# TRADE LIBERALIZATION, ECONOMIC INTEGRATION AND REGIONAL DISPARITIES

LIBERALIZACIÓN DELCOMERCIO, INTEGRACIÓN ECONÓMICA Y DISPARIDADES REGIONALES
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RESUMEN

¿Qué impacto tienen la apertura comercial y la integración económica en la distribución geográfica de las actividades económicas? Para responder a esta pregunta el presente documento propone un marco teórico con base en los desarrollos recientes de la teoría internacional y de la geografía económica. El trabajo revisa la literatura aplicada, demostrando que los principales componentes y mecanismos del marco propuesto encuentran, de hecho, apoyo en la evidencia empírica. Asimismo, con base en esta "validación", se emplea el marco teórico para interpretar la evolución de las disparidades espaciales en áreas del mundo que han estado involucradas en los procesos de apertura comercial e integración económica.

Palabras clave: integración económica, disparidades regionales, comercio internacional

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ABSTRACT

What is the impact of trade liberalization and economic integration on the geographical distribution of economic activities? To address this question the present paper proposes a conceptual framework based on recent developments in the theory of international trade and geographical economics. It then surveys the applied literature to show that the main components and mechanisms of the proposed framework find indeed support in the empirical evidence. Finally, based on this "validation", it uses the conceptual framework to interpret the evolution of spatial disparities in areas of the world that have been involved in processes of trade liberalization and economic integration.

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Keywords: economic integration, regional disparities, international trade

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## Abstract

What is the impact of trade liberalization and economic integration on the geographical distribution of economic activities? To address this question the present paper proposes a conceptual framework based on recent developments in the theory of international trade and geographical economics. It then surveys the applied literature to show that the main components and mechanisms of the proposed framework find indeed support in the empirical evidence. Finally, based on this "validation", it uses the conceptual framework to interpret the evolution of spatial disparities in areas of the world that have been involved in processes of trade liberalization and economic integration.

# 1.    *Introduction*

The concentration of activities in a few locations is probably the most distinctive feature of the economic space and its policy relevance cannot be overstated as long as the geographical distribution of economic activities determines the geographical distribution of living standards. Several areas of the world are undergoing processes of trade liberalization and economic integration, a diffuse concern is about the effects of this processes on spatial disparities.

The present paper proposes a conceptual framework to assess the economic impact and the welfare implications of trade liberalization for the reallocation of economic activities both between and within countries. The conceptual framework is presented in Section 2 and is based on recent developments in the theory of international trade and geographical economics.[1] Introducing the notion of "market potential" as a guidance to understanding the effects of trade barriers on the economic landscape, the framework produces three key insights. First, both at high levels and low levels of trade barriers, regional disparities tend to mirror the geographical distribution of immobile natural resources and productive factors. Differently, for intermediate trade barriers, the spatial distribution of economic activities may depart from the one dictated by those exogenous drivers. This generates a bell-shaped relation between spatial disparities and the level of trade barriers. Second, strong complementarities among different economic activities and actors may give rise to lock-in effects that delay the materialization of the effects of trade liberalization and economic integration. This may lead to a discontinuous reaction of spatial disparities to those policy changes. Third, whether a given reduction in the barriers to goods and factors mobility fosters or hampers regional disparities depends on whether it exacerbates or compresses the ladder of regional market potentials. This is ultimately an empirical issue.

The next sections take up this empirical challenge from two complementary angles. Section 3 surveys the applied literature to show that the main components and mechanisms of the conceptual framework find support in empirical studies. Based on this "validation", Section 4 analyzes the evolution of the market potential in regions that have been involved in processes of trade liberalization and economic integration.

There are three main findings in Section 3. First, the notion of market potential is, indeed, of guidance in explaining the spatial distribution of economic activities. Second, trade barriers are

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[1] See Combes, Mayer and Thisse (2008) for a recent appraisal of those models and related empirical evidence. Baldwin et al. (2003) provide a detailed analysis of their policy implications.

important determinants of the location of economic activities and their impact feeds through changes in market potentials. Third, this impact is not necessarily smooth as spatial disparities may react discontinuosly to continuous changes in trade barriers. These findings lend support to the conceptual framework developed in the previous section.

Section 4 inspects the spatial distribution of market potentials across the EU, the USA and South America. While revealing a lot of heterogeneity, it detecs some key regularities that can be explained in terms of the conceptual framework. First, market potentials follow clear spatial patterns gradually changing from "central" regions to "peripheral" ones. Second, the persistency of such patterns after periods of trade liberalization and economic integration shows that spatial disparities are quite resilient. Third, at the same time, the resilience of spatial disparities seems to vary depending on spatial scale. In particular, spatial disparities among EU countries, among US states, among South American countries and among Brazilian states have been shrinking. This has not happened to spatial disparities within EU countries. Hence, complementarities among economic activities and actors seem to be stronger the finer the spatial scale.

Section 5 proposes a temptative analysis of the possible impact of the *Corredor Vial Interoceánico Sur* (CVIS) in Peru to show how the conceptual framework can be used to shed light on the effects of large regional integration projects. Section 6 concludes.


## 2. A conceptual framework

The location of economic activities matters for regional welfare as long as there are trade barriers and not all natural resources and productive factors are geographically mobile. Moreover, firms face relevant location choices as long as their shipments are costly and their operations face some degree of indivisibility. For example, fixed costs of production may require some minimum size threshold for plants to break even. Indivisibilities then force firms to choose an "address" as they cannot ubiquitously fragment their operations to serve their customers and tap their suppliers locally wherever these may be.[2]

In the presence of indivisibilities in production and costs in shipments, its location choice determines the extent to which not only a firm has easy access to its customers and suppliers but also it is exposed to the competition of other firms. Ideally, a firm would like to be close to customers and suppliers but as far as possible from its competitors. However, as all firms are

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[2] Scotchmer and Thisse (1992) call this the 'folk theorem of spatial economics'.

attracted to where customers and suppliers are located, market access and local competition go hand in hand.[3]

Spatial disparities arise when firms' gains from market access more than offset their losses from local competition, in which case economic activities end up being disproportionately present in larger markets. When economic activities do not rely much on immobile natural resources and productive factors, the disproportionate presence of firms in larger markets and thus spatial disparities become more likely when trade barriers fall as this reduces the dispersion force due to local competition more than it reduces the agglomeration force due to market access. When, instead, proximity to immobile natural resources and factors is important, spatial disparities increase only for a while as trade barriers fall because at some point the disproportionate presence of firms in larger markets congests the local supply of immobile natural resources and factors. As a result, spatial disparities emerge for intermediate levels of trade barriers whereas the geographical distribution of economic activities tends to mirror the geographical distribution of immobile natural resources and productive factors at high and low levels of trade barriers. The reason for this is that, for high trade barriers, different places must be self-sufficient so that economic activities develop proportionately to the availability of local resources. On the other hand, for low trade barriers, market access and local competition are more or less the same for all regions so that what matters for firms' location choices is proximity to immobile resources and factors.[4]

Firms' location choices are not trivial not only because market access and local competition are in conflict but also because their relative impact on firms' profits depends on a set of underlying industry characteristics. In particular, concentration is more likely to take place in sectors where increasing returns are intense and market power is strong. The reason is that more intense returns to scale increase the attractiveness of larger markets while stronger market power reduces the negative impact of firms' proximity to competitors. Hence, market access is stronger in sectors characterized by more intense returns to scale and local competition is weaker in sectors characterized by stronger market power, which is typically associated with more pronounced product differentiation and livelier R&D.

In recent years a plethora of economic models have transformed these general ideas into a coherent conceptual framework, sometimes called "New Economic Geography" (NEG).[5] The aim of this section is to use that framework to discuss the implications of international trade liberalization and

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[3] Krugman (1991), Krugman and Venables (1995).
[4] Puga (1999), Ottaviano, Tabuchi and Thisse (2002).
[5] See, e.g., Ottaviano and Thisse (2004).

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regional integration on the geographical distribution of economic activities.[6] The specific question addressed is: Should we expect international trade liberalization and regional integration to foster or hamper regional disparities?

The technical complexity of the relevant models is proportionate to the complexity of the issues at stake. However, it is possible to summarize most of their main insights through an example based on a simplified economy consisting of 2 countries, each made of 2 regions, and 2 sectors, each employing to factors. One country is larger than the other due to proportionately larger endowments of immobile natural resource and productive factors. Moreover, each country is made of a larger region and a smaller region, again due to proportionately different endowments of immobile natural resource and productive factors. (Inter)Regional disparities will refer to differences between regions within the same country. International disparities will refer to differences between countries.

Natural resources and productive factors are employed in an advanced sector or in a more traditional one. The former features: higher trade barriers; higher product differentiation; higher fixed costs of production; higher capital intensity.[7] In both sectors the fixed costs are more capital intensive than variable costs. In this setup, the crucial driver of regional disparities in terms of welfare is the geographical distribution of the advanced sector: the larger the share of this sector a region hosts, the larger its welfare. Thus, from now on, we can focus on the location of firms in the advanced sector and, when we talk about "firms" without further specification, it will be understood that we refer to firms in that sector.

## 2.1. Attraction and regional disparities

Intuition can be boosted through an incremental discussion of the insights one can get by increasingly augmenting the complexity of the conceptual framework, starting from the simplest situation of an autarkic region isolated from the rest of the world.

In this situation, the number of firms that are active in a region is proportionate to the region's own size (a.k.a. "attraction"): the larger the region's stocks of natural resources and productive factors, the larger the size of its advanced sector. This implies that, *when regions are isolated from one another, the extent of regional disparities is entirely determined by the distribution of immobile*

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[6] Ottaviano and Pinelli (2006) use a similar framework to discuss these issues in the case of Finland.
[7] Trade barriers include all costs associated with the shipment and the sale of goods to distant markets. They include transportation costs, administrative barriers, custom duties, informational costs, distribution costs, etc. That is why, for example, they tend to be higher for advanced differentiated goods that for standardized commodities.

*natural resources and immobile factors*. By continuity, this is roughly the case also when trade barriers are not prohibitive but still very high.

## 2.2. Accessibility and regional disparities

The next step is to allow for trade and capital movements between the regions of the same country. As internal barriers to trade and capital mobility gradually fall from prohibitive levels, the larger region starts offering a better option for firms' location. The reason for this is that the larger region represents the trade cost minimizing location as firms face no barriers for sales in the local market. In other words, the larger region has better "accessibility".

This implies that, at the autarkic proportionate firm distribution between regions, lower barriers boost relative profits in the larger country, therefore inducing firms to relocate there from the smaller region. The outcome is a new distribution of firms such that the larger region ends up hosting a more than proportionate share of firms. This result is know as the "home market effect" (HME) and gets stronger as interregional transactions become increasingly cheap.[8] Hence, *in an economy composed of two region improvements in interregional transport infrastructure and the liberalization of internal trade tend to reinforce regional disparities*.

Clearly, with two regions, the larger one has not only stronger "attraction" but automatically also better "accessibility". In this respect, an important caveat is that, if one considers more than two regions, then the largest region is not necessarily the most appealing location for firms. That happens because, when faced with multiple location options, firms value not only the size of local markets but also the possibility of using a region as an export base to other regions. Accordingly, a small region that offers good access to other regions may well be more appealing than a large region that offers bad access to the rest of the economy (see Figure 1). This idea is captured by the notion of "market potential".[9] The "nominal" market potential (NMP) of a region is a weighted average of the sizes of the local and distant markets that a firm can reach when located in that region. The weight attached to each distant market is inversely related to its bilateral trade barriers with the region of interest. In other words, the NMP is a measure of overall market access.

A parallel notion is the "real" market potential (RMP), which discounts market access to account for the adverse impact of local competition on firms' profitability. Specifically, while the NMP predicts the revenues that a firm can earn by locating in a certain region, the RMP predicts the

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[8] Krugman (1980), Helpman and Krugman (1985).
[9] Harris (1954).

corresponding profits. No relocation takes place when firms are happy with their current locations, which happens when firms understand that they would not be able to increase their profitability by relocating. That is the case when profits are the same in all regions or, equivalently, when the RMP is the same everywhere as firms move until the regional variations in market access (signalled by the NMP) are perfectly compensated by the regional variation in local competition. In other words, through their location decisions, firms arbitrage out any profit differential across regions.

As interregional barriers to goods and factor mobility fall from a prohibitively high level, accessibility becomes an important dimension of the location decision. At the initial autarkic firm distribution, the NMP rises in regions that gain accessibility. Hence, *interregional liberalization reinforces regional disparities only if the NMP of larger regions rises with respect to the NMP of smaller regions*. Otherwise, regional disparities fall. This casts a shadow on the frequent uncritical application of the insights from two-location arguments to real work multi-location situations.[10]

## 2.3.   International trade and regional disparities

Consider now what happens when our simple national economy opens up to international trade. In so doing, assume initially that its two regions gain equal access to the foreign market and capital remains internationally immobile. The sheer appearance of a foreign market reduces the relative appeal of the smaller region as a location for production.. This is the more so, the larger the relative size of the foreign market with respect to the domestic one and the more integrated the two regions are. Hence, *when regions have the same access to foreign markets, international trade liberalization fosters regional disparities and this effect is stronger the more important the foreign market and the more integrated the national market*.

In reality it is seldom the case that all regions gain equal access to foreign markets. Asymmetric access may originate from different geographical proximity to the border or from the way the transport infrastructure is organized. A region that is closer to the border may become a natural "gate" through which international trade passes. Analogously, a region that plays a central role in the internal transport network is a natural "hub" also for international shipments. All the rest given, gates and hubs are most likely to be appealing locations for economic activities because their

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[10] See Behrens, Lamorgese, Ottaviano and Tabuchi (2004) for a detailed discussion of this issue..

advantage in terms of accessibility boosts their NMP. Then, *if the smaller region is a gate or a hub, international trade liberalization may reduce regional disparities.*[11]

## 2.4. International capital mobility and regional disparities

Trade liberalization is not the only dimension of the freer international transactions. Another important dimension is capital mobility.

When capital is internationally immobile, firms can relocate only within national borders. Differently, when capital is internationally mobile, firms can also relocate from one country to the other. In this case, the logic of the HME applies also at the international level determining the direction of relocation: all the rest given, as international trade barriers fall, firms migrate from the smaller to the larger country. However, they do not redistribute proportionately between regions within countries. In the smaller country, it is the smaller region that sheds relatively more firms. In the larger country, it is the larger region that absorbs relatively more firms. Thus, *international capital mobility amplifies the positive effect of trade liberalization on regional disparities in the smaller country as well as in the larger one*. The impact of capital mobility on regional disparities is more pronounced when international trade barriers are lower and when their level is close to the one of interregional barriers within countries.

These results apply when, through international trade liberalization, regions gain equal access to the foreign market. In the case of asymmetric access, regional disparities surely increase only if larger regions are also gates or hubs for international shipments.

## 2.5. Congestion and re-dispersion

So far we have argued that, absent any asymmetry in the access to foreign markets, interregional and international trade liberalization foster international and regional divergence monotonically. This may not happen when the geographical concentration of economic activities faces additional costs due to congestion and market crowding in the usage of immobile natural resources and productive factors.

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[11] Behrens, Gagné, Ottaviano and Thisse (2006).

In this case, when trade barriers become low enough to make market access and local competition more or less the same across regions and countries, the crucial driver of firm location decisions is the price of immobile natural resources and productive factors. Accordingly, *in the presence of congestion and market crowding in immobile natural resources and productive factors, after some threshold further trade liberalization may lead to the re-dispersion of economic activities* as these are proportionately attracted by the geographical distribution of those resources and factors.

## 2.6. Interregional vs. international disparities

The conceptual framework developed so far is rich enough to generate asyncronic evolutions of interregional and international disparities.

*When the costs related to congestion and market crowding are not so relevant, interregional disparities grow faster than international disparities whenever barriers to goods and capital mobility fall faster within than between countries.* Otherwise, if barriers to goods and capital mobility fall faster between than within countries, one should expect international disparities to grow faster than interregional ones.

Things turn out to be different when congestion and market crowding are important. In this case, *if congestion cost differentials are more relevant between than within countries, when goods and capital mobility gets free enough, international disparities start to shrink while interregional disparities keep on expanding.* Vice versa, if congestion cost differentials are more important within than between countries, one may observe a reduction in interregional disparities while international disparities increase.

## 2.7. Transport costs and regional disparities

So far no real distinction has been made between trade barriers (e.g., tariffs, standards, regulations) and transport costs. This is problematic for several reasons. For example, tariffs generate revenues whereas transport costs do not, so their impact on welfare is bound to be generally different. Yet, there are more subtle issues that are not tied to considerations of tariff proceeds and are thus relevant also for other trade barriers such as standards and regulations. Changes in transport costs and changes in border related trade frictions usually have different impacts on the location of firms, the structure of trade, and the welfare of nations. The main reason is that, even after trade is

liberalized, transportation must still occur along some given transport routes. In other words, falling trade barriers make transport costs more not less important.

That is why deeper economic integration often involves far reaching infrastructural programs.[12] Then the previous discussion implies that only infrastructural changes improving the market potential of a certain location are able to attract economic activities towards that location. As we have seen this has important (and someway unexpected) consequences. Improved global transport infrastructure between a developed location enjoying a market size advantange and a less developed one can decrease the attractiveness of the latter. This is called the 'straw effect', because economic activities migrate to developed locations through new infrastructure as juice in a glass is sucked up by a straw.[13] The reason is that, unless the prices of non-tradables is much higher in the developed region, better transportation improves its market potential more than it improves the market potential of its less developed trading partner.

Another, even more unexpected, consequence is captured by the 'shadow effect', according to which improved local transportation does not necessarily make a location more attractive. Consider, for example, two locations H and F. In the presence of a third location T, if this is large (i.e. it has strong 'attraction') and well connected to both H and F (i.e. it has good 'accessibility'), an increase in H's market size or a decrease in H's production costs due to better local transportation may well map into a decrease in its output share. The reason is that the improved local infrastructure of H is disproportionately used for shipments to and from T, which 'casts a shadow' on H's attractiveness. That would be the case, for instance, if location T were a transport 'hub' or 'gate'. Favourable demand or cost shocks to any other location could result in supply expanding in the hub or in the gate and contracting elsewhere.

Better global infrastructure may nonetheless reduce geographical disparities. That would happen in three leading case. First, as already discussed, if the prices of non-tradables are much lower in less developed locations, improved transport connections with developed locations result in firms and workers relocating from the latter to the former.[14] Second, if better global infrastructure allows for long-distance commuting, the concentration of firms in developed regions is partly detached from local market size as workers spend their income elsewhere. This favours some dispersion of economic activities.[15] Third, better global means of communication (e.g. improved ICT) foster the

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[12] See Section 3.2 for a discussion of the impact of EU infrastructural projects in Portugal and their impact on the agglomeration and redispersion of economic activities. See Section 5 for a related discussion of the road projects in the South East of Peru.

[13] Behrens, Lamorgese et al (2007a,b).

[14] Puga (1999).

[15] Borck, Pflüger and Wrede (2007).

diffusion of local knowledge to distance places. Whenever knowledge spillovers are the main source of agglomeration economies, production cost asymmetries fall, thus promoting more even economic geography.[16]

To summarize, improved global infrastructure supports a more even distribution of economic activities when the prices of non-tradables are much higher in less developed locations, when it promotes long-distance commuting and when it is conducive of knowledge transmission from developed to less developed locations.

## 2.8. "Putty clay" geography and labour mobility

Sometimes the complementarities among economic activities are strong enough to generate cumulative causation among the location decisions of economic actors.[17] When this happens their co-location becomes self-sustaining and leads to "putty clay" geography: *while there is a priori great flexibility on where particular activities locate, once the agglomeration process has started regional disparities take shape and become quite rigid*.[18]

The implication is that, as trade barriers gradually fall, nothing may happen for a while. Then, when trade barriers pass some critical threshold, the economic landscape changes abruptly in the directions described above.

When workers are mobile, cumulative causation is more likely to take place. The reason is that market size differences can be driven by migration.[19] Consider an initial situation with two identical regions that is altered by a positive demand shock to one of them. Assume that production is labour intensive. Specifically, for the sake of argument, assume that production employs only labour and no capital. The demand shock will create an incentive for supply to expand in the shocked region. However, output expansion will require additional employees. This will push wages up, thus attracting workers from the other region. As workers immigrate, local income rises and this feeds back into higher expenditures. The larger the immigration flow for a given wage differential, the more local expenditures expand, which makes cumulative causation more likely.

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[16] Baldwin, Martin and Ottaviano (2001).
[17] Krugman (1991) highlights the complementarities between firms and workers decisions; Krugman and Venables (1995) stress, instead, the complementarities between upstream and downstream producers; Baldwin (1999) focuses, instead, on the complementarities between innovation and production.
[18] Fujita and Thisse (1996).
[19] Indeed, in NEG's seminal paper by Krugman (1991) cumulative causation is sustained by labour migration rather than capital accumulation.

## 2.9. Multinational and natural resources

The fragmentation of the production process has experienced a remarkable growth in the last three decades. [20] Indeed, a defining aspect of the ongoing process of globalization is the rise of global production chains and their strategic decisions in terms of access to customets, suppliers and scarce resources. Generally speaking, the logic behind the plant location choices of multinationals is very much like the one described so far aimed at striking the profit maximizing balance between market access and competition. With respect to national firms, multinationals internalize the cost saving gains that can be reaped by locating each stage of the production chain in the country or region enjoying a comparative advantage in that stage. This comes at an additional cost of more complex governance that has been recently falling due to the improvements in information and communication technologies.

The international trade literature has traditionally focused on industrial activities. It argues that a multinational is only one of several possible modes of firm internationalization that arises when physical proximity is crucial to access customers, suppliers and resources and when contractualized transactions outside firms' boundaries are too costly.[21] When this is the case its additional costs of governance all well worth paying.

The impact of multinationals on the distribution of economic activities is, however, a much neglected topic.[22] In this vacuum, some insights can be nonetheless gauged. First of all, going multinational is a mode of firm internationalization that pays when contractual costs are high outside firms' boundaries. If transport costs and trade barriers are also high, horizontal multinationals are able to access different national makets by replicating the same stages of production in different countries. If transport costs and trade barriers are low, vertical multinationals are able to access immobile factors and natural resources wherever they are by fragmenting their production chain in different countries. In both circumstances firms acting as multinationals tend to bring economic activities where otherwise they would not take off in a efficient way. In this respect they promote the geographical dispersion of economic activities.

This conclusion has to be qualified in order to take into account the extent to which multinationals contribute to local income. When their contribution is substantial both directly in terms of employment and local investment, they can be a powerful tool of regional development. This is

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[20] Feenstra (1998).

[21] Markusen (2002), Barba Navaretti and Venables (2004).

[22] See Combes, Mayer and Thisse (2008): "While economic geography brings to light a number of relevant questions regarding globalization, the literature has yet to take a serious look at the spatial behavior of multinational firms. This may very well be the most challenging puzzle to unravel" (p.377).

typically the case when their production stages located in a certain area are characterized by high valued added and a relevant fraction of the corresponding profits is spent locally. In this respect a lot of caution should be dedicated by policy makers to the way multinational (but also national) firms associated with natural resources operate whenever regional development ranks high among their priorities. The reason is that it could be easy to end up with situations in which only low value added activities are performed in resource rich areas and most profits are funnelled elsewhere.

multinationals are able to shift their profits across countries.[23].

## 2.10. Summary

The key insights of the conceptual framework can be summarized as follows:

- Both at high levels and low levels of trade barriers, regional disparities tend to mirror the geographical distribution of immobile natural resources and productive factors.

- Differently, for intermediate levels, the spatial distribution of economic activities may depart from the one dictated by those exogenous drivers. This is because, for intermediate trade barriers, market access and local competition play an important role in determining firms' location choices.

- Strong complementarities among different economic activities and actors may give rise to lock-in effects that delay the materialization of the effects of trade liberalization and economic integration. This may lead to a discontinuous reaction of spatial disparities to those policy changes.

- Whether the liberalization of goods and capital movements fosters or hampers regional disparities depends on whether it exacerbates or compresses the ladder of regional market potentials, which is ultimately an empirical issue.

The next sections take up this challenge from two complementary angles. Section 3 surveys the applied literature to show that the main components and mechanisms of the conceptual framework find support in empirical studies. Based on this validation, Section 4 analyzes the evolution of market potential in regions that have been involved in processes of trade liberalization and economic integration.

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[23] A similar argument also applies when the different stages of production do not take place within the boundaries of a single (multinational) firm.

## 3.    *A reality check*

The previous section has described a conceptual framework for understanding the impact of trade liberalization and economic integration on regional disparities. Are its components and mechanisms actually working in reality? We address this question through a critical selection of the main findings of recent empirical works on the topic. While these works do not currently provide a consolidated view on the issue, they still represent a useful benchmark for assessing the empirical relevance and predictive power of the underlying conceptual framework.[24]

Recent empirical findings can be classified in three broad groups depending on their focus on the role of the market potential, on the impact of trade costs or on the importance of "putty-clay" geography.[25]

### 3.1.   **Market potential**

The crucial notions of our conceptual framework are the "nominal market potential" (NMP), which captures customer/supplier proximity, and the "real market potential" (RMP), which captures both customer/supplier proximity and competitor proximity. The former predicts the sales that firms can make if located in a certain area. The latter predicts the profits than firms can make if located in that area. In the long run, since firms can freely pick their location, RMP differences should eventually vanish as NMP differentials are capitalized in local price differences.

A similar argument can be applied to labor after realizing that higher sales and profits are typically associated with higher nominal and real wages. Accordingly, the NMP predicts the nominal wages that workers can earn if employed in certain area, whereas the RMP predicts the real wages than workers can make if located in that area. In the long run, if workers can freely relocate, real wage differences should eventually disappear as nominal wage differentials are capitalized in local price differences.

The foregoing predictions identify two natural tests of the empirical validity of the conceptual framework.[26] On the price side, higher NMP should be associated with higher revenues and higher nominal wages both in the short run and the long run. It should also be associated with higher local prices in the long run, especially in the presence of labor mobility. On the quantity side, positive shocks to NMP should attract both firms and workers.

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[24] Combes, Mayer and Thisse (2008)

[25] See Ottaviano and Pinelli (2005) as well as Ottaviano (2008) for an overview of the role of other Marshallian forces affecting firm location.

[26] See Head and Mayer (2004) for a detailed survey.

## Price effects

The price predictions have been tested at both international and interregional levels. In cross-country studies labour mobility is negligible and capital mobility limited, which means that RMP differentials do not vanish even in the long run. Accordingly, across countries higher RMP (as well as higher NMP) should be related to higher profits and wages. When brought to the data, these predictions are quite successful: *RMP variations explain around 35 per cent of the cross-country income variation.* This result is independent of institutions, natural resources, and physical geography. Interestingly, a country's access to the coast raises the local nominal wage by over 20 per cent, which reveals the dominant role of gate regions.[27]

In cross-region investigations, labour mobility plays an important role. This implies that real wages should be equalized across regions in the long run. In other words, in the long run NMP-driven nominal wage differences should be capitalized in local price differentials. These differentials are essentially determined by the interregional variations in the prices of non-traded goods and services with a dominant role played by land values. Therefore, higher NMP should be associated with both higher wages and higher land rents. This prediction finds indeed empirical support.[28] Cross-region studies also highlight the dominant role of transport hubs and gates: a 10 per cent increase of the distance from them reduces the nominal wage by 1-2 per cent.[29]

## Quantity effects

The quantity predictions stem from the idea that local shocks to final demand or intermediate supply generate short-run RMP variations. The associated variations in profits and real wages cause the relocation of firms and workers, which move towards higher NMP and temporarily higher RMP areas. In the long run NMP differences persist, while RMP differences disappear as firms and workers crowd higher NMP areas.

As to firms, most studies target what is considered the relatively footloose part of their activities: foreign direct investment (FDI).[30] The focus on FDI is crucial in that, whenever their impact on local market conditions is negligible, the spatial allocation of foreign plants can not be expected to

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[27] Redding and Venables (2004) investigate 101 developed and developing countries in 1996.
[28] Hanson (1998) studies US counties from 1980 to 1990.
[29] Hanson (1997) studies of Mexico from 1965 to 1988.
[30] Coughlin et al (1991) study the location decision of all foreign investors across US states. Head et al (1999) concentrate on Japanese firms only. Head and Mayer (2002) analyze the behaviour of Japanese firms across European regions.

lead to RMP equalization even in the long run. In general, FDI analyses show that foreign firms indeed favour locations with higher RMP. In so doing, they take into account both customer and supplier proximity. According to the estimated impact, *a 10-per-cent rise in RMP yields a 10.5-per-cent increase in the probability of a region being chosen by foreign investors.*

As to workers, the number of studies addressing the impact of customer and supplier proximity is very small. Existing results suggest that migrants respond to RMP differentials in the predicted way. However, their response is limited by distance, which signals the dampening effects of distance-related mobility costs and migration barriers.[31]

## 3.2. Trade barriers

The conceptual framework implies a non-linear relation between trade barriers and the geographical concentration of economic activities: when trade costs are either high or low, economic activities follow the distribution of immobile natural resources and productive factor; when trade costs are intermediate, economic activities are more concentrated in space than immobile resources and factors.

A first approach to the investigation of such non-linearity starts from the observation that trade costs have declined over time due to both improvements in the transport technology and, after WWII, reductions in tariffs. Some scholars have, therefore, tried to infer the impact of trade costs on spatial disparities from the evolution of industrial location over time. For example, the geographical concentration of manufacturing across US states fell until 1900, then rose to a climax around 1927, and finally fell again until 1987 when it reached its level in 1860.[32] The geographical concentration of manufacturing across EU countries rose sharply between 1972 and 1996 but slowed down after the implementation of the Single Market Programme in 1986.[33] While these patterns are broadly consistent with the predictions of the conceptual framework, they can hardly be interpreted as evidence of any clear-cut impact of trade costs on spatial disparities since many other variables are likely to have affected industry location over time.

A more direct approach is implemented by so-called "concentration regression", which regress alternative indices of geographical concentration on various measures of "trade costs" (such as administrative barriers, geographical size - larger areas imply greater average distances -,

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[31] See Crozet (2000) for a study of European regions, which shows that a region with 100 Km radius attracts workers within a radius of no more than 120 Km.
[32] Kim (1995).
[33] Brülhart (2001).

expenditures on transport and communication as well as road/railway/communication density).[34] Existing analyses are typically cross-country. The findings of studies on the effects of external trade barriers on cross-country agglomeration are inconclusive and somewhat contradictory.[35] Those of studies on the effects of trade barriers on within-country disparities are sharper, showing that disparities more pronounced when both external and internal interactions are harder.[36] This would be consistent with the conceptual framework as long as the average integration of the sampled countries were low enough.[37]

Clearly, the main challenge in assessing whether there exists a non-linear relation between trade barriers and regional disparities comes from the fact that it is hard to tell whether the observed level of trade barriers is 'high', 'low' or 'intermediate'. An interesting way of circumventing this problem has been recently proposed in a study that represents the first attempt to explicitly investigate the impact of transport policy on industry location within a conceptual framework akin to the one adopted in this paper.[38] The proposed approach is a mixture of regression and simulation analyses. In particular, using data on Portugal over the period 1985 to 1998, regressions confirm the empirical relevance of the underlying conceptual framework over different periods of time.[39] They also find that *Portuguese transport policy has not contributed towards spatial equity. However, the simulation of a further planned expansion of the transport network shows that, if transport costs are lowered sufficiently, industry will eventually spread.* This suggests a bell-shaped relationship between transport costs and spatial disparities, as suggested by the conceptual framework.

More generally, the foregoing analysis of the Portuguese case provides a convincing and concrete example of how the conceptual framework discussed in the present paper can be effectively used to evaluate and forecast the effects of trade liberalization (here due to transport policies) on the spatial distribution of economic activities.

The Portuguese case exhibits several features of an ideal natural experiment. From 1985 to 1998 Portuguese public investment in transport infrastructure represents more than 1.90% of GDP. More than 70% of such investment is related to road networks. Moreover, in those years transport infrastructure absorbs 13.5% of the European structural funds received by Portugal, 62.2% of which

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[34] Additional controls are introduced for the potential impact of additional variables (such as development stages, industrial compositions, and institutions).

[35] Combes and Overman (2004).

[36] Rodriguez-Pose and Gill (2006) analyze eight major countries finding that the link between trade and regional disparities is stronger when sectoral changes in trade composition are taken into account. In particular, regional disparities increase when primary sector goods lose importance. In the case of Argentina Sanguinetti and Volpe (2009) show that lower sectoral tariffs have been associated with de-concentration of industries out of the area surrounding Buenos Aires. This may reveal the role played by local congestion costs.

[37] Ades and Glaeser (1995), Rosenthal and Strange (2001).

[38] Teixeira (2006).

[39] Holl (2004) reaches a similar conclusion in the case of Spain.

allocated to road networks, increasing the motorway network from 234km to 1393km. As a result, one finds that Portuguese transport costs have fallen dramatically (45% on average) among the Portuguese districts over the reference period.

Contrary to the Portuguese authorities' expectations, however, such a massive decrease in transport costs has not reduced regional imbalances. The reason lies in the specific details of the infrastructural project that gives a strong "network character" to the Portuguese economic space. That the specific details of the project (including the original status quo) matter is testified by the simulated effects of further plans by the Portuguese Ministry of Transports for the transport road network design in 2010. Again the planned investment is huge implying overall transport cost savings of about 42% from 1998 to 2010. Nevertheless, the analysis predicts that this time transport cost reductions would lead to a substantial spatial dispersion of economic activity.

Further support to the conceptual framework is provided by the sectoral pattern of agglomeration. From 1985 to 1998, while transport costs fall in all sectors and spatial concentration rises for Portugal as a whole, only 12 out of 25 sectors experience increased agglomeration. In particular, as predicted by the conceptual framework, these are sectors with significant increasing returns to scale and R&D, such as the high-tech industries (e.g., Medical-surgical and optical, Electronic machinery, Equipment for treatment of information) and some capital goods industries (e.g., Basic Metallurgy, Metal products, and Machinery industries). On the contrary, sectors with limited returns to scale and R&D tend to become more dispersed (e.g., Textile, Clothing and Leather and footwear).

An additional and promising new direction of investigation on the impact of trade barriers focuses on specific instances of large exogenous changes. The most insightful analysis so far uses the separation of Germany at the end of World War II as a "natural experiment" to test the relevance of a conceptual framework based on the same premises as the one of the present paper.[40] In the context of German separation, our conceptual framework has the very clear implication that regions close to the border between East and West Germany should become less appealing locations as their NMPs fall substantially with respect to those of other German regions further away from the border. As a result, mobile factors should avoid those border regions, the local prices of immobile resources and factors should drop and their economic activity should slow down substantially with respect to areas that, being far away from the East-West divide, rely much less on trade links with East Germany. These predictions find support in the estimates according to which, *during the period of German*

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[40] Redding and Sturm (2008).

*division, the accumulated difference in growth between the eastern and western regions of West Germany attributable to the gap in market potential amounts to as much as 33 per cent.*


### 3.3. Spatial inertia

The inertia of "putty clay" geography has been investigated through the examination of the correlations of spatial disparities across sectors and across time.[41]

In the case of Japan, when regional disparities across Japanese regions are measured in terms of population density, their intertemporal rank correlation between 1998 and 1600 is estimated to be equal to 0.83.[42] This is quite striking as, over such a long time horizon, the population of Japan grows by ten times and its economy undergoes an impressive structural change from rural to industrial and then to service-based specialization. Calculating the same correlation across German cities generates a value of 0.84 between 1939 and 1999.[43] Thus, the experience of both countries suggests that *spatial disparities tend to be very stable through time*.

However, while still quite high, the rank correlation for Germany is remarkably lower than that for Japan, which equals 0.93 over a comparable period. Due to the presence of mountains, the fraction of usable territory is much smaller for Japan than Germany. Hence, such discrepancy between the two countries can be interpreted as evidence that *physical geography can be an important determinant of economic geography.*

Turning to the intertemporal correlation of the spatial concentration of sectors, several studies look at US manufacturing. They find that the correlation coefficient of manufacturing across counties is quite high ranging from 0.64 for the period 1860–1987,[44] to 0.92 for the period 1972-1992.[45] Comparable analyses for Ireland and Portugal between 1985 and 1998 reveal smaller but still substantial positive correlations of 0.41 and 0.68 respectively.[46] Overall, *sectoral concentration seems to be rather stable in time.*

When taken together, these results on the persistency of spatial and sectoral concentration suggest that the *impact of trade liberalization and economic integration on regional disparities may be discontinuous as it takes time for the spatial distribution of economic activities to react.*

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[41] Combes, Mayer and Thisse (2008).
[42] Davis and Weinstein (2002).
[43] Brakman et al. (2004).
[44] Kim (1995)
[45] Dumais et al. (2002).
[46] Barrios et al. (2005)

### 3.4. Summary

This section has confronted some of the key components and mechanisms of the conceptual framework with empirical evidence. The findings are quite encouraging:

- The notion of market potential is of guidance in explaining the spatial distribution of firms, workers and returns to immobile resources and factors.

- Trade barriers are important determinants of the location of economic activities and their impact feeds through changes in market potentials.

- This impact is not necessarily smooth as spatial disparities may react discontinuosly to continuous changes in trade barriers.

## 4. Europe, North and South America

The conceptual framework developed in Section 2 and "validated" in Section 3 has introduced the notion of market potential. It has argued that the regional NMP is a good measure of the amount of economic activities a region can support as it takes into account both the size of the local market and the accessibility of other markets from that region.

Against this background, the present section describes the geographical distribution of NMPs within three large areas recently affected by processes of trade liberalization and economic integration: the European Union, the United States of America, and South America. It addresses two main questions: (i) whether NMPs are evenly distributed across regions or not; (ii) whether regional disparities in NMPs have been growing through time or not as trade has become freer.

### 4.1. Regional disparities in the EU

Panel (a) of Figure 2 depicts the distribution of NMPs across EU regions in 2001 (at the NUTS3 level of disaggregation).[47] This panel reveals the presence of a lot of heterogeneity both between and within countries. In particular, it highlights *a distinct centre-periphery gradient from*

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[47] Only other regions within the EU contribute to the calculation of the NMP of a EU region. In all Section 4 distances between regions are calculated as straight-line distances between their major cities. Actual road distances are, instead, used in Section 6.

*tendentially higher NMP for regions close to the geographical centre of the EU to tendentially lower NMP for regions further away.*

This has implications for spatial disparities both between and within countries. Not only southern countries have lower NMPs than central countries, but also southern regions within southern countries tend to have lower NMPs that the corresponding northern regions. A mirror image is evident for northern countries. These have lower NMPs than central countries and their northern regions have lower NMPs than their southern ones. Analogous considerations can be made moving East-West in the map.

Panel (b) of Figure 2 shows, instead, the evolution of regional NMPs across EU regions from 1991 to 2001 spanning the period associated with the implementation of the Single Market Program (SMP). There are two salient features. First, central countries have been less successful in improving their NMPs than peripheral ones (with the notable exception of Italy). This suggests *a fall in cross-country disparities during the implementation of the SMP*. Second, within countries, regions closer to the EU centre have not performed worse than those further away, which suggests that that *interregional disparities within countries may have actually increased* in levels.

Figure 6 provides additional information on these patterns of spatial concentration. Panel (a) refers to the EU as a whole whereas panel (b) looks at Italy. In both panels there are two curves concerning the years 1991 (blue curve) and 2001 (red curve). For the corresponding year each curve plots the distribution of NMPs across (NUTS3) regions. Moving upwards along the vertical axis, regions are ranked in increasing order of NMP. Along this axis a value $y$ denotes the percentile of the $y$% regions with the largest NMPs. The horizontal axis reports, instead, the percentage share of the aggregate NMP across all regions belonging to the regions in the various percentiles. For example, let $x$ be the value on the horizontal axis that corresponds to a value $y$ on the vertical one. Then, for the corresponding year, each figure tells us that $x$% of aggregate NMP belong to the $y$% regions with the largest NMPs.

If all regions had the same NMPs (i.e. equal attraction and accessibility), all pairs of $x$ and $y$ would consist of two identical values. Graphically, this situation is represented by the straight upward sloping diagonal line. At the other extreme, if only one region accounted for almost the entire aggregate NMP, the other regions being negligible (i.e. small and isolated), all values of $y$ would be associated with values of $x$ close to 100. Hence, the further away is a curve from the diagonal, the more concentrated the aggregate NMP is in a few regions.

In both panels the curves in 1991 and 2001 do not coincide with the diagonal, thus signalling the presence of regional disparities in NMPs. The comparison between years reveals, however,

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different evolutions between and within countries. In panel (a) the red curve is generally above the blue one: *in the EU as a whole, regional disparities have fallen from 1991 to 2001*. Differently, in panel (b) the opposite is true. The red curve lies below the blue one except for the 10% top regions. This implies that *in Italy regional disparities have increased from 1991 to 2001*. This has happened as the bottom regions and to some extent also the very top ones have lost ground to the in-between regions.

## 4.2. Regional disparities in the USA

The distribution of NMPs across US states in 2007 is depicted in panel (a) of Figure 3. [48] As in the case of the EU, this panel reveals the presence of a lot of spatial heterogeneity. However, differently from the EU, it highlights a inverse centre-periphery pattern as higher NMPs tend to be associated with states that are further away from the geographical centre of the US. This hints at *the importance that proximity to natural resources and natural means of communication may have for a deeply integrated economy* like the US one.

Panel (b) of Figure 3 depicts the evolution of NMPs across US states from 1997 to 2007 covering the period that followed the implementation of the North American Free Trade Agreement (NAFTA). Its most salient feature is that NMP growth has been biased in favour of the southern and western states. *Proximity to Mexico seems*, therefore, *to have helped these states to improve their NMPs relative to the other US states*. The fact that some of the fast growing states end up being in the lowest ranks of of NMPs in 2007 is also suggestive of a fall in spatial disparities across the USA.

This reduction in spatial disparities within the US does not necessarily conflict with the lack of convergence within EU countries given that several US states are much closer to the notion of EU countries than to the notion of EU regions (NUTS3). Moreover, Figure 7 shows that, when information on concentration patterns is represented as in Figure 6, *no discernible pattern of falling regional disparities emerges*.

## 4.3. Regional disparities in South America

The distribution of NMPs across South American countries in 2007 is depicted in panel (a) of Figure 4. [49] Again, this panel reveals the presence of a lot of heterogeneity between countries.

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[48] Only other states within the US contribute to the calculation of the NMP of a US state.
[49] Only other countries within South America contribute to the calculation of the NMP of a South American country.

However, differently from the EU and the US, one could be tempted to conclude that there is no clear geographical gradient per se. The largest eastern countries indeed enjoy the highest NMPs. However, according to the conceptual framework, the close association between local market size and NMP would be typical of countries that are not very integrated for which local market size is all that matters.

While this may be true to some extent, a closer look at panel (b) of Figure 4 shows that things are more complex that this. The panel depicts the evolution of NMPs across South American countries from 1997 to 2007 spanning a period associated with renewed efforts aimed at deeper integration in the area under the auspices of the Andean Community and MERCOSUR. The panel shows that, during this decade, the largest countries have been less successful than the others in improving their market potential, which has lead to *a fall in spatial disparities across South American countries*.

Moreover, a clearer geographical gradient and further evidence of shrinking disparities appear when one looks within countries. Figure 5 allows us to do that in the case of Brazil. The distribution of NMPs across Brazilian states in 2004 is depicted in panel (a).[50] This panel reveals a lot of heterogeneity among Brazilian states and a distinct gradient as NMPs are the highest for South and South-East states, and fall with distance from them. When matched with the evidence in panel (a) of Figure 4, this finding implies falling NMPs as we move eastward on the map of South America.

Panel (b) of Figure 5 shows, instead, the evolution of NMPs across Brazilian states from 1991 to 2004. The key feature is that South and South-East states have been less successful than others in improving their NMPs. This suggests *falling disparities across Brazilian states*. As in the case of the US, this pattern of fading spatial disparities within Brazil does not necessarily conflict with the persistency of regional disparities within EU countries, the reason being that Brazilian states are much closer to the notion of EU countries than to the notion of EU regions (NUTS3).[51]

The impression of falling regional disparities in South America is reinforced when one looks at the evolution of spatial concentration depicted in Figure 8. Both between countries and within Brazil curves have generally shifted towards the diagonal, thus suggesting that the regions with top NMP account for less of the aggregate NMP than before.

## 4.4.  Summary

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[50] Only other states within Brazil contribute to the calculation of the NMP of a Brazilian state.

[51] See the Appendix for a similar analysis conducted on comparable CAF data for Argentina, Bolivia, Brazil, Chile, Ecuador, Peru and Venezuela using actual road distance between main cities rather than straight-line distance as in this section..

Inspection of the spatial distribution of market potentials across the EU, the USA and South America reveals a lot of heterogeneity. Some regularity, however, emerges:

- Market potentials gradually change from "central" regions to "peripheral" ones.

- The persistency of this gradient after periods of trade liberalization and economic integration shows that spatial disparities are quite resilient.

- At the same time, their resilience seems to vary depending on spatial scale. Spatial disparities among EU countries, among US states, among South American countries and among Brazilian states have been shrinking. This has not happened to spatial disparities within EU countries. Hence, complementarities among economic activities and actors seem to be stronger the finer the spatial scale.

## 5. Applying the conceptual framework: A simple Peruvian example

Section 2.7 has argued that deeper economic integration often involves far reaching infrastructural programs and that, according to the proposed conceptual framework, only infrastructural changes improving the market potential of a certain location are able to attract economic activities towards that location.

The aim of this section is to operationalize these insights by using the proposed framework to discuss the expected implications of a specific infrastructural project involving the consolidation of the *Corredor Vial Interoceánico Sur* (CVIS) in Peru. This is a system of roads connecting the sea ports of San Juan de Marcona, Matarani and Ilo to the main cities of the southern mountain range, Arequipa, Puno and Cusco, and to Iñapari and the triple bonder of Peru, Brasil and Bolivia through the department of Madre de Dios.

The CVIS is an interesting target of analysis because it has been conceived by the Peruvian government as a tool of regional equity with the aim of promoting the economic development of a region whose 6 million inhabitants suffer from a poverty level above the national average. Moreover, by better integrating the regions close to triple border, it is also expected to promote the flows of goods from the Centre West of Brasil and the North of Bolivia to the Southern ports of Peru.

## 5.1. *Corredor Vial Interoceánico Sur (CVIS)*

The CVIS is considered the biggest road paving project in the history of Peru. It involves a total road length of about 2.600 km between Peru and Brasil, 1.015 km of which are currently not paved. It covers the southern departments of Madre de Dios, Cusco, Apurímac, Ayacucho, Puno, Arequipa, Moquegua and Tacna, which account for 32% of Peru's territory and 20% of its population.

Administratively, the roads targeted by the CVIS are divided in five administrative Sections (*Tramos*) but paving essentially concerns Sections 2, 3 and 4 (see Figure 9). Section 2 goes from Urcos, in the Department of Cusco, to Puente Inambari, in the Department of Madre de Dios. Section 3 goes from Puente Inambari, through Puerto Maldonado (capital city of Madre de Dios), to Iñapari at the triple border of Peru, Brasil and Bolivia. Section 4 goes from Puente Inambari to Azángaro, close to Juliaca in the Department of Puno. These three sections represent the only part of the *Red Vial National* serving the South West of Peru and are the only road connection between the Department of Madre de Dios and the rest of Peru through the steep mountain range.

## 5.2. *The impact of CVIS on regional market potentials*

Will the CVIS achieve its stated objective in terms of regional equity? Will the Peruvian regions directly involved in the project become more attractive locations for economic activities? This is clearly a complex question whose answer goes much beyond the scope of the present paper. It nonetheless provides a useful example showing how the proposed conceptual framework could prove a useful complementary tool of analysis within a more general assessment of the regional impact of the CVIS.

According to the framework, in order to see whether the regions directly involved in the CVIS can be expected to become more attractive locations for economic activities, one has to check whether or not the project increases their market potentials with respect to other peruvian regions.

Panel (a) in Figure A.6 depicts the distribution of market potentials across Peruvian regions. These potentials, differently from those presented in Section 4., are based on actual road distances rather than straight-line distances. Ideally, one would also like to adjust the various road distance measures to account for the speed of the corresponding connections as determined by steepness, roughness, windingness, paving and climatic conditions. Together with estimates of the expected time saving from the CVIS, those pieces of information would allow for a direct assessment of the impact of

that project on the geography of regional market potentials. Unfortunately the data required for such a direct assessment are currently unavailable. Hence, the aim here is only to illustrate through a simple example how the methodology based on the proposed conceptual framework works by taking a very indirect route to measuring the improvements in road connections in South-Eastern Peru.

To understand the limits of the example and how future research could improve on them, it is important to fully spell out its working assumptions. First of all, the analysis is restricted to the market potential of Peruvian regions as calculated by considering only their ease of access to the Peruvian market. Thus, the fact that the CVIS will improve the access from Peru to Brasil and Bolivia is not taken into account. Second, the effect of the CIVS on distance are measured as an improvement in the efficiency of the roads between the main cities of the relevant departments, namely Cusco, Puno and Puerto Maldonado. Third, improved efficiency is modelled as a "virtual" reduction of road distance between Puerto Maldonado and Cusco (Section 2 and 3) as well as between Puero Maldonado and Puno (Sections 3 and 4) given that Cusco and Puno are already linked by a paved highway.

The logic is that paving and all accompanying infrastructure increase the speed of road connection and this is equivalent to a virtual fall in road distance. Taking straight-line distance as given, road "efficiency" is calculated as the ratio of straight-line to road distance. This measure ranges from 0 when there is no road connection (i.e. the road is "infinitely long") to 1 when the road takes the direct straight route. It is, therefore, an indirect measure of the windingness of the road. When calculated for the roads linking Cusco to Puerto Maldonado (unpaved), Puerto Maldonado to Puno (unpaved) and Puno to Cusco (paved), the efficiency values are 0.59, 0.45 and 0,85 respectively. This reveals that the second road is almost twice as winding as the third, which is itself roughly 30% less winding than the first. The following calculations assumes that the CIVS will bring road efficiency from Cusco to Puerto Maldonado and from Puerto Maldonado to Puno at the same level as road efficiency between Puno and Cusco. This roughly corresponds to a virtual decrease in road distance from Puerto Maldonado to Cusco and Puno by roughly 30% and 55% respectively. Equivalently, it roughly corresponds to an increase in the speed of road connections from Puerto Maldonado to Cusco and Puno by roughly 40% and 90% respectively. This is not too far from harmchair evidence based on worldwide differential speed limits between paved and unpaved roads. Yet, with respect to those speed limits, it has the advantage of also taking someway into account that the effect of paving depends on other characteristics of roads such as steepness, roughness, windingness and climatic conditions. Taking the away between Cusco and Puno as reference tries to

control for some of those features: paving can hardly make crossing the mountains from Peru into the Amazones easier for trucks than driving from Cusco to Puno.

The results of this thought experiment are reported in Figure 10. This shows a huge increase in the market potential of Madre de Dios, which almost triples as the department gains easier access to all other Peruvian regions. Quite naturally, the gain in market potential is much smaller for the other departments as, in the experiment, they gain better access only to Madre de Dios. The relative sizes of these smaller gains reflect the fact that access to Madre de Dios is more important for closer departments with smaller GDPs. Note, however, that larger increases should be expected for all departments once better access to Bolivia and Brasil through the CVIS were also taken into account.

## 5.3.  *Summary*

The proposed conceptual framework can be used to understand the possible impacts of large projects of regional integration. This section has used the CVIS in Peru as an example in order to show the methodology at work. This large infrastructural project will improve the road connection of Puerto Maldonando to Cusco and Puno.

Conditional on caveats due to current data limitations, the analysis has revealed that, as a result of CVIS, the now isolated department of Madre de Dios will experience a huge increase in its market potential thanks to better access to other Peruvian regions. Moreover, given that, thanks to the CVIS, Madre de Dios will also become a better "gate" region for merchandise traffic among Peru, Bolivia and Brasil, there are all the premises to expect that Madre de Dios become a much more attractive location for economic activities.

## 6.    *Conclusion*

What is the impact of trade liberalization and economic integration on regional disparities? The present paper has proposed a conceptual framework to address this question based on recent developments in the theory of international trade and geographical economics.

The framework has been validated on state-of-the-art empirical evidence and then used to interpret the evolution of spatial disparities in regions that have been involved in processes of trade liberalization and economic integration.

On the one hand, there is no evidence that these policies have increased spatial disparities among countries. Indeed, there is some evidence that these disparities have actually fallen after liberalizing the mobility of goods and factors.

On the other hand, the evolution within EU countries seems to suggest that spatial disparities are more resilient at the regional level. According to the conceptual framework, this may be due the fact that complementarities among economic activities and actors operate at a fine spatial scale.

Finally, a temptative analysis of the possible impact of the *Corredor Vial Interoceánico Sur* (CVIS) in Peru has been used to show how the proposed conceptual framework can be used to shed light on the effects of large regional integration projects.

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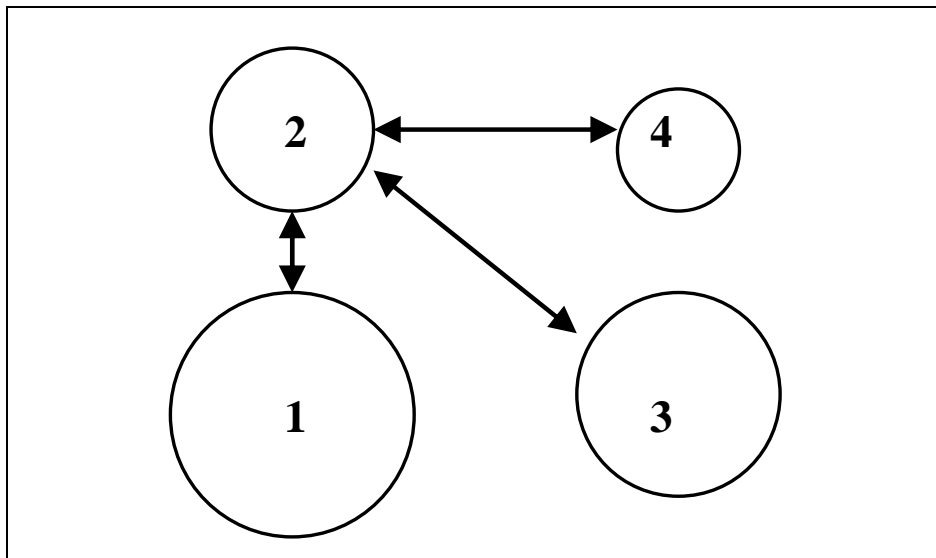
**Figure 1 - Region 2 is smaller than region 1 but has higher market potential**
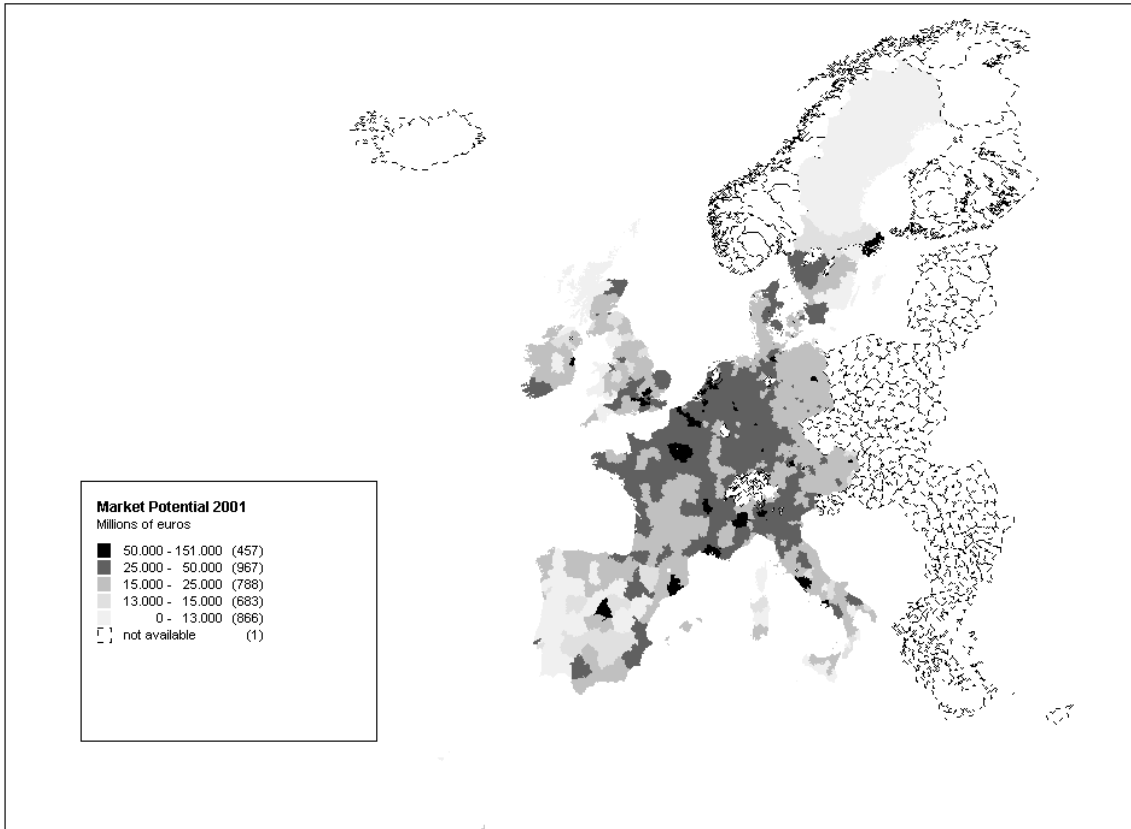
**(a)**
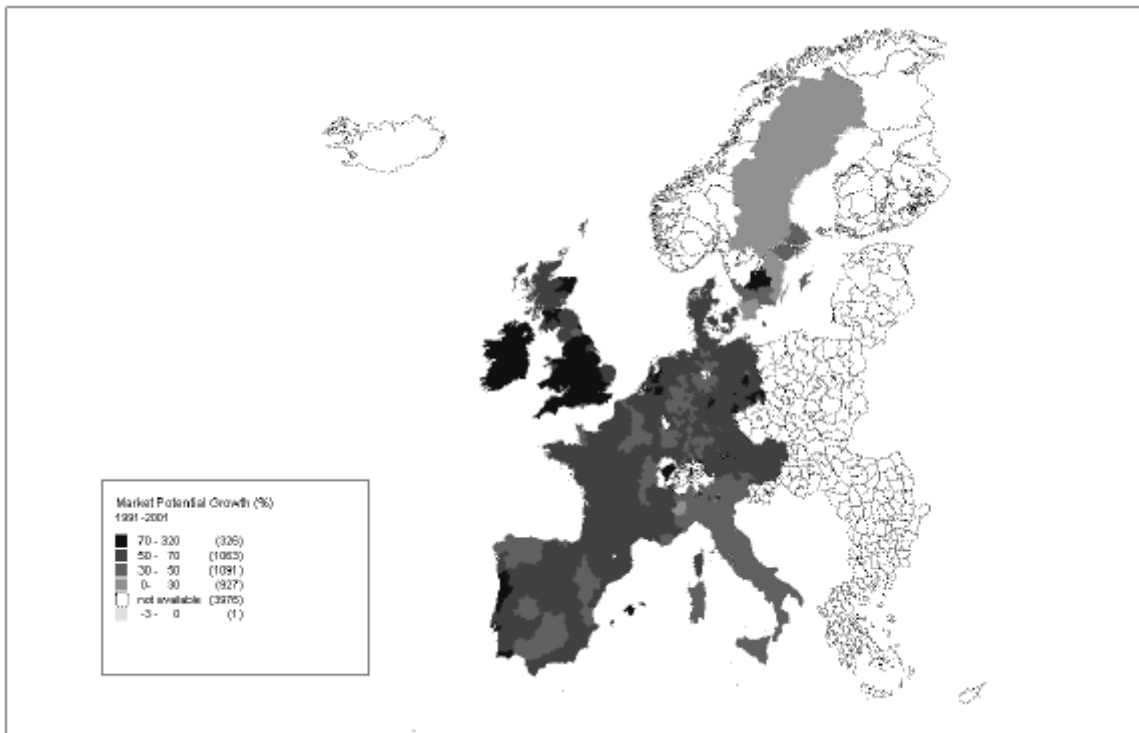


**(b)**

**Figure 2 – European Union (1991-2001)**
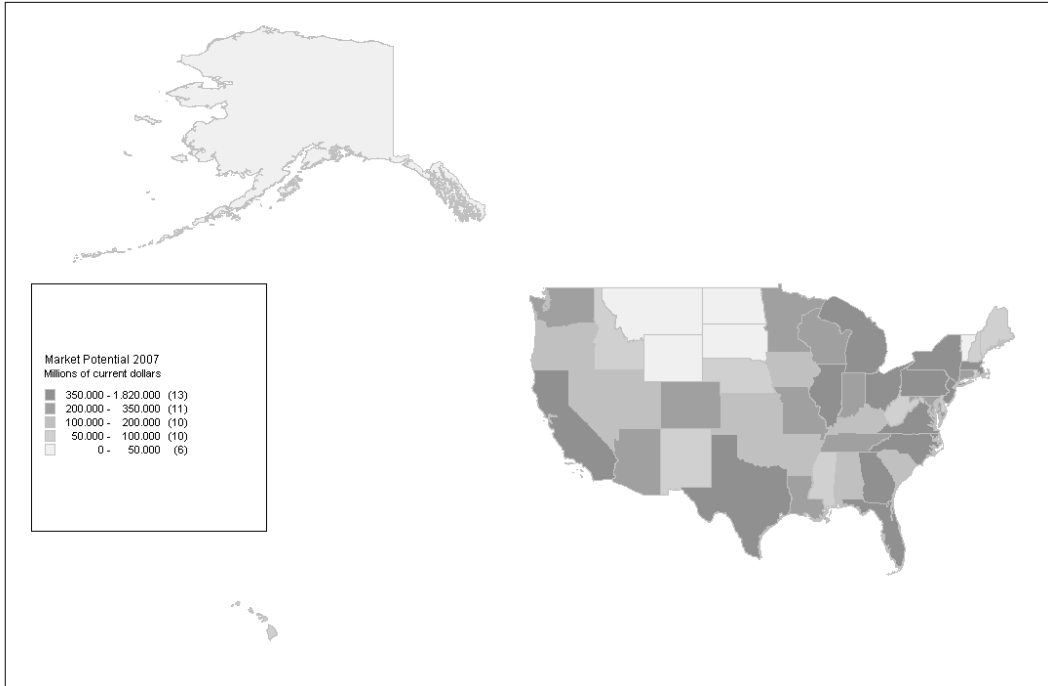
**(a)**



**(b)**

**Figure 3 – United States of America (1997-2007)**
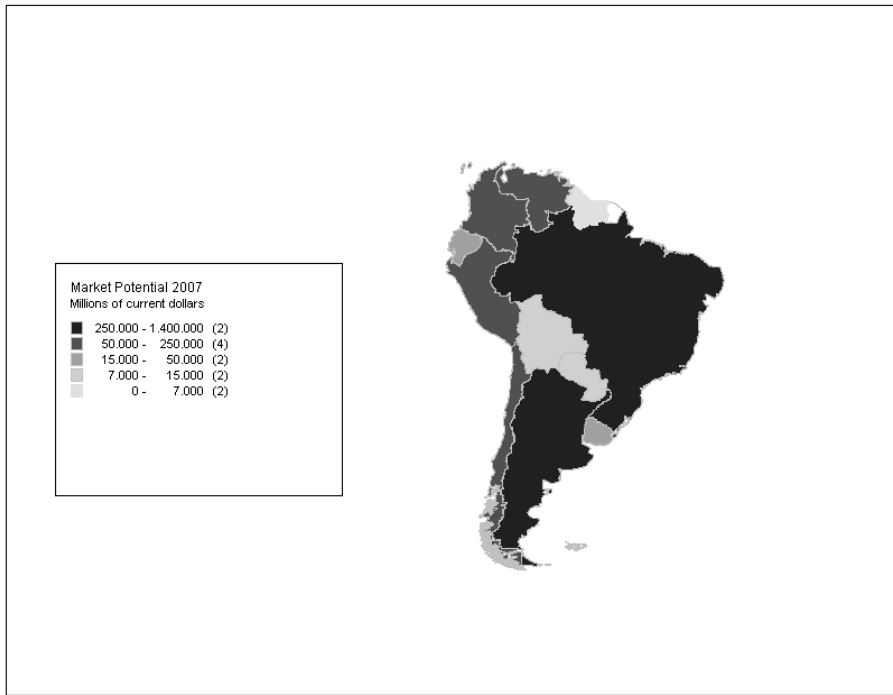
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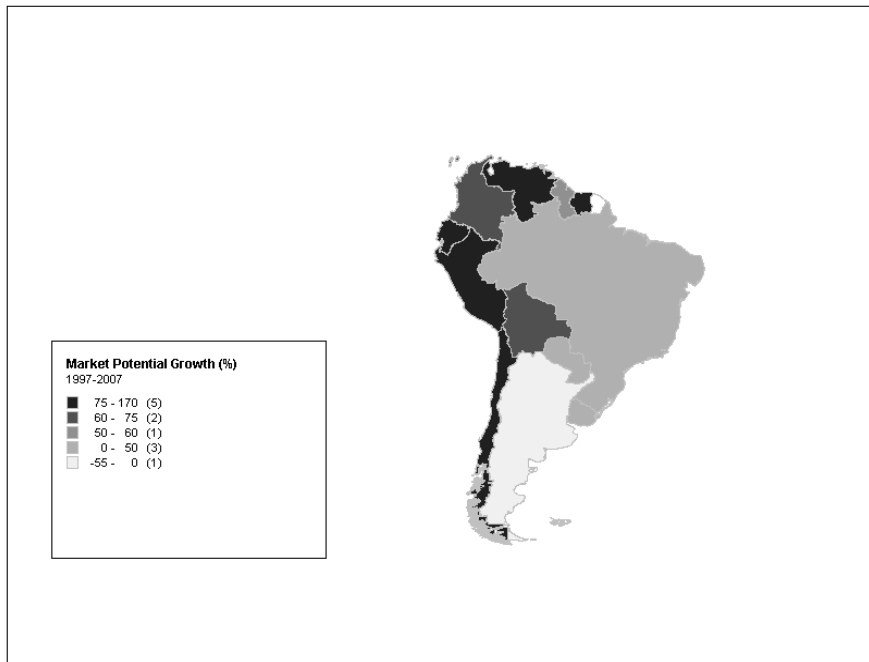


**(b)**

**Figure 4 – South America (1997-2007)**
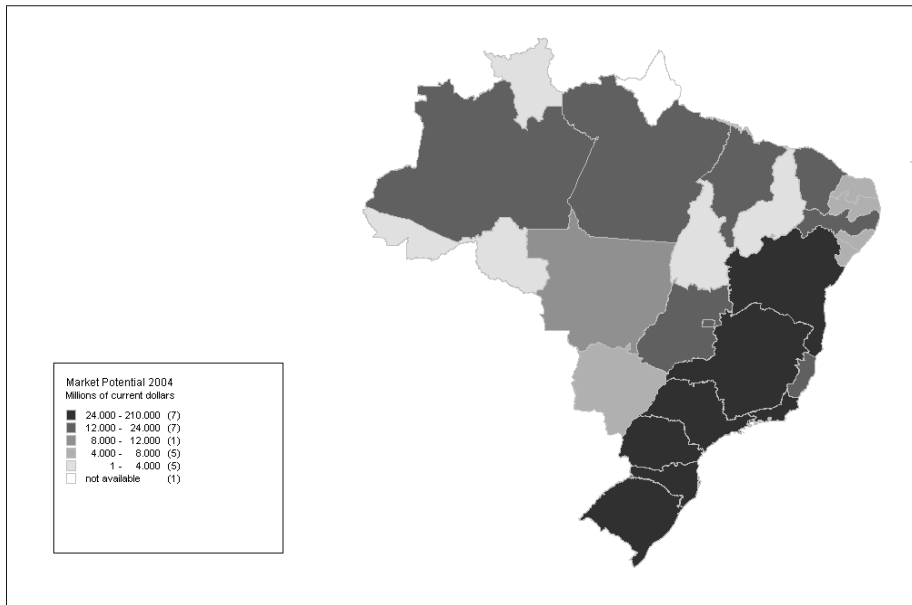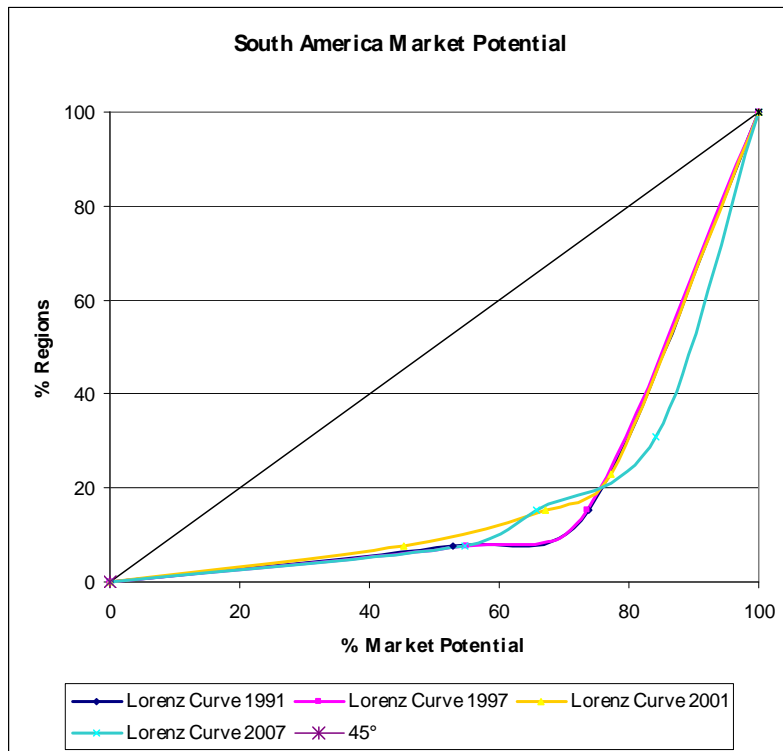
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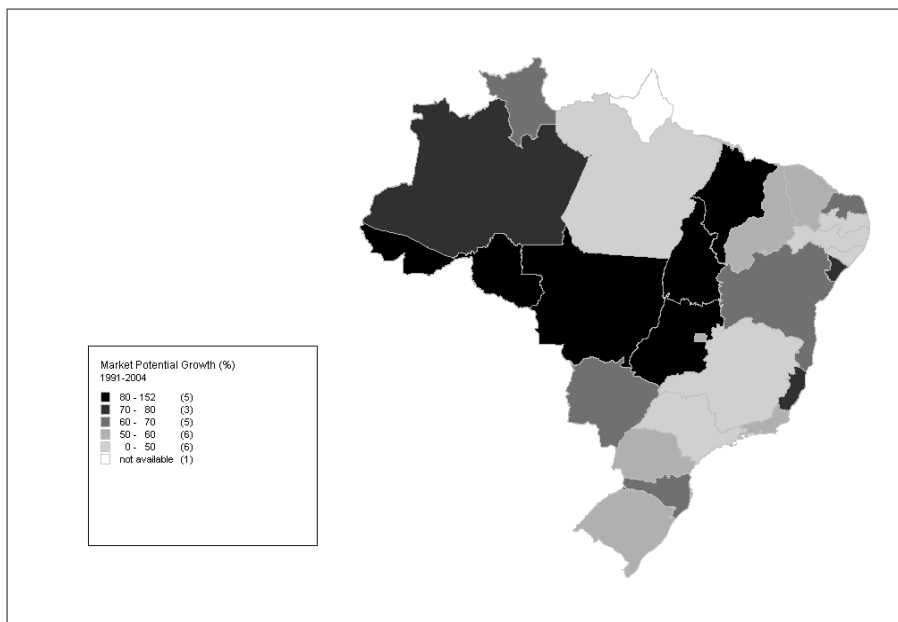


**(b)**

**Figure 5– Brazil (1991-2004)**
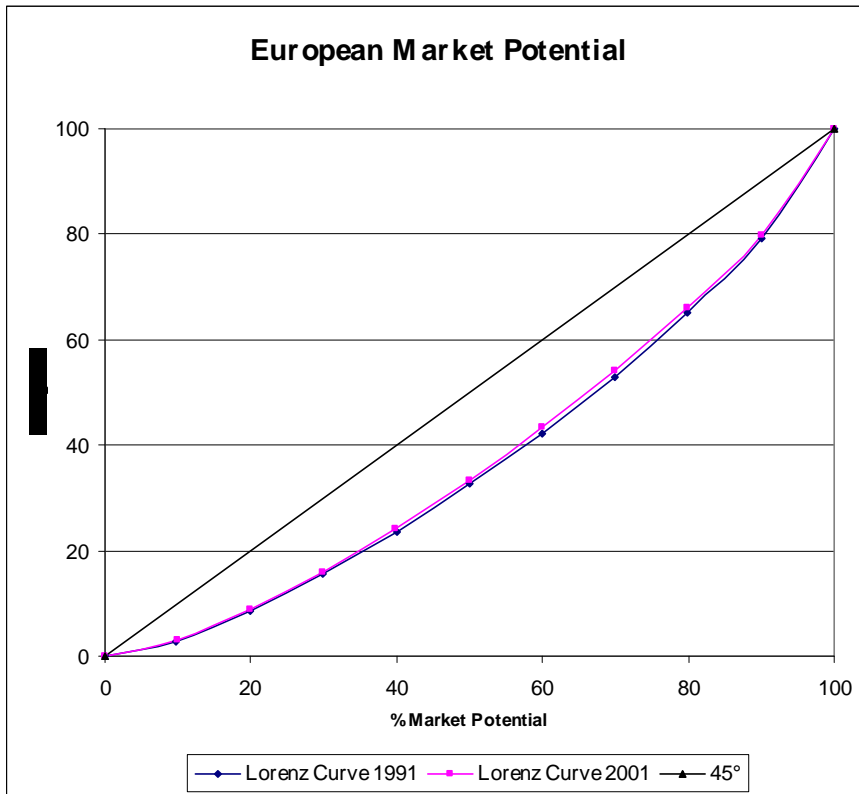
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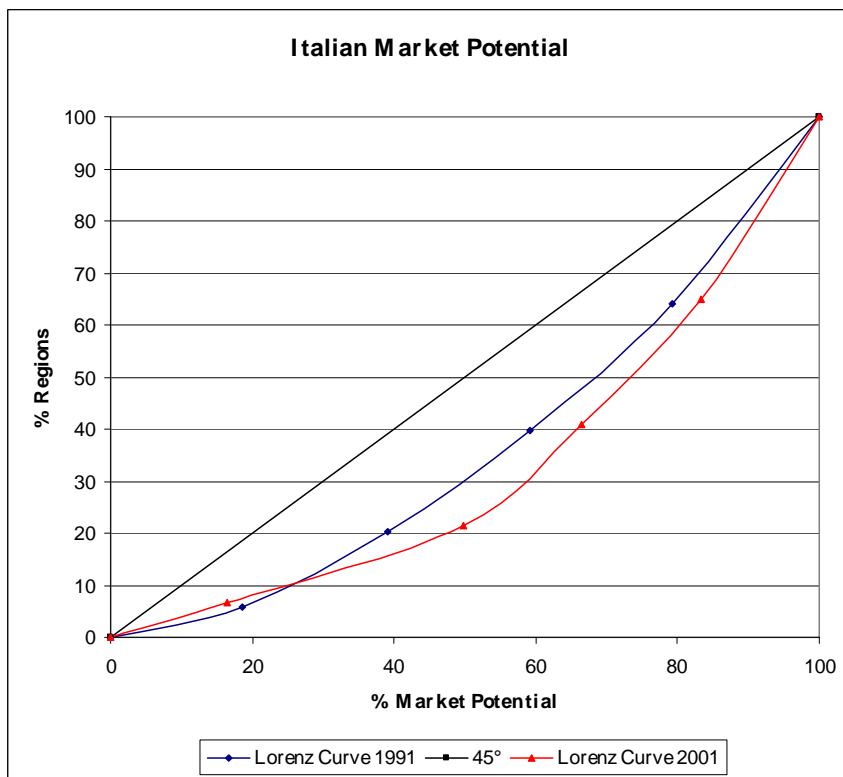


**(b)**

**Figure 6 – Between and within NMP concentration in the EU (1991-2001)**
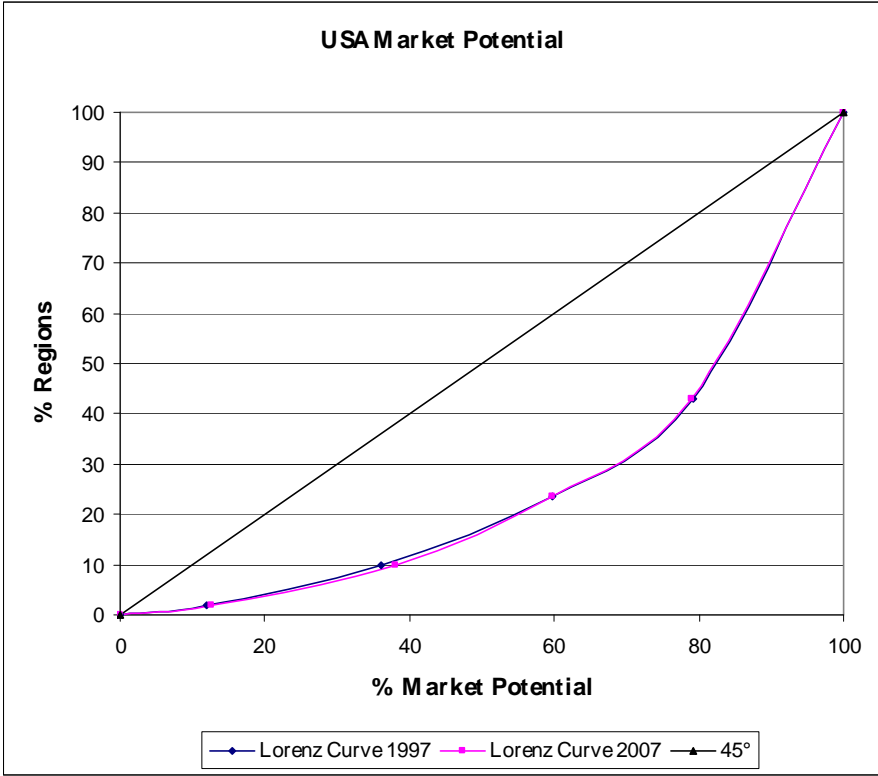
**Figure 7 – NMP concentration in the USA (1997-2007)**

**(a)**
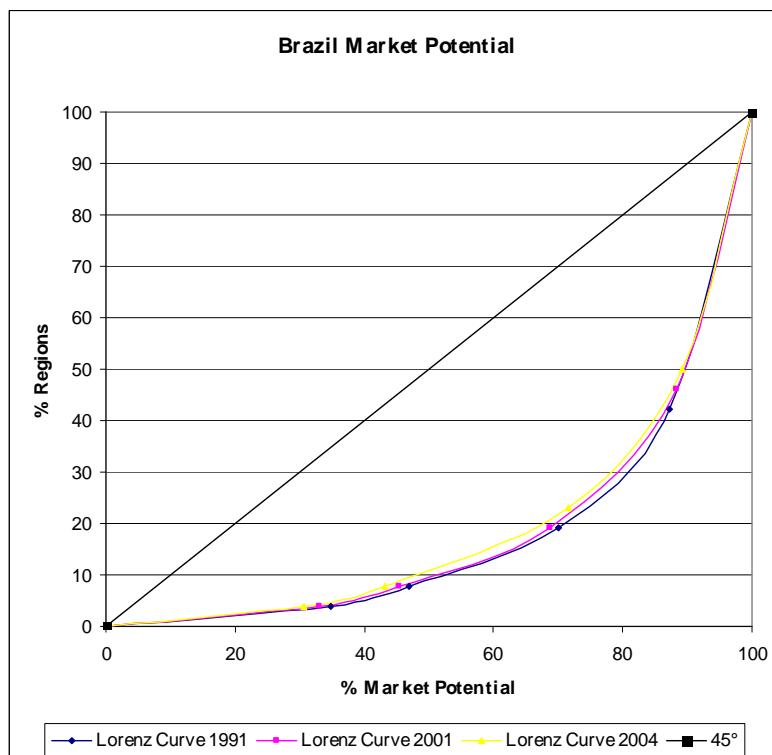


**(b)**

**Figure 8 – Between and within NMP concentration in South America (1991-2001)**
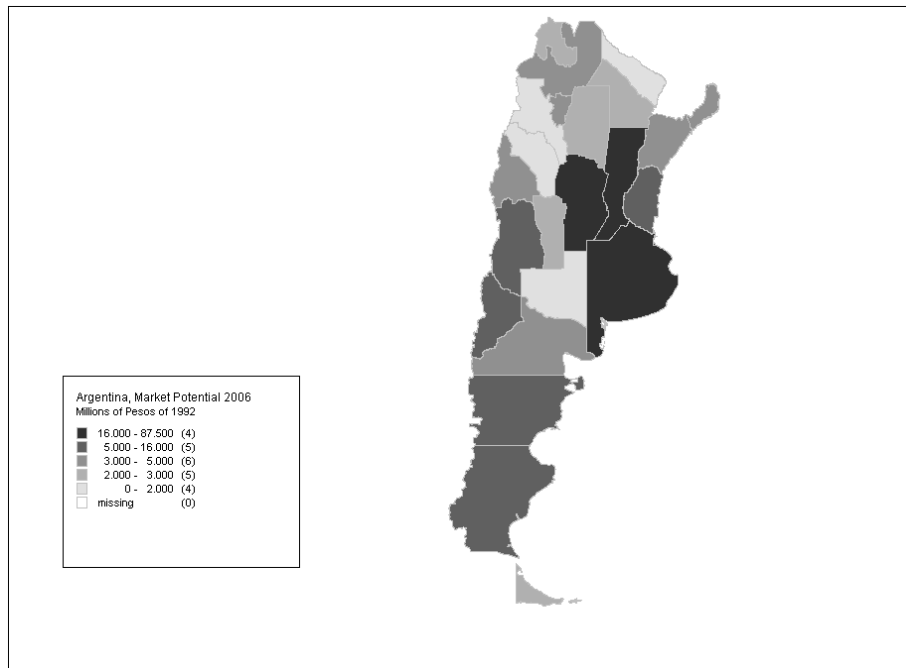
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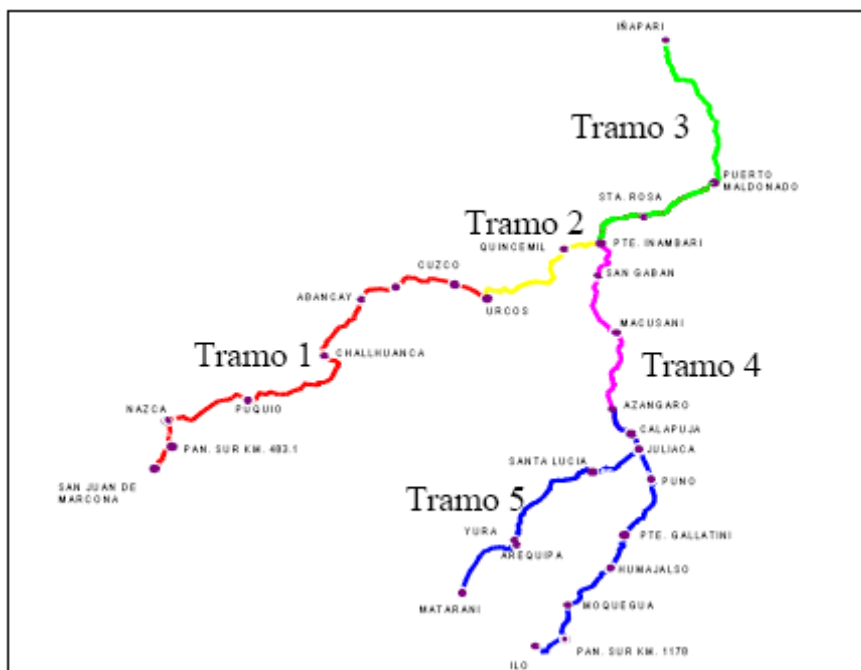


**(b)**

**Figure 9 – Corredor Vial Interoceánico Sur (CVIS)**

|                | Growth (%) |
|----------------|-----------:|
| Lima y Callao  | 0,01       |
| Piura          | 0,02       |
| La Libertad    | 0,03       |
| Cajamarca      | 0,03       |
| Lambayeque     | 0,04       |
| Ancash         | 0,04       |
| San Martín     | 0,05       |
| Ucayali        | 0,09       |
| Junín          | 0,09       |
| Amazonas       | 0,11       |
| Pasco          | 0,12       |
| Huánuco        | 0,13       |
| Ica            | 0,13       |
| Tumbes         | 0,14       |
| Arequipa       | 0,18       |
| Huancavelica   | 0,33       |
| Ayacucho       | 0,50       |
| Cusco          | 1,14       |
| Moquegua       | 1,19       |
| Tacna          | 1,36       |
| Puno           | 1,81       |
| Apurímac       | 2,48       |
| Madre de Dios  | 186,24     |
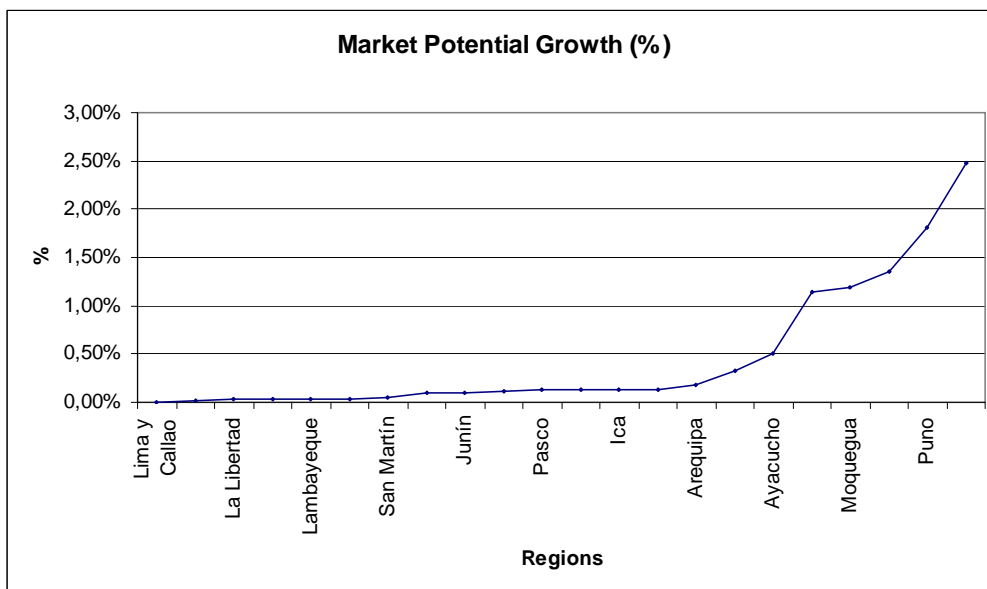
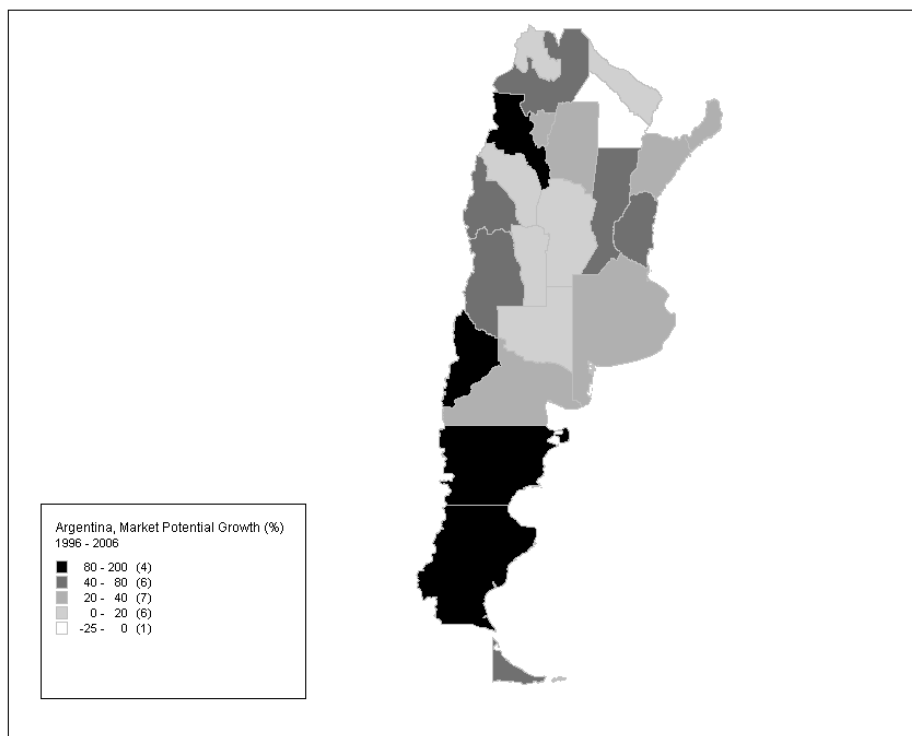

**Figure 10 – The impact of CVIS on market potentials in Peru**

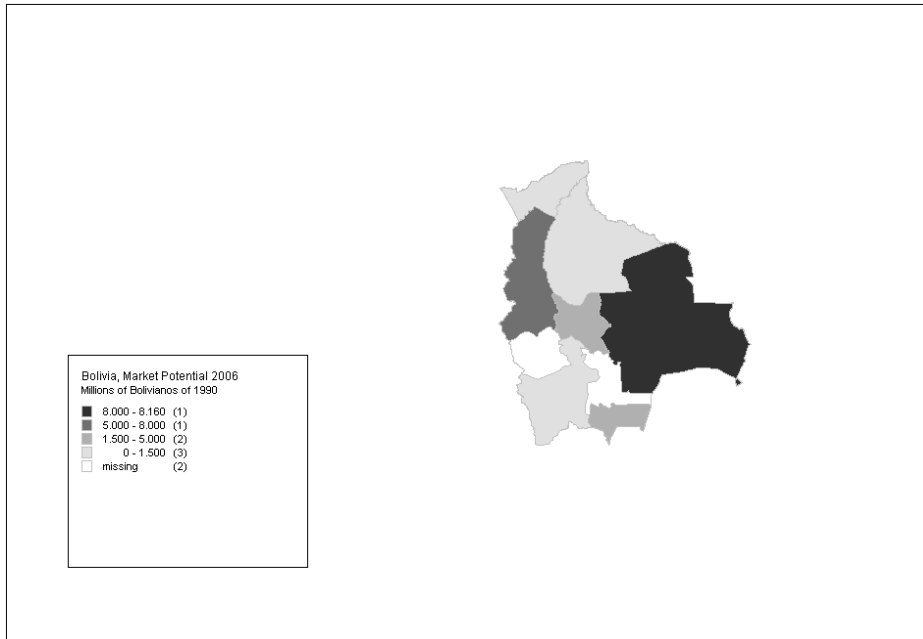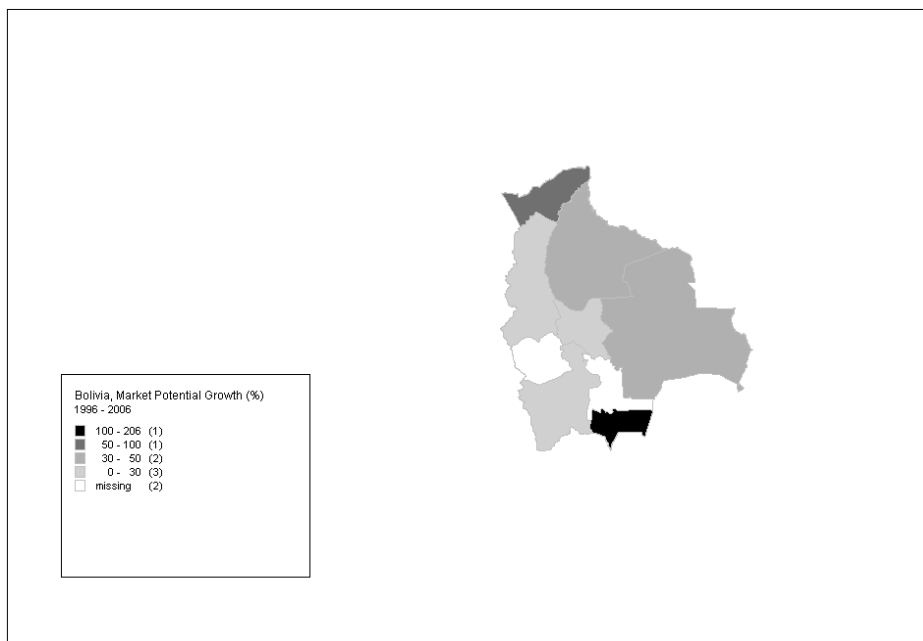# APPENDIX: Regional disparities in South America by country



Argentina, Market Potential 2006
Millions of Pesos of 1992

16.000 - 87.500  (4)
5.000 - 16.000  (5)
3.000 -  5.000  (6)
2.000 -  3.000  (5)
    0 -  2.000  (4)
missing          (0)

**(a)**



Argentina, Market Potential Growth (%)
1996 - 2006

80 - 200  (4)
40 -  80  (6)
20 -  40  (7)
 0 -  20  (6)
-25 -   0  (1)

**(b)**

**Figure A.1– Argentina  (1996-2006)**

Bolivia, Market Potential 2006
Millions of Bolivianos of 1990

■ 8.000 - 8.160 (1)
■ 5.000 - 8.000 (1)
■ 1.500 - 5.000 (2)
□ 0 - 1.500 (3)
□ missing (2)

**(a)**



Bolivia, Market Potential Growth (%)
1996 - 2006

■ 100 - 206 (1)
■ 50 - 100 (1)
■ 30 - 50 (2)
□ 0 - 30 (3)
□ missing (2)

**(b)**

**Figure A.2– Bolivia (1996-2006)**
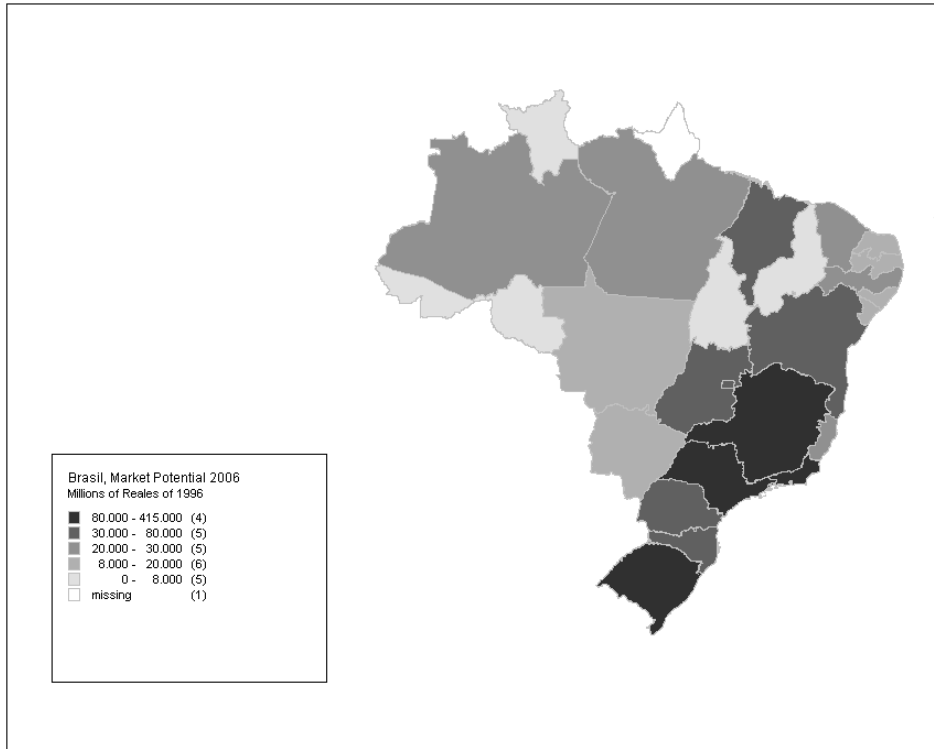
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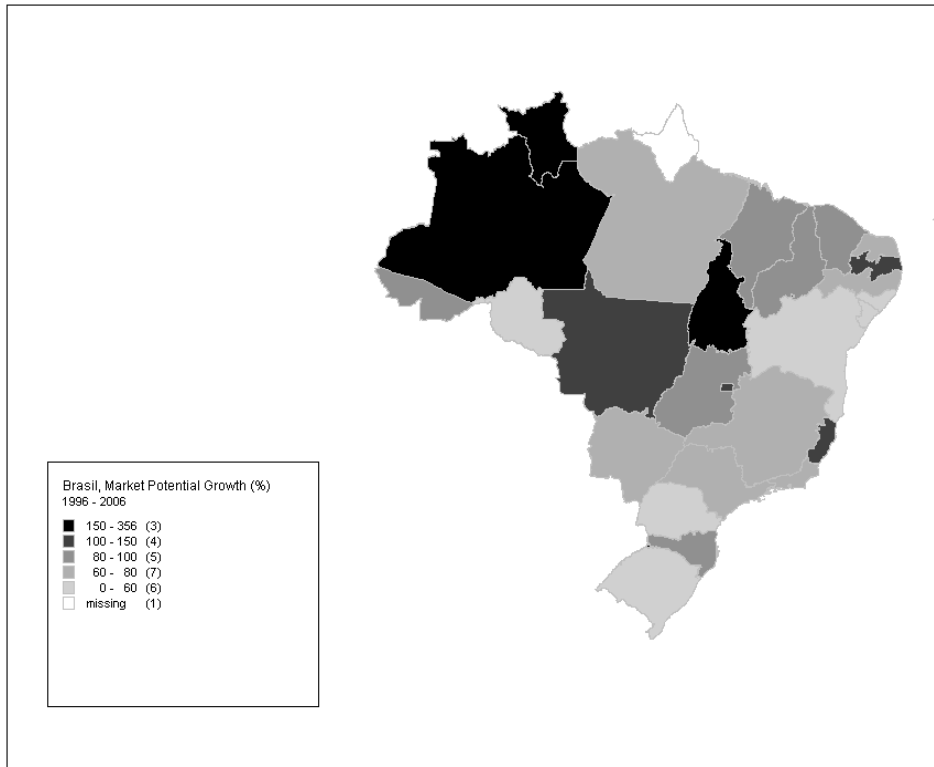


**(b)**

**Figure A.3– Brazil (1996-2006)**
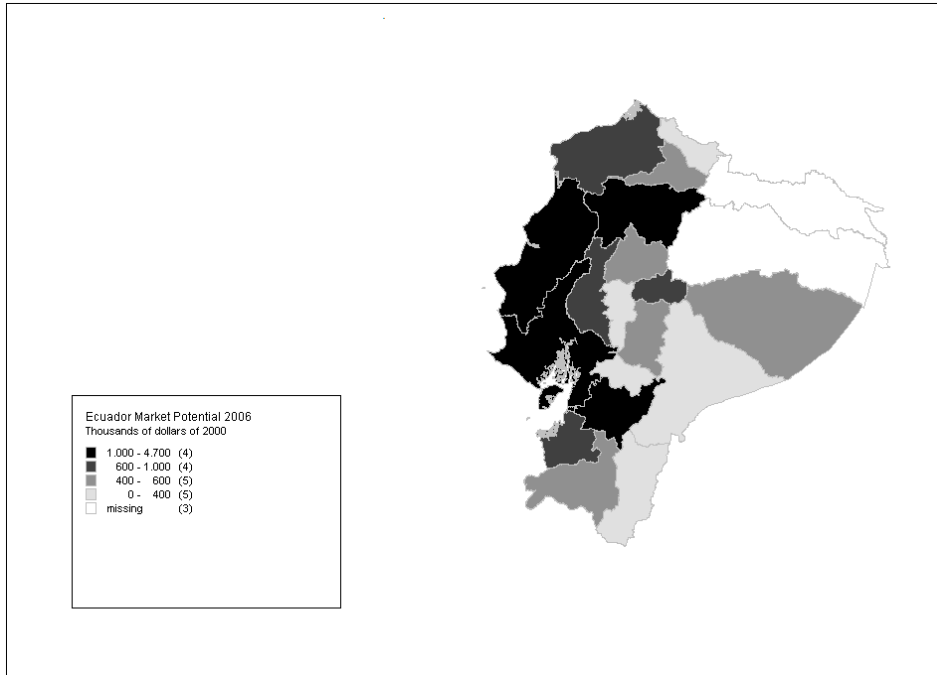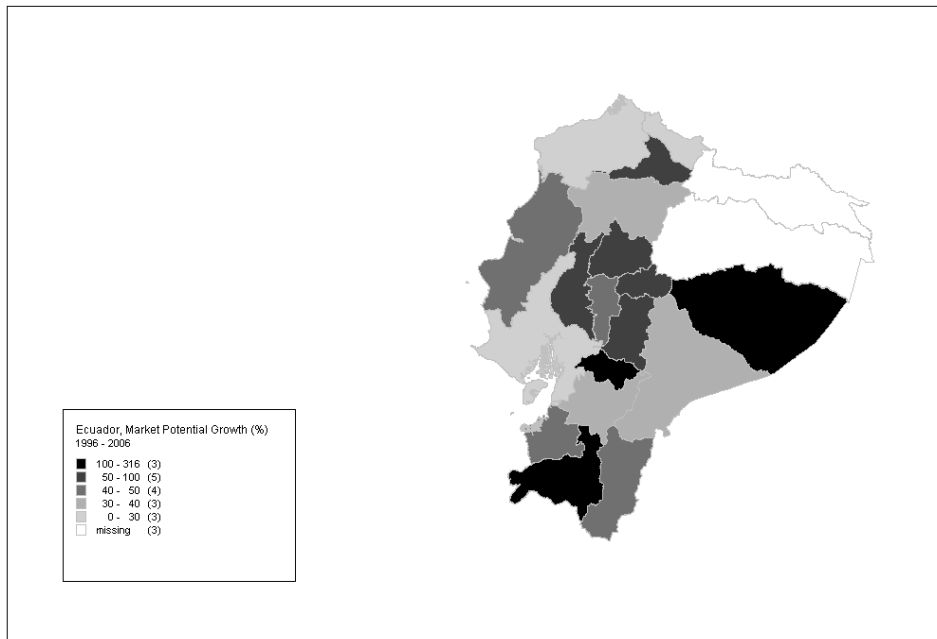
44

**(a)**

Chile, Market Potential 2006
Millions of Pesos constant of 1986

- ■ 800.000 - 4.100.000 (1)
- ■ 500.000 - 800.000 (3)
- ▨ 250.000 - 500.000 (3)
- ▨ 0 - 250.000 (3)
- □ missing (3)

**(b)**

Chile, Market Potential Growth (%)
1996 - 2006

- ■ 56 - 60 (2)
- ▨ 45 - 56 (2)
- ▨ 35 - 45 (4)
- ▨ 0 - 35 (2)
- □ missing (3)
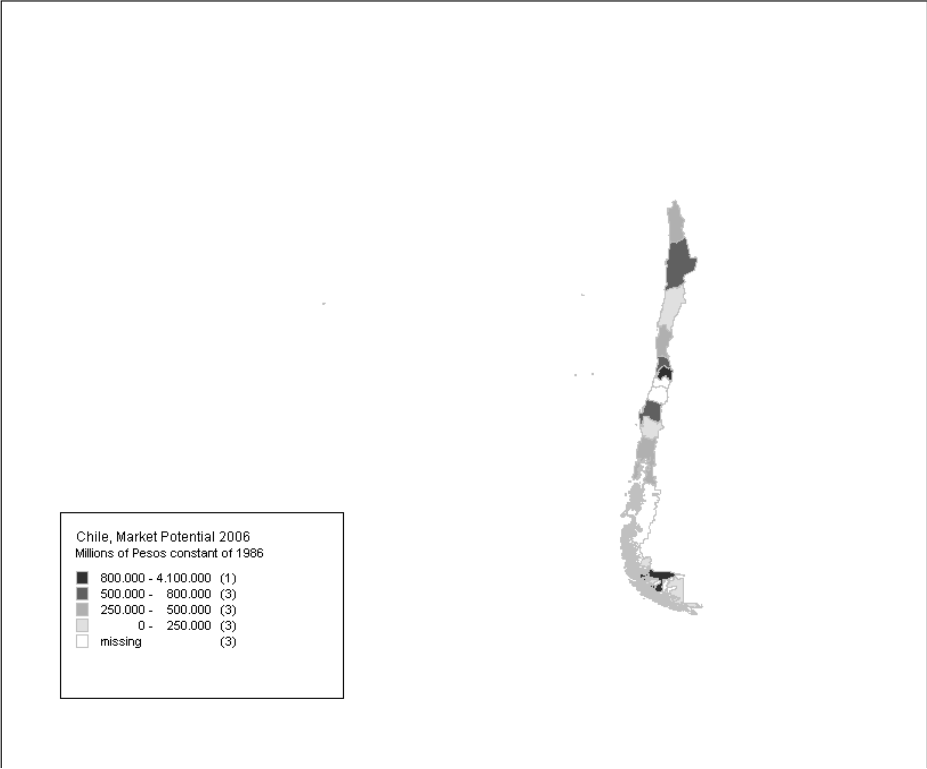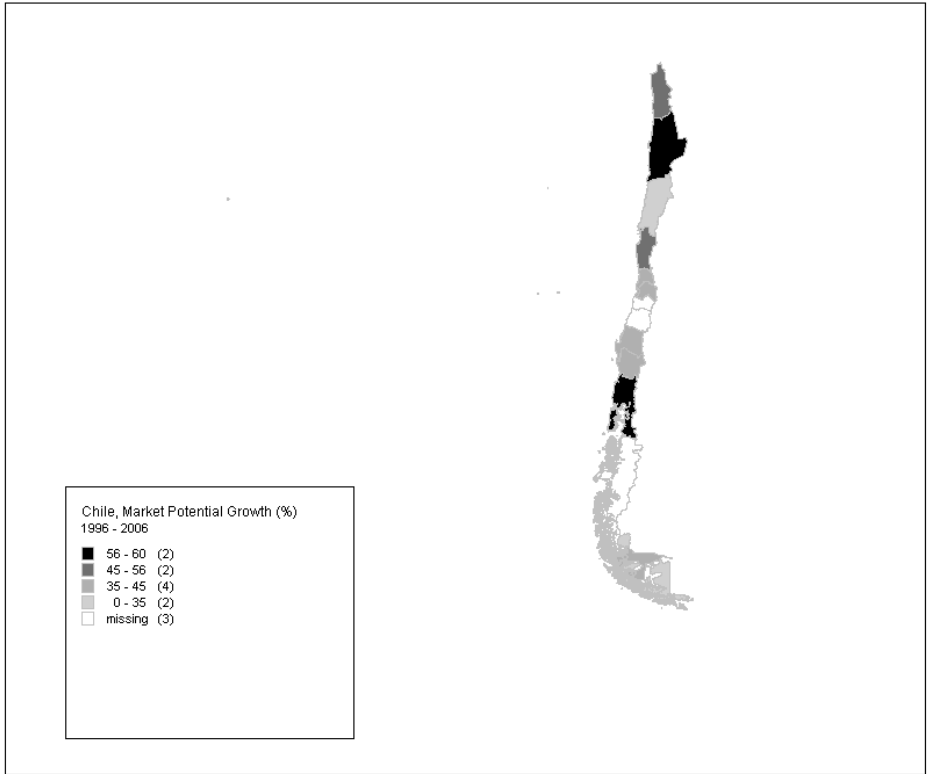
**Figure A.4– Chile (1996-2006)**

**(a)**



**(b)**

**Figure A.5– Ecuador (1996-2006)**

Peru, Market Potential 2006
Thousands of Nuevo Soles constant of 1994

■ 5.500 - 8.200 (4)
■ 4.000 - 5.500 (4)
■ 2.000 - 4.000 (5)
■ 1.500 - 2.000 (5)
□ 0 - 1.500 (5)
□ missing (2)

**(a)**



Peru, Market Potential Growth (%)
1996 - 2006

■ 65 - 90 (5)
■ 55 - 65 (6)
■ 35 - 55 (6)
□ 0 - 35 (6)
□ missing (2)
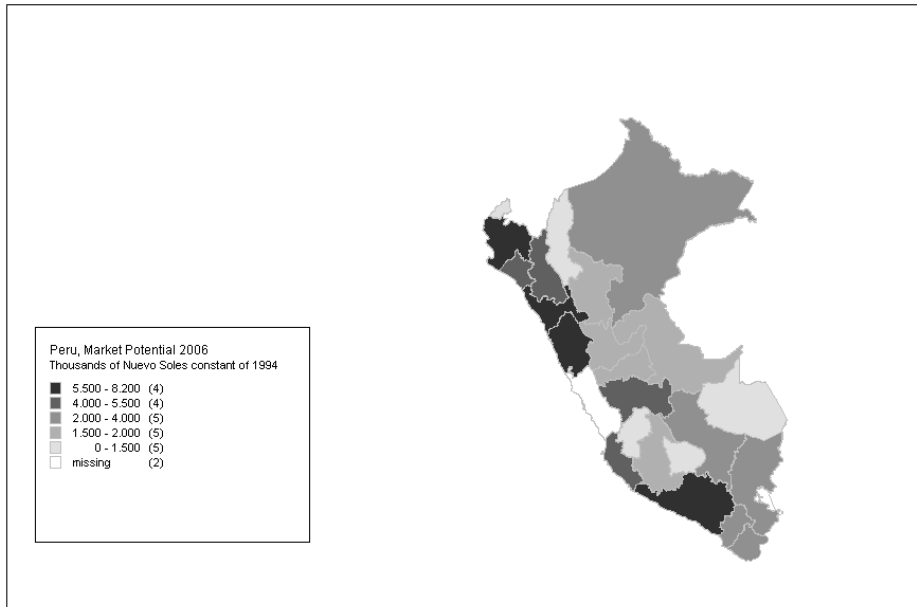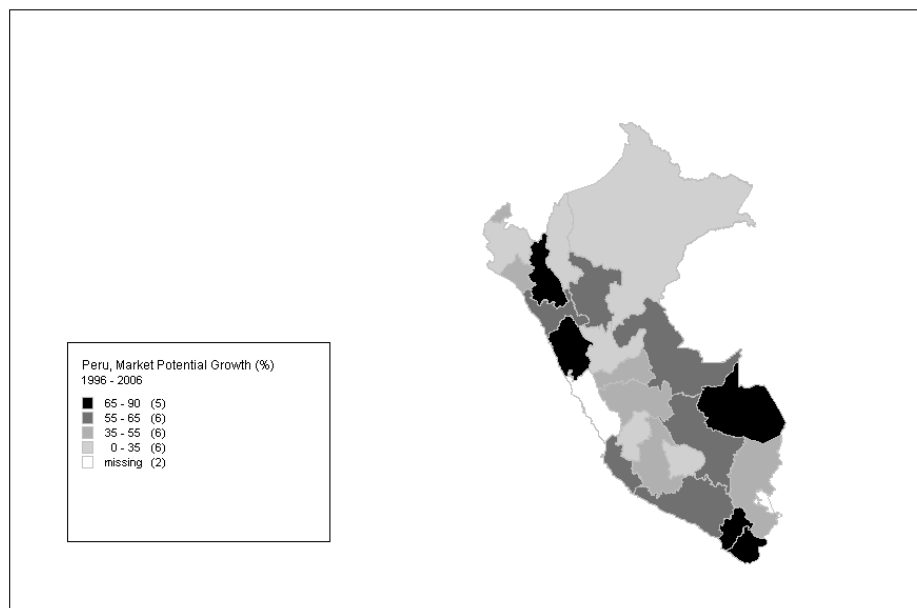
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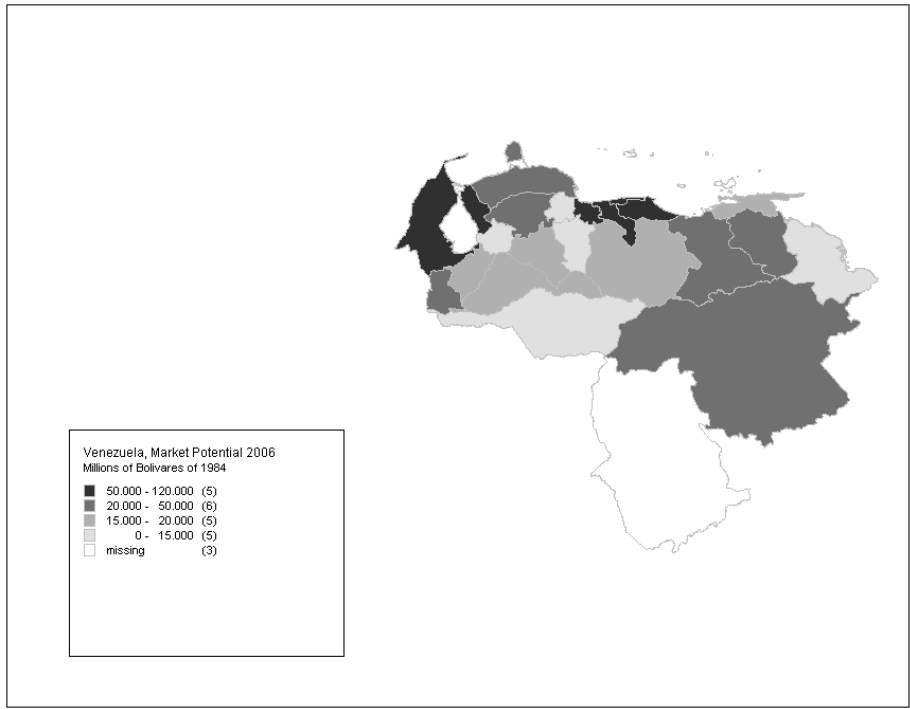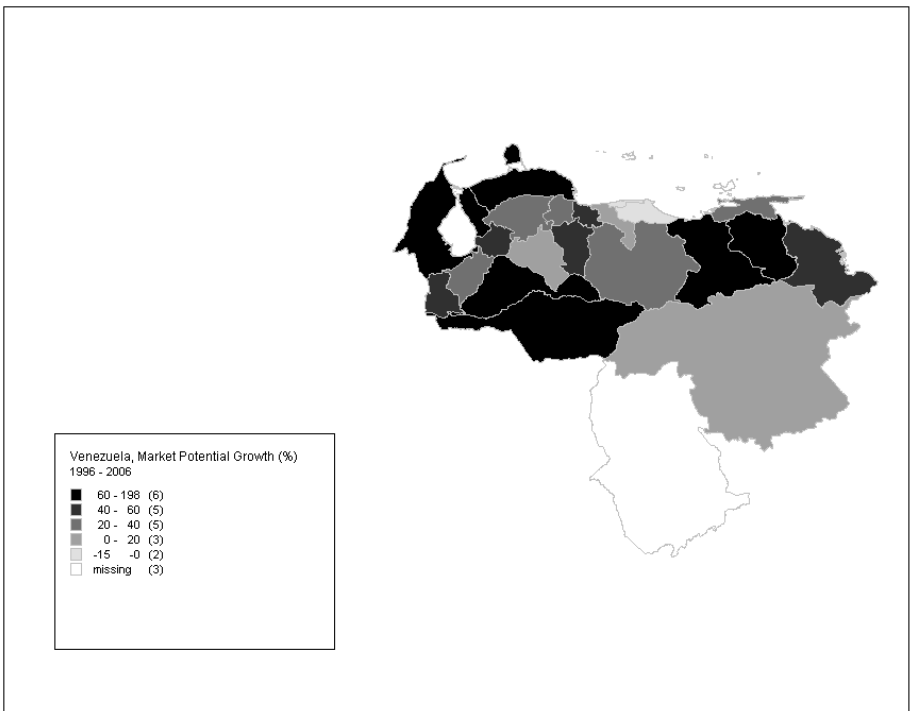
**Figure A.6– Peru (1996-2006)**

**(a)**



**(b)**

**Figure A.7– Venezuela (1996-2006)**