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PUBLIC INVESTMENT FOR SUSTAINABLE GROWTH:

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ISSUES

- What sorts of investment are needed for sustainability?
  - Moving beyond fiscal/financial debt sustainability
  - Focus on more sustainable utilization of natural and human resources to address congestion, pollution, inequality and resilience to trade shocks
- What to do about it? Case of Chile
  - Economy-wide shadow prices, together with national and local tax agenda to lock process in place
- How? Contracting arrangements to involve private sector
  - PPPs for sharing risk, or greenfield investments and unbundling for uncertainty associated with climate change

CAN A SUSTAINABLE GROWTH AGENDA HELP DEFINE PUBLIC INVESTMENT FRAMEWORK?

- **Public investment cornerstone of sustainable development agenda, SDGs and COP22**
  - Critical in Chile, but also in the international context, e.g., in China and the EU
  - But investment and connectivity not always sufficient e.g., EU (Ahmad, Bordignon and Brosio, 2016)
- **Chile has an excellent** investment allocation mechanism, SNI (praised by the World Bank), and prudent management of liabilities (low debt and deficits, SWF)
- **but** has resulted in
  - Concentration of activities in the metropolitan areas; with congestion and pollution; potential for catastrophic earthquake risk
  - Informality and increasing inequalities
  - Poor utilization of natural and human resources (Harvard Complexity assessment, Hausman et al)
- **Chile vulnerable as a primary exporting country in an increasingly uncertain trading environment and facing a middle income trap** (Ricardo Lago, 2014)

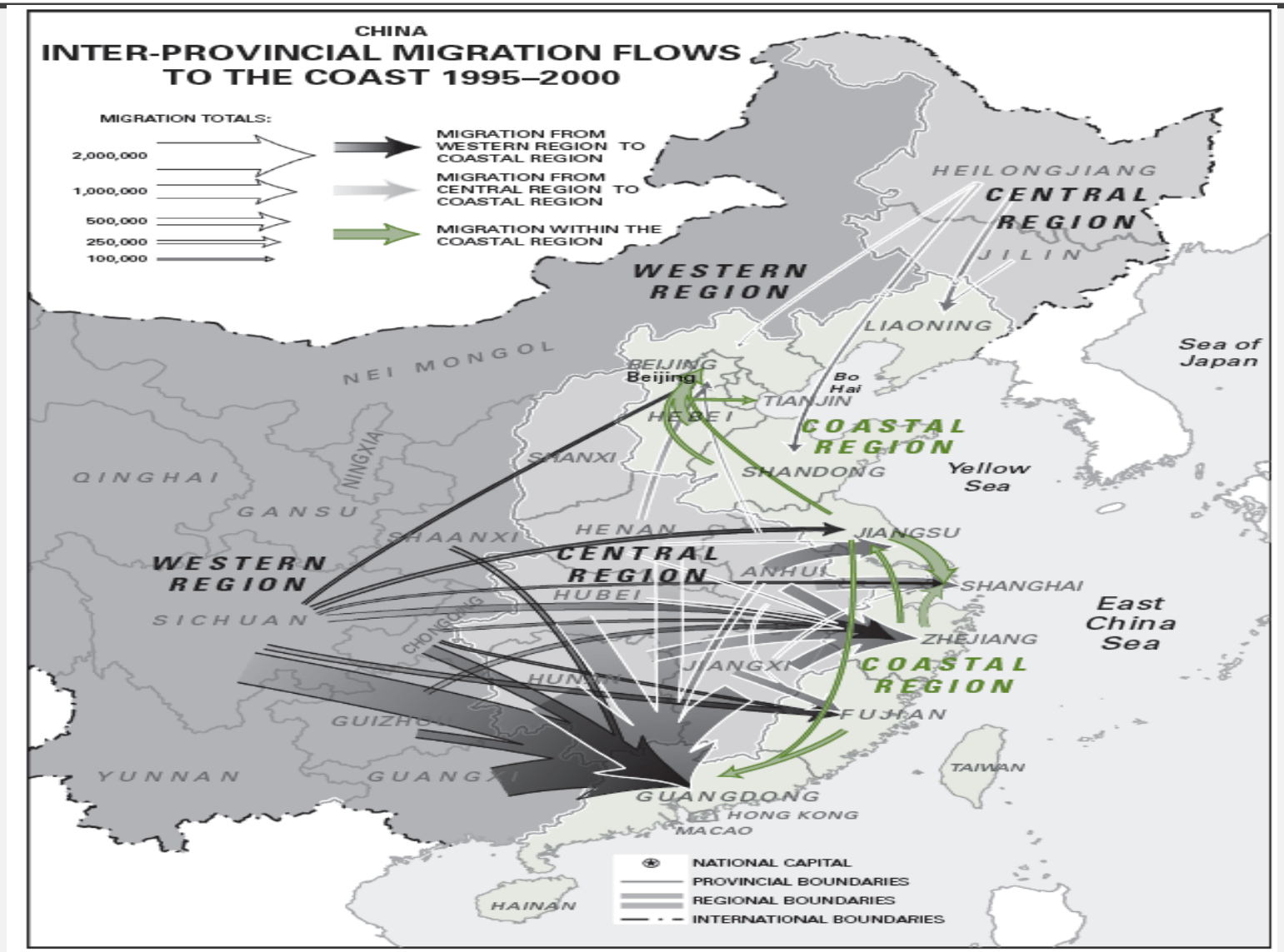
IS IT SUFFICIENT TO JUST MANAGE THE PROCESS WELL?

Examples from Chile, China and the EU (Italy and Spain)

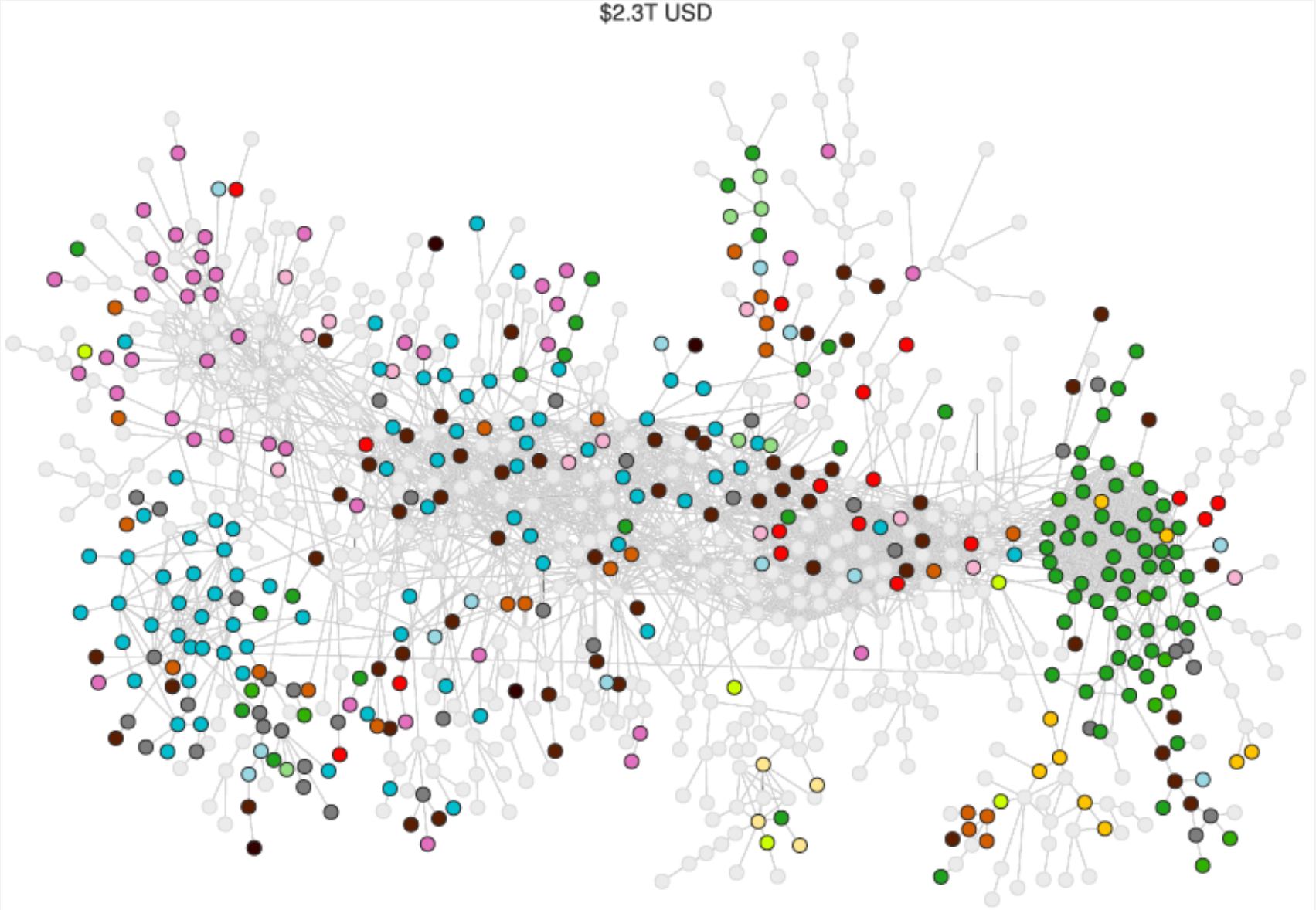
SDGS AND PUBLIC INVESTMENT STRATEGY

- **National rebalancing and investment to generate sustained employment and growth, with an improved quality of life**
  - Address interpersonal and inter-regional inequalities, as well as **congestion and pollution (Santiago, Guangzhou/Shenzhen)**
  - Better utilization of both **domestic and external linkages—motorways and high speed trains connecting N and S Italy**
- **Huge growth potential with improved connectivity—cross-border, national and sub-national**
  - Coastal hubs strategy in China—problems of success (as in Chile)
  - Sustainable new "hubs"—moving investment to new technologies, better use of labour and comparative advantage—not trivial
  - Tapping into unrealized potential with global value chains: physical connectivity (Chile vs China)

CHINA: MIGRATION TO "COASTAL URBAN HUBS"



CHINA 2014: STRUCTURE OF EXPORTS, COMPLEXITY



LOGIC FOR NEW DOMESTIC HUBS

- **Better utilize the existing production and factor endowment structures**
- **Relatively little additional connectivity possible with existing hubs**
  - Congestion and pollution raise effective costs of production
  - Extensions based on domestic "distance" better utilization of the interior provinces
- **Silk Route/OBOR cross-border investment assumes that external linkages would also provide additional elements to raise the aggregate production possibility frontier**
  - Utilizing the considerable "space" in the production frontiers of neighboring countries,
  - In addition to opening up say the Western region, and providing shorter (and safer) access to markets in the Middle East and Europe and critical supplies of raw materials

REBALANCING OR "SUSTAINABLE URBAN HUBS"

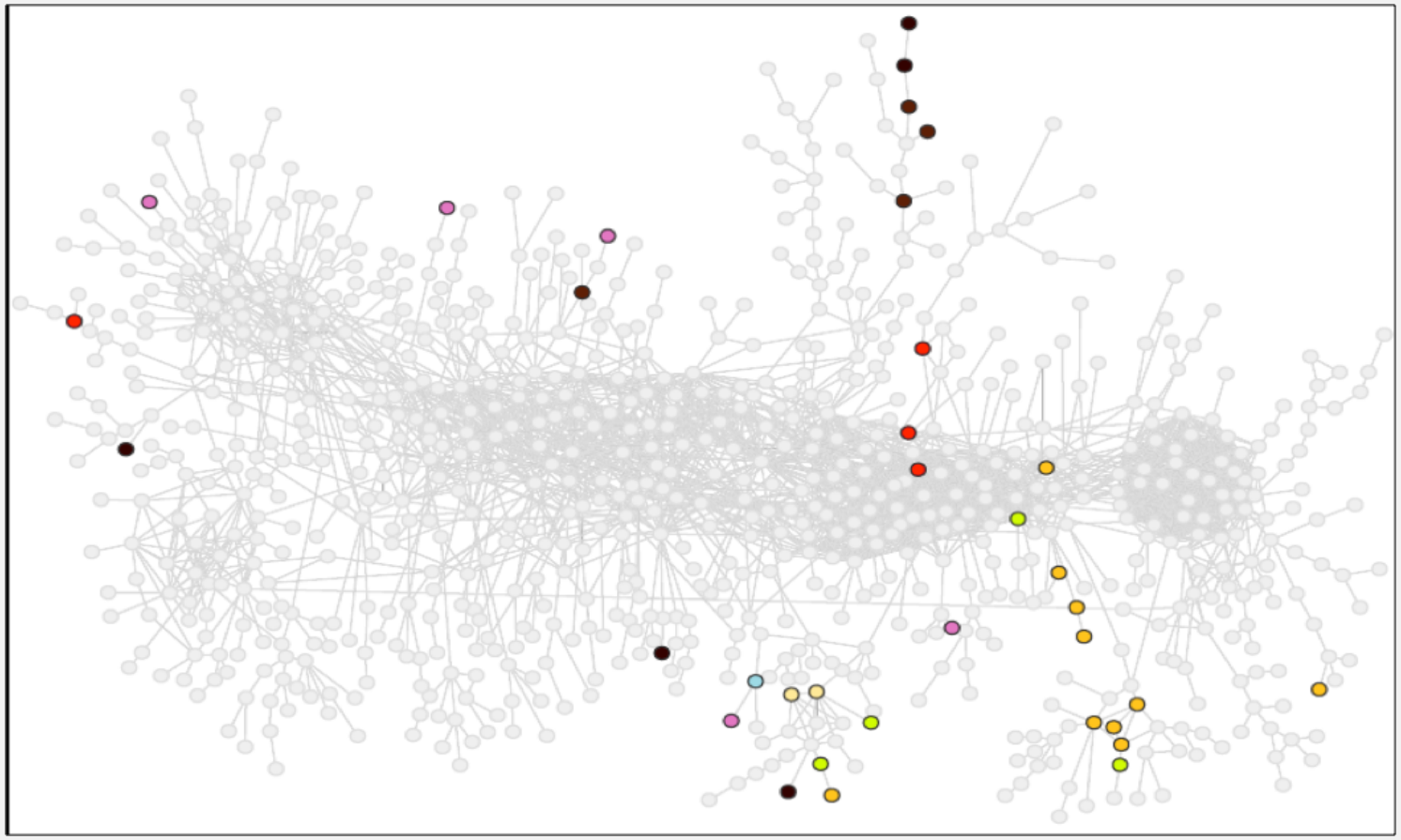
SOME LESSONS FROM CRISIS IN EUROPE—CONNECTIVITY INFRASTRUCTURE

- **Major emphasis on public investment for connectivity in the EU—structural funds**
- **Mixed results for lagging regions** (Ahmad, Bordignon and Brosio, 2016)
- **Inability to generate new sustainable "hubs"** or generate private investment
  - High speed trains within and between countries
    - Italy: Turin-Milan-Rome-Naples high speed train
      - Unable to revive declining industries in Turin
      - Unable to provide a boost to lagging economy of Southern Italy
      - Make it more attractive to commute to ***existing hubs***: Milan or Rome
    - Same issue: Barcelona-Madrid-Seville
- **Difficulty with complementary local investments and public services** needed to create attractive locations for private firms and workers—serious governance issues in Southern Italy

CHILE: NET RESULTS…

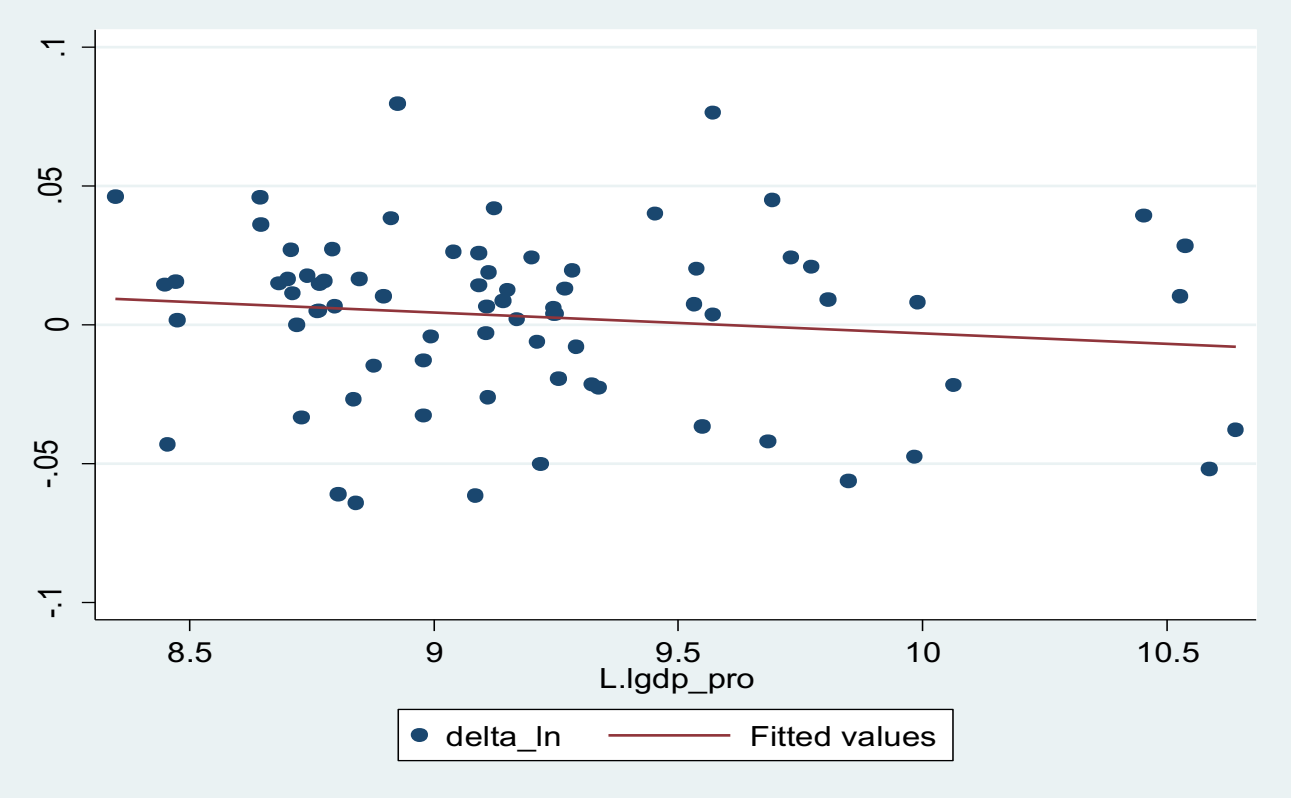
- Relatively poor utilization of linkages with natural and human resources
  - Chart 1 (Ahmad and Zanola)
- Some convergence—due to slowing down of growth in the metropolitan areas and exports—not faster growth in new hubs
  - Chart 2 (Ahmad and Zanola)
- Results in "middle income trap" (Ricardo Lago, 2013)

POORLY DEVELOPED LINKAGES IN CHILE (2014)



Note: This chart shows linkages for various sectors, from primary production in the outer ranges to more complex processing in the interior (the colors represent different sectors). The lack of connections in the chart above signify a primary exporting country. Source: Ahmad and Zanola (2015) based on *The Atlas for Economic Complexity*, Center for International Development, Harvard University.

CHILE: CONVERGENCE OR MIDDLE INCOME TRAP?



Source: Ahmad and Zanola 2015.

Note: The scatterplot plots growth in per capita gdp (vertical axis) and ln (yt-1) (horizontal axis), or the previous year's regional income level. The straight line represents the fitted line of the linear regression in each scatterplot. Convergence intensity is determined by the slope of the size: the greater the slope the greater the convergence rate.

BUT SOME DIFFICULTIES IN METHOD…

- Zero inequality aversion and discount rate above marginal social cost of public funds
- The appraisal method does not consider:
  - Interpersonal and territorial inequalities
  - Congestion and pollution costs
  - Migration to metropolitan areas, leading to extensive informal settlements and concentrations of poor households in mostly affluent regions

WHAT AND WHERE TO INVEST AND HOW TO FINANCE IT?

- Project choices and tax/public pricing decisions are inextricably linked
- Seen most clearly with environmental concerns, and income distribution
- Just taking market prices and ignoring distributional and environmental considerations will lead to greater concentrations in the advanced areas
  - Santiago de Chile—increasing pollution, congestion and the highest inequalities in Chile (both spatial and interpersonal) in Latin America
  - As well as an economy with relatively little complexity or job creation potential
- But how are project selection and public pricing/taxation linked?

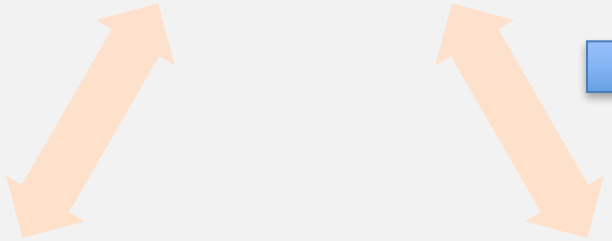
ECONOMY-WIDE SHADOW PRICES AND SUPPORTING TAX REFORMS

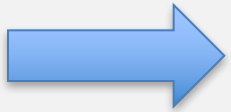
Examples from Chile

INTEGRATION OF INVESTMENT STRATEGY WITH SUSTAINABLE GROWTH

Investment strategy:

Appropriate AR for K and L
Inequality aversion (Atkinson index)
Intersectoral analysis
Appropriate cost of public funds (discount rate)





- Tax reforms structural reforms (at national and local levels)
- Avoid "Middle income trap".
- Economic and social convergence.
- Diversification.
- Pollution and congestion.

Improvement of local public service delivery

(Accountability through local own-source revenues and equalization transfers)

Sustainable urban hubs

take into account inter-related nature of public investments

Coordination of policies across levels of governments and economic sectors

CONSISTENT SET OF ECONOMY-WIDE SHADOW PRICES TO GUIDE INVESTMENT

- Ahmad and Stern 1991, Drèze and Stern 1987, Essential input for project appraisal, generalizations to incorporate inter-industry effects
- ***Also identify reorientations of trade and sectoral investments consistent with, for example, a green growth agenda***
  - focusing on groups of projects and
  - service delivery for sustainable new "hubs"
  - Critical multilevel finance issues
- Tax/public pricing decisions needed to lock in place decisions by both producers and consumers

CHILE: SHADOW PRICES
SENSITIVITY TO FACTORS OF PRODUCTION

Groups	K=0.81			K=0.5			K=0.25		
	L=0.37 M=0.43 H=0.73	L=0.62 M=0.68 H=0.98	L=0.87 M=0.93 H=1	L=0.37 M=0.43 H=0.73	L=0.62 M=0.68 H=0.98	L=0.87 M=0.93 H=1	L=0.37 M=0.43 H=0.73	L=0.62 M=0.68 H=0.98	L=0.87 M=0.93 H=1
Flour, pasta and cereals	0.404	0.409	0.321	0.435	0.445	0.351	0.459	0.470	0.376
Vegetables	0.395	0.380	0.316	0.430	0.426	0.351	0.458	0.454	0.379
Fruits	-0.030	-0.089	-0.317	0.046	0.006	-0.240	0.108	0.067	-0.178
Meats and Sausages	0.255	0.260	0.182	0.280	0.299	0.207	0.301	0.320	0.227
Oils and fats	0.354	0.355	0.311	0.368	0.369	0.325	0.379	0.380	0.336
Fish, crustaceans and molluscs	0.228	0.242	0.154	0.244	0.257	0.170	0.257	0.270	0.183
Fuels (a)	0.847	0.852	0.837	0.864	0.869	0.854	0.877	0.882	0.868
Other food products	0.523	0.535	0.461	0.546	0.557	0.482	0.563	0.574	0.499
Liquor	0.474	0.505	0.416	0.503	0.533	0.445	0.526	0.556	0.468
Textiles, clothing and footwear	0.494	0.497	0.385	0.523	0.527	0.414	0.547	0.550	0.438
Material for conservation, and repair	0.451	0.460	0.383	0.479	0.488	0.411	0.502	0.510	0.433
Stationery and Office Supplies	0.478	0.502	0.398	0.514	0.538	0.435	0.544	0.567	0.465
Mining	0.538	0.545	0.512	0.596	0.603	0.569	0.643	0.649	0.616
Chemical industry	0.527	0.539	0.505	0.568	0.580	0.547	0.601	0.613	0.586
Basic metal industry	0.491	0.496	0.455	0.509	0.513	0.472	0.523	0.527	0.493

SHADOW PRICES
SOCIAL PROFITABILITY

Groups	K=0.81			K=0.5			K=0.25		
	L=0.37 M=0.43 H=0.73	L=0.62 M=0.68 H=0.98	L=0.87 M=0.93 H=1	L=0.37 M=0.43 H=0.73	L=0.62 M=0.68 H=0.98	L=0.87 M=0.93 H=1	L=0.37 M=0.43 H=0.73	L=0.62 M=0.68 H=0.98	L=0.87 M=0.93 H=1
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WHAT DO WE SEE FROM THE RANGE OF SHADOW PRICES?

- Highest accounting ratios for the higher-linkage and value-added sectors
- Also reflected in the social profitability analysis
- Changes in the ARs for petroleum/fuels consistent with various levels of a carbon tax, say, led to significant changes in the ARs of other sectors, but no major change in social profitability
  - Thus the objective for diversification remains
  - But the means of getting there would be very different, in terms of investment components, as well as spatial effects
- Suggests the importance of employment enhancing linkages
  - Develops the policy agenda consistent with a sustainable growth strategy
  - But needs to be "locked in place" with national and local tax reforms

THEORY OF REFORM (1)

- Drawing on optimal tax theory and applications to emerging markets (Ahmad and Stern 1984; 1991)
- Evaluates the effects of an additional unit of public supplies, or tax/public pricing reforms in terms of effects on:
  - Producers
  - Consumers
  - Government revenues
  - More recent work also focuses on incentives to cheat and administrative implications

THEORY OF REFORM (2)

- Tax/pricing reforms needed to make the structural changes "stick"
- Shadow prices incorporate the effects on producers, a key element of the theory of reforms (see Drèze and Stern, 1987)
  - While the cost-benefit analysis can direct the choice of appropriate "environmentally friendly" projects
  - Both pricing and tax policy come into play in ensuring appropriate adjustments by households and consumers that will also affect private firms and their incentives to invest
- The policy framework for sustainable investment must include a focus on producers as well as consumers

COMBINATIONS OF TAXES NEEDED

- **National level: VAT** remains the center-piece to reduce costs of doing business and enhance competitiveness
  - Recently completed replacement of business tax by VAT in one go was the correct thing to do
  - More work needed on sharing and compensation mechanisms for provinces (origin-based sharing of VAT is problematic (Xu Shanda and Wang Daoshu, 2011))
- **Some rationalization of the rate structure of the VAT**, including a simplified regime for smaller taxpayers remains to be done, but the major step has been taken
- Need to focus on the **VAT interactions with the income taxes** (for equity purposes and to tap the most rapidly growing income bases, and to stop cheating)
- **Piggy-back on a carbon tax to address congestion and pollution**….is the same level needed in every city?
- **Property taxes to anchor local access to credit**, sustainable use of local PPPs
- **Needs to be supplemented by arms' length equalization framework**

REVENUE-SHARING OR OWN-SOURCE REVENUE OPTIONS?

- **Often revenue-sharing** (origin-base) needed to close vertical gaps with subnational governments
  - Political economy concerns with natural resources (Indonesia)
  - Good basis for overall local budgets if predictable (could vary a lot with natural resources, and cyclicality of VAT)
  - ***May negate the positive incentives with appropriately designed taxes if transfers fill "gaps"***
- **But does not constitute "own-source revenues", which permit:**
  - Some control over base/rates at margin; and
  - Critical for accountability and access to credit
- In unitary states, like China and Chile, **the center would legislate a band for a "piggy back",** and the local government could choose where within a band it should set its rate
  - **Easiest to see in the case of say a carbon tax**, where pollution levels vary
  - A local "**piggy-back**" on a central base and administration maintains the center's tax rate setting capabilities, with some local flexibility
  - Most importantly, this **delegated tax handle creates ability to seek and service debt while minimizing risk**

DIRECTIONS OF REFORM

- We use concept of the welfare loss associated with:
  - an increase in the ith tax sufficient to raise $1 in revenue (see Ahmad and Stern, 1984, 1991)
  - Where we use welfare weights:
  - e = 0 equal weights for all
  - e = 5 heavy weight on the poorest

$$\lambda_i = \frac{-\frac{\partial V}{\partial t_i}}{\frac{\partial R}{\partial t_i}} = \frac{\sum_h \beta^h x_i^h}{X_i + \sum_{j=1}^{n} t_j^e \frac{\partial X_j}{\partial p_i}}$$

$$\beta^h = \left(\frac{I^1}{I^h} \right)^e$$

CHILE—DIRECTIONS OF REFORM—RANKINGS 2014

Groups	e=0	e=0.5	e=1	e=2	e=5
Rents (houses and apartments)	1	1	1	1	1
Transportation	2	3	15	21	19
Other services	3	17	24	24	24
Education	4	23	25	25	25
Telephone services	5	16	22	23	23
Hotels and restaurants	6	11	16	18	18
Textiles, clothing and footwear	7	7	12	14	8
Health	8	13	18	16	10
Meats and Sausages	9	5	4	6	9
Public basic services	10	2	2	2	2
Financial services	11	14	17	15	14
Entertainment	13	26	26	26	27
Electricity	14	4	3	5	7

CHILE DIRECTIONS OF REFORM (CONTINUED)

Groups	e = 0	e =0.5	e=1	e=2	e=5
Vegetables	15	9	11	12	15
Non-alcoholic beverages	16	8	7	7	6
Pharmaceutical products	17	21	21	20	20
Dairy products, cheese and eggs	18	10	10	11	13
Other food products	19	19	20	19	22
Gas	20	12	8	10	12
Liquor	21	15	6	3	3
Fruits	22	18	13	8	5
Tobacco	23	25	23	22	21
Toiletries and cosmetics	24	27	27	27	26
Fish, crustaceans and molluscs	25	20	9	4	4
Oils and fats	26	22	14	9	16
Fuels	27	24	19	13	11

Source: Ahmad and Viscarra, 2016.

WHAT DO WE SEE? LINKAGES BETWEEN TAX AND SPENDING TO MINIMIZE RISKS

- **In Chile and South Asia or Indonesia taxing fuel affects other commodities** (effective tax approach essential)
  - Affects lower income households—although the rich consume more—issue important with higher inequality aversion
- **Need compensation for the poorest of those affected** (usually urban lower middle class):
  - CCTs can constitute poverty trap and **risks affect labour mobility**
  - Alternatives: universal pension (Mexico 2013)
  - Universal health care (Indonesia?)
- **Intergovernmental aspects**
  - **Piggy-backs to avoid "race to the bottom", as well as constituting own-source revenues**
  - Likely need a **higher overall rate in metropolitan areas**, such as Santiago or Mumbai to encourage structural change and generate incentives for polluting industries to move elsewhere

COORDINATED NATIONAL AND SUBNATIONAL TAXES

- **VAT and tax administration reforms to generate sufficient revenues and reduce the cost of doing business: competitiveness**
  - Reduce production costs (EU)
  - Generate information to stop the cheating (Mexico)
  - But need sub-national tax handles for accountability and responsible access to credit—very weak base in emerging market countries
- **Importance of coordination for carbon tax/ income tax "piggy back"**
  - National base to stop "race to the bottom"
  - Flexibility for higher taxes in more congested/polluted areas by "piggy back"
  - Piggy-back does not require sub-national administration (easing capacity constraints)

HOW TO BRING IN THE PRIVATE SECTOR, IN THE PRESENCE OF CLIMATE CHANGE UNCERTAINTY

Builds on Ahmad, Bhattacharya, Vinella and Xiao, G24-GGGI Working Paper 5.

INVOLVING THE PRIVATE SECTOR IN PUBLIC INVESTMENTS

- Considerable emphasis on PPPs in order to relax short-term financing constraints on public infrastructure,
- G24-GGGI WP 5 outlined a case for risk-sharing, given asymmetric information and possible of reneging on contracts
  - Key issues: the role of equity in keeping private partner "honest"
  - The requirement of full information required under IPSAS 32, at each level of government,
    - linked to own-sources of revenue at sub-national level to prevent "game play" across levels of government
- More difficult: uncertainty, e.g., with respect to "climate change"
  - Can PPPs be used, or unbundled contracts, including public investment followed by privatization or securitization?

CONTRACTUAL INCOMPLETENESS AND IRREVERSIBILITY

- Uncertainty leads to ***contractual incompleteness***
  - the parties are unable to foresee all possible future contingencies
    - ✓ long-term state-contingent contracts are unfeasible
  - the decisions about actions related to undisciplined contingencies are left with the party managing the project
  - such decisions are often *non-verifiable* (i.e., they cannot be verified by a third party such as a Court of law, hence they cannot be embodied in legally enforceable contracts)
- Infrastructure projects also display ***irreversibility***
  - *Leads to rigidities,* making future adaptation difficult
  - High quality water, transport or electricity investments require *operations and maintenance expenditures* in the future to maintain the viability of the projects
- Affect incentives and dynamic moral hazard (Martimort and Straub 2016)

BUNDLING VS UNBUNDLING

- With commitment considerations, desirable to bundle into a single contract
  - As with PPPs
- If flexibility is important, then preferable to design a sequence of short-term contracts with different agents
  - Initial agent will not internalize the negative externality induced by the irreversibility of early investments, hence the incentive to under-invest will be mitigated
  - subsequent agent will face more commitment and less flexibility, to the benefit of the delegating authority
- Organizational form depends on
  1. the presence of *rents* associated with the moral hazard problem and the availability of instruments to contain them;
  2. the concerned sector or *kind of project* and the environmental specificities;
  3. (relatedly) the likelihood of future *technological improvements*.

CEDING RENTS?

- As argued in Martimort and Straub (2016), conceding rents may be needed to address moral hazard because
  - agents are protected by *limited liability*
  - and if they are risk adverse

- Moral hazard is more easily addressed if there are ways to reduce the rents, hence the stake for opportunistic behavior (shirking/cheating) by delegated agents
  - If so unbundling is less useful
  - And the PPP model becomes more appropriate

CONTAINING RENTS

- Martimort & Straub (2016) suggest a few ways:
  a. tighten *competition* in the tendering stage;
  b. boost diversification through the acquisition of *financial bonds* to reduce the need for insurance within the relationship;
  c. introduce *risk-* and *revenue-sharing mechanisms*, as already in use in many utilities and projects
     - ✓ e.g.: greenfield concessions for toll highways (Iossa, EPI 2015)
- Need to fine-tune complementary *institutional mechanisms*

GOVERNANCE ISSUES

- **Central governments** typically better placed to handle the financial and management burdens if there are a series of unbundled contracts
  - But ***may lack full information on the local conditions*** that may be relevant
- **Local governments** are better able to design and follow-up on PPPs for local public goods
  - But the PPPs ***design and contracting may be too complex*** for many local governments (need for technical support from a central PPP-management body)
  - Still generate the ***need to record the liabilities on the local government balance sheet*** (hard to do, even in OECD countries)
  - And to avoid "game play", ***local own-source revenues would be needed*** to limit the generation of liabilities within a medium-term budget constraint

CONCLUSIONS

From Sustainable Growth Strategy to Economy-wide shadow prices back to macro policy and supporting fiscal measures

TOWARDS A SUSTAINABLE STRATEGY?

- **Critical to have a correspondence between the Government's Green Growth Strategy and the project selection criteria**
  - Beyond the allocation of funds to sectors or the investment funds
  - Helps to "fix" the choice of economy-wide shadow prices
  - Macro-factors needed to choose essential accounting ratios; choice of marginal social cost of public funds
  - Similarly feedback loop from the effects of the investments to the need for measures at the national and sub-national level
- **How to achieve sustainable growth objectives?**
  - **Focus on economy-wide shadow prices,** (Ahmad and Hernández IADB 2016 for Chile, drawing on Drèze and Stern, 1987, Ahmad and Stern 1991)
  - **Together with national and subnational taxes and transfers, and better governance** (recording of liabilities in the medium-term)
- **Involving the private sector in an efficient manner in the financing and management of investments** (PPPs or unbundled sequential contracts)

SOME OF THE FISCAL POLICY COMPONENTS OF A SUCCESSFUL INVESTMENT POLICY

- **Public investment important in expanding overall production possibility frontier and potential for sustainable growth**
- **Fiscal reforms need to support "sustainable hubs"**
  - Clean VAT providing revenues and full information on the value-chain
  - More effective room for sub-national own-source taxation (particularly at the local level), linked to issuance of credit and service delivery to minimize risks of future crises
  - Deepening of public financial management reforms to strengthen monitoring and evaluation of liability buildup, PPPs
  - Avoid gap-filling transfers including badly designed equalization systems (Indonesia)
- **But need to manage risks effectively**—full recognition of liabilities and own-source taxes for accountability
- **Governance structure**—rationalization of numbers of levels and layers of administration and their responsibilities—part of medium-term agenda