation is one area that lacks clear initiatives in the EU, since projects are evaluated regionally but proposed by national governments.

IIRSA, by contrast, has a shorter history and is built on very different institutional foundations. A crucial difference, as we mentioned more than once, is that subregional integration efforts in Latin America have not been associated with the establishment of a supranational entity endowed with significant funding power. For this reason, our focus in investigating IIRSA has not been on understanding the evolutionary process of institution-building. Instead, our objective was to analyse the main characteristics of this initiative, and also to analyse IIRSA's coordination efforts within the theoretical framework we presented. Such an analysis profited substantially from our parallel investigation of the European experience. Overall, what this investigation finds is that the governance structures and coordination mechanisms that have been put in place in IIRSA have been designed to address some of the critical challenges of coordination of MTI projects in South America. IIRSA has succeeded in institutionalising dialogue among public works authorities of the different countries and among national coordinators, mobilising resources to group projects so as to maximise network effects and positive spillovers, introducing ranking criteria to prioritise projects, fostering capacity building at the national level, and showing that coordination in the decision and execution of MTI projects is possible in South America (as shown by the execution of some of the projects in IIRSA's "Implementation Agenda based on Consensus 2005-2010" (AIC)).

On the last point, however, one could argue that the "demonstration" value of executing the AIC has come at the cost of choosing feasible but relatively small projects that aim to resolve bottlenecks rather than to begin to develop the transport network required for a highly integrated region. To give one example, the three projects chosen for the Andean GTE have an average size of only 7.1 million dollars. The idea seems to have been to show concrete advances in the physical integration process, showing to the countries that coordination is possible, by implementing a series of projects that were believed to have high impact on regional integration. For this reason, we observe that several of the projects in the agenda are "anchor projects". The risk of this strategy is that progress needs to go far beyond implementing anchor projects for the full effects of integration to be felt, as there are important spillovers (e.g. due to network effects) of constructing groups of projects rather than isolated segments of them.

Among the remaining issues that should be addressed to realise the full potential of IIRSA, we pointed out that information and measurement of the costs and benefits of projects should be significantly improved, especially in terms of identifying a range of localised and regional spillovers, which has also been an enduring problem in TEN-T and reflects the complexity inherent to MTI. This is especially hard to achieve, as it is conditional to a large degree on national data and assessment capabilities over which IIRSA has no control. Also essential to the participating countries harvesting the full results from MTI are the advances in expediting border crossings and

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[103] In Europe, these problems have been addressed through diverse mechanisms. Much more data-collection and research has been funded by the EC in the last decade, although as part of it is carried out in institutes and universities, it is a matter of debate the degree to which this research has been incorporated into policy decisions. Guidelines for assessing and selecting priority projects along strategic transport corridors have been updated by groups of high-level national representatives with leadership from the EC, trying to take into account current and future extensions of the networks to accession and neighbouring countries.

removing artificial barriers to trade introduced by inefficient custom procedures, an area where the evidence indicates that much further work is still needed.[104]

We highlighted the importance of achieving an adequate balance between model sophistication and informational and processing capabilities, for which there is no easy solution because of the heterogeneity among countries in terms of capabilities and available resources, and therefore the answer may lie in making complementary investments and sharing information and expertise among countries, as well as leveraging any available external assistance. As in Europe, the IIRSA initiative also runs the risk of national governments favouring projects that have significant demonstrable national benefits (especially those that satisfy political economy considerations), and which are therefore already assimilated as a priority in the national development agenda, over alternatives whose regional benefits are large, although not considered at the moment of assessment, ranking and allocation of resources by national governments. We cannot expect this problem to disappear naturally, or even in response to institutional development and political shifts, and therefore we have suggested actions that clarify the potential regional impact of each MTI project, align national and regional incentives, tie decisions along project stages to ensure time-consistency, and address the binding financial constraints that to a large extent underlie this dilemma.

The previous point is crucial. Financing of MTI projects, as we emphasise throughout the paper, is closely related to the overarching goal of executing regionally-advantageous yet feasible MTI projects. The comparative analysis of TEN-T and IIRSA is particularly useful in this respect, because it shows clearly that certain types of projects –notably, cross-border sections of land transport projects– pose serious difficulties for coordination at the implementation stage because neither private participants nor national governments might have the incentives or resources for financing these. European countries have benefited from the European Commission allocation of increasing amounts of financing for TEN-T priority projects, and funding rules have been established to target funding towards cross-border projects, yet by all estimates it is the national governments that will have to find the necessary funds for MTI – and judge the opportunity costs in a situation of significant budgetary constraints. Both in Latin America and in Europe, it is very important that an assessment of MTI projects takes adequately into account the opportunity costs, since there might be education, health or other infrastructure projects with a higher expected social return than those of regional transport infrastructure.[105]

Additionally, limited degrees of freedom in conducting fiscal policy in Latin America due to high indebtedness, extensive revenue earmarking and inflexible expenditures (such as salaries, pensions and interest payments) constituting the lion's share of Government expenditure also represent a serious limitation to effective funding of MTI projects with public money.

Continued availability of multilateral debt for building IIRSA projects provides relief to the financing dilemma by injecting external resources and potentially ring-fencing national commitments. However, an important assumption behind this role of multilateral debt is that the problem faced by Governments is one of liquidity rather than one of solvency. That is, the problem would be that Governments cannot get financing at a low enough rate or for high enough amounts to invest in MTI projects.

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[104] See "Sintesis y Conclusiones del Programa de Proyectos Piloto: Pasos de Frontera", presented in IIRSA's 8th meeting of National Coordinators, held in Buenos Aires, June 29th 2006.

[105] However, given the current design and evaluation problems in transport infrastructure projects faced by countries, as well as the allegedly limited human and financial resources dedicated by Latin American Governments to carrying cost-benefit analyses of education and health investment projects, not to mention the problems of comparing non-monetary benefits of investment projects, the task of applying suitable and comparable methodologies to different types of projects (transport, education, etc.) in order to assign resources efficiently currently seems far off.

But if projects are not believed to be properly assessed, or if a Government has a limited capacity to issue debt, then debt would not be the solution. For this reason, new instruments (bi-national and multinational funds, special purpose vehicles) could be useful for stabilising the stream of public resources allocated to long-term investment in new regional transport networks (and in other types of regional infrastructure). Fresh income streams are available to governments in a number of countries in Latin America that export non-renewable resources, and these instruments could provide a vehicle for channelling the current windfall from high commodity prices towards durable transport infrastructure that benefits all sectors of the economy and, by facilitating exports within the region and the world, can provide the basis for export diversification, increased value-added and sustainable growth.

The Private Sector could potentially play an important role in the design, evaluation, construction, operation, maintenance and financing of MTI. As a matter of fact, the Private Sector participates actively in many transport infrastructure projects at the national level in Latin America, often under different forms of Public Private Partnerships (PPPs). Given the limitations to the public sector of finding the resources for financing infrastructure, it would be important to mobilise private sector resources to finance and bear the risks of transport infrastructure as much as possible, including those for multinational projects.[106] In any case, and even if PPPs become viable in MTI projects, helping to overcome information and risk problems, the role for Government coordination will still be paramount. There will still be a need for Governments to coordinate on project design, assessment and evaluation, as well as on coordination of public financial support, such as government guarantees provided to the private sector. Therefore, rather than reducing the need for coordination between governments, PPPs would actually increase the necessity for effective public coordination in multinational transport infrastructure projects.

Finally, one of the most important policy implications springing from our analysis of MTI financing in European TEN-T and IIRSA is related to the fact that financing responsibilities have usually been separate from decision-making at the design, assessment and evaluation stages of MTI projects. Such a separation has resulted in an increased likelihood of coordination failure taking place, as funds for Pareto-improving MTI projects are more difficult to be forthcoming in such a situation. This is a problem that could be ameliorated by developing both formal and informal links between the government officials in charge of these different activities and decisions. Improving dialogue and fostering joint decision-making between the ministries and agencies responsible for finance and transport infrastructure would be an important step forward. In the case of IIRSA, this could take the form of the inclusion of Ministers (or Vice-Ministers) of Finance in IIRSA's CDE meetings, so that the authorities who authorise expenditure and who negotiate debt issuance with multilateral banks are present during the decision-taking process and participate directly in the prioritising exercise for regional projects. Introducing such participation early on could facilitate resource allocation later on, averting discrimination against MTI projects. Additionally, the participation of senior policymakers of the Finance area in the CDE could help to align the future incentives of subnational governments and other actors whose collaboration in MTI project implementation are essential.

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[106] However, we have explained above that the interest of the private sector in MTI might be low due to a series of reasons, including different and even incompatible legislation for MTI projects, difficulties to securing Government guarantees, the likelihood that multiple-jurisdictions result in higher risks, such as regulatory risk, etc. The lack of availability of long-term domestic financing, due to underdevelopment of domestic capital markets, is another source of difficulties for the participation of the private sector in MTI projects.

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Appendix

Appendix I

Interactive Investment Game

Consider the iterative investment game in Figure 9. For the strategy *Invest* to be preferred to *Don't Invest* by country **B** when given the move, the probability **β** of the game being interrupted after the second investment round needs to satisfy the condition:

$$\beta < \frac{P + \dfrac{X}{2} - C}{P + \dfrac{X}{2}}.$$

Similarly, for the strategy *Invest* to be preferred to *Don't Invest* by country **A** in the first investment round, the probability **α** of the game being interrupted after the first investment round needs to satisfy the condition:

$$\alpha < \frac{(P + X - C) - \beta(P - \dfrac{C}{2})}{(P + X - \dfrac{C}{2}) - \beta(P - \dfrac{C}{2})}.$$

For example, let's assume that **P** = 5, **X** = 2 and **C** =2. In that case, country **B** will choose *Invest* in the second investment stage only if $\beta < \dfrac{2}{3}$. If that is not so, the project will not be started, as both countries are better off by not investing. Now, if it is true that $\beta < \dfrac{2}{3}$, country **A** will only choose to invest in the first investment round if $\alpha < \dfrac{7}{10} + \varepsilon$, for any ε arbitrarily close to zero.

For **X** non negative, increases in network effects **P** and positive externalities **X** allow the project to be executed with larger probabilities of interruption **α** and **β,** while increases in the project's cost **C** to each country reduces the maximum probabilities of interruption **α** and **β** that can be tolerated without the project collapsing.

Appendix II

Projects of the Consensual Implementation Agenda 2005-1010

Nº	PROJECTS	AXIS	MILLIONS IN US$	COUNTRIES
1	Duplication of Rute 14	MERCOSUR-Chile	370	AR (BR)
2	Adjustment of Branco River-Montevideo-Colonia-Nueva Palmira Corridor	MERCOSUR-Chile	177	UY (AR-BR)
3	Construction of Jaguarão-Branco River International Bridge	MERCOSUR-Chile	12	BR-UY
4	Duplication of Palhoça-Osorio Tranche (Mercosur Rodovia)	MERCOSUR-Chile	800	BR (AR-UY)
5	Los Andes-Mendoza Railroad Project	MERCOSUR-Chile	251	AR-CH
6	International Rute 60 CH (Valparaiso-Los Andes sector)	MERCOSUR-Chile	286	CH (AR)
7	Northwest Argentine Gas Pipeline	MERCOSUR-Chile	1 000	AR (BO)
8	Construction of Salvador Mazza-Yacuiba International Bridge	Capricorn	10	AR-BO
9	President Franco-Porto Meira new bridge and Frontier Centre (CEBAF)	Capricorn	55	PY-BR
10	Construction of Pailón-San José-Puerto Suárez Motorway	Central Interoceanic	435	BO (BR-CH-PE)
11	São Paulo Railroad Ring (North and South)	Central Interoceanic	300	BR
12	Infante Rivarola-Cañada Oruro Border Crossing	Central Interoceanic	1	BO-PY
13	Construction of the Cañada Oruro-Villamontes-Tarija-Abaroa Station Motorway (1st stage)	Central Interoceanic	60	BO (PY)
14	Toledo-Pisiga Motorway	Central Interoceanic	76	BO (CH)
15	Rehabilitation of Iquique-Colchane Motorway	Central Interoceanic	19	CH (BO)
16	Rehabilitation of El Sillar Tranche	Central Interoceanic	30	BO (BR-CH-PE)
17	Desaguadero's Frontier Centre (CEBAF)	Andean	8	BO-PE
18	Cúcuta-San Antonio del Táchira Border Crossing	Andean	2	CO-VE
19	Recovery of the Navigability of the Meta River	Andean	108	CO-VE
20	Pasto-Mocoa Motorway	Amazon	183	CO
21	Paita-Tarapoto-Yurimaguas Motorway, Ports and Logistic Centres	Amazon	338	PE (BR)
22	Lima-Tingo María-Pucallpa Highway, Ports and Logistic Centres	Amazon	589	PE (BR)
23	Francisco de Orellana Port	Amazon	105	EC
24	Paving of Iñapari-Maldonado Port-Inambari, Inambari-Juliaca/Inambari-Cusco	Peru-Brasil-Bolivia	1 055	PE (BR)
25	Bridge over the Acre River	Peru-Brasil-Bolivia	12	BR-PE
26	Boa Vista-Bonfim-Lethem-Georgetown Motorway (1st stage: studies)	Guiana Shield	3	GY-BR
27	Bridge over the Takutu River	Guiana Shield	10	GY-BR
28	Venezuela (Guiana City)-Guiana (Georgetown)-Suriname (Paramaribo) Motorway (1st stage)	Guiana Shield	1	VE-GY-SU
29	Improvements in the Nieuw Nickerie Via-Paramaribo-Albina and International Crossing over the Marowijne River	Guiana Shield	105	SU-GY
30	Exports by SMEs using Postal Deliveries	IT	1	All
31	Implementation of the Roaming Agreement in South America	IT	1	All
	TOTAL		6 403,60	

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